



THE MORROW PROJECT



4TH EDITION

Onyosa

THE MORROW PROJECT

4TH EDITION

One hundred and fifty years after the fall of civilization, the members of the Morrow Project wake to a changed world. Without the modern transit and communications infrastructures, distances that once took hours, now take weeks, and news that once traveled in milliseconds now takes months to arrive, if ever. This new world is characterized by tiny hamlets of simple daily existence awash in a sea of barbarism and anarchy.

The Morrow Project could not prevent the coming catastrophe, nor did they have the resources to help everyone immediately. It was possible to help with the rebuilding, but even this was a massive undertaking. Plan became action and over the years many well-trained teams were cryogenically frozen in hidden bunkers to emerge at the time when their resources and help could do the most good.

Intended to be part of an organized plan to re-build America, your team finds that they have missed the 3-5 year expected wake-up call. Now, far outside the original time frame and unable to contact the rest of the project, they must start alone the process that was intended for thousands.

Isolated in a world where the war is only a distant legend, your team must rely on their ingenuity, training and each other to carry out the general orders of the project:

1. Assist the population in rebuilding America whenever possible.
2. Reunite with the bulk of the Morrow Project forces.
3. Survive!

The Morrow Project may be played with nothing other than this book, dice, paper and pencil. Included in this book are full details on Morrow Project teams, vehicles, equipment, modern weapons, complete medical details, people and creatures living in the post-holocaust world, and more.



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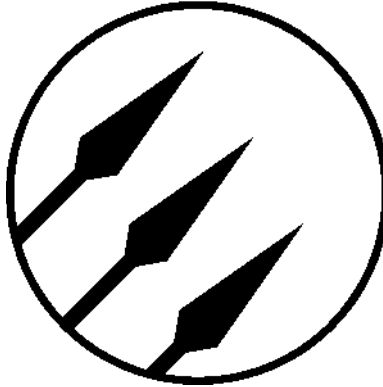
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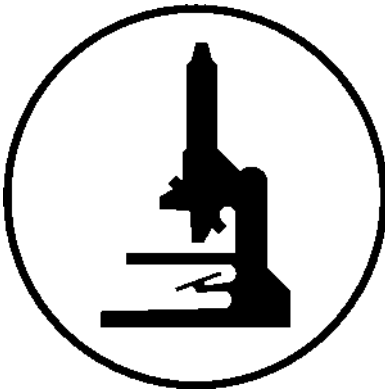
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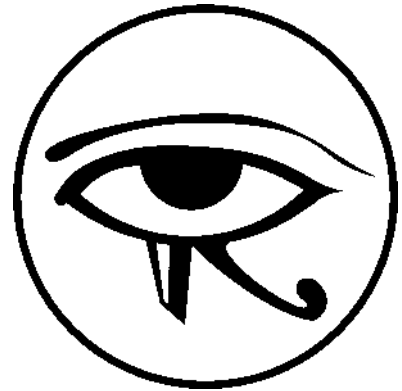
MARS



SCIENCE



RECON



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THE MORROW PROJECT - 4TH EDITION

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Thanks also to all those patient fans of The Morrow Project, even after all those promises of 'it'll be out next year.'

Special Thanks goes to those who first brought us The Morrow Project; Kevin Dockery, Robert Sadler and Richard Tucholka.

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FOREWORD

Welcome to the 4th edition of The Morrow Project.

I'm sure many of you were wondering if this day would ever come. Much like the Project itself, the game has been cryogenically frozen ready for the wake-up call. The game comes to you now, after years of waiting, ready to bring hope to those loyal gamers who survived what some predicted to be the very end of gaming itself.

Some, now that you have the book, will be wondering what on earth has happened to the game. It has changed a little, and when I say a little I actually mean a lot. The earlier editions of the game were slightly confused on which set of rules were being used. I remember picking up the game back in the early 90's, and, being a big fan of the Chaosium rule system, proceeded to run my Friday night group through the first scenario. However, those game sessions were full of endless judgment calls, and we still weren't sure on how to properly create a character. Worst of all was combat, given the adjunct set of rules inserted into the center of the rule book, we were never sure if we were handling combat correctly. Ultimately we defaulted to our familiarity with other games we knew, as I'm sure other long term players ended up using rules they were familiar with.

So, that was the first task of writing a new edition of the game, making a single set of rules. Discard the Chaosium inspired insert. Go back to basics, and establish what parts of the game were fundamental, and then incorporate them into a rule system that remained backwardly compatible to earlier editions.

My aim, even from that first meeting to discuss the re-write, was to establish a system that tightly meshed both rule sets together, and produced something new. Gone were the D20 tables, and most of the other dice types. Instead everything was based upon 1D100 and 4D6. We had new Ability scores, permitting a more rounded character. The core mechanism of rolling under a score that is a product of an Ability Score x 2 plus any skill, borrows inspiration from the old 2nd edition D&D NWP. The degrees of success mechanism had already been used in another game I was writing, and had its influences from a conversation I had had with Steve Perrin the original author of Runequest. The doubles as critical or fumble rule was, I thought, new. I was later to find that it had been thought of before.

Of course, the original scope of the work consisted only of a revision of just the combat rules. I work in the IT industry, so fully expect scope creep, in this case it was self inflicted. For many of the changes in these rules, you can lay the blame squarely on me. For other changes, you may have to look towards my co-writer Robert O'Connor, his contributions, criticisms, editing and patience were priceless. Thanks.

Thank you to Chris Garland who allowed me a lot of creative freedom for the re-write. Thank you to the original authors of The Morrow Project, some of their material is still in this book. Thank you to those who contributed additional material for this book. Thank you for the play-testers who took the time to give us valuable feedback, and especially to you for reading or buying this book.

Chris Morrell,

Lead Writer, 4th Edition TMP.

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The Morrow Project and the Reconstruction Effort

Executive Summary:

The purpose of this briefing is to illustrate the Project's intentions with regard to what we have termed the Reconstruction Effort, the rebuilding of the USA. It is intended to illustrate to MP personnel where their efforts fit within the Project's strategy, rather than telling them what to do in a given situation. It is an aid to collaboration, not an operational plan.

Reconstruction Strategy:

Objective:

The Project's objective is the reconstruction of the USA as a functioning Nation State.

The Morrow Project cannot predict what you will find when you awake. We have assumed that the USA will be (at best) in a condition equivalent to a 'fragile' state and may have completely devolved into a 'failed' state. It is possible that sections of the continent will be out of communication or even in active conflict with surviving government structures.

We have based this strategy upon the assumption that there will be some form of government among the survivors that you encounter, although it may not take the same form as the current US government.

Success conditions:

The Morrow Project can be said to have been successful when:

- o The US government is functioning throughout the territory of the USA and in a form that is as close to the current Constitution as the surviving citizens are capable of achieving.
- o This government effectively controls legitimate social, political, economic and security institutions that meet the population's needs, including adequate mechanisms to address any grievances that may have arisen before or during the Reconstruction Effort.
- o Any group opposed to this reconstruction of the USA (for whatever reason) has been effectively co-opted, marginalized, or separated from the population, with the voluntary assistance and consent of the population; and;
- o Any armed non-governmental forces (including the Morrow Project) have decamped or been demobilized, and/or been integrated into the political, economic, and social structures of the USA.

Components/Functions

The Morrow Project (and anyone else willing to reconstruct the USA) will have two imperatives - political action and security operations.

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The reconstruction of the USA is likely to be first and foremost a political struggle (as was its creation). The exact form of this struggle is impossible to predict and will vary from region to region.

Security operations, guided and supported by an information campaign, should improve the political and economic situation at the local level, increasing the probability of success by obtaining the support of citizens. However, all personnel must remember that successful security operations will not necessarily result in MP "success," although security will probably be a prerequisite to political resolution.

To support these two imperatives, the Morrow Project will provide four components or functions in support of the US government:

Information, Economic, Political and Security.

All units must be capable of providing these functions, although some specialist units will obviously be better suited for some specific tasks.

Information. This is the foundation for all other activities. No one can plan the Reconstruction Effort, or evaluate reconstruction activities without it. Clearly, Recon and some specialist teams will take the lead in information-gathering operations - but all MP personnel must understand that collection, formulation, and dissemination of information are crucial in shaping perceptions and gaining support.

- o An information campaign creates a narrative. The type of Narrative that we need is one that will enhance the legitimacy of the Project and (more importantly) the surviving US government. It must 'resonate' with the survivors and be based upon verifiable facts and measurable progress. Deeds speak.

- o An information strategy must address ideological, social, cultural, political, and religious motivations that influence or engender a sense of common interest and identity among the survivors. It should be based upon any and all available data (e.g. government census/tax data, or public opinion polling), not just surveys performed by MP teams.

- o A comprehensive information strategy involves understanding the effects of operations on the population, adversaries, and the environment.

- o Information includes intelligence, which allows units to distinguish between criminals and other survivors. Action against these criminals may lead to further intelligence.

Note: Security, political and economic measures are critical; however, to be effective in the strategic sense, they must be integrated into a broader information strategy.

Economic. This function includes programs for rebuilding or providing critical infrastructures in the financial, telecommunications, energy distribution and transportation fields. The objective is to enable, support and facilitate agricultural, industrial, educational, medical and commercial activities.

Assistance in effective resource and infrastructure management, including (re)

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construction of key infrastructure, is vital.

Note: without a national infrastructure a nation cannot exist.

Political. This focuses on strengthening the capability and capacity of the government to respond - and to be seen to be responding - to the needs of its people. Associated activities may include diplomacy, advising/training, and DDR (disarmament, demobilization, and reintegration) programs. The Morrow Project may need to support political efforts where survivors are not able to operate freely because of the security environment.

Note: it is vital that the nation is governed by its citizens NOT the Morrow Project.

Security. This function includes five components:

- o Armed force: to secure the Reconstruction Effort and local population from attack or intimidation by external threats
- o Civilian enforcers: to include community policing, law enforcement, police intelligence activities, border police/patrol and paramilitary field forces.
- o Individual Security: the protection of human rights, and the effective functioning of civil legal institutions (courts, jails, prisons) and;
- o Public safety (fire, ambulance, sanitation, civil defense), and;
- o Public Health (access to food, safe drinking water, and medical care.)

Note: Economic and political progress may not be dependent upon a completely secure environment, but an insecure one is unlikely to recover or develop.

Conclusion:

If the Morrow Project is to be effective, it must carry out multi-faceted and integrated operations that apply its unique capabilities across four functional areas: information, political, economic and security. All Teams should be capable of performing at least some of these functions and must not regard them as appropriate to 'just Recon', or 'just Specialty.'

The goal of the project is to help the US government achieve control over its sovereign territory by re-establishing, re-developing, and consolidating legitimate, effective government institutions.

Bruce S. Morrow
B.S. Morrow, 8/7/1978

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THE OFFER

WELCOME TO THE MORROW PROJECT

Last Week

Good morning. For those of you who don't know me, I'm Bruce Morrow; the CEO of Morrow Industries. You're all probably wondering why you've been invited here today. I'll explain in a moment, but let me ask you all a question first. What if you were absolutely certain some terrible event was going to happen sometime soon - something so horrible that millions would die as a result and millions more would be in danger of dying the longer it took help to arrive? Of course, you would prevent the disaster if you could, but if that weren't possible, wouldn't you want to do something to help the survivors?

While you're thinking that over, I want you to take a look at the screen in front of you. There are five locations highlighted on this map - locations where some sort of natural disaster will take place in the next week. How do I know this? Well, you'll just have to trust me on this for now. I would like you to pay particular attention to the specific details like the time the event occurred, the number of people injured or killed and the location of the event.

Now, the reason I've asked you here is simply to ask you to watch the news this next week. That's all. But, if these five events occur exactly when and where I say they will, and you're curious as to how I knew they would, come back and I'll have an interesting offer for you. If not, then you've lost nothing but a few hours of your time.

Day Zero

Good morning and welcome back. Last week, you were all wondering whether or not I was crazy. Since you're here today, I assume you all noticed those five events occurring exactly when and where I said they would and you want to know how I knew. Am I correct? Well, let's take care of some paperwork first and then I can explain a bit more.

I need everyone to sign this non-disclosure agreement before I go any further. It simply states that the information I'm revealing today is sensitive, confidential, and cannot be discussed with or transmitted to anyone unless specifically authorized. There's some legal mumbo-jumbo at the bottom related to what would happen if you were to disclose this info, but it basically comes down to us denying everything and you ending up looking like a fool, so let's not let it come to that. For those of you that

already work for me at Morrow Industries, and that is many of you, unauthorized disclosure of any information discussed today would also result in your termination. If you're not willing to sign, well, the exits are that way.

[There is a brief pause in conversation while the forms are passed out. Everyone present looks it over and most sign the agreement. A few people decide not to, and are shown to the exits. Once all the forms have been collected, Bruce continues his presentation.]

All right, now that you've all signed that form, I can tell you one of my secrets. I have some equipment that allows me to see future events before they've happened. That's how I was able to show you the details of those natural disasters last week. Some time ago, using this device, my staff and I were able to determine there's a major disaster headed our way. We did what we could to change things in an effort to prevent it from happening. Unfortunately, those changes didn't prevent it; they simply changed the specifics of the disaster. For example, instead of October, it occurred in September. Instead of affecting this city, it affected another. No matter how many times we tried, we found that although we could modify some aspects of the disaster, we could not prevent it completely. However, we saw that if enough people worked together in the immediate aftermath, it will be possible to preserve most of our society and culture and rebuild what was destroyed. So, we changed our focus from prevention to recovery.

That's why you're here - I need your help. You all possess skills and knowledge which could be useful in easing the suffering of your fellow man, if correctly applied. The disaster will be of such huge proportions that our society might not survive. Without help, the survivors and their descendants would be plunged into a new dark age. The disaster will be worldwide - help will not be coming from any other country. So, what can be done? Bear with me for a moment and I will try to answer that question.

You might be surprised to learn that I've had people watching you for some time, to not only evaluate your skills but also your character. When I first learned of this impending doom, I recruited people based on skills alone. However, after several of these highly skilled people turned out to be rather self-centered and possessed of a low moral character, I changed my tactics. All of you gathered here today are what I would call 'good people' - that is; kind and considerate, concerned for your fellow man, proud

to be a citizen of this country, and willing to help those in need.

With that in mind, I have a proposition for you. I would like you to be part of a special team I'm putting together - a pet project of mine, if you will. If you accept, your life will change completely. You see, since help can't come in the future when the disaster occurs, it will have to come from the past - that is - from us. The team I'm organizing will be trained and put into place now to go into action shortly after the disaster has occurred.

However, before any of you answer, think it over carefully. Go home and talk to your loved ones - see what they think. If you decide to accept my offer, rest assured that they'll be taken care of as well. If, however, you decide this isn't for you, that's okay. This is a heavy burden I'm asking you to accept, and I'll understand if it's too much for you. Nothing further will be said about it and no negative actions will be taken against you if you decide not to accept this responsibility. However, if you decide not to join, you are still bound by the non-disclosure agreement you've signed.

Day One

To those of you gathered here today, I wish to say 'Thank You' with all my heart. You have decided to accept my offer and join the Project. For some of you, this decision was easy. For others, it may have been difficult. Either way, you all decided to trade in your safe and ordinary lives for one less ordinary, and certainly less safe. You have chosen to apply your skills to help your fellow man in his hour of need, despite the difficult circumstances you'll find yourselves in. For all of this, I salute you.

Now I'm sure many of you are wondering why I haven't just gone to the government with this information and put the full resources of our

country behind this effort. In the beginning, I considered doing this, but quickly changed my mind. You see, part of the problem has to do with the government. Not that I think it's corrupt or anything like that, but it is slow moving. Like all bureaucracies, the more important the work, the more layers it has to go through. When I first saw the disaster coming, I knew that I had to get people trained, facilities constructed and equipment emplaced quickly. If I had taken this information to the government, it would have taken months, if not years, of special committee deliberations just to authorize the funding for this sort of project. And that's assuming that they would believe me in the first place. So, I had to rely on my own people and resources to get things started.

Another factor that prevented me from going to the government was the concern that the equipment and information I would provide them would be taken and used for other purposes; purposes that would not serve to help in the recovery from this disaster, and actually might make the aftermath worse for the survivors. So, it became very important that this information be kept private from the government and the public at large. If we can conduct our preparations on our timetable, with no governmental oversight to slow us down, we stand a much better chance of having enough teams in place to deal with the disaster. Once the disaster has struck, there will be no more need for secrecy. We will operate in the open on our own, and in association with government forces, to help rebuild society. But until then, we must keep the existence of the Project secret.

With that in mind, I can tell you a little about how the Project is organized. We have a main command base to coordinate all teams, several regional bases to provide support to teams in their areas, several supply bases to manage large stores of equipment for reconstruction and the individual team bolt-holes scattered across the country. But I'm not going to tell you where any of these facilities are located. In an effort to avoid compromising the security of these facilities, all information regarding their locations, assigned personnel and equipment, radio call-signs and such will be on a need-to-know basis only. This way, if a field team were to be pressured to reveal such information, they would have nothing to tell and therefore would prevent unfriendly elements from unraveling the entire Project.

I don't mean to unnecessarily scare you with such talk, but we assume there will be some people and organizations that will attempt to take advantage of the disaster for their ben-



efit. There are always some unscrupulous individuals that show up in the aftermath to steal from, murder and rape their fellow survivors. Although we expect surviving law enforcement and military units to provide some protection, we will also provide you with the equipment and training to protect yourselves and those around you from these miscreants.

So, with no further ado, let's begin the processing and preparation for your Project training. We'll take care of some more paperwork here, allow you to return home for your belongings and then put you on a plane to one of our training centers.

Day Two

Hello, my name is Marvin Peterson, and I'm part of the staff here at the Morrow Institute. It's my job to welcome all new recruits and show you around the compound. First off, let me say 'congratulations' for volunteering for the Project. The work ahead will not be easy, nor will it be safe, and the fact that you are willing to participate says volumes about your character. I hope that this overview will assuage any fears you might have concerning the plans and capabilities of our leadership team, as well as the sort of activities you may be required to perform in the field.

This center is one of several scattered across the United States and is owned and operated by the Training Division of our parent corporation - Morrow Industries. Many of you were recruited directly from Morrow Industries and are already familiar with some of the activities conducted here. As a matter of fact, some of you may have even attended some training here before Project personnel contacted you. As you no doubt noticed upon your arrival, security at the Institute is typical of that found at many other corporate locations anywhere in the country, and is not disguised or hidden. The relatively open nature of this facility actually works better than any amount of Security personnel patrolling the grounds.

The ostensible purpose of this center is corporate training and team building conducted via courses like our patented 'Morrow Executive Wilderness Confidence Course'. This consists of a series of classroom exercises punctuated by periods of running about in the woods shooting paintballs at each other, climbing around on wooden platforms, constructing makeshift rope bridges and other similar activities. We do run a number of Morrow Industries management teams through this facility, but a far greater number of Project personnel are actually mixed



in with them - sort of hiding them in plain sight, if you will. The same exercises used to build corporate esprit de corps apply just as well to our Project teams. So, these centers serve two functions; the one that the general public sees and the one that only Project personnel see.

Although the Morrow Industries folks will only be here for a two-week period, you've all got about a year of training ahead of you, so you'll become quite familiar with this site. As a matter of fact, you'll probably start to question exactly what you've gotten yourselves into about the third or fourth month into your training. By the eighth or ninth month, you'll probably be wondering why you volunteered in the first place. Let me assure you, though, that all of this training is necessary and very important to your survival. And, for that matter, for the survival of all those you'll help later.

Most of your training will take place here, but you may be spending some time at other facilities depending upon what kind of team you are being assigned to and your individual specialty. This facility provides primary training for all Project volunteers and specialized training for MARS, Recon and Science teams. Everyone in the Project has undergone training here, no matter what their eventual assignment, so you could consider this to be your boot camp. No matter where you came from or what your particular skills are you'll all receive the standard Morrow Project basic training to ensure that you can operate all Project equipment.

After all, there's no sense giving you a radio if we don't teach you how to use it, right?

So, with no further ado, let's get on with the tour. We'll start with the Administration building that we're standing in. This is the nerve center of the entire facility and is where the Site Coordinator and his staff work. In addition, Site Security has an office here to manage their various teams, but you're more likely to see them out patrolling the grounds than in here. The last element operating from this building is our Morrow Industries Public Affairs office. They handle all of the questions from the 'outside world' and serve as the first line of defense for the Project, even though they aren't part of the Project.

On that note, let me emphasize this point - although you are all Project members and are aware of its existence, many of the other people you'll encounter here do not. Therefore, it is vitally important that you do your utmost to maintain secrecy concerning the Project. As Bruce pointed out to you earlier, the Project must remain hidden until the disaster. Only afterwards can we reveal its existence. To prematurely blow its cover could jeopardize everything we're working on and throw the survival of civilization to the winds. So, it's no small matter when we talk about keeping a tight lid on things. That's enough of the heavy-handed stuff, let's move on.

Directly in front of you are the Classrooms. We've got everything from the most modern high-tech computer labs to the lowest-tech one-room-schoolhouse style teaching facilities. Science labs, workshops and even a small infirmary are here to support the classroom learning. No matter whether you're fresh out of school or you've got a few years under your belt, you'll be amazed at the amount of time you'll spend here. Since you've all come here with different skills and abilities, we'll start with the basics and work our way up. Our goal is to train you as a Morrow Project team member first and concentrate on your specialty later.

The next building is the Equipment Warehouse, over to your left. Here we store all of the uniforms and field gear used by all of our personnel, both temporary and permanent. Once your orientation is complete, you'll receive all of your basic issue from this location. This will be the equipment you'll use here in training as well as what you'll have in the post-disaster time. It might be awhile before we'd be able to resupply you, and what you get might be all that you'll have for some time, so take good care of it!

Off to your far left you can see the housing facilities. Like military barracks, both floors contain a large, open squad bay with bunk beds. Although each of the two buildings can house sixty people, we've never had that many people in training at any one time. The buildings are co-ed, but men and women have separate shower and latrine facilities on opposite ends of each floor, for modesty's sake. Although we really should have you all sharing the same facilities, since you probably won't have the luxury of separate living quarters in the post-disaster world, we have to remember that some of our trainees aren't in the Project and might object. However, you'll still have to get used to living and sleeping together in the same room. Any shyness or extreme prudishness will have to be gotten over pretty darn quick!

Adjacent to the Barracks is the Dining Facility. Meals are served cafeteria-style, with the hours of operation posted on the bulletin board outside. Typically, there is a special meal prepared to welcome each new batch of management trainees, as well as a final 'graduation' dinner with all the fixin's, but I'd stay away from the chicken marsala if I were you.

Behind us is the Armory. All of the pistols and rifles used for training, as well as some of the more unusual weapons such as grenade launchers, are stored here. Anything more exotic will be stored in a separate Project warehouse somewhere else. Although there are a number of 'real' weapons used for live-fire training, most of the weapons can only fire paintball ammunition. You'll practice with these, but will actually be issued real weapons before cryo-freeze, so don't worry.

Finally, the Motor Pool, off to your right, is where we house a small number of 4x4 jeeps, motorcycles and electric carts, as well as a small garage for tune-ups and minor repairs. There are also two of our Commando Ranger armored cars for our Security personnel, although they're seldom taken out of the garage. You'll all be provided opportunities for driving practice with these vehicles, but your team vehicle(s) will be delivered new from the plant instead of these worn-out training models.

These eight buildings form the Operations Hub and are where you'll spend the majority of your time here. Now that you've seen the various buildings where you'll be living and working for the next year or so, my orientation is finished. If you'll grab your belongings, we'll head over to the Barracks and get you settled in. After your gear is stowed, it's off to the Dining Facility for brunch. Then we'll finish up your paperwork

and issue you your Project equipment. Ladies and gentlemen, please follow me and we'll get started.

Day Three

Good morning, I'm Tim Henshaw and I'm one of the primary trainers here. I'd like to tell you a bit about what you can expect while you're here. As Marvin mentioned yesterday, this is where we run you through Morrow Project basic training and teach you how to use all of the nifty gear you'll be receiving. Some of you may already have these skills, but our training regimen is set up to ensure that every Project volunteer has them. If only one team member knows how to use the radio and something happens to him, the rest of the team could be in trouble.

Your Project training consists of four distinct phases - Basic, Branch, Specialty and Team. Although the coursework may be hard, please understand that it's important you acquire this knowledge now. After all, after the disaster, you probably won't have the time or opportunity to learn these things, even if there was someone around to teach you. Don't worry about flunking out either. It's not that kind of training. We've already gone to some effort to get you here, and we can't afford to waste a single volunteer. That doesn't mean we'll take it any easier on you! But we will take the time to ensure that you learn this information.

Basic Training will last approximately three months and will teach you all of the necessary skills that every Project member must possess - what we call "foundation skills". These are things like operation and maintenance of standard Project vehicles, basic weapons marksmanship, first aid, map reading and basic radio procedures, among others. In addition, you'll receive physical fitness training on a regular basis. Our goal here is to strengthen you for the work ahead and ensure you can use not only your personal equipment, but also that of any of your teammates.

After Basic Training, you'll undergo a weeklong period of personal, technical and psychological review sessions with our staff. This is to evaluate whether or not you've successfully acquired these foundation skills and determine if you're ready for the next phase of training. If these sessions are negative or inconclusive, you may be sent back for additional training with the time dependent on the staff members' analysis. If the reviews are positive, you'll be given a tentative Branch assignment and instructions for the appropriate training. Those of you placed in



the MARS, Recon or Science Branches will continue your training here. Those of you placed in one of our Specialty Branches (like Agriculture, Psychology, Engineering or Medical, among others) will receive your paperwork and instructions on how to proceed to another training facility for your Branch training.

Branch Training will last approximately five months and will expand your knowledge to include those particular skills necessary to function in your particular Branch. For MARS personnel, this will include additional weapons training, specialized search & rescue activities, police-style functions (like crowd control and physical restraint) and enhanced military-style group tactics. For Science personnel, you'll study specialized Project scientific gear, general laboratory procedures and enhanced versions of basic college science classes (like Chemistry 101, Biology 101, Engineering, Geology and Physics). And for Recon personnel, this will entail two types of training - the first will involve training in sociology, psychology, economics, linguistics and political science. The second will involve lots of fieldwork including extensive map & compass, first aid, camouflage and tracking training.

After Branch Training, another week of review sessions awaits. This time, a positive review will mean you'll receive a tentative team assignment and be formed into small ad-hoc groups of similarly trained individuals. Up to this point, you've all been treated as individuals. After this break in training, you'll be treated as part

of a team, even if that team is only temporary for purposes of additional training. At this point, your barracks assignment will probably be changed to put you and your teammates into a closer living situation. In addition to being evaluated on your technical skills, you will now also be evaluated on how you interact with your team. Every two weeks, these temporary teams will be reshuffled and you'll find yourselves in a new group, with some familiar faces and some unfamiliar.

Specialty Training will last approximately four months and will enhance your technical skills in relation to how they function in a team environment. You'll find that many skills you thought worthless in isolation flourish when combined with the other skills of your teammates. Many of the things you learned in training really come into their own in a group environment. However, the most important part of this phase is to boost your productivity and develop a strong instinct for teamwork. Although each of you will bring a certain amount of expertise to any endeavor, we are all part of one big Project and it's important for you to understand how you all fit into it. Making you work in these temporary teams is essential to building a strong Project identity, since you may find yourselves isolated from your actual teams and will need to work with other teams. Developing cross-functional skills and learning to adapt to changing situations on the fly will be important to your teams' survival.

Another week of review sessions takes place at the end of the Specialty Training phase. At this stage, Project analysts should have assembled a fairly comprehensive profile on each one of you and will be able to form real teams for the last phase of training. Unlike the previous ad-hoc teams, this final team assignment is permanent and should not change. Assuming a positive review, you'll move on to the final phase of training. By this point, your technical skills should be very solid and require little effort on your part to perform correctly.

Team Training is the last step before you receive your operational orders and are put into cryo-freeze. You've acquired the minimum skills necessary for all Project team members, you've learned those skills required by your Branch assignment and enhanced those skills in team situations. Now you will hone those skills to perfection in conjunction with your new team. You will probably have worked with them before during Specialty Training, but now is when you will really work to develop the synergy. Your team will become more than co-workers, it will become a close-knit family of

sorts. You will build permanent bonds that will last much longer than the four months you'll spend training here. After the disaster, these people will be the closest friends you'll have. You'll come to rely on their advice, their knowledge, and their humor.

At the end of Team Training is your Final Exercise. Your team will be briefed, equipped, frozen and moved to Bolt-hole #1 - one of the few truly secret sites on this center. Everything about this exercise will be as real as we can make it, but still maintain a controlled environment. Those psychological profiles I mentioned earlier come into play now, as our staff creates a unique test for each team. All details of this test are confidential and are not disclosed to other teams, even after completion. Your team may have specific requirements to fulfill or may have to fall back on the general Morrow Project principles. Some equipment may be damaged, missing or may have been rigged to malfunction. There may be staff members portraying other Morrow team members or survivors of the disaster in need of assistance. Your technical skills may be pushed to the limit to complete the test, or you may have to perform some really arduous physical activities. Everything about the test will have been designed to evaluate your competence and, more importantly, how you handle the test. Some of you may find yourselves in over your head, while others seem to sail right through. You might think the scenario is impossible to complete, and you might be right - but it's important how you handle that realization. All I can say for sure is that you and your team will definitely remember your Final Exercise.

When you complete this last test, you will all be given an honest to goodness vacation. After spending about a year cooped up here or at another training center, you'll undoubtedly be feeling a little stir-crazy. So, now that you've finished all your training, we want to give you an opportunity to spend a little time away from this environment. This is your chance to catch a few rays, do some snorkeling, whatever you feel like. Those of you with families will probably want to spend time getting reacquainted with your loved ones. So, take a good look around and soak in the world, because when you return, you'll be frozen and placed in your bolt-hole to await the wakeup signal.

And that, ladies and gentlemen, is a quick run-down of your training schedule. If there are any questions, I'll try to answer them now. If not, we'll go ahead and start getting you orientated and ready for your first day of training.

INTRODUCTION

PROJECT MEMBER SUSAN FAITH:

Susan tried to wake from her strange sleep. She felt like she was in a womb, wearing a numbing second skin. There was a reason why that was important, but she could not remember. The cold was so difficult to resist.

Silence and darkness beckoned when a shock went through her body. Heart racing, her torpor began to fade, and she remembered who she was.

I am Specialist Susan Faith, of Recon Team BR-B-11, frozen near Runnels, Iowa. Vivid memories burst forth and Susan struggled to bring order to her waking dream.

She remembered survival training. The classes she ran to cross-train her fellow Project members. Joining the Morrow Project, a secret group dedicated to rebuilding the world after the collapse of civilization. Learning that she would be slotted, the nickname the project had for cryogenic hibernation. Her husband Bill, smiling and holding her hand as the anesthesiologist sent Susan into a dreamless sleep. The surprise she felt on waking up from the freeze three months later, not a day older. The practice run had been a complete success.

Where was Bill? In the next cryoberth? On the other side of the continent? Those memories refused to surface.

I'm waking up the same way as last time. Susan thought. My brain misfiring, doing a random memory dump.

College and her Anthropology professor, Dr. Stanze, flashed unbidden into her mind. The old bat said I'd never do anything worthwhile. Wonder if this counts.

Warmth returned to her fingers and toes. Susan became aware of the lines and wires that connected her to the machinery of the cryotube. With a fine whirr, the ventilator tube withdrew and Susan coughed briefly before breathing unaided for the first time in---

"How long have I been asleep?" she said, her voice a hoarse croak. Opening her eyes, Susan tried to look around. Red light shone through the tube's hardened glass lid.

It's either nighttime outside or we're running on emergency power. Get up, Sleeping Beauty. No Prince Charming here to help you now. Susan pressed the button that unlocked the lid. Her muscles ached dully as she pushed it open. She plucked the monitor leads from her arms, legs and chest.

Here we go. It's time to save the world.

Susan sat up and looked around. The other five members of Team BR-B-11 were emerging from their cryotubes.

How strange this all looks, under the red light, she thought. It's a cross between a submarine and a vampire movie.

Susan swung her legs to the ground and stood up. A wave of dizziness and nausea swept over her. She grabbed the side of the tube for support. It felt like she was about to black out. The feeling settled after several long seconds. She noticed someone standing beside her.

"Honey, are you all right?" It was Bill. "You might need to sit down."

"No, I feel better now. That was a lot rougher than waking up from the practice freeze."

Bill put an arm around Susan's shoulders. They kissed and held each other for a moment.

"Good to see you again, Sue. We're going to have to get suited up and get out of here." Bill said. "I think there's only an hour of power left."

Once the power failed, they would have to find their way out of the underground bunker they had been buried in --- without lights or ventilation.

Susan and Bill walked over to the lockers that lined one wall of the cryotube room. Inside were Project-issue uniforms, helmets, backpacks and web belts. They dressed in silence.

"Bill! Susan!" Lauren waved from the door to the storage room. "You need to check topside. Dave, Janet and Mike --- we have to get the vehicles ready to go."

Dave turned the wheel that opened the storage room door. The storage room was the



main part of the bunker. It contained two V-150 APCs and a variety of supplies.

Everyone brought their packs into the storeroom and placed them near the APCs. Susan put on a respirator mask and donned a plastic 'hazard suit' over garment. Bill checked pressure gauges and a Geiger counter that were sampling the air in one of the emergency exit's airlock chambers.

"Inner chamber's good. Suit looks sealed. Open the inner door, Sue," he said.

Susan opened the inner airlock door, walked into the chamber, and sealed herself in. Above her head, another hatch hid a ladder that led to the surface six meters above. She read a status panel and spoke to Bill over an intercom.

"Ladder chamber checks out. I'm going to open the top hatch and climb to the crow's nest."

"OK. Hear from you soon."

Sue climbed a set of rungs set in the opposite wall and opened the top hatch. Her ears popped with the pressure change --- the bunker's atmosphere was at a higher pressure to stop contaminants from entering. She began climbing to the crow's nest. This was a combination periscope and atmospheric sampler that sat at the top of the ladder.

I hope we can get out of the bolt-hole. Susan thought. Her gloved hands felt clumsy on the ladder rungs. Soon she reached the top.

"Bill, I'm at the nest." Susan deployed the periscope and activated the sampler. She looked at the world outside. It was nighttime and all she could see was some very tall grass. Rotating the periscope didn't change the scene.

The sampler beeped and chirped. Susan looked at it. The machine's tiny display read:

NO CONTAMINANTS DETECTED. RADIATION LEVELS NOMINAL.

"It's all clear outside. I'm coming back down."

By the time Susan returned to the supply room, Bill and Janet were loading the big armored cars with supplies. Mike, Dave and

Lauren were holding a quiet conversation next to the bunker's main doors.

"There's only enough power to get the generator started on one of the APCs. Once that's up and running, then it's time to open the bunker doors and get the other one going," Mike said.

Dave asked: "Can we splice the APC into the bunker electrical systems? Is there any redundant cabling we can use?"

"What's in the cryotube room? We don't need anything in there anymore. Without power it is no good as a life boat," Janet offered.

"How much time do we have before the lights go out? Mike?" Susan asked.

Mike scratched his head. "I figure about fifteen minutes before there's not enough juice to start an APC. At least we'll have charged batteries for flashlights."

"But no air flow," Dave muttered. "Gives us another half hour or so after the lights go out, right?"

"Time to stop talking and get an APC wired up so we can run this place long enough to escape," Lauren said. "Let's go. Mike, you're our electrical engineer. What are we going to need?"

"Once we get the vehicle generators going, we can use the starter cable to backfeed power from the APC's. The lights and air only need to be off for a minute or two, max. Although, it will reduce the life of the APC's reactor a little," Mike explained, opening an access panel at the back of the nearest vehicle.

The Project relied on two remarkable innovations: cryogenic hibernation and practical fusion power. Inside almost all the Project's vehicles was an electrodynamic confinement reactor - a vacuum chamber containing a complex grid of electromagnets which could hold a fusing ball of plasma and tap its energy to produce electricity. The big advantage of this system was that vehicles only needed to refuel every 18 months or so. The big disadvantage was that a high-voltage, high current electrical source was needed to start the reactor.



"Break out the flashlights, everyone." Lauren said as she pulled her torch out of her pack.

"Bill, can you get in the APC? When I signal, start her up." Mike asked. He opened another panel and screwed a thick cable onto the socket beneath. "Dave, I'm going to need some light over here soon."

Mike gave Bill the signal.

"1... 2... 3... Go!"

Sparks sputtered from the power socket and the lights went out. The ventilation system stopped. Susan found the sudden silence rather spooky. She turned her flashlight on, and the rest of the team followed suit. There was a soft whine as the reactor ignited.

"Dave, let's have that light." Mike said quietly. He unscrewed the cable from the socket and plugged it in to the first access panel. The lights remained off.

"Damn. Got to be some circuit breakers somewhere."

"I think there's a panel over near the exit doors. Found it!" Janet cried triumphantly. She threw some switches, and the lights and air came back on.

"Laura, try the main doors." Lauren asked.

The large double doors groaned as the electric motors found purchase. They slowly began to open.

Lauren yelled "Let's get the second APC fired up and get ready to move out!"

Susan put her flashlight into her pack, and plugged the starter cable into the second APC. Dave jumped in the big car and started the engine.

Now it's time to save the world, she thought.

INTRODUCTION

The Morrow Project is a pen and paper role playing game that follows the adventures of a group of modern people transported into the future to help rebuild a world destroyed by some future calamity. Using high technology, their own wits, and their memories of modern society, they set out into a wilderness of a devastated world and try to rebuild as best they can.

The most important thing that you need to play is your imagination. All role playing games depend on the ability of a game master (called the Project Director in the Morrow Project) to create a believable world inhabited by sinister humans and strange creatures, along with average folks who need a helping hand, and on the imaginations of a group of players who explore this world. In many ways, a role playing game is an epic novel or a great play that the players make up as they go along. They use a set of rules, such as this book, to provide them a focus and frame work for their creativity, and dice to determine the outcomes of different situations, but the game takes place inside of your mind and exists only in your imagination.

The Morrow Project is different from most role playing games in that the players are not seeking money or power, but to rebuild a world destroyed by disaster. The world is not a pretty place, so the characters carry weapons and drive fusion powered vehicles to protect themselves from people who would oppress, murder, and enslave, but their mission is to rebuild society as best they can.

Playing the Morrow Project is easier than other games because the characters come from a world that is just like the one that the players are coming from. Gravity works just as it should, cars have tires and brakes, and magic is a faerie tale. The world the players will be exploring may be different, but since it is in the future the characters and the players each would not expected to know much about it.



BASIC CONCEPTS

When you form a role playing group for the first time, you should choose one of your number to be the Project Director (PD). The PD will need to design a “world” in which the players can play. This world can be designed in great detail, or left mostly blank, as suits the PD. A PD will usually create a map of the area where the game takes place, and write some sort of “history” of the area, outlining the good guys and bad guys the players are likely to meet.

Once the PD is finished he or she will supervise each player in creating characters to explore the world with. Most players will belong to a “team,” meaning that they all belong to the same Morrow Project unit and are familiar with each other at the start of the game. There are several ways of rolling up characters, and the PD will help the players through the process so the characters form a balanced and playable team, while allowing the players to create an alter ego that is fun to play.

THINGS PLAYERS NEED

Basic supplies to play the game include:

- Dice (2 ten-sided, and 4 six sided.)
- Pens and paper. Players will want to keep notes of things in the game.
- A character sheet. This allows character records to be kept in a clean and organized manner.
- A copy of this book. In play, it is best to have your own as it seems the time when you need the book the most, someone else is using it.

In addition, many players and PDs invest in:

- Lead or plastic miniatures to help visualize play.
- A mat with a hex or square grid.
- Maps of the region your characters are playing in. There are lots of maps available at a reasonable price, and the Internet has services like MapQuest and Google Maps. The more detailed the map, the better. Many players consider the 1:24,000 or 1:25,000 quadrangles the ideal maps for Morrow Project games.
- Pre-produced adventures. Many PDs will use pre-written adventures to help them create a complete world. Most PDs mix pre-written modules produced by Timeline Ltd. with ones they write themselves, giving themselves the best of both worlds.
- Game supplements. These are books that expand game concepts produced by Timeline Ltd.



THE LANGUAGE OF ROLE-PLAY

New players often get mystified at all of the terms that are used by experienced gamers. One of the most confusing things for new players is the convention of throwing or rolling dice to determine outcomes.

Throwing dice determines outcomes. In most situations, you have to throw a certain number of dice to determine what happens with your action. The number and type of dice needed to throw are described using a short-hand based on how many dice, and how many sides the dice each have. For example, a single six-sided dice like you would find in any board game would be called a d6. If you had to throw two of these dice, you would write 2d6, meaning that you could get a result of from 2 (assuming you rolled a pair of 1s) to 12 (for a pair of sixes). The rules may modify this by some number. For example 2d6+2 would mean you would roll two 6-sided dice, and add 2 to the total, getting a number from 4 (rolling a pair of ones and adding two) to 14 (rolling a pair of sixes and adding two).

INTRODUCTION

Sometimes it is important if you roll over or under a certain number, determining if you succeed or fail in an important task. In that case, you see something like this in the rules: “roll your Strength task base” which gives a score that is read as a percentage. For most task resolutions in the game you will have to roll a d100. A d100 is the result of reading the two results from a pair of ten sided dice (d10.) They aren’t added together, but instead one die is designated as the 10’s, and the other as the 1’s. For example rolling a 4 and a 2 with a pair of d10 can be a result of 42. If your strength task base was 46, then any roll equal to or under that number would succeed.

As a rule of thumb, you need to roll lower than the target number, but get the highest result you can, when resolving tasks. A roll of 46 on a d100 would be a success, and the best success possible, barring special circumstances.

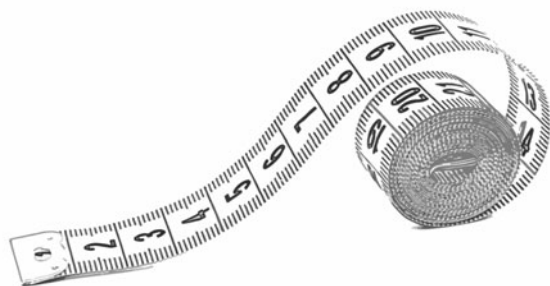
UNITS OF MEASURE

The Morrow Project uses metric, like most science fiction role-playing games. Conversions to English units are listed throughout these rules unless there are problems with space, such as some of the busier tables. There are also three custom time units found in these rules.

THE METRIC SYSTEM

Today the metric system is all around us. In everyday life we see and use the system without even realizing it. Almost every American today can tell you how much liquid is in 2 liters. If you have been in a grocery store any time in the last 30 years there is a good chance you have seen soda sold in a 2 liter bottle. If you have a well stocked tool box, it will probably contain a metric socket set. Most manufacturers list both English and metric measurements. This is because these products are intended for markets all over the world.

Warning: If you are the type of person that calculates everything out to at least 3 decimal places, stop now and skip ahead to the next section. Otherwise you could be greatly disturbed by reading the following.



Here are some ball park estimates that can get you started. A meter is a little over a yard. A kilometer is just a little longer than 10 football fields or about half a mile. A millimeter is between a 1/16 and 1/32 of an inch. When estimating weight a kilogram (kilo) is fairly close to 2 pounds. An ounce is a few more than 25 grams but just call it 25 for calculations. So 4 ounces is a little over 100 grams. Temperature is a little trickier. One degree Celsius is close to 2 degrees Fahrenheit but they start at different points. Water freezes at 32 degrees Fahrenheit which is 0 Celsius. Other good temperatures to remember are: 10 °C (50 °F) is a cool fall or spring day, 21 °C (70 °F) is generally considered a comfortable indoor temperature, 37 °C (98.6 °F) is normal body temperature or for most a hot summer day.

After only a few gaming sessions, you will be slinging around metric terms like an expert.

See the appendix for a table of conversions.

TIME UNITS

While the custom time units in this game are not part of the metric system, they do follow the same basic principles. Each succeeding unit is a multiple of 10 of the



previous unit. This makes calculating time intervals quick and easy. There are 10 combat turns to a tactical turn. Ten tactical turns to a game turn. Finally 10 game turns to an hour.

UNIT	DURATION
Combat Turn	3.6 Seconds
Tactical Turn	36 Seconds
Tactical Turn	10 Combat Turns
Game Turn	6 Minutes
Game Turn	10 Tactical Turns
Game Turn	100 Combat Turns
Hour	10 Game Turns
Hour	100 Tactical Turns
Hour	1000 Combat Turns

THE MORROW PROJECT

GRADUATION DAY

"Welcome. Your team now consists of volunteers who accepted the task of the Morrow Project. Each of you has received, and completed, 12 months of intensive training. You are versed in the operation of all the standard issue equipment that will be deployed with you and your team. As a reward for all your hard work, you will shortly be granted 2 weeks R&R to return home, visit family and friends."

"You are to report back to the Medical Lab in two weeks at 0600 hours. You are entitled to bring personal effects no bigger than a shoe box*, these items will be stored with you. You will be equipped, and given a final brief. You will be sedated, and placed in a cryo-tube. These 'freezers' will then be taken to your allocated bolt-hole, and connected to the location's independent power. Your team will be remotely activated from Prime Base within two to three years after the outbreak of the war."

"You have already been briefed on the location of your assigned bolt-hole, and had a chance to familiarize yourself with the surrounding area. As a security measure no other teams will be aware of the location of your bolt-hole, only Prime Base will possess this information. You will be provided with maps leading you to hidden supply caches, containing sufficient equipment to maintain the team for 18 months. Vehicles provided are also designed to operate on their power cell for up to 18 months."

"Before those 18 months have passed it is expected that you will have made contact with other teams, your Regional Base, and with Prime Base where you will be resupplied."

"Your standing orders remain. Assist the local population in their recovery, and reunite with other Project teams."

"Upon activation you will receive additional orders via radio on the secure frequency."

RECRUITMENT & TRAINING

The Project recruits its personnel in a variety of ways. Many are headhunted from normal jobs because they fit a personality model of people who would make good team members.

These approaches are very subtle and spread over several months. As a result, the project usually has a

good idea about the individual's suitability and desire to join. Indeed, more than two-thirds of the initial prospects identified by this method never reach the stage of being invited to join because their recruiter decides that they are too committed to their current lives.

Others are initially recruited by Morrow Industries, or one of its charitable foundations, especially people with scientific or technical backgrounds. Their assignments are tailored to put them in situations where their suitability for the project, and willingness to join if asked, can be assessed.

Finally, a few personnel are recruited directly by Bruce. There are others that never talk of their pasts, and do not seem to appear on any official databases.

Regardless of how they enter the project, potential recruits are told the bare minimum about its real nature at first. Often, they begin working for one of the project's cover organizations. These include charities working in the third world and the ghettos of America's cities, as well as cutting edge research and development facilities.

At some point during this time, potential recruits who seem suitable will be given a limited amount of additional information about the project. Depending on how they respond, those who show interest move in to the first stage of the training program, the so-called "Basic Course".

Every project member goes through this, from MARS assault troopers to Science team physicists and base logistics specialists. About one third do not complete the course, either because they fail to meet the demands of the course, because they decide that the project is not for them after all, or because the trainers decide that the prospect is not suitable.

Almost all the people who wash out do so within the first three months, before they learn about any of the real secrets of the project, such as cryotechnology or fusion power. Many of those rejected for the project itself are still considered good candidates for other roles and often continue to work for Morrow Industries or one of its charitable foundations.

Occasional rumors go around that the project maintains a special bolt-hole in a remote area, where those who have seen too much – such as the fusion reactors – but later become a security risk are kept "on ice" in cryo-tubes for revival after the war, when their knowledge will no longer be a threat to the project.

The project selects people from a variety of backgrounds. People are rarely recruited younger than

their late twenties, as the project is looking for people with maturity and a good level of existing knowledge. Few are older than mid forties for field teams, as the project needs people in decent physical shape and with at least a decade of working life ahead of them after revival. There is not a set age limit, however, and personnel assigned to permanent bases can easily be older.

About half the people recruited have a first degree, and around 15% have a higher degree, a significantly higher percentage than the general population. The project does not specifically recruit people with such qualifications except for science specialists and similar, but the sort of bright, highly motivated people they are looking for have often earned degrees anyway.

Around 20% of recruits have some form of military or law enforcement background, about twice the rate in the general population, as such people are preferentially likely to have useful skills. Recruits who believe that the project is staffed largely with ex-SF vets are hopelessly naïve. While the project recruits almost all such people it can get, this is still only 2-3 people in the average year, most of which go to MARS teams.

The training itself is mainly conducted on two large estates owned by Morrow Industries in remote areas of Oregon and New Mexico respectively, but some takes place at other locations, including a firearms training centre for law-enforcement officers in Virginia, and the Cadillac Gage facility in Michigan.

The two training centers take students in batches of 30-40 students at a time, a new batch every three months. Each batch is organized into a number of teams that go through training together. The initial selection into teams is done by the trainers based on personality assessments, but trainees often move between teams during the first three-month phase, based on how the trainees actually interact with each other.

The teams are reorganized after the completion for the first phase, when the main shakeout happens, usually reducing the training batch to about two dozen students.

Losses in the remaining training phases mean that around twenty students graduate from basic at each training centre, suggesting that the project is freezing a little less than 200 people per year.

Assuming a forty-year period of operation, this would mean that the project has about 6,500 frozen personnel in total. However, there are perennial rumors that the project has more than one set of training centers, compartmentalized for security.

The Basic Course takes three months. The material comes thick and fast, concluding with a two-week field exercise, allowing the trainees to put what they have learned into practice under the most realistic conditions the project can create, with actors and training staff playing the people that the team must deal with in various scenarios.

Training kicks off with “The Big Walkabout”, a series of long hikes in the Appalachians or the Colorado Rockies. During this time, the trainees learn land navigation, how to move at night, ford rivers, build shelters and the basics of living in the field, from digging latrines to setting snares for small game that they must clean and butcher for the pot. Teams learn how to recover useable materials from derelict buildings. It is a test of team work and ability to become part of the group – the team sees no-one apart from each other and a half-dozen training staff during the month, so that any personality conflicts come to light as quickly as possible.

Then it's back to the training center for intensive medical training. The teams learn First Aid, basic public health measures, and the treatment of radiation and chemical weapon effects. After this is Firearms training, delivered in parallel to vehicle training. The project is adamant that every team member should be able to defend themselves and their teammates, which means being able to act as a rifleman if necessary. The training starts with basic range work, to teach the fundamentals of marksmanship, and learning how to use and maintain a variety of personal weapons.

From there trainees progress through a series of steadily more realistic situations,

PERSONAL BELONGINGS

Morrow Project Personnel have an allowance for personal effects that can occupy a space no greater than 30 cm x 20 cm x 20 cm. Weight is also a factor, usually limited to 10kg. Although there is plenty of space within the bolt-hole for the team member to store a large amount of personal effects, the bolt-hole is not intended for long term storage once the team awakes. Any personal effects must be capable of being carried by each team member, or stored on a team issued vehicle. Project coordinators also have the right to veto any effects that may hinder the success of the project; this includes controlled substances, certain firearms and weaponry, and offensive material.

Cosmetics and personal toiletry supplies are permitted, although spray-on canisters are discouraged.

practicing contact and stoppage drills in both rural environments and in a custom built “town” on one of the project’s training sites.

From this point on, team members are expected to have their personal weapons either on them or close at hand almost all of the time, and other training is periodically interrupted by impromptu range sessions and tactical scenarios, run using only the weapons the team has at hand.

In Vehicle training, the trainees learn to drive the simpler XR-311 and Humvee cross country, before progressing to the Commando Ranger and V-150. Most teams end up cursing as they practice using the winch and ground anchors to extract a bogged down vehicle from a mud-hole for the third or fourth time.

The trainees also learn vehicle maintenance, initially on the worn-out and balky diesel versions of the vehicles, before finally meeting the first of the project’s secrets when they learn how to maintain the fusion-powered vehicles they will actually use.

The final element of basic training is the “Civics” course, intended to teach the team how to deal with and rebuild communities they encounter. It covers everything from physical infrastructure, through law enforcement training, to how to hold fair elections.

Once the team has reached this stage, they have completed “Project Basic”, and move on to advanced training. At this point, team makeup is finalized, and team members are assigned to particular roles within their team, such as contact specialist or mechanic.

Usually, these assignments build on existing knowledge, but every team member gets around nine months of further training in their branch and specialist fields.

Advanced training is heavily tailored around the individual and their particular specialty – for example, a medical specialist is likely to be rotated through the Emergency Rooms of the free clinics that the project maintains in the Washington and LA ghettos, while a MARS heavy weapon specialist might train at the Cadillac Gage facility in Detroit for part of the time.

Great efforts are made to keep the trainees feeling like a team throughout this phase, even while they are pursuing their various individual courses. Teams live together whenever they are not at offsite training locations.

The field exercises bring the whole group back together as a team, and are based around the primary function of the team. Exercises for MARS teams might focus on dealing with a military threat, for example, while a medical team might have to set up and run a field

hospital and an engineering team might have to get a town’s power and water systems working again.

Once the teams have completed their advanced training and returned from a much deserved leave, they go into their “pre-freeze” phase. The team’s gear load is finalized, issued, checked and stowed. This phase ends with a big dinner (traditionally steak and eggs, for high protein and low residue), before the teams finally walk down to medical for the hour-long process of cryo-suspension.

MORROW PROJECT TEAMS

The project is organized into a variety of team types. While each is specialized for its role, they all have received basic project training and are expected and equipped to turn their hands to whatever problem they might encounter, as a specialist team may not be available.

RECON

Reconnaissance and Contact teams (usually referred to as “Recon”) are the project’s most basic. The plan is that they will be revived three to six months ahead of the rest of the project, to assess the situation and make contact with survivor groups.

This would allow the specialist teams to be used where they could do most good, and to avoid danger areas.

In addition to this, recon teams are the project’s generalists. While they do not have the resources or depth of training of the specialists, they receive at least some training in a very wide range of skills, and can therefore tackle a wide variety of tasks.

They are also the most heavily armed units apart from MARS, and are expected to deal with low-level security and tactical problems if no MARS team is available.

Most recon teams consist of 5-6 personnel, though some have as many as 8. Most are generalists, with limited training in a range of skills spread across the group.

The most common vehicle for recon teams is the V-150, in either the APC or 20mm turret configurations, giving the advantage of amphibious capability and limited armor protection when encountering potentially hostile groups. On average, there is a vehicle issued for every three team members.

There is an average of three recon teams per state, though obviously larger or more densely populated states such as Texas will have more and other states less.

MARS

M.A.R.S. (Military Assistance, Rescue & Security) units are the closest thing the project has to pure military forces. Their job is to create a safe environment in which the specialist teams can work, by providing security, dealing with bandits, training local military and law enforcement personnel etc.

Most personnel with prior military experience go into these teams. Each includes a medic, a mechanic and a negotiator as well as weapons specialists. They are equipped with specialized military hardware, including sniper rifles and antitank weapons.

In addition to their own gear, MARS units are intended to be able to act as the nucleus of larger forces recruited from survivors, and have at least one 'contingency' cache holding a large amount of basic ordnance and other gear to equip such a force.

There is a squad sized MARS team assigned as first response at a level of roughly one per state. Such teams usually have around 12 people and at least three V-150s, usually one APC and one with a 20mm turret.



MEDICAL & CIVIL ACTION

Medical & Civil Action teams are initially intended to provide immediate assistance to communities, and help them deal with large numbers of refugees. Once the initial situation has been stabilized, they are intended to help rebuild infra structure, both physical (e.g. water purification, power) and social (education, law enforcement).

These teams vary considerably in size, depending on the conditions expected in their area of operations. At the lowest level a small medical team might have a doctor, his assistant and three generalists in a humvee and a commando ranger.

At the upper end of the scale, a combined team might have a dozen people, including a doctor, a teacher, a civil engineer and a mechanic, plus support and security personnel. A group of this size is issued a commando ranger, and at least two humvees (one towing a water purification unit, the other towing a fusion power trailer.)

There is at least one of the large combined teams per state, plus a variable number of the smaller teams as support.

AGRICULTURAL

Agricultural teams are specialists intended to help get food production and distribution back on its feet. The project planners expect famines after the war, with much of the seed grain and livestock needed for future planting being eaten to stave off starvation.

They are also equipped to help get farming machinery and distribution networks back into operation.

A typical agricultural group will contain 8-10 people, including agronomists, a veterinarian, a civil engineer and several mechanics. The usual vehicle issue is a commando ranger or humvee, and several 2 ½ ton trucks pulling fusion power and portable forge trailers.

Agricultural teams have extremely large caches, with bulk stocks of non-hybrid seed grain and fertilizers. Some teams also have special caches of frozen livestock, holding live animals such as cattle, sheep and horses in modified freeze tubes. They have large amounts of frozen sperm and ova for artificial insemination, to help rebuild livestock gene pools devastated by war and its aftermath. Each regional base has at least one agricultural team within its area of operations.

ENGINEERING

Engineering teams are specialists in demolitions, repair, recovery and reconstruction. They are intended to do everything from salvaging usable machinery from the ruins and repairing damaged project vehicles, through to repairing bridges and getting power stations running again.

A typical engineering team would have 8-10 people, usually including civil, electrical and mechanical engineers, plus several mechanics and technicians. Vehicles include the ARV version of the V-150, a 2 ½ ton truck with a portable machine shop in the back, and an XR311 or humvee. In addition, three trailers bearing a fusion power plant, portable forge and general cargo - tools and reconstruction supplies - are issued.

There is approximately one engineering team available per state, with at least one additional engineering team assigned to each of the regional commands.

SCIENCE

Science teams are intended to deal with missions requiring pure-science skills and equipment beyond those available to the more hands-on oriented medical or engineering teams. Examples might include defusing unexploded nuclear weapons, leaking reactors or waste storage containers, dealing with a disease outbreak with containment, treatment and immunization, or predicting the climate effects caused by the war and its aftermath.



They are also intended to provide a pool of scientific knowledge to help Prime Base and the regional command teams in their planning.

A typical science team can consist of a mix of physicists, chemists, medical doctors, zoologists, botanists, civil engineers, computer specialists, mechanics and generalists.

The team's vehicles are usually a pair of XR311s or humvees, plus a pair of 2 ½ ton trucks with equipment shelters on the back, one configured as a medical laboratory and the other as a physics and chemistry lab. At least two cargo trailers are issued, loaded with additional equipment and supplies.

Science teams are generally held as central resources, with one or two available to each of the six regional commands.

SPECIALTY

Specialty teams are highly variable in their composition and equipment, almost by definition.

Some are versions of the other types of teams, dedicated to particular tasks, such as the engineering groups intended to help rebuild locks and clear wrecks along the Mississippi and Ohio rivers.

Some have specialized equipment, such as the radio broadcast units assigned to each regional command,

equipped with a mobile radio station to restore news and information broadcasting.

Others have special skills, such as the small team of anthropologists, psychiatrists and negotiators intended to deal with religious and political extremists or help project personnel traumatized by their experiences.

Finally, many of the specialty teams are assigned to a number of fixed bases spread throughout the US. As well as prime and the regional bases, these include communications relays, fusion power plants and even small air strips for the project's limited number of aircraft.

JOBS AND POSITIONS

Each character in the Morrow Project has a job to do. The PD may want to make a list of jobs for the team available to the players.

The choices of jobs that need to be done are actually easier than one might first realize. Each vehicle and team has certain requirements that must be filled if they are to function properly. You might for instance have a Recon team with a V-150 vehicle. The designation Recon team gives the unit no special priorities except that they have a scout. The V-150 on the other hand, must have a crew of at least two, and depending upon the weapons may require more.

Needless to say, it is often necessary for characters to double up on assignments. For example, the team commander is usually the top gunner and the driver can act as a mechanic if needed. All members of a team know at least the basics of each other's job so they can do it in the case of an emergency.

All vehicles need someone to drive them, equipment needs an operator, and weapons require a gunner. The MARS team must have some military trained men; the Science teams must have scientists and technicians each with their own specialty. Most teams need a trained field medic.

SUGGESTED ROLES

- Team Leader
- Driver
- Gunner
- Medic
- Mechanic
- Scout
- Quartermaster
- Radio Operator
- Contact Specialist
- Navigator

THE FREEZING PROCESS

The first achievement of the Morrow Project at the time of its founding in 1972 was the development of a way to house their personnel and minimize the need for supplies until after the coming holocaust and the chaos which would follow. Morrow scientists perfected the science of cryogenics early in 1974 and immediately began placing groups of volunteers into 'cold sleep'.

The freezing process operates by creating a controlled environment of intense cold. It is intended to slow the human metabolic rate to almost zero. This environment is maintained through the use of a complex mixture of gases and other drugs which prevent ice crystals forming in the cells of the body. Careful temperature monitoring along with precise application of microwave heating is also used to stop ice formation.

When the electronic wake up signal is received by the freezing unit it immediately begins the warming procedure. The body's temperature is brought up slowly and uniformly by the application of microwaves. As the body approaches normal temperature several minor electrical shocks are administered to the body to restart the heart. Should the heart not immediately start, the unit commences heart massage and ventilation. The subject is re-frozen if spontaneous circulation doesn't start after five minutes. Otherwise, the cryogenic gases and fluids are exhaled or excreted normally when the subject wakes.

The Morrow freezing capsules underwent many refinements over the years from 1974 to 1999 and as each year came and went the teams that were put to sleep had an increasing chance of intact revival.



TUBE SHOCK

The PD may decide that Characters being resuscitated from their 'cold sleep' require a CON task check (see the Skill chapter.)

Exceptional Success:	The character wakes up refreshed, awash with artificial endorphins.
Success:	The character wakes up groggy and dehydrated, as if hung over.
Failure:	The character required attention from the tubes emergency systems. They may wake up 1-2 hours later than the other characters in the team feeling tightness to the chest and a painful throat.
Exceptional Failure:	The character required attention from the tubes emergency systems, and may have flat-lined for a few minutes. Medical assistance from a team member may have been required. The character may have awoken with a physical or mental injury that requires extended treatment. For example, memory loss, slurred speech, partial paralysis, organ failure.

PLACEMENT OF THE TEAMS

The question of survival during and after a nuclear war was only one of the problems that the Project had to overcome. Besides the freezing process which preserved the teams until their revival, there were the problems of where and how to place the cryogenics and other equipment. Bruce Morrow himself made the suggestion that each team should be widely separated on the basis that a dispersed force would be less likely to fall victim to unforeseen circumstances. There was, after all, no way to protect huge bunkers housing large numbers of people from the possibility of a near miss or a direct hit from nuclear weapons. While the probability of such a disaster could be kept quite low, the consequences would be fatal to the Project, so teams were spread across the country.

Individual bunkers, 'bolt-holes', were then buried in a wide variety of locations; and as a further precaution against any kind of catastrophe overtaking more than one group, only a few of the specialized teams had more than a vague idea of the location of any other team.

WHY ARE THE PROJECT TEAMS ARMED?

It must be remembered that after a nuclear war, equipment of a technological nature will fall into disuse or disrepair within a relatively short time. With the major manufacturing centers destroyed it will be impossible to obtain spare parts, and the specialized knowledge needed to repair many things we take for granted will have been lost. Barring very special and isolated cases it is certain that electrical power will be non-existent. Automobiles will have quit on the roads and abandoned for lack of fuel.

Weapons would also be severely affected. For the first few years, during the time that the Project personnel are expected to be activated, they would be very common, given the number that are currently in existence. Until the ammunition runs low they would prove to be vital for survival. It is this environment that the Project had planned for in equipping its teams.

Once the ammunition runs out, replacing it is almost impossible. A reversion to more primitive weapons would ensue – black powder firearms, bows, arrows, blades and clubs. The average technological level would then be closer to the mid-1800s.

So the Morrow teams have a tremendous advantage over anyone they encounter. Their equipment is in prime working condition when they awaken, and the crews have the necessary tools and knowledge to keep their equipment in good repair. It is the possession of such good equipment that causes all Morrow teams to be the object of such greedy consideration by every selfish survivor in the area. This is the reason that Morrow personnel are given adequate means to defend themselves.

MORROW PROJECT BASES

Just as there are several types of teams, the project has a variety of bases. Some are limited facilities, intended for one use only, like bolt holes or supply caches. Others were designed for permanent or repeated use, like Prime base or the regional supply depots.

Most project bases were located in rural or wilderness areas to avoid accidental destruction during the war or possible discovery before the frozen portion of the project was reactivated.

For reasons of operational security, the field teams do not know where the bases are, or vice versa – one of the project planners' nightmares was that if this secrecy was not preserved, anyone finding a single team would

be able to interrogate them for the locations of other teams, which could then be captured or killed as they lay helpless in cryo-sleep.

Teams therefore have a list of radio frequencies for Prime Base, their regional base, and in some cases, other teams in their area. They will use these, together with a set of authentication codes, to establish contact and link up after revival.

PRIME BASE

Prime Base is designed to be the central brain running the project. While some of its staff was frozen like the field teams, a small cadre would remain awake throughout the war, recording and monitoring what happened.

When they judged the time was right, the frozen staff would be revived. Extremely low frequency (ELF) transmissions would be broadcast as a signal to wake the rest of the Project, or whatever specific teams Prime Base thought could be best utilized at the time.

The full complement at Prime Base would then be able to act as a coordinating and planning staff, assimilating the reports from the recon teams and assigning the specialists to where they could do most good.

In addition to this coordinating role, the frozen staff included specialists in a variety of fields, and equipment far beyond anything available to the field teams, including fully equipped laboratories, a small surgical hospital, machine shops and so on, all intended to assist in the reconstruction.

Finally, Prime Base had extensive computer, print, microfilm and audio libraries, intended to preserve as much knowledge and culture as possible. The information stored included literature, history, science, philosophy and technical "How to..." books, as well as hundreds of thousands of hours of recorded music, movies and TV.

Rumors suggest that Prime Base is a sealed, underground environment, with air recycling and hydroponic farms capable of supporting life indefinitely.

Given Prime Base's importance to the project, its location was a closely guarded secret for fear it would become a potential treasure trove for looters, or even become a nuclear target itself during the war if a hostile government became aware of such a facility designed to assist in the reconstruction of America.

As a final failsafe, an alternate base was constructed, so that the teams could be revived even if some unforeseen catastrophe overwhelmed Prime Base. This base

had the same libraries as Prime, and many of the same facilities, albeit on a rather smaller scale. However, it had only a relatively small frozen staff of specialists in addition to its small “awake team”.

REGIONAL BASES

The project divided the US into nine regions, each centered on a regional command and supply base. Canada was also divided into three regions, also with regional command bases.

Each of these bases has a small frozen command & support team of around two dozen people, intended to coordinate the efforts of the teams in the region, and provide more local technical support than could be provide by prime base.

Each regional base has a medical bay, with a doctor and assistants, plus machine shops and a repair bay with mechanics and electronics technicians.

These bases were also logistics centers, with extensive amounts of ammunition, parts and other supplies for the field teams, plus large stocks of supplies and equipment to help with reconstruction efforts.

A regional base will have several vehicles available – usually a V-150 with a 20mm turret, a couple of commando rangers and two or three XR-311s or Humvees, plus a pair of 2 ½ ton trucks and a V-150 ARV.

Like bolt holes, the regional bases are filled with an inert gas atmosphere to keep the stored equipment in perfect condition, with the base staff in cryo-sleep.



REGIONS

The Project established 9 regions in the United States, and 3 in Canada. These regions were similar to those adopted by FEMA later on. Hawaii, Puerto Rico, Guam, and other U.S. territories were regarded as targets for rebuilding once all the primary regions were restored. It is possible that bolt-holes were still placed in these locations for wake-up at a later stage.

Regions of the Morrow Project:

REGION	STATE
Bravo (B)	Iowa, Kansas, Missouri, Nebraska
Charlie (C)	Illinois, Indiana, Michigan, Minnesota, Ohio, Wisconsin
Delta (D)	Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont
Foxtrot (F)	New Jersey, New York, Delaware, District of Columbia, Maryland, Pennsylvania, Virginia, West Virginia
Golf (G)	Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee
Hotel (H)	Arkansas, Louisiana, New Mexico, Oklahoma, Texas
Juliet (J)	Arizona, California, Nevada
Kilo (K)	Alaska, Idaho, Oregon, Washington
Lima (L)	Colorado, Montana, North Dakota, South Dakota, Utah, Wyoming

Regions of the Morrow Project - Canada

REGION	PROVINCE
Whiskey (W)	Alberta, British Columbia, Yukon Territory.
Yankee (Y)	Manitoba, Ontario, Saskatchewan
Quebec (Q)	New Brunswick, Newfoundland, Nova Scotia, Quebec

Additional Designation Codes, using the NATO phonetic alphabet, are applied:

Alpha (A) is reserved for Prime Base and Command.

Echo (E) is reserved for Regional Bases, but is prefixed with the Region.

Victor (V) is reserved for references to Mexico and to a lesser extent Central America, as the Project recognized that Personnel in Regions H & J may need to expand operations to handle this region.

Xray (X) is reserved for references to external sources outside the United States, including Hawaii, and other U.S. Territories.

Romeo (R) is used for Recon team designation and is prefixed by the assigned Region.

Mike (M) is used for Mars team designation and is prefixed by the assigned Region.

Sierra (S) is used for Science team designation and is prefixed by the assigned Region.

November (N), Tango (T), Uniform (U) and Zulu (Z) are used for Medical, Agricultural, Engineering and Special teams.

Papa (P) is reserved for direct references to the Project, especially to Bruce Morrow, the man behind the Project.

Team codes usually consist of the 2 letters that refer to their assigned region, and their team designation. Then, there are 2-3 numbers and/or letters that refer to the team's batch number under which they were referred during the Project training. The batch number would have also followed them, so that their bolt-hole and caches will contain this as part of their coding.

For example, a Mars team assigned to California would be JM-B15 (Juliet-Mike Bravo-Wun-Fife). B15 would be included in their bolt-hole ID, and on their assigned vehicles. Project personnel are more likely to resort to referring to themselves by this suffix, as it served as their team training ID.

BOLTHOLES

The bolt-hole is the most common (and most basic) project facility, designed to protect a single team in cryo-sleep through the war and the years immediately following it, until the wakeup signal is sent by Prime Base.

Most bolt-holes are buried underground, for both concealment and radiation protection, and are invariably situated well away from potential nuclear targets.

Once the team are in their freeze tubes and the bolt-hole is sealed, the atmosphere inside is replaced with nitrogen at a slight overpressure, with no oxygen to permit corrosion; things do not rust or age in a project bolt-hole.

The wakeup code is sent from Prime Base using ELF signals, capable of penetrating deep underground. Once this signal is picked up by the bolt-hole computer, it starts the wakeup procedure, replacing the inert gas atmosphere with a bottled air mix, and reviving the team in their cryo-tubes.

Once the team is revived and ready to begin operations they should evacuate and re-conceal the Bolt-hole as quickly as possible. The bolt-hole contains the team's freeze tubes, their vehicle, a table and benches for them to assemble their gear, and a sensor/periscope/antenna package to allow them to survey their environment and contact Prime Base before leaving the bolt-hole.

While it has lights and power, the bolt-hole has no facilities for extended occupation; most importantly, they do not have sleeping accommodation, running water or toilet and cooking facilities. Added to the fact that bolt-holes are intentionally located in remote areas for security reasons, they would not make good permanent bases, and are not designed to.

Weapons and similar equipment are given a light coating of oil before storage, and electronic items have their batteries removed and stored separately in charger slots which charge them fully as part of the wakeup process.

It normally takes teams around two hours of work to prepare and check their vehicle and gear after wakeup, and be ready to move out of the bolt-hole.

TEAM SUPPLY CACHES

Although teams emerge from their bolt holes with full loads of supplies, they simply cannot carry enough equipment and gear to sustain them for more than a very limited period, let alone complete their mission.

Each team therefore has a number of supply caches - usually six - buried throughout its area of operations and marked on the AutoNav units in the team's vehicle.

Each contains food for the team, plus ammunition, spares and other equipment, sealed in an inert preservative atmosphere like a bolt hole. The typical cache is approximately 2 meters (7 feet) on a side, but larger versions exist, up to forty foot shipping container size (12x2.3x2.5m internal space).

In addition to the supplies for the team themselves, each cache generally contains equipment to help local communities the team has contacted. Such supplies are fairly limited for recon teams, but can be very extensive indeed for specialist teams. For example, MARS teams have enough equipment to outfit platoon-sized units recruited from survivors, while agricultural team caches contain literally tons of bulk seed and tools.

Finally, each team has an emergency store that is not marked on the team's AutoNav, containing weapons and equipment that will not mark them out as members of the project. These are intended as a last resource for teams that are being pursued or have lost all their equipment through some other accident.

Caches are well hidden or buried, and the teams have only a grid reference that equates to a 10mx10m square on the ground, so there is usually some form of surface marker.

Most commonly, this is a fake US Geological Survey benchmark. These are short concrete pillars, set solidly into the ground, and bearing a brass data plate. However, other markers are sometimes used, especially in urban areas where a USGS benchmark would be out of place.

Caches are usually buried at least one meter (~3.5 feet) below the marker, though sometimes the marker has a buried data plate, showing the offset to the cache. (e.g. "Cache is 10 meters west of marker")

The cache door is a stainless steel hatch sealed with O-rings against moisture, and it opens outwards. To open the cache, the team must pry open a small stainless steel panel in the door, sealed with a waterproof gasket.

Behind this cover plate is a slot for an MPID card, and a numeric keypad for the team to enter a six-digit code. This code is the same for all a given team's caches, and is memorized during training. This unlocks the door, which can then be opened.

Caches are filled with the same inert gas as bolt-holes, to keep stored equipment in mint condition. They do not have the same purge function to replace this with a bottled air mix, so it is recommended that the team allow a few minutes for this gas to disperse before entry.

REGIONAL & LEGACY CACHES

In addition to the supply caches of the individual teams, the project planners also created a number of special caches under the direct control of each regional command, as a supplement to the regional supply bases. These are of four main types.

The first are simply large stores of equipment, including seed, bulk food, medicine and vehicles. While they do not contain anything that would not be available at a regional supply base, these supplementary caches allow better geographic coverage. They also allow the regional command to provide large amounts of relief aid to post-war authorities they might not necessarily completely trust, without compromising the location of the regional bases.

The second category hold more specialized equipment that had served its primary purpose and might never be needed again, but was stored "just in case", rather than being disposed of. For example, when the Stoner weapons system went out of production, the tooling was stored in one of these caches, rather than broken up.



The third category are the so-called "legacy caches", dating from the earliest phase of the project, before Bruce Morrow returned with the cryogenic and fusion technology that underpins the model of dispersed, frozen teams that the project finally adopted.

The equipment in these caches is often rather older than the current issue, and it was judged better to leave it where it was than to recover them and re-use their gear, especially as there were concerns about security as well as the effectiveness of the preservation techniques.

The caches were often large, and contained stocks of ammunition, bulk food, medical supplies, warm clothing, and spare parts. However, these items may not be exactly what the project finally adopted – for example, the ammunition is largely 7.62x51mm, as these caches mostly pre-date the adoption of the M-16, while much of the food consists of C-rations or equivalents.

Finally, each region has several "super caches" scattered through its area, and intended to completely re-equip a team that has lost its initial load of gear, through accident or violence. These contain a complete set of gear suitable for a recon team, including vehicles, and could be regarded as being simply a normal bolt-hole, without the freeze tubes for personnel.

SPECIALTY BASES

Like specialist teams, these bases are the hardest to generalize about, as each is configured for a particular function. For reasons of operational security, few field teams know much about these installations. Examples discussed in training include medical facilities, large-scale fusion power stations intended to provide electricity for reconstruction, and communications and weather monitoring installations.

Others are rumored to include "super bolt-holes", containing hundreds of freeze tubes ready for large-scale freezing of Morrow Industries personnel once war became imminent, laboratory facilities and "cryo-ark" caches containing sperm and ova of endangered species to allow extinct species to be recreated after the war.

The command teams at regional bases will generally know what specialist bases are in their regions, though they will not know the exact locations.

PERSONNEL

When the Project was first formed the powers-that-be began a search for suitable volunteers to be frozen and revived after the war. The initial recruitment and training began in the late 1970's, continuing with a peak in the late 1980's, and terminating in 2017 with the advent of the end of the world.

In the Morrow Project the personnel are given substance through the imagination of the player, and the list of core abilities assigned. These abilities are essential in determining the character's strengths and weaknesses, even whether they live or die. Core Abilities are measured with a score from 10 to 30 (although exceptional scores are possible up to 40), and they form the basis for undertaking certain tasks.



CORE ABILITIES

STRENGTH (STR) - An index of muscle power which influences lifting and throwing capacity and the ability to do damage in melee. Someone with high Strength would have a large muscle mass, and possibly a well defined physique, and may be found in positions involving heavy labor or intense activity.

CONSTITUTION (CON) - Represents aerobic capacity and resilience - how much physical damage the character can take and how quickly they will recover. Someone with a high Constitution may display an abundance of energy, happily undertaking a physical task for lengthy periods, and could be seen in positions that require continued repetition or the enduring of something unpleasant or tiring.

DEXTERITY (DEX) - A composite of agility, co-ordination and reaction speed. It determines how fast a character can act and how many things they can do at once. A person with a high Dexterity has quick reactions, is often lithe in appearance, and has a good balance. Such a person can be seen in positions that require the manipulation of small objects, or need a person to be fleet-of-foot.

AWARENESS (AWA) - This is a measure of the character's attention to detail, their ability to perceive things in their surrounding using all five senses. It is employed in combat for ranged attacks. Someone with

a high Awareness is constantly alert, processing stimuli that most may overlook. They may be seen performing tasks that require a good ear for music, an eye for detail, or well developed taste-buds, such as a police detective, or a food critic.

EXPRESSION (EXP) - A character's ability to communicate ideas, thoughts or feelings to another either directly through language or another medium. Expression represents the ability to interact with others, to impress, charm, and persuade. Someone with high Expression finds commanding attention from others easier, and may be found in positions of leadership or the arts.

REASONING (REA) - A rating of the character's ability to analyze evidence, to rationalize, and determine the optimum course of action to take. At a certain level it is the character's IQ, although a person with a low Reasoning does not necessarily have a low IQ. It is their mental agility, and the ability to quantify their surroundings. A person with a high Reasoning can solve puzzles quickly, and provide solutions to complex issues. They may be found in positions as problem-solvers, trouble-shooters, or academics.

FOCUS (FOC) - A character's mental focus and stability. It represents their strength of will, their determination, courage, and self-control. Someone with a high Focus would be extremely sure of them-selves, and may be found in positions of danger or high pressure.

To obtain the scores for all the Core Abilities above you will need four six-sided dice (4d6). Roll all four dice to reach a random number between 4 and 24. Add 6 to this score and record it next to the ability. Repeat for each ability. This should produce a number between 10 and 30 for each.

ABILITY SCORES (HUMAN)

00	Dead / Unable to Function
01-04	Very Limited Functionality
05-09	Many Tasks are Difficult
10-17	Below Average
18-22	Average
23-29	Above Average
30-39	Exceptional
40	Pinnacle of Human Ability

As a rule of thumb, a core ability score x 5 represents the percentage of normal adult human capability. A score of 20 is 100% of the human norm, whilst a score of 10 represents only 50% of the standard ability. The extreme of 40 can be seen as 200% of the normal human ability.

ALTERNATIVE METHODS FOR CORE ABILITY CREATION:

METHOD 1: DICE ALLOCATION

Take a pool of 28 dice (that would be 4 for each core ability), and allocate between one and six dice to each of the core abilities. Roll the allocated number of dice, and add 6 to the result. No result can be below 10, or above 40. Should such a result occur, any score below 10 must be bumped up to 10, at the cost of points from another Core Ability. Likewise for scores above 40, the additional points are allocated to another Core Ability. With this method the player may concentrate on their character's strengths, improving their odds of achieving a decent score, although the end result is still random.

METHOD 2: POINT PURCHASE

All Core Abilities start out equal to 10. Then take a pool of 80 points and allocate them as required to each of the core abilities. Until the core ability reaches 25, for every point allocated, the core ability increases by 1. Increasing to a score of 26 to 30 each cost 2 points per point, 31 to 35 costs 3 points per point, and 36 to 40 costs 5 points per point.

POINT COST

ABILITY SCORE	POINT COST
10	0
11-25	1 per point up to 25
26-30	2 per point above 25
31-35	3 per point above 30
36-40	5 per point above 35

Average non-player characters have a pool of 70 points.

MP personnel have a pool of 80 points.

Heroic level characters have a pool of 100 points.

Legendary characters have a pool of 120 points.

EXAMPLE: Susan Faith has been approached for recruitment into the Morrow Project. Rolling her Core Abilities we get, 2,5,1,4 with the 4 dice for Strength. Adding 6 to this total we have a Strength (STR) of 18. Continuing on with the other core abilities, we get CON: 18, DEX: 21, AWA: 28, EXP: 20, REA: 19, FOC: 24. Susan may not be amongst the strongest or healthiest on the Project, but she is alert and determined.

TASK BASE

Core abilities form a base percentage for Tasks. This is known as the TASK BASE, and can be determined by multiplying the score by 2. This Base percentage is used for all manner of Tasks, for example, when resisting a grapple, roll Strength %. When firing a Rifle, use Awareness %, plus the character's Rifle skill.

Task Base: Core Ability x 2.

TASK BASE TABLE

SCORE	%	SCORE	%	SCORE	%
10	20	21	42	32	64
11	22	22	44	33	66
12	24	23	46	34	68
13	26	24	48	35	70
14	28	25	50	36	72
15	30	26	52	37	74
16	32	27	54	38	76
17	34	28	56	39	78
18	36	29	58	40	80
19	38	30	60		
20	40	31	62		

EXAMPLE: Susan can swing a punch using her Strength for a Task Base of $18 \times 2 = 36\%$.

TASK TERMINOLOGY

Significant character actions with the risk of failure are referred to as TASKS. For example, standing up and walking around is usually automatically successful. Doing the same thing in the dark with multiple injuries is a task. To a character's Task base, other modifiers can be added, as well as any experience or training the character has in this task. This experience is represented as a SKILL, a focused ability in a small set of certain tasks. A Skill's bonus is added to the Task base when it is deemed to be of assistance with the particular task being carried out.

So, a SKILL is a measure of the experience and knowledge in completing a set of various tasks. A TASK is a specific function or action, to which the TASK BASE for a particular Core Ability is the character's raw talent. A TASK CHECK is a roll made on a d100 (two d10) to determine whether the attempt at a Task was successful.

PHYSICAL ATTRIBUTES

MASS

MASS is a measure of weight and size. It also determines the minimum STR necessary to function efficiently.

A human adult male will usually have a MASS of 10, an adult female a MASS of 9. However, there is some variation in this depending upon their build. This is the comparative width and scale of certain parts of the body. It is a measure of muscle mass and bone structure. Characters with Small builds tend to be skinny and those with large builds more robust.

Roll for build using 2D6. Check the table below and note the MASS score.

MASS TABLE

MALE	FEMALE	DESCRIPTION	MASS	WEIGHT (KG'S)
2D6	2D6			
--	2-4	Petite	8	31+STR
2-4	5-8	Small	9	44+STR
5-8	9-10	Medium	10	60+STR
9-10	11-12	Large	11	80+STR
11-12	--	Huge	12	104+STR

EXAMPLE: Rolling 6 on the two dice, and consulting the Female column, Susan is a 'Small' person (MASS: 9). With a STR score of 18, she weighs $44 + 18 = 62$ kg or 137 lbs.

HEIGHT

To calculate the character's Height in centimeters (cm), add the sum of 4-six sided dice (4D6) to 165 (150 for a female character).

HEIGHT TABLE

ADULT (IN CM)

Female	$150 + 4D6$
Male	$165 + 4D6$

EXAMPLE: Rolling 9 on 4d6, Susan's height is $150 + 9 = 159$ cm, or 1.59 meters tall, or 5' 3".

WEIGHT

To calculate the character's weight, take the Weight listed for the characters MASS, and add their STR score.

For adult human-sized characters:

Total Weight = Base Weight (in kgs) + STR



ENDURANCE POINTS

A character's starting Endurance Point total is equal to their CON score. Endurance Points measure how fatigued a character is. Generally, a person loses 1 point of Endurance for every hour they are continuing with a task, such as travelling on foot. Harder tasks such as a forced march or travelling through difficult terrain will cost more. Reaching zero Endurance Points means the character is exhausted, and becomes 'stunned.'

STRUCTURE POINTS

The next step in creating a character is to calculate Structure points (Sp). They measure the maximum amount of damage the body and parts of the body can take before it is destroyed or broken. To calculate Structure points, take the average of Strength (STR) and Constitution (CON), by adding them together and dividing by 2, and multiply this by the character's MASS score. This gives an average value of 200, with a range of 80 to 480.

CALCULATING STRUCTURE POINTS

$0.5(STR + CON) \times MASS$

EXAMPLE: Susan has STR 18, CON 18 and MASS 9. She has $0.5(18 + 18) \times 9 = 162$ Sp.

To quickly calculate both Structure Points and Blood Points, consult the following table using the sum of STR+CON and the MASS score.

SP/BP CALCULATION

STR + CON	MASS				
	8	9	10	11	12
19-20	80	90	100	110	120
21-22	88	99	110	121	132
23-24	96	108	120	132	144
25-26	104	117	130	143	156
27-28	112	126	140	154	168
29-30	120	135	150	165	180
31-32	128	144	160	176	192
33-34	136	153	170	187	204
35-36	144	162	180	198	216
37-38	152	171	190	209	228
39-40	160	180	200	220	240
41-42	168	189	210	231	252
43-44	176	198	220	242	264
45-46	184	207	230	253	276
47-48	192	216	240	264	288
49-50	200	225	250	275	300
51-52	208	234	260	286	312
53-54	216	243	270	297	324
55-56	224	252	280	308	336
57-58	232	261	290	319	348
59-60	240	270	300	330	360
61-62	248	279	310	341	372
63-64	256	288	320	352	384
65-66	264	297	330	363	396
67-68	272	306	340	374	408
69-70	280	315	350	385	420
71-72	288	324	360	396	432
73-74	296	333	370	407	444
75-76	304	342	380	418	456
77-78	312	351	390	429	468
79-80	320	360	400	440	480

LOCATION STRUCTURE POINTS

Damage taken by the character can be applied as Whole Body Damage Points (wDp), which are taken from the Structure Point total, or Location Damage Points (Dp), which are subtracted from Structure Points allocated to a certain location on the Medical Table. When a location is reduced to zero or less Structure Points, it

is rendered unusable. For a location in a limb, this will disable all locations below it on that limb. For critical areas, like the head, it could mean immediate death.

Structure Points are allocated among the locations as indicated by the percentages listed on the Medical Table below. Following that there is a quick reference table with the percentages already calculated.

MEDICAL TABLE

D100	LOCATION	ZONE	% OF SP
01-06	Head	Head	6%
07-08	Neck		2%
09-10	Right Shoulder	Right Arm	2%
11-13	Right Upper Arm		3%
14	Right Elbow		1%
15-17	Right Lower Arm		3%
18	Right Wrist		1%
19-20	Right Hand		2%
21-22	Left Shoulder	Left Arm	2%
23-25	Left Upper Arm		3%
26	Left Elbow		1%
27-29	Left Lower Arm		3%
30	Left Wrist		1%
31-32	Left Hand		2%
33-39	Mid Torso	Torso	7%
40-47	Right Upper Torso		8%
48-55	Left Upper Torso		8%
56-62	Abdomen		7%
63-64	Groin		2%
65-66	Right Hip	Right Leg	2%
67-72	Right Thigh		6%
73	Right Knee		1%
74-78	Right Calf		5%
79	Right Ankle		1%
80-82	Right Foot		3%
83-84	Left Hip	Left Leg	2%
85-90	Left Thigh		6%
91	Left Knee		1%
92-96	Left Calf		5%
97	Left Ankle		1%
98-00	Left Foot		3%

STRUCTURE POINT ALLOCATION, 80-299

LOCATION	80-99	100-119	120-139	140-159	160-179	180-199	200-219	220-239	240-259	260-279	280-299
Head	5	7	8	9	10	11	13	14	15	16	17
Neck	2	2	3	3	3	4	4	5	5	5	6
Right Shoulder	2	2	3	3	3	4	4	5	5	5	6
Right Upper Arm	3	3	4	5	5	6	6	7	8	8	9
Right Elbow	1	1	1	2	2	2	2	2	3	3	3
Right Lower Arm	3	3	4	5	5	6	6	7	8	8	9
Right Wrist	1	1	1	2	2	2	2	2	3	3	3
Right Hand	2	2	3	3	3	4	4	5	5	5	6
Left Shoulder	2	2	3	3	3	4	4	5	5	5	6
Left Upper Arm	3	3	4	5	5	6	6	7	8	8	9
Left Elbow	1	1	1	2	2	2	2	2	3	3	3
Left Lower Arm	3	3	4	5	5	6	6	7	8	8	9
Left Wrist	1	1	1	2	2	2	2	2	3	3	3
Left Hand	2	2	3	3	3	4	4	5	5	5	6
Mid Torso	6	8	9	11	12	13	15	16	18	19	20
Right Upper Torso	7	9	10	12	14	15	17	18	20	22	23
Left Upper Torso	7	9	10	12	14	15	17	18	20	22	23
Abdomen	6	8	9	11	12	13	15	16	18	19	20
Groin	2	2	3	3	3	4	4	5	5	5	6
Right Hip	2	2	3	3	3	4	4	5	5	5	6
Right Thigh	5	7	8	9	10	11	13	14	15	16	17
Right Knee	1	1	1	2	2	2	2	2	3	3	3
Right Calf	5	6	7	8	9	10	11	12	13	14	15
Right Ankle	1	1	1	2	2	2	2	2	3	3	3
Right Foot	3	3	4	5	5	6	6	7	8	8	9
Left Hip	2	2	3	3	3	4	4	5	5	5	6
Left Thigh	5	7	8	9	10	11	13	14	15	16	17
Left Knee	1	1	1	2	2	2	2	2	3	3	3
Left Calf	5	6	7	8	9	10	11	12	13	14	15
Left Ankle	1	1	1	2	2	2	2	2	3	3	3
Left Foot	3	3	4	5	5	6	6	7	8	8	9

Table continues on next page

EXAMPLE: Susan Faith has a STR of 18, and a CON of 18. The average of these is 18. Susan's MASS score is 9, so her Structure Point total is $18 \times 9 = 162$. Using the 160-179 column of the Structure Point Allocation table, this gives her 10 Structure Points in the Head, 3 in the Neck, etc.

BLOOD POINTS

Tissue damage as a result of injury may lead to blood loss. The rate of bleeding is equal to the Structure Point damage created by a wound. For example, a 9 point bullet wound to the abdomen causes 9 points of blood point loss every tactical turn (36 seconds) until treated. Blood Points represent the volume of blood loss a char-

PERSONNEL

STRUCTURE POINT ALLOCATION, 300-499

LOCATION	300-319	320-339	340-359	360-379	380-399	400-419	420-439	440-459	460-479	480-499
Head	19	20	21	22	23	25	26	27	28	29
Neck	6	7	7	7	8	8	9	9	9	10
Right Shoulder	6	7	7	7	8	8	9	9	9	10
Right Upper Arm	9	10	11	11	12	12	13	14	14	15
Right Elbow	3	3	4	4	4	4	4	5	5	5
Right Lower Arm	9	10	11	11	12	12	13	14	14	15
Right Wrist	3	3	4	4	4	4	4	5	5	5
Right Hand	6	7	7	7	8	8	9	9	9	10
Left Shoulder	6	7	7	7	8	8	9	9	9	10
Left Upper Arm	9	10	11	11	12	12	13	14	14	15
Left Elbow	3	3	4	4	4	4	4	5	5	5
Left Lower Arm	9	10	11	11	12	12	13	14	14	15
Left Wrist	3	3	4	4	4	4	4	5	5	5
Left Hand	6	7	7	7	8	8	9	9	9	10
Mid Torso	22	23	25	26	27	29	30	32	33	34
Right Upper Torso	25	26	28	30	31	33	34	36	38	39
Left Upper Torso	25	26	28	30	31	33	34	36	38	39
Abdomen	22	23	25	26	27	29	30	32	33	34
Groin	6	7	7	7	8	8	9	9	9	10
Right Hip	6	7	7	7	8	8	9	9	9	10
Right Thigh	19	20	21	22	23	25	26	27	28	29
Right Knee	3	3	4	4	4	4	4	5	5	5
Right Calf	16	17	18	19	20	21	22	23	24	25
Right Ankle	3	3	4	4	4	4	4	5	5	5
Right Foot	9	10	11	11	12	12	13	14	14	15
Left Hip	6	7	7	7	8	8	9	9	9	10
Left Thigh	19	20	21	22	23	25	26	27	28	29
Left Knee	3	3	4	4	4	4	4	5	5	5
Left Calf	16	17	18	19	20	21	22	23	24	25
Left Ankle	3	3	4	4	4	4	4	5	5	5
Left Foot	9	10	11	11	12	12	13	14	14	15

acter can lose before they die, about 50% of the total blood volume in the character's body.

When Blood Points reach zero, the character will die from decompensated shock.

Blood Points are equal to the average of Strength (STR) and Constitution (CON) multiplied by the character's MASS score. This gives an average of 200, with a range of 80 to 480.

CALCULATING BLOOD POINTS

$$0.5(\text{STR} + \text{CON}) \times \text{MASS}$$

EXAMPLE: Susan has 162 Blood Points, equal to her Structure Point total.

See the table SP/BP Calculation to quickly calculate BP's.



the character receive a blood transfusion they need to have the correct blood type or it may kill them.

BLOOD TYPE & FACTOR

2D6 BLOOD TYPE

2-3	B
4-7	O
8-11	A
12	AB

1D6 RH FACTOR

1-5	+ (positive)
6	- (negative)

EXAMPLE: Susan gets a roll of 9, followed by a 4. Her blood type is A+.

EFFECTS OF BLOOD LOSS

For every 10 blood points lost, a character also loses an Endurance point. When Endurance falls to zero, the character becomes stunned and cannot act.

When a character's blood points fall to their MASSx4 score or less, then they need to make a CON check every tactical turn. Failure leads to death.

When Blood Points reach zero, no CON check is possible, and the character dies immediately through shock.

EXAMPLE: Tom's MASS is 10. There is a chance of dying should his Blood Points fall to 40 or less.

RECOVERING BLOOD POINTS

Blood volume will restore itself over 2-3 days if blood loss is stopped with first aid or medical care and the character is hydrated. Red cell mass takes 4-8 weeks to return to normal with adequate nutrition.

In rule terms, Endurance points are restored 24 hours after bleeding stops. Blood points are recovered at the rate of 1 point per 100 (or fraction thereof) starting Blood Points per day. An average character with 200 Blood Points, may recover 2 Bp's per day.

Blood transfusion may be required to stabilize a bleeding character and will restore 50 blood points per liter (25 per unit). The procedure and its risks are described in the 'Damage and Recovery' chapter.

BLOOD TYPES

If a character is suffering from Blood Loss, then it is essential that the Blood Type is known. Roll on the below tables (Type & Rhesus) and note it down. Should

DERIVED ABILITIES

ACTIONS

Any task performed during a combat turn takes at least one action. Some take more. Long tasks will carry over into following combat turns until the required Actions are spent. The number of Actions available to a character depends on their DEX score. It may be reduced by fatigue.

ACTIONS

DEX	ACTIONS
0-4	0 (may require a DEX task check to take an action)
5-10	1
11-16	2
17-24	3
25-30	4
31-35	5
36-40	6

EXAMPLE: Susan has a DEX of 21, and gets 3 Actions.

PACE (MOVEMENT RATE)

A character can walk a number of meters in a combat turn, equal to the sum of their STR, DEX, and MASS divided by ten. This is the character's Pace, and also represents the number of kilometers they can walk in an hour.

CALCULATING PACE

(STR + DEX + MASS)/10

PACE

STR+DEX+MASS PACE

28-34	3
35-44	4
45-54	5
55-64	6
65-74	7
75-84	8
85-94	9

A character can commit more than one Action to movement by picking up their pace, travelling a number of meters equal to the Pace score multiplied by the number of Actions spent moving. The table below indicates the multipliers for certain types of movement, the Actions required, and the multiplier for cost of Endurance Points for prolonged use.

MOVEMENT

SPEED ACTIONS ENDURANCE

Walk (x1)	1	x1
March (x2)	2	x2
Run (x3)	3	x4
Sprint [x3, +DoS]	3	[1+DoS]
Crawl, Swim [x1/2]	1	x1
Climb Down (x1/5), Climb Up (x1/10)	1	x1

Sprinting requires a successful Athletics test. Each Degree of Success also increases movement speed by one. A Sprint costs 1 point of Endurance plus the number of Degrees of Success achieved, and can be sustained for up to STR seconds. A PD may permit extended sprinting, but at a cost of further Endurance points.

JUMPING

JUMPING SPRINT OR RUN STANDING

Height (m)	Speed/15	Pace/6
Distance (m)	Speed/4	Pace/4

A successful Athletics test can be used to increase pace, just like a sprint.

EXAMPLE: Susan with a STR+DEX+MASS of 48 has a Pace of 4.8 or 5 meters. With 3 Actions, she can move at a run up to 15 meters.

AGE

Normally, a recruit for a Morrow Project Team has been around long enough to have proven their exceptional ability, and their humanitarian spirit. They are usually young enough to have no commitments, and a willingness to do their duty for the dispossessed of the future.

As a rule of thumb, a character starts out with an age equal to 16 + 4D6 in years.

TRAINING POINTS (TP)

A character starts off with a number of Training Points equal to their FOCUS plus REASONING scores multiplied by five. Added to this, you can add the character's Age x 2. These are spent to purchase and increase skills that the character has obtained before they 'started the game'. Skills may have been learned in formal education, as part of a character's career – including Morrow Project training, or hobbies, etc.

TRAINING POINTS (ALL CHARACTERS)

(FOC+REA) x 5 + (Age x 2) Training Points

A Player may choose to have an older character (or in the case of Survivor characters, a younger character.) The character's age can affect the amount of Training Points available. See the section under 'Playing Older or Younger Characters'.

EXAMPLE: Susan has REA 19 & FOC 24 and she is 29 years old. She gains 43 x 5 = 215 + 58 = 273 Training Points.

A PD may choose to give a set amount of Training Points to their players, in which case 250 is the suggested amount.

PLAYING OLDER OR YOUNGER CHARACTERS [OPTIONAL]

Older characters suffer from a reduction in core ability scores, but gain experience. Younger characters suffer from a reduction in experience, and may well have reduced core ability scores. For younger characters, reference the MASS score for that age group, MASS x 2 is the average STR score for that age. DEX and EXP may also be reduced accordingly for really young characters. Older characters suffer a loss of core ability scores as defined by the chart below. For example, playing a 52 year old character loses 12 points to be allocated amongst the player's choice of core abilities.

For every year of the character's age, they gain 2 additional Training Points. From age 13 they gain an additional REA+FOC points. From age 17 this increases to REA+FOC x 2. From age 20 onwards this is REA+FOC x 5.

Availability of younger characters should be reserved for those from survivor groups.

TRAINING POINTS BY AGE

AGE	TRAINING POINTS MAIN POOL	+ AGE	CORE ABILITIES
0	0	0	*
1-12	0	+ Age x 2	*
13-16	REA+FOC	+ Age x 2	*
17-19	REA+FOC x 2	+ Age x 2	--
20-40	REA+FOC x 5	+ Age x 2	--
41-50	REA+FOC x 5	+ Age x 2	-6
51-60	REA+FOC x 5	+ Age x 2	-12
61-70	REA+FOC x 5	+ Age x 2	-18
71-80	REA+FOC x 5	+ Age x 2	-24
81+	REA+FOC x 5	+160	-30

FINISHING TOUCHES

By this stage you should be getting a good idea as to the character's strengths and weaknesses. This would be a good point to think about some of those details about the character you will play. Think about how much education they had, and in what discipline. Did they have a career before being recruited? You can use the character's age as a guide. Once you've got a decent concept, you will need to go to the Skills chapter and allocate Training Points out to the related skills.

Most importantly, now is the time to come up with a name for your character. What color hair and eyes do they have? Are there any distinguishing features? What about their marital status? Do they write with their left or right hand?

PERSONALITY TRAITS & STYLES [OPTIONAL]

Characters are more than a collection of numbers. There are two layers of complexity for determining the disposition of a character that the Players and PDs can choose to embrace or ignore. The simplest is to select up to 3 personality styles from the list below. The additional layer is to generate the five personality traits, and then use that as a guide to pick personality styles. Using either method will help to flesh out the character and aid role-playing.

Personality styles can allow a character to gain a bonus or penalty once per game session to any activity that conforms to this style. The bonus is usually +10% to the task check or the PD may offer some other bonus.

For tasks that conflict with this personality style there would be a -10% penalty instead. For example, a character with a violent disposition will be more prone to start or join in a fight. They will be more effective during that conflict, and will find it hard to stand down.

TRAITS

The Morrow Project established personality testing early on, as a means of identifying those with potential for recruitment. They formed a series of tests based upon Tupes and Christal's Five Factor Model, measuring five principal qualities.

'Volatility' is a rating of a person's emotional instability. Highly Volatile persons would be unpredictable, with visible changes in desires and mood, aggression, anxiety. People with low Volatility control their emotions, even in the most stressful situations.

'Extroversion' is an indication of a person's willingness to work within and between social groups(s). They tend to be friendly and sociable, desiring the stimulation and company of others. People with a low level of this trait tend to keep to themselves and may find it difficult to communicate with others.

'Compassion' is a person's level of sympathy for the suffering of others. High Compassion people display empathy for the feelings of others, and are willing to help others in need. Low Compassion traits are associated with a disregard for the feelings of others. This personality type looks out for 'number one'; they tend to be selfish and are often suspicious, greedy and arrogant in their dealings with others.

'Discipline' reflects a person's self control and ability to work to plan, or their willingness to conform to the social mores of their peer group. People with high Discipline traits aim to achieve and display loyalty to their cause. Low Discipline people are spontaneous, lacking the drive to remain at a task, or the willingness to follow the rules or orders given to them.

'Curiosity': Some people are anxious to learn, eager for knowledge and new experiences. They love new challenges, and are quick to adapt to change. They can be very imaginative and creative. People with low levels of this trait tend to keep their head in the sand and avoid new ideas and changes to their daily lives. They are often fearful of change, and blinkered to its presence.

These Five traits can provide some depth to the character. If you wish to score these, you can roll 4D6-4, giving a range of 0 to 20, or allocate 50 points. Multiply this by 5% for a rating of 0% to 100%. Anything around 50% is a balanced measure.

When uncertain of a character's reaction to a certain event, a roll may be attempted against that trait's score. This is especially useful for NPCs, and the traits may even be applied to larger social groups, for example, when asked how the local townsfolk will react to a stranger showing up.

STYLES

Styles are based around a keyword. They are grouped in order of their associated trait. The Players and PD are free to make up their own personality styles.

In the listing below, (0) indicates neutrality, (+) is associated with a high value of the trait, (-) a low value.

VOLATILITY:

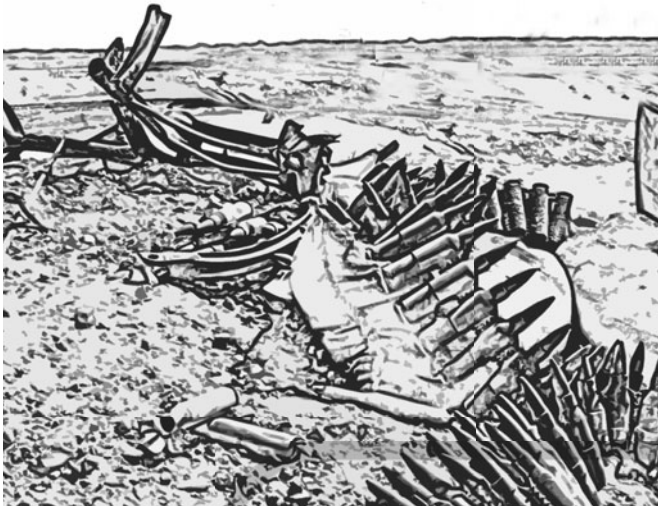
Aggressive (+):	Violent and impulsive, prone to sudden rages.
Cowardly (+):	The character lacks resolve in the face of adversity.
Envious (+):	Driven by jealousy.
Fighter (-0):	Loves a good fight, but won't start one without good cause.
Temperate (0):	Moderation in all things is the highest good.
Vengeful (+):	Revenge for slights is uppermost on the character's mind.
Warrior (-):	Ruled by a code of conduct, this character is dedicated to the martial arts and the appropriate use of force to solve problems.

EXTROVERSION:

Builder (+):	The character is a canny politician who likes to form networks and organizations.
Conciliator (+):	Seeks to resolve disputes, aims to produce acceptable compromises.
Enterprising (+):	The character is a canny businessman who likes to wheel and deal.
Leader (+):	A charismatic leader who inspires extreme loyalty.
Prophet (+):	A messenger dedicated to spreading their faith or vision amongst the people.
Temperate (0):	Moderation in all things is the highest good.

COMPASSION:

Conciliator (+):	Seeks to resolve disputes, aims to produce acceptable compromises.
Conqueror (-):	Convinced that might makes right, the character will use force to achieve their ends.
Corruptible (-):	The character's loyalty is available to the highest bidder.
Counselor (+):	Renowned for their thoughtful nature and wise insights.
Cruel (-):	The suffering of others is irrelevant as long as the character gets what they want!
Reformer (-+):	The character is driven to remake their world the way they want it.
Envious (-):	Driven by jealousy.
Faithful (+):	Regards family life as the ideal – Loyal to their spouse, children and blood relatives.
Forgiving (+):	The character is prepared to turn the other cheek.
Generous (+):	There's always money and time to spare for worthy causes.
Greedy (-):	The character's primary goal is to acquire wealth.
Humanitarian (+):	The character wants to treat the sick, prevent disease, etc.
Hedonism (-0):	Pleasure is the primary purpose of life.
Just (+):	The character regards justice as the highest ideal and the only consideration in deciding a course of action. They react angrily to injustice and brutality.
Liar (-):	The character engages in deceit for personal gain, or to keep dark secrets hidden.
Loyal (+):	Loves someone (or something) so completely that they would sacrifice themselves for that person (entity, cause or ideal).
Lustful (-):	Casanova or Don Juan had this as their great drive.
Manipulator (-):	Ruthlessly uses others for their own gain, is prepared to discard friendships and relationships if the situation demands it.



COMPASSION:

Mercenary (-):	The character's skills are available to the highest bidder.
Merciful (+):	Former enemies will be treated fairly, even generously.
Miser (-):	Making money and holding on to it drives the character, to the point where they will almost always haggle and pinch pennies.
Pacifist (+):	Violence is not the answer in resolving any dispute!
Philanthropist (+):	The character wants to leave a legacy, and will create charitable foundations, spend their wealth on the community, etc.
Principled (+):	Honest and honorable, the character's word is their bond.
Redemption (+):	The character seeks to atone for some past wrong.
Selfish (-):	The character looks out for themselves at all times.
Suspicious (-):	Worries about the motivation of others.
Temperate (0):	Moderation in all things is the highest good.
Troublemaker (-):	Causing dissent and mayhem is its own reward.
Trusting (+):	Generous to their friends, will tend to regard people in the best possible light.
Unscrupulous (-):	Morally flexible, the ends justify any means for this character.
Valorous (+):	The character is prepared to risk life, limb and reputation to attain their goal.

DISCIPLINE:

Arbitrary (-):	Associates may find the character difficult to deal with as they are driven by their whims and passing fancies.
Amiable (0+):	Easy going, co-operative, instills and feels strong loyalty to their group.
Builder (+):	The character is a canny politician who likes to form networks and organizations.
Counselor (+):	Renowned for their thoughtful nature and wise insights.
Cowardly (-):	The character lacks resolve in the face of adversity.
Reformer (+):	The character is driven to remake their world the way they want it.
Energetic (+):	The character is driven to meet their goal, and is very hard-working.
Faithful (+):	Regards family life as the ideal – Loyal to their spouse, children and blood relatives.
Fighter (0+):	Loves a good fight, but won't start one without good cause.
Generous (+):	There's always money and time to spare for worthy causes.
Hedonism (-0):	Pleasure is the primary purpose of life.
Idealist (+):	The character seeks the realization of their ideal.
Indulgent (-0):	There's always money and time to spare for things the character considers important.
Lazy (-):	The character seeks the easiest route to attaining their desire.
Mercenary (+):	The character's skills are available to the highest bidder.
Philanthropist (+):	The character wants to leave a legacy, and will create charitable foundations, spend their wealth on the community, etc.
Principled (0+):	Honest and honorable, the character's word is their bond.
Redemption (+):	The character seeks to atone for some past wrong.
Spendthrift (-):	Wealth is spent as quickly as it is earned, or even faster.

Table continues on next page

DISCIPLINE:

Teacher (+):	Sharing knowledge is the greatest good.
Temperate (0):	Moderation in all things is the highest good.
Thrill-seeker (-):	The character thrives in chaotic environments or risky situations.
Trusting (+):	Generous to their friends, will tend to regard people in the best possible light.
Unreliable (-):	The character can't consistently apply effort towards their goal.
Warrior (+):	Ruled by a code of conduct, this character is dedicated to the martial arts and the appropriate use of force to solve problems.

CURIOSITY:

Aesthete (+):	The character appreciates beauty, and tries to collect items that gratify this sense. They may be artists, scholars, or crusaders trying to impose their vision of the beautiful on the world.
Conservative(-):	Resists change for change's sake; is convinced of the superiority of traditional values.
Mystic (+):	Spiritual journeys of discovery and mystical insights are the greatest goal.
Scholar (+):	The pursuit of knowledge is the greatest goal.
Teacher (+):	Sharing knowledge is the greatest good.
Temperate (0):	Moderation in all things is the highest good.

ERA [OPTIONAL]

When was the character frozen? Given that teams may have been moved to various locations, it isn't necessarily true that the entire team may have initiated their deep sleep at the same time. You may choose to roll to determine what era the character experienced before being frozen. The PD, however, may have already determined the Era the entire team was frozen.

ERA

D10 ERA

1-2	1970's
3-5	1980's
6-7	1990's
8-9	2000's
10	2017 (Final Freeze, witness to the events that led to the end.)*

[*] If the team or character was there at the end, and was quickly frozen and moved to a nearby site, they may be more aware of what ended the world they knew. However, it is likely that their training wasn't completed, and so may not be 'trained' in all the required skills provided during the Morrow Project Training (see the Skills chapter.)

PSIONICS [OPTIONAL]

Sometimes, a person exhibits extraordinary intuition, which manifests as extra-sensory perception. Other related abilities are known as psionics. The Morrow Project made special efforts to recruit people with such talents, referring to them as 'Espers'. Some disappear into the depths of the organization, seemingly never seen again. Others are trained to enhance these abilities, and are often frozen with regular team members.

GAINING POWERS

Make a FOC task check (see the Skills chapter for rules on task resolution.) On an Exceptional Success, the character has a Psychic Talent. On an Exceptional Failure, the character is susceptible to Psychic talents (the Degrees of Failure could provide bonuses to the Esper targeting this character.) Successes or Failures indicate an ordinary non-psychic character.

With an Exceptional Success, consult the table below. This indicates the Level (or power-rating) of the Character's Talent. A Level 7 Telepath is a lot more powerful than a Level 1.



POWER LEVEL

D100	LEVEL
--	0 (Latent)
11	1
22	2
33	3
44	4
55	5
66	6
77	7
88	8
99	9

Roll a D100 to determine the actual talent the character has shown an aptitude for.

TALENT

D100	TALENT
01-05	Teleportation
06-14	Telekinesis
15-29	Reform
30-54	Telepathy
55-79	Extra-Sensory Perception
80-99	Entropkinesis
00	Unclassified (to be determined by the PD)

Provided the last roll was an Exceptional Success, once a talent has been determined, the player may roll again for the chance of another. With a string of exceptional successes it is possible for a character to gain all psychic talents. Once a roll is not an exceptional success, no further powers are possible. If the same psychic talent is rolled for more than once, the PD may ask for a reroll, or can add the results together for determining the Level.

Each Psychic Talent is a root skill which requires specialization as soon as it reaches 0%. Initially the character is untrained, but can attempt tasks at -30%. Psychic Talents are Complex skills.

EXAMPLE: Madame Giselle has a FOC of 23, or task base of 46%. Rolling for Psychic Talents, Giselle gets a 22. It's an exceptional success. This gives a Level 2 Talent. Rolling on the Talent table she gets a 47, Telepathy. Training to use her talent she buys a skill of 10%. Having to specialize at 0% she chooses 'Send'. She also then buys 'Shield' at 5% and 'Sense' at 5%.

BUYING TALENTS

A PD may permit their players to buy Psychic Talents for new characters, instead of rolling an Exceptional Success for them. If they do, then the cost is 20 Training Points per Level of the chosen Talent (or rolled Talent.) The Initial purchase of a Talent provides Level 0 rather than the expected Level 1. Level 0 is regarded as a Latent form of the Talent. A Latent user cannot usually call upon their power, the PD choosing to attempt a Task check during exceptional circumstances. Otherwise, the character has a heightened sense related to their Talent. A Latent Telepath may instinctively have a sense when someone is lying. A Latent Entropkinetic may know when their Luck is about to run out.

The PD may wish to restrict the Level of a Talent that can be purchased. Level 3, the maximum for an average character, should be sufficient.

RAISING TALENTS

The Skill level for a Psychic Talent can be increased just like any other (see the Skills Chapter.) A talent's power level is much harder to increase. The character must have invested the necessary Training Points to increase their FOCUS core ability. Each time FOC is raised by 1, the character may make a FOC task check. On an exceptional success, there is a chance of an increase to a Talent's Level. The Character needs to already possess a Psychic Talent, and the exceptional success must produce a higher Level than was previously obtained. If this is the case, the Level increases by 1; otherwise it remains static. With an exceptional failure, the PD may choose to reduce the current Level of the Talent.

For example, after increasing the FOC score, the PD permits the player to roll a FOC task check. The result is a 33. The character already is a Level 2 Telepath, and the result would produce a Level 3. The PD allows the character to increase their Talent to Level 3.

It is conceivable that through repeated use of psychotropic drugs, a bonus may be given to the FOC task check, opening up the possibility of achieving far greater power levels.

USING PSYCHIC TALENTS

On a successful task check using the appropriate Talent, the Esper loses an amount of Endurance equal to twice the power level used. A failed attempt still costs 1 point of Endurance, as does the use of a Latent (0) talent.

BASELINE	COST
Distance:	1 per meter of range to single target. 2 per meter of range to all within forward arc. 10 per meter to all within sphere surrounding Esper.
Duration:	2 per minute the effect will last. 10 per day a passive effect will last, or amount of time between events.
Power:	10 per Degree of Success a target needs to resist or avoid the attack. 10 per Structure Point repaired, or Potency reduced. 2 per Blood Point healed. 10 per +1 or -1 to a target's affected Core Ability or calculated value.
Bonus/Penalty:	2 per +1% or -1% provided to a target's next affected task check. 5 per +1% or -1% provided to a target's affected task checks within a duration.
Energy:	5 per point of Damage caused or prevented, or Radiation dissipated.
Weight:	10 per 1 point of MASS affected.

The successful use of a talent produces an amount of PK points equal to:

10 x the talent's power level x Degrees of Success achieved.

Exception: a Latent Power level (0) produces only 2 x Degrees of Success.

If there are 0 Degrees of Success, Latents fail to generate any effect. For any other power level, assume 1 Degree of Success, but halve the total PK points available. So PK points equal (5 x talent power level) in this case.

The PK points produced are used to modify the effects of the power. They can be spent in the following ways:

The default value of any baseline when no PK points are spent is 0.

Distance is the range to the target or how far the Talent will take the character, so Distance 0 affects the character only, or someone they can touch.

Duration is how long the talent is intended to last or how far into the future or past the character wishes to look, so Duration 0 is an instantaneous effect.

Power is the effective Degrees of Success the target needs to overcome the Esper. It can also be used to determine adjustments to Ability scores or recovery rates.

Bonus/Penalty is the adjustment to a future Task check.

Energy is the amount of potential damage the talent can cause, or, if used defensively, the amount that can be prevented or shielded against.

Weight refers to the bulk of an object in MASS points.

EXAMPLE: A Level 2 Teleport uses the Weight & Distance baselines. On achieving 3 Degrees of Success, the player gains 60 PK points to allocate between Weight and Distance. Pushing themselves, they manage to teleport a MASS 2 object 40 meters.

When a talent involves an effect that continues over a period of time, the PD may require the Esper to maintain concentration (a FOC task check) throughout. Losing concentration could result in the premature end of the effect.

Some Talent Specialties require that different rates be applied to the Baseline costs. For example, Object Reading, a specialty of the Extra-Sensory Perception talent, has a Distance Baseline cost of 10 per year, as the effect measures its range in terms of years viewed.

Regeneration, a specialty of Reform, is regarded as a passive effect, where the results of the talent are not usually realized until the duration has passed.

A talent that remains in effect over a longer duration prevents the Esper from regaining their lost Endurance points until the effect ends.

HIGHER LEVEL EFFECTS

A PD who wishes to measure Psychic powers in a more epic way within their game, especially for higher levels, may want to use the Geometric rate shown below rather than the Linear rate for power levels. The amount of PK points produced is instead: 10 x the Rate for the talent's power level x Degrees of Success achieved. As you can see, the ratio of a level 9 Esper is 40,000 times more powerful under this method than under the standard method. Be warned. A level 9 Esper can create a nuclear explosion, or shield themselves from its effects, can wipe themselves from the memories of everyone on the continent, or travel several thousand kilometers in an instant.



Level	1	2	3	4	5	6	7	8	9
Rate	1	2	6	24	120	720	5040	40320	362880

TALENTS

Talents are treated just like any other skill (refer to the Skills chapter). The Training Point cost is exactly the same. They are all Complex Skill, but even untrained someone who has acquired the Talent can attempt it at -30%. The list below describes some of the Talents, their specialties, and the Base-Line values available to the talent.

SKILL NAME	DIFF.	ABILITY	BASE/SPEC.
ENTROPKINESIS	C	FOC	-- / 0

Entropkinesis is the talent of manipulating probability, of enhancing ones success in a task or disabling an opponent's chances. It is the power of Luck, of controlling the laws of Entropy. Many with this talent are unaware of it, unconsciously adjusting the odds in their favor or wishing bad luck to another. Lucky charm is focusing the power through an object, providing a bonus to tasks whilst in possession of the object.

An Affinity is a natural aptitude towards a certain skill or set task. Curse is allocating a penalty to an opponent's task checks. Coincidence is adjusting the odds of certain events to occur that otherwise do not require a task check from the user.

Specialties: Lucky Charm, Affinity [Choose Skill], Curse, Coincidence

Baselines: Distance, Duration, Bonus/Penalty

EXAMPLE: Eloise has the Entropkinesis talent at Level 2, and has trained in Coincidence to +20%, with the FOC task base of 36% her total is 56%. The PD could rule that a successful use of this Specialty would result in some happenchance outcome. Or, having gained 3 Degrees of Success, fortune has resulted on favorable conditions for sneaking past the enemy, granting +30% instantly, or +10% over the next 5 minutes.

EXTRA-SENSORY PERCEPTION	C	AWA	-- / 0
--------------------------	---	-----	--------

The ESP talents deal with remote sensing and detection of psychic presences or psychic residues. Object reading allows the character to learn about the thoughts, motivations and sensory impressions of people that may have handled the item in the past. Clairaudience is remote listening, clairvoyance remote viewing. Clairsentience is projecting all senses to a remote location - the equivalent of 'astral projection' and out-of-body experiences. Precognition allows the sensing of possible future events.

Specialties: Object reading, Clairaudience, Clairvoyance, Clairsentience, Precognition

Baselines: Distance, Duration

SKILL NAME	DIFF.	ABILITY	BASE/SPEC.
TELEPATHY	C	AWA	-- / 0

These talents enable characters to detect, transmit and receive emotions and thoughts. Sense enables the character to detect living things within the range radius. Send allows the projection of thoughts or emotions. The target character can resist (a FOC check). Link forms telepathic connections between characters. Formed thoughts or emotions can be freely exchanged. The target character can resist (a FOC check). Shield enables the character to protect themselves or others from psychic probes. Successfully protected characters are invisible to ESP and telepathy, or gain bonuses to resisting Strike. Strike enables the attacking character to do Endurance, AWA, REA or FOC damage to targets equal to the Power applied. Each additional target within range costs an extra Endurance point. The defending character can make a FOC check to resist. If shielded, each DoS purchased adds to any DoS generated by the FOC check to resist attribute loss.

Specialties: Sense, Send, Link, Shield, Strike

Baselines: Distance, Duration, Power

EXAMPLE: Giselle with her Telepathic talent (Level 2) to 'Send' thoughts has a Task % of 60. Rolling 23 she gets 2 Degrees of Success. She chooses a target 20m away, and buys a Power of 2 Degrees of Success. If her target resists and cannot get more than 2 DoS, she is successful. If the target was willing, then she might have chosen to put her 40 PK points into Distance for 40 meters, and a Power of 0 Degrees of Success.

REFORM	C	FOC	-- / 0
--------	---	-----	--------

These talents allow the character to heal themselves and others, and repair objects. Boost Attribute allows the character to temporarily increase a chosen Core ability by 1 point per point of Power applied. Empathic healing transfer's damage from the target character to the healer at a rate of 1 SP or BP per Power applied. Reparation fixes damage at a rate of 1 SP or BP per Power applied. Mending can be applied to non-living objects. It works like Reparation. Regeneration allows a character to heal faster for a period of time equal to Duration and at a multiple equal to the Power used. Endurance does not recover during this time, and the talent cannot be used to restore Endurance points. Restoring all SP's in a lost body part may constitute it regenerating back.

Healing may be an extended task, requiring multiple rolls until the Esper is exhausted or the target is healed.

Specialties: Boost [Attribute], Empathic Healing, Reparation, Mending, Regeneration

Baselines: Duration, Power

TELEKINESIS	C	FOC	-- / 0
-------------	---	-----	--------

This is the remote manipulation of matter and energy which is less subtle than reform powers. Manipulate enables the character to move, bend or operate objects which would be normally out of reach. Levitation enables the character to lift objects off the ground, including them-selves, float in the air, walk on liquids, etc. Throw allows the character to hurl an object at a target. Manipulate is a relatively controlled use of the talent, whilst Throw is a rough, violent use.

Duration is how long they can move the object for. Weight is how much they can move. Energy is the amount of velocity the object can have per combat turn, or the amount of force placed upon the item to bend or break it. The Weight and Velocity can determine the damage dealt on impact.

Electrokinesis allows the character to project or control electrical currents. Pyrokinesis is controlling or producing fire or rapidly heating objects. Hydrokinesis is controlling water, purifying liquids etc. Cryokinesis enables rapid cooling of objects. Aerokinesis is controlling the air/wind. Sonokinesis is the ability to control or create sound-waves. An attack using any of these specialties can produce Damage equal to the Energy value purchased.

Specialties: Manipulate, Levitation, Throw, Electrokinesis, Pyrokinesis, Hydrokinesis, Cryokinesis, Aerokinesis, Sonokinesis

Baselines: Duration, Weight, Distance, Energy

SKILL NAME	DIFF.	ABILITY	BASE/SPEC.
TELEPORTATION	C	FOC	-- / 0

The character can move through space. An exceptional Failure in a Teleportation attempt could place the character in an undesired, often fatal, position. The distance teleported is partly limited by conservation of energy. Ascents and moving closer to the equator cause cooling; descents, East-West movements and moving towards the poles cause warming.

Maximum ascent/descent: 800m / 1600m

Maximum move North/South/East/West: 1600km

These maxima assume dangerous levels of hypo- or hyperthermia (100+ SP of heat or cold damage). Characters can get around these limits with specially designed suits.

Damage is a function of range ($SP = km/16$) and altitude change ($SP = m/8$ up, $m/16$ down.)

Organic is the ability to Teleport themselves or other living creatures. The presence of inorganic material can interfere with the attempt, so baggage is usually at a minimum (-1% to the Task check for every 1 Kg of Inorganic material.) Inorganic is the ability to Teleport non-living objects. Call is the ability to summon an object from a pre-designated location directly to the Esper. Distance is the range to the required location, Weight is the maximum load that can be teleported (including own body weight.)

Specialties: Organic, Inorganic, Call

Baselines: Distance, Weight

OTHER TALENTS

It has been rumored that the Morrow Project has recruited personnel with rare talents such as, Seismic Control, Flight, and even Chronoportation. It is the latter talent that has caused a great deal of closed door discussions between Morrow Project team members. What if they did have someone who could teleport themselves back and forth through time? Is this how they know what is to come?



SKILLS & TASKS

SKILLS

A Skill quantifies a character's experience and training. It can encompass a single task, or a broad group. It adds to the appropriate Task Base of a Core Ability for the given task. A character with Awareness of 20 may attempt to track a marauder through woodland. Unadjusted the Task requires the player roll a D100, and get a score equal to or less than the Task %. In this case, the Task Base would be 40%. Rolling a 2 and a 7 counts as 27, and is a success. However, if the character also had training in 'Observe' or 'Hunt' at +10%, then the Task % would be $40 + 10 = 50\%$. Some tasks are natural to attempt, requiring no formal training or experience, for example, listening for an approaching vehicle. Some need at least a little training or experience; usually they involve the operation of certain equipment. Some cannot even be attempted without some formal training or extensive experience. These particular tasks tend to be of a more academic nature.

EXAMPLE: Susan tries to keep her cool during the Morrow Project intensive interview, so she can use her FOCUS core ability. Her FOC is 24, so her Task base is 48%. Rolling 31 on the D100 means that Susan kept it together.

Skills are broken down into levels of difficulty and specialization. Using a 'BAC' rule, a skill's complexity is described as either: 'Basic' (skills that are natural to the character – like 'observe' – and require almost no training); 'Advanced' (skills that are easy to learn, but can be attempted – like 'firearms'); and 'Complex' (skills that cannot usually be used without substantial training – many academic studies fall into this category.)

Basic skills start off with a base of +0%.

Advanced Skills, if not trained, can be attempted, but with a -10% penalty.

Complex Skills, if not trained, as a rule cannot be attempted. Sometimes, however, the PD may determine that the character knows a little about the Task, in which case they do so with a -30% penalty.

EXPERTISE

EXPERTISE	
SKILL %	EXPERTISE
--	Untrained (-10% for Advanced skills, cannot be attempted if Complex)
0	Trained (Basic skills start at this level), basic familiarity with the skill
5	Low level competence
10	Confidence with the subject, semi-professional
20	Professional, Intern, entry level for some professional careers, threshold for specialties
30	Proven knowledge in a chosen field (specialty), a qualified practitioner of that specialty
40	A recognized expert in that chosen field, granted professorship, senior professional status
50	A recognized elite in that chosen field, one of only a few
60	The pinnacle of expertise, where the skill has been refined to the peak of human capacity

Skills also have specialties. Examples include driving a ground vehicle which is broken up into classes depending on vehicle size, and the various types of firearms. When a skill reaches 20% any further increases are done through the specialty. The specialty is treated as a sub-skill of the main subject, and the character can learn numerous specialties from the main or 'root' skill, each starting at 20%. The main skill remains frozen at 20%, and will very rarely increase beyond this.

The Skill and specialty can be written as such:

Firearms 20%
Handgun +10% = 30%

OR in full as:

Firearms 20 + 40 (AWA Task Base) = 60%
Handgun +10% = 70%

With a Base Task of 40%, a Shotgun can be used at $40+20 = 60\%$, whilst a Handgun can be used at $40+20+10 = 70\%$.



Some skills are an exception to this rule, requiring a Specialization of the Skill as soon as it is trained. 'Performance' and 'Artisan' for example need a specialty to be chosen immediately on selecting the skill. Further specialties can be chosen, but start at 0%.

A player may decide to have their character specialize earlier in a skill that would normally do so at 20%. In this case the character reserves the right to receive further 'general training' in the skill, but focuses all their time and effort in a single field of study. The main skill remains at the lower level, but can be increased at a later stage. The PD may place a premium on returning to general studies.

Some skills already start with a score greater than 0%. These are representative of the character's knowledge of their environment, and years of training by immersion in their society. These skills are 'Language [Own]', which starts out equal to REA+EXP, and 'Culture [Own]' which starts at REA+FOC.

EXAMPLE: Susan has been trained to use Firearms, which is an 'Advanced' skill. A firearm is an item of equipment that requires some prior knowledge to fire correctly, but lack of knowledge does not prevent Susan from attempting to use it. With no training, Susan would have been able to use her Awareness Task Base of 56% but with a -10% penalty. Susan has trained, and has a skill in Firearms of 10%. She can use this to fire a handgun, or a rifle. Should she train enough to reach the ceiling of her general expertise with all firearms, at 20%, she can continue to learn the skill by choosing a specialty.

Having trained in Firearms she can now shoot with a base accuracy of 66%.

Susan on the other hand, wishes to speak French to a tourist, but has no experience with the language. Language (other) is a Complex skill, and without training cannot be attempted. It also requires a specialty to be chosen immediately on being trained. Susan can speak 'Spanish' (Language [Spanish]), and at best the PD may decide that the task be attempted but with a penalty.

The PD rules that although she doesn't possess Language (French), she may attempt to communicate, using her EXPRESSION task base, but with a -20% penalty. This gives her 20%, and a very limited communication.

TASK RESOLUTION

The chance of success is equal to the Task Base + the Skill level (of an appropriate skill) + any situational modifiers.) This is called the Task %.

Roll 1D100. If the result is equal to or less than the chance of success, the character has succeeded. A result higher than the success chance is a failure.

EXAMPLE: Susan wants to demonstrate to the French tourist how to find the Post Office. Gesturing directions, she has a 40%-20% = 20% chance of accomplishing this. Rolling 47 on the D100, greater than her 20% chance of success, she fails. The tourist leaves Susan, confused and heading in the wrong direction.

DIFFICULTY OF TASK

DIFFICULTY

LEVEL	PENALTY/BONUS
Simple	+40%
Routine	+20%
Challenging	+0%
Difficult	-20%
Very Difficult	-40%

DEGREES OF SUCCESS AND FAILURE

These can be used to qualify how well - or badly - a task attempt went.

Example situations include:

1. Riposte! Making and/or parrying a physical or rhetorical attack.
2. Research: Looking for information in a combat, library or laboratory environment.
3. Repair: Fixing equipment - or people!
4. Recovery: Getting over fatigue or illness.

More successes imply more damage to the target, better quality information, or repair job, or a more rapid recovery. A 6 degree of success repaired engine is much better than one fixed with 1 degree of success.

Compare the chance of success to the 1D100 roll. It equals the tens digits of the result rolled. For example, if the chance of success is 65%, and the dice roll is 23%, the degree of success is 2.

If a task attempt fails, then the degree of failure is given by subtracting the tens digits of the result rolled from 10. For example, if the chance of success is 65% and the dice roll is 93%, the degree of failure is 1 (10-9).

A degree of success can be written as DoS, whilst degree of failure is DoF, or sometimes negative DoS.



EXAMPLE: Susan fires her rifle at a deer. Her chance of success is 66%. She rolls a 23, and succeeds. She also gains 2 degrees of success. The shot hit, but didn't hit anything major. The deer begins to run. Susan quickly readies the rifle and takes another shot. The PD rules that there is a -20% penalty, with the deer starting to run. With a chance of success of 46% Susan rolls a 62. If only the deer hadn't run, that would have been a success, with 6 Degrees of Success. Instead, in Susan's panic she manages to jam her rifle, getting $10-6=4$ degrees of failure. The PD declares that it will take Susan at least 4 Actions to clear it, and the deer will be long gone.

EXCEPTIONAL SUCCESS AND FAILURE

Any double on the result rolled leads to an exceptional result. Degrees of success or failure are doubled.

EXAMPLE: Susan is doing some research for her final paper. She uses her FOC ability for a task base, and her Research skill. This gives her a 58% chance of success. Rolling a 44, with a double, she gains an exceptional success. This gives her double the normal degrees of success, a total of 8. Not only did she uncover the material for her paper, but some unexpected data that will no doubt make her paper shine with distinction.

OPPOSED TASKS

Conflicting or competing characters e.g. attacker-defender or people in a race each make a task attempt and compare degrees of success. The character with the highest degree of success is victorious.

If the loser was actively hindering the winner's efforts, then the winner applies the net degree of success (winner's successes – the loser's) to the final outcome. Examples include race times or competitive baking, building, cooking, knitting, etc.

Note that if the loser fails, this leads to the winner gaining **more** successes!

MARGINAL SUCCESS

A result that produces 0 degrees of success is said to be a marginal success, and produces the absolute minimum result that warrants a success. In combat this could mean winging the target, doing only half the usual damage. A successful result rolled of 01-09 is a marginal success.

AUTOMATIC SUCCESS AND FAILURE

A roll of 00 is an automatic failure, and also invokes an exceptional result. A roll of 01 is an automatic success.

If the chance of success exceeds 100%, then the task may automatically succeed. This is up to the PD's discretion. If degrees of success need to be determined, for every 10% add 1 degree of success, 100% counts as 10, 110% as 11, etc.

DEGREES OF SUCCESS/FAILURE

D100	DEGREES OF SUCCESS	DEGREES OF FAILURE
01-09	0	10
10-19	1	9
20-29	2	8
30-39	3	7
40-49	4	6
50-59	5	5
60-69	6	4
70-79	7	3
80-89	8	2
90-99	9	1
00	--	0

EXCEPTIONAL RESULTS

D100	EXCEPTIONAL DOS	EXCEPTIONAL DOF
11	2	18
22	4	16
33	6	14
44	8	12
55	10	10
66	12	8
77	14	6
88	16	4
99	18	2
00	--	0

MORE THAN ONE CORE ABILITY

When a particular task could call for, in equal parts, two separate Core Abilities, then the PD can rule that the Task Base is instead a sum of both of those Abilities, rather than a single Ability x 2%. For example, leaping from one rope to another requiring both STR & DEX would have a Task Base equal to STR + DEX, instead of STR x 2.

MORE THAN ONE SKILL

When attempting a Task, there may be situations where more than one Skill the character possesses would be useful. In this case the PD can rule that both skills can be applied. If two specialties from the same root skill are assessed to be of importance in a task, then the second specialty's score is added, with the base skill score being added only once.

UNOPPOSED TASKS

Tasks that are unopposed and given plenty of time, can be completed without resorting to a Task check. If the character keeps trying to complete the task, they will eventually achieve the best level of success appropriate to their ability. Instead of reading the die roll for determining the DoS achieved, read the character's Task Base + Skill. Thus, 40% + 20% = 60% would provide 6 DoS should the character spend enough time performing the task. This does not apply to certain tasks where time is of the essence, such as stopping someone bleeding to death.

CONDITIONAL SUCCESS

The PD may determine that in order to complete the task successfully, not only is a successful roll required, but a certain amount of degrees of success are also necessary. Getting less than the required amount would result in some form of partial completion of the task. For example, defusing a bomb on a timer would normally be successful given enough time. The PD in this case asks that the player obtain 4 degrees of success, as a measure of defusing the bomb within the time constraint. With 3 degrees of success the player would have saved the day, except that they were too slow.

PAST EXPERIENCE

Although the character has raw talent in the form of their core abilities, it is the life path choices they made before signing up with the Morrow Project that taught them the important skills and gave them the good moral code that got them noticed. In this Game you will use Training Points to gain and enhance the skill-sets your character uses.

TRAINING POINTS

A character has a Training Points pool which equals their FOCUS + REASONING scores, multiplied by five. They represent the dedication and understanding the character has had growing up. To this total, a character also gains an additional amount of Training Points equal to their Age, multiplied by two. These points can be used to purchase education and career skills, Project training and advantages and disadvantages if desired.

Training Points: (FOC + REA) x 5, plus (AGE x 2)

Characters below the age of 20 will have far fewer Training Points available. The table 3.14 in Chapter 3 indicates the expected pool of Training Points available by Age.

BUYING INITIAL SKILLS

A player may invest a number of Training Points into a Skill, buying 1% for every TP used. Investing 10 Training Points will give the Character 10% in that chosen skill. As a general rule, the minimum investment is 5%, representing the completion of Basic training. A root skill can be raised to 20% before the character has to begin learning specialties. Some skills are exempt from this, or must specialize at 0%. A player may wish their character to have begun specializing earlier than the 20% level. Either way, once the root skill has reached its cap, all further increases are done in one of the chosen specialties.

EXAMPLE: Lauren Coleman invests 20 Training Points to gain 20% in Persuade. However, she actually wants additional training in the skill. Choosing to take an Advanced Debating class, she invests a further 5 Training Points in the Persuade skill. Because the skill is already at the threshold, she places the additional 5% in the specialty 'Debate'. It is recorded on the character sheet, thus:

Persuade	20%
Debate	+5%

Extending her training further, she takes further specialties in 'Deceive', 'Interrogate', and 'Intimidate', investing 20 more Training Points between them.

Deceive	+5%
Interrogate	+10%
Intimidate	+5%

Although these specialties, and others not specified, would be already available in the root skill of Persuade at 20%, the higher expertise requires their purchase individually. In total, this has cost Lauren 45 Training Points.

SKILL LEVELS

A character can be said to be professionally qualified in their chosen field once they achieve a skill of 20% or more. It is prudent to determine which skills the character is well known for, and establish whether they are known to have some competence in that field. For example, a qualified doctor should have at least 20% in Medicine [specialty], but one with less than 20% has either dropped out of medical school or is in the process of learning.

For a starting character, the PD may elect to cap Skill levels at the 20% threshold (in order to avoid the need for specialty selection.)

TRAINING TIME

When creating a character bear in mind that it can take some time to acquire higher level of skills. A PD should reserve the right to allow a player to buy a skill at 50 or 60%. To give you an idea of the likely time a character needs to invest in training or experience for a single skill, refer to the table below.

TRAINING TIME		
%	TRAINING (FOR ONE SKILL)	EXPERIENCE
0-4	6 weeks (Night Class, One Semester)	3 months
5-9	12 weeks (Full Time Class, One Semester)	6 months
10-14	6 months (Full Year of focused Classes)	12 months
15-19	1 year (Associates or Bachelors Degree)	30 months
20-24	2 years (Post-Grad or Masters Degree)	5 years
25-29	3 years (Doctorate, Medical Degree)	8 years
30-34	5 years (—)	12 years
35-39	7 years (—)	17 years
40-44	10 years (—)	25 years
45-49	13 years (—)	32 years
50-54	16 years (—)	40 years
55-59	20 years (—)	50 years

Note that although a Bachelors Degree may take 3-4 years to complete, the major subject may only be receiving approximately 12 months of dedicated training.

DETERMINING CHARACTER BACKGROUND AND SKILLS

Often the best way of determining your character's life path is to work backwards from the skill set you want them to start with in the game. Project characters must have at least 50 Training Points allocated to the year of team training. The average character will then have about 200 points left to allocate to other skills.

The Project branch your character is in will be a function of their previous career. For example, MARS' ranks are made up largely of ex-military or law enforcement personnel. Science tends to be made up of academics, scientists and engineers. Recon personnel are the most diverse in terms of background; strong interpersonal and survival skills are an obvious asset. Exceptions should have an interesting explanation.

Character age influences training points. Older characters have had time to prove themselves and accumulate a wider range of skills as a result of life experience. Younger characters may have exceptional abilities and a narrower repertoire of high skill levels e.g. a mathematical or musical prodigy.

Did your character graduate from high school, or did they study for a GED later on?

Did your character start working straight after school, go on to further study, or just drift around for a while?

Higher education takes time. A basic degree means a character's career doesn't start until age 22. Master's and doctoral degrees add another one to four years, depending on the field of study.

As a rough guide, each year of education or a career is worth 20 Training Points. More intense training, memorable job experiences or higher levels of motivation lead to faster learning. A minimum rate of 10 points per year is suggested - it takes real effort to avoid learning things.

'Fast' and 'slow' learning years should be explained in the character's biography. They can provide role-playing direction in terms of the character's personality, and plot hooks to an attentive Project Director.

Some occupations require minimum prerequisites, either education or certain ability scores. The Project Director may offer you the chance to roll some related Task or Skill check in order to qualify.

Some occupations list a minimum Training Point expenditure. These should be allocated to core skills associated with the occupation which are essential to safe practice. You may choose to allocate points otherwise. The implication is that the character either hasn't completed their training, has failed to maintain skill in that area, or never gained it in the first place. The explanation may provide role-playing opportunities.

For example, with 260 Training Points to spend, 50 are reserved for Morrow Project training. The remaining 210 points are allocated thus: 60 points for College, 20 points for a Master's Degree, 20 points as a Pharmacist's assistant, 110 points for working as a Pharmacologist for a leading pharmaceutical company.

FREE FORM EXPENDITURE

If you feel more confident in the skills you think your character should have acquired, then you can choose to allocate as you see fit. However, you may find it useful having some guidance on how many points should go to certain skills. Expect to allocate 20%, for example, to a skill which has served as a Major subject of study, or is the primary skill used in an occupation. This could be higher depending upon the time your character may have spent studying or using a given skill.

SPECIALIZATIONS

In the Education and Career packages you will see some skills listed with a specialty already specified in parenthesis. This indicates the usual field of study most often found within that career. You will not be required to take this specialty until the root skill is raised to 20%. Of course you may elect to specialize even before the root skill gets to 20%. Some skills, however, require specialization at 0%.



PREVIOUS EDUCATION / CAREER PATH

EDUCATION

HIGH SCHOOL / GED

Graduation: High School Diploma or GED.

Years of Study: 2+; most students graduating at the age of 18.

Training Points: 0-20; most experience here in available within the Language (Own) and Culture (Own) skills. Only College level classes will warrant Training Point expenditure.

Skill Selection: Use the Selections available to Trade School or College.



TRADE / TECHNICAL SCHOOL

Graduation: Associates Degree or equivalent Professional Qualification.

Years of Study: 4.

Training Points: 60-80.

Minimum: 15 in chosen Major Field of study.

Skill Selection: (choose from)

- B:** Acrobatics, Athletics, Bargain, Climb, Persuade.
- A:** Agriculture, Animal Handling, Artisan (any), Communications, Computer Technology, Construction, Drive (any), Emergency Procedures, First Aid, Instruct, Leadership, Legal Procedures, Maintenance (any), Meditation, Nursing (any), Operate Equipment, Performance (any), Research, Sports, Swim.
- C:** Commerce (any), Electronics, Explosives, Language (other), Martial Arts (any), Pilot Aircraft (small or large).

COLLEGE

Graduation: Bachelor's Degree.

Years of Study: 4.

Training Points: 60-80.

Minimum: 15 in chosen Major Field of study.

Skill Selection: (choose from)

B: Athletics, Climb, Persuade.

A: Agriculture, Animal Handling, Computer Technology, First Aid, Instruct, Leadership, Meditation, Music, Nursing (any), Performance (any), Research, Sensor Operations (in major field), Sports (any), Swim.

C: Archeology, Biology, Chemistry, Commerce, Culture (other), Engineering, Forensics, Geography, Geology, History, Journalism, Language (other), Linguistics, Literature, Martial Arts (any), Mathematics, Pharmacy, Philosophy, Physics, Programming, Psychology, Theology.

GRADUATE SCHOOL

Graduation: Master's Degree and/or Doctorate.

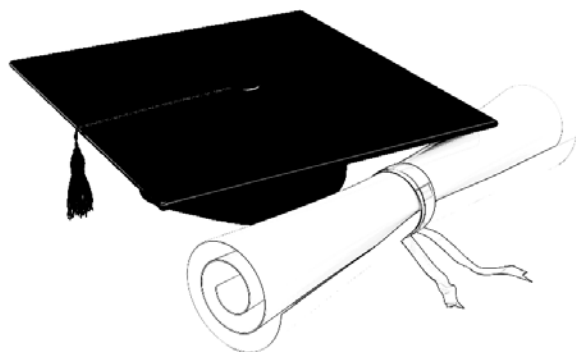
Pre-requisite: Bachelor's Degree.

Years of Study: 1 (Master's); 2 (Doctorate).

Training Points: 20-40.

Minimum: 10 in new Major Field of study, or an additional 5 in existing Major Field of study.

Skill Selection: Use College Skill Selection



MEDICAL SCHOOL

Graduation: M.D.

Pre-requisite: Bachelor's Degree.

Years of Study: 4.

Training Points: 60-80.

Minimum: 20 in Medicine, 20 in Surgery.

Skill Selection: (choose from)

B: Persuade.

A: Instruct, Research.

C: Medicine, Pharmacy, Psychology, Surgery.

VETERINARY SCHOOL

Graduation: D.V.M.

Pre-requisite: Bachelor's Degree.

Years of Study: 4.

Training Points: 60-80.

Minimum: 20 in Veterinary Medicine, 20 in Biology (Zoology).

Skill Selection: (choose from)

A: Animal Handling, Commerce, Instruct, Research.

C: Biology (Zoology), Medicine, Pharmacy, Veterinary Medicine.

DENTAL SCHOOL

Graduation: D.D.S.

Pre-requisite: Bachelor's Degree

Years of Study: 4.

Training Points: 60-80.

Minimum: 20 in Dentistry.

Skill Selection: (choose from)

B: Persuade

A: Commerce (Business), Instruct, Research

C: Dentistry, Medicine, Pharmacy, Psychology

LAW SCHOOL

Graduation: J.D.

Pre-requisite: Bachelor's Degree

Years of Study: 4.

Training Points: 60-80.

Minimum: 20 in Law.

Skill Selection: (choose from)

B: Persuade

A: Commerce (Business), Instruct, Leadership, Performance (Speech)

C: Culture (other), Law, Psychology



CIVILIAN CAREERS

ACADEMIC

Pre-requisite: Associate's Degree or College Degree (usually Master's or Doctorate) - depending on the field of Academic discipline.

Minimum: 20 in skill associated with Academic discipline.

Skill Selection: (choose from)

Commerce (Business), Computer Technology, Create (Writing), Culture (other), Instruct, Language (other), Leadership, Performance (Speech), Persuade, Sensor Operations (Biology, Chemistry, Geology, Physics, depending on specialty), Research, Specialty subject (major).

ATTORNEY

Pre-requisite: J.D.

Minimum: 20 in Law.

Skill Selection: (choose from)

Bargain (Negotiate), Commerce (any), Computer Technology, Culture (other, Politics), Forensics, Intimidate, Law (any), Leadership, Negotiate, Performance (Speech), Persuade, Psychology, Research.

COMPUTER OPERATOR/PROGRAMMER

Minimum: 20 in Computer Technology, 10 in Programming.

Skill Selection: (choose from)

Commerce (any), Computer Technology, Electronics, Maintenance (Computer), Mathematics (any), Programming, Research.

DENTIST

Pre-requisite: D.D.S.

Minimum: 20 in Dentistry.

Skill Selection: (choose from)

Commerce (any), Computer Technology, Dentistry, Instruct, Persuade, Pharmacy, Psychology.

DOCTOR

Pre-requisite: M.D.

Minimum: A board-certified specialist must have 20 in Medicine or Surgery, with at least an additional 10 in a specialty skill in their field.

Skill Selection: (choose from)

Biology (any), Commerce (any), Computer Technology, Forensics, Instruct, Legal Procedures, Medicine (specialty), Persuade, Pharmacy, Psychology, Research, Sensor Operations (Medical), Surgery (specialty).

ENGINEER

Minimum: 20 in Engineering (specialty).

Skill Selection: (choose from)

Chemistry, Commerce (especially Business as management skill), Computer Technology, Drive (any), Explosives (civil, combat, mining), Electronics, Geology, Geography (civil, transportation), Leadership, Maintenance (computer, electrical, mechanical), Mathematics (any), Navigate, Operate Equipment (combat, mechanical, mining), Persuade, Physics, Programming, Research, Sensor Operations (Avionics, Chemistry, Geology, Physics, etc. depending on engineering specialty).

FARMER

Minimum: 20 in Agriculture.

Skill Selection: (choose from)

Agriculture, Bargain, Animal Handling, Commerce (any), Drive (any), Hunt, Maintenance (Auto, Mechanical), Navigate, Operate Equipment, Ride, Survival, Veterinary Medicine.



FIREFIGHTER

Minimum: 20 in Firefighting, 10 in First Aid.

Skill Selection: (choose from)

Climb, Communications, Drive (Automobile or Heavy Vehicle), Emergency Procedures, First Aid, Maintenance (Auto), Melee Weapon (Axe), Navigate, Persuade, Psychology.



JOURNALIST

Minimum: 20 in Journalism.

Skill Selection: (choose from)

Bargain (Negotiate), Create (Draw, Film, Photography or Writing), Culture (other), Language (other), Persuade, Psychology, Research.

LAW ENFORCEMENT OFFICER

Pre-requisite: Associates Degree or Bachelor's Degree.

Minimum: 10 in Drive (Automobile), 20 in Legal Procedures, 20 in Firearms (Handgun).

Skill Selection: (choose from)

Artillery (grenade launchers e.g. SWAT), Athletics, Bargain (Negotiate), Climb (SWAT), Communications, Drive (Automobile or Heavy Vehicle), Emergency Procedures, Firearms (Handgun, Machine Guns, Rifle, Shotgun), Forensics, Hunt, Instruct, Intimidate, Language (other), Law (criminal, civil), Leadership, Legal Procedures, Martial Arts, Melee Weapons (club), Navigate, Persuade, Psychology, Special Weapons (pepper spray, tear gas dispensers, water cannon), Stealth, Tactics (SWAT), Thrown Weapon (grenade).



PARAMEDIC

Minimum: 20 in Drive (Automobile), 20 in First Aid

Skill Selection (choose from):

Climb, Communications, Drive (Automobile), Emergency Procedures, First Aid, Maintenance (Auto), Medicine (Critical Care), Navigate, Persuade, Pharmacy, Psychology, Surgery (Orthopedic, Trauma)

PILOT

Pre-requisite: AWA 20+

Minimum: 20 in Navigation, 20 in Pilot Aircraft.

Skill Selection: (choose from)

Communications, Computer Operation, Maintenance (Electrical, Mechanical), Navigate, Parachuting, Pilot Aircraft (any), Sensor Operations (Avionics)

PRIEST OR MINISTER

Minimum: 20 in Persuade, 20 in Theology.

Skill Selection: (choose from)

Commerce (any), Persuade, Performance (Speech), Philosophy, Psychology, Theology.

NURSE

Minimum: 20 in Nursing.

Skill Selection: (choose from)

Commerce (Business), Culture (other, Sociology), Dentistry (if dental nurse), First Aid, Instruct, Medicine (specialty), Nursing (specialty), Persuade, Pharmacy, Psychology, Surgery (specialty), Veterinary Medicine (if vet nurse)

TRADESMAN

Minimum: 20 in Artisan (trade).

Skill Selection: (choose from)

Artisan (trade), Bargain, Commerce (Business), Construction, Drive (Automobile or Heavy Vehicle), Maintenance (any), Operate Equipment, Scrounge

MILITARY CAREERS

RECRUIT TRAINING / BASIC TRAINING

Pre-requisite: CON 20+.

Graduation: BCT/AIT.

Years of Study: 3 months – 1 year.

Training Points: 40-60.

Skill Selection: (choose from)

B: Athletics, Brawl, Climb, Observe

A: Artisan (Gunsmith), Drive Automobile, First Aid, Sport, Swim

C: Martial Arts

Branch Skill Selection (select a branch of the Armed Forces):

Air Force:

A: Firearms (Handgun, Rifle).

Army:

B: Stealth (Camouflage)

A: Artillery, Construction (Fortify), Firearms (Rifle), Gunnery (Land), Thrown Weapon (grenade).

C: Special Weapons (rocket launcher).

Marines:

B: Stealth (Camouflage)

A: Artisan (Gunsmith), Construction (Fortify), Firearms (Rifle), Gunnery (Land or Sea), Pilot Watercraft (Boat), Survival (any), Thrown Weapon (grenade).

C: Special Weapons (rocket launcher).

Navy:

A: Artillery, Firearms (Handgun, Rifle, Shotgun), Gunnery (Sea), Pilot Watercraft (Boat).

CONTINUED MILITARY SERVICE

After Basic and Specialty Training, subsequent service is broken into terms. They are generally based on four-year cycles which are further subdivided into tours of duty. Tours may last up to four years, but average one to two.

MILITARY SERVICE

Pre-requisite: BCT/AIT.

Note: This is available in addition to any specialty selected from below.

Skill Selection: (choose from)

Athletics, Brawl, Scrounge, Sports, Swim.

NCOS AND OFFICERS

Pre-requisite: BCT/AIT.

Note: This is available in addition to Military Service above and any specialty selected from below.

Skill Selection: (choose from)

Instruct, Leadership, Persuade, Psychology, Tactics.

GROUND CREW/SUPPORT

Pre-requisite: BCT/AIT.

Skill Selection: (choose from)

Artisan (any), Drive (Automobile or Heavy Vehicle), Communications, Electronics, Emergency Procedures (Firefighting), Firearms (Handgun, Rifle), Maintenance (Auto, Electrical, Mechanical), Navigate, Operate Equipment (Construction, Mechanical), Scrounge, Sensor Operations (Avionics, Radar).

MEDICAL - MEDIC

Pre-requisite: BCT/AIT.

Minimum: 20 in First Aid.

Skill Selection: (choose from)

Communications, Drive (Automobile), Emergency Procedures (Crisis Management, Crowd Control, Search and Rescue), Firearms (Handgun, Rifle), First Aid, Medicine (critical care), Persuade, Pharmacy, Psychology, Scrounge, Surgery (critical care, orthopedics, trauma).

MEDICAL - NURSE

Pre-requisite: BCT/AIT.

Note: Nursing staff hold officer ranks.

Minimum: 20 in Nursing.

Skill Selection: (choose from)

Commerce (Business), Drive (Automobile), First Aid, Instruct, Nursing (specialty), Medicine (specialty), Persuade, Pharmacy, Psychology, Research, Scrounge, Surgery (specialty).

MEDICAL – DOCTOR/DENTIST

Pre-requisite: BCT/AIT, M.D. or D.D.S.

Note: Medical staff hold officer ranks.

Minimum: 20 in Medicine, Surgery or Dentistry.

Skill Selection: (choose from)

Commerce (Business), Computer Technology, Dentistry, Forensics, Instruct, Leadership, Legal Procedures, Medicine (specialty), Persuade, Pharmacy, Psychology, Surgery (specialty).



LEGAL

Note: As per Attorney, civilian career.

MILITARY POLICE/SECURITY

Pre-requisite: BCT/AIT.

Minimum: 20 in Emergency Procedures or Legal Procedures.

Skill Selection: (choose from)

Bargain (Negotiate), Brawl, Computer Technology, Drive (Automobile), Emergency Procedures (Crisis Management, Crowd Control, Riot Control), Firearms (Handgun, Rifle), Forensics, Hunt (Track), Instruct, Interview, Language (other), Law, Legal Procedures, Martial Arts (style), Persuade (Intimidate, Interrogate), Psychology, Stealth, Thrown Weapon (grenade).

INTELLIGENCE

Pre-requisite: BCT/AIT.

Skill Selection: (choose from)

Brawl, Communications, Computer Technology, Electronics, Firearms (Handgun, Rifle), Instruct, Language (other), Martial Arts, Math (Cryptography), Operate Equipment (Security), Persuade (Interrogate, Intimidate), Psychology, Sensor Operations (Radar, Surveillance), Stealth, Thrown Weapon (grenade).

PUBLIC RELATIONS

Note: As per Journalist, civilian career.

CHAPLAIN

Note: As per Priest or Minister, civilian career.

AIR FORCE – FLIGHT CREW

Pre-requisite: BCT/AIT.

Skill Selection: (choose from)

Communications, Computer Technology, Emergency Procedures (Firefighting), Firearms (Handgun, Rifle), Gunnery (Air), Leadership, Maintenance (Electrical and Mechanical), Navigate, Observe, Parachuting, Persuade, Sensor Operations (Avionics), Survival (wilderness).

AIR FORCE - PILOT

Pre-requisite: BCT/AIT, 25+ AWA (Fighter Pilots also require 25+ DEX).

Note: Pilots hold officer ranks.

Minimum: 20 in Pilot Aircraft.

Skill Selection: (choose from)

Communications, Computer Technology, Firearms (Handgun, Rifle), Gunnery (Air), Instruct, Leadership, Maintenance (Electrical, Mechanical), Navigate, Observe, Parachuting, Persuade, Pilot Aircraft (any), Sensor Operations (Avionics), Survival (wilderness).

ARMY – ARMOR OR ARTILLERY

Pre-requisite: BCT/AIT.

Skill Selection: (choose from)

Artisan (Gunsmith), Artillery, Communications, Computer Technology, Construction (Fortify), Drive (Heavy or Tracked Vehicle), Electronics, Firearms (Handgun, Machine Gun, Rifle), Gunnery (Land), Maintenance (Auto, Mechanical, Electrical), Navigate (Land), Sensor Operations (Radar), Stealth (Camouflage).

**ARMY - AVIATION**

Note: As per Air Force – Flight Crew or Air Force - Pilot, military career.

ARMY – ENGINEERING

Pre-requisite: BCT/AIT.

Skill Selection: (choose from)

Artisan (Gunsmith), Communications, Computer Technology, Construction, Drive (any), Engineering (Combat, Civil, Electrical, Mechanical), Explosives, Firearms (Handgun, Rifle), Firefighting, Fortify, Geology, Instruct, Maintenance (any), Navigate, Operate Equipment, Physics, Pilot Watercraft (Boat), Scrounge, SCUBA, Sensor Operations (Geology, Physics, Radar), Stealth (Camouflage), Swim.

ARMY – INFANTRY (REGULAR)

Pre-requisite: BCT/AIT.

Skill Selection: (choose from)

Artisan (Gunsmith), Artillery, Communications, Construction (Fortify), Drive (any), Explosives, Firearms (Handgun, Machine Gun, Rifle), First Aid, Navigate, Observe, Special Weapon (flame or rocket launcher), Stealth (Camouflage), Tactics, Thrown Weapon (grenade).

ARMY – INFANTRY (AIRBORNE)

Pre-requisite: BCT/AIT, STR 20+, DEX 20+, CON 20+.

Note: This is available in addition to Army – Infantry (Regular) above.

Skill Selection: (choose from)

Brawl, Martial Arts, Parachuting, Stealth, Survival.

ARMY – INFANTRY (RANGERS)

Pre-requisite: BCT/AIT, STR 23+, DEX 23+, CON 23+.

Note: This is available in addition to Army – Infantry (Regular), and Army – Infantry (Airborne) above.

Skill Selection: (choose from)

Climb, Hunt (Track), Swim.

ARMY – SPECIAL FORCES

Pre-requisite: BCT/AIT, STR 25+, DEX 25+, CON 25+, 20+ in Language (other).

Note: This is available in addition to Army – Infantry (Regular), and Army – Infantry (Airborne) above.

Skill Selection: (choose from)

Instruct, Leadership, Melee Weapon (Knife), Language (other), Persuade (Intimidate, Interrogate).

Subspecialties also exist for Army – Special Forces, Skill Selections are in addition to those listed above.

Communications:

Communications, Electronics, Maintenance (Electrical), Mathematics (Cryptography).

Engineering:

Construction, Explosives, Engineering (Combat, Civil, Electrical, Mechanical), Maintenance (any), Navigation.

Intelligence:

Mathematics (Cryptography), Persuade (intimidate, Interrogate), Psychology, Stealth.

Medical:

Emergency Procedures (Crisis Management), First Aid, Medicine (Critical Care), Pharmacy, Psychology, Surgery (Trauma).

Weapons:

Artisan (Gunsmith), Any weapons skill, Communications, Tactics.

MARINE - ARTILLERY

Note: As per Army – Artillery, military career.

MARINE - AVIATION

Note: As per Air Force – Flight Crew or Air Force - Pilot, military career.

MARINE – INFANTRY

Pre-requisite: BCT/AIT, STR 20+, DEX 20+, CON 20+.

Skill Selection: (choose from)

Artillery, Communications, Construction, Drive (any), Explosives, Firearms (Handgun, Machine Gun, Rifle), First Aid, Gunnery (land), Martial Arts, Navigate, Observe, Pilot Watercraft (Boat), Special Weapon (rocket launcher), Stealth (Camouflage), Survival, Swim, Tactics, Thrown Weapon.

MARINE – SNIPER

Pre-requisite: BCT/AIT, STR 23+, DEX 23+, CON 23+.

Note: This is available in addition to Marine – Infantry above.

Minimum: 30 in Firearms (Rifle).

Skill Selection: (choose from)

Climb, Hunt (Track), Stealth.



MARINE – FORCE RECON

Pre-requisite: BCT/AIT, STR 25+, DEX 25+, CON 25+.

Note: This is available in addition to Marine – Infantry above.

Skill Selection: (choose from)

Climb, Parachuting, Persuade (Interrogate, Intimidate), Swim (SCUBA).

NAVY – PILOT

Note: As per Air Force – Flight Crew or Air Force - Pilot, military career.

NAVY – SAILOR (COMMAND)

Pre-requisite: BCT/AIT.

Note: Command staff hold officer ranks.

Skill Selection: (choose from)

Communications, Computer Technology, Emergency Procedures (Firefighting), Engineering (any), Firearms (Handgun), Instruct, Leadership, Navigate, Persuade, Pilot Watercraft (any), Sensor Operations (Radar, Sonar), Social Science (Psychology), Tactics.

NAVY – SAILOR (COMMUNICATIONS)

Pre-requisite: BCT/AIT.

Skill Selection: (choose from)

Communications, Computer Technology, Electronics, Emergency Procedures (Firefighting), Firearms (Handgun), Instruct, Language (other), Maintenance (Electrical), Math (Cryptography), Sensor Operations (Radar, Sonar).

NAVY – SAILOR (ENGINEERING)

Pre-requisite: BCT/AIT.

Skill Selection: (choose from)

Artisan (any), Computer Technology, Emergency Procedures (Firefighting), Engineering (Electrical, Mechanical, Naval Architecture, Nuclear), Firearms (any), Instruct, Leadership, Maintenance (Electrical, Mechanical), Operate Equipment, Scrounge, Sensor Operations (Physics, Radar, Sonar), Swim (SCUBA).

NAVY – SAILOR (GUNNERY)

Pre-requisite: BCT/AIT.

Skill Selection: (choose from)

Artisan (Gunsmith), Artillery, Emergency Procedures (Firefighting), Firearms (Handgun, Machine Gun, Rifle), Gunnery (Sea), Maintenance (Electrical, Mechanical), Operate Equipment, Sensor Operations (Radar, Sonar).

NAVY – SEAL

Pre-requisite: BCT/AIT, STR 25+, DEX 25+, CON 25+.

Skill Selection: (choose from)

Any weapons skill, Climb, Explosives, Engineering (Combat, Civil, Electrical, Mechanical, Naval Architecture, Nuclear), Martial Arts, Persuade (Intimidate, Interrogate), Navigate, Parachuting, Pilot Watercraft (Boat, Hovercraft, Submarine), Stealth, Survival, Swim (SCUBA).

MORROW PROJECT TRAINING

Project recruiters usually looked for experts in their field. Most were drawn from college campuses or the military. Others came from industry and business, off the farm, or from the skilled trades. If a person's knowledge could help restore or preserve civilization and they were of good character, they were a potential recruit. In rule terms, a Project character should have at least two career skills at 20%, although exceptions are known.

The Morrow Project training program is grueling and relentless. The first 3 months are dedicated to basic training in core skills. The remaining 9 months are spent in specialist classes dedicated to the trainees chosen team. Then, add 1 year to the character's age, if necessary.

As part of Morrow Project Training, a character will get a minimum training in all Skills listed for their chosen Branch Training. All these Skills are considered 'trained', and start at 0%. Additional Training Point expenditure can be used to raise select skills. Specialties listed in parenthesis must be selected should the root skill be increased beyond 20%.

Branch Training [9 months] – At least 50 points should be spent on skills from the Morrow Project Core Skill Selection and Branch Skill Selection.

Team Leader Training [2 months] – For the chosen candidate from the team, usually requires EXP + REA = 50+.

MORROW PROJECT TEAM – BASIC TRAINING (CORE)

Pre-requisite: Recruitment into the Project (assumed for Morrow Project characters)

Graduation: MPTP, eventual deployment in cryo-tube.

Years of Study: 3 months – 1 year.

Training Points: 30+.

Note: This is available in addition to any Branch selected from below.

Skill Selection: (choose from)

Athletics, Brawl, Communications, Construction, Drive (MPV), Emergency Procedures, Firearms, First Aid, Gunnery (Land), Hunt (Track), Maintenance (Electrical or Mechanical), Martial Arts, Navigation, Observe, Pilot Watercraft (Hovercraft), Psychology, Stealth, Survival, Swim, Tactics.

TEAM LEADER

Pre-requisite: EXP and REA totaling 50+.

Graduation: MPTL

Years of Study: 2 additional months.

Training Points: 0+.

Note: This is available in addition to Morrow Project Team Personnel above and any Branch selected from below.

Skill Selection: (choose from)

Leadership, Persuade, Tactics.

BRANCH TRAINING - RECON

Graduation: MPB-R

Years of Study: 9 months – 1 year.

Training Points: 20+.

Skill Selection: (choose from)

Bargain, Culture (other), Instruct, Melee Weapon (Knife), Persuade, Scrounge, Thrown Weapon.

BRANCH TRAINING - MARS

Graduation: MPB-M

Years of Study: 9 months – 1 year.

Training Points: 20+.

Skill Selection: (choose from)

Artillery, Explosives, Melee Weapon (Knife), Special Weapons (Rocket launcher), Thrown Weapon.

BRANCH TRAINING - SCIENCE

Graduation: MPB-S

Years of Study: 9 months – 1 year.

Training Points: 20+.

Skill Selection: (choose from)

Biology, Chemistry, Computer Technology, Culture (other), Engineering, Geology, Geography, Mathematics, Medicine (Critical care), Operate Equipment, Physics, Sensor Operations (by science specialty), Surgery (Trauma).

BRANCH TRAINING – [OTHER]

Graduation: MPB-X

Years of Study: 9 months – 1 year.

Training Points: 20+.

Skill Selection: (choose from)

[Additional Skills relative to the focus of the Branch's activities]

PLAYING NON-MORROW PROJECT PERSONNEL

It's entirely possible that during the course of play a player loses their character, and it seems inconvenient to introduce yet another lone member of the Morrow Project who just so happened to be passing by, or the player may prefer a different challenge. This being the case, a player may choose to play a character from any of the Survivor Groups as listed in the 'Survivors' chapter in this book. Roll up the core abilities as normal, unless the write-up specifies any modifiers. Remember that in the future world of The Morrow Project, certain skills will no longer be available. Each SURVIVOR GROUP also lists a set of skills that every member of that type will have received training in. Training Points can be spent to increase these. Survivor Group skills are all regarded as having been 'trained', and start at 0%.

SKILLS & TASKS

SKILLS SKILL LIST – BY DIFFICULTY (! – skill must specialize at 0%, no 20% threshold exists.)

NAME ATTRIBUTE EXAMPLE SPECIALTIES BASIC (EVERYONE HAS THESE AT 0%)

Acrobatics	DEX	Balance, Bars, Dodge, Roll
Athletics	DEX	Climb, Jump, Lift Weights, Run, Throw
Bargain	EXP	Appraise, Negotiate, Fence
Brawl	STR	Grapple, Pin, Strike (w/ hands & feet), Throw
Climb	STR	Equipped, Free, Ice, Mountain
Culture (own)!	REA	[Own] (Starts at REA+FOC)
Language (own)!	EXP	[Own] (Starts at REA+EXP)
Navigate	AWA	Air, Make Map, Land, Sea
Observe	AWA	Culinary, Engineering, Industrial, Investigation, Military, Musical
Persuade	EXP	Deceive, Interrogate, Intimidate, Pacify
Scrounge	FOC	Beg, Evaluate, Fence, Search
Stealth	DEX	Camouflage, Conceal, Disguise, Hide, Intrusion, Sleight, Sneak

ADVANCED (EVERYONE CAN TRY THESE, BUT SUFFERS A -10% PENALTY IF UNSKILLED.)

Agriculture	REA	Agronomy, Apiculture, Aquaculture, Forestry, Herding, Horticulture
Animal Handling	FOC	Calm Beast, Tend [Animal], Train [Animal]
Archery	AWA	Bow, Crossbow
Artisan!	FOC	Bricklayer, Blacksmith, Carpenter, Plumber, Chef, etc
Communications	EXP	Cryptography, Digital, Print, Radio, Telegraphy, Telephony, Television, Traffic Analysis
Commerce	REA	Accounting, Business, Economics, Logistics
Computer Technology	AWA	Applications, Hardware, Networks, Security
Construction	STR	Build, Excavate, Fortify
Create!	EXP	Draw, Film, Forgery, Music, Paint, Photo, Sculpt, Writing

NAME	ATTRIBUTE	EXAMPLE SPECIALTIES
Divination	FOC	Astrology, Dream Reading, Numerology, Palmistry, Tarot

Drive	DEX	Automobile, Heavy Vehicle, MPV, Tracked Vehicle
Firearms	AWA	Handgun, Machine Gun, Rifle, Shotgun

Emergency Procedures	FOC	Crisis Management, Crowd Control, Firefighting (urban, wilderness, industrial e.g. oil well or rig fires), Hazmat (includes NBCR threats) Riot Control, Search and Rescue.
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First Aid	REA	CPR, Fractures, Wound Care
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Gunnery	AWA	Air, Land, Sea
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Hunt	AWA	Big-game, Birds, Fishing, Pests, Small-game, Track
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Instruct	EXP	Academic, Adult, Child, Special, Technical
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Leadership	EXP	Business, Crisis, Military, Political, Social
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Legal Procedures	REA	Judicial, Police
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Maintenance	FOC	Auto, Computer/Electronic, Electrical, Mechanical
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Meditation	FOC	Aromatherapy, Hypnosis, Massage, Prayer, Tai-Chi, Taoist, Yogic, Zen
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Melee Weapon	STR	Axe, Club, Knife, Spear, Sword, Staff
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Operate Equipment	DEX	Construction, Industrial, Mechanical, Mining, Scientific, Security
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Parachuting	DEX	Military, Paragliding, Skydiving
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Performance!	EXP	Dance, Debate, Music, Prestidigitation, Song, Speech
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Pilot Watercraft	DEX	Boat, Hovercraft, Ship, Submarine
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Research	FOC	Interview, Laboratory, Library, Statistical
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Ride	DEX	Bicycle, Horse, Motorcycle, Surfboard
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Sensor Operations	AWA	Avionics, Chemistry, Geology, Medical, Physics, Radar, Sonar
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NAME	ATTRIBUTE	EXAMPLE SPECIALTIES
Sport	STR	[Specific sport/pastime]
Special Weapon	AWA	Flame Weapon, Rocket Launcher
Survival	AWA	Desert, Jungle, Mountain, Polar, Wilderness
Swim	DEX	Diving, SCUBA, Rescue
Tactics	REA	Air, Land, Sea
Thrown Weapon	STR	Dart, Sling, Grenade, Spear
COMPLEX (CANNOT BE ATTEMPTED UNTIL TRAINED)		
Archeology	REA	[by historical period, region or culture], Environmental
Artillery	AWA	Guns, Rockets (inc. Missiles), Mortar (inc. Grenade Launcher)
Astronomy	REA	Astrophysics, Observational, Planetology
Biology	REA	Anatomy, Biochemistry, Biophysics, Botany, Ecology, Genetics, Microbiology, Paleontology, Physiology, Zoology
Chemistry	REA	Analytical, Industrial, Inorganic, Organic, Physical
Culture (other)!	REA	[other culture], Anthropology, Politics, Sociology
Dentistry	REA	General, Oral Surgery, Orthodontics, Periodontics, Prosthodontics
Electronics	FOC	Aerospace, Biomedical, Civilian, Industrial, Scientific
Engineering	REA	Aeronautical, Architecture, Chemical, Civil, Combat, Electrical, Mechanical, Mining, Naval Architecture, Nuclear, Transportation
Explosives	DEX	Demolition, Disposal, Nuclear
Forensics	REA	Anthropology, Ballistics, Criminology, Engineering, Entomology, Toxicology
Geography	REA	Environmental, Geomatics, Glaciology, Human, Meteorology, Oceanography, Regional

NAME	ATTRIBUTE	EXAMPLE SPECIALTIES
Geology	REA	Geochemistry, Mineralogy, Paleontology, Petrology, Pedology, Seismology, Vulcanology
History	REA	Ancient, Medieval, Modern, [by region, period or culture]
Journalism	EXP	Broadcast, Print, Web
Language (other)!	EXP	[other Language], Linguistics
Law	REA	Civil, Criminal, Forensics, International Relations, Jurisprudence, Taxation
Literature	REA	[Language], [Period], [Culture], [Form], [Author]
Martial Arts!	DEX	Aikido, Boxing, Hapkido, Judo, Karate, Kickboxing, Savate, Taekwondo
Mathematics	REA	Applied, Cryptography, Pure, Statistics
Medicine	REA	Critical Care, Forensics, General Practice, Imaging, Internal Medicine, Pathology, Psychiatry, Traditional
Nursing	EXP	Critical Care, Dental, Medical, Midwifery, Rehabilitation, Surgical, Veterinary
Pharmacology	REA	Pharmacy, Therapeutics, Toxicology
Philosophy	REA	[Era], [person or school], emphasis (ethics, logic, cognition, etc)
Physics	REA	Acoustics, Astrophysics, Biophysics, Condensed Matter, Cryogenics, Nuclear, Optics, Particle, Plasma, Quantum, Theoretical
Pilot Aircraft	AWA	Fighter, Large, Rotary Wing, Small
Programming	REA	Algorithms, Commercial, Industrial, Networking, Scientific, Security
Psychology	REA	Clinical, Developmental, Forensic
Surgery	DEX	Ob-Gyn, Oral, Orthopedics, Trauma, Vascular
Theology	REA	[By religion]
Veterinary Medicine	REA	Farm, Large Animal, Pathology, Small Animal, Zoo

SKILL DESCRIPTIONS

SKILL NAME	DIFFICULTY	CORE ABILITY	BASE %	SPECIALTY %
ACROBATICS	B	DEX	0	20

This skill deals with maneuvers that are more dependent on agility and whole-body strength than those in the Athletics skill. They include balance (e.g. tight-rope walking), rolling, tumbling and targeted leaping (e.g. a trapeze artist).

Specialties: Balance, Bars, Dodge, Leap, Roll

AGRICULTURE	A	REA	-10	20
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This is the science of farming. Agronomy involves the management of soil, crops and livestock, apiculture bees, aquaculture fish and other seafood, herding animals, horticulture fruits, vegetables and flowers.

Specialties: Agronomy, Apiculture, Aquaculture, Forestry, Herding, Horticulture

ANIMAL HANDLING	A	FOC	-10	20
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Animal Handling involves knowing how to care for and gain the trust of an animal. It can also be used as First Aid for animals.

Specialties: Calm Beast, Tend [Animal], Train [Animal]

ARCHEOLOGY	C	REA	--	20
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This is study of the ancient world and cultures through analysis of remains and environmental data.

Specialties: [by region, period or culture], Environmental

ARCHERY	A	AWA	-10	20
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This is the use and upkeep of bows, crossbows and their ammunition.

Specialties: Bow, Crossbow

ARTILLERY	C	AWA	--	20
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This is a familiarity with the operation and maintenance of indirect fire weapons such as field guns, mortars, grenade launchers, etc.

Specialties: Guns, Rockets (inc. Missiles), Mortar (inc. Grenade Launcher)

ARTISAN!	A	FOC	-10	0
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This skill represents the training of a tradesperson in a specialist area such as carpentry, welding, plumbing, smithing, etc.

Specialties: Bricklayer, Blacksmith, Carpenter, Plumber, Chef, etc

ASTRONOMY	C	REA	--	20
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This is the study of celestial bodies, such as planets, stars, and nebula.

Specialties: Astrophysics, Observational, Planetology

ATHLETICS	B	DEX	0	20
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Competitive running, track and field etc. The character is familiar with appropriate training regimens and competitions. The Athletics skill can be used when attempting to throw an object, or when performing a run or sprint.

Specialties: Climb, Jump, Lift Weights, Run, Throw

BARGAIN	B	EXP	0	20
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This is the ability to reach an agreement with another person or group. It encompasses trade and barter, assessing the value of an object, and convincing someone that an object is worth more than it may appear.

Specialties: Appraise, Negotiate, Fence

SKILL NAME	DIFFICULTY	CORE ABILITY	BASE %	SPECIALTY %
BIOLOGY	C	REA	--	20
This is the study of living things. Botany deals with plants, Microbiology bacteria and other micro-organisms, Zoology animals. Anatomy studies structure, Biochemistry and Biophysics function at the molecular level, and Physiology function at the tissue, organ and organism level. Ecology deals with the interactions between plants, animals, and the environment. Genetics concerns heredity and how traits are distributed through a population. Paleontology is the study of ancient life. <i>Specialties:</i> Anatomy, Biochemistry, Biophysics, Botany, Ecology, Genetics, Microbiology, Paleontology, Physiology, Zoology				
BRAWL	B	STR	0	20
The Brawl skill represents experience with unarmed fighting, to swing a punch, or to wrestle an opponent. Not as systematic as a martial art, but just as effective with enough skill. <i>Specialties:</i> Grapple, Pin, Strike (w/hands & feet), Throw				
CHEMISTRY	C	REA	--	20
This is the study of atomic and molecular systems, and the structure and properties of matter. Analytical chemistry deals with the detection and quantification of substances in samples. Industrial chemistry concerns the efficient mass production of substances. Organic chemistry is all about carbon compounds, so it overlaps with biochemistry and petroleum engineering. Physical chemistry tries to determine the properties of substances e.g. density, boiling and melting points. <i>Specialties:</i> Analytical, Industrial, Inorganic, Organic, Physical				
CLIMB	B	STR	0	20
The character is familiar with climbing and descent techniques using a variety of equipment. <i>Specialties:</i> Equipped, Free, Ice, Mountain				
COMMERCE	A	REA	-10	20
Commerce is the study of business operations, finance and management. Accounting is the recording and analysis of financial transactions and inventory levels. Business is a management skill - how to run an organization and hopefully get the best out of your employees. Economics is the study of the distribution of goods and services within a society. Logistics concerns operation and maintenance of supply and distribution networks. <i>Specialties:</i> Accounting, Business, Economics, Logistics				
COMMUNICATIONS	A	EXP	-10	20
This is the use of communication equipment from Morse-code with flashlights and semaphore with flags, to secure band radios, and satellite uplinks. <i>Specialties:</i> Cryptography, Digital, Print, Radio, Telegraphy, Telephony, Television, Traffic Analysis				
COMPUTER TECHNOLOGY	A	AWA	-10	20
This is the use of computer equipment and software, from understanding how a word processor works, to configuring a server farm. <i>Specialties:</i> Applications, Hardware, Networks, Security				
CONSTRUCTION	A	STR	-10	20
This is the art of building or modifying a structure either above or below ground. <i>Specialties:</i> Excavate, Fortify, Build				
CREATE!	A	EXP	-10	0
The character can produce artworks in their chosen medium (photography, film, painting, sculpture, writing, music, dance, etc.) <i>Specialties:</i> Draw, Film, Forgery, Music, Paint, Photo, Sculpt, Writing				

SKILLS & TASKS

SKILL NAME	DIFFICULTY	CORE ABILITY	BASE %	SPECIALTY %
CULTURE (OTHER)!	C	REA	--	0

The character has lived in, or researched extensively a foreign society and is familiar with its customs and beliefs. This could also include the study of various cultures collectively in terms of their anthropological, sociological, or political structure.

FAMILIARITY WITH ANOTHER CULTURE:

SKILL %	DESCRIPTION
0	Basic knowledge, general facts about the people
5	Aware of general customs
10	Can live with the people, knowing their daily customs, and facts usually prevalent in daily conversation
15	Is aware of much of the psychology behind the people, why they do what they do. Can live extensively with the people, almost as one of them, but still evidently a foreigner or outsider
20	Knows as much of the other culture as an average native, and can pass as one of them, save for some differences in appearance
30+	Is aware of elements of the culture that many of the native people may be unaware of

Specialties: [other culture], Anthropology, Sociology, Politics

CULTURE (OWN)	B	REA	REA+FOC	--
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The character is familiar with their society's prevailing mores, social behaviors, famous and infamous figures, current political and other controversies, etc.

Specialties: None.

DENTISTRY	C	REA	--	20
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This is the medical and operative care of teeth and gums.

Specialties: General, Oral Surgery, Orthodontics, Periodontics, Prosthodontics

DIVINATION	A	FOC	-10	20
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This is the art of fortune-telling. It is largely based on old wives' tales and street psychology.

Specialties: Astrology, Dream Reading, Numerology, Palmistry, Tarot

DRIVE	A	DEX	-10	20
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The character can operate ground vehicles. Automobile covers cars and trucks up to 10 tons mass; Heavy vehicles weigh more than 10 tons; Tracked vehicles include tanks and armored personnel carriers and overlaps with Operate Machinery with regard to bulldozers. MPVs are specialized Project vehicles such as the MARS and Science-1.

Specialties: Automobile, Heavy Vehicle, MPV, Tracked Vehicle

ELECTRONICS	C	FOC	--	20
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This skill deals with the maintenance and repair of electronic devices. Success is highly dependent on the availability of spare parts.

Specialties: Civilian, Biomedical, Aerospace, Scientific, Industrial

EMERGENCY PROCEDURES	A	FOC	-10	20
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The character has training in dealing with situations that are routinely managed by personnel such as firefighters, paramedics, and ambulance or police officers.

Specialties: Crisis Management, Crowd Control, Firefighting (urban, wilderness, industrial e.g. oil well or rig fires), Hazmat (includes nuclear, radiological and biological threats), Riot Control, Search and Rescue

SKILL NAME	DIFFICULTY	CORE ABILITY	BASE %	SPECIALTY %
ENGINEERING	C	REA	--	20
The cost-effective design and construction of machines, factories, mines, etc. in the area of specialty. Examples include Aeronautical (aircraft and support systems), Civil (buildings, roads, water and sewage systems), Chemical (chemical processing plants, oil refineries etc.), Electrical (power grids and stations, computer and control equipment), Mechanical (industrial and construction machinery), Mining (blasting and mine works), Naval Architecture (boats, ships and hovercraft), Nuclear (reactors and fuel processing) and Transportation (networks and port design).				
<i>Specialties:</i> Aeronautical, Architecture, Chemical, Civil, Combat, Electrical, Mechanical, Mining, Naval Architecture, Nuclear, Transportation				
EXPLOSIVES	C	DEX	--	20
This is the art of setting explosive charges to blast or demolish things. Knowing how to safely handle and defuse explosive devices.				
<i>Specialties:</i> Disposal, Demolition, Nuclear				
FIREARMS	A	AWA	-10	20
The character can use some types of gun. Handguns are pistols and revolvers that can be used one-handed; Machine Gun refers to any weapons capable of burst or fully automatic fire; Rifles are long-barreled spiral bore guns best used two-handed; Shotguns are smoothbore long-arms.				
<i>Specialties:</i> Handgun, Machine Gun, Rifle, Shotgun				
FIRST AID	A	REA	-10	20
The skills required to provide basic life support, splint fractures, and dress burns and other wounds. These measures are aimed at keeping someone alive until definitive care can be given.				
<i>Specialties:</i> CPR, Fractures, Wound Care				
FORENSICS	C	REA	--	20
The character is familiar with handling and analyzing evidence taken from potential crime scenes.				
<i>Specialties:</i> Anthropology, Ballistics, Criminology, Engineering, Entomology, Toxicology				
GEOGRAPHY	C	REA	--	20
This is the study of the earth's surface, oceans and atmosphere. It also deals with land use, settlement patterns and their effect on the environment. Geomatics is the design, construction and use of geographical information systems (GIS).				
<i>Specialties:</i> Environmental, Geomatics, Glaciology, Human, Meteorology, Oceanography, Regional				
GEOLOGY	C	REA	--	20
This is the study of the structure of the earth, of earthquakes and volcanoes, and minerals and rocks.				
<i>Specialties:</i> Geochemistry, Mineralogy, Paleontology, Petrology, Pedology, Seismology, Vulcanology				
GUNNERY	A	AWA	-10	20
The character can use vehicle-mounted weapons to effect. Depending on their area of specialty, this includes tank main guns, naval artillery, or aircraft weapon systems.				
<i>Specialties:</i> Air, Land, Sea				
HISTORY	C	REA	--	20
This is the study of written and other physical records of past events. It involves the analysis of often scarce evidence in order to better understand an event or culture.				
<i>Specialties:</i> Ancient (to the fall of Rome), Medieval (to the Industrial Revolution), Modern, [by region, period or culture]				
HUNT	A	AWA	-10	20
This is the art of identifying, tracking, pursuing and capturing a target animal. Big game is more than 100kg, small game less.				
<i>Specialties:</i> Big-game, Birds, Fishing, Pests, Small-game, Track				

SKILLS & TASKS

SKILL NAME	DIFFICULTY	CORE ABILITY	BASE %	SPECIALTY %
INSTRUCT	A	EXP	-10	20

This is the art of teaching others what you know.

Specialties: Academic, Adult, Child, Special, Technical

JOURNALISM	C	EXP	--	20
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This is the arena of print and broadcast news.

Specialties: Print, Broadcast, Web

LANGUAGE (OTHER)!	C	EXP	--	20
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The character can speak, read and write in another language. Linguistics represents familiarity with theories of language. A skilled character can study an unknown language and construct grammar and vocabulary given enough time.

SPEAKING ANOTHER LANGUAGE:

SKILL %	DESCRIPTION
0	Basic knowledge, a few key words and phrases
5	Can engage in simple conversation, usually in critical areas such as asking for directions
10	Can converse in everyday topics but struggles with more complex concepts
15	Can converse in a broad range of topics but is evidently not native
20	Can speak as a native
30+	Can cope with specialist or technical use of the language

Specialties: [other Language], Linguistics

LANGUAGE (OWN) !	B	EXP	REA+EXP	--
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This is the primary language spoken by the character. If they come from a literate culture, then they can read and write also. A character with legitimate reason to have been raised as bi-lingual may divide the starting skill of REA+EXP between both.

Specialties: None.

LAW	C	REA	--	20
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Familiarity with legal procedures, jurisprudence and a body of law in a given area of specialty e.g. civil, criminal, international relations and their super-specialties.

Specialties: Civil, Criminal, Forensics, International Relations, Jurisprudence, Taxation

LEADERSHIP	A	EXP	-10	20
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Represents the ability to direct others, to inspire confidence, and make appropriate decisions in difficult situations. Highly skilled leaders can maintain morale in seemingly hopeless circumstances.

Specialties: Business, Crisis, Military, Political, Social

LEGAL PROCEDURES	A	REA	-10	20
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This represents a familiarity with policing and courtroom etiquette, and the general process of legal negotiations, mediation and dispute resolution by court proceedings.

Specialties: Judicial, Police

LITERATURE	C	REA	--	20
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The character has closely studied writing (novels, poetry, plays, etc.) in their area of specialty - by author, language, period or culture.

Specialties: [Language], [Period], [Culture], [Form], [Author]

SKILL NAME	DIFFICULTY	CORE ABILITY	BASE %	SPECIALTY %
MAINTENANCE	A	FOC	-10	20

The character can repair devices in their area of specialty and get them working again. Electrical devices include appliances, air conditioning systems, the wiring of a house or vehicle, etc.

Specialties: Auto, Computer/Electronic, Electrical, Mechanical

MARTIAL ARTS!	C	DEX	--	20
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Systems of melee combat, usually unarmed.

Each fighting technique offers bonuses to different types of melee attacks and defenses.

TECHNIQUE	BONUS PROVIDED ON A SUCCESSFUL ATTACK/DEFEND CHECK
Aikido	+2 DoS to throws
Boxing	+1 DoS to hand strikes (punches) and blocks
Hapkido	+1 DoS to strikes and throws
Judo	+1 DoS to pins, grapples and throws
Karate, Kickboxing, Taekwondo	+2 DoS to all strikes
Savate	+1 DoS to strikes and blocks

Blocks are parrying attacks with your limbs.

A martial arts trained character can throw an opponent. The distance is given by $2[(STR/MASS) + DoS]$ meters on a Martial Arts task. The thrown character takes damage equal to their MASS score.

Pin maneuvers allow an attacker to immobilize a limb, or gain a headlock around the neck and do damage.

Grappling is gaining a hold of part of the target to try to push them over or hold them still.

Specialties: Aikido, Boxing, Hapkido, Judo, Karate, Kickboxing, Savate, Taekwondo

MATHEMATICS	C	REA	--	20
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The character is skilled in numerical analysis and modeling and can apply this to a variety of situations.

Applied math refers to fields like oceanography and climatology; cryptography to data encryption and decryption; pure math refers to specialties such as group and number theory or topology; statistics to numerical analysis and probability. Characters may be able to crack codes and ciphers with appropriate equipment.

Specialties: Applied, Cryptography, Pure, Statistics



SKILLS & TASKS

SKILL NAME	DIFFICULTY	CORE ABILITY	BASE %	SPECIALTY %
MEDICINE	C	REA	--	20
This skill deals with the diagnosis and treatment of disease, predominantly with drugs, diet and behavior modification. Critical care represents areas like anesthesia, emergency medicine and intensive care. Forensics is the interface between medicine and law. General Practice is community and family care. Imaging and Pathology are diagnostic specialties. Internal Medicine represents specialties like cardiology, dermatology, etc. Traditional represents pre-modern systems of non-surgical healing. <i>Specialties:</i> Critical Care, Forensics, General Practice, Imaging, Internal Medicine, Pathology, Psychiatry, Traditional				
MEDITATION	A	FOC	-10	20
This is the art of relaxation, on focusing on the tranquil to overcome the distractions of the world. <i>Specialties:</i> Aromatherapy, Hypnosis, Massage, Prayer, Tai-Chi, Taoist, Yogic, Zen				
MELEE WEAPON	A	STR	-10	20
The character is proficient in armed combat with a class of weapons. These include axes and picks (Axe), blades (less than 50cm = Knife, longer = Sword), clubs and spears. <i>Specialties:</i> Axe, Club, Knife, Spear, Sword, Staff				
NAVIGATE	B	AWA	0	20
This is the ability to use a map or landmarks and not get lost. Characters with appropriate equipment can create their own maps. <i>Specialties:</i> Air, Make Map, Land, Sea				
NURSING	C	EXP	--	20
Nurses are skilled in the art of patient care. They can diagnose and treat illnesses within their area of specialty. Critical care is areas like anesthetics, ER and ICU; midwives deliver babies. <i>Specialties:</i> Critical Care, Dental, Medical, Midwifery, Rehabilitation, Surgical, Veterinary				
OBSERVE	B	AWA	0	20
A systematic inspection aimed at information gathering. It enables a character to identify an experienced fighter, a potential ambush, or distinguish a scary-looking fortress from the real thing. <i>Specialties:</i> Culinary, Engineering, Industrial, Investigation, Military, Musical				
OPERATE EQUIPMENT	A	DEX	-10	20
The character can operate devices in their area of specialty – heavy machinery, assembly lines, analyzers, alarm systems and work out what to do when they malfunction. <i>Specialties:</i> Construction, Industrial, Mechanical, Mining, Scientific, Security				
PARACHUTING	A	DEX	-10	20
The character can sky-dive from an aircraft and is familiar with parachuting equipment. <i>Specialties:</i> Military, Paragliding, Skydiving				
PERFORMANCE!	A	EXP	-10	0
The character can proficiently play music, speak, sing, or dance, etc. for an audience. <i>Specialties:</i> Dance, Debate, Music, Prestidigitation, Song, Speech				
PERSUADE	B	EXP	0	20
This is the art of getting others to do what you want them to – believe a lie, volunteer information, reconsider a course of action, calm down. <i>Specialties:</i> Deceive, Interrogate, Intimidate, Pacify				

SKILL NAME	DIFFICULTY	CORE ABILITY	BASE %	SPECIALTY %
PHARMACOLOGY	C	REA	--	20
This skill concerns the manufacture, storage and safe administration of drugs. <i>Specialties:</i> Pharmacy, Therapeutics, Toxicology				
PHILOSOPHY	C	REA	--	20
This is the study of ideas, logic, and thought. Characters with this skill can be more convincing speakers or debaters. They may be better able to detect faulty arguments in writing or in speech. <i>Specialties:</i> [Era], [person or school], emphasis (ethics, logic, cognition, etc)				
PHYSICS	C	REA	--	20
This is the study of matter, energy and the forces involved in their interactions. <i>Specialties:</i> Acoustics, Astrophysics, Biophysics, Condensed Matter, Cryogenics, Nuclear, Optics, Particle, Plasma, Quantum, Theoretical				
PILOT AIRCRAFT	C	AWA	--	20
The character is a skilled pilot. Fighters are specialized high-speed combat planes. Small aircraft have up to two engines, large ones three or more. Rotary wing refers to helicopters. <i>Specialties:</i> Fighter, Large, Rotary Wing, Small				
PILOT WATERCRAFT	A	DEX	-10	20
The character is an accomplished sailor. Boats are less than 40 feet (12m) long; ships are bigger than this. <i>Specialties:</i> Boat, Hovercraft, Ship, Submarine				
PROGRAMMING	C	REA	--	20
The skill represents the art and science of writing computer software, and knowing how to exploit existing software configurations. <i>Specialties:</i> Algorithms, Commercial, Industrial, Networking, Scientific, Security				
PSYCHOLOGY	C	REA	--	20
This is the study of the human mind and behavior. Characters with this skill can sense the motives of others and possibly detect deceit more readily than those without. <i>Specialties:</i> Clinical, Developmental, Forensic				
RESEARCH	A	FOC	-10	20
This is the art of finding specific information by interview (speaking to people), library (reading books and journals), laboratory (assays or experiments) or statistical (data analysis) work. <i>Specialties:</i> Interview, Laboratory, Library, Statistical				
RIDE	A	DEX	-10	20
Traveling on an animal or device where you need to maintain your balance to stay on board. <i>Specialties:</i> Bicycle, Horse, Motorcycle, Surfboard				
SCROUNGE	B	FOC	0	20
The skill of finding treasure amongst clutter. Successfully foraging for items rather than food can be vitally important in a post-apocalypse situation. <i>Specialties:</i> Beg, Evaluate, Fence, Search				
SENSOR OPERATIONS	A	AWA	-10	20
This skill represents the use of electronic and mechanical sensors to gain information. Areas of specialty include Avionics (radars and navigation systems), Biology, Chemistry (pathology lab analyzers, chromatography rigs, etc.), Geology (sonophones, magnetic anomaly detectors, etc.), Medical (X-rays, ultrasound, MR, nuclear med), Physics (electron microscopes, particle accelerators, etc), Radar, Sonar, Surveillance (night vision, microphones, etc). <i>Specialties:</i> Avionics, Chemistry, Geology, Medical, Physics, Radar, Sonar				

SKILLS & TASKS

SKILL NAME	DIFFICULTY	CORE ABILITY	BASE %	SPECIALTY %
SPECIAL WEAPON	A	AWA	-10	20
The character is skilled in operating rocket launchers and flame weapons. <i>Specialties:</i> Flame Weapon, Rocket Launcher				
SPORT	A	STR	-10	20
The character regularly plays sport of some description and is familiar with competitions, statistics, notable players, etc. in their field of interest. <i>Specialties:</i> [Specific sport/pastime]				
STEALTH	B	DEX	0	20
The character is skilled in not being seen or heard, moving quietly and not being recognized if they are spotted by an observer. Camouflage, Conceal and Sleight deal with different sizes of object – the latter two focus on hiding things on one's person. Disguise refers only to changing one's appearance. <i>Specialties:</i> Camouflage, Conceal, Disguise, Hide, Intrusion, Sleight, Sneak				
SURGERY	C	DEX	--	20
This is the art and science of treating disease with manual or operative methods. Many specialties exist; only a few examples are listed. <i>Specialties:</i> Ob-Gyn, Oral, Orthopedics, Trauma, Vascular				
SURVIVAL	A	AWA	-10	20
The skill represents the ability to stay alive in a hostile environment. <i>Specialties:</i> Desert, Jungle, Mountain, Polar, Wilderness				
SWIM	A	DEX	-10	20
The character can float, swim above and under water, and use a snorkel. SCUBA skill represents expertise with underwater breathing systems, decompression schedules and common diving-related hazards. Rescue refers to lifesaving techniques. <i>Specialties:</i> Diving, SCUBA, Rescue				
TACTICS	A	REA	-10	20
The character is familiar with small scale combat situations and can exploit the terrain and their comrade's abilities to best advantage in same. <i>Specialties:</i> Air, Land, Sea				
THEOLOGY	C	REA	--	20
This is the study of religion and religious beliefs and customs. It may be focused entirely upon one religion, if so then a specialty may be chosen at 0% rather than at 20%. <i>Specialties:</i> [By religion]				
THROWN WEAPON	A	STR	-10	20
The character can throw specialist weapons for maximal accuracy and distance. <i>Specialties:</i> Dart, Sling, Grenade, Spear				
VETERINARY MEDICINE	C	REA	--	20
Medicine and Surgery for animals. The Farm specialty deals with common livestock (cattle, pigs, poultry, sheep, and goats). Large animals are defined as massing 100kg or more. Pathology is partly diagnostic and partly the veterinary analog of Internal Medicine (cardiology, neurology, etc.). <i>Specialties:</i> Farm, Large Animal, Pathology, Small Animal, Zoo				

IMPROVING SKILLS AND ABILITIES

At the end of a Scenario, the PD can hand out 1-5 Training points to each player. Alternatively, they could hand out 1-2 points per session. The PD may allocate these points immediately to certain skills or abilities that played an important role in the scenario, or a general pool may be kept and spent from. Training during down time produces 1 TP per week, or, alternatively the Degrees of success achieved via the Instruction rules.

RAISING A SKILL

Training points can be used to increase existing skills or purchase new ones.

To increase an existing skill, refer to the table 'Training Point Cost For Skills'. This lists how many Training Points it costs to raise the chosen skill by 1D3% (roll 1D6, halve the result).

The cost to purchase new skills is given in the 'Untrained' row. Basic skills are all considered as 'Trained'. A New skill that was 'Untrained' that becomes 'Trained' starts at 0% (rather than gain a d3%.)

A root skill not currently at the 20% threshold can still be trained up at a cost based upon the current root plus the highest specialty score.

EXAMPLE: Fred has 15% in Swimming and 12% in SCUBA. 15+12=27. To increase Swimming skill, refer to the 21-30 row (9 points per 1D3%).

TRAINING POINT COST FOR SKILLS

TRAINING POINT COST BY SKILL TYPE			
CURRENT SKILL	BASIC	ADVANCED	COMPLEX
Untrained	0	2	4
0-10	2	3	4
11-20	4	6	8
21-30	6	9	12
31-40	8	12	16
41-50	10	15	20
51-60	12	18	24

RAISING A CORE ABILITY

A Core Ability score can be increased, but it is extremely costly, and no Core Ability can be increased by more than 6 points beyond its starting score. Once the Training Points have been invested, add 1 to the ability score.

Number of Training Points for +1 to Core Ability

Base Training Points Cost: For every 5 points or fraction thereof of the Core Ability, multiplied by 10.

TRAINING POINT COST FOR ABILITIES

CURRENT SCORE	TRAINING POINT COST
1-5	10
6-10	20
11-15	30
16-20	40
21-25	50
26-30	60
31-35	70
36-40	80

MAINTENANCE OF SKILLS AND ABILITIES

Core abilities and Skills can degrade over time. If a character neglects to keep refreshed on a skill, or provide exercise for their core ability, they may suffer a temporary penalty to any tasks involving that skill or ability. This could be a time frame of about a month for physical skills and abilities, and about a year for those involving the mind. Should the neglect continue for an excessive period of time, then the PD may determine a permanent loss of perhaps 1D3% from a skill, or 1 point from a core ability. Thus an infirmed character may be on -20% on all physical skills and/or -5 from STR & DEX until they endure an intense physiotherapy program. An elderly character confined to their bed for extensive periods, may continue to lose 1 point of STR every few months. Once their STR drops below 10 (or their MASS score) they may find it impossible to get out of bed unaided.

EXAMPLE: Mike Lucas during his time at College had an accident with his knee during Judo practice. He remained on crutches for a few weeks, eventually returning to his Judo classes. For a while his skill was a little rusty, suffering a -10% penalty on his Martial Arts (Judo). With further exercise he managed to recover completely, losing the penalty. Meanwhile, those Biology classes he took in High School have all but been completely forgotten.

INSTRUCTION

The teacher must have a higher skill level in the subject taught than the student(s). Some skills are harder to learn than others, so it takes longer to teach them. This is measured by the amount of Training Points necessary to achieve an increase in the skill.

An Instruct skill check is made once every 10 – 14 days (depending upon the intensity of the course.)

The teacher rolls Instruct + EXPRESSION. Each degree of success gained is a potential training point available to a student. This is the quality of the Instructor's delivery, and no student can learn more than this.

The student needs to make a FOCUS check to learn. Each Degree of Success represents a training point gained. Points in excess of the teacher's degrees of success are wasted.

If the teacher or student gets 0 degrees of success, nothing new is learned. Exceptional failures lead to a waste of time for both parties; exceptional successes are just that!

MODIFIERS TO INSTRUCTION

STUDENT-TEACHER RATIO %

1-5:1	+10
6-10:1	+5
11-20:1	+0
21-30:1	-5
31-40:1	-10
40+:1	-20

ENVIRONMENT %

Laboratory/workshop/simulator	+10
Classroom	+0



TRAVEL & TIMING

TIMING

TIMING IN THE GAME

The Morrow Project breaks down game time into segments called 'Combat Turns', which are roughly 3.6 seconds each. A character in the game is capable of taking a number of Actions within the space of a combat turn, however it generally consists of move, attack, defend.

A 'Tactical Turn' is made up of 10 combat turns (36 seconds), and deals with some in game book-keeping as well as squad maneuvers.

A 'Game Turn' is made up of 100 combat turns (6 minutes.)

There are 10 Game Turns, or 1000 combat turns, within the space of 1 Game Hour, and 24 Game Hours in a Game Day.

TIMING OUTSIDE THE GAME

A single sitting of a game, usually consisting of a few hours during an evening when all the players and PD (GM) can get together, is called a 'Game Session'.

A collection of Game Sessions that focus on completing a particular mission is called a 'Scenario' or 'Module'. Sometimes a scenario can be completed within one game session, but usually they take more.

An on-going game that last multiple game sessions, and consists of one or more scenarios that feature a continuation of the same characters, is called a 'Campaign'.

MOVEMENT

A character's walking speed is equal to $(STR + DEX + MASS)/10$ meters per combat turn, or kilometers per

hour. For an average character, this is $(20+20+10)/10 = 5$ meters per combat turn or kilometers per hour.

Faster movement costs more in Actions and Endurance:

MOVEMENT SPEED

SPEED	ACTIONS	ENDURANCE
Walk (x1)	1	x1
March (x2)	2	x2
Run (x3)	3	x4
Sprint (x3, +DoS)	3	[1+DoS]
Crawl, Swim (x1/2)	1	x1
Climb Down (x1/5)	1	x1
Climb Up (x1/10)	1	x1

The figure in brackets is a multiplier of the character's walking speed. The Endurance listed is a multiplier of total expected Endurance loss. Carrying very little weight and undertaking routine tasks would cost 1 point of Endurance per hour. Running for an hour would thus cost $1 \times 4 = 4$ Endurance.

Sprinting requires a successful Athletics test. Each Degree of Success also increases movement speed by one. A Sprint costs 1 point of Endurance plus the number of Degrees of Success achieved, and can be sustained for up to STR seconds. A PD may permit extended sprinting, but at a cost of further Endurance points.

JUMPING DISTANCE

JUMP FOR:	SPRINT OR RUN	STANDING
Height (m)	Speed/15	Pace/6
Distance (m)	Speed/4	Pace/4

A successful Athletics test can be used to increase speed, just like a sprint.

ENDURANCE

A character has a number of Endurance points equal to their CON score.

Points are lost by exertion, injury and blood loss. They are restored by rest. Certain medications may temporarily increase Endurance.

For every hour of activity, the character loses an Endurance point.



ENDURANCE COSTS

CONDITION ENDURANCE COST

MOVEMENT

Walk (x1)	1
March (x2)	2
Run (x3)	4
Crawl, Swim (x1/2)	1
Climb Down (x1/5)	1
Climb up (x1/10)	1

ENCUMBRANCE: REFER TO SECTION ON CARRYING AND LIFTING

Medium	1
Heavy	2
Extreme	4
Maximal	5

TERRAIN

Rough/hilly	1
Forest	2
Mountain, jungle, swamp	3

BLOOD LOSS 1 per 10 BP

COMBAT 1 per encounter

WOUNDS Variable; see Damage and Recovery section

EFFECTS OF FATIGUE

When Endurance reaches 5 or less, a character becomes tired and all task checks are at -10%. When Endurance reaches zero, they lose all available actions and become 'stunned'. They must make a CON task check each game turn to avoid falling unconscious.

Stunned characters must make a successful CON check to act at all. This can be attempted every Combat Turn. Degrees of success recover lost actions, then Endurance points.

Unconscious characters can recover on a successful CON check. The frequency of the checks depends on the reason why they lost consciousness.



Exhaustion (zero Endurance from fatigue) - check every game turn.

Head injury/sedatives - check every hour.

More severe levels of injury or drug overdoses - daily, weekly or even monthly checks may be appropriate.

RECOVERING ENDURANCE

Resting quietly regains 1 point per hour, sleeping 3 points.

Characters with CON scores of 30 or more regain 2 points per hour of rest and 5 per hour of sleep.

After particularly stressful situations, e.g. combat, a character can take a tactical turn resting. They may then make a CON task check. The Endurance points gained equals the degrees of success on the check. This can be attempted only once a day. If the attempt to recover is an exceptional failure, then the character may suffer from delayed shock, losing a number of Endurance points equal to the degrees of failure.

HEROIC EFFORT

In desperation characters can gain an additional Action by sacrificing Endurance. This is usually in reaction to a potentially lethal event.

The character must make a FOC check. If successful, the character gets an additional life-preserving action. They lose one point of Endurance for each Action already taken in the combat turn.

EXAMPLE: Susan has already spent the combat turn hiding behind an overturned truck, having used up all 3 of her Actions; she is now faced with a grenade that tumbles into view. Susan rolls a FOCUS Task check (24 x 2% = 48%), getting a 23. Getting her act together, and pushing herself that bit further, she starts to scramble away from the grenade. The PD asks for a DEX task + Athletics skill, each Degree of Success being 1 meter Susan manages to move away from the grenade before it goes off. At the end of the Action, Susan loses 3 points of Endurance.

STIMULANTS

These drugs temporarily boost Endurance. After they have worn off, the character loses Endurance equal to the amount given by the drug.

STIMULANTS			
CLASS	ENDURANCE BONUS	DURATION	EXAMPLE
A	+1	2 hours	Caffeine
B	+2	4 hours	Low-dose amphetamine
C	+5	12 hours	Cocaine
D	+10	24 hours	Modafinil (Provigil)

CARRYING AND LIFTING

ENCUMBRANCE LEVELS

A character can carry a load up to their (STR x MASS) in kilos, less their actual body weight in kilos. Below this a character can carry, unhindered, a weight up to their STR score squared, divided by 40. Anything above this penalizes the Actions available to the character and reduces their Endurance score. This Endurance penalty is added to any other Endurance losses. The table

below shows the levels of Encumbrance, and the penalties associated with them.

Example: Running whilst carrying a Medium load will incur the loss of 3+1=4 points of Endurance.

ENCUMBRANCE LEVELS			
ENCUMBRANCE LEVEL	LOAD (KG)	ACTIONS	ENDURANCE
Light	(STR x STR)/40	0	0
Medium	(STR x STR)/20	1	1
Heavy	(STR x STR)/10	2	2
Extreme	(STR x STR)/5	4	4
Maximal	[(STR x MASS) - Body Weight]	5	5

Large, relatively weak characters cannot heft as much. Look up the encumbrance level for their STR on the table. If their Maximal encumbrance is less than the Light limit, any value above the Light limit is treated as Maximal encumbrance. This applies to the other encumbrance levels on the table.

ENCUMBRANCE TABLE					
STR	LIGHT (-0)	MEDIUM (-1)	HEAVY (-2)	EXTREME (-4)	MAXIMAL (-5)
1	0.03	0.05	0.1	0.2	****
2	0.1	0.2	0.4	0.8	****
3	0.2	0.5	0.9	1.8	****
4	0.4	0.8	1.6	3.2	****
5	0.6	1.3	2.5	5	****
6	0.9	1.8	3.6	7.2	****
7	1.2	2.5	5	10	****
8	1.6	3.2	6.4	12.8	****
9	2	4	8	16	****
10	2.5	5	10	20	****
11	3	6	12	24	****
12	3.6	7.2	14.5	29	****
13	4	8.5	17	34	****
14	5	10	20	40	****
15	5.5	11	23	46	****
16	6.5	13	26	52	****

Table continues on next page

ENCUMBRANCE TABLE

STR	LIGHT (-0)	MEDIUM (-1)	HEAVY (-2)	EXTREME (-4)	MAXIMAL (-5)
17	7	14	29	58	****
18	8	16	32	64	****
19	9	18	36	72	****
20	10	20	40	80	****
21	11	22	44	88	****
22	12	24	48	96	****
23	13	26	52	104	****
24	14.5	29	58	116	****
25	15.5	31	62	124	****
26	17	34	68	136	****
27	18	36	73	146	****
28	19.5	39	78	156	****
29	21	42	84	168	****
30	22.5	45	90	180	****
31	24	48	96	192	****
32	25	51	102	204	****
33	27	54	108	216	****
34	29	58	116	232	****
35	31	62	124	246	****
36	32	64	128	256	****
37	34	68	136	272	****
38	36	72	144	288	****
39	38	76	152	304	****
40	40	80	160	320	****
41	42	84	168	336	****
42	44	88	176	352	****
43	46	92	184	368	****
44	48	96	192	384	****
45	51	102	204	408	****

The maximum is given either by the Extreme encumbrance value for their STR score (see table above), or a ceiling given by $[(STR \times MASS) - \text{body weight}]$, **whichever is greater**.

Examples:

A character with STR 10, MASS 12, weight 120kg has an Extreme encumbrance of 20kg and a calculated maximum of 0! Use 20kg.

A character with STR 15, MASS 12, weight 120kg has an Extreme encumbrance of 45kg and a calculated maximum of 60kg. Use 60kg.

A character with STR 20, MASS 12, weight 120kg has an Extreme encumbrance of 80kg and a calculated maximum of 120kg. Use 120kg.

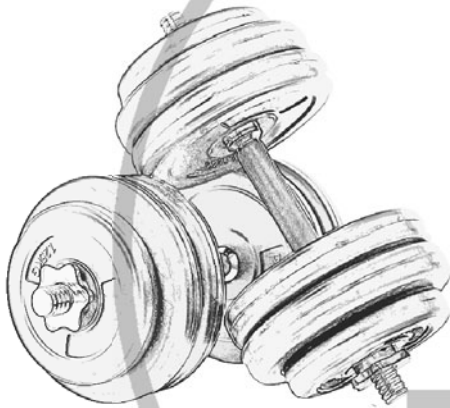
The power-lifter character with STR 40, MASS 10, weight 85kg has an Extreme encumbrance of 320kg and a maximum of 315kg. Use 320kg.

Example: Susan Faith has a STR of 18, and a MASS of 9. She can carry up to 8kg with no penalty. From 8.1kg to 16kg, she has a medium encumbrance, with 1 less Action available and a cost of 1 additional Endurance point for tasks undertaken. From 16.1kg to 32kg she is heavily encumbered, suffering the loss of 2 Actions and 2 additional Endurance points for tasks she attempts.

From 32.1kg to 64kg she is extremely encumbered. Most individuals cannot operate for extended periods with such loads. They do not have any available Actions, and so must succeed in an Athletics task check. Susan's weight is 60kg, so her maximum encumbrance is $18 \times 9 = 162\text{kg} - 60\text{kg} = 102\text{kg}$. She can still carry a load from 64.1kg to 102kg. This maximum load costs her a loss of 5 Actions, and 5 additional Endurance points. Exceeding 102kg falls under the Lifting rules.

LIFTING

A character can lift a maximum of their STR x MASS upon a successful STR task check, plus any appropriate skill. This can be maintained for a number of combat turns equal to the degrees of success achieved. An exceptional failure results in physical damage either equal to the degrees of failure, or to the object's MASS/2. The character loses one Endurance point per combat turn regardless of success.



THROWING

A character can throw an object of MASS 1 equal to twice their STR score in meters. With a successful Throw check, the degrees of success can be added to this distance at a rate of 2m per DoS, or used to counter any attempts by the target to vacate the blast area.

A character can throw an object with MASS 2 equal to their STR score in meters, plus any degrees of success.

A streamlined grenade is regarded as MASS 1, whilst all others are MASS 2.

In general, throw distance = $2[(\text{STR}/\text{MASS of object}) + \text{DoS}]$ meters.

Maximum throw weight
= (STR x 2) kg (2-handed)
= (STR / 2) kg (1-handed)



AGING

A character reaching an age equal to their CON + FOC scores in years must make an aging check. This is a CON task. On a success, there is no loss. On a failure, for every degree of failure, the character loses an ability point. The player can choose which core abilities the lost points are to be taken from.

AGING FREQUENCY

AGE	FREQUENCY
20-39	8 years
40-59	5 years
60-79	3 years
80-99	2 years
100+	1 year

Aging checks become more frequent as the character grows older. Refer to the table.

MASS

As seen in Chapter 2, MASS is a score to represent the relative weight and scale of objects. The following tables illustrate the range of MASS from 0.1 to 100 and the likely objects that could be found with that MASS score.

MICRO-MASS TABLE (0.1-0.9)

MASS	WEIGHT RANGE(G)	COMMENT
0.1	up to 3	Insects
0.2	4-10	
0.3	11-22	
0.4	23-42	Mouse
0.5	43-65	
0.6	66-94	
0.7	95-131	
0.8	132-172	
0.9	173-249	Mole

TRAVEL & TIMING

MASS TABLE (1-100)

MASS	WEIGHT RANGE(KG)	COMMENT
1	0.25-0.4	Rat, squirrel
2	0.5-1	
3	2-4	Newborn; term infant average 3.5kg
4	5-9	3 months to 1 year old
5	10-15	1-3 years old
6	16-24	4-8 years old
7	25-36	9-12 years old
8	37-50	13-16 years old
9	51-69	Average woman
10	70-90	Average man
11	91-116	Black bear
12	117-146	
13	147-185	Small cow, horse, motorcycle
14	186-224	Tiger, donkey, motorcycle
15	225-270	
16	271-322	
17	323-381	Grizzly bear, cow, moose
18	382-447	Mule
19	448-519	
20	520-600	
21	601-688	
22	689-784	
23	785-888	
24	889-999	Draft horse
25	1000-1125	Compact car; large cow/ox
26	1126-1253	
27	1254-1394	
28	1395-1552	Mid-size car
29	1553-1709	
30	1710-1890	
31	1891-2071	Large car
32	2072-2269	Large 4WD/SUV
33	2270-2477	
34	2478-2694	
35	2695-2940	Small elephant
36	2941-3182	
37	3183-3441	
38	3442-3717	

MASS TABLE (1-100)

MASS	WEIGHT RANGE(KG)	COMMENT
39	3718-3999	
40	4000-4320	
41	4321-4630	
42	4631-4964	
43	4965-5313	Average elephant
44	5314-5669	
45	5670-6075	
46	6076-6462	
47	6463-6877	
48	6878-7312	Large elephant
49	7313-7749	2 ½ Ton Truck
50	7750-8250	
51	8251-8723	
52	8724-9230	
53	9231-9757	M113 APC
54	9758-10284	LAV (V150)
55	10285-10890	
56	10891-11455	
57	11456-12064	
58	12065-12092	
59	12093-13319	
60	13320-14040	
61	14041-14710	
62	14711-15426	
63	15427-16165	
64	16166-16899	
65	16900-17745	
66	17746-18526	
67	18527-19360	
68	19361-20219	
69	20220-21069	
70	21070-22050	
71	22051-22950	M3 Bradley IFV
72	22951-23912	
73	23913-24900	
74	24901-25874	
75	25875-27000	
76	27001-28028	
77	28029-29125	
78	29126-30251	

MASS TABLE (1-100)

MASS	WEIGHT RANGE(KG)	COMMENT
79	30252-31359	
80	31360-32640	M977 HEMTT cargo truck
81	32641-33804	
82	33805-35047	
83	35048-36321	
84	36322-37569	
85	37570-39015	
86	39016-40324	
87	40325-41717	
88	41718-43151	
89	43152-44549	
90	44550-46170	
91	46171-47633	
92	47634-49196	M48 Patton tank, semi-trailer
93	49197-50787	
94	50788-52344	
95	52345-54150	
96	54151-55775	
97	55776-57507	
98	57508-59275	
99	59276-60999	M60, M1 tank
100	61000-63000	

HIGHER MASS SCORES

MASS 104: M1A1 - 68673kg, M1A2 - 69790kg

MASS 135-143: Blue whale: 150-177 tons

NOTES TO MASS TABLES

Base weight in kg is $0.06(\text{MASS} \times \text{MASS} \times \text{MASS})$

Add $(\text{MASS} \times \text{STR})/10$ to get final weight.

A Base STR equal to $2 \times \text{MASS}$ has been assumed as an average creature strength.



COMBAT

Dave Richards signaled for Lauren to hold back with the rest of the team. He knew something was wrong. Things were far too quiet.

The old town was obviously being lived in. New roofs had been constructed over the remnants of the partially intact walls. They had seen movement on the streets as they approached.

Dave unclipped his sidearm, and listened.

He heard a crack from a building up ahead, and even as he began running for cover, there was a whizzing sound by his ear followed by a stinging pain on his cheek.

Dave crashed through a nearby open doorway, taking shelter there. He touched the side of his face and looked at his fingers. They were covered in blood. 'Great', he thought.

The voice of Lauren announced itself on the radio.

"Dave? What's going on? Are you alright?"

"Yeah. Just great," Dave replied with a little regret in his voice, "probably won't have to shave for a while."

"What?" Lauren seemed puzzled.

"Looks like they intend to defend the town. It sounds like they're using some black powder rifle. It grazed my face. I'm sheltering in one of the buildings. I doubt they're going to make withdrawing easy for me."

Dave pocketed his radio once more, only half listening to Lauren's remarks, and examined his pistol whilst removing the safety.

Carefully, he peered around the doorframe. There was another crack, and fragments of plaster leapt from the wall near his head. Instinctively he withdrew once more.

1..2..3..he counted to himself.

A second later he was back outside again with pistol raised; firing in the direction the shot had come from.

He continued to run towards the building across the street, and took shelter once more.

'This will be interesting', Dave thought with exhilaration.

OVERVIEW

Sometimes it is impossible to resolve disputes non-violently. Communities may be paranoid about outsiders, fearful of disease or marauders intent upon murdering them in their sleep. Whole territories may be in the grip of war. Life may be of little value to volatile leaders hoping to make some gain at the expense of well equipped 'do-gooders'. Then there are all those wild animals out there and numerous mutants. It's a dangerous world, and the characters will struggle to stay alive.

Combat is broken out into a small segment of time called a 'combat turn.' This lasts about 3.6 seconds. During this time, characters can perform a limited number of actions based upon their DEXTERITY score. Fatigue and the effects of damage can reduce the number of actions a character can execute.

The order of play is determined by a character's initiative score which is based upon the amount of actions they have available, Tactics skill and a die roll.

Actions are then declared from the lowest initiative score to the highest.

They are then resolved from the highest initiative score to the lowest. Faster characters get to act first, and they may have the experience to anticipate the moves of slower ones.

Once actions are resolved, combat then progresses into the next combat turn.

ORDER OF COMBAT

1. Roll for Initiative.
2. Combat turn starts.
3. Declaration of Actions. Players declare Actions in reverse Initiative order (lowest to highest).
4. Task Resolution. In Initiative order (highest to lowest), Determine chance of Success (apply modifiers) then roll for tasks (observe, attack, defend, etc.). Actions in reserve may be used to defend. Compare results.
5. Determine Effects. Allocate Degrees of Success. Roll for hit location with a successful attack. Determine amount of damage.
6. Determine Results. Roll for Shock check. Determine if target suffers from shock, unconsciousness or death.
7. Book-keeping. Record Blood Point loss and any Endurance loss. Determine if Panic occurs.
8. End of Combat Turn. After all players have used their Actions, go to (2).

1. INITIATIVE

To determine who goes first, roll one ten-sided die (1D10) and add the character's available Actions. Highest score goes first. Once combat commences, Initiative remains locked. Characters with Tactics skill can make a check at the beginning of the combat. For each degree of success they achieve there is a +1 to Initiative. A Leader of a squad may also make a Tactics + EXP check, each degree of success adding +1 to Initiative to all members of their squad. Those squad-members cannot then use their own Tactics check, and must follow their squad leader's orders.

Changes to Initiative can occur from one combat turn to another. Panic, losing a team member, or injury or fatigue can contribute modifiers to the order of play. The PD is free to modify as they see fit. Generally, any change in the number of available Actions constitutes a penalty to the Initiative score.

2. THE COMBAT TURN

Combat takes place in 'Combat Turns', each lasting approximately 3.6 seconds.

THE TACTICAL TURN

At the end of every 10th Combat Turn there is the resolution of the 'Tactical Turn' (36 seconds), which handles some of the book-keeping. A Tactical turn is also the time it takes for a field commander to issue a change in tactics, and for those orders to be carried out.

3. ACTIONS

Within the combat turn, events are broken down into Actions. All participants within the combat turn each declare their intended Actions in reverse Initiative order (lowest to highest.)

Any task performed during a combat turn takes at least one action. Some take more. Long tasks will carry over into following combat turns until the required Actions are spent. The number of Actions available to a character depends on their DEX score. It may be reduced by fatigue.

An Action is less a segment of time, but more a measure of the amount of concentration and activity that must be undertaken to complete a task. Some Actions may be performed simultaneously. For the number of Actions available, refer to Chapter 3.

CONSOLIDATED ACTION TABLE

TASK	ACTIONS
Walk (PACE x 1)	1
March (PACE x 2)	2
Run (PACE x 3)	3
Sprint (x 3 + Athletics DoS)	3
Draw weapon/equipment	1 per piece
Melee attack	1
Melee defense/Dodge	1
Duck for cover (within 1 meter)	1
Dive for cover (within PACE meters)	2
Snap shot	1
Aim Weapon (negates snap-shot penalty)	1
Short burst (3-rounds)	2
Medium burst/full-auto fire	3
Reload weapon (box magazine/clip feed)	1
Holster or sheath weapon	1
Prepare explosive charge (set timer)	1
Arm weapon (pull pin on grenade)	1
Throw weapon	1
Prepare disposable weapon/bow for firing	2
Assemble weapon (scope, silencer etc.)	2 per piece
Clear action (work action, clear jam)	2
Unpack weapon or ammo from case/crate	3
Aim or re-aim mortar	3
Load revolver or belt-fed weapon	3
Reload missile launcher (TOW/Dragon)	6
Reload crossbow	6
Issue Verbal Command (E.g. "Stop!")	1
Open or close hatch or door	2
Put on protective mask (gas mask)	3
Don or remove protective suit	30

In general, a character can attack once per combat turn with a given weapon. For example, there is no prohibition against someone throwing a punch and then firing a gun. The character merely has to have enough Actions to do it. Firearms may be fired more than once in a combat turn, but each additional fire action loses any aiming bonuses.

Actions may be withheld to permit contingent acts e.g. “I’ll shoot the first person to walk through the door.”

It is prudent to reserve Actions to allow a response to the acts of others. With no Actions free, the character will be caught off guard. Being able to dive for cover or surrender could be potentially life-saving.

EXAMPLE: Taking the initiative during the pause in enemy fire Dave Richard begins to run towards the Imp rifleman, pistol drawn. That’s two actions declared, with one in reserve. As Dave closes in on his target, he notices the rifleman taking aim from the nearby ruin. The options are to dive for cover, or fire his pistol as a reaction. Diving for cover is the action most likely to keep Dave alive. If he chose to fire his pistol, it would be a snapshot with a penalty of 20% as he doesn’t have enough Actions to aim.

4. RESOLVING COMBAT

In Initiative Order (highest to lowest), each player determines the success of their declared Actions. Some Actions may require Task checks, shooting at someone for example. Task checks in combat generally suffer from numerous modifiers, such as for the target’s size, how visible they are etc. Modifiers are listed below. Once the final chance of success has been calculated, the player may roll their D100. A success means that the target has been hit, and the degrees of success achieved measures how well they have been hit.

MODIFIERS TO COMBAT

TARGET SIZE

Affects visual spotting and hitting

MASS	MODIFIER
1 (rat, squirrel)	-20
3 (baby, cat)	-15
5 (toddler)	-10
10 (Man-size)	+0
15 (cow)	+5
20	+10
25 (compact car)	+15
30 (large car)	+20
45 (2-1/2 ton truck)	+35
MASS:	-2 for each step below 10, +1 for each step above.

VISIBILITY

Affects spotting, base chance is AWA task base.

CONDITIONS	MODIFIER
No moon, overcast	-150
Starlight	-100
Full moon	-80
Candlelight	-30
Partial camouflage	-20
Lit street at night	-15
Flashlight	+15
Overcast day	+50
Vehicle headlights	+65
Daylight	+80
Light bulb filament	+100
The Sun	+150
A-bomb blast	160+

NIGHT VISION DEVICES [1]:

Gen. 1	+50
Gen. 2	+70
Gen. 3	+90
Thermal sight	+10[2]

[1] Reduce penalties due to darkness by the amounts listed.

[2] Bonus applies for each 5°C [9°F] difference between object and background.

NOISE:

Affects spotting, base chance is AWA task base.

-1 per meter separation between source and listener, except for suppressed gunfire which fades at -5 per meter.

SOURCE	MODIFIER
Sneaking person, stalking cat, rustling leaves	-50
Whisper	-20
Walking person	+0
Speech, running person, Suppressed handgun	+50
Industrial noise, Suppressed SMG	+60
Air pistol, clapping	+80
Suppressed Rifle (Light)	+85
Motor vehicle, air rifle	+90

SOURCE	MODIFIER
Gale force winds, dog bark, handgun, rapids, busy street	+100
Sub-machinegun, jackhammer, construction site	+120
Suppressed Rifle (Heavy)	+140
Car horn	+150
Heavy lorry, piston engine, (aircraft propeller)	+160
Rifle or machinegun	+170
Jet engine at takeoff	+200
Siren, heavy rifle or machinegun	+280
Grenade or artillery shell	+300
Thunderflash stun grenade	+350

RANGE:

Visual spotting modifiers in clear weather, base chance is AWA task base.

TERRAIN	CLEAR	HILL/ MTN	SWAMP	FOREST/ JUNGLE
MODIFIER	RANGE IN METERS			
-70	8000	2560	800	320
-60	5600	1760	580	240
-50	4000	1280	400	160
-40	2800	880	290	120
-30	2000	640	200	80
-20	1400	440	145	60
-10	1000	320	100	40
0	700	220	72	30
10	500	160	50	20
20	350	110	36	15
30	250	80	25	10
40	175	56	18	7
50	125	40	12.5	5
60	85	28	9	3.5
70	40	20	6	2.5

Binoculars, telescopic sights, etc. reduce penalties by 20% for each 2x magnification.



WEATHER	MODIFIER
Light rain, snow or fog	-20
Heavy rain, snow or fog.	-40

FIREARMS RANGE	MODIFIER
Point Blank (less than 10m)	+20
Short (10-50m)	+10
Medium (50-Effective Range m)	+0
Long (up to Effective x 2 m)	-10
Extreme (each multiple of Long, to Max Range)	-10 (-20 at up to Effective x 4m, etc.)

SPEED:

Movement makes it easier to spot something, but harder to hit it. For every km/h difference in speed, +1 bonus to spotting, -1 penalty to hit.

AIMING AND FIRE MODE:

FIRE MODE	MODIFIER
Snap shot (un-aimed fire)	-20
Aiming (per Action)	+0, +10 per additional Action, up to Weapon Skill
Short Burst (3 rounds)	+10
Medium Burst (4-10 rounds)	+20
Full Auto (11+ rounds)	+40
Additional Targets	-20 per target
Non-braced burst/auto fire	Snap shot, lose auto-fire bonus

COVER:

Affects targeting with reduced visible area.

COVER	MODIFIER
No Cover, unaware	+0
Partial Cover (1/4 concealed)	-10
Prone, Lying Flat	-20
Moderate Cover (1/2 concealed)	-30
Full Cover (9/10 concealed)	-40

MODIFIERS TO CLOSE COMBAT

CLOSE COMBAT	MODIFIER
Target is prone or surprised	+20
Target is flanked	+10
Aimed Attack (1 additional Action)	+10
Attackers reach is greater than targets	+10
Attackers reach is less than targets	-10
Target is fleeing or avoiding the fight	-10
Attacker is prone or surprised	-20

Modifiers for using close-combat weaponry or unarmed attacks.

RANGE EFFECTS ON DAMAGE

As a missile weapon continues past its effective range, it begins to lose momentum. Damage falls by 1 for every multiple of effective range rounded down the missile had to travel before it hits its target. For example, firing an 9mm round from a HP-35 at a target 200m away would only have a damage value of $9-4 (200/45 = 4 \text{ rounded down}) = 5$. Heavier missiles may drop by more than 1 for every multiple of effective range.

ATTACKING AND DEFENDING

To attack a target the attacker rolls a weapon-appropriate task (i.e. Firearms). If the defender is unaware, they are merely a target.

Degrees of success rolled by the attacker may be used to:

1. **Improve accuracy.** Each degree of success allows the attacker to adjust the hit location by 1 zone e.g. hand to wrist. Allocation to accuracy must be made before location is rolled for. Refer to the location tables following.
2. **Improve E-factor.** This increases the chance that the attack will defeat the target's armor. For melee attacks it represents extra effort behind the swing or thrust. For ranged attacks it represents targeting weak spots in the target's defenses.

If the degrees of success achieved are 0, or are reduced to 0, then the attack is considered a glancing blow, and only delivers half of the usual E-factor.

If the defender is aware, they get to react to the attack. There is a penalty of 20% to the defense task if the attacker is using a gun or bow.

In this situation, they can:

1. Block or Parry

The defender must get more degrees of success than the attacker and the damage value of the weapon used. It is relatively easy to deflect a fist (base damage 1), but a bullet (9+) is much more difficult.

If the defender gets the same degrees of success as the attacker (plus the weapon's damage), then they suffer a glancing blow which does half damage. If they get more, then the attack is deflected.

Another object is generally used to block an incoming attack e.g. a sword fight. The blocking object provides some extra armor to the target if the parry fails equal to the object's MASS score or its damage value (whichever is greater.).

2. Dodge

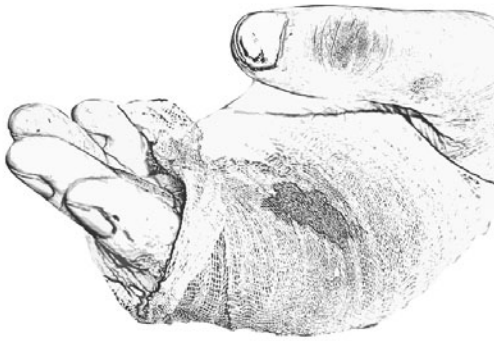
Moving away from an attack is easier than deflecting it. The defender needs to get more degrees of success than the attacker with a movement related task. Example skills are Acrobatics, Athletics, Brawling, and Martial Arts.

3. Dive for Cover!

The character throws themselves to the ground or behind an object, hopefully out of the way of the attack. This costs one Action if the cover is within a meter or two Actions if it is within (Pace) meters. Cover provides extra armor to resist an attack. This can use the same movement related skills as Dodge.

5. HIT LOCATION

With a successful attack, the attacker needs to roll for exactly where the target was hit. If they have degrees of success available, then they may be allocated towards shifting the rolled location to something more appropriate. They must be allocated before the initial location is rolled for, and once determined not all degrees of success need to be used. For example with 3 degrees of success available, the player chooses to allocate 2 towards accuracy. Rolling a 09 for location, the player can now shift by up to 2 zones. The player elects to shift by only 1 from 'Right Shoulder' to 'Neck', counting as a head shot, and more likely to kill.



HIT LOCATIONS

STANDARD BIPEDAL CHART (HUMAN)

D100	LOCATION	SP %
01-06	Head	6%
07-08	Neck	2%
09-10	Right Shoulder	2%
11-13	Right Upper Arm	3%
14	Right Elbow	1%
15-17	Right Lower Arm	3%
18	Right Wrist	1%
19-20	Right Hand	2%
21-22	Left Shoulder	2%
23-25	Left Upper Arm	3%
26	Left Elbow	1%
27-29	Left Lower Arm	3%
30	Left Wrist	1%
31-32	Left Hand	2%
33-39	Mid Torso	7%
40-47	Right Upper Torso	8%
48-55	Left Upper Torso	8%
56-62	Abdomen	7%
63-64	Groin	2%
65-66	Right Hip	2%
67-72	Right Thigh	6%
73	Right Knee	1%
74-78	Right Calf	5%
79	Right Ankle	1%
80-82	Right Foot	3%
83-84	Left Hip	2%
85-90	Left Thigh	6%
91	Left Knee	1%
92-96	Left Calf	5%
97	Left Ankle	1%
98-00	Left Foot	3%

CALLED SHOT TABLES AND PARTIAL COVER

A called shot can be made, taking a penalty to the attack check, for the benefit of a smaller hit location chart. These tables can also be used when a target is partially covered. For example if a target's head and upper torso is visible from a window, then the PD may allow a shot at -30%, and make a hit location roll using the 'Head Shot' table. Degrees of Success used to move the randomly assigned location will be used on the alternative table.

CENTRAL LOCATIONS: (-20% TO HIT)

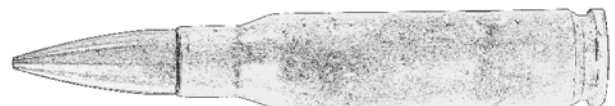
D100	LOCATION
01-06	Right Shoulder
07-12	Left Shoulder
13-32	Mid Torso
33-52	Right Upper Torso
53-72	Left Upper Torso
73-92	Abdomen
93-00	Groin

HEAD SHOT: (-30% TO HIT)

D100	LOCATION
01-21	Head
22-28	Neck
29-34	Right Shoulder
35-40	Left Shoulder
41-60	Mid Torso
61-80	Right Upper Torso
81-00	Left Upper Torso

KNEE SHOT: (-30% TO HIT)

D100	LOCATION
01-15	Hip
16-45	Thigh
46-55	Knee
56-80	Calf
81-85	Ankle
86-00	Foot



LOWER LOCATIONS: (-10% TO HIT)
D100 LOCATION

01-15	Abdomen
16-20	Groin
21-25	Right Hip
26-39	Right Thigh
40-41	Right Knee
42-52	Right Calf
53-54	Right Ankle
55-60	Right Foot
61-65	Left Hip
66-79	Left Thigh
80-81	Left Knee
82-92	Left Calf
93-94	Left Ankle
95-00	Left Foot

UPPER LOCATIONS: (-10% TO HIT)
D100 LOCATION

01-10	Head
11-14	Neck
15-18	Right Shoulder
19-23	Right Upper Arm
24-25	Right Elbow
26-30	Right Lower Arm
31-32	Right Wrist
33-35	Right Hand
36-39	Left Shoulder
40-44	Left Upper Arm
45-46	Left Elbow
47-51	Left Lower Arm
52-53	Left Wrist
54-56	Left Hand
57-68	Mid Torso
69-79	Right Upper Torso
80-90	Left Upper Torso
91-00	Abdomen

NON-HUMAN HIT LOCATIONS
QUADRUPED CHART (SHEEP)

D100	LOCATION	SP %
01-08	Head	8%
09-12	Neck	4%
13-17	Right Fore Shoulder	5%
18-20	Right Fore Shank	3%
21	Right Knee	1%
22-24	Right Fetlock	3%
25	Right Hoof	1%
26-30	Left Fore Shoulder	5%
31-33	Left Fore Shank	3%
34	Left Knee	1%
35-37	Left Fetlock	3%
38	Left Hoof	1%
39-42	Breast	4%
43-51	Fore Flank	9%
52-60	Belly	9%
61-68	Rear Flank	8%
69-73	Rump	5%
74	Tail	1%
75-79	Right Rear Shoulder	5%
80-82	Right Rear Shank	3%
83	Right Rear Hock	1%
84-86	Right Rear Cannon	3%
87	Right Rear Hoof	1%
88-92	Left Rear Shoulder	5%
93-95	Left Rear Shank	3%
96	Left Rear Hock	1%
97-99	Left Rear Cannon	3%
00	Left Rear Hoof	1%



VEHICLE HIT LOCATIONS

4-WHEELED APC (V-150)		
D100	LOCATION	SP %
01-02	Main Gun / Turret	2
03-05	Forward Top Hull	3
06-07	Forward Window	2
08-10	Pilot Compartment	3
11-13	Co-Pilot/Gunner Compartment	3
14-17	Front Upper Hull, Right	4
18-21	Front Upper Hull, Center	4
22-25	Front Upper Hull, Left	4
26	Winch/Lights	1
27-29	Forward Bow, Right	3
30-32	Forward Bow, Left	3
33-34	Forward Axle	2
35-36	Forward Wheel, Right	2
37	Forward Tire, Right	1
38-39	Forward Wheel, Left	2
40	Forward Tire, Left	1
41-44	Side, Right Front	4
45-48	Side, Right Center	4
49-52	Side, Right Rear	4
53-54	Side, Right Door	2
55-58	Side, Left Front	4
59-62	Side, Left Center	4
63-66	Side, Left Rear	4
67-68	Side, Left Door	2
69-71	Rear Top Hull	3
72-75	Rear Upper Hull, Right	4
76-79	Rear Upper Hull, Center	4
80-83	Rear Upper Hull, Left	4
84-86	Rear Engine Block	3
87-89	Stern, Right	3
90-92	Stern, Left	3
93-94	Rear Axle	2
95-96	Rear Wheel, Right	2
97	Rear Tire, Right	1
98-99	Rear Wheel, Left	2
100	Rear Tire, Left	1

6. DAMAGE

This equals (damage - armor value). Any remaining points are applied to the hit location. Degrees of success from the attack roll can be added to the damage value.

Marginal successes (0 degrees of success) are treated as grazing or glancing blows. Halve the damage.

Damage is treated as penetrative (that it cuts the flesh or enters the target's body), or Blunt (which crushes the external area.) Penetrative damage always causes Blood Point loss. Blunt damage may not.

Armor can be used to protect against damage. Armor has two ratings, one for Ballistic (bullets and fragments) attacks, and the other for Non-Ballistic. There is a third rating reserved for larger objects such as vehicles, Explosive (EX.)

Armor can also be flexible or hard. Flexible armor may resist penetration, but will transmit blunt force. Bullets and fragments that don't penetrate flexible ballistic armor can still do blunt damage. This is equal to the damage value less half the Armor Value of the Armor.

Armor-piercing ammunition penetrates better, but tends not to fragment in the target, so it does less damage. Subtract half the armor rating from the damage value, and then halve what's left to determine net damage.

Wound-enhancing ammunition doesn't penetrate armor very well. Subtract double the armor value from the E-factor, and then double what's left to determine net damage.

Example: Jane is shot with a 9mm pistol (damage=9). The bullet strikes her in the abdomen, which is protected by Project-issue resistweave coveralls (armor value 7). Net damage is $9-7 = 2$ points penetrating, plus 3 ($7-(7/2)$) points of blunt injury.

An armor-piercing bullet would do $9-4$ (half the armor rating) = $5/2 = 3$ points penetrating, plus 3 points of blunt injury.

A wound-enhancing bullet wouldn't penetrate at all ($9-14 = -5$). It would do $9/2 = 5$ points of blunt damage. $7/2 = 3$ points would be stopped by the resistweave, leaving Jane with 2 points of blunt injury.

If Jane was unarmored, the bullet would do 9 points of penetrating damage; an armor-piercing version would do 4, the wound-enhancing version 18 points. Armor is very useful.

Once damage is dealt to a target, a Shock check (see the Damage chapter) may be necessary. The results of this may be death or reduced blood loss. The Shock check

also determines the amount of Endurance points lost due to the injury. Certain locations, such as the head or torso, if reduced to 0 Structure Points will usually result in death, and a Shock check may not be necessary.

BALLISTIC DAMAGE

Projectiles cause damage by virtue of the energy transferred into the target. For these rules, bullet damage can be calculated as follows. It is referred to as 'E-factor' and corresponds to the extent of tissue disruption in the target. E-factor is matched against a target's armor value. Any points that remain are referred to as 'damage points' (Dp.)

The E-factor can be found by multiplying the object's diameter (in inches) by the velocity of the projectile at launch (in feet per second) and dividing the result by 50.

$$(D \times V) / 50 = E$$

D = Projectile diameter, V = Velocity at launch (muzzle velocity), E = E-factor

A metric conversion:

$$(\text{diameter in mm} \times \text{velocity in meters per second}) / 387$$

Examples: A 9x19mm bullet from a handgun has a velocity of 381m/second.

E-factor is $(9 \times 381 / 387)$, or 8.8 which rounds up to 9.

A .357 Magnum bullet has a velocity of 1200 feet per second. E-factor is $(.357 \times 1200 / 50)$, or 8.6, which rounds to 9.

RESOLVING BURST DAMAGE

Automatic weapons have a tremendous rate of fire. Rather than individually resolve each of up to 60 shots, break bursts that hit into blocks of three or five, and see if the first block is enough to incapacitate or kill the target. If so, move to the next target. If not, try with the next block, etc.

SAMPLE WEAPONS

The base E-factor or damage for natural weapons for smaller or larger creatures can be determined as follows:

SAMPLE WEAPONS					
WEAPON	CALIBER	DAMAGE	WEIGHT	EFFECT RANGE	MAX RANGE
Browning HP-35	9x19mm	9	0.9 kg	45m	2000m
Smith & Wesson M27-3	.357 Magnum	10	1.2 kg	75m	2150m
Smith & Wesson M29-6	.44 Magnum	13	1.4 kg	150m	2300m
Ingram M10	9x19mm	9	2.8 kg	100m	2000m
Stoner M23 Carbine	5.56x45mm	14	3.7 kg	300m	2600m
Stoner M22 Rifle	5.56x45mm	15	3.7 kg	400m	2650m
M16A1	5.56x45mm	15	3.1 kg	400m	2650m
M21 Sniper Rifle	7.62x51mm	17	5.3 kg	1000m	3725m
Punch, Head Butt	--	1	--	0m	1m
Kick,	--	2	--	0m	1m
Rock, Knife, Razor	--	1	0.2 kg	0m	1m
Combat Knife, Blackjack	--	2	0.5 kg	0m	1m
Club, Rifle Butt, Hatchet	--	4	1 kg	0m	1m
Pipe, Crowbar, Saber, Sword	--	5	1.5 kg	1m	2m
Sledgehammer, Axe, Spear	--	6	2 kg	1m	2m
Throwing Knife	--	2	0.4 kg	5m	10m
Tomahawk	--	4	1 kg	10m	20m
Spear	--	6	2 kg	30m	70m
Short Bow	--	8	2 kg	30m	400m
Compound Bow	--	16	4 kg	80m	700m

NATURAL WEAPONS

NATURAL ATTACK DAMAGE

Punch	MASS/10
Kick	MASS/5
Claw	MASS/10 + 1
Bite (Sharp)	MASS/5 + 2

ARMOR TYPES

Armor comes as either hard or flexible, and has two Armor Values, one for bullets and one for melee and missile attacks. The armor value is the total amount of damage it can absorb before being penetrated or generally allowing the remaining force of impact to reach the wearer. Hard armor will absorb as much damage as its AV permits. Flexible armor is effective against penetrative damage, but half of the damage it prevents from such an attack is translated into blunt damage. This is also the case for blunt based attacks, flexible armor only protects at half its normal value.

PERSONAL ARMOR VALUES

ARMOR TYPE	BALLISTIC AV	NON-B AV	FLEXIBLE/HARD
Cloth	0	1	Flexible
Padded	1	3	Flexible
Leather	2	4	Flexible
Chain	2	10	Flexible
Plate	5	14	Hard
Resistweave	7	4	Flexible
BALLISTIC ARMOR			
NIJ I	6	1	Flexible
II-A	10	1	Flexible
II	12	2	Flexible
III-A	14	2	Flexible
III	17	3	Hard
IV	20	5	Hard

The U.S. National Institute of Justice (NIJ) standards are used to rank ballistic armor protection.

Level I armor is flexible and somewhat effective against .38 Special and .22 rifle rounds. It is not recommended for pistol ballistic protection. The nylon flak jackets used in Korea had this level of protection.

Level II-A armor is effective against 9mm rounds and .40 S&W FMJ i.e. medium pistols.

Level II is effective against .357 Magnum rounds.

Level III-A protects against high-velocity 9mm FMJ rounds or .44 Magnum heavy pistol ammo.

Level III protection uses a combination of hard steel and ceramic plates in addition to flexible cloth and polyethylene. It resists full metal jacket assault rifle rounds e.g. 7.62x51mm NATO.

Level IV armor makes extensive use of ballistic plates and is the highest current level of personal protection. It is effective against .30-06 Armor-Piercing rounds.

LAYERING ARMOR

It is possible for characters to wear multiple armor layers e.g. a ballistic vest over Project coveralls. The overall protection provided is equal to the rating of the best type plus half the rating of the other, rounded down. For example, a level II vest worn over Project coveralls has a ballistic rating of $12+3 = 15$, non-ballistic $4+1 = 5$.

ARMOR VALUES FOR BARRIERS AND VEHICLES

An object's armor value is a function of what it is made of, and how thick it is. The values listed below are per centimeter thickness (1cm ~ 0.4 inch) of the material.

BARRIER AV

MATERIAL	BALLISTIC AV	NON-B AV
Wood, dirt, glass	0.5	0.5
Ordinary masonry or concrete, rammed earth, wood construction	2-3	2-3
Good masonry, dense concrete, stone	3-4	3-4
Reinforced concrete	5	5
Hard Steel	15	30

Example barriers:

- Wooden door (house, 2x0.8m high/wide): effective thickness of wood 2-4cm, AV 1-2.
- Wooden ship's hatch (1.5mx0.8m high/wide): wood 6cm, AV 3
- Car door: effective thickness 3mm steel, AV 4 (non-B 9)
- Steel security door (2x0.8m high, wide): 2.5cm thick, AV 37 (non-B 111)

Vehicles and other structures (buildings and bunkers) also have a blast resistance rating (EX) which is a measure of their ability to prevent explosive damage to items and people they contain. Enclosed vehicles or structures can protect their occupants better than open-faced ones.

The EX rating is equal to (ballistic AV x MASS x 4) for enclosed, or (ballistic AV x MASS) for open ones.

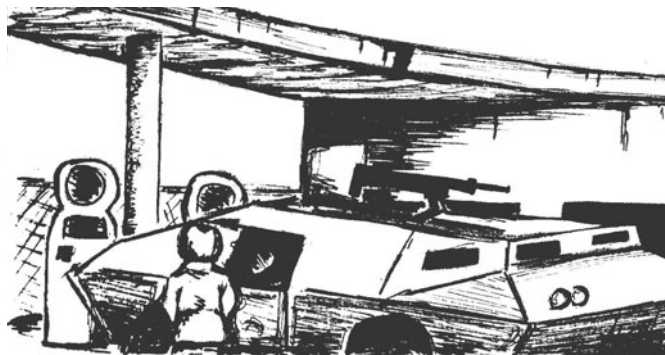
For armored vehicles NATO standard STANAG 4569 provides a reference for comparison.

VEHICLE PROTECTION LEVELS

LEVEL	BALLISTIC (B)	EXPLOSIVE (EX)	EXAMPLE VEHICLE
1	Assault rifle: 5.56, 7.62 ball (20)	155mm HE round burst at 100m (2700)	Baseline Humvee, light Project vehicles
2	7.62x39mm AP (30)	80m (4725)	Upgraded Humvee, Commando Ranger
3	7.62x51mm AP (40)	60m (6725)	Baseline Stryker AFV, V-150, mine resistant vehicles
4	12.7x99mm heavy machinegun AP (60)	30m (10225)	Bradley and Stingray AFVs, upgraded Stryker
5	25x137mm cannon APDS (140)	25m (10575)	

AP = armor piercing; APDS = armor piercing discarding sabot, AFV = armored fighting vehicle.

The 155mm round is the M107 high explosive shell which contains 15lbs (6.8kg) TNT – 12725 explosive damage.



SPECIAL SITUATIONS

AUTOMATIC FIRE

Automatic fire occurs in one of three forms. Short Burst consists of 2-3 rounds being fired, and provides a +10% bonus to the attack roll. A Medium Burst is anything from 4-10 rounds, providing a +20% bonus, and can be used to attack multiple targets. The Full Auto, or Full Burst, is 11 or more rounds fired at one or more targets, providing a +40% bonus to the attack roll.

There is a -20% to the attack roll for each additional target. Also -1 bullet per meter between targets has to be sacrificed.

The number of rounds that hit the target is based upon the amount of Degrees of Success allocated. Initially the first round 1 fired will hit on a successful attack roll. For every 10 rounds fired, or fraction thereof, 1 Degree of Success is equal to 1 additional bullet hitting the target. A Full Auto of 15 rounds would produce 2 hits for every DoS allocated. With 6 DoS available, a maximum of 13 rounds will hit their intended target(s). Obviously no more bullets can hit the target(s) than the weapon fired.

Using Degrees of Success achieved in the Attack roll reduces the available points for accuracy and damage.

SAMPLE AUTO-FIRE RATES

WEAPON	MAGA-ZINE	CYCLIC RATE	MAX FIRE RATE/CT
SMG/ASSAULT RIFLE			
Ingram M10	32	1100	32
Uzi	32	600	32
Stoner M23 carbine	30	750-800	30
Stoner M22 rifle	30	750-900	30
M16A1	30	650-750	30
MACHINE GUNS			
Stoner MG Mk23/M207	150 belt	700-1000	60
M60	100/200 belt	550	33
M240/FN MAG	100/200 belt	650-750, 950-1000	45, 60
M2HB .50 cal.	105 belt	450-600	36

Shotgun rounds are treated as medium burst (buck-shot) and full auto attacks (BB and smaller shot). How-



ever, they cannot be used to attack multiple targets that are more than 3 meters apart at Effective Range, or 6 meters apart at a range where the shot can still do at least 1 damage point.

EXPLOSIVE DAMAGE AND DEMOLITIONS

Explosions cause damage by blast, thermal and kinetic effects. The pressure wave generated by the blast can rupture lungs and eardrums and shear blood vessels. Heat causes burns; shrapnel and other objects thrown by the blast wave can cause blunt or penetrating injuries.

The energy of an explosion is given by its wDp rating. The further away from the blast, the less intense the blast and heat effects; subtract 100 wDp for every meter away from the blast point. If the damage sustained is greater than twice the character's Structure Point rating, they are blown apart; more than five times, the character is vaporized.

Resolve fragment attacks like automatic fire:

$$\text{Number of hits} = \frac{\text{Attacker's net degrees of success} \times (\text{burst radius} - \text{actual radius})}{100}$$

For example, a character is 10m away from an M67 fragmentation grenade when it goes off. The base number of fragment hits = (15-10) = 5.

Multiply by the attacker's net degrees of success (their attack roll minus any successes rolled by the victim when they dive for cover, etc).

Explosives can be used to punch through obstacles or barriers. To find out how much C4 – the 'reference explosive' – is needed to form a man-sized (.5 square meter) hole in an obstacle, refer to this chart:

BREACHING CHARGES

AV	REINFORCED CONCRETE THICKNESS	MASS C4 (KG)	NUMBER M112 BLOCKS
50	.1m	0.08	0.14
100	.2m	.56	1
150	.3m	2.24	4
200	.4m	2.8	5
250	.5m	5.04	9
300	.6m	9.52	17
350	.7m	14	25
400	.8m	21.28	38
450	.9m	26.32	47
500	1m	34.72	62
550	1.1m	45.92	82
600	1.2m	62.16	111
650	1.3m	75.6	135
700	1.4m	87.92	157
750	1.5m	95.2	170
800	1.6m	110.88	198
850	1.7m	133.28	238
900	1.8m	164.08	293
950	1.9m	185.92	332
1000	2m	208.32	372
1050	2.1m	223.44	399
1100	2.2m	247.52	442
1150	2.3m	274.4	490
1200	2.4m	333.2	595

There are ways of using less explosive when breaching obstacles. Detonating the charge off the ground, so that more of the blast is directed into the obstacle, halves the amount required. The charge needs to be at a height equal to the thickness of the object to be breached.

Boring a hole into the obstacle, placing the charge inside and sealing the hole with solid material like sand, dirt or concrete (tamping) halves the explosive requirement again - one-quarter the amounts listed. The depth of the hole needs to be at least half the thickness of the target. Shaped charges direct the blast in a fixed arc or jet, further reducing the amount of explosive needed to penetrate armor. This principle is applied in anti-armor rockets like the LAW, TOW, etc. and the 40mm HEDP grenades.

Explosives vary in the amount of energy they release per unit mass ; to determine the equivalent mass of some other explosive, use this conversion table:

EXPLOSIVE CONVERSIONS

EXPLOSIVE RELATIVE EFFECTIVENESS

C4 or C3	1
Amatol	0.87
Ammonium Nitrate	0.31
Black Powder	0.41
Dynamite (40% nitro)	0.49
Dynamite (60% nitro)	0.62
Guncotton	0.69
Nitroglycerine	1.12
Nitrostarch	0.60
PETN (Primercord)	1.24
Picric Acid	0.70
RDX	0.85
Tetryl	0.93
TNT	0.75

Example: Mike Lucas needs to blow a hole through a meter thick stone wall, which has an AV of 300. He needs the equivalent of 9.52 kg C4, but only has access to black powder. The relative effectiveness of black powder is 0.41. $9.52/0.41 = 23.2\text{kg}$ of black powder.

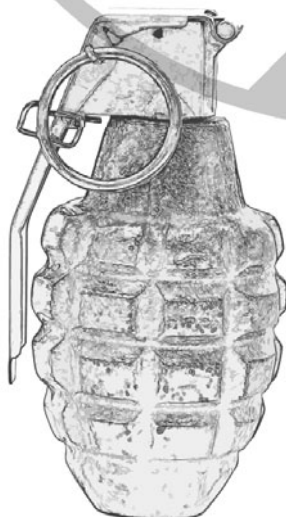
INDIRECT FIRE AND SCATTER

Grenades bounce. Mortar fire does not have pinpoint accuracy. Degrees of success on Throw or Artillery checks can be used to reduce scatter and increase accuracy. Degrees of failure make things worse.

Base Direction of Scatter (roll 1D10):

1	2, 3	4
5	T	6
7	8, 9	0

"T" = target



BASE SCATTER DISTANCES

WEAPON	BASE SCATTER, METERS	EACH DOS/DOF
Thrown Grenade	2D6-7	1 meter
Launched Grenade	10D6-35 or 5(2D6-7)	5 meters
Mortar	40D6-140 or 20(2D6-7)	20m

A negative number on the adjusted base scatter roll indicates drift in the opposite direction e.g. the opposite of a 5 result on the diagram above (to the left) is 6 (to the right).

SUPPRESSIVE FIRE

Automatic weapons can be used to hinder enemy movement or return fire.

The attacker declares a beaten or danger zone at the beginning of the Combat turn. This has a base size of 5 square meters. For each additional square meter, subtract one from the burst fire attack bonus.

Attack with medium burst or full auto fire. The beaten zone lasts until the end of the Combat Turn.

Example: Joe fires a 30 round full-auto burst from his M60 machine gun down the street to slow down an oncoming gang of Razers. He sweeps out a $3 \times 10 = 30$ square meter area, so he loses $30 - 5 = 25\%$ from his auto fire bonus for determining degrees of success.

Characters must make a FOC check to cross or move about in a beaten zone. -10% penalty per ten rounds in the burst.

Crossing the zone is extremely risky!

Using an appropriate movement skill (e.g. Athletics), compare degrees of success to each attacker. Use the automatic fire table to determine the number of hits if the attacker has more successes.

Example: Two of the Razers make their FOC check (at a -30% penalty) and move towards Joe's position as he blazes away. Joe rolls 4 degrees of success. Each Razer rolls against DEX or Athletics. The first rolls 1 failure, so is hit by 15 bullets (5 degrees of success x 3 rounds). The second rolls 6 successes and manages to cross the beaten zone unscathed. Hopefully Joe can get him in the next combat turn...

KNOCK-OUT

An attack may be called for the purposes of knocking out a target. The target must be unaware of the attack, and the weapon used must be appropriate for attempting a non-lethal attack. A called shot to the head must be taken (see below), suffering a -30% penalty. If the head or neck is hit, then the attack still delivers its usual Sp damage, but instead of Blood Point loss, it cause Endurance Point loss equal to the twice the Damage points (Dp) delivered.

PANIC

Characters may panic if the tide of combat is turning against them. This is especially true for non-player characters. These rules are best suited to help the PD decide whether an enemy force will fight on, or flee.

The players and PD should negotiate whether the panic rules should apply to player characters or not.

Make a FOC check with the following modifiers:

PANIC MODIFIERS	
NPCS AND FOC RATINGS FOR MORALE PURPOSES:	MODIFIER
Green - unused to combat	15
Regular - new members of military/ law enforcement	20
Veteran - have been in many combat situations	30
Elite - commandos, Special Forces, seasoned SWAT teams, etc.	40
FORCE RATIO:	MODIFIER
Each 2:1 enemy outnumber friends	-10%
Each 2:1 friends outnumber enemy	+10%
ADDITIONAL CONDITIONS	MODIFIER
Character wounded	-10%
Character sees friends injured	-10%
Character sees friends killed	-20%
Character sees enemies wounded/ killed	+10%
Leader injured	-20%
Leader killed	-30%
Each DoS on Leadership skill check	+5%

Depending upon the results of the FOC task check, the following occurs:

Exceptional Success: The character is willing to take any risk to defeat the enemy. This is either heroic or suicidal behavior. The character gains a bonus to all

tasks equal to degrees of success percent for a tactical turn.

Success: The character stands their ground.

Failure: The character is shaken. Any task that doesn't help them escape the battlefield has a penalty of (degrees of failure) x 5%. This lasts for a tactical turn.

Exceptional Failure: The character is paralyzed by fear, unable to move or act. Regard them as stunned with Endurance = 0.

HOSTILITY

This is a measure of a non-player character's aggressive tendencies. It can range from 0% where nothing will cause them to lose their temper or commit a spiteful action, to 100% where violence will ensue without provocation. If using Personality Traits, use the 'Volatile' score for rating an NPC's Hostility.

Negotiation efforts can increase the rating by 5% per degree of success achieved. Almost any of the interaction skills can be used.

Ex. Success: Immediate murderous rage, DoS add to attacker's initiative.

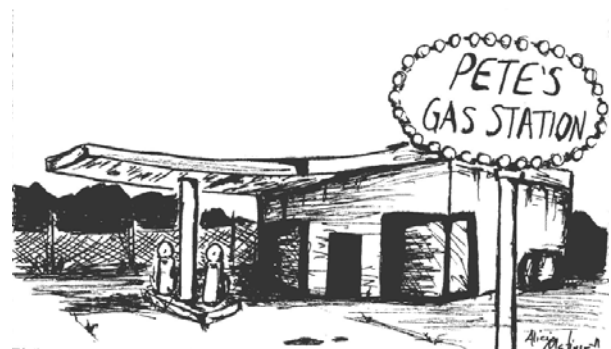
Success: Fight!

Failure: Situation remains tense.

Ex. Failure: An unexpected favorable twist - perhaps someone mistakes one of the characters as an old friend, or they take a fancy to them, etc.

7. BOOK-KEEPING

After all characters have taken their Actions, and damage has been dealt, players should record any Structure Point loss, Endurance point loss etc on their character sheet. Any wounds that cause Blood Loss should be totaled up and Blood Points should be deducted accordingly. Rules for Blood Point loss, and preventing it, can be found in the Damage chapter.





EXAMPLE OF COMBAT

ROUND ONE

Dave gets a 4 with his D10 roll, and adding in the number of Actions he has available, his Initiative is 8. The Sniper has 3 Actions, and rolls a 7, for a total Initiative of 10. The Sniper goes first.

Dave declares his intended Actions. He has decided to go for it, taking a snapshot at the window the sniper is hiding in, whilst running as fast as he can for the open doorway at the bottom of the sniper's building. Dave states that he's going to run in a curve, rather than a straight line towards the sniper.

The Sniper spends an Action aiming, and the last two to take a couple of shots at Dave as he runs. The first shot gains the benefit of the aim, the second does not.

Because Dave's running is the reason for him being an available target, it is also his defensive action in avoiding the Sniper's shots. The PD asks Dave to make his Athletics task check (62%), whilst the Sniper makes his Firearms task check (70%).

Dave rolls a 93, whilst the Sniper rolls an 82. Both are failures. The PD opts to use Degrees of Failure, calculating that Dave gets 1, and the Sniper 2. The Sniper, seeing Dave fire his Pistol towards the window, ducks further into cover. This throws off his aim, and his Rifle shot is wild. Dave, meanwhile, stumbles to one knee, and knowing that he isn't going to make it across this time, quickly flees back to cover behind the ruined wall. Dave has one Action in reserve, so uses this to withdraw.

The PD asks that Dave now make his declared Pistol shot, deciding that the Sniper's cover and range offers a -40% penalty. Dave's shot is at 73% -20% for not aiming -40% for the targets cover and range, a 13% chance. Dave rolls a 41, missing.

The Sniper takes his second shot, this time without aiming. Dave, returning back to cover, gets another Athletics task check. This time Dave gets a 38, that's a success with 3 Degrees of Success. The Sniper rolls a 16, also a hit but with only 1 Degree of Success. Dave has more Degrees of Success, so manages to avoid the Sniper's second shot which would have hit him had he not moved.

ROUND TWO

Dave declares that he is resting behind the wall. He tries to come up with a new tactic. He needs to get a moment of surprise; otherwise he will be gunned down as soon as he shows his head. Meanwhile, the Sniper spends the entire round aiming his Rifle at where he believes Dave will first appear. This is a Conditional Action, the Sniper aiming until such time as his target appears. The Sniper's Firearms skill is at +20%, so he can gain a maximum bonus for Aiming equal to his skill of +20%. To get this requires 3 Actions committed to aiming, one to negate the snapshot penalty, and the other two to bestow a +10% bonus each. The PD carries this bonus over to the next round.

ROUND THREE

The PD allows Dave to make a Tactics (49%) task check. Any Degrees of Success achieved will add to Dave's Initiative, but any Degrees of Failure will reduce it. Dave rolls a 31, that's three Degrees of Success, and a +3 to Initiative. With the higher Initiative of 11, Dave takes an Action to throw a stone across to the other side of the street, hoping that this will distract the Sniper long enough. The PD calls for an Athletics task check (62%), rolling a 45. With 4 Degrees of Success it hits something large enough to make sufficient noise. With Dave's remaining Actions he intends to run as fast as he can for the Sniper's building, keeping one in reserve.

The PD makes a Tactics task check (46%) for the Sniper to determine whether he ignores the distraction, knowing it to be just that. With a roll of 93, the Sniper turns to check for other possible enemies approaching. This causes the Sniper to lose his Aiming bonus.

The Sniper's Actions, as he sees Dave leave the safety of his cover, will be to re-aim his rifle, using two Actions, giving a +10% bonus, and fire a single shot with the remaining Action.

Dave runs, making an Athletics task check, rolling a 27. The Sniper takes his shot at 80%, rolling a 94, missing.

Dave crashes into the doorway of the Sniper's building, his heart pounding away.

ROUND FOUR

The PD asks for a new Initiative check now that both Dave and the Sniper have temporarily lost sight of each other. Dave rolls an $8+4 = 12$. The Sniper gets a $10+3 = 13$. The Sniper gets the Initiative. Dave must declare his Actions first, although the Sniper will not be aware of them initially.

Dave's first Action is to sneak up the stairs, keeping low to the ground with his Pistol ready. The PD states that this will take him 2 Actions to climb the stairs. Then with his 2 remaining Actions he will peer carefully over the top of the stairs, and take a snapshot.

The Sniper will remain low and move towards cover from an upturned rusting refrigerator. He will then crouch down behind it (1 Action), and take a snapshot at the top of the stairs.

The PD determines that both Dave and the Sniper will take a -30% due to cover, together with -20% for their snapshots. The Sniper has Initiative so gets to resolve his shot first ($70-30-20=20\%$). Rolling a 05, the shot hit, but only with 0 Degrees of Success. This is a glancing blow, causing half of the usual damage.

The PD determines that the upper torso and head are visible, so rolls for location on the Head Shot chart. Rolling 84, Dave is grazed on his Left Upper Torso with an E-factor of $15/2 = 7.5$ or 8. Luckily, Dave has his Project coveralls on, offering 7 points of soft protection. Dave takes 1 penetrative or ballistic damage, and a further 3 blunt or non-ballistic damage (the coveralls only provide half their Av versus non-ballistic damage.) He has 19 Structure Points in that location, taking 4.

The threshold for the Torso is 2 points of damage, so once this is exceeded, a Shock Check is necessary. Dave's CON task base is 42%. Rolling 35 he succeeds, meaning he loses 2 Endurance Points, loses the 4 Structure Points in damage, and will lose 1 Blood Point per turn from the Ballistic part of his damage.

Dave returns fire. Taking his shot ($73-30-20=23\%$), and rolling 49, he misses.

ROUND FIVE

The PD asks for a new Initiative check. Dave rolls a $5+4 = 9$. The Sniper rolls a $2+3 = 5$. Dave has the Initiative.

The Sniper declares that he will aim, and take another shot at the top of the stairs. Finally, he will duck back out of sight behind the fridge.

Dave, seeing that the Sniper is aiming for another shot, chooses to take an aimed shot himself, and then drop flat to the stairs. Given a positive outcome, he holds an Action in reserve, ready to jump up and move towards the Sniper's position.

Dave gets to shoot first. The PD determines that given that both are aiming when shots are fired, both are only at a -20% for cover.

Rolling 44 out of 53 ($73-20=53\%$) is an exceptional success. That's 8 Degrees of Success. Dave chooses to use 4 for targeting, and 4 for additional damage.

The PD chooses to use the Upper Location's chart for determining where the Sniper was hit. Rolling a 40 is the Upper Left Arm. Dave has 4 Degrees of Success allocated for targeting, he chooses to shift the location to Right Hand.

The total E-factor is $9+4 = 13$. The Sniper has no protection on his hand, and so takes all the damage directly to his hand. The Hand's Structure Points are reduced to 0, rendering it useless. The PD rules that the additional damage continues through to the Rifle barrel, rendering it useless as well.

A Shock check is called for. The Sniper's CON task base is 44%. He rolls a 47, a failure. He loses Endurance Points equal to the damage caused, in this case 4, plus an additional 2 for reaching 0 SP in the Hand. The damage is all Ballistic, so he begins to lose $4 \times 2 = 8$ Blood Points per turn.

The Sniper, unable to carry out all but one of his declared Actions, drops back down behind the fridge.

Dave completes his declared Actions by rushing out into view and closing in on the Sniper.

Dave loses 1 Blood Point from the wound to his side.

ROUND SIX

Initiative checks once more and Dave gets $5+4 = 9$. The Sniper gets $2+3 = 5$.

The Sniper declares his Actions. He will attempt to stop the blood flow from his hand, essentially using all his Actions to do so.

Dave will slowly approach the fridge, keeping his Pistol aimed as he makes a wide circle to the side keeping distance from the Sniper.

The PD asks the Sniper to make a First Aid task check, a 42% chance. He rolls a 49, failing to control the blood-flow. He loses 8 Blood Points at the end of the turn.

ROUND SEVEN

The Sniper surrenders. Dave maintains his aim on the Sniper, coming in closer to kick the damaged Rifle away. Dave then picks up his Radio and calls in the rest of the team.

DAMAGE & RECOVERY

DAMAGE

Characters can be injured in many ways, by violence, flame, falling and more insidious threats such as drugs, poisons, diseases and radiation.

In general, damage causes loss of Structure Points. Some conditions may cause damage to core ability scores.

If a character is lucky enough to survive the initial trauma, then there are secondary and tertiary effects of the damage. An injury usually leads to bleeding, and therefore blood loss. This Blood Point loss can be attributed to both internal and external bleeding.

If the character has managed to avoid bleeding to death, then they face the risk of infection, an effect that may not be detected for 3-5 days after the initial injury.

All injuries can cause blood loss in addition to structure point damage. Blood Points are usually lost at the rate of (damage points) per tactical turn. Critical injuries bleed faster.

Blunt attacks can cause internal damage and bleeding. Blood Point loss tends to be lower than with penetrating injuries.

CALCULATING STRUCTURE POINT LOSS

Damage is applied either to a specific location or to the character's pool of structure points in the case of Whole Body Damage. Armor may protect a location.

In most cases, Structure point loss equals damage points minus armor value.

In general, Whole Body Damage can only be resisted with enclosed armor. In some situations e.g. fire damage, the PD may allow partial protection from armor.

Partial protection from armor also occurs when bullet impacts are converted to blunt trauma by modern ballistic armor. The damage the character sustains is equal to half the damage absorbed by the armor.

Example: Joe is hit in the chest by a 9mm pistol round (9 DP). Luckily, he is wearing a vest that absorbs the damage. He takes $9/2 = 4$ points of blunt damage to the chest.

Shock checks are required above a certain threshold of damage. Without immediate medical attention, character death occurs when any one of the following locations loses all its Structure Points: head, neck, torso (all zones), abdomen and groin, or when Whole Body Damage equals or exceeds the character's structure point pool.

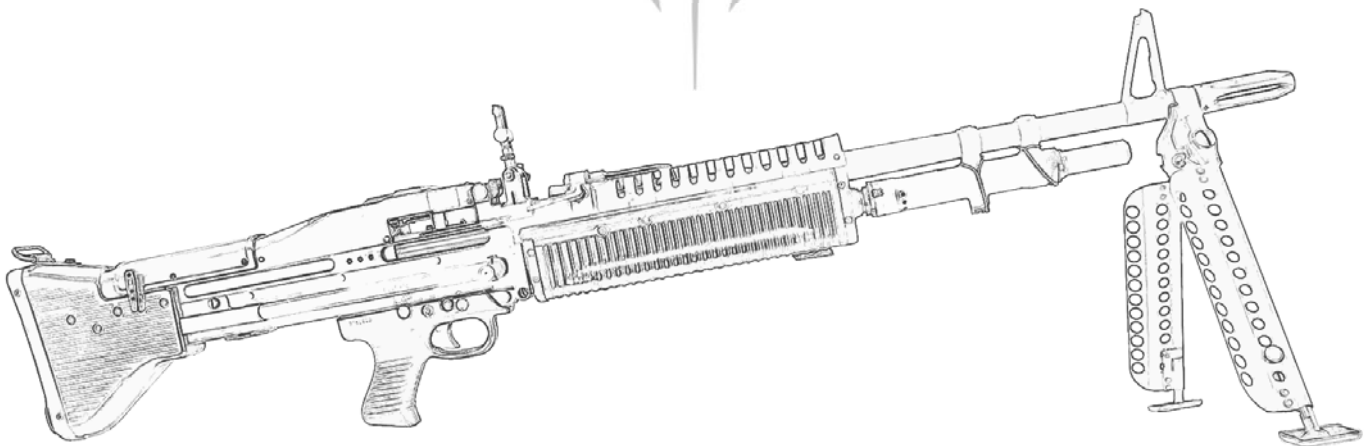
SHOCK CHECKS

Injury has other consequences - for example, blood loss and impaired function.

Massive injuries can be immediately fatal, but sometimes it is possible to fight for several minutes after life-threatening wounds. In some cases, minor injuries can be quickly incapacitating. It's a cruel world.

Shock checks are CON tasks. There is a 5% penalty for every multiple of MASS in DP sustained.

Example: Mike Lucas has MASS 10. For every 10 points of DP sustained, the shock check has a 5% penalty.



SHOCK CHECK TABLE

RESULT	EFFECT	DAMAGE DEALT TO:			
		HEAD	TORSO	LIMB	WHOLE BODY [WDP]
THRESHOLD		MASS/5 [2]	MASS/5 [2]	[0]	MASS X 2 [20]
Exceptional Success	Sp	Dp	Dp	Dp	Dp
	BR	Dp-DoS	Dp-DoS	Dp-DoS	[DoS x 5%] x Dp
	END	0	0	0	0
	Special	[+DoS x 2% to Recovery]	[+DoS x 2% to Recovery]	[+DoS x 2% to Recovery]	[+DoS x 2% to Recovery]
Success	Sp	Dp	Dp	Dp	Dp
	BR	Dp	Dp	Dp	Dp
	END	3	2	1	1
	Special	--	--	--	--
Failure	Sp	Dp	Dp	Dp	Dp
	BR	Dp + DoF	Dp + DoF	Dp + DoF	Dp
	END	Dp	Dp	Dp / 2	[reduced to 0]
	Special	DoF x 5% [Impaired]	DoF x 2% [Impaired]	DoF x 2% [Dismemberment]	DoF x 2% [Impaired]
		DoF x 5% [Critical Bleed]	DoF x 5% [Critical Bleed]	DoF x 2% [Critical Bleed]	
Exceptional Failure	Sp	--	--	Dp	--
	BR	--	--	Dp + DoF	--
	END	--	--	Dp x 2	--
	Special	Death	Death	DoF x 5% [Dismemberment]	Death
				DoF x 5% [Critical Bleed]	

KEY:

Threshold = The amount of Dp applied required before a Shock check is necessary

Sp = Structure Point loss

Dp = Damage Points applied, having been reduced by any armor or protection

BR = Bleed Rate, the amount of Blood Points lost per Tactical Turn

END = Endurance Point loss

DoS = Degrees of Success achieved

DoF = Degrees of Failure achieved

Recovery = the % bonus to allocate to Recovery Rolls relating to this wound

Impaired = the chance that additional impairment of the location has occurred. This can range from loss of mobility, penalty to task checks for certain activities, or other medical complications which, if left untreated, could lead to death.

Critical Bleed = the chance of major hemorrhage where blood points are lost per combat turn, rather than per tactical turn.

Dismemberment = the chance of a limb being severed. All locations beyond that struck are lost (e.g. below the knee, ankle, wrist, etc.). A CON check is required to avoid critical bleeding - if successful, blood loss per tactical turn is doubled. A severed neck is immediately fatal.

Death = Death is instant. A PD may allow for immediate Medical attention to save a person from this status.

EFFECTS OF DAMAGE

HEAD

Locations (Head, Neck)

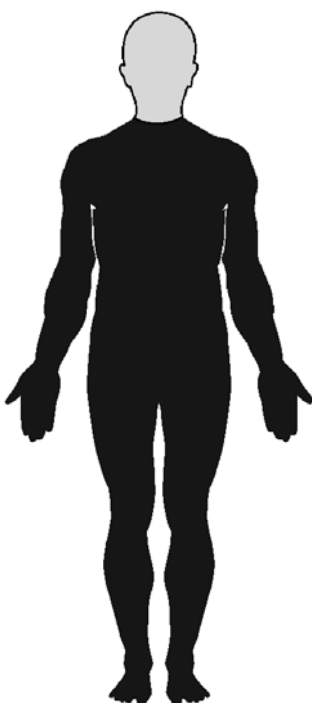
EFFECTS OF SHOCK CHECK:

RESULT THRESHOLD	EFFECT	MASS/5 [2]
Exceptional Success	Sp	Dp
	BR	Dp-DoS
	END	0
	Special	[+DoS x 2% to Recovery]
Success	Sp	Dp
	BR	Dp
	END	3
Failure	Sp	Dp
	BR	Dp + DoF
	END	Dp
	Special	DoF x 5% [Impaired] DoF x 5% [Critical Bleed]
Exceptional Failure	Sp	--
	BR	--
	END	--
	Special	Death

Damage dealt to the Neck uses the Head Zone for Shock check, with one exception. Also add in the Dismemberment chances from the Limb Zone when dealing with a Failure or Exceptional Failure.

LOCATION REDUCED TO 0 SP OR LESS

END is reduced to 0, CON task check to avoid Death every Game Turn until Medical Aid can bring Sp back to 1 or more.



TORSO

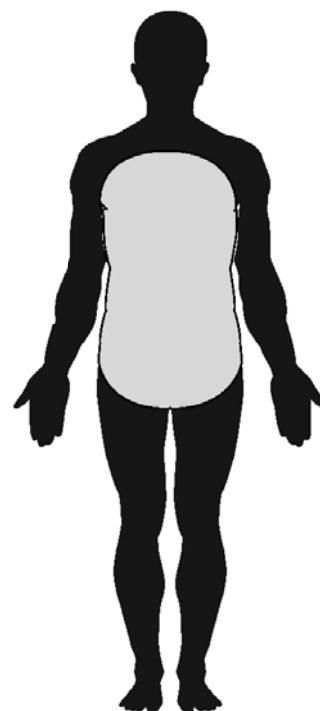
Locations (Mid Torso, Right Upper Torso, Left Upper Torso, Abdomen, Groin)

EFFECTS OF SHOCK CHECK

RESULT THRESHOLD	EFFECT	MASS/5 [2]
Exceptional Success	Sp	Dp
	BR	Dp-DoS
	END	0
	Special	[+DoS x 2% to Recovery]
Success	Sp	Dp
	BR	Dp
	END	2
Failure	Sp	Dp
	BR	Dp + DoF
	END	Dp
	Special	DoF x 2% [Impaired] DoF x 5% [Critical Bleed]
Exceptional Failure	Sp	--
	BR	--
	END	--
	Special	Death

LOCATION REDUCED TO 0 SP OR LESS

END is reduced to 0, CON task check to avoid Death every Game Turn until Medical Aid can bring Sp back to 1 or more.

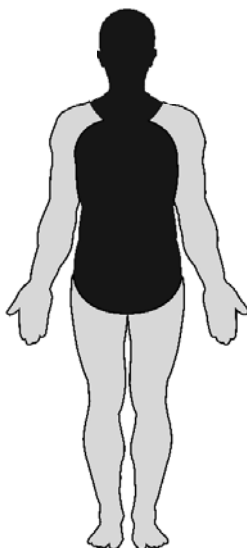


LIMB

Locations (Right Shoulder, Right Arm, Right Upper Arm, Right Elbow, Right Lower Arm, Right Wrist, Right Hand, Left Shoulder, Left Upper Arm, Left Elbow, Left Lower Arm, Left Wrist, Left Hand, Right Hip, Right Thigh, Right Knee, Right Calf, Right Ankle, Right Foot, Left Hip, Left Thigh, Left Knee, Left Calf, Left Ankle, Left Foot)

EFFECTS OF SHOCK CHECK

RESULT THRESHOLD	EFFECT	[0]
Exceptional Success	Sp	Dp
	BR	Dp-DoS
	END	0
	Special	[+DoS x 2% to Recovery]
Success	Sp	Dp
	BR	Dp
	END	1
Failure	Sp	Dp
	BR	Dp + DoF
	END	Dp / 2
	Special	DoF x 2% [Dismemberment]
		DoF x 2% [Critical Bleed]
Exceptional Failure	Sp	Dp
	BR	Dp + DoF
	END	Dp x 2
	Special	DoF x 5% [Dismemberment]
		DoF x 5% [Critical Bleed]



LOCATION REDUCED TO 0 SP OR LESS

END is reduced by a further 2. All locations further down the limb, and the location itself, are useless, until Medical Aid can bring Sp back to 1 or more.

WHOLE BODY EFFECT (WDP)

EFFECTS OF SHOCK CHECK

RESULT THRESHOLD	EFFECT	MASS X 2 [20]
Exceptional Success	Sp	Dp
	BR	[DoS x 5%] x Dp
	END	0
	Special	[+DoS x 2% to Recovery]
Success	Sp	Dp
	BR	Dp
	END	1
Failure	Sp	Dp
	BR	Dp
	END	[reduced to 0]
	Special	DoF x 2% [Impaired]
Exceptional Failure	Sp	--
	BR	--
	END	--
	Special	Death

LOCATION REDUCED TO 0 SP OR LESS

Death. No chance of redemption.

BLOOD LOSS AND ITS CONSEQUENCES

Tissue injury causes varying amounts of blood and fluid loss. These can be very large in the case of burns and multiple traumas. Each injury site will have a bleeding rate determined by initial structure point damage and the result of any shock checks.

Base bleeding rate is (damage points) per tactical turn (36s).

Critical bleeds occur ten times faster - (damage points) per combat turn (3.6s).

Blood loss (and BP loss) continues until the character bleeds to death - or spontaneously stabilizes, or first aid or medical treatment stems the flow. See 'Stopping Blood Loss', below.

To determine the Bleed Rate, apply the multiplier listed below to the Structure Point loss for a given wound, based upon the type of damage received. Certain results on the Shock Check can adjust this Structure Point loss for the purposes of Bleed Rate calculation.

DAMAGE TYPE	DP	EXAMPLE
Ballistic Damage	x1	Gunshot
Puncture Damage	x0.75	Knife Wound
Slash Damage	x0.5	Axe Wound
Concussive Damage	x0.2	Hammer Blow

Once the total Bleed Rate has been calculated, which can be broken down for each separate wound, a character will lose these many Blood Points every Tactical Turn. Critical Bleed Rates [which are effective for a given wound] are applied every Combat Turn, and are therefore 10 times the normal rate.

ANEMIA

Characters are less able to exert themselves following bleeding. For every 20 BP lost, reduce Endurance by 1.

BLEEDING OUT

If BPs are reduced to MASSx4 or less, blood volume is critically low. A CON task is required every Game Turn to avoid death. Transfusion is required. Death is immediate when BPs reach zero.

RESUSCITATION

Immediate medical attention is required to stabilize critically wounded characters. Unfortunately, some injuries cannot be fixed, such as decapitation, whole-body damage sufficient to reduce a character's Structure Points to zero, or the loss of all Blood Points.

The treating character makes a First Aid, Medicine or Surgery task check. They need to generate more degrees of success than the dying character's degrees of failure on the Shock check to be able to resuscitate them at all. Should the location be reduced to 0 Sp's rather than through the Shock check, then 2 degrees of success need to be beaten for the torso, 5 degrees of success for the head, 10 for the whole body, and 4 for 0 Blood Points.

If the wounded character succeeded on their Shock check but went below zero Structure or Blood points anyway, their degrees of success do not add to those of the treating character.

Resuscitation takes a minimum of one game turn, and brings the wounded character back to 1 Structure Point in the affected area or 1 Blood Point. The wounded character is unconscious and on 0 Endurance points.

QUICK KILL / MULTIPLE HITS

Characters hit by multiple simultaneous attacks e.g. shrapnel, shotgun blasts, automatic weapons fire are in trouble. The PD may wish to apply multiple hits to a target in groups of 5. All the damage from the attacks is applied to the targeted locations, less the Armor value worn. If the character isn't killed outright due to 0 Sp's in a critical location, then roll for a Shock check as usual. Multiple hits to the same location use the total damage when making the check. The PD may wish to check against Whole Body damage first, to determine if this is lethal. For Quick Kills, usually against NPC's, the PD may assume all damage is against the Mid Torso, and roll for the effects.

Example: Joe Average is hit in the abdomen from a three round burst from an M-16 (E-factor 15). He is wearing resist-weave coveralls (Armor = 7) which reduce the bullets' damage to 8 each. $8 \times 3 = 24$ Dp.

He only has 16 Structure points in this location. May he rest in peace. Even if he had enough Sp's in the location, he would follow on with a Shock check for 24 points of damage to the Abdomen.

STOPPING BLOOD LOSS

At the end of a tactical turn, a character will lose Blood Points equal to the structure point damage of all new wounds. Some wounds may cause less than the usual Blood Point Loss, whilst others could cause more than expected. Each wound is treated separately for attempting to stop the blood flow.

SPONTANEOUS STABILIZATION (AKA 'NATURAL REDUCTION')

The character lies still and applies pressure on the wound. They cannot take any other physical action except talking, moaning or groaning. Every ten tactical turns (one game turn) the character can make a CON task check. Each degree of success reduces blood loss rate by 1. An Exceptional Success doubles this figure.

FIRST AID (AKA 'SHORT TERM ATTENTION')

Direct pressure can be applied to a wound. A wound can be held, bandaged or tourniqueted every combat turn. This requires a successful STR, CON, First Aid or Medicine check. A tourniquet provides a 20% bonus to the check or two degrees of success.

Each degree of success reduces blood loss by one point. The task can be repeated to help control the bleeding.

The wounded character cannot move or lift heavy objects, otherwise the bleeding will resume at its former rate.

MEDIUM TERM ATTENTION

This is first aid or field surgery aimed at controlling blood loss and dressing the wound. Each wound takes a game turn to treat. This is a CON + First Aid/Medicine for the injured character or DEX + First Aid/Medicine for an assisting medic.

All degrees of success reduce bleeding rate; Exceptional Successes stop bleeding from the wound. The task can be repeated to help control the bleeding.

The character cannot perform any strenuous actions (running, lifting heavy objects) for fear of rebleeding but is not otherwise limited.

LONG TERM ATTENTION

This is ongoing dressing and wound care to prevent infection and wound breakdown.

Once structure points have started to recover, the character can perform normal activities.

There is a chance of wound breakdown and rebleeding - CON check daily; for each degree of failure, bleed rate of one BP per tactical turn.

BLOOD COMPATIBILITY

When a character receives a blood transfusion, it is essential that it is of a compatible blood type. If it is incompatible, then the character may die (requiring a CON task check at -50% to avoid.) To know which blood types are compatible, consult the following table. The recipient's Blood Type is listed at the top, and beneath that are all the compatible types they can accept.

BLOOD COMPATIBILITY TABLE

RECIPIENT:

O-	O+	A-	A+	B-	B+	AB-	AB+
O-	O-	O-	O-	O-	O-	O-	O-
	O+		O+		O+		O+
		A-	A-			A-	A-
			A+				A+
				B-	B-	B-	B-
					B+		B+
						AB-	AB-
							AB+

DAMAGED CORE ABILITIES

Provided STR, CON & DEX remain equal to or higher than the character's MASS score, then everything is fine. However, should one, especially STR, fall below

MASS the character will find it difficult to continue to function at full capacity. The strain is too great. For every 1 point a physical ability is below the MASS score, there is a -5% penalty to Tasks relating to that ability.

This is also true to some degree for the other ability scores. A character needs to maintain a minimum FOCUS & REASONING score of 10. The same for the EXPRESSION & AWARENESS core abilities. As these drop below 10, then the character suffers, usually the same -5% penalty. A FOCUS score below 10 could indicate the gaining of some permanent mental illness; REASONING, major memory loss, or the lack of short term memory.

A Core ability that reaches 0 usually means the character's death, or in the case of FOCUS, a complete absence of that ability - irreversible insanity, for example. A Core Ability at 0 is usually impossible to recover from.

OPTIONAL RULE: BLOOD LOSS SIMPLIFIED

If you are averse to recording the blood point loss every tactical turn, and monitoring constant CON task checks and medical assistance checks in order to reduce the Bleed Rate (BR), or indeed combat has finished and you want to get back to more role-playing, then this optional rule may be for you.

Rather than track Blood Point loss over time, a suggested 'quick' calculation is to roll 2d6, and multiply the result by the adjusted Bleed Rate for a wound. Allow all those willing to make Medical assistance checks, or for the character to make their CON task check, in order to reduce the BR before making the 2d6 roll. The minimum blood loss should be equal to the initial BR assessed for the wound.

Should there be a Critical Bleed, then roll 2d6 and multiply it by 2 (PD's should feel free to multiply it by either 5 or 10 depending upon how lethal they want a critical bleed to be.) Remember that with a Critical Bleed, blood loss occurs rapidly over seconds, rather than minutes. Left without sufficient medical assistance, a character is likely to bleed out.

Endurance loss and other associated factors, remain the same, once total blood loss has been calculated.

A wounded character that engages in physical exertion after blood loss has been controlled, but before the wound has begun to heal (regained at least 1 Structure Point), still risks opening up the wound again, and losing additional blood points.

For example, after being shot in the leg for 8 Sp, effectively destroying his knee, and achieving a failure on

the CON task check, the adjusted Bleed Rate is 14. The Medic puts pressure on the wound, and administers a coagulant, achieving 5 degrees of success. The Bleed Rate is reduced to 9. The PD rolls 1d10, getting a 7. The target loses 63 blood points before stabilizing.

PAIN

A PD may wish to determine whether a character (or NPC) can push beyond the debilitating agony of certain injuries. This is in essence a Panic check, as detailed in the combat chapter. Modifiers should be applied based on the situation, and medication administered. A successful FOC task check will allow the character to continue to take actions.

HEALING

The rate of recovery of Blood Points, Structure Points, and Core ability values depends on the character's CON and the type and intensity of medical attention that they receive.

CRITICAL CARE AND STABILIZATION

Severely wounded (0 SP in a critical zone) characters need resuscitation. This is a First Aid/Medicine task which takes a game turn. Equipment and environment provide bonuses and penalties to the task:

EQUIPMENT

- Blood and intravenous fluids +10%
- Field Medical Kit +10%
- Universal Drug +30%
- Med Unit +20%

ENVIRONMENT

- Dirty, active combat, inadequate equipment etc. -10% per factor
- Field (no distractions) 0%
- Aid Station/basic hospital +10%
- Trauma Center/Intensive Care +20%

Each degree of success adds 1 SP to an affected region; Exceptional success doubles this.

The wounded character dies on a failure.

RECOVERY

Blood points are recovered at the rate of 1 per 100 starting points per day. So for the average character who starts with 200 BP this is 2 BP per day. This assumes

adequate hydration and nutrition. Infections and other complications will slow or prevent the recovery of BP.

Structure points are regained more slowly. The basic rate is 1 point every 2.5 days, or 4 points per ten days.

The character makes a CON task check.

Base: CONx2.

BONUSES

- Attending medic's Medicine or Surgery skills: +%
- Environment: as per stabilization section above

EQUIPMENT

- Specific medications (e.g. antibiotics, antivenoms, etc.) +10%
- Field Medical Kit +10%
- Universal Drug +30%
- Med Unit +20%

Each degree of success is another SP recovered over ten days.

Degrees of failure are a penalty to SP, and represent a chance of a complication (DoF x 5%).

Exceptional failure means that a complication has occurred. This is usually an infection, which prevents further recovery until treated. There is a chance of a medical emergency which requires resuscitation (DoF x 2%).

A second CON task check is made. The virulence of the infection equals the total degrees of failure from the two rolls.

Core abilities regenerate at a rate of one point per ten days. Appropriate use of medical skills can increase this rate: +1 for a success, +2 for an Exceptional Success.

Failure stops recovery in that ten day period. Exceptional Failure causes the loss of 1-2 points and further recovery over the next ten days.

Depending on the injury pattern the PD may rule that further recovery of SP or ability points is impossible. For example, if the Sp was from a joint, there may be a permanent 10% penalty for all future tasks involving that limb/joint.

101 OTHER WAYS TO GET HURT

BURNS

A burn can be either to a location on the Medical Table, or to the whole body. The effects of damage from burns are resolved every combat turn, and those effects are cumulative. For example, if running through a burning building when a flaming beam lands on him, Joe takes 6 points of damage per combat turn. The first turn he resolves the damage for 6 Dp, the second turn he resolves for 12 Dp, and so on, until the exposure stops. Burns also do damage to Blood Points, from loss of bodily fluids, equal to one half of the total Dps taken from the exposure.

BURN TABLE

TEMP	FLASH	DP/SECOND	DP/COMBAT TURN	DESCRIPTION
100	-	1 per 3	1	
200	-	1 per 2	2	Air temperature threshold for airway injuries
400	-	1	4	Average house fire
600	1	2	7	
800	2	4	14	
1000	5	10	36	
1200	10	20	72	Cotton spontaneously ignites - napalm burns at this temp.
1400	15	30	108	
1500	20	40	144	Peak intensity house fire
1600	25	50	180	
1800	40	80	288	
2000	60	120	432	
2200	80	160	576	
2400	110	220	772	
2500	130	260	916	Thermite burn temperature
2600	150	300	1080	
2700	175	350	1260	Phosphorus burn temperature
2800	200	400	1440	
3000	250	500	1800	
3200	300	600	2160	

KEY

Temp=temperature of heat source, deg. Celsius

Flash = exposure of less than a second

BURN SEVERITY

THICKNESS	LOCATION	WHOLE BODY	EFFECT
Superficial (first degree)	1-4 Dp	1-7 wDp	--
Partial thickness (second degree)	5-9 Dp	8-20 wDp	--
Full thickness (third degree)	10-14 Dp	21-40 wDp	-1 STR, -1DEX
Deep (fourth degree)	15+ Dp	41+ wDp	-1 CON, DEX, STR per 20 Dp

BODY SURFACE AREA

Use the 'Rule of Nines' to estimate percentage burned:

- Handprint 1%
- Head/neck, arm each 9%
- Front and back of chest, abdomen, and front and back of legs each 9%

Protective clothing has a burn protection rating (BPR), which is based on the time taken for the person wearing the outfit to suffer a partial thickness burn with an air temperature of 1200C.

BURN PROTECTION RATING

BPR	TIME TO BURN	EXAMPLE
1	0.5 seconds	Untreated clothing
6	3 seconds	Secondary protective clothing e.g. Project coveralls.
35	17 seconds	Minimum rating for firefighter's turnout.
38	19 seconds	NASCAR driver's suit
50-60	25-30 seconds	Modern fire-fighting suit
80	40 seconds	Top fuel drag racer's suit

The BPR rating of Protective Clothing x 10 is the effective Armor Value against such extreme heat damage.

FALLING & COLLISIONS

For every meter of height an object or person falls, they take their MASS score in Damage points (Dp). This may also be true for someone being hit by the falling object or person, taking the MASS score in Damage points for every meter it has fallen.

For every 10km/h of velocity an object or person is travelling when they come to an abrupt stop, they also take their MASS score in Damage points. If the stop isn't as abrupt, like landing in an airbag, then the damage taken is reduced substantially. At least half damage, possibly as great a reduction as one-tenth.

The terminal velocity for an object or person, falling, is equal to 20 times their MASS score in km/h (or meters per combat turn.)

Objects that are shaped for throwing or are streamlined have an effectively **higher** MASS, as they can achieve a higher terminal velocity.

Items like parachutes with relatively large areas have a reduced effective MASS. Non aerodynamic items have

a reduced effective MASS, but not as much as something with wings or a chute!

A working chute halves MASS for the sake of determining terminal velocity. A character can reduce the impact of a fall by flexing their knees, or rolling on landing. Each degree of success on the Athletics/Acrobatics/Operate Parachute check reduces fall damage by (MASS) Dp.

VEHICLE CRASH PROTECTION

Safety harnesses act as armor, and allow the character to ignore some of the collision velocity. Head protection and neck bracing are assumed.

TYPE	VELOCITY IGNORED
Forward seating, shoulder belt	140km/h
Forward seating, lap belt	2km/h
Rearward seating	280km/h
Sideways seating	32km/h
Air bags	20km/h (front-rear or side-on depending on location)

Example: Max loses control of his XR 311 and runs into a tree. If Max had been wearing a helmet and a shoulder belt, he could ignore up to 140km/h of collision speed (but the XR 311 will be wrecked). If he was only wearing a lap belt, he could only ignore the first 2km/h of collision speed (ouch).

Upward acceleration injury threshold 72km/h (over 0.1 second).

Downward acceleration injury threshold 54km/h (over 0.1 second).

These assume a parachute or ejector seat and are the threshold for fractures of the femurs, pelvis and vertebral column.

DROWNING AND ASPHYXIATION

Characters can be deprived of oxygen in a number of situations - by poisonous or hypoxic gases, choking, strangulation or even exposure to vacuum.

A character can hold their breath for a number of combat turns equal to their Endurance. They can extend this by making a Meditation, Swim or Athletics check by one combat turn for each degree of success.

The act of holding one's breath costs two Endurance points, three if underwater.

If holding one's breath isn't possible, or the breath-holding time runs out, the character takes 5 points of whole body damage per combat turn.

In addition, they must make a CON check to avoid losing Endurance points equal to twice the degrees of failure on the roll. On an Exceptional Failure, they become unconscious and also lose Endurance points.

STARVATION AND DEHYDRATION

People need food and water to survive. Increased activity requires more food and water.

The minimum requirement for survival is 200mL water and 200 kilocalories per MASS point.

For every point of Endurance spent in a day, add another 200mL of water and 200 kilocalories.

High temperature environments need larger water intakes because of sweating ('Thermal Illnesses').

If a daily requirement for either water or food is not met, then the rate of healing (BP, SP or Characteristic values) is halved. If no water or food is ingested, then healing stops.

The ration pack described in the equipment section assumes that 1 person day of food is equal to 3600 kilocalories because it was designed for soldiers in the battlefield.

Detailed lists of caloric content of food are widely available, so will not be provided here.

BASICS (OR WHY SUPER FOOD PILLS ARE IMPOSSIBLE):

- Carbohydrate or protein: 4 kilocalories per gram
- Fat: 9 kilocalories per gram
- Ethanol: 7 kilocalories per gram
- (gasoline and diesel fuel: 9-11 kilocalories per gram)

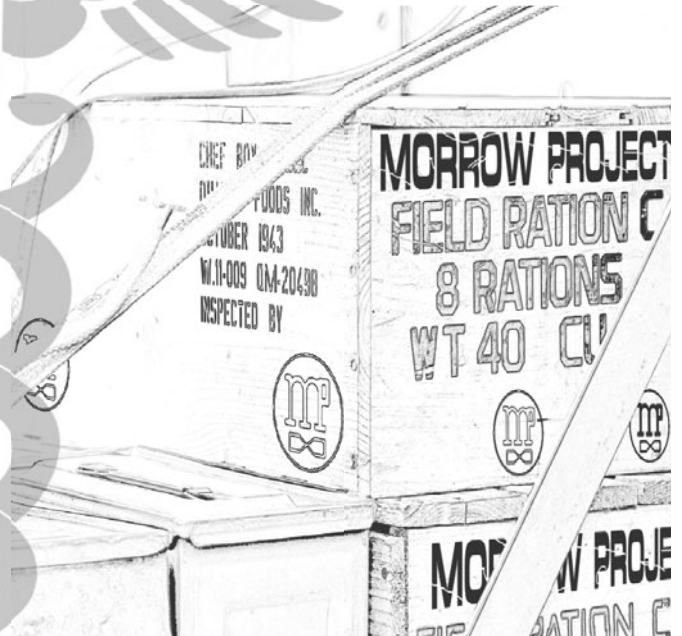
STARVATION

The effects of starvation are more insidious in onset as the body breaks down stored fat and protein (muscle) for fuel. For every three days of reduced food intake, make a CON task check.

PENALTIES

No food at all:	-10%
Reduced water intake:	-5%
No water intake:	-10%

For each day beyond the first, there is a cumulative -1% to all task checks – including the CON task check. This penalty dissipates at a rate of 5% per day once a full daily calorie requirement is met. This penalty stacks with that from Dehydration.



Exceptional Success: No effect. Check in a number of days equal to Degrees of Success achieved.

Success: No effect. Check in three days.

Failure: -1 CON, -1 STR. Check in three days.

Exceptional Failure: -1 CON, -1 STR. For each Degree of Failure, subtract an additional STR and CON point. Check in three days.

Death occurs when CON=0.

A large number of attribute points can be lost on an Exceptional Failure.

This could represent a concurrent illness or complication of malnutrition.



DEHYDRATION

Lack of water soon leads to problems. For every day of reduced water intake, make a CON task check.

PENALTIES:

No water at all:	-10%
Reduced food intake:	-5%
No food intake:	-10%

For each day beyond the first, there is a cumulative -2% to all task checks – including the CON task check. This penalty dissipates completely when a full daily water requirement is met. This penalty stacks with that from Starvation.

Exceptional Success: No effect. Check next day.

Success: -1 CON. Check next day.

Failure: -2 CON, -2 STR. Check next day.

Exceptional Failure: -2 REA, FOC, CON, STR. For each Degree of Failure, subtract an additional STR and CON point. Check next day.

Death occurs when CON=0.

A large number of STR and CON points can be lost on an Exceptional Failure.

This could represent a concurrent illness or complication of dehydration.

A PD may substitute CON and STR losses for SP & BP. For each point of CON or STR loss, 2 points of both SP & BP are lost. Once SP is lost equal to MASS x 2, then there is a chance of Death each day equal to SP lost. For example, instead of losing -2 CON, -2 STR through dehydration, the PD rules that 8 SP's & 8 BP's are lost. After 3 days of this, 24 SP's have been lost. There is a 24% chance of Death. With each day, if this continues, the chance of Death increases by 8%.

A PD may also elect to increase Endurance point costs by 1 for those suffering from Starvation or Dehydration.

ELECTRICITY

Electric shocks do whole-body damage. Depending on the amount of current that passes through the body, burns, unconsciousness and death may ensue.

The character makes a CON check on exposure, and takes the listed damage each combat turn. Shock checks are required for each additional combat turn of exposure.

ELECTRICAL DAMAGE

CURRENT DAMAGE

10-400 micro A	Microshock - if appropriate conditions exist (leak current across or through chest), cardiac arrest on failed CON check (5Dp per combat turn).
1 mA+	1 Dp per combat turn. Character aware of tingling.
10 mA+	2 Dp per combat turn, character can't let go of conductor, pain. Cardiac arrest on an Exceptional Failure of CON check.
100mA+	3 Dp per combat turn, cardiac arrest on Failure of CON check.
1A+	10 Dp per combat turn, need Exceptional Success on CON check to avoid cardiac arrest, Skin begins to burn.
1000A+	100 Dp per combat turn, including cardiac arrest damage. Divide total damage by 5 and check for limb loss (5% chance for every damage point above the Sp value for the limb).
10000A+	100 Dp per second, includes cardiac arrest damage. Check for limb loss as per 1000+A shock.

KEY

1 micro A = 1 microampere or 0.000001 A

1 mA = 1 milliamp or 0.001 A

EXAMPLES

1A	Starter motors, defibrillators, etc.
10A	Household mains, industrial motors, etc.
100-1000A	High tension power transmission
10000A+	Lightning bolts

THERMAL ILLNESSES

Extremes of heat and cold can cause injury.

Overheating due to exertion in hot weather can cause heat stroke.

Hypothermia and frost bite can occur when heat loss exceeds heat production in cold weather or when immersed in water.

HEAT

The smaller the difference between body and ambient temperature, the harder it is to cool down. Sweating and evaporative cooling from sweat becomes less efficient as humidity increases.

TEMPERATURE-ACTIVITY TABLE

ADJUSTED TEMPERA- TURE °C (°F)	WORK RATE (ENDURANCE/ HOUR)		
	LIGHT (<3)	MODERATE (3-6)	HEAVY (>6)
25 (77)	No limit	No limit	No limit
26 (79)	No limit	No limit	4
27 (81)	No limit	No limit	3
28 (82)	No limit	4	2
29 (84)	No limit	3	2
30 (86)	No limit	2	2
31 (88)	4	2	1
32 (90)	3	1	1
33 (91.4)	2	1	1
35 (95)	1	1	Hazard
37 (98.6)	1	Hazard	Hazard
46 (115)	Hazard	Hazard	Hazard

20% relative humidity is assumed as a baseline. Add 1 degree Celsius for every 20% increase in relative humidity. Rain = 100% humidity.

No limit: No breaks are required to limit heat exposure.

Number: Time interval in hours between checks.

Hazard: Any work may precipitate a heat illness. Check every half hour.

Clothing can prevent the evaporation of sweat, and act as an insulator. Bulkier clothing increases the risk of hyperthermia. The correction factors listed below are added to the temperature to determine the risk for the wearer. They are additive. For example, a character

wearing a flak jacket over their fatigues has a correction factor of $2+2 = 4$.

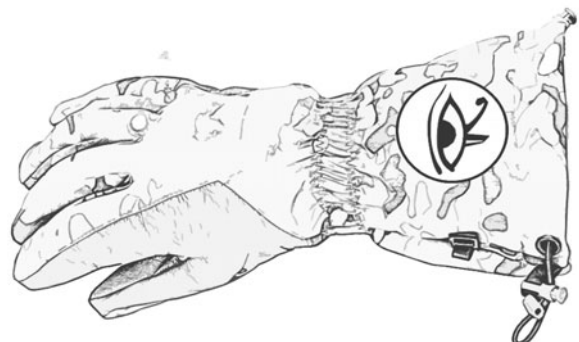
COLD PROTECTION

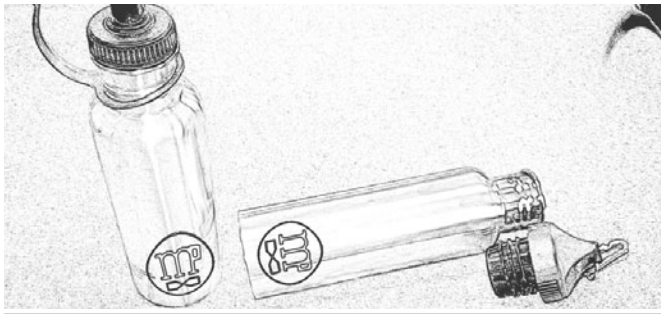
CLOTHING TYPE	COLD PROTECTION
Summer lightweight work clothes	0
Cotton coveralls, light woolen suit, military fatigues, flak jacket, torso body armor	2
Winter work clothing, NBC suit	4
Permeable water barrier (e.g. maritime protective clothing)	6
Naval cool-weather clothing e.g. U.S. Navy's A-2	3
U.S. Navy's A-1 cold weather clothing	6
Cold weather protective clothing (e.g. ECWS)*	12
Waterproofed hiking boots (dry)	3
Vapor barrier boots Type 1	4
Vapor barrier boots Type 2	8
Insulated gloves (-2 DEX)	2
Contact gloves (-4 DEX)	3
Trigger-finger mittens (10% penalty to fine tasks)	4
Arctic mittens (20% penalty to fine tasks)	5

* The ECWS doesn't protect the hands and feet. Depending on the weather conditions, it is worn with either type of vapor barrier boots, gloves and mittens.

A 'quick and dirty' rule for temperature correction factor is (clothing mass in kg /3), or (lbs/6). Round down.

Hydration is protective. Water requirements are as follows in liters per hour at each work rate.





WATER REQUIREMENTS PER HOUR

TEMP (°C)	LIGHT	MODERATE	HEAVY
25-28	0.5	0.75	0.75
29	0.5	0.75	1.0
30	0.75	0.75	1.0
31	0.75	0.75	1.0
32+	1.0	1.0	1.0

Maximum absorption rate for water is 1.5 liters per hour. Maximum recommended consumption is 12 liters per day. The minimum adult water requirement is 2 liters per day.

HEAT ILLNESSES

HEAT EXHAUSTION

Symptoms include fatigue, headache, nausea and vomiting, dizziness, and muscle pains. An elevated heart rate and temperature and signs of dehydration may be evident.

The basic treatment measures are cooling (e.g. ice-packs to the neck, groins and axillae, evaporative cooling with water sprays) and rehydration (usually oral).

HEAT STROKE

There are two forms, an acute type related to exertion and a chronic type due to exposure. Both are medical emergencies; the latter is usually seen in the very young, the very old and those unable to remove themselves from the heat. While features of heat exhaustion are often present, the distinguishing feature of heat stroke is altered level of consciousness related to central nervous system dysfunction. Delirium with altered perception (hallucinations) or coma may be present. The onset of symptoms is usually sudden.

Aggressive treatment with cooling (evaporative or invasive) and IV rehydration are required to prevent death. Other intensive supportive measures may be required. Organ failure, severe hyperthermia with a core temperature of 42.2 °C (108 °F) or more, or coma longer than 4 hours are all poor prognostic indicators. Mortality may reach 70%, especially in those with other chronic illnesses.

GAME RULES

Determine a character's baseline risk by checking the temperature-activity table. Adjust for clothing and hydration. Make the following CON check at each interval:

Modifiers:

- -20% for every 5 Endurance points spent per game turn, or exposed to temperatures above 40°C (104°F) and no exertion
- -10% if dehydrated
- -20% if hazardous temperature on temperature-activity table

Exceptional Success: Check again in three hours.

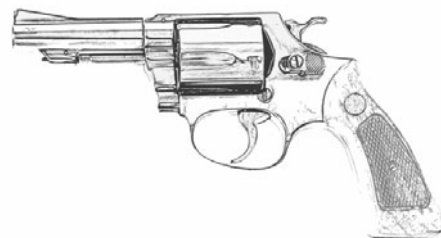
Success: Check again in an hour.

Failure: Heat exhaustion. Structure Point damage equals Endurance points spent per hour. It is applied every game turn until treated.

Exceptional Failure: Heat stroke. Structure Point and Blood Point damage equals Endurance points spent per hour. Damage is applied every minute until treated.

Example: Max's XR 311 has broken down in the desert. He is trying to hike to the top of a hill to contact the rest of his team by radio. Max has an Extreme Encumbrance level, so he is using 7 endurance points per hour (2 for hiking, +1 for terrain and +4 for encumbrance). This is a heavy work rate. The ambient temperature is 35 Celsius, so Max is at risk of hyperthermia. Since he is wearing Project-issue coveralls, Max is effectively operating at 37 Celsius (WBGT correction +2).

Every hour, Max's player must make a CON check to avoid heat injury (with a 40% penalty; -20% from work rate, -20% for hazardous temperature). On a Failure, Max sustains 7 structure points per game turn from heat exhaustion. On an Exceptional Failure, Max sustains 7 structure and blood points per minute from heat stroke.



COLD INJURIES AND HYPOTHERMIA

The rate of heat loss exceeds heat production. The usual cause is exposure or immersion.

ASSESSING RISK

The amount of damage is determined by ambient temperature, wind, and any protective clothing worn. A character makes a CON check periodically to see if hypothermia (failure) or cold burns/frostbite (exceptional failure) develops.

TEMPERATURE AND WIND CHILL

Wind can cause an additional cooling effect by convection. This greatly increases the risk of freezing cold injuries (frostbite). The effective air temperature is shown in the table on page 114.

CLOTHING AND ACTIVITY

Clothing acts as an insulator. The cold protection rating of an item of clothing is equal to its temperature correction value, and acts as armor against cold damage. Layering is additive; for example, a flak jacket over fatigues has a cold protection rating of 4.

Characters may exert themselves to protect against the cold. Every extra Endurance point spent per hour stops 1 point of cold damage.

IMMERSION INJURIES

Water has a much higher heat capacity (1,000 times) and thermal conductivity (25 times) than air. Immersion will rapidly lead to hypothermia.

IMMERSION			
WATER TEMPERATURE °C (°F)	COLD DAMAGE, STRUCTURE POINTS	TIME TO MODERATE HYPOTHERMIA	SURVIVAL TIME
>27 (80+)	1 per 2 game turns	> 12 hours	indefinite
21-27 (70-80)	1 per game turn	3-12 hours	3 hours to indefinite
16-21 (60-70)	1 per three minutes	2-7 hours	2-40 hours
10-16 (50-60)	1 per minute	1-2 hours	1-6 hours
4-10 (40-50)	2 per minute	25-60 minutes	1-3 hours
0-4 (32-40)	4 per minute	12-30 minutes	30-90 minutes
-2 (29)	16 per minute	3 minutes	15-30 minutes

The times given above assume minimal insulation (nude or lightweight summer clothing).

Time to moderate hypothermia = time to take 25% of an average character's structure points in cold damage; see Hypothermia, below, for more details. Survival time assumes that resuscitation will be successful after being rescued.

PROTECTIVE MEASURES

Treading water and swimming with or without a buoyancy device do not protect from hypothermia! Flotation devices reduce the chance of drowning once hypothermia sets in.

There are two ways to slow the onset of hypothermia:

1. Minimizing heat loss by huddling with others, or the 'HELP' position (arms folded across chest, legs drawn up as much as possible). Both maneuvers act as one point of cold protection, and require personal flotation devices.
2. Wearing protective clothing. Purpose-built survival suits can reduce the rate of heat loss (cold damage) by two to ten times. Ordinary clothing's cold protective value is halved (round down).

HYPOTHERMIA

Core or central body temperature determines the clinical features present and the prognosis.

MILD: CORE TEMPERATURE 32-35°C (90-95°F)

The most obvious symptom is shivering with loss of fine motor co-ordination. Deterioration in judgment with confusion and eventual onset of lethargy and apathy with further falls in temperature are evident.

Uneventful recovery is expected.

MODERATE: CORE TEMPERATURE 28-32°C (82-90°F)

Delirium and slowing of reflexes predominate. Victims are unable to assist rescuers, which is particularly important in maritime rescues. Below a core temperature of 31 degrees, shivering fails to generate additional heat. Mortality is about 20%.

SEVERE: CORE TEMPERATURE LESS THAN 28°C (82°F)

Subjects are usually unconscious and look dead, with pale skin, rigid muscles and no obvious pulses or respiratory efforts. The heart becomes very irritable and any movement may precipitate ventricular fibrillation, an abnormal writhing of the cardiac muscle which is lethal if untreated. CPR and rewarming are necessary to sustain life. Electrical defibrillation is ineffective until core temperature is greater than 30 degrees. Mortality exceeds 50%, especially if other chronic illnesses are present.

DAMAGE & RECOVERY

WIND CHILL - TEMPERATURE

WIND SPEED KM/H (MPH)	AIR TEMPERATURE (°C,°F)											
	10 50	4.4 40	-1.1 30	-6.7 20	-12.2 10	-18 0	-23 -10	-29 -20	-34 -30	-40 -40	-46 -50	-51 -60
0	10 50	4.4 40	-1.1 30	-6.7 20	-12.2 10	-18 0	-23 -10	-29 -20	-34 -30	-40 -40	-46 -50	-51 -60
8 (5)	9 48	2.8 37	-2.8 27	-8.9 16	-14.4 6	-20.6 -5	-26.1 -15	-32.2 -26	-37.8 -36	-43.9 -47	-49.4 -57	-55.6 -68
16 (10)	4.4 40	-2.2 28	-9 16	-16 3	-22.8 -9	-29.4 -21	-36.1 -33	-43.3 -46	-50 -58	-56.7 -70	-63.9 -83	-70.6 -95
24 (15)	2.236 22	-5.6 9	-12.8 -5	-20.6 -18	-27.8 -32	-35.6 -45	-42.8 -58	-50 -58	-57.8 -72	-65 -85	-72.8 -99	-80 -112
32 (20)	0 32	-7.8 18	-15.6 4	-23.3 -10	-31.7 -25	-39.4 -39	-47.2 -53	-55 -67	-63.3 -82	-71.1 -96	-78.9 -110	-86.7 -124
40 (25)	-1.1 30	-9.4 15	-18 0	-26.1 -15	-33.9 -29	-42.2 -44	-50.6 -59	-58.9 -74	-67.2 -89	-75.6 -104	-83.3 -118	-91.7 -133
48(30)	-2.2 28	-10.6 13	-18.9 -2	-27.8 -18	-36.1 -33	-44.4 -48	-52.8 -63	-61.7 -79	-70 -94	-78.3 -109	-87.2 -125	-95.6 -140
56 (35)	-2.8 27	-11.7 11	-20 -4	-28.9 -20	-37.2 -35	-46.1 -51	-55 -67	-63.3 -82	-72.2 -98	-80.6 -113	-89.4 -129	-98.3 -145
64+ (40+)	-3.3 26	-12.2 10	-21.1 -6	-30 -22	-38.3 -37	-47.2 -53	-56.1 -69	-65 -85	-73.9 -101	-82.8 -117	-91.1 -132	-100 -148

KEY:

Clear boxes – Low risk: freezing injury possible in several hours. Hourly CON check.

Light grey – Moderate risk: partial thickness cold injury within a minute to bare skin. CON check every game turn.

Dark grey – Danger: partial thickness cold injury within 30 seconds to bare skin. CON check every game turn.

WIND CHILL - DAMAGE

WIND SPEED KM/H (MPH)	AIR TEMPERATURE (°C,°F)											
	10 50	4.4 40	-1.1 30	-6.7 20	-12.2 10	-18 0	-23 -10	-29 -20	-34 -30	-40 -40	-46 -50	-51 -60
0	.25 .25	.5 .5	1 1	2 2	3 4	4 5	5 6	6 1	1 2	2 3	2 3	3 3
8 (5)	.25 .25	.5 .5	1 1	2 2	4 5	5 6	6 1	1 2	2 3	3 3	3 5	3 7
16 (10)	.5 .5	1 1	2 3	3 4	5 6	6 1	1 2	2 3	3 3	3 6	5 7	7 8
24 (15)	.5 .5	1 1	3 3	4 4	6 6	1 3	2 3	3 5	3 6	6 8	7 9	8 10
32 (20)	1 1	2 2	3 4	5 6	1 1	2 3	3 3	4 5	5 6	6 8	8 9	9 10
40 (25)	1 1	2 3	4 4	6 6	1 1	2 3	3 3	4 5	6 7	7 8	9 10	10 11
48(30)	1 1	3 3	4 4	6 6	1 1	3 3	3 3	5 5	6 7	8 8	9 10	10 11
56 (35)	1 1	3 3	4 4	6 6	1 1	3 3	3 3	5 5	7 7	8 8	10 10	11 11
64+ (40+)	1 1	3 3	4 4	6 6	1 1	3 3	3 3	6 6	7 7	8 8	10 10	11 11

KEY:

Clear boxes – damage points per game turn

Grey boxes – damage points per combat turn

GAME EFFECTS

MILD:

Cold damage equals 10 to 20% of the character's Structure Points.

20% penalty to mental tasks, -4 DEX, -2 STR.

MODERATE:

Cold damage is between 20 and 40% of the character's Structure Points.

40% penalty to all tasks, -6 DEX, -4 STR.

SEVERE:

Cold damage is more than 40% of the character's Structure Points.

CON check at a 30% penalty to remain conscious; no movement is possible. On an Exceptional Failure, cardiac arrest ensues. 5 Structure Points damage per combat turn until resuscitated.

FREEZING AND NON-FREEZING COLD INJURIES

Freezing injuries are cold burns. The face, feet and hands are especially vulnerable.

Superficial injuries become red and swollen and have a waxy appearance. Hard white patches can appear. Numbness in the area is usual.

Partial thickness injuries also develop blisters within 24 hours of injury which can contain clear or milky fluid.

In full thickness injuries, the blisters are blood-filled. Black scar tissue forms over several weeks.

Deep injuries involve underlying muscle and bone. Extensive tissue loss is certain. Amputation may be required to prevent systemic infection (sepsis).

POISON & DISEASE

Two notable hazards in the post-apocalypse world are poisoning and infectious disease.

There are an enormous variety of drugs, venoms and chemicals that can cause disability or death. They may be encountered in the toxic ruins of devastated cities and landfills, in an animal bite, or even in the medical kit of a well-intentioned healer.

Infectious diseases have been a cause of enormous amounts of suffering and death throughout the ages.

The advent of sanitation (clean water supplies and sewage systems) and effective medical care has reduced this burden across much of the world. With the collapse of civilization, Pestilence will return with a vengeance.



EXPOSURE

Exposure to a toxin or disease can occur through a variety of routes:

- airborne (inhaled)
- ingested (eaten or drunk)
- contact (through the skin, with bodily fluids or by touching contaminated objects)
- by vector (spread by animal e.g. fly, flea, mosquito, rodent, etc.)
- injected (snake bite, hypodermic needle, intravenously, etc.)

Once exposed, they need to make a CON task check, which may be at a penalty or bonus depending on how potent the toxin is or how infectious the disease is. Toxins have a 'Potency' penalty or bonus, diseases an 'Infectivity' one.

If the character fails this check, the agent will begin doing damage after a certain period of time. In the case of a disease, this is its incubation period; for a toxin, the onset time. Degrees of Failure make the effects of the disease or poison – damage and task penalties – worse.

DAMAGE

The rate and amount of damage caused is referred to as 'Intensity' for a poison and 'Virulence' for a disease.

During the active phase of the illness, a character will generally suffer damage to their ability scores. The amount can be determined with a single roll at the

beginning of the illness. They can make CON checks at certain periods of time to limit the damage. Many diseases and poisonings require medical assistance for this to occur.

Damage may be severe enough to precipitate a crisis e.g. shock, or respiratory or cardiac arrest. Resuscitation is then required - immediate life-preserving medical treatment. Characters suffer 5 Structure Points per combat turn until resuscitation commences.

Once the active phase of the illness is over, the character can begin recovery as per the healing rules. Some conditions may significantly delay healing.

EXAMPLE

WOUND INFECTION

1. A character gets bitten by some critter.
2. The PD decides that it's a dirty bite, and there's a chance of a wound infection.
3. The character fails the Infectivity check with 2 degrees of failure.
4. The PD secretly rolls for incubation - overt symptoms will begin after three days.
5. The PD rolls 2 for Virulence. The CON damage is $2+2 = 4$ CON per day. All tasks are at an 8% penalty. Manifestations of disease are as described in its entry.
6. The PD rolls to determine the length of the active phase: 7 days.

The character will lose 4 points of CON per day for the next week unless they 'resist' the infection or it gets treated.

As far as ongoing rolling is concerned, the player makes a daily CON check. Depending on the result, things can get better (CON loss stops and they can enter the recovery process) or worse (overwhelming infection with more damage).

Other players or NPCs can try to contribute specific measures to reduce damage (e.g. surgery to drain an abscess) or general supportive care (medical/nursing skill). The magnitude of the reduction is equal to the supporting character's degrees of success.

You can't start recovering unless the illness is over.

Some example poisons and diseases are presented below.

INFECTIOUS DISEASES

WOUND INFECTIONS

Are a common sequel of trauma, especially if the wound has been contaminated with dirt or bowel content (~30%). Bites often get infected.

Route of Exposure: Contact

Infectivity: -20% to CON check for abdominal or head wounds or bites. No penalty for chest or limb wounds. Degrees of Failure add to virulence.

Incubation Period: 3-5 days (1D3+2).

Virulence: 1D6 + DoF CON per day. Fever (task penalty = CON damage x2). Other symptoms and signs include pain and signs of inflammation at the site (hot, red, discharges of pus, etc).

Active phase: 2D6 days

Treatment options: Surgical drainage (Surgery task degrees of success reduce attribute loss), antibiotics (Medical/Nursing task degrees of success reduce attribute loss).

Daily CON checks allow 'spontaneous' recovery (CON loss stops) - but only on Exceptional Success without surgical or medical treatment.

On an Exceptional Failure, overwhelming infection ensues (see 'Sepsis', below).

CHEST/RESPIRATORY INFECTIONS

They range from sore throats and runny noses to life threatening pneumonias. Most are viral and therefore not treatable with antibiotics.

Route of Exposure: Inhaled (respiratory droplets), Contact

Infectivity: Ranges from no penalty to -20% to CON. Degrees of Failure add to virulence.

Incubation Period: 1D6 days

Virulence: Range from 1D3 CON (once, e.g. mild flu) to 2D6 (+ DoF) CON per day (life-threatening). Symptoms and signs include fever, sore throat, runny nose, cough, sputum, chest pain, shortness of breath, etc. Task penalty = CON damage x2.

Active phase: 1D6-2D6 days.

Treatment options: Supportive care (Medical/Nursing skill aids CON task check), antibiotics (degrees of success reduce attribute loss).

Daily CON checks allow 'spontaneous' recovery (CON loss stops). On a Failure, overwhelming infection ensues (see 'Sepsis', below).

DIARRHEAL ILLNESSES

The spectrum ranges from viral gastroenteritis to food poisoning to cholera. They are usually viral and most common in winter and spring. Bacterial infections are due to contamination of food and water supplies, as a result of poor hygiene practices or inadequate sanitation facilities.

Route of Exposure: Ingestion of contaminated food or water, contact.

Infectivity: No penalty to CON. Degrees of Failure add to virulence.

Incubation Period: 1D3 days for most, some food poisoning 1D6 hours, typhoid 1D3 weeks.

Virulence: Range from 1D6 CON per week (typhoid) to 1D6 (gastro, food poisoning) to 4D6 (cholera) (+DoF) CON per day. Blood point loss is twice this. Symptoms and signs include abdominal pain, fever, nausea, vomiting, and diarrhea (up to liters per day in the case of cholera). Task penalty = CON loss x2.

Active phase: 1-2 days for food poisoning, 1D10 days for gastroenteritis and cholera, 4 weeks for typhoid.

Treatment options: Supportive care - rehydration to stop BP loss. Medical/Nursing skill aids CON task check.

Daily CON checks allow 'spontaneous' recovery (CON loss stops) - but only on Exceptional Success without medical or nursing treatment.

On an Exceptional Failure, overwhelming infection ensues (see 'Sepsis', below).

MENINGITIS/ENCEPHALITIS

These are infections of either the lining of the brain/spinal cord (meningitis) or the substance of the brain. There are a wide variety of viral and bacterial causes. Viral meningitis is a self-limiting illness. Bacterial meningitis is 100% fatal without antibiotic or antiserum treatment.

Encephalitis is usually viral, and causes disability or death.

Route of Exposure: Inhaled (respiratory droplets), contact, vector for encephalitides (mosquitoes, birds and ticks, rabid animals)

Infectivity: No penalty to CON task. Degrees of Failure add to virulence (CON loss).

Incubation Period: 1D6 days for meningitis, 3-10 days for viral encephalitis, 20-60 days for rabies. The length of the incubation period in rabies depends on how far the bite is away from the brain.

Virulence: CON check:

Exceptional Success: 1D6 CON once. Fever and headache only.

Success: 1D6 CON once, and -1 to AWA, REA and CON per day

Failure: 1D10 CON once, and -2 to AWA, REA and CON per day

Exceptional Failure: Overwhelming infection. AWA, REA=0. Resuscitation required. Other attributes are lost just like a Failure result.

Symptoms and signs include fever, headache, neck stiffness, alterations to conscious state, seizures, weakness, paralysis. Task penalty = CON loss x2.

Active phase: 1D6+4 days for viral, 2 weeks for bacterial. Rabies kills over a few weeks (2D6 damage to AWA, REA, FOC and CON per week) from the onset of symptoms.

Treatment options: Supportive (Medical/Nursing skill aids CON task check). Characters requiring resuscitation need intensive care equipment.

Antibiotics help reduce attribute loss for bacterial meningitis. Some viral infections can be treated with specific antiviral drugs.

Daily CON checks allow 'spontaneous' recovery (CON loss stops) - but only with medical or nursing treatment. Death occurs on an Exceptional Failure.



SEPSIS

Represents overwhelming infection with spread of organisms into the bloodstream.

Route of Exposure: Any, but inhaled or contact usual.

Infectivity: -10 to -20% to CON. Degrees of Failure add to virulence.

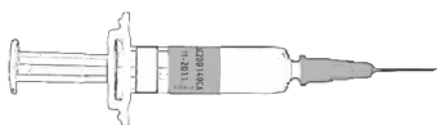
Onset Time: 1D3 to 1D6 days.

Virulence: 2D6-4D6 +DoF CON per day. Characters are incapacitated.

Active phase: Until dead or successfully treated.

Treatment options: Intensive care with multi-organ support (Medical/Nursing care adds to CON task check). Antibiotics (DoS reduce attribute loss).

Daily CON checks allow 'spontaneous' recovery (CON loss stops) - but only with high-level medical/nursing treatment. Death occurs on a failure.



POISONS, TOXINS & DRUGS

NERVE AGENTS

Examples: G series, VX, organophosphate pesticides. Potent inhibitors of nerve and muscle function

Route of Exposure: Inhaled (G series and VX), contact (VX), ingested (pesticides).

Potency: -10 to -30% to CON. Degrees of failure add to intensity.

Onset Time: 2D6 combat turns

Intensity: -2 AWA, CON, DEX, STR per minute. Degrees of failure are applied as immediate CON damage. Task penalty = CON loss x2.

Warning symptoms are shortness of breath, muscle weakness, runny nose, and blurred vision.

When AWA reaches 0, victim starts convulsing (unconscious, needs prompt medical attention). When STR reaches 0, the character stops breathing.

Active phase: Until dead (CON=0) or successfully treated.

Treatment options: Specific antidotes: atropine to stop CON loss, sedatives to stop seizures, ventilation if the character stops breathing. Supportive care adds to CON task check and slows attribute loss rate to daily instead of hourly.

The character makes a CON check each day to stop losing ability points and start recovering. Exceptional Successes can be used to recover lost attributes. On Exceptional Failure, attribute loss rate is doubled.

CHOKING AGENTS

These substances are corrosive to the airways and lungs. Examples include phosgene, chlorine and vaporized acids and bases (e.g. ammonia).

Route of Exposure: Inhaled.

Potency: -10% to CON check. Degrees of failure add to intensity (attribute loss; 5% task penalty per DoF).

Onset Time: 2D6 combat turns

Intensity: CON check:

Exceptional Success: -2 AWA. Eye irritation and cough.

Success: -2 CON. 1D6 SP damage to chest. Shortness of breath and chest pain are present.

Failure: As per success, then severe lung inflammation after 1D6 hours. 5 points of damage per combat turn until resuscitated.

Exceptional Failure: Choking from airway obstruction. 5 points of damage per combat turn until resuscitated.

Active phase: 24 hours

Treatment options: Resuscitation for choking casualties. Supportive care. Delayed lung inflammation can develop.

CON check daily for three days.

Exceptional Success: Start recovery.

Success: No symptoms.

Failure leads to 1 point of CON damage.

Exceptional Failure: Severe lung inflammation develops. 5 points of damage per combat turn until resuscitated.

BLOOD AGENTS

Represent substances like cyanide and hydrogen sulfide which prevent body tissues from using oxygen. Both substances have lots of natural and industrial sources.

Route of Exposure: Inhaled, ingested, contact

Potency: -10% to CON check. Degrees of failure are applied to attributes (choose)

Onset Time: 2D6 combat turns after inhalation, 1D6 minutes after contact or ingestion

Intensity: Depends on CON check.

Exceptional Success: Symptoms delayed by a game turn.

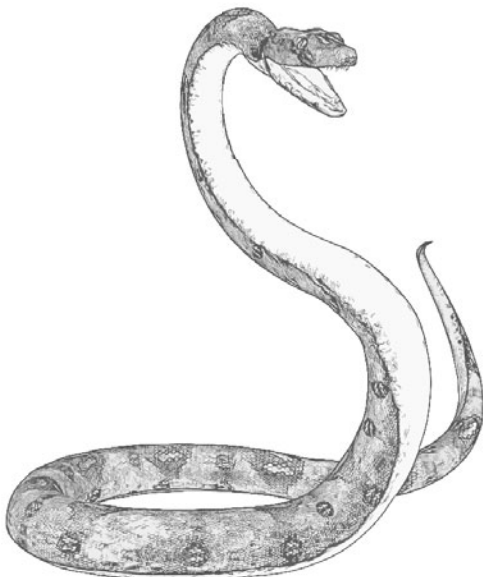
Success: Onset of symptoms delayed by a minute.

Failure: Anxiety, weakness, tremor. -2 to DEX, STR and END per minute. When any attribute reaches zero, fitting ensues. 5 points damage per combat turn until resuscitated.

Exceptional Failure: Immediate convulsions and cardiac arrest. DEX=STR=END=0, 5 damage points per combat turn until resuscitated. This is a medical emergency requiring intensive care.

Active phase: Until dead or specific antidotes given (available for cyanide but not for hydrogen sulfide). Treatment options: Specific antidotes, supportive care (Medical/Nursing skill adds to CON check).

Daily CON check required to see if recovery can start. Death occurs on an exceptional failure.



HALLUCINOGENS

Psychoactive compounds are found in many plants (e.g. anticholinergic compounds like atropine and derivatives). The chemical warfare agent BZ is a long-acting synthetic.

Route of Exposure: Ingested, inhaled, injected, contact

Potency: No penalty to CON. Degrees of failure add to intensity – AWA loss and task penalty.

Onset Time: 2D6 combat turns by injection; one game turn by other routes.

Intensity: Depends on CON check.

Exceptional Success: Dry mouth, blurred vision. – (DoF +1) to AWA. Task penalty is 1% per DoF.

Success: Hallucinations, disorientation. (DoF + 2) to AWA. Task penalty is 5% per DoF. Failure: 50/50 chance for drowsiness (stunned) or delirium (AWA 0, agitated and restless). Exceptional Failure: Coma, seizures. This is a medical emergency requiring intensive care.

Active phase: Up to 48 hours.

Treatment options: Intensive care for coma/seizures, otherwise supportive care only. Medical/nursing skill adds to CON check. CON check every 12 hours to see if recovery has begun.

SNAKE BITES

All snake venoms have one or more of the following components:

1. Neurotoxins to weaken or paralyze the prey;
2. Lytic factors that begin digesting tissue to aid the spread of the venom; and
3. Haemotoxins to prevent blood coagulation.

For example, coral snake venom is predominantly neurotoxic, rattlesnake predominantly lytic and haemotoxic, mocassin predominantly lytic. This covers the snakes commonly found in North America.

Route of Exposure: Usually injected, contact.

Potency: -10% to CON check. Degrees of failure add to attribute loss and damage.

Onset Time: 1D6 hours post bite.

Intensity: Depends on CON check.

Exceptional Success: Dry bite, no envenomation.

Success: -4 STR for neurotoxin, 1D6 SP per hour for lytic, 1D6 BP per hour for haemotoxic.

Failure: -8 STR for neurotoxin, damage as above and infection of bite site will develop in 1D6 days for other toxins.

Exceptional Failure: Respiratory muscle paralysis due to muscle weakness for neurotoxins and lytics. 5 damage points per combat turn until resuscitated. BP loss is applied every game turn for haemotoxins.

Active phase: Until antivenom is given. When all the SP in the bite site is depleted, an adjacent location is involved as the venom spreads. This can be stopped with appropriate bandages (First Aid at the time of the bite).

Treatment options: Antivenom is required. There is a small risk of a life-threatening allergic reaction (on Exceptional Failure). Once the toxin is neutralized, recovery begins as usual.

SPIDER BITES

The widow spider is found across North America. Its venom contains alpha-latrotoxin, which causes pain, muscle cramping, nausea, vomiting and headache.

Route of Exposure: Injected.

Potency: -10% to CON check. Degrees of failure add to damage.

Onset time: 1D10 game turns.

Intensity: Depends on CON check.

Exceptional Success: Mild envenomation, 1 damage point at bite site.

Success: Moderate envenomation, 1D6 damage points and -1 to STR and DEX from muscle pain.

Failure: Severe envenomation, nausea, vomiting and pain. 1D10 damage, -2 to STR and DEX, 10% to all tasks.

Exceptional Failure: As per severe envenomation, and a severe allergic reaction occurs to the venom or antivenom requiring resuscitation.

Active phase: One day or until treated with antivenom.

Treatment options: Antivenom may be given. It treats all symptoms and reverses 2 points of attribute loss. However, there is a small risk of a life-threatening allergic reaction (on Exceptional Failure).



SEDATIVES

Sleeping aids. Older agents (e.g. barbiturates) are much longer lasting and more dangerous in overdose.

Route of Exposure: Ingested, injected

Potency: -10% to CON check. Degrees of Failure increase the risk of overdose by canceling out any successes on the intensity check.

Onset Time: 2D6 combat turns after injection. 1D6 game turns after ingestion.

Intensity: Depends on CON check.

Exceptional Success: Subject recovers an extra point of END per hour of sleep.

Success: Subject sleeps normally.

Failure: Subject is stunned (END=0). They need someone to support their airway so they can breathe. Airway obstruction causes 5 points of damage per combat turn until fixed. This is an easy First Aid or Medical task (+30%).

Exceptional Failure: Overdose. Airway obstruction ensues.

Resuscitation and intensive care is required until the patient wakes.

Active phase: 1D6 hours. Multiply by 1D6 for older agents.

Treatment options: Supportive care. There is a specific antidote for benzodiazepines.

ANESTHETICS

Drugs used to enable surgery.

Route of Exposure: Airborne, injected.

Potency: -20% to CON check. Degrees of Failure increase the risk of overdose by canceling out any successes on the intensity check.

Onset Time: 1 Tactical turn after inhalation or injection.

Intensity: Depends on CON check.

Exceptional Success: Subject is stunned (END=0).

Success or Failure: Subject becomes unconscious. END=0. Begin resuscitation/surgery, or character takes 5 points of damage per combat turn from airway obstruction.

Exceptional Failure: Cardiac arrest. 5 points of damage per combat turn until resuscitated.

Active phase: Recovery is usually within 1D6 game turns of the drugs being stopped for modern agents. Older drugs may leave the subject stunned for 1D6 hours.

Treatment options: CON check each game turn to recover from stunning. END recovers at a rate of 3+DoS points per hour.

RADIOACTIVE CONTAMINATION

Radioactive contamination is a residue of nuclear explosions and the dispersion of radioactive material such as reactor fuel. Most of the radiation would have dissipated given the long period between the war and the waking of the Project teams. The lack of radioactivity may be a clue that the characters have overslept. Blast sites will be obvious on inspection. There will be some low-level residual contamination and unusual isotope distributions.

Nuclear explosions release prompt radiation from the 'glow' of the fireball and delayed contamination from debris and material irradiated by the blast.

High-altitude explosions (airbursts) cause induced radiation and late fallout. The latter takes months to years to return to earth and contributes to the general background radiation.

Surface bursts, where the bomb fireball contacts the ground or emerges from it, produce lots of debris which falls back to earth within a day - early fallout.

CONTAMINATION ZONES

ZONE	AIRBURST	SURFACE BURST
Fireball	3000 prompt, 3000 to 50/h at edge induced.	3000 prompt and 3000/h fallout
20 psi zone	1000 prompt, 2/h induced	600 prompt, 3000/h fallout

(TOTAL DESTRUCTION)

10 psi	600 prompt, 0.5/h induced	100 prompt, 1000/h fallout
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(SEVERE DESTRUCTION)

5 psi	100 prompt, 0.2/h induced	50 prompt, 1000/h fallout
3 psi	50 prompt, 0.05/h induced	12 prompt, 300-1000/h fallout

(MODERATE DESTRUCTION)

1 psi	12 prompt, 0.01/h induced	5 prompt, 100-300/h fallout
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(MILD DESTRUCTION)

The amount of radiation declines with time.

Dose units are measured in **Rads**.

DOSE FRACTION	INDUCED	FALLOUT
1	From time of explosion	
1/10	30h (1 day)	7h
1/100	90h (4 days)	49h (2 days)
1/1000	200h (8 days)	343h (2 weeks)
1/10000	16 days	14 weeks

After this the dose for fallout radiation decreases much more rapidly, on the order of halving every 2 months. Induced radiation is negligible after three weeks. Note that background radiation is about 100 millirads (0.1 rad) per year.

NON-EXPLOSION EXAMPLES

- High level: fuel and fuel waste, weapons grade material: 1 rad per minute, 60 rads per hour.
- Intermediate level: fuel cladding, sludge from fuel processing, and material from decommissioned reactor: 10 millirads (0.01 rads) per minute, 0.6 rads per hour.
- Low level: discarded protective clothing, filters: 10 millirads (0.01 rads) per hour.

RADIATION EXPOSURE

The total dose depends on dose rate, exposure time and shielding.

DOSE RATES

RADS/HR	RADS/ GAME TURN	RADS/ TACTICAL TURN	RADS/ COMBAT TURN
6000	600	60	6
5000	500	50	5
4000	400	40	4
3000	300	30	3
2000	200	20	2
1000	100	10	1
150	15	1.5	0.15
100	10	1	0.1
75	7.5	0.75	0.075
50	5	0.5	0.05
30	3	0.3	0.03
20	2	0.2	0.02

TF refers to Transmission factor - multiply the radiation level by this to determine the dose the character gets.

SHIELDING

I. VEHICLE/SUIT

TF

MARS or Scientific One	0.03
M1 Abrams or M60 tank	0.04
M48A2 tank	0.08
M2 Bradley, M3 CFV	0.2
HAAM suit	0.2
Commando vehicles, SK-5	0.2
M113 APC	0.3
Bulldozer	0.5
HMWWV, 2-1/2 ton truck	0.6
Airscout	0.6
Jeep, XR 311	0.8
Hazard suit	0.95
Project coveralls, clothing	1

II. STRUCTURE

TF

Multistory building:	
Upper stories	0.01

SHIELDING

Lower stories (3 floors)	0.1
Frame house:	
First floor	0.6
Basement	0.1
Urban area	0.7
Woods/forest	0.8
Foxhole	0.1
Underground shelter (1m earth cover)	0.0002

Radiation damage is permanent. Further exposures are cumulative and are added to a character's total.

EXPOSURE CLASSES

CLASS	DOSE (RADS)	RISK
RES 0	0	Normal. Lifetime risk of fatal cancer 20%.
RES 1	less than 75	Mild. Cancer risk increased by 6%.
RES 2	75-150	Moderate. Wound healing may be impaired. Further exposure should be avoided.
RES 3	150+	Severe. Only in an absolute emergency should any further exposure be risked.

RADIATION DAMAGE

Whole-body radiation produces a variety of effects.

Following exposure, there is a prodrome characterized by nausea and vomiting. Above 800 rads, all characters will have nausea and vomiting after exposure. Below this, there is a chance of avoiding these unpleasant symptoms, which cause a 10% penalty to all tasks.

Bone marrow toxicity becomes evident with doses above 200 rads.

Sunburn-like changes appear above 600 rads.

The lining of the gastrointestinal tract begins to leak above 800 rads, leading to bloody diarrhea.

An acute inflammation of the blood vessels of the brain occurs above 3000 rads. This will lead to seizures, coma and death within days.

The character makes a CON check to resist nausea, vomiting and late effect damage. Degrees of success or failure can be applied to attribute loss. Characters taking more than 4D6 CON damage or who have their CON reduced to zero need resuscitation.

Recovery occurs as per the healing rules.

RADIATION DAMAGE

DOSE (RADS)	PRODROME	LATENCY	LATE EFFECTS
0-100	***** No Obvious Effect *****		
101-200	N+V in 1D6h, lasts 1 day. +20% to CON task	3D6 days	CON check: ES: No symptoms S: -1D6 CON, ENDx2 F: -2D6 CON, ENDx2 EF: Use fail result for 201-600 rads
201-600	N+V in 1-3h, lasts 1 day. No bonus to CON task	2D6 days	Bone marrow syndrome; hair falls out above 300 rads. CON check: ES: -1D6 CON, then -1 CON per day, ENDx2 S: -2D6 CON, then -1 CON per day, ENDx2, BPx2 F: -3D6 CON, then -1 CON per day, ENDx2, BPx2 EF: Use fail result for 601-800 rads.
601-800	N+V in 1-2h, lasts 1 day. -20% to CON task	1D6 days	Radiation burns appear. CON check: ES: -2D6 CON, ENDx2, BPx2 S: -3D6 CON, ENDx2, BPx2 F: -4D6 CON, ENDx2, BPx2 EF: Use fail result for 801-3000 rads.
801-3000	N+V in 2D6 game turns, lasts 1 day	1D6 days	Gastrointestinal syndrome. CON check: ES: -3D6 CON, then -1CON per day, ENDx2, BPx2 S: -4D6 CON, then -1CON per day, ENDx2, BPx2 F: -5D6 CON, then -1CON per day, ENDx2, BPx2 EF: Use fail result for 3001+ rads.
3001+	N+V in 1D6 game turns, lasts 1 day	None	Cerebral syndrome 1% chance of survival (01 on initial CON check). CON check: ES: remain conscious, -5D6 CON, then -1 CON per day S: remain conscious, END=0, -5D6 CON, then -1D6 CON per day F: Convulsions and coma, -1 CON per hour
10000+	N+V in 1D6 game turns, lasts up to one day	None	0% chance of survival. CON check: ES: remain conscious, END=0, -1 CON per hour S, F: Convulsions and coma, -2 CON per hour until death

KEY

N+V: nausea and vomiting

ES: Exceptional Success

S: Success

F: Failure

EF: Exceptional Failure

ENDx2: Endurance costs doubled due to fatigue.

BPx2: Blood Point losses doubled due to bone marrow failure.

END=0 Endurance reduced to zero.

MORROW PROJECT WEAPONS

THE USE OF FIREARMS

My name is Thompson ... and yes, I'm related to that Thompson, General John T., the inventor of the Tommy Gun. He was my great-grandfather. I'll be your Primary Weapons Instructor here at the range, and I'll oversee each step in your training, which will include handguns, rifles, automatic weapons, crew-served weapons, special weapons, and the ever-popular course on using both the bayonet and the knife.

One thing that's come to my attention is that some of you have been talking among yourselves, asking "Why do we need all these guns?" Well, I'll tell ya.

We can't know for certain what the world'll be like three to five years after The End comes, but given how people react after wars devastate their homes, it's a good bet that everyone who has a gun will be more than willing to use it. It'd be wonderful if we could just issue you guys nightsticks and nothing more, but the simple fact of the matter is, a lot of people out there right now have guns. And not just revolvers; we're talking fully automatic assault rifles, pipe bombs, and worse. And after three or more years of hunger and infighting and the like, these people are going to look at you, with your ration packs and medical supplies and electric vehicles, and it's a sure bet that more than one survivor is going to want to take all that away from you.

That's why we give you guns: so you can protect yourself from people like that. And since the people facing you include gang-bangers with automatic weapons, the Project will be issuing you with comparable firepower: handguns, assault rifles and the like.

Remember this: we don't want you to have to use those weapons, but when the time comes and you have to shoot, you aren't likely to be outgunned. Strategic Air Command had a saying for this: Peace through Superior Firepower. So you're going to be issued exactly that. Just remember, it's for your own protection.

Which brings up one of the questions every training class asks: "Why are we being trained in all these things? Why would a Reconnaissance team need to know how to use an anti-tank rocket launcher, or a demolition charge, or a flame thrower, if we're never going to be issued one?"

It's a good question, and I'd be pretty suspicious of any class that didn't have at least one person ask it.

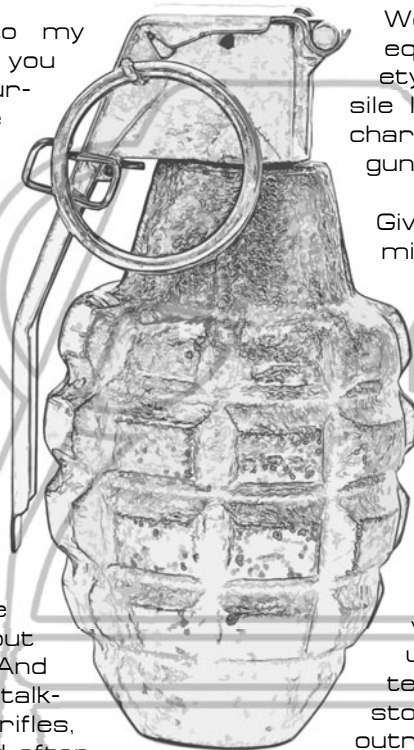
Well, here's the low-down: the Project equips its MARS teams with a wide variety of lethal firepower: anti-tank missile launchers, rocket launchers, demolition charges, flamethrowers and heavy machine-guns just to name a few.

Given the kinds of people whom our teams might run into in, it only makes sense. Ever seen "Mad Max"? Ever seen "Kill-dozer"? It's a statistical certainty that our field teams are going to run into people who not only have high-powered weapons, but also have fortified themselves inside armored vehicles and impromptu bunkers. And let's not forget that there's a better-than-even chance that some jokers after The End are going to manage to get access not only to US military weapons, but also abandoned military vehicles as well. Given those kinds of situations, it's imperative that our MARS teams have the firepower necessary to stop such madmen and pocket dictators outright.

And yeah, I know what you're about to ask: if that's the job of the MARS teams, then why should Recon and Science personnel learn how to handle these weapons? Especially if we aren't going to be issued them?

Simple. When you run into one of these nut jobs and call in a Military Assault, Rescue and Security team, it's likely that it's going to be for something far larger than six or eight guys can handle by themselves.

If that happens, you can bet the MARS team is going to draft your sorry butts into the operation to back them up, give supporting fire, run a diversion during the rescue, whatever. So you Recon and Science people sure as hell better know which end of a rocket launcher is which, because people's lives are going to depend on it!



PROJECT EQUIPMENT

Teams are issued a wide variety of gear to complete their missions. The equipment can be divided into the following categories:

1. Weapons: Individual issue, team issue, vehicle mounted.
2. Protective and Survival: Body armor, cold weather clothing, NBC/HAZMAT masks and suits, medical and survival kits, tents, load-bearing equipment. Food.
3. Information Gathering and Storage: binoculars, night vision and thermal sensors, laboratory equipment, navigation aids, recording systems.
4. Vehicles: Provide protection, mobility and storage space.

Procurement cycles were broken into multi-year blocks. If problems were encountered with a piece of equipment it was either fixed or retired depending on the severity of the fault and whether a satisfactory replacement could be found. The Project had access to most of the scientific and engineering talent the West had to offer as a result of the academic and industrial connections forged by Morrow himself as well as the members of the Council of Tomorrow.



WEAPONS

The Project planners felt that firearms would play an important part in the survival and success of the Morrow Project and its personnel in the post-apocalypse world.

HANDGUNS

Pistols are semi-automatic. They fire one shot for each pull of the trigger and are loaded with a magazine or "clip" of ammunition. Silencers or suppressors may be fitted to reduce firing noise. The Project issue device weighs 0.24kg and is 12.7cm long.

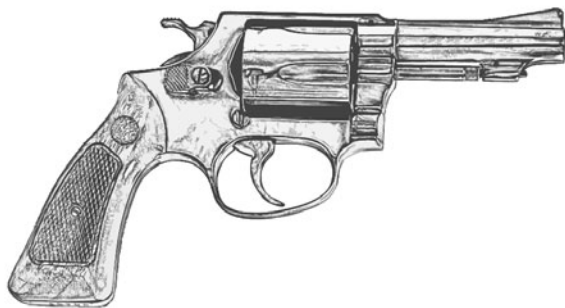
Revolvers are manually operated. The weapon must be cocked and/or the trigger pulled for the weapon to fire. Ammunition is held in a six round cylinder that is slower to load than a pistol with its magazine. Both types of weapon can be fired one-handed.



NAME	BROWNING HP-35
CAL.	9x19 mm
E-FACTOR	9
WT. (EMPTY)	.88kg
BARREL	11.8cm
LENGTH	20cm
EFF. RNG.	50m
MAX. RNG.	2012m
TYPE OF FIRE	Semi-automatic
RATE OF FIRE	40 rpm
FEED DEVICE	13 rd magazine
FEED DEVICE WT.	.2kg
BASIC LOAD	3 magazines (39 rds)
LOAD WT.	.6 kg
TOTAL WT.	1.48 kg
MP DEPLOYMENT	1975

COMMENTS

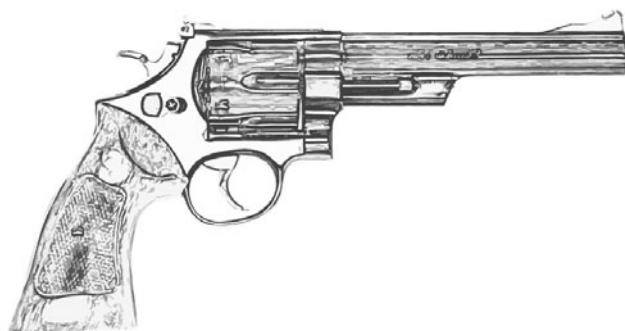
This pistol, also known as the Browning Hi-Power, fires a single shot for each pull of the trigger. Its 13 round magazine is a distinct advantage in close-in fighting. 20 round magazines are also available (.34 kg each). It will not fire unless a magazine is fully inserted into the grip.



NAME	SMITH & WESSON M27-3 1/2"
CAL.	.357 Magnum (9x33mm)
E-FACTOR	10
WT. (EMPTY)	1.24kg
BARREL	8.9cm
LENGTH	20.3cm
EFF. RNG.	75m
MAX. RNG.	2150m
TYPE OF FIRE	Single-shot repeater
RATE OF FIRE	24 rpm
FEED DEVICE	6 rd cylinder
FEED DEVICE WT.	n/a
BASIC LOAD	24 rds
LOAD WT.	.45 kg
TOTAL WT.	1.69 kg
MP DEPLOYMENT	1975

COMMENTS

A snub-barreled, heavy framed revolver. It can fire both .38 Special as well as .357 Magnum ammunition (E-factor = 8 with .38 Special). The short barrel on this weapon allows it to be more easily concealed. A very common civilian firearm.



NAME	SMITH & WESSON M29-6 1/4"
CAL.	.44 Magnum
E-FACTOR	13
WT. (EMPTY)	1.35kg
BARREL	16.5cm
LENGTH	30.2cm
EFF. RNG.	150m
MAX. RNG.	2290m
TYPE OF FIRE	Single-shot repeater
RATE OF FIRE	24 rpm
FEED DEVICE	6 rd cylinder
FEED DEVICE WT.	n/a
BASIC LOAD	24 rds
LOAD WT.	.56kg
TOTAL WT.	1.91 kg
MP DEPLOYMENT	1975

COMMENTS

An extremely powerful handgun, the equal to a rifle in some cases. A common civilian firearm.



NAME	GLOCK 17
CAL.	9x19 mm
E-FACTOR	9
WT. (EMPTY)	.62kg
BARREL	11.4cm
LENGTH	18.8cm
EFF. RNG.	60m
MAX. RNG.	2012m
TYPE OF FIRE	Semi-automatic
RATE OF FIRE	40 rpm
FEED DEVICE	17 rd magazine
FEED DEVICE WT.	.25kg
BASIC LOAD	3 magazines (51 rds)
LOAD WT.	.75kg
TOTAL WT.	1.37kg
MP DEPLOYMENT	1987

COMMENTS:

Glock is an Austrian company which began manufacturing handguns in the 1980s. The design of the guns incorporates a number of innovations, including the use of plastics to reduce weight. The weapons are easy to use with a trigger-based safety system, rather than separate catches or levers. They are also easy to maintain and repair. The Glock 17 has only 33 different parts, including those in the magazine. This is about two-thirds that of a comparable pistol. Over two-thirds of police departments in the United States currently use Glock handguns. 33 round magazines are also available (.45kg each).

NAME	GLOCK 26
CAL.	9x19 mm
E-FACTOR	9
WT. (EMPTY)	.56kg
BARREL	8.8cm
LENGTH	16cm
EFF. RNG.	45m
MAX. RNG.	2012m
TYPE OF FIRE	Semi-automatic
RATE OF FIRE	40 rpm
FEED DEVICE	10 rd magazine
FEED DEVICE WT.	.18kg
BASIC LOAD	3 magazines (30 rds)
LOAD WT.	.54kg
TOTAL WT.	1.1kg
MP DEPLOYMENT	1999

COMMENTS:

This is a lightweight compact pistol. Magazines from the Glock 17 will fit in the 26, but they protrude from the base of the grip. 26 magazines won't fit in the 17. See the Glock 17 entry for more details.



NAME	WALTHER P4
CAL.	9x19mm
E-FACTOR	9
WT. (EMPTY)	.74kg
BARREL	10.4cm
LENGTH	19.7cm
EFF. RNG.	50m
MAX. RNG.	2012m
TYPE OF FIRE	Semi-automatic
RATE OF FIRE	40 rpm
FEED DEVICE	8 rd magazine
FEED DEVICE WT.	.2kg
BASIC LOAD	3 magazines (24 rds)
LOAD WT.	.6kg
TOTAL WT.	1.34kg
MP DEPLOYMENT	1975

COMMENTS

A compact 9mm pistol. Its multiple inbuilt safety features enable one to carry this weapon with the hammer down on a chambered round and quickly fire by just pulling the trigger.

NAME	TAURUS 410
CAL.	.45 Colt (11.43x40.6mm); .410 bore (10.41x63.5mm)
E-FACTOR	9, or by shot
WT. (EMPTY)	.82kg
BARREL	7.6cm
LENGTH	22.5cm
EFF. RNG.	50m
MAX. RNG.	1463m
TYPE OF FIRE	Single-shot repeater
RATE OF FIRE	20 rpm
FEED DEVICE	5 rd cylinder
FEED DEVICE WT.	.11kg (.45); .13kg (.410)
BASIC LOAD	20 rounds each
LOAD WT.	.96kg
TOTAL WT.	1.78kg
MP DEPLOYMENT	2013

COMMENTS:

A snub revolver that can fire either .45 Colt or .410 shot rounds.

The .410 slug has an E-Factor of 15 (wound enhancing); shotshells can contain three 000 buckshot pellets (E-factor 9 each) or 14g (0.5oz) smaller shot.

SUBMACHINEGUNS

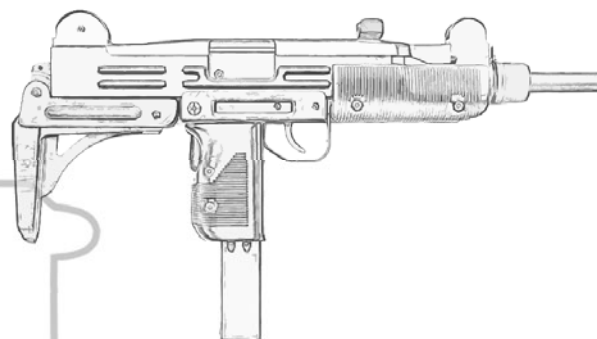
Also known as “machine-pistols”, these weapons are larger than pistols, hold more ammunition in their magazines and are normally fired fully automatic. This means the weapon continues to fire as long as the trigger is pulled and there’s some ammo left. Most submachineguns are selective-fire, in that there is a switch on the weapon that allows it to be fired either semi- or fully automatic. The weapons are often fitted with a folding stock that can be extended for bracing against the shoulder or hip while firing. Values with the stock folded and extended are listed. A submachinegun is commonly fired in bursts of 3 rounds, the trigger being held until 3 rounds are fired, then released.



NAME	INGRAM (COWBRAY) M10
CAL.	9x19mm
E-FACTOR	9
WT. (EMPTY)	2.84kg
BARREL	14.6cm
LENGTH	26.9/54.8cm
EFF. RNG.	100m
MAX. RNG.	2012 m
TYPE OF FIRE	Selective fire
RATE OF FIRE	40/96 rpm ; CYCLIC 1090
FEED DEVICE	32 rd magazine
FEED DEVICE WT.	.62kg
BASIC LOAD	12 magazines (384
LOAD WT.	7.44kg
TOTAL WT.	10.28kg
MP DEPLOYMENT	1975

COMMENTS

A small submachinegun carried in a hip holster as a pistol would be. It is issued with a suppressor (27cm long, weighs .34kg) and a folding stock. Although it is commonly seen in action movies and police dramas on television, the weapon is actually relatively rare.



NAME	UZI NO 2 , MK A
CAL.	9x19 mm
E-FACTOR	9
WT. (EMPTY)	3.6kg
BARREL	26cm
LENGTH	47/65cm
EFF. RNG.	200m
MAX. RNG.	2012m
TYPE OF FIRE	Selective fire
RATE OF FIRE	64/128 rpm ; CYCLIC 600
FEED DEVICE	32 rd magazine
FEED DEVICE WT.	.62 kg
BASIC LOAD	12 magazines (384
LOAD WT.	7.44kg
TOTAL WT.	11.04kg
MP DEPLOYMENT	1975

COMMENTS

A very rugged weapon equipped with a folding stock. Its compact design allows it to be fired with only one hand and it can easily be carried slung at the hip ready for instant use. The Ingram suppressor and magazines can be used with the Uzi.



NAME	HECKLER & KOCH MP5A3
CAL.	9x19 mm
E-FACTOR	9
WT. (EMPTY)	2.88kg
BARREL	22.5cm
LENGTH	49/68cm
EFF. RNG.	250m
MAX. RNG.	2012m
TYPE OF FIRE	Selective fire: single shot, 3-rd burst, full auto
RATE OF FIRE	45/100 rpm ; CYCLIC 650 rpm
FEED DEVICE	30 rd magazine
FEED DEVICE WT.	.53kg
BASIC LOAD	12 magazines (360 rounds)
LOAD WT.	6.36kg
TOTAL WT.	9.24kg
MP DEPLOYMENT	1975

COMMENTS

Used by law enforcement and counter-terrorist groups around the world, this is a highly reliable and robust weapon using the roller locking action seen in H&K's line of assault rifles. The two length values are with the stock retracted and extended respectively. A suppressor can be fitted; it is 21cm long and weighs 0.24kg.

CARBINES AND ASSAULT RIFLES

These are short rifles, normally loaded with an “intermediate” round larger than a pistol cartridge but smaller than a “full-sized” rifle cartridge. They also have a large magazine and are usually selective-fire. Three round bursts are easier to control than full auto fire, so modern weapons tend to have a burst setting and may not be capable of full-auto mayhem. Noise suppressors can be fitted (add 0.7kg and 20cm to weapon mass and length).

Note: The Stoner weapons system adopted by the Morrow Project is a special case in the field of firearms. It may either be issued as a particular weapon (see entries) or as a kit of parts (weight 17.5kg). The kit consists of several different barrels, feed mechanisms, and stocks, and a single receiver. By assembling different barrels and parts, one receiver can be assembled into any one of the different Stoner weapons.





NAME	M16 SERIES		
	A1	A2	A4
CAL.	5.56 x 45mm		
E-FACTOR	15		
WT. (EMPTY)	3.18 kg	3.58kg	3.4kg
BARREL	50.8cm		
LENGTH	99.1cm	100cm	100cm
EFF. RNG.	400m	450m	500m
MAX. RNG.	2653m	2653m	2653m
TYPE OF FIRE	Selective	Selective	Selective
RATE	45/150 rpm; CYCLIC 800 rpm	45/150 rpm; CYCLIC 940 rpm	45/150 rpm; CYCLIC 950 rpm
FEED DEVICE	30 rd magazine		
FEED DEVICE WT.	.47kg		
BASIC LOAD	12 magazines (360 rounds)		
LOAD WT.	5.64 kg		
TOTAL WT.	8.82 kg	9.22 kg	9.04kg
MP DEPLOYMENT	1975	1987	1999

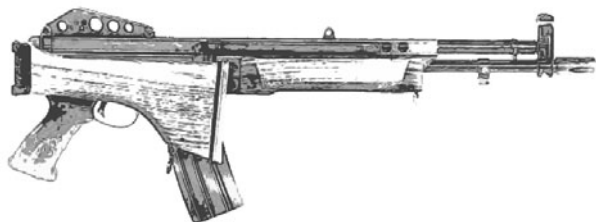
COMMENTS

The M16 series has been the standard rifle of the US military since the 1960s. Accessories such as telescopic sights, starlight scopes and the M203 grenade launcher can be mounted. The A1 is capable of full-automatic fire. The A2 series included improvements such as a greater effective range, three-round burst mode for greater fire control and accuracy and an improved rear sight. The A4 has had the rear sight and carry handle replaced with a Picatinny rail which allows a very wide variety of accessories to be mounted.

NAME	M4 CARBINE
CAL.	5.56x45mm
E-FACTOR	14
WT. (EMPTY)	2.78kg
BARREL	36.8cm
LENGTH	71.1/78.7cm
EFF. RNG.	300m
MAX. RNG.	2653m
TYPE OF FIRE	Selective fire: single shot and 3-round burst
RATE OF FIRE	45/150 rpm ; CYCLIC 750 rpm
FEED DEVICE	30 rd. magazine
FEED DEVICE WT.	.47kg
BASIC LOAD	12 magazines (360 rounds)
LOAD WT.	5.64kg
TOTAL WT.	8.42kg
MP DEPLOYMENT	1987

COMMENTS

A shortened version of the M16A2. Comes with a retractable stock.



NAME	STONER M23 CARBINE
CAL.	5.56x45mm
E-FACTOR	14
WT. (EMPTY)	3.67kg
BARREL	35cm
LENGTH	68/90cm
EFF. RNG.	300m
MAX. RNG.	2653m
TYPE OF FIRE	Selective fire
RATE OF FIRE	40/94 rpm ; CYCLIC 750 rpm
FEED DEVICE	30 rd magazine
FEED DEVICE WT.	.45kg
BASIC LOAD	12 magazines (360 rounds)
LOAD WT.	5.4 kg
TOTAL WT.	9.07 kg
MP DEPLOYMENT	1975

COMMENTS

This is a lightweight, folding stock carbine version of the Stoner weapons system. The Stoner magazines cannot be used with the M16 or M4.

NAME	STONER M22 RIFLE
CAL.	5.56x45mm
E-FACTOR	15
WT. (EMPTY)	3.72kg
BARREL	51cm
LENGTH	102.2cm
EFF. RNG.	400m
MAX. RNG.	2653m
TYPE OF FIRE	Selective fire
RATE OF FIRE	40/90 rpm ; CYCLIC 750 rpm
FEED DEVICE	30 rd magazine
FEED DEVICE WT.	.45kg
BASIC LOAD	12 magazines (360 rounds)
LOAD WT.	5.4 kg
TOTAL WT.	9.12kg
MP DEPLOYMENT	1975

COMMENTS

This rifle version of the Stoner system has a longer barrel and a fixed stock compared to the carbine.

RIFLES

These are long range guns, usually semi-automatic or bolt-action. They fire a large cartridge with great range and penetration. A variety of sighting devices and suppressors can be fitted for use as a sniper weapon.



NAME	M21 SNIPER RIFLE
CAL.	7.62x51mm
E-FACTOR	17
WT. (EMPTY)	5.3kg
BARREL	55.9cm
LENGTH	112cm
EFF. RNG.	1000m
MAX. RNG.	3725m
TYPE OF FIRE	Semi-automatic
RATE OF FIRE	20 rpm
FEED DEVICE	20 rd magazine
FEED DEVICE WT.	.73kg
BASIC LOAD	12 magazines (240 rounds)
LOAD WT.	8.76kg
TOTAL WT.	14.06kg
MP DEPLOYMENT	1975

COMMENTS

This is a highly accurate version of the M14 battle rifle. The weapon comes equipped with a 3X-9X telescopic sight and a Sionics noise suppressor (silencer). The telescopic sight can be removed and a starlight scope attached for use at night.



NAME	REMINGTON M24 SNIPER WEAPON SYSTEM
CAL.	7.62x51 mm
E-FACTOR	17
WT. (EMPTY)	6.3kg (rifle 5.4kg, scope 0.6kg and sling 0.3kg)
BARREL	66cm
LENGTH	109cm
EFF. RNG.	1200m
MAX. RNG.	3725m
TYPE OF FIRE	Single-shot repeater (bolt action; minimum 3 actions to fire and reload)
RATE OF FIRE	20 rpm
FEED DEVICE	5 rd internal magazine
FEED DEVICE WT.	.13kg
BASIC LOAD	50 rounds
LOAD WT.	1.3kg
TOTAL WT.	7.6kg (weapon + ammo); 25.3kg (all items in system)
MP DEPLOYMENT	1987

COMMENTS

A modification of the famous Remington 700 rifle with a fixed 10X telescopic sight. MP versions have a reinforced fibreglass stock with a black non-reflective coating. Included in the system is a backup set of iron sights, a bipod, carry case and a set of spare parts. A suppressor can be fitted; it weighs 0.8kg and is 24cm long.



SHOTGUNS

These smoothbore weapons can fire many projectiles for each shot. The usual combat load is 00 buckshot which is nine .33 caliber lead balls for a 12 gauge (18.5x70mm) shotgun. There are also fully automatic shotguns that are fired in three round bursts which when fired with magnum loads result in 27 projectiles launched in each burst. These are very devastating close-in weapons as the shot spreads to cover a large area but loses power rapidly over long range. E-Factor values and ranges listed are for the standard combat load per pellet.

Some sample E-factor values:

12 gauge 2.75" – 9 x 00 buck; 1 oz (28g) slugs, 1.125-1.25 oz (32-35g) shot

rifled slugs 21-24 – treat as wound-enhancing (E-factor 10-12)

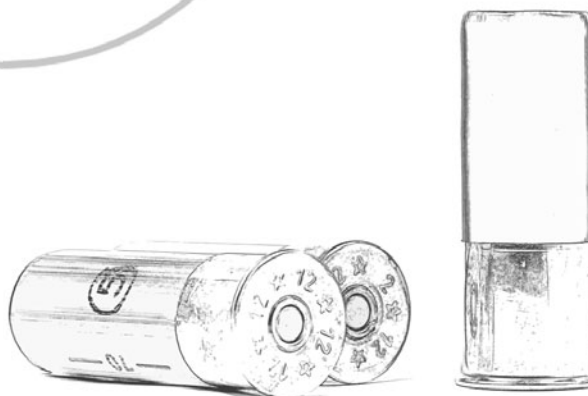
000 (.36")	9 per pellet
00 (.33")	8 pp
0 (.32")	7 pp
#1 (.3")	6
#2 (.27")	5
#3 (.25")	4
#4 buck (.24")	4 pp
BB (.18")	3 pp
#7 (.1")	2 pp

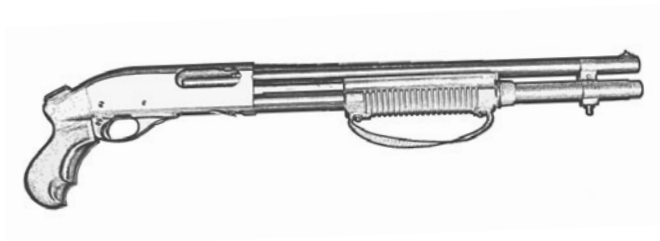
Smaller shot 1 or less pp: treat as non-ballistic

NAME	BARRETT M82A1A
CAL.	12.7x99mm
E-FACTOR	30
WT. (EMPTY)	14.75kg
BARREL	73.7cm
LENGTH	144.8cm
EFF. RNG.	1000m
MAX. RNG.	6660m
TYPE OF FIRE	Semi-automatic
RATE OF FIRE	20 rpm
FEED DEVICE	10 rd magazine
FEED DEVICE WT.	1.3kg
BASIC LOAD	2 magazines (20 rounds)
LOAD WT.	2.6kg
TOTAL WT.	17.35kg
MP DEPLOYMENT	1999

COMMENTS

An anti-materiel rifle adopted by the U.S. Army and issued to selected Project teams. It is equipped with bipod, muzzle brake, carrying handle, metallic sights, a 10X scope, and a 10-round box magazine. A suppressor can be fitted; it weighs 1.8kg and is 31cm long.





NAME	REMINGTON 870
CAL.	12 gauge (18.5x70mm)
E-FACTOR	8
WT. (EMPTY)	3.6kg
BARREL	53.3cm
LENGTH	80cm
EFF. RNG.	90m
MAX. RNG.	510m
TYPE OF FIRE	Single-shot repeater (pump action)
RATE OF FIRE	21 rpm
FEED DEVICE	7 rd tubular magazine
FEED DEVICE WT.	.56kg
BASIC LOAD	50 rounds
LOAD WT.	4kg
TOTAL WT.	7.6kg
MP DEPLOYMENT	1975

COMMENTS

Introduced in 1950, this shotgun was first modified for combat use by the U.S. Marine Corps in 1966.



NAME	HIGH STANDARD M10B
CAL.	12 gauge (18.5x70mm)
E-FACTOR	8
WT. (EMPTY)	4.4kg
BARREL	45.7cm
LENGTH	68.6cm
EFF. RNG.	90m
MAX. RNG.	510m
TYPE OF FIRE	Semi-automatic
RATE OF FIRE	25 rpm
FEED DEVICE	4 rd tubular magazine
FEED DEVICE WT.	.32kg
BASIC LOAD	50 rounds
LOAD WT.	4kg
TOTAL WT.	8.4kg
MP DEPLOYMENT	1975

COMMENTS

A semi-automatic shotgun action inside a nylon sheath in a bullpup configuration, where the trigger is in front of the receiver. The weapon has a swiveling buttstock which is braced against the inside of the right arm so the weapon can be fired accurately one-handed. The detachable flashlight on top of the weapon is focused so the shot pattern hits in the center of the light beam.



NAME	ATCHISSON ASSAULT SHOTGUN (AA-12)
CAL.	12 gauge (18.5x70mm)
E-FACTOR	8
WT. (EMPTY)	5.2kg
BARREL	45.7cm
LENGTH	99cm
EFF. RNG.	90m
MAX. RNG.	510m
TYPE OF FIRE	Selective fire
RATE FIRE	45/90 rpm ; CYCLIC 360 rpm
FEED DEVICE	20 rd drum
FEED DEVICE WT.	2.1kg
BASIC LOAD	4 drums (80 rounds)
LOAD WT.	8.4 kg
TOTAL WT.	13.6 kg
MP DEPLOYMENT	1975

COMMENTS

A "machine-shotgun" firing 12 gauge shotshells of any load. This weapon is currently being manufactured by Mid America Recreation Inc. in Illinois. It has been used by U.S. forces in Iraq.

LIGHT MACHINEGUNS

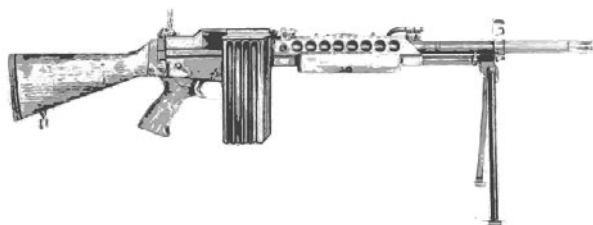
These are large, heavy weapons capable of only full-automatic fire. They are belt-fed, that is the ammunition is held in flexible metal belts that break up into separate links after being used. They have a built in bipod for shooting from the ground or can be mounted on the M122 tripod. These weapons are capable of long-range fire but are light enough to be hand-held and fired like a rifle from either the hip or shoulder. They fire rifle caliber ammunition and are normally fired in 6 round bursts.



NAME	STONER MK23
CAL.	5.56x45mm Linked
E-FACTOR	15
WT. (EMPTY)	4.5 kg
BARREL	45cm
LENGTH	90.3cm
EFF. RNG.	700m
MAX. RNG.	2650m
TYPE OF FIRE	Full automatic
RATE OF FIRE	150 rpm ; CYCLIC 750 rpm
FEED DEVICE	150 rd belt
FEED DEVICE WT.	1.95 kg
BASIC LOAD	4 belts (600 rounds)
LOAD WT.	7.8 kg
TOTAL WT.	12.3kg (add 6.35kg for tripod)
MP DEPLOYMENT	1975

COMMENTS

A short, lightweight, belt fed machinegun version of the Stoner weapons system. Also referred to as a "commando" machinegun.



NAME	STONER M207
CAL.	5.56x45mm Linked
E-FACTOR	15
WT. (EMPTY)	5.4kg
BARREL	51cm
LENGTH	102.2cm
EFF. RNG.	800m
MAX. RNG.	2650m
TYPE OF FIRE	Full automatic
RATE OF FIRE	150 rpm ; CYCLIC 750 rpm
FEED DEVICE	150 rd belt
FEED DEVICE WT.	1.95kg
BASIC LOAD	4 belts (600 rounds)
LOAD WT.	7.8 kg
TOTAL WT.	13.2kg (add 6.35kg for tripod)
MP DEPLOYMENT	1975

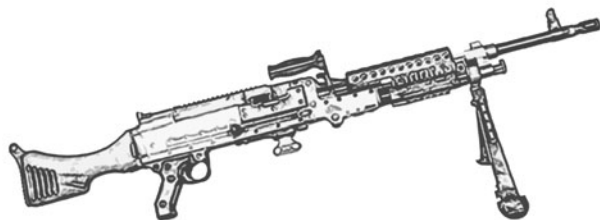
COMMENTS

This is a heavier, longer range version of the Stoner system machinegun.

NAME	M60
CAL.	7.62x51 mm Linked
E-FACTOR	17
WT. (EMPTY)	10.51 kg
BARREL	56cm
LENGTH	110.5cm
EFF. RNG.	1200m
MAX. RNG.	3100m
TYPE OF FIRE	Full automatic
RATE OF FIRE	200 rpm ; CYCLIC 550 rpm
FEED DEVICE	100 rd belt
FEED DEVICE WT.	2.94kg
BASIC LOAD	3 belts (300 rounds)
LOAD WT.	8.82kg
TOTAL WT.	19.33kg (add 6.35kg for tripod)
MP DEPLOYMENT	1975

COMMENTS

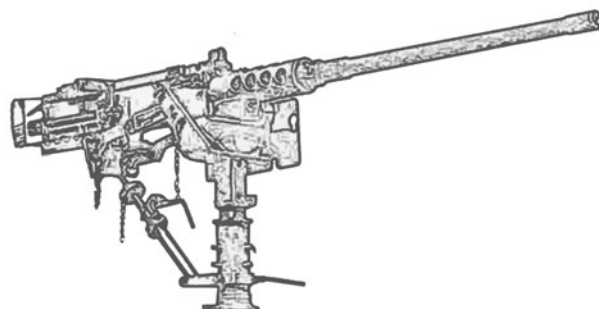
The standard issue U.S. Army machinegun for almost two decades. It can be mounted on a tripod or used on its own built-in bipod. Mounted on the tripod the weapon can use a 250 round belt.



NAME	M240 (FN MAG-58)
CAL.	7.62x51 mm Linked
E-FACTOR	17
WT. (EMPTY)	10.85kg
BARREL	54.5cm
LENGTH	120.7cm
EFF. RNG.	1200 m
MAX. RNG.	3100m
TYPE OF FIRE	Full automatic
RATE OF FIRE	250 rpm ; CYCLIC 800 rpm
FEED DEVICE	100 rd belt
FEED DEVICE WT.	2.94 kg
BASIC LOAD	3 belts (300 rounds)
LOAD WT.	8.82kg
TOTAL WT.	19.67kg (add 6.35kg for tripod)
MP DEPLOYMENT	1975
COMMENTS	A very reliable machinegun, used by armies around the world. It was chosen by the U.S. Army to replace the M60 in the 1980s.

HEAVY MACHINEGUNS

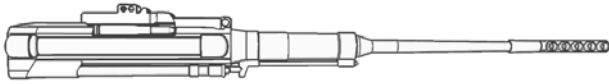
A very large weapon, the ammunition for some being in the small cannon class. These weapons are always mounted either in a vehicle or on a tripod, and require a crew of three to six men to carry the weapon and its ammunition. Capable of being fired either semi or full automatic, these guns can be utilized as a long range sniping system. When used on full automatic they are normally fired in 10 round bursts.



NAME	M2HB "MA DEUCE"
CAL.	12.7x99mm Linked
E-FACTOR	30
WT. (EMPTY)	38.1 kg
BARREL	114cm
LENGTH	165.3cm
EFF. RNG.	1300m
MAX. RNG.	6660m
TYPE OF FIRE	Full automatic
RATE OF FIRE	70/150 rpm ; CYCLIC 550 rpm
FEED DEVICE	105 rd belt
FEED DEVICE WT.	13.05kg
BASIC LOAD	3 belts (315 rounds)
LOAD WT.	39.05kg
TOTAL WT.	77.15kg (97.15kg with M3 tripod)
MP DEPLOYMENT	1975

COMMENTS

This gun is designed to be fired from either a tripod or a vehicle mount. Its great weight and heavy recoil requires it to be firmly set before firing and prevents any possibility of hip-firing it. The weapon's size and weight requires at least a three man crew to carry the weapon and its ammunition.



NAME	RH 202
CAL.	20x139mm
E-FACTOR	57
WT. (EMPTY)	81.5kg
BARREL	1.52m
LENGTH	2.61m
EFF. RNG.	2000m
MAX. RNG.	7000m
TYPE OF FIRE	Selective fire
RATE OF FIRE	70/100 rpm ; CYCLIC 400 rpm
FEED DEVICE	100 rd belt
FEED DEVICE WT.	41.7kg
BASIC LOAD	n/a
LOAD WT.	n/a
TOTAL WT.	157.55kg
MP DEPLOYMENT	1975

COMMENTS

A "machine cannon" mounted in vehicle turrets. It can fire either high-explosive, armor piercing or incendiary ammunition at the switch of a lever. The E-factor value shown is for the armor piercing ammunition.

NAME	20MM M56A1 HIGH EXPLOSIVE INCENDIARY (HEI)
WT.	.25kg
MIN. RNG.	11m
EFF. RNG.	2000m
MAX. RNG.	7000m
E-FACTOR	57 ballistic + 40 explosive
PACKAGING	100 round belt per case
PACKAGE WT.	41.7kg

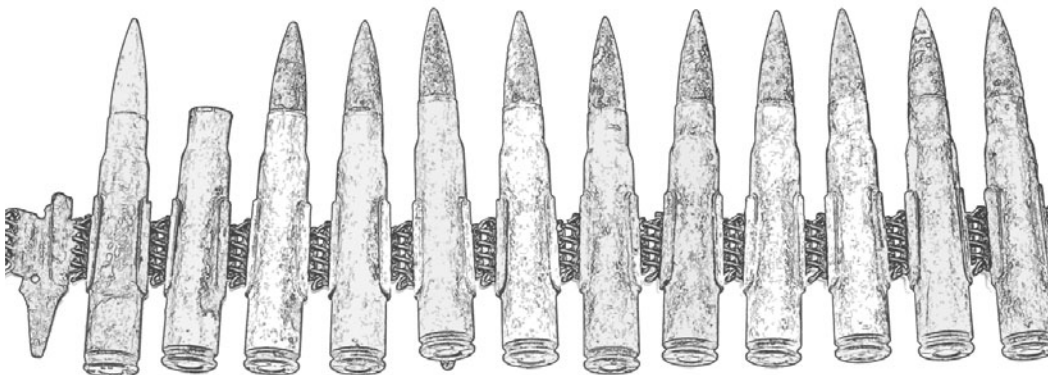
COMMENTS

This cartridge is used where a high explosive effect combined with an incendiary effect is most useful e.g. against vehicles, personnel, buildings, and aircraft. If the round impacts on a fuel container it will ignite the contents. In a combat loaded belt there are two HE-I rounds for every three AP-I rounds.

NAME	20MM T221E3 ARMOR PIERCING INCENDIARY (API)
WT.	.25kg
MIN. RNG.	11m
EFF. RNG.	2000m
MAX. RNG.	7000m
E-FACTOR	63
PACKAGING	100 round belt per case
PACKAGE WT.	41.7kg

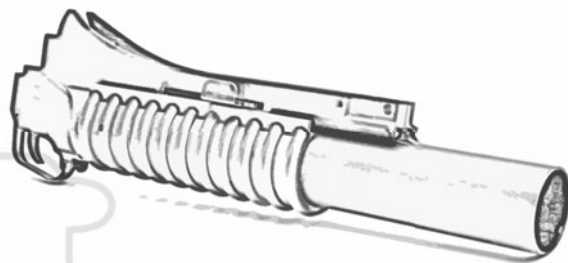
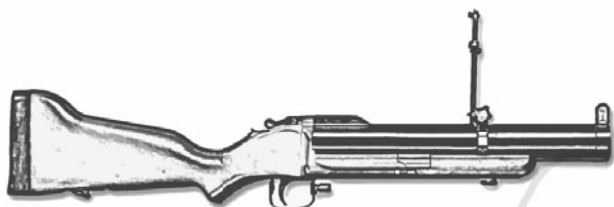
COMMENTS

An armor piercing round with an incendiary element for use against armored targets. The round contains no explosive but will ignite any combustible material it strikes. A five round burst contains three AP-I rounds followed by two HE-I rounds with the Project issue ammo belts.



GRENADE LAUNCHERS

These are multi-purpose weapons firing 40mm grenades. With the high-explosive rounds the launchers act as small mortars, as flare guns when used with white parachute flares or star clusters, and as non-lethal weapons if used with gas or stunbag rounds. Some of the launchers are mounted on rifles, carried in holsters, or mounted on vehicles. With the multiple projectile buckshot rounds the launchers act as large shotguns firing 20 #4 buckshot for each round fired.



NAME	M79 GRENADE LAUNCHER
CAL.	40x46mm
E-FACTOR	**
WT. (EMPTY)	2.72 kg
BARREL	35.7cm
LENGTH	73.7cm
EFF. RNG.	350m
MAX. RNG.	400m
TYPE OF FIRE	Single shot
RATE OF FIRE	15 rpm
FEED DEVICE	Break open manual loading
FEED DEVICE WT.	varies with grenade
BASIC LOAD	36 rounds
LOAD WT.	9.72kg
TOTAL WT.	12.44kg
MP DEPLOYMENT	1975

COMMENTS

A "shotgun" type grenade launcher that fires low-velocity 40mm shells. It can also fire a rocket powered grapnel hook to a height of 150m (hook wt. 2.25kg).

NAME	M203 GRENADE LAUNCHER
CAL.	40x46mm
E-FACTOR	**
WT. (EMPTY)	1.36kg
BARREL	30.5cm
LENGTH	40.5cm
EFF. RNG.	350m
MAX. RNG.	400m
TYPE OF FIRE	Single Shot
RATE OF FIRE	15 rpm
FEED DEVICE	Slide action manual loading
FEED DEVICE WT.	.27kg
BASIC LOAD	36 rounds
LOAD WT.	9.72kg
TOTAL WT.	11.08kg
MP DEPLOYMENT	1975

COMMENTS

A grenade launcher designed to be mounted under an M16 series rifle. When mounted on the rifle both weapons can be fired simultaneously. The launcher cannot be used unless it is mounted on the rifle.



NAME	M174E3 GRENADE LAUNCHER
CAL.	40x46mm
E-FACTOR	**
WT. (EMPTY)	7.25kg
BARREL	35.5cm
LENGTH	71.2cm
EFF. RNG.	400m
MAX. RNG.	400m
TYPE OF FIRE	Selective fire
RATE OF FIRE	40/90 rpm ; CYCLIC 300 rpm
FEED DEVICE	12 rd drum
FEED DEVICE WT.	4.5kg
BASIC LOAD	3 drums (36 rounds)
LOAD WT.	13.5kg
TOTAL WT.	20.75kg (M122 tripod wt. adds 6.35kg)
MP DEPLOYMENT	1975

COMMENTS

A machinegun grenade launcher, first trialled in Vietnam. It may be either tripod mounted or hand held and fired. It fires all the 40mm family of grenades except the M576E2 and M1029.

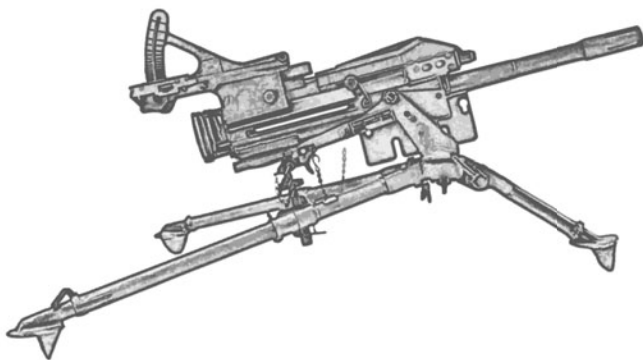


NAME	HK69A1 GRENADE LAUNCHER
CAL.	40x46 mm
E-FACTOR	**
WT. (EMPTY)	1.8kg
BARREL	35.6cm
LENGTH	46.3/68.3cm
EFF. RNG.	350m
MAX. RNG.	400m
TYPE OF FIRE	Single shot
RATE OF FIRE	15 rpm
FEED DEVICE	Break open manual loading
FEED DEVICE WT.	.27kg
BASIC LOAD	36 rounds
LOAD WT.	9.72kg
TOTAL WT.	11.52kg
MP DEPLOYMENT	1975

COMMENTS

A short, folding stock grenade launcher. The weapon, with the stock folded, can be carried in a hip holster.

** Dependent on ammunition type



NAME	MK 19 MOD 3
CAL.	40x53mm
E-FACTOR	**
WT. (EMPTY)	32.9kg
BARREL	35.5cm
LENGTH	109.5cm
EFF. RNG.	1600m
MAX. RNG.	2200m
TYPE OF FIRE	Selective fire
RATE OF FIRE	40/60 rpm ; CYCLIC 400 rpm
FEED DEVICE	32 or 48 rd belt in can
FEED DEVICE WT.	20 or 30kg
BASIC LOAD	1 can
LOAD WT.	20 or 30kg
TOTAL WT.	72.9 or 82.9kg (M3 tripod wt. 20kg)
MP ADOPTION	1987

COMMENTS

A machinegun grenade launcher. It may be either tripod or vehicle mounted. 40x46mm grenades can be fired after being individually loaded. The gun's action cannot fit the M1029 Crowd Dispersal Munition or M1006 sponge round. 40x53mm grenades cannot be fired from 40x46mm launchers. They will explode in the launcher!

** Dependent on ammunition type

GRENADE ROUNDS

Minimum range in the entries below refer to the arming distance for explosive or pyrotechnic rounds. Note that some types can be fired at point-blank range.

A typical grenadier's load is as follows:

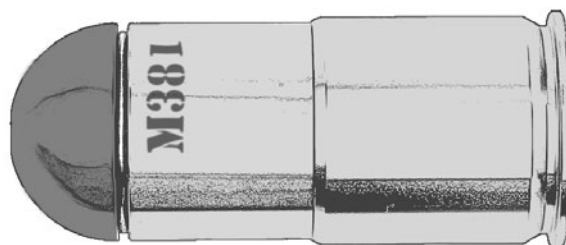
- 12 M433 HEDP
- 8 M651 CS gas
- 6 Stunbag
- 4 M576E2 multiple projectile
- 3 Star shells (one each red, white & green)
- 3 White illuminating parachute flares

The aim is to have a variety of ammo available to deal with as many contingencies as possible.

NAME	40MM M381 HIGH EXPLOSIVE
WT.	.23kg
MIN. RNG.	30m
EFF. RNG.	350m
MAX. RNG.	400m
E-FACTOR	100 explosive + fragments
BURST RADIUS	15m
PACKAGING	6 rounds per bandoleer, 72 rounds per case
PACKAGE WT.	26.3kg

COMMENTS

A high explosive grenade for use against personnel. The round explodes into fragments (E-factor=4) on contact. The round will not penetrate a hard surface as the contact sets it off. Gold ogive (rounded end) with green case.



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NAME	40MM M397 HIGH EXPLOSIVE AIRBURST
WT.	.23kg
MIN. RNG.	15m
EFF. RNG.	350m
MAX. RNG.	400m
E-FACTOR	100/150 explosive + frag-ments
BURST RADIUS	5m
PACKAGING	6 rounds per bandoleer, 72 rounds per case
PACKAGE WEIGHT	26.5 kg

COMMENTS

This grenade is designed to detonate above the ground to increase damage. Once the round hits the ground, an 80 millisecond pyrotechnic fuse is ignited. This lifts the grenade back into the air to a height of about 1.5m (5 feet) before detonation. If the round successfully airbursts (80% chance) it will do 1.5x the explosive E-factor of the M381. The round explodes into fragments (E-factor=4). Gold end with green case.

NAME	40MM M433 HIGH EXPLOSIVE DUAL PURPOSE (HEDP)
WT.	.23kg
MIN. RNG.	30m
EFF. RNG.	350m
MAX. RNG.	400m
E-FACTOR	75 ballistic, 120 explosive
BURST RADIUS	5m
PACKAGING	6 rounds per bandoleer, 72 rounds per case
PACKAGE WT.	26.3kg

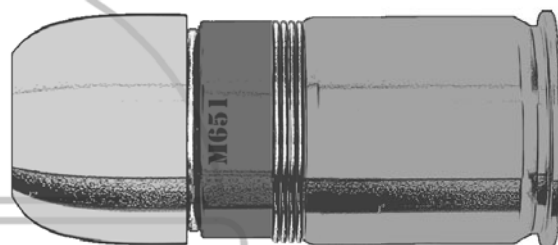
COMMENTS

A combination round with fragmentation combined with an anti-armor capability. The round explodes on contact sending fragments (E-factor =4) through the burst radius. The main force of the explosion is focused forward where it will penetrate 5 centimeters of steel (AV 75). Gold end with green case.

NAME	40MM M651 CS GAS
WT.	.31kg
MIN. RNG.	30m
EFF. RNG.	200m
MAX. RNG.	400m
E-FACTOR	2 blunt + gas
BURST RADIUS	2.5x4.5x2m
PACKAGING	24 rounds per case
PACKAGE WT.	11.8kg

COMMENTS

A burning-type CS grenade. The round, on impact, starts burning and fills the burst radius with a cloud of CS gas. The round burns for 30 seconds and will penetrate a hard surface (i.e. 1 cm pine or a normal window) before functioning. See M7A3 CS grenade entry for the effects of the gas. Grey ogive with red neck and olive case.



NAME	40MM M576E2 MULTIPLE PROJECTILE
WT.	23kg
MIN. RNG.	Zero
EFF. RNG.	35m
MAX. RNG.	50m
E-FACTOR	4 ballistic per pellet
PACKAGING	12 rounds per bandoleer, 144 rounds per case
PACKAGE WT.	42.6kg

COMMENTS

This is a 40mm shotgun shell. The round contains 20 pellets of #4 buckshot. The round has a very short range and will function in all the 40mm grenade launchers except the M174E3. Black neck and green case.

NAME 40MM M583 (WHITE), M661 (GREEN), M662 (RED), M695 (ORANGE) PARACHUTE FLARES

WT. .23kg

MIN. RNG. n/a

EFF. RNG. 200m

MAX. RNG. 200m

PACKAGING 44 rounds per case

PACKAGE WT. 20.8kg

COMMENTS

These are parachute flares used to illuminate an area. The round is fired into the air and when it reaches its maximum altitude (170m) it ejects a magnesium flare on a parachute. The flare burns for 40 seconds illuminating a circle 400m across with 45,000 candlepower (+90 to visibility). White neck, green base. Raised letter on head end to denote colour.

NAME 40MM M585 (WHITE), M663 (GREEN), AND M664 (RED) STAR SHELLS

WT. .23kg

MIN. RNG.

EFF. RNG. 200m

MAX. RNG. 200m

PACKAGING 44 rounds per case

PACKAGE WT. 20.2kg

COMMENTS

These are signal flares. When fired the shells burst at approximately 170 meters altitude and release 5 illuminating stars which burn for 7 to 11 seconds. The shells are used for signalling and are bright enough for use during the day as well as at night. White neck, green base. Head end has raised dots on top.

NAME 40MM M713 (RED), M715 (GREEN), AND M716 (YELLOW) GROUND MARKER

WT. .23kg

EFF. RNG. 200m

MAX. RNG. 200m

PACKAGING 44 rounds per case

PACKAGE WT. 20.2kg

COMMENTS

This round is used for aerial identification and marking locations. It arms between 15 and 45m and is designed to release smoke on impact. There is a backup fuzing mechanism if the impact trigger fails. Light green neck, green base.

NAME 40MM M1029 CROWD DISPERSAL MUNITION

WT. .25kg

MIN. RNG. 10m

EFF. RNG. 50m

MAX. RNG. 70m

E-FACTOR 1D10 non-ballistic (blunt) per ball

PACKAGING 48 rounds per case

PACKAGE WT. 20kg

MP DEPLOYMENT 1987

COMMENTS

This round consists of a 122mm long aluminium housing containing 48 12.2mm (.48 calibre) rubber balls. It cannot be fired from machinegun type launchers. When this round is fired it acts like a large shotgun shell. The payload spreads to cover a 3 metre diameter circle at 30 metres. The pellets are very likely to penetrate targets less than 10m away. They also tend to bounce. Firing at walls or other hard targets within 20m is not recommended.

NAME	40MM STUNBAG
WT.	.23kg
MIN. RNG.	0m
EFF. RNG.	50m
MAX RNG.	70m
E-FACTOR	1D10 blunt
PACKAGING	44 rounds per case
PACKAGE WT.	20.2kg
COMMENTS This round when fired opens into a 15cm diameter cloth bag filled with fine lead shot. The bag is designed to knock down or knock out personnel without doing permanent harm.	

NAME	40X53MM M384 HIGH EXPLOSIVE
WT.	.34kg
MIN. RNG.	18m
EFF. RNG.	1000m
MAX. RNG.	2200m
E-FACTOR	250 explosive + fragments
BURST RADIUS	15m
PACKAGING	50 rounds per case
PACKAGE WT.	26kg
COMMENTS A high explosive grenade for use against personnel. The round explodes into fragments (Damage=4) on contact. The round will not penetrate a hard surface as the contact sets it off. Yellow ogive (rounded end) with olive drab case.	

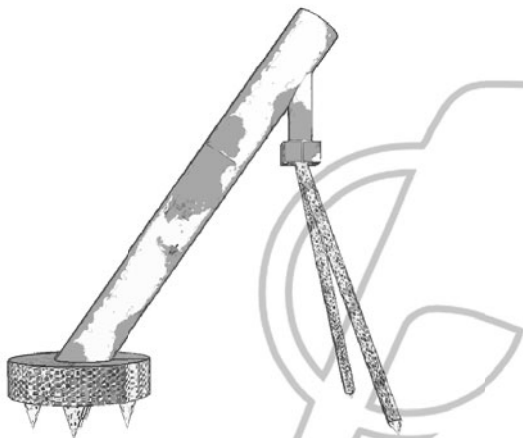
NAME	40X53MM M430 HIGH EXPLOSIVE DUAL PURPOSE
WT.	.34kg
MIN. RNG.	18m
EFF. RNG.	1000m
MAX. RNG.	2200m
E-FACTOR	150 explosive + fragments
BURST RADIUS	5m
PACKAGING	48 linked rounds in container
PACKAGE	WT. 30kg
COMMENTS An armor-piercing high explosive round. It will penetrate 5cm steel (AV 75) and explodes into fragments (Damage=4) on contact. The round will not penetrate a hard surface as the contact sets it off. Yellow ogive (rounded end) with olive drab case.	



40MM - ACTUAL SIZE

MORTARS

A short, smooth-bore cannon that fires fin-guided bombs in a high arc. Mortars are used to fire a shell over an obstacle such as a wall or hill to hit a target close behind it. The weapon is normally fired by dropping the round down the muzzle of the gun a single shot at a time. Some vehicle mounted mortars can be breech loaded from the back like a cannon. Since the mortar is fired at targets out of sight this is known as an “indirect fire” weapon. They are most accurately used with a “forward observer”, someone who can see the target and call back corrections for misses to the mortar crew. When mounted on the ground the heavy recoil settles the base of the gun deeper and deeper into the ground with each shot. This means the weapon must be re-aimed with each shot for maximum accuracy. When ground mounted the weapon requires a crew of at least 3 to carry and operate the mortar and its ammunition. One man can operate the gun slowly, but cannot carry the weapon.



NAME	M29A1 MORTAR
CAL.	81mm
E-FACTOR	**
WT. (EMPTY)	40.48kg
LENGTH	129.5cm
EFF. RNG.	4595m
MAX. RNG.	4595m
TYPE OF FIRE	Single shot
RATE OF FIRE	6 rpm
FEED DEVICE	Single shell
FEED DEVICE WT.	4.23kg
BASIC LOAD	6 rounds
LOAD WT.	25.38kg
TOTAL WT.	65.86kg
MP DEPLOYMENT	1975

COMMENTS

A smooth-bore, muzzle-loading cannon firing a fin stabilized shell. The high arc of the fired shell allows it to drop on targets hidden behind obstacles. The great weight of the weapon and its ammunition requires at least three men to carry it.

** Dependent on ammunition

NAME	81MM M301A3 ILLUMINATING
WT	4.89kg
LENGTH	52.8cm
MIN. RNG.	100m
EFF. RNG.	3150m
MAX. RNG.	3150m
BURST RADIUS	1200m
PACKAGING	3 rounds per case
PACKAGE WT.	24.94kg

COMMENTS

Also known as a star shell, this round ejects a white magnesium flare on a parachute. The flare illuminates a 1200 meter area with 500,000 candlepower for 75 seconds (+120 to visibility). The fuse of the round is adjustable for what altitude the round will function at. The round can also be set to function on impact in which case the magnesium will burn at 1980°C igniting any flammable material it contacts.

NAME	81MM M374A2 HIGH EXPLOSIVE
WT.	4.23kg
LENGTH	52.8cm
MIN. RNG.	72m
EFF. RNG.	4595m
MAX. RNG.	4595m
E-FACTOR	1240 explosive + fragments
BURST RADIUS	34m
PACKAGING	3 rounds per case
PACKAGE WT.	23.13kg

COMMENTS

A high explosive round that is used against unarmored targets and personnel. The round, on impact, explodes into fragments (E-factor=6) throughout the burst radius. The explosion will blast through .8 meters of concrete or 1.3 meters of rock (AV 400).

NAME	81MM M375A4 WHITE PHOSPHORUS
WT.	4.23 kg
LENGTH	52.8cm
MIN. RNG.	72m
EFF. RNG.	4737m
MAX. RNG.	4737m
BURST RADIUS	20m
PACKAGING	3 rounds per case
PACKAGE WT.	23.13kg

COMMENTS

This shell contains white phosphorus which burns at 2700°C for 120 seconds producing large amounts of dense white smoke. The phosphorus is spread over the burst area. The round is used to ignite fires and as a signaling and antipersonnel weapon.



FLAMETHROWERS

Come in several types, the most common being a back-pack of tanks with a hose leading to a hand held gun. A flamethrower is psychologically devastating as the flame is terrifying to watch. It may either be fired with the fuel ignited or the fuel can be sprayed over a target, allowed to soak in, then lit. Used in this manner it is a very effective threat because the flames will consume all the oxygen around the target unless it is specially sealed.

NAME	HAFLA-35L
CAL.	35mm
WT.	.63kg
LENGTH	44.5cm
EFF. RNG.	70m
MAX RNG.	70m
E-FACTOR	flame damage
BURST RADIUS	8m
TYPE OF FIRE	Single shot disposable
BASIC LOAD	3 rounds
LOAD WT.	1.89kg
TOTAL WT.	1.89kg
MP DEPLOYMENT	1975

COMMENTS

A single shot disposable "flamethrower" firing an incendiary shell. The shell burns at 1300°C for 120 seconds.

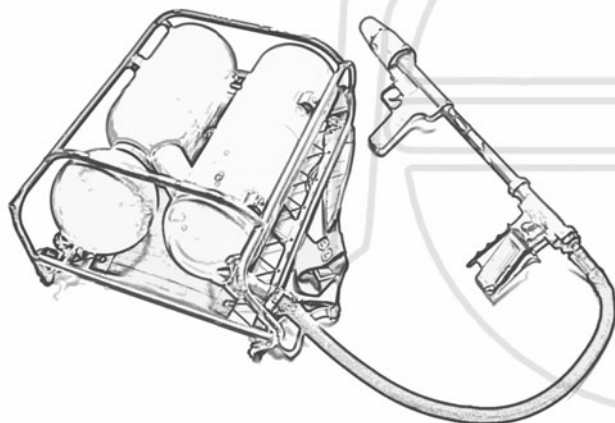


NAME M9A1-7 FLAMETHROWER

WT. (EMPTY)	11.8kg
EFF. RNG.	55m
MAX. RNG.	55m
TYPE OF FIRE	Semi-automatic
RATE OF FIRE	5 rpm
FEED DEVICE	4 1/4 gallon (11L) tank
FEED DEVICE WT.	10.9kg
BASIC LOAD	one filling
TOTAL WT.	22.7kg
MP DEPLOYMENT	1975

COMMENTS

A backpack type flamethrower with a hand-held flamegun. The flamegun can fit inside a hip holster issued with the weapon. The tank holds enough fuel for five two-second "bursts". Each burst burns at 1200°C for 120 seconds. The weapon can be fired with the fuel either lit or unlit. The entire tank may be fired in one long shot.



M9A1-7 FLAMETHROWER

MISSILE LAUNCHERS

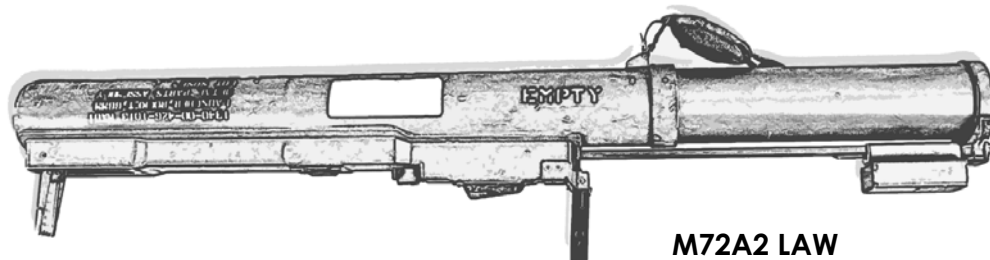
These are recoilless weapons of several types. They range from small, hand-held, single shot launchers to large, mounted missile systems. Their complexity varies from simple tubes or guide rails to complex launching systems with integral sighting and tracking. All missile launchers have a danger area behind them. This is caused by the "back blast" of the rocket's exhaust as it is launched. Some of the largest launchers can only be used on vehicles while some of the medium variety can be carried and operated by a crew.

NAME M72A2 LAW

WT.	2.37kg
LENGTH	65.5cm/89.3cm
MIN. RNG.	10m
EFF. RNG.	350m
MAX. RNG.	1000m
E-FACTOR	420 ballistic, 533 explosive
MP DEPLOYMENT	1975

COMMENTS

A lightweight disposable rocket launcher firing a 66mm high explosive warhead, which will penetrate 28 centimeters of steel (AV 420). The launcher needs to be extended and the sights flipped up for use. There is a danger area behind the launcher 15m long and 8m wide at its base on firing due to backblast.



M72A2 LAW

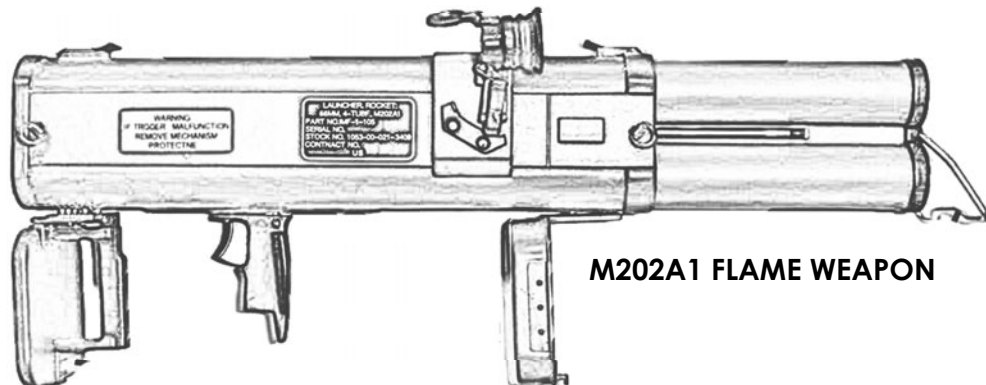
NAME	ARMBRUST 300
WT.	6.3kg
LENGTH	85cm
MIN. RNG.	30m
EFF. RNG.	300m
MAX. RNG.	1500m
E-FACTOR	450 ballistic, 533 explosive
MP DEPLOYMENT	1975
COMMENTS	A disposable, flashless, noiseless, recoilless gun firing a 67mm high explosive shell that will penetrate 30 centimeters of steel (AV 450). The “backblast” from the weapon is made up of plastic flakes and is so short the firer can stand with a wall only 1 meter behind him.

NAME	M202A1 FLAME WEAPON
WT.	5.18kg
LENGTH	68.6cm/88.3cm
MIN. RNG.	20m
EFF. RNG.	750m
MAX. RNG.	750m
BURST RADIUS	20m
BASIC LOAD	3 4rd clips
LOAD WT.	20.25kg
TOTAL WT.	25.43kg
MP DEPLOYMENT	1987

COMMENTS

A 4-barrel reloadable 66mm rocket launcher. The rocket fired is incendiary and will cover the burst radius with flame that burns for 10 seconds at 1000°C. The weapon has a 15m long backblast which is 15m wide at its base. This system largely replaced the backpack mounted flamethrowers in U.S. Army issue in the late 1970s.

ARMBRUST 300

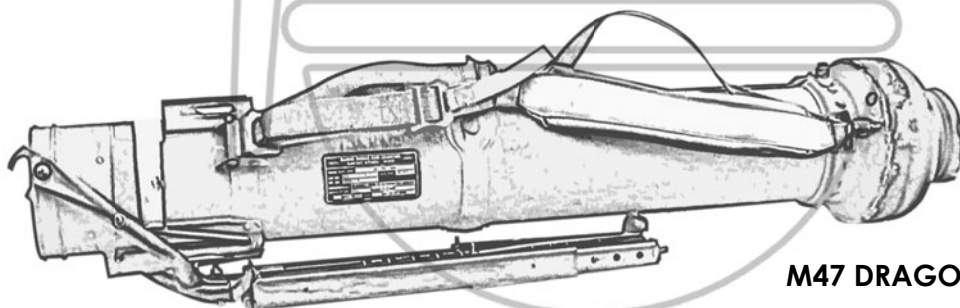


M202A1 FLAME WEAPON

NAME	M47 DRAGON
WT.	11.47kg (launcher); +3.1kg (daysight, 6x mag); +9.82kg (night sight, 4x mag)
LENGTH	1.2m
MIN. RNG.	65m
EFF. RNG.	1000m
MAX. RNG.	1000m
E-FACTOR	870 ballistic, 3120 explosive
BASIC LOAD	2 missiles
LOAD WT.	35.86kg
TOTAL WT.	35.86kg
MP DEPLOYMENT	1975

COMMENTS

This is a man-portable wire-guided missile. The missile's carrying case is the launch tube and is disposed of after firing. A sighting device must be attached to fire the weapon. When the sight is held on the target the missile automatically tracks to the target, so the target must stay in sight to be hit. The 140mm warhead will penetrate 58cm of steel (AV 870). The backblast area extends 30m from the rear of the launcher and is 30m wide at its base. The danger area extends to 50m. The minimum size of an enclosed area for firing is 3x4.6m.

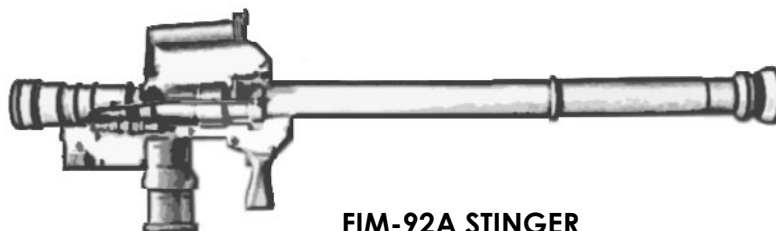


M47 DRAGON

NAME	FIM-92A STINGER
WT.	15.66kg
LENGTH	1.5m
MIN. RNG.	300m
EFF. RNG.	4800m
MAX. RNG.	4800m
E-FACTOR	2900 explosive
BASIC LOAD	2 missiles
LOAD WT.	31.32kg
TOTAL WT.	31.32kg
MP DEPLOYMENT	1987

COMMENTS

A shoulder-fired, heat seeking, guided anti-aircraft missile. The missile comes complete in a launch tube which is thrown away after use. When fired at the target the missile will automatically track no matter what the aircraft does. If the target is not reached before the missile reaches maximum range the warhead will self destruct. The FIM-92 has been adapted as a vehicle-mounted anti-air missile. It is deployed in sets of four launch tubes (2x2) – the Army's standard vehicle mount launcher system. The danger area behind the weapon is 50m long and 25m wide.



FIM-92A STINGER

NAME	BGM-71 TOW
WT.	78.5kg
LENGTH	128cm
MIN. RNG.	65m
EFF. RNG.	3750m
MAX. RNG.	3750m
E-FACTOR	870 ballistic, 3120 explosive
MISSILE WEIGHT	18.8kg
MP DEPLOYMENT	1975

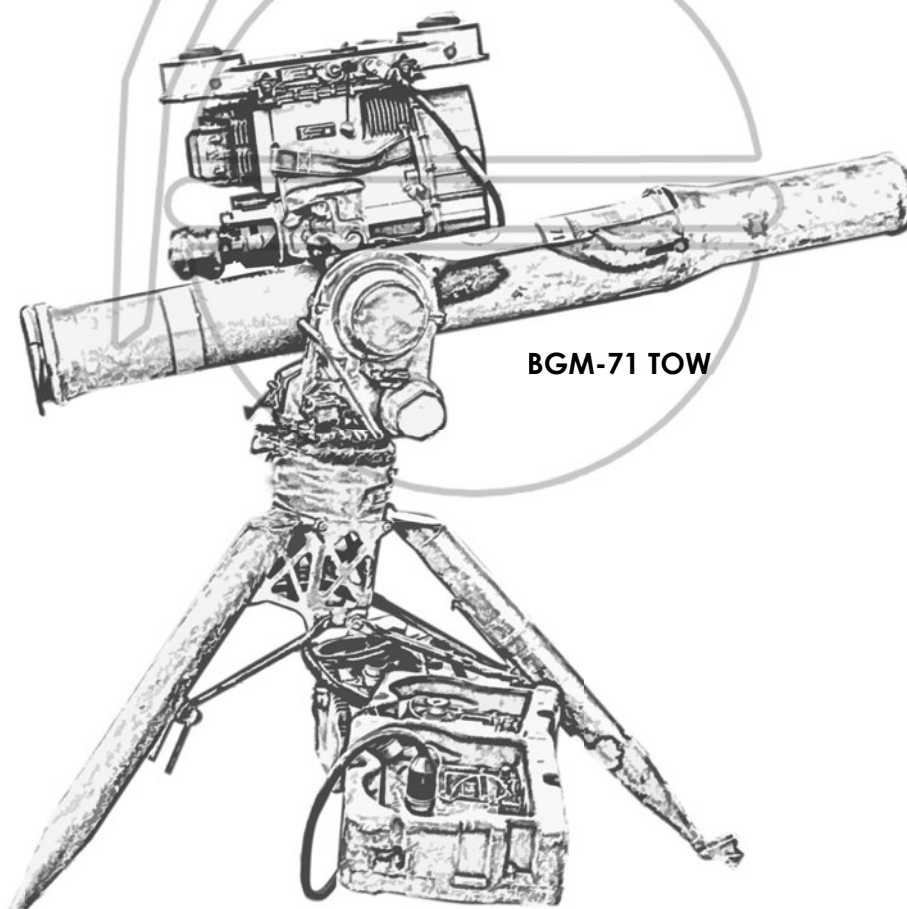
COMMENTS

TOW stands for Tube launched, Optically sighted, Wire guided. The missile will penetrate 58cm of steel (AV 870) and is sighted the same as a Dragon. The guide impulses follow a wire that trails behind the missile. If the wire breaks the missile crashes. The length and weight stats above are for the M151E2 launch system.

NAME	2.75 IN. ROCKET POD M200A1 A.K.A. LAU-61/A
WT.	130.6kg
LENGTH	1.6m
MIN. RNG.	100m
EFF. RNG.	3000m
MAX. RNG.	3000m
BURST RADIUS	20m
BASIC LOAD	19 missiles
LOAD WT.	161.5kg
TOTAL WT.	292.1kg
MP DEPLOYMENT	1975

COMMENTS

This is a multi-tube rocket launcher firing 19 rockets. The pod is normally mounted on helicopters or large vehicles. The rockets can be fired in pairs, one per second, or in multiples of two. The pods are normally mounted in pairs totaling 38 available rockets.


BGM-71 TOW

NAME 2.75 INCH (70MM) MK40/
HYDRA-70 HIGH EXPLO-
SIVE ROCKET

WT. 8.5kg
LENGTH 1.5m
MIN. RNG. 100m
EFF. RNG. 3000m
MAX. RNG. 3000m
E-FACTOR 525 ballistic, 2600 explosive
PACKAGING 3 per case
PACKAGE WT 46.7kg

COMMENTS

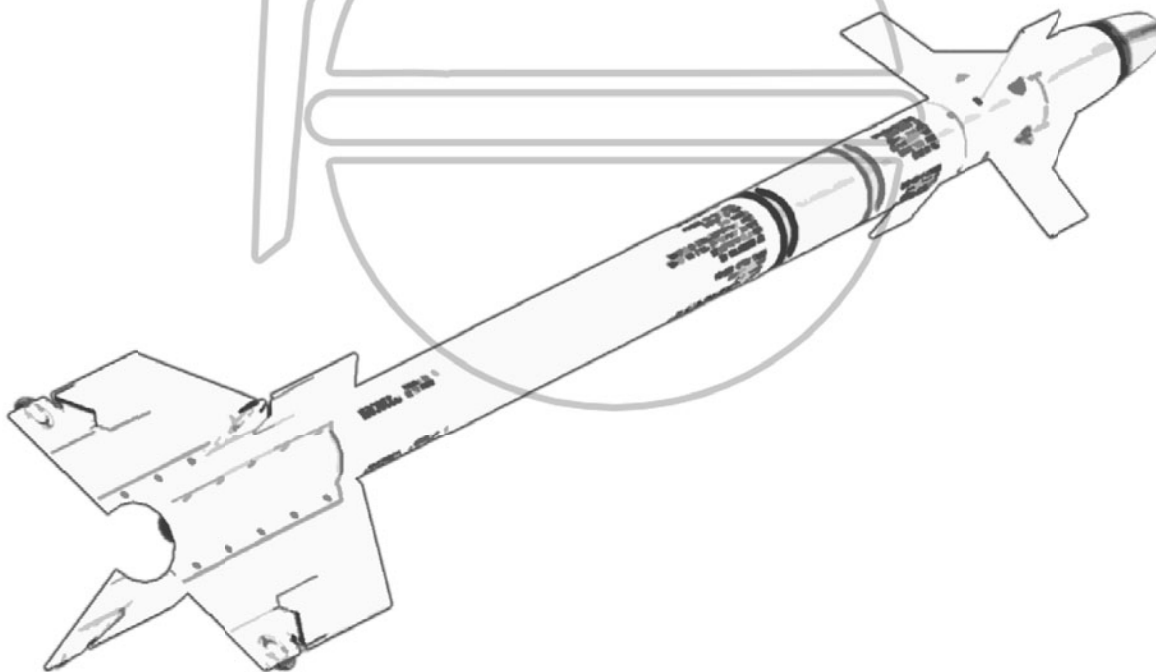
A long, slender rocket fired from the M200A1 rocket pod. The rocket has four fins which unfold to guide it after it is fired. The rocket acts as an artillery shell against ground targets. The high explosive warhead will blast through 35 centimeters of steel (AV 525) or over one meter of concrete.

NAME CHAPARRAL (SIDEWINDER
AIM-9D)

WT. 89kg
LENGTH 2.87m
MIN. RNG. 300m
EFF. RNG. 17700m
MAX. RNG. 17700m
E-FACTOR 13260 explosive
MP DEPLOYMENT 1975

COMMENTS

A large heat-seeking missile. This weapon is fired from a vehicular mount and will track on the strongest heat source it is aimed at. The missile has an automatic override that prevents it from tracking on a magnesium flare.



CHAPARRAL (SIDEWINDER
AIM-9D)

NAME	MAVERICK AGM-65D
WT.	210kg
LENGTH	2.5m
MIN. RNG.	150m
EFF. RNG.	22500m
MAX. RNG.	22500m
E-FACTOR	1830 ballistic, 76700 explosive
MP DEPLOYMENT	1975

COMMENTS

This missile will track any object that it is sighted on regardless of where it dodges. The weapon tracks on infrared and will also target on a picture that is programmed into it from a remote camera. The missile has a camera and computer in its nose and actually "looks" for its target. The 30.5cm diameter warhead will penetrate over 1.22 meters of steel (AV 1830).

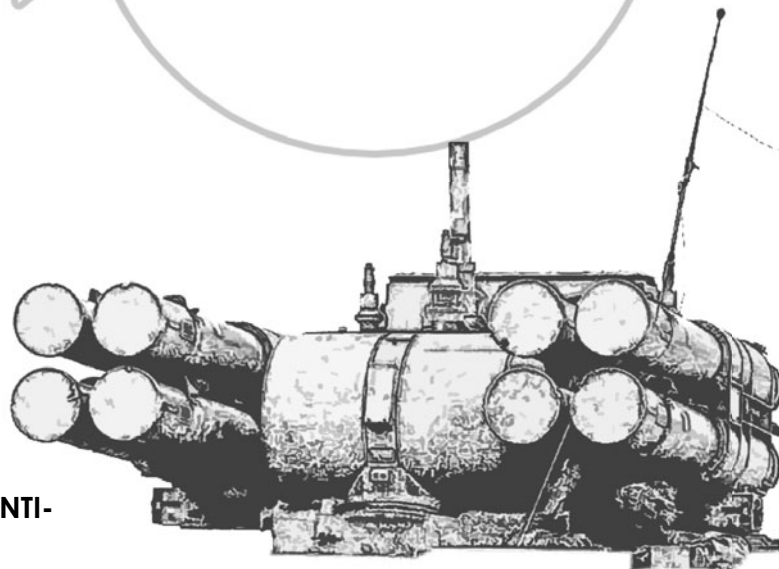
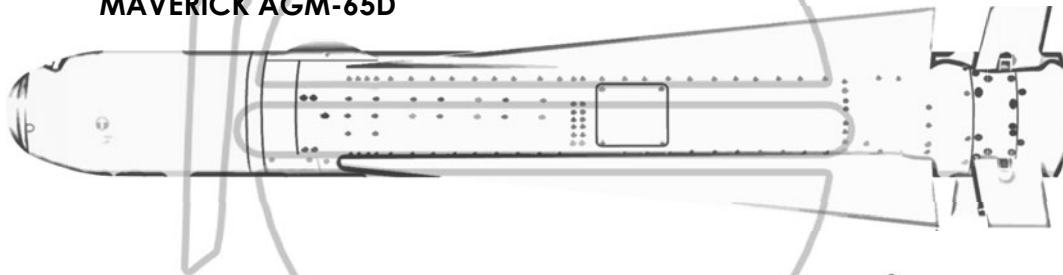
NAME	ADATS (AIR DEFENSE ANTI-TANK SYSTEM)
WT.	51kg
LENGTH	2.05m
MIN. RNG.	300m
EFF. RNG.	10000m
MAX. RNG.	25000m
E-FACTOR	1350 ballistic, 28860 explosive
MP DEPLOYMENT	1999

COMMENTS

This missile uses infra-red and optical tracking to home in on its target. It can be used to engage ground and air targets. It is fielded in units of eight launch tubes (2 2x2 cells), each 2.2m long and 27.3cm in diameter. The 15.2cm diameter warhead will penetrate over 90cm of steel (AV 1350).

ADATS was adopted by the Canadian Armed Forces. It did not reach operational status with the U.S. military.

MAVERICK AGM-65D



ADATS (AIR DEFENSE ANTI-TANK SYSTEM)

EXPLOSIVES

These can be used for a variety of purposes: felling trees, uprooting stumps, mining and tunnelling as well as combat purposes. Most need another explosive to set them off e.g. a detonator or primercord. More primitive explosives like black powder or nitroglycerine are responsive to flame and shocks like being hit by a bullet – or even vigorously shaken (in the case of nitro).

Each team is issued a basic demolition kit, which is described below. Replacement supplies for the kit are provided in the team's caches.

NAME BASIC DEMOLITION KIT

WT 57.5kg (explosives not included)

ADDITIONAL COMMENTS

All the equipment necessary to prepare and detonate explosive charges. Generally, 2 cases of M112 blocks are issued and the equipment and explosive equally divided between two team vehicles.

Contents include:

- Ten M1 timer/detonators (300g each). These are mechanical timers that will set off any explosive charge. The timer can be set for 1-48 hours in one-hour intervals, 1-10 minutes in one-minute intervals, and 10-60 seconds in ten-second intervals.
- Twenty M2A1 detonators (50g each). These are ring-pull detonators that will set off any charge they are inserted into after an eight second delay.
- Fifty M60 Fuse igniters (70g each). These will light time fuse or primercord under any conditions, including underwater. To operate the igniter, place the end of the fuse in the igniter's base, remove the safety pin and pull the igniter ring. The fuse is now lit.
- Four rolls of primercord (5kg, 152m long). Primercord is a flexible rope with a high explosive PETN core. It can be used to connect charges so that they explode near-simultaneously – the detonation velocity of primercord is 7500m or 24000 feet per second. The cord can be used as an explosive charge in its own right. PETN is a sensitive explosive. Gunfire and flame will detonate it. Explosive damage is 10 per meter of cord.
- Ten rolls of M700 time fuse (450g per 15m roll). This burns at a constant rate of 1cm (0.4 inch) per second, so a full roll takes 25 minutes to be consumed. It is waterproof and covered in plastic. A blasting cap needs to be crimped on the end of the fuse that is inserted into the charge.
- Ten rolls of electrical detonating wire (2kg per 100m roll). One end is attached to a blasting cap and

inserted into a charge. The other is connected to either the M57 or 10-cap detonating devices.

- Ten M57 electric detonators (200g each). These are also used in the claymore mine. They produce enough power to detonate a single blasting cap and are used for remote command detonation.
- Two ten-cap electrical blasting machine (600g each). A hand-cranked detonator which can produce enough power to detonate ten blasting caps simultaneously.
- Two tins of blasting caps (500g ea.). Each waterproof tin, lined with cotton wool, contains 50 electric and non-electric caps.
- Two basic toolkits (500g ea.). A set of pliers, cap crimper, fuze cutter, and measures made of non-sparking bronze.
- Two pocket manuals (100g ea.). A reference guide which discusses required charge masses, techniques for optimizing blast effects, and how to prepare some impromptu explosive substances. +10% to Explosives skill if base skill less than 10%, +5% otherwise. Printed on plasticized, waterproof card-stock.

NAME M112, C-4 DEMOLITION BLOCK

WT. .56kg
E-FACTOR 1300 explosive
BASIC LOAD 4
LOAD WEIGHT 2.24kg
PACKAGING 30 per case
PACKAGE WT. 21.6kg

COMMENTS

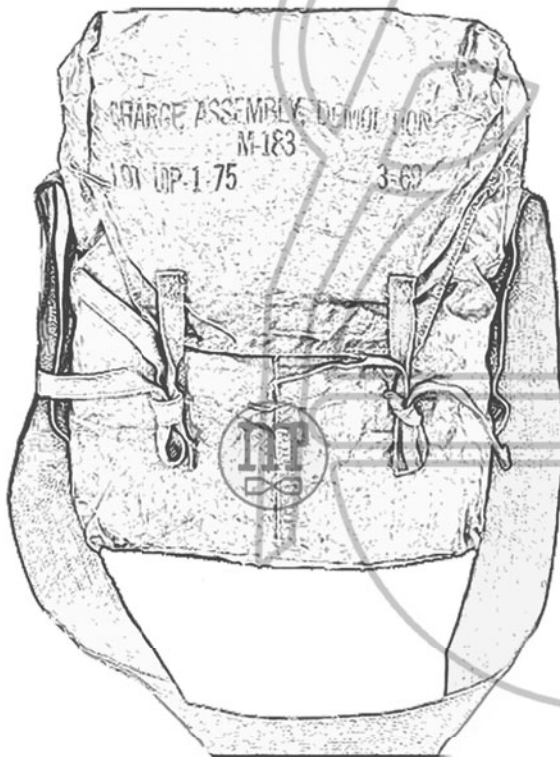
A packaged block of C-4 plastic explosive. The block has adhesive on one side that will stick to any dry surface. One block will blast a hole 30 cm square through 10mm thick steel plate or a .6m diameter hole through a 10 cm thick rock or concrete wall. The explosive can be detonated by primercord, blasting cap, or another explosion.



NAME	M183 DEMOLITION
WT.	10.5kg
E-FACTOR	20800 explosive
PACKAGING	2 per case
PACKAGE WT.	25.7kg

COMMENTS

A satchel charge containing 16 M112 demolition blocks and 4 M15 priming assemblies. The priming assemblies are 2 meters of primercord with a blasting cap at each end. The charge will blast a 2 meter square hole through 1 meter of concrete or rock. It will also blast a .6 meter hole through 7.6cm of steel. It takes 1-3 game turns (6-18 minutes) to properly arm the firing assemblies.



GRENADES

Small explosive charges designed to disperse or ignite a filler, which may be metal fragments, chemicals, etc. Most are operated by removing a safety pin, which ignites a short fuse. After three to five seconds the main charge detonates. Some grenades (explosive and fragmentation) have a secondary arming lever which acts as another safety device. Making traps with frag grenades is therefore easy with a little imagination. The effective range values given in each entry assume the thrower has average human strength (20).

NAME	M67 FRAGMENTATION
WT.	.39kg
SIZE	6.4x9cm
EFF. RNG.	40m – MASS 1
FUSE DELAY	4 seconds
E-FACTOR	275 explosive + fragments
BURST RADIUS	15m
BASIC LOAD	4
LOAD WT.	1.56kg
PACKAGING	30 per case
PACKAGE WT.	23.6kg
MP DEPLOYMENT	1975

COMMENTS

The U.S. standard issue fragmentation grenade from 1968. Containing 180 grams of explosive the grenade explodes into approximately 400 fragments (E-factor=4) over the burst radius.

M67 FRAGMENTATION



NAME	M34 WHITE PHOSPHORUS
------	----------------------

WT.	.76kg
SIZE	6x13.2cm
EFF. RNG.	20m – MASS 2
FUSE DELAY	4 seconds
BURST RADIUS	35m
BASIC LOAD	4
LOAD WT.	3.04kg
PACKAGING	16 per case
PACKAGE WT.	18.9kg
MP DEPLOYMENT	1975

COMMENTS

This grenade contains white phosphorus as its filler. When the grenade explodes it throws fragments of phosphorus throughout the burst radius. The fragments, which burn at 2700°C for 60 seconds, will ignite any flammable substance they contact. The grenade also creates a large cloud of dense white smoke while burning.

NAME	AN-M8, HC SMOKE
------	-----------------

WT.	.67kg
SIZE	6.4x14.5cm
EFF. RNG.	20m – MASS 2
FUSE DELAY	2 seconds
BASIC LOAD	2
LOAD WT.	1.34kg
PACKAGING	16 per case
PACKAGE WT.	18.5kg
MP DEPLOYMENT	1975

COMMENTS

This is a burning-type grenade that produces a dense cloud of white smoke during its burning time of 120 seconds. While burning the grenade canister reaches a temperature of 1200°C.

NAME	M6, CN-DM GAS
------	---------------

WT.	.48kg
SIZE	6.4x14.5cm
EFF. RNG.	20m – MASS 2
FUSE DELAY	2 seconds
BASIC LOAD	2
LOAD WT.	.96kg
PACKAGING	16 per case
PACKAGE WT.	15.8kg
MP DEPLOYMENT	1975

COMMENTS

This grenade acts the same as the AN-M8 grenade but the smoke cloud consists of a mixture of tear and vomit gases. The DM gas causes immediate heavy vomiting. The effects last for up to one hour after exposure. The grenade burns for 60 seconds.



NAME	M7A3, CS GAS
WT.	.43 kg
SIZE	6.4x14.5cm
EFF. RNG	40m – MASS 1
FUSE DELAY	2 seconds
BASIC LOAD	2
LOAD WT.	.86kg
PACKAGING	16 per case
PACKAGE WT.	13.5kg
MP DEPLOYMENT	1975

COMMENTS

This grenade creates a dense cloud of CS tear gas. The gas causes pain in the skin, eyes, throat, and lungs as well as difficulty seeing. The effects of the gas disappear 15 minutes after exposure. The grenade burns for 60 seconds.

NAME	M9A1, BZ GAS
WT.	.45 kg
SIZE	6.4x14.5cm
EFF. RNG.	40m – MASS 1
FUSE DELAY	2 seconds
BASIC LOAD	2
LOAD WT.	.9kg
PACKAGING	16 per case
PACKAGE WT.	14.2kg
MP DEPLOYMENT	1975

COMMENTS

This is a burning type grenade. Upon ignition it releases a cloud of BZ gas and burns for 60 seconds. The gas causes temporary slowing of physical and mental activity, disorientation, and hallucinations. The effects last for up to 6 hours.

Note: For this grenade, if you unscrew the fuse and hold it up to someone's face they receive the full effects of the gas without firing the grenade.

NAME	AN-M14, TH3 INCENDIARY
WT.	.91kg
SIZE	6.4x14.5cm
EFF. RNG.	20m – MASS 2
FUSE DELAY	2 seconds
BASIC LOAD	2
LOAD WT.	1.82kg
PACKAGING	16 per case
PACKAGE WT.	29.2kg
MP DEPLOYMENT	1975

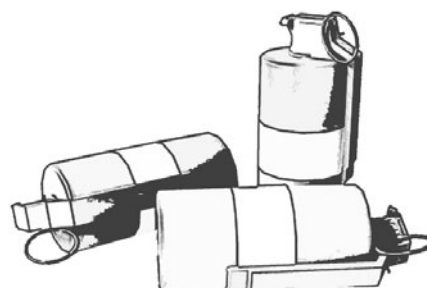
COMMENTS

The extreme heat (2200°C) of this thermite-filled grenade will destroy any equipment it is placed on and ignite any flammable material within 2 meters. The grenade will burn its way through 15mm of armor steel (AV 23) and will burn underwater. The thermite burns for 40 seconds.

NAME	MK3A2, EXPLOSIVE
WT.	.44kg
SIZE	5.4x13.4cm
EFF. RNG.	40m – MASS 1
FUSE DELAY	4 seconds
E-FACTOR	295 explosive
BASIC LOAD	2
LOAD WT.	.88kg
PACKAGING	20 per case
PACKAGING WT.	20.3kg
MP DEPLOYMENT	1975

COMMENTS

This is a prepackaged demolition charge of 8 oz (.226kg) of TNT. The grenade's fibreboard casing causes no fragmentation.



NAME MK 1, ILLUMINATING

WT.	.28kg
SIZE	5.6x11cm
EFF. RNG.	40m – MASS 1
FUSE DELAY	7 seconds
BASIC LOAD	4
LOAD WT.	1.12kg
PACKAGING	25 per case
PACKAGE WT.	23kg
MP DEPLOYMENT	1975

COMMENTS

This is a hand-thrown flare. The grenade illuminates a 200m diameter area with 55000 candlepower for 25 seconds (+90 to visibility).



NAME NICO THUNDERFLASH

WT.	.28kg
SIZE	6x13.5cm
EFF. RNG.	40m – MASS 1
FUSE DELAY	2.5 seconds
BURST RADIUS	10m
BASIC LOAD	4
LOAD WT.	1.1kg
PACKAGING	30 per case
PACKAGE WT.	15kg
MP DEPLOYMENT	1987

COMMENTS

A stun grenade which contains eight submunitions which are ejected after the fuse delay. Each flies off in a random direction and flashes after a 0.5 second delay. The flashes are each 175-185 decibels and several hundred thousand candelas in intensity (+120 to visibility). All characters in the burst radius are temporarily deafened and blinded.

MINES

NAME M25, ANTIPERSONNEL

WT.	.08kg
SIZE	5.1x7.6cm
E-FACTOR	20 explosive + fragments
BURST RADIUS	.16m
PACKAGING	96 per case
PACKAGE WT.	18.5kg
MP DEPLOYMENT	1975

COMMENTS

This small plastic cone-shaped blast mine is directional and designed to puncture a tire or wound a foot (E-factor=6). It is emplaced by simply pressing it into the ground.

NAME M16A1, ANTIPERSONNEL

WT.	3.6kg
SIZE	10.4x24cm
E-FACTOR	888 explosive + fragments
BURST RADIUS	30m
PACKAGING	4 per case
PACKAGE WT.	20.3kg
MP DEPLOYMENT	1975

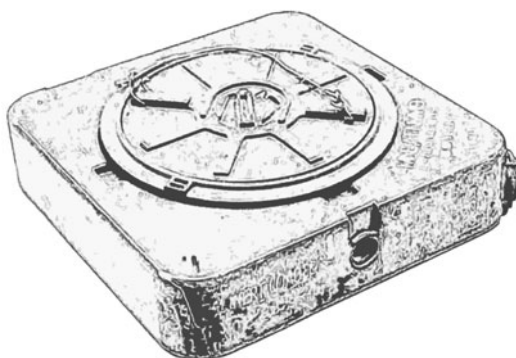
COMMENTS

This mine when fired throws a shell 1 meter into the air. When the shell explodes it hurls steel balls (E-factor=4) over a 30 meter radius circle. The mine will fire from pressure or it may use two 10 meter tripwires.



NAME	M18A1 CLAYMORE
WT.	1.6kg
SIZE	22x3.5x8.3cm
E-FACTOR	1460 explosive + fragments
BURST RADIUS	16m +100x50m fan
BASIC LOAD	1
LOAD WT.	1.6kg
PACKAGING	1 per bandoleer, 6 bandoleers per case
PACKAGE WT.	23.9kg
MP DEPLOYMENT	1975
COMMENTS	This mine acts as a giant shotgun shell. The mine's blast fires 700 0.7g steel spheres (E-factor=4) out in a cone 100m long and 50 meters wide by 2 meters high at its end. The mine is issued in a bandoleer with an M57 electrical firing device and an M4 blasting cap with 30 meters of firing wire.

NAME	M19 ANTITANK
WT.	12.6kg
SIZE	33.4x12.4cm
E-FACTOR	20355 explosive
PACKAGING	2 per case
PACKAGE WT.	36kg
MP DEPLOYMENT	1975
COMMENTS	A non-metallic blast mine made entirely of plastic. The mine is designed to destroy armored vehicles but may also be used as a packaged demolition charge. The explosive charge is equal to 8.815kg (19.5lb) of C-4 explosive.



LASERS

Fire high energy coherent light beams. The effect is similar to the detonation of a small explosive charge on the target's surface, as the energy deposited causes ablation due to rapid transformation of the surface to plasma. All Project lasers can fire up to ten pulses per second or continuously for three minutes. After three consecutive minutes of continuous discharge, the laser overheats and takes twenty minutes to cool and reset.

NAME	LASER MK 1
TYPE	200kW laser
WT.	1200kg
EFF. RNG.	5000m
E-FACTOR	100 per second
POWER OUTPUT	200kW
MP DEPLOYMENT	2013

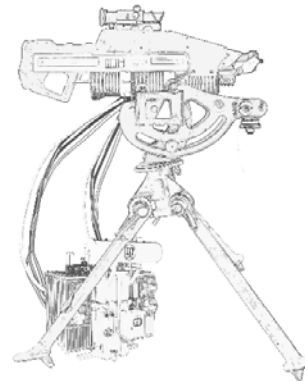
COMMENTS

This is a vehicle mounted solid state infrared laser. It requires a fusion reactor to run. The beam can penetrate over 6cm of steel per second, which is about 30 times faster than the most powerful industrial lasers. The output can be tuned for cutting or welding. The main role for the weapon is point or area defense from artillery rounds and missiles.

NAME	LASER MK 2
TYPE	50kW laser
WT.	100kg assembled (40+40+20kg tripod)
EFF. RNG.	2000m
E-FACTOR	25 per second
POWER OUTPUT	50kW
MP DEPLOYMENT	2013

COMMENTS

The weapon has an integral tripod mount. It requires an external power supply. The beam from this laser penetrates 1.5 centimeters of steel a second. A modified version can be mounted on the HAAM suit.



WEAPONS ISSUE

Individual team members are allocated a basic weapon load. This consists of a primary weapon, a sidearm, ammunition and magazines for both, and an assortment of grenades or explosives. These loads average 20 kilos each so that when included with the basic personal load the total does not exceed the 41 kilo standard. Some examples are listed below.

Heavy weapons (light machineguns, grenade launchers, mortars, rocket and flame weapons) are issued to a team. Unfortunately, someone might need to carry them around the countryside. It is expected that extra ammunition for these would either be carried among the team or stored in their vehicles.

SOME EXAMPLE INDIVIDUAL BASIC LOADS

RIFLE/SMG

LOAD #1

WT. 19.94 (19.99/20.04/19.24)kg
1 Stoner M22 (M23/M16/M4) w/12 mags
1 HP-35 w/3 mags
4 M67 Grenades
4 M34 WP Grenades
2 M72A2 LAWs

LOAD #2

WT. 19.95 (20/20.05/19.25)kg
1 Stoner M23 (M22/M16/M4) w/12 mags
1 HP-35 w/3 mags
8 M67 Grenades
4 M34 WP Grenades
4 Mk3A2 Grenades
2 M6 CN-DM Grenades

LOAD #3

WT. 20.34 (19.58/18.54/18.52/17.72)kg
1 UZI (M10/MP5/M16/M4) w/12 mags
1 HP-35 w/3 mags
4 M67 Grenades
2 M34 WP Grenades
2 M72A2 LAWs

LOAD #4

WT. 18.82 (19.58/17.78/17.76/16.96)kg
1 M10 (UZI/MP5/M16/M4) w/12 mags
1 HP-35 w/ silencer & 3 mags
4 M67 Grenades
2 M6 CN-DM Grenades
2 M9A1 BZ Grenades
2 M34 WP Grenades
3 HAFLA-35Ls

SHOTGUN

LOAD #5

WT. 19.68 (16.68/17.48)kg
1 Atchisson w/4 drums (Rem. 870/M10B+100 shells)
1 HP-35 w/3 mags
4 M67 Grenades
4 M34 WP Grenades

LOAD #6

WT. 20.06 kg (19.26)kg
1 M10B (Rem. 870) w/50 rds
1 M27-3 1/2 w/24 rds
8 M67 Grenades
6 M34 WP Grenades
3 M7A3 CS Grenades
3 M9A1 BZ Grenades

SNIPER

LOAD #7

WT. 20.14 (13.68)kg
1 M21 w/12 mags (M24 w/50 rds)
1 HP-35 w/3 mags
4 M67 Grenades
4 M34 WP Grenades

GRENADIER

LOAD #8

WT. 23.8 (24.56/22.54/22.85/22.9)kg
1 M10 (UZI/MP5/M23/M22) w/6 mags
1 HK69A1 w/36 rds 40mm
1 HP-35 w/3 mags
4 M67 grenades
2 M7A3 CS grenades
2 AN-M14 TH3 grenades

LOAD #9

WT. 23.34 (22.54)kg
1 M16A2/M203 (M4/M203) w/36 rds 40mm & 12 mags
1 HP-35 w/3 mags
4 M67 Grenades

BASE OF FIRE/MMG

LOAD #10

WT. 18.38kg
1 Stoner Mk 23 w/4 belts
1 HP-35 w/3 mags
4 M67 Grenades
4 M34 WP Grenades

LOAD #11

WT. 19.83kg
 1 M240/MAG-58 w/3 belts
 1 HP-35 w/3 mags
 2 M67 Grenades
 1 M34 WP Grenade

LOAD #12

WT. 19.28kg
 1 Stoner M207 w/4 belts
 1 HP-35 w/3 mags
 4 M67 Grenades
 4 M34 WP Grenades

LOAD #13

WT. 24.45kg
 1 M60 w/3 belts
 1 HP-35 w/3 mags
 2 M67 Grenades
 2 M34 WP Grenades
 2 AN-M8 HC smoke Grenades

HEAVY WEAPON

LOAD #14

WT. 27.89kg
 1 M9A1-7 Flamethrower
 1 HP-35 w/3 mags
 2 AN-M14 TH3 Grenades
 3 HAFLA-35Ls

LOAD #15

Wt. 31.99 (32.75/31.49/31.8/31.85) kg
 1 M202A1 w/3 clips
 1 M10(UZI/MP5/M23/M22) w/6mags

LOAD #16

WT. 34.4kg (18.74kg)*
 1 FIM-92 Stinger and 1 missile
 4 M67 Grenades
 2 M34 WP Grenades

LOAD #17

WT. 19.8 (20.56/19.3/19.61/19.66/19.64/18.84)kg
 1 ARMBRUST 300
 1 M10 (UZI/MP5/M23/M22/M16/M4) w/6 mags
 1 HP-35 w/3 mags
 4 M67 Grenades
 4 M34 WP Grenades
 2 M7A3 CS Grenades

LOAD #18

WT. 44.72 (45.48/44.22/44.53/44.58/44.56/43.76)kg
 33.25 (34.01/32.75/33.06/33.11/33.09/32.29kg)*
 1 M47 Dragon w/2 missiles
 1 M10 (UZI/MP5/M23/M22/M16/M4) w/6 mags
 2 M67 Grenades
 2 M34 WP Grenades

MEDICAL ISSUE

A medics or doctors load includes all the standard issue equipment plus a sidearm. A large medkit and a surgical kit are usually carried. An assistant would carry a weapon and well as a drug kit.

#19 MEDIC/DOCTOR

WT. 20.02 kg
 1 HP-35 w/3 mags
 2 AN-M8, HC smoke grenades
 1 Surgical kit
 1 Large medkit
 1 universal antibody/antidote system

#20 ASSISTANT

WT. 22.16 (22.11/22.1/21.3)kg
 1 Stoner M22 (M23/M16/M4) w/4 mags
 1 HP-35 w/3 mags
 4 M67 Grenades
 1 drug kit

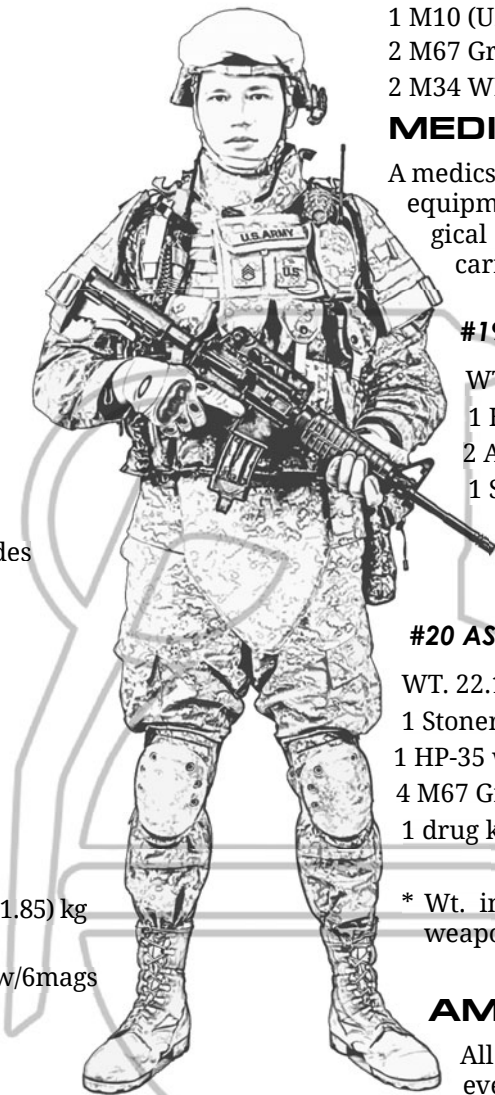
* Wt. in brackets is with one load in the primary weapon.

AMMUNITION SUPPLY

All of the firearms in the Morrow Project will eventually have their ammunition supply exhausted. To resupply individual and vehicular basic loads supply dumps were placed throughout the countryside (see Installations).

To allow for easy exchange of ammunition the NATO designation is used. If a weapon uses 5.56x45mm rounds it may fire that size only. In the case of an automatic weapon that uses linked ammo, the rounds must be in belts for the weapon to function. Linked ammunition is normally found in combat loads, with different bullet types linked in a repeating order.

The following list shows the types of ammunition available in the Morrow Project and the Project's weapons that they fit in.



AMMUNITION

- 9x19mm Ball: HP-35, Glock pistols, all submachine-guns.
- .357 Magnum Ball: S&W M27-3 ½
- .44 Magnum Ball: S&W M29-61/4
- .45 Long Colt Ball: Taurus 410
- 5.56x45mm Ball, Tracer: Stoner M22 & M23, M16 series, M4
- 5.56x45mm Linked: 4 Ball, 1 Tracer: Stoner Mk 23 & M207
- 7.62x51mm Ball, Tracer: M21, M24.
- 7.62x51 mm Linked: 4 Ball, 1 Tracer: M60, M240/MAG-58
- 12.7x99mm Linked: 4 API, 1 API-T: M2HB
- 20mm Linked: 2 HEI, 3 API: Rh 202
- 12 Gauge Magnum 00 Buckshot: All shotguns.
- .410 bore shot shells: Taurus 410
- 40x46mm Grenades: M79, M203, M174E3, HK69A1
- 40x53mm Grenades: Mk19

AMMUNITION PACKAGING

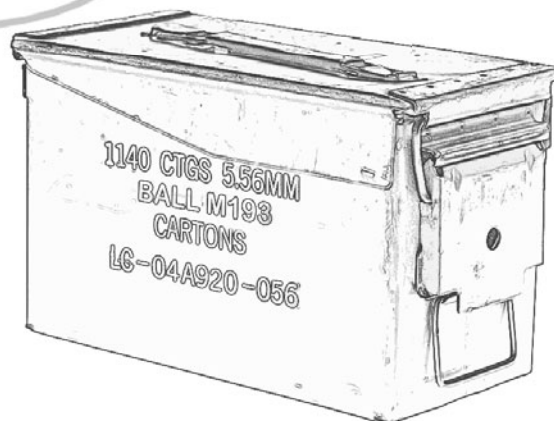
The following list is of the small arms ammunition that is always found in a supply dump. The list shows only that ammunition that is not covered elsewhere in the book.

- 9x19mm Ball, 50 rounds to a carton, 10 cartons to a metal case, 2 cases to a can.
1000 cartridges per can.
Case wt. 20.3kg.
- .357 Magnum Ball, 50 rounds to a carton, 50 cartons to a metal-lined wooden box.
2500 cartridges per case.
Case wt. 41.73kg
- .44 Magnum Ball, 50 rounds to a carton, 12 cartons to a metal can, 2 cans to a wooden case. 1200 cartridges per case.
Case wt. 43.09kg
- .45 Long Colt Ball, 50 rounds to a carton, 10 cartons to a metal case, 2 cases to a can.
1000 cartridges per can.
Case wt. 30kg.
- 5.56x45mm Ball or Tracer, 20 rounds to a carton, 41 cartons to a metal box, 2 boxes to a wooden case.
1640 cartridges per case.
Case wt. 31.29kg
- 5.56 x 45mm Linked, 150 rounds to a bandoleer, 4 bandoleers to a metal box, 2 boxes to a wooden case.
1200 cartridges per case.
Case wt. 31.29kg

- 7.62x51mm Ball or Tracer, 20 rounds to a carton, 23 cartons to a metal box, 2 boxes to a wooden case
920 cartridges per case.
Case wt. 31.29kg
- 7.62x51mm Linked, 100 rounds to a bandoleer, 2 bandoleers to a metal box, 4 boxes to a wooden case.
800 cartridges per case.
Case wt. 34.92kg
- 12.7x99mm Linked, 105 rounds per metal box, 2 boxes per wooden case.
210 cartridges per case.
Case wt. 37.64kg
- 20mm Linked, 100 rounds per metal box
100 cartridges per case.
Case wt. 43.09kg
- 12 Gauge Magnum 00 Buckshot, 25 rounds to a carton, 20 cartons to a wooden case.
500 cartridges per case.
Case wt. 39.91 kg
- .410 bore shot, 50 rounds to a carton, 10 cartons to a metal case, 2 cases to a can.
1000 cartridges per can.
Case wt. 40.3kg.

EXPLOSIVE SUPPLIES:

- Primercord, 8 152m rolls per case. Package wt. 56.65kg.
- M2A1 Detonator, 200 per case. Package wt. 27.9kg
- M1 Timer/Detonator, 150 per case. Package wt. 26kg. Use same stats for M57 detonator.
- M700 Time fuse, 80 15m coils per case. Package wt. 29kg
- Blasting caps, 3600 per case. Package wt. 51.5kg
- M60 Fuse igniter, 300 per case. Package wt. 25.2kg.



AMMUNITION COUNTS

The firearms in the Project all hold limited amounts of ammunition, either in a belt, magazine, or some other feed device. These weapons can run out of ammunition quickly, especially with automatic fire. To help keep a count of the ammunition used and that amount still available the following system has been developed.

An example of an ammunition count sheet is as follows.

M10 Ingram submachinegun, three 30 rd. magazines, short burst = 4 rds., medium burst = 8 rds., long burst = 12 rds.

***** _ ***** _ ***** _ _ _

* = short burst

_ = reload

_ _ _ = out of ammunition

To use the sheet, one or more of the asterisks would be crossed out each time the weapon was fired. When a dash is reached the magazine is empty and the weapon must be reloaded. When three dashes are reached the weapon is completely out of ammunition. In the case of semi-automatic fire, a separate count is kept of the individual shots and when they add up to a short burst an asterisk is marked off. For a semi-automatic weapon, there would be an asterisk for each round in the magazine since it cannot fire a burst. This system is also used for keeping track of other supplies that can be used up, such as grenades, blocks of explosives, medkit injections and so on.

Note: A magazine is not designed to be thrown away after being used. Ammunition is replaced in it and it is used again. There are always some spare magazines at a supply dump but empties should not be thrown away unless absolutely necessary.



MORROW PROJECT EQUIPMENT

PROTECTIVE AND SURVIVAL EQUIPMENT

The greatest advantages the Project teams have are their training, dedication and equipment. Morrow teams are generously supplied with gear that is in excellent condition. Team members have the necessary expertise to keep their supplies in good order (and PDs may wish to inflict 1-2 hours of maintenance time on their players). Their gear is also a great liability, especially when dealing with greedy unscrupulous types.

BASIC PERSONAL LOAD

(Wt. 21kg)

- 1 Pair Coveralls (1.7kg)
- 1 Pair boots (1.5kg): Steel capped toe and heel, armored sole (AV B4, NB4)
- Beret (pre-1985 teams) or Baseball cap (post-1985 teams)
- Pair of light leather gloves (.2kg)
- AN/PRC-68 radio (1.4kg)
- Morrow Project ID card
- Compass
- Perry whistle
- Swiss army type pocket knife (.1kg)
- Waterproof wristwatch
- Hardcover notepad & pen/pencil
- Survival kit (.2kg)
- Generator flashlight (.4kg)
- 3 canisters wind/waterproof matches (50 each)
- 1 set load bearing equipment (web gear) (1kg)
- 1 KCB-70 knife/bayonet (.8kg): contains screwdriver and hacksaw, sheath + knife forms wire-cutter.
- 1 Personal medical kit (.7kg)
- 1 liter canteen w folding cup (1.2kg filled)
- 1 M1 CBR kit (.8kg)
- 1 M7A1 protective mask in carrier (1.3kg)
- Project rucksack (1.5kg)
- Cold weather jacket (1kg): Rating 4.
- 5 liter folding canteen with carrier (.5kg empty)
- Waterproof rain poncho/shelter half (.5kg)
- Bungees/tent pegs for shelter
- 30m parachute cord (.5kg)
- Spare pair Coveralls (1.7 kg)
- 3 sets underwear (.6kg)
- Sleeping bag (1.6kg)
- Foam sleeping mat (.4kg)
- Mess kit (2 mess tins, knife, fork, spoon) (.6kg)
- Toilet kit (.2kg)
- Weapons cleaning kit (.1kg)

BODY ARMOR

NAME	COVERALLS
TYPE	Body Armor
ARMOR VALUE	7 ballistic, non-ballistic 4.
WT.	1.7 kg
UNIT OF ISSUE	Pr.

COMMENTS

The Morrow Project standard uniform. The coveralls are made of a bullet-resistant resistweave cloth. They have pockets, a zip-on hood, and are water resistant. On the right shoulder is the Morrow Project patch with a unit (MARS, Recon, etc.) patch and bar on the left shoulder. A name tape is above the right chest pocket.

NAME	PASGT HELMET
TYPE	Body Armor
ARMOR VALUE	14 ballistic, non-ballistic 4.
WT.	1.7kg
UNIT OF ISSUE	Ea.
MP DEPLOYMENT	1987

COMMENTS

First generation Kevlar helmet. A clip-on face shield with the same armor value is available and weighs the same as the helmet.



NAME	PASGT VEST
TYPE	Body Armor
ARMOR VALUE	14 ballistic, non-ballistic 2.
WT.	4kg
UNIT OF ISSUE	Ea.
MP DEPLOYMENT	1987
COMMENTS	
A vest that covers the chest and upper abdomen. If layered with the basic coveralls, the net protection is 17 ballistic, 5 non.	



NAME	INTERCEPTOR BODY ARMOR
TYPE	Body Armor
ARMOR VALUE	Vest base 14 ballistic, non-ballistic 2. Inserts 17/3
WT.	3.8kg for vest, plates 1.8kg each for total 7.4kg
UNIT OF ISSUE	Ea.
MP DEPLOYMENT	1999

COMMENTS
This improved body armor system protects the front and rear torso. The ceramic composite plates can withstand up to three hits by 7.62x51mm rifle rounds. Additional plates to protect the side of the torso, neck and groin can be fitted, but this increases the weight of the armor by another 8.2kg. The outside of the suit has PALS (Pouch Attachment Ladder System) webbing, a grid that allows a variety of load bearing gear to be attached. If layered with the basic coveralls, the net protection is 20 ballistic, 5 non in the plated areas. Other zones are protected at 17/5.



ENVIRONMENT

NAME	CAMP KIT
TYPE	Camping equipment
WT.	21kg
UNIT OF ISSUE	Ea.
COMMENTS	A plastic crate containing camping gear for six people

Crate contents:

- Two four-person dome tents (4kg each) – The extra space is intended for prolonged occupation or gear storage. The tents have large awnings, to create a covered space for cooking or gear storage.
- Two green eyeleted plastic tarps, 2x3m (1.5 kg each).
- A spare set of poles & pegs for tent, plus bungees, parachute cord etc to rig tarps as shelters, vehicle awnings etc (1kg).
- Water purification pump, with two spare filters, good for a month's use each (2 kg).
- Lightweight multi-fuel stove (1.5kg).
- Aluminum field cooking kit (Two pots w lids/frying pans, enamel plates, serving spoon, ladle, strainer etc) (2.5kg).
- Two battery powered rechargeable electric lanterns (1 kg each, run 36hrs on one four-hour charge).
- A 10 liter (2.5 gallon) folding water carrier, with shoulder straps and hanging loop. It comes with a pouring tap and sprinkler nozzle to rig it as a field shower. (1kg)

NAME, TYPE	CONTACT KIT
WT.	13kg
UNIT OF ISSUE	Ea.

COMMENTS

This contains clothing and personal effects that an itinerant survivor might possess. It is aimed to provide disguise to Project contact specialists and other personnel. All items look worn, but are in good condition. Typical items include: clothing (hat, shirt, jeans, jacket, boots, belt, socks, underwear), eating utensils, a cup and canteen (often mismatched or improvised e.g. an old soda bottle as a canteen), fire making equipment, twine, knife, blanket, poncho, and miscellaneous items like playing cards, pen and paper, a watch, etc.

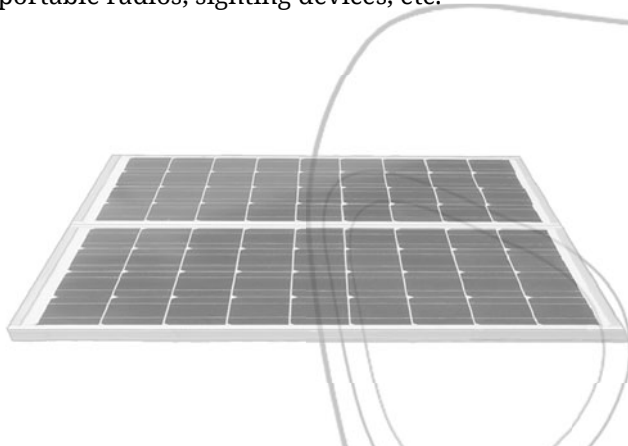
NAME	EXTENDED COLD WEATHER CLOTHING SYSTEM ("EK-WAX")
TYPE	Cold Weather Personal Equipment
WT.	8.16kg
UNIT OF ISSUE	Set
COMMENTS	A box containing a set of synthetic cold weather clothing (underwear, pants, parka, balaclava, cap, gloves, mittens, socks, 2 pairs of boots etc.) good for protection to -50°C (-60°F). The box also contains a white camouflage coverall. Cold Protection rating 12 to body, 8 to feet, 7 to hands when full set worn.



NAME	M85 SOLAR POWER UNIT
TYPE	Power supply
WT.	3kg
UNIT OF ISSUE	Ea.
MP DEPLOYMENT	1987

COMMENTS

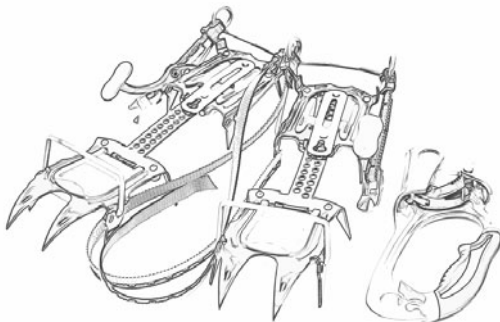
This folding photoelectric array opens to one square meter (10.8 square feet). It can be used to recharge batteries. The array can intercept about 5kWh per day, assuming good weather. Most small battery powered items can be recharged in 1-6 hours e.g. portable radios, sighting devices, etc.



NAME	MOUNTAIN KIT
TYPE	Mountain Climbing Equipment
WT.	12.83kg
UNIT OF ISSUE	Set

COMMENTS

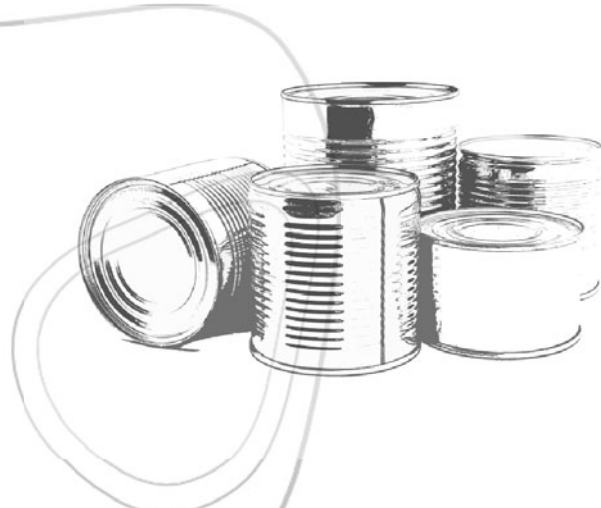
A large pack containing the materials needed for rock climbing. The pack contains the following; two 33m coils of 11mm nylon rope (breaking strength 1700kg), a folding grappling hook, 20 pitons (spikes for attaching rope to rocks), 30 snaplinks (rings for attaching the rope to a piton), a 225 gram hammer for driving in and removing pitons, and a set of climbing spikes for added traction. The set also has 6 M688 rocket shells for launching the grappling hook from the M79 grenade launcher.



NAME	RATION PACK, 60 PERSON-DAYS
TYPE	Food Supply
WT.	35kg
UNIT OF ISSUE	Ea.

COMMENTS

This is simply a backpack of dehydrated food, canned juices, and vitamins sufficient for 4 people for 15 days. The pack also contains materials for heating, a folding pot, and water purification tablets.



NAME	TRADE PACK
TYPE	Contact kit
WT.	15kg
UNIT OF ISSUE	Ea.

COMMENTS

This is a pack containing luxury items for trade to locals. The pack contains 60 gold double eagle coins, 50 silver dollars, 6 one liter bottles of liquor, tobacco, candy, 6 sewing kits, 4 mirrors, 6 combs and brushes, various toilet articles, 6 knives and a selection of fishing gear.

NAME	UTILITY PACK
TYPE	Tool kit
WT.	20kg
UNIT OF ISSUE	Ea.

COMMENTS

The "Odds & sods box" is a strong plastic crate with lid, containing miscellaneous items that the mission planners thought teams were likely to find necessary or useful.

MORROW PROJECT EQUIPMENT

An example list of contents includes:

TOOLS:

- 15m (50 ft) electrical extension cord on reel (1kg)
- Battery charger and set of common rechargeable batteries (6 each AAA to D cells) (.5kg charger, plus 1.5kg for batteries)
- Set of basic spares for team equipment (replacement bulbs, fuses etc) (.5kg)
- Waterproof writing case (Chino graph board & pencils, 4 pens, 4 pencils, 2 pads graph paper, scientific calculator, steel compass, scissors, protractor, ruler & set squares) (1.5kg)
- Two pairs of heavy-duty kitchen scissors (.1kg each)
- Box of 24 HB pencils, with erasers (.1kg)
- Magnifying glass (.1kg)
- 20m (~65ft) tape measure
- 10m (~35ft) Plumb line
- Two magic markers (.1kg each)
- Two cans spray paint (orange & black) (.4kg each)
- Windup alarm clock (.3kg)
- Claw hammer & nails (1kg)
- 50m (~150ft) parachute cord (.1kg)
- Sharpening kit
- Sewing kit (needles, thread, buttons, cloth for patches etc) (.2kg)
- Two small metal mirrors, for shaving or signaling (.1kg each)
- Two rolls of electrical tape
- Three tubes of superglue (.1kg)
- Two 12 liter (3 gallon) Plastic buckets (.75kg each)
- Pack of Ziploc bags, cable ties, rubber bands, paper clips, safety pins etc
- Box (100 pairs) disposable surgical gloves
- Pair of rechargeable hair clippers (.5kg)

SURVIVAL AND SAFETY EQUIPMENT:

- Two mesh high-visibility vests, with reflective panels (.3kg each)
- First aid manual (simple step-by-step guide, intended for people without training) (.5kg)
- Project field manual (diagrams of basic water & sewage filtration setups, formulas for useful compounds like black powder and bleach, how to make soap, napalm etc) (.5kg)
- Four aluminum foil "space blankets" (.2kg each)
- Four heavy orange polythene "survival bags" (50 liter capacity, .3kg each)
- Set of wire snares, fish hooks & line
- Six sets of earplugs for high-noise environments

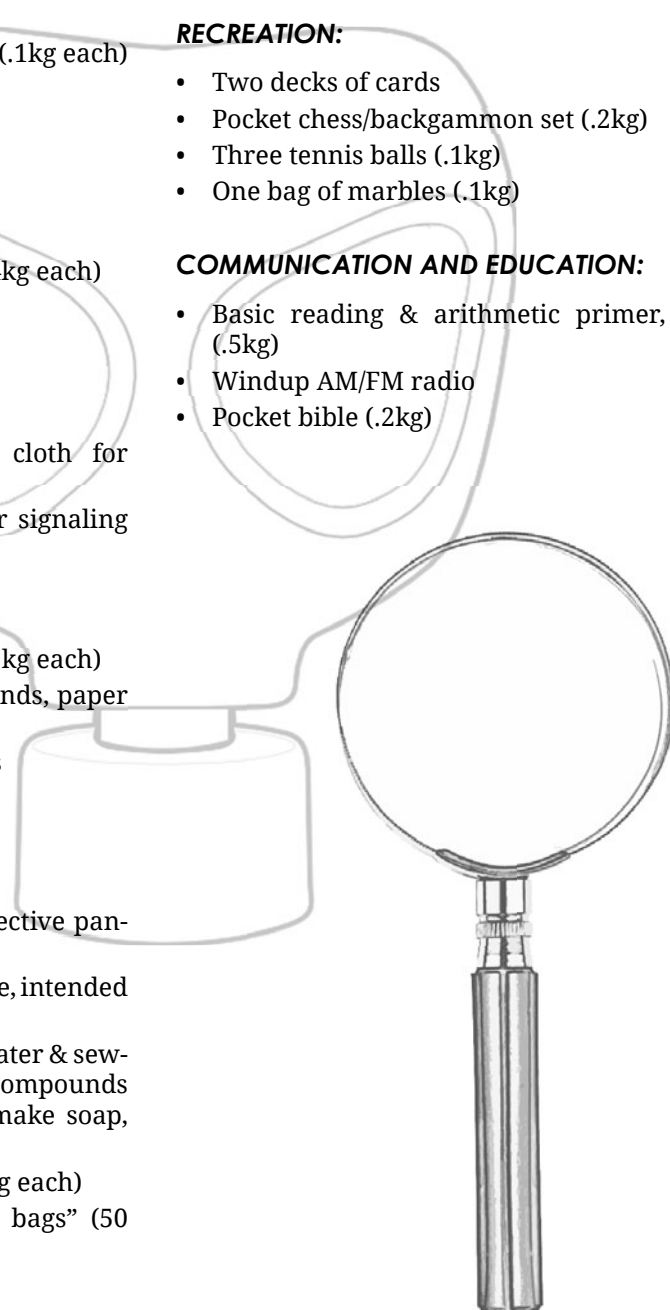
- Mini dental kit (instruments, temporary fillings etc) (.4kg)
- Two bottles of insect repellent (.4kg)
- Two bottles of high-factor sunscreen (.4kg)
- \$1000 in \$ 20 bills
- \$5 in quarters
- Two rechargeable stun guns (10 shots, .2kg each)
- Two cans pepper gas spray (10 uses, .2kg each)
- Three pairs police-issue handcuffs, with keys (.3kg each)
- Two padlocks, with keys (.4kg each)

RECREATION:

- Two decks of cards
- Pocket chess/backgammon set (.2kg)
- Three tennis balls (.1kg)
- One bag of marbles (.1kg)

COMMUNICATION AND EDUCATION:

- Basic reading & arithmetic primer, for teaching (.5kg)
- Windup AM/FM radio
- Pocket bible (.2kg)



HAZARD GEAR

NAME	M17A1
TYPE	Protective Mask
WT.	1.3kg; replacement filters 0.2kg
UNIT OF ISSUE	Ea.

COMMENTS

This is a protective gas mask. Its filters provide protection from any gas or biological agent that has to be inhaled to be effective. The filters last 12 hours under use after which they must be replaced. The mask has an attachment that allows a drink to be taken from a canteen while worn.



NAME	M1 CBR KIT
TYPE	Detector Kit
WT.	.8kg
UNIT OF ISSUE	Ea.

COMMENTS

An air sampling detector set for chemical and biological agents as well as radiation. It will sound an alarm and identify any dangerous chemicals or biological agents in the area. It takes two combat turns to detect and identify a hazard. The device also acts as a dosimeter, keeping a record of the amount of radiation the person wearing it has been exposed to.

NAME	HAZARD SUIT
TYPE	Protective Coverall
WT.	1.5kg
UNIT OF ISSUE	Ea.

COMMENTS

A rubberized plastic overgarment, gloves, boot covers and hood with integral layers of activated charcoal designed to protect against biological, chemical and some forms of radiological contamination for up to six hours. The hood contains a mask equivalent to the M17A1. Ballistic AV 1, Non-B 3.

NAME	HAZARD SUIT MK II
TYPE	Protective Suit
WT.	Rebreather system 15.8kg, suit 3.5kg
UNIT OF ISSUE	Ea. To selected teams

COMMENTS

This full-body positive pressure suit with perspex visor provides up to 12 hours of protection against biological, chemical and radiological threats. It is made from multiple layers of impermeant plastic (e.g. Tyvek), rubber and activated charcoal. The outside layer is reinforced with aluminum foil and fiberglass. The backpack rebreather unit has an endurance of four hours. Ballistic AV 2, Non-B 4.

MEDICAL EQUIPMENT

NAME	MEDKIT
TYPE	Individual First Aid Kit
WT.	.7kg
UNIT OF ISSUE	Ea.

COMMENTS

A medical kit that will fit on an equipment belt. The contents can be used to treat wounds, burns, infections, allergic reactions and some poisonings. There are eight doses of each of the following drug types in the kit: antidote for nerve agents, antibiotics, analgesics, sedatives, and stimulants. These need to be loaded into an injector to be administered. The kit also includes bandages, two tourniquets and a foil space blanket. A larger (5kg) version exists in satchel form. It is intended for use by medics or doctors, and contains diagnostic equipment as well as more drugs and supplies.

MORROW PROJECT EQUIPMENT

NAME SURGICAL KIT

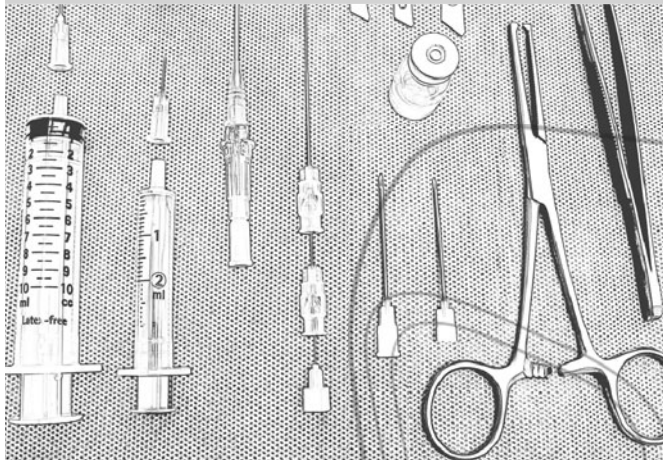
TYPE Medical kit

WT. 11.3kg

UNIT OF ISSUE Set

COMMENTS

A large backpack kit for use by doctors or medics. The kit contains instruments and supplies to conduct major operations in the field.



NAME DRUG KIT

TYPE Treatment supplies

WT. 13.6kg

UNIT OF ISSUE Set

COMMENTS

A complement to the surgical kit. This pack contains various drugs and the means for administering them as well as instructions for their use. The kit contains 20 doses of any given major drug. Also contained in the kit are 6 reloads for medkits or one reload to a large medkit.



NAME 'UNIDRUG' UNIVERSAL ANTIBODY/ANTIDOTE

TYPE Nanomedicine

WT. 0.9kg total; programming module 0.4kg; 20 doses weigh 0.5kg

COMMENTS

A revolutionary development in nanotechnology, deployed in the final Project update. The system includes a programming module and delivery system. A sample of the patient's blood needs to be placed in the module so that the nanomachines recognize their new host and the target germ or poison. Once they are 'tuned', they can be administered. In game terms, the patient automatically stabilizes and has a bonus of 30% to their first recovery roll. On an Exceptional Failure, they 'crash' and require resuscitation. Untuned Unidrug is highly toxic and acts like blood agent poisoning. There is no antidote.

NAME MED UNIT

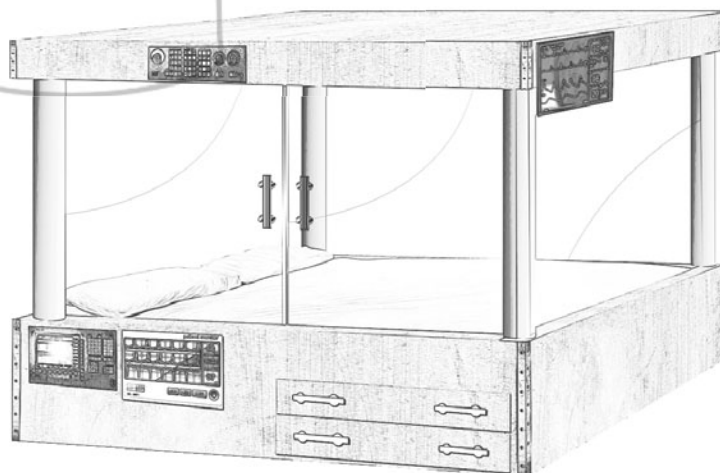
TYPE Medical Treatment Center

WT. 272kg

UNIT OF ISSUE Ea.

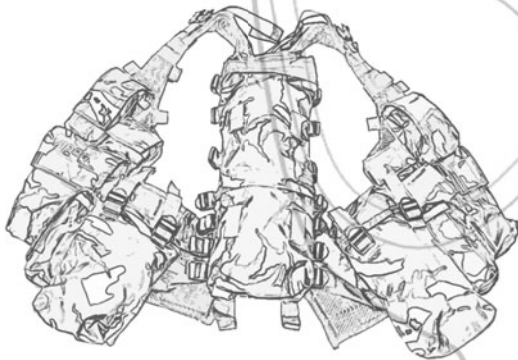
COMMENTS

This is a large enclosed bed with attached medical support equipment. It is normally found in bases and in the MARS-ONE and Scientific-one vehicles. The unit is self-contained and may be used as an operating theater with a sterile environment. It can be used to initiate cryo-sleep.



OTHER LOAD-BEARING EQUIPMENT

NAME	BASIC WEB GEAR
WT.	1kg empty
COMMENTS Olive-drab nylon belt, shoulder harness, ammo pouches and pistol holster. There are multiple attachment points on the belt and harness for the pouches. Other equipment can be affixed e.g. knife, medical kit, CBR kit, etc. Two types of magazine pouch are standard issue. The first can hold any one of: four rifle magazines, six SMG magazines, one 150 round ammo belt (5.56 or 7.62mm), eight 40mm grenades, 25 12 gauge shotshells, four hand grenades. The second can hold two pistol magazines or two dozen loose rounds. It's usual to carry one small and two large pouches. The holster is ambidextrous and can be attached to the belt in a variety of positions, or rigged as a shoulder holster.	



NAME	GRENADIER'S VEST
WT.	0.6kg empty
PACKAGE WT.	6.6kg
COMMENTS This front of this mesh vest is covered in pouches that can hold 24 40mm grenades. The other twelve rounds in the loads listed above are held in two to four belt pouches.	

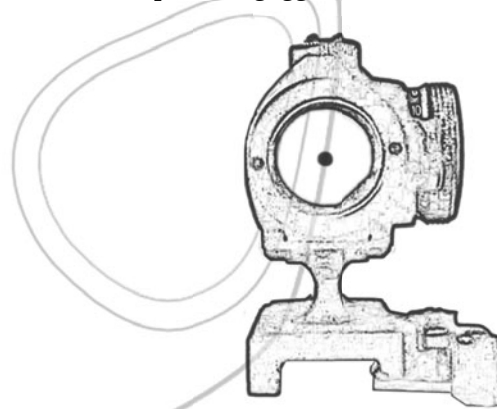


SENSORS, COMMUNICATIONS AND DATA STORAGE

NAME	AIMPOINT COMPM2/M68 CLOSE COMBAT OPTIC
TYPE	Red-dot reflex sight
WT.	.2kg
EFF. RNG.	600m
BATTERY LIFE	5000 hours
PERFORMANCE	1x magnification.
MP DEPLOYMENT	1999

COMMENTS

This telescopic sight projects a red dot into the shooter's field of view. It allows the rapid placement of accurate fire. It adds a +10% bonus to the first action spent aiming, and can be used with night vision scopes and goggles.



NAME	AN/PAS-7
TYPE	Thermal (infrared) viewer
WT.	5kg
EFF. RNG.	400/3000m
BATTERY LIFE	48h
PERFORMANCE	4.5x magnification. Ignores light penalties.

COMMENTS

Detecting heat, this sighting device relies on temperature differences to obtain contrast. A warm body hiding in a tree or a cold vehicle under brush is easy to spot. Fog, rain and smoke are transparent to infrared. A man-sized object can be readily spotted at 400m; hotter objects can be spotted much further away – the 3000m value is for a running car or truck engine (+10% per 5°C [9°F] difference between object and background).

NAME	M9823 STARLIGHT SCOPE OR AN/PVS-2
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TYPE	Night vision sight
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WT.	1.75kg or 2.7kg
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EFF. RNG.	RNG. 600m
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BATTERY LIFE	48h
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PERFORMANCE	4x magnification. +50 to visibility penalties caused by darkness.
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COMMENTS

A first generation light amplifying telescopic sight. Some ambient light is required for the scope to work. It can be mounted on most rifles and machine-guns.

NAME	AN/PVS-5
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TYPE	Night Vision Goggles
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WT.	.41kg
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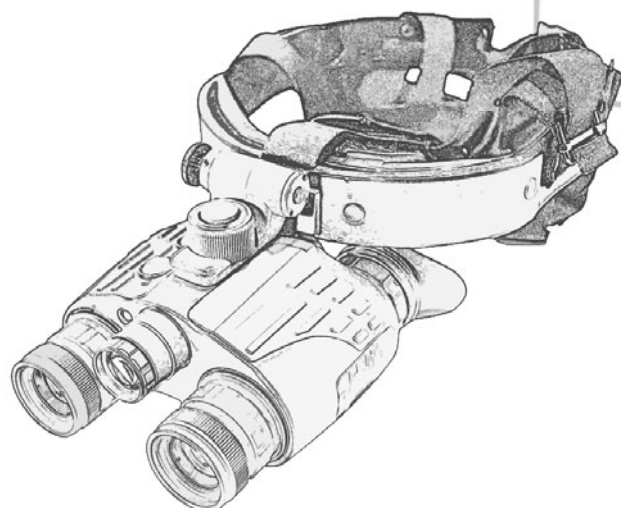
EFF. RNG.	150m
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BATTERY LIFE	100 hours
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PERFORMANCE	4x magnification. +70 to visibility penalties caused by darkness.
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COMMENTS

A passive second generation light amplification device designed to be worn on the head with or without helmets. It has a built-in infrared light source to aid with close-up work (the range value given). They are normally worn by drivers so they can avoid using lights. A map can also be read while using these binoculars. Eye strain is a problem with prolonged use (more than 4 hours).



NAME	CP-7 LASER RANGE-FINDER
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TYPE	7x45 binoculars/rangefinder
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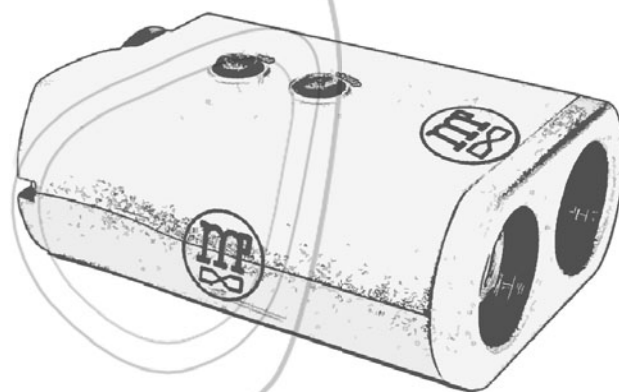
WT.	1.7kg
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EFF. RNG.	160-3000m
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BATTERY LIFE	600 'shots' (rangings)
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COMMENTS

A pair of 7x binoculars with a built-in laser transmitter and receiver. When aimed at a target and 'fired' the range to the target is immediately shown inside the eyepiece. The laser's pulse is too quick and weak to be detected by the target.



NAME	AN/PRC-68
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TYPE	Personal Communicator
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WT.	1.4kg
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EFF. RNG.	Up to 5km; usually 300m with short antenna, 1.6km with long.
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BATTERY LIFE	36 hours. Output 1-2 watts.
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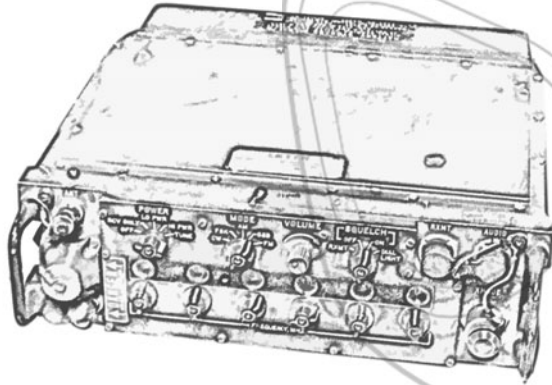
COMMENTS

A small VHF pocket communicator. This radio has a telescoping antenna, a built-in microphone, an earphone, and a lanyard for attaching it to an equipment belt. It also has a built-in voice scrambler which can be turned on or off and is automatically decoded by another Morrow Project radio. The unit can be used with the antenna collapsed or extended. With the antenna collapsed the unit will fit into a shirt pocket but the range is cut in half. The batteries are recharged by plugging them into a vehicular power system.

NAME	AN/PRC-70
TYPE	Backpack Communicator
WT.	17.7kg
EFF. RNG.	25 to 40km (backpack antenna)/800 to 4,000km
BATTERY LIFE	30 hours. Output 3-41 watts.

COMMENTS

A man-pack multi-mode (AM/DSB, AM/SSB, FM, CW, FSK) radio suitable for vehicular and portable use. With the backpack antenna the range is 40 kilometers, with the larger vehicular antenna the range reaches 4,000 kilometers with CW (Morse code only). This radio also has an integral voice-scrambler. The batteries can be recharged from a vehicular power system and the radio can be used while charging.



NAME	MAGNETIC SENSOR
TYPE	Metal locator/detector
WT.	15kg
EFF. RNG.	600m
BATTERY LIFE	12h

COMMENTS

A highly sensitive magnetometer that will detect objects over 200 grams in weight. When set on automatic it will sound an alarm and indicate the range, direction, and size of any ferromagnetic object of sufficient mass. It has a 'dead space' of 1m around the device itself in which it will not react. The detector can be mounted in vehicles and use that power supply or use batteries.

NAME	AN/PPS-05
TYPE	Portable Radar
WT	6.35kg
EFF. RANGE	1500m
BATTERY LIFE	12h

COMMENTS

A portable Doppler radar set. This device will detect moving objects, including aircraft. The base range is given for man-sized targets; add 50m range for every MASS point above 12. The set will indicate the approximate size, range, speed and direction of the object detected with an audible tone as well as a numerical display. It has a proximity alarm that can be programmed to go off if something approaches.



MORROW PROJECT EQUIPMENT

NAME	AUTONAV
TYPE	Automatic navigation system
WT.	17kg

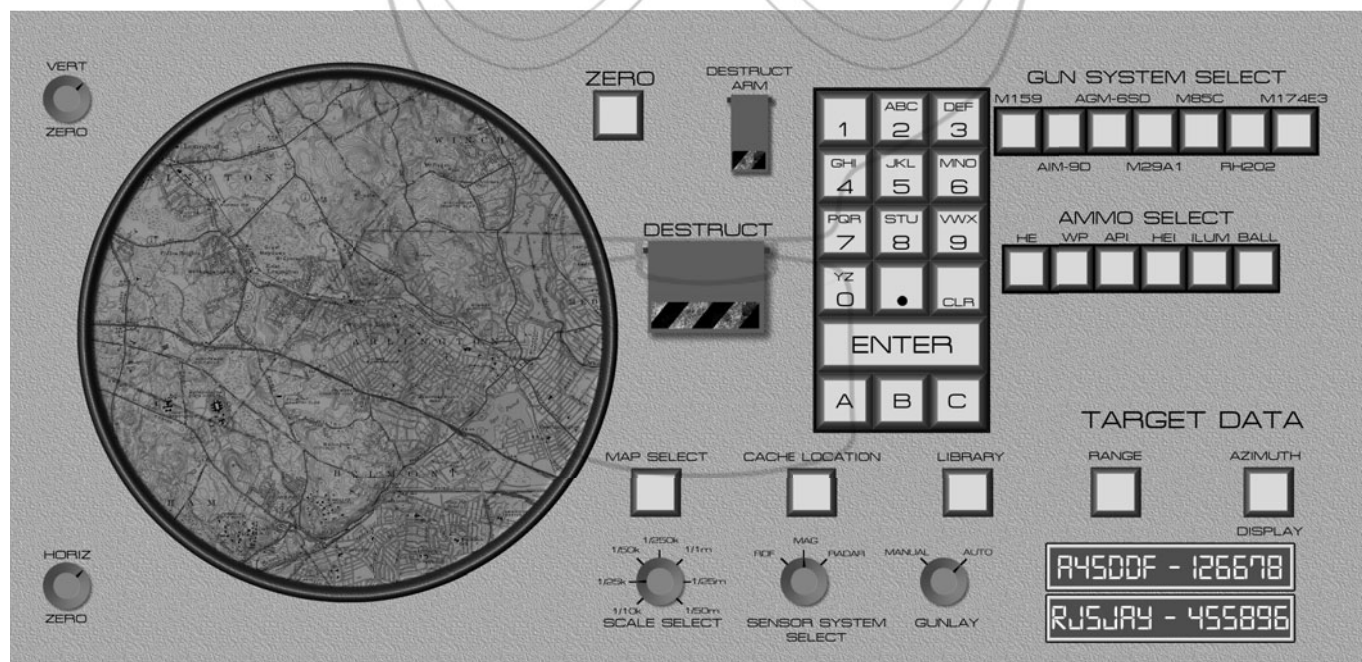
COMMENTS

A vehicle mounted, inertial navigation system. It runs off the vehicle's power supply and has an internal emergency battery that will last twelve hours. The system automatically tracks and displays the vehicle's current location on the screen. Maps are stored either in microfiche format or in solid-state memory, depending on the 'generation' of the device. Locations of interest can be entered as waypoints into the device's memory. Cache and bolthole locations are usually already present. For security purposes, a thermite charge can be detonated by entering a destruct sequence either on the Autonav's keypad or by toggling certain function switches. The charge is sufficient to completely destroy the system within its case.

NAME	M1 ROCKET FLARE
TYPE	Signal pyrotechnic
WT.	.4kg

COMMENTS

A plastic tube holding a single-shot illuminant rocket. The tube can either be handheld and fired manually by pulling a lanyard, or set up as a trip flare, using the 10m tripwire included in the base cap. The rocket reaches an altitude of 170m, before bursting to release a magnesium flare that drifts down on a parachute. The flare burns for 45 seconds, illuminating a 400m circle with 45,000 candlepower (+90 to visibility). The flare rocket is too inaccurate to be used effectively as a weapon.



MORROW PROJECT VEHICLES

POWER SOURCE

The miniature fusion reactors used on many electric-drive Project vehicles gives them enormous range, limited only by crew fatigue. There is a lower limit on the size of a vehicle that can be fitted with a fusion source. Smaller craft usually have high-capacity batteries and are designed to be recharged by a 'mother ship' with a fusion plant.

NAME	FUSION REACTOR
TYPE	Primary Vehicle power source
WT.	1000-5000+kg
POWER OUTPUT	100-1000+kW
COMMENTS	A self-contained, electrical power source. Due to its size and weight it is used in larger vehicles. The fusion reaction is contained in an electromagnetic bottle. The reaction continues as long as fuel is available. Each size of reactor is provided with enough fuel to last for 540 days. (Approximately 18 months) This figure is based on expected normal use. Your mileage may vary. (One liter of heavy water provides 460MW-days power, so a 100kW plant would run continuously for over twelve years (4600 days) on one liter of fuel).

STATISTICS

These are mainly real-world values (size, maximum speed, turning radii, etc.). Game statistics are calculated as follows:

- **MASS** – uses unloaded weight.
- **PAYLOAD** is the total mass of items that the vehicle can carry on board over and above any weapons and ammo listed in the entry. The weight of characters counts against the allowance!
- **STR, DEX, PACE** – maximum speed is used to find running pace. Wheeled vehicles get an overall x6 multiplier (x3, x2 for wheels). STR and DEX are calculated from the PACE value. DEX scores for vehicles are generally low due to their size; use the creature rules, -1 per 3 MASS over 12. STR scores reflect power-to-weight ratios, and can be quite high for aerial vehicles and motorbikes!
- **INT** – Integrity is similar to a character's Constitution score. It is usually 20 for a new vehicle. It may vary depending on the vehicle's type and condition. On average the Integrity Task Base is 40% (Integrity x 2%). A vehicle that is not maintained, or has seen a lot of action, will have a reduced Integrity score. A brand new vehicle built to high specs will have

a higher score. If a vehicle's current condition is unknown, the PD may determine its Integrity score by rolling 4D6+6.

- Structure points (SP) equal MASS squared.
- The (EX) armor rating is equal to (ballistic AV x MASS x 4) for enclosed vehicles, or (ballistic AV x MASS) for open topped ones.

VEHICLE DAMAGE

Vehicles have three Armor Values, one for ballistic (B) and non-ballistic (NB) attacks, and one for explosive blast resistance (EX). There may be some variation between locations e.g. tires or tracks vs. front hull armor. In the descriptions that follow, the values are for the craft's hull.

For any attack, damage in excess of the relevant armor value means that internal damage occurs. The location loses Structure Points equal to the net damage (E-factor or explosive rating minus armor value). If a location loses its Structure Points, it has been destroyed and must be replaced. The armor value in that location is also reduced to zero. If all Structure Points are lost, the vehicle is reduced to scrap.

When a vehicle takes Structure Point damage, an Integrity Task Check may be necessary. Much like a Shock Check for living creatures (see Chapter 7, Table 7.1), the result determines the extent of the damage received. This can vary from only losing SP's from the location, to the vehicle being disabled, destroyed, or even exploding.

For every multiple of MASS in damage sustained, there is a 1% penalty to the Integrity check.

For each Vehicle location destroyed, Integrity is reduced by 1.

Use the following table to determine the effects of damage to a Vehicle Location.

Explosive blasts are treated slightly differently. Should explosive damage exceed the armor value, use the 'Whole Vehicle' column in the integrity check table. The PD may also wish to allocate blast damage among the vehicle's occupants as an additional effect.

VEHICLE INTEGRITY CHECK

DAMAGE DEALT TO:

EFFECT	ENGINE / FUEL	PILOT / PASSENGER	CONTROLS / WEAPON	LOCO-MOTION (WHEELS)	NON-CRITICAL LOCATIONS	WHOLE VEHICLE (WDP)
Exceptional Success	Normal damage taken. SP = Dp					
Success	SP = Dp, -1 Pace	10% Passenger/Pilot injured, SP = Dp	10% Location Disabled, SP = Dp	SP = Dp, -1 Pace	SP = Dp	SP = Dp
Failure	50% of Engine Malfunction, SP = Dp, Pace reduced by DoF	50% Passenger/Pilot injured, SP = 2xDp	50% Location Disabled, SP = Dp	50% Location Disabled, Sp = Dp Pace reduced by DoF	50% Location Disabled, SP = 2xDp	30% Vehicle Disabled, -1 Integrity
Exceptional Failure	Engine Destroyed. DoF x 10% chance of Explosion	Passenger/Pilot injured, SP = 2xDp + DoF	Location Destroyed, DoF x 5% chance of Explosion	Location Destroyed.	Location Destroyed.	Vehicle Destroyed.

DAMAGE EXAMPLE

Susan and Dave are scouting in their V-150 near the ruins of Des Moines when they drive into an ambush.

A volley of musket fire rings out; the soft lead balls have an adjusted E-factor of 7 (15 divided by 2, as wound enhancing) so they flatten against or bounce off the V's armor (ballistic rating 40).

After passing the first few groups of riflemen, our heroes encounter a primitive mine field in the form of small kegs of black powder. The attackers get lucky and as the V drives over one of the barrels it explodes. The blast does 9000 points of explosive damage. The V has an EX value of 8640, so this is 360 points above the armor value. The PD makes an Integrity check using the vehicle's base of 25, with a penalty of 7% (360/MASS 54). A Success is rolled, so the V loses 360 Structure Points, but the hull is intact and the vehicle still operable.

The PD tells Susan and Dave's players 'Suddenly, here's a blinding flash, an ear-shattering blast and smoke leaking into the cabin. The vehicle bucks like a bronco, but you somehow just manage to maintain control...'

REPAIRING A VEHICLE

Using the Maintenance Skill, and given sufficient tools and spare parts, a Mechanic can repair a vehicle. A Skill check is made once per day, the degrees of success represent the number of Structure Points the vehicle regains. Degrees of failure may cause the loss of additional Structure Points, or even Integrity (INT). A Vehicle is required to receive an amount of maintenance annually, in degrees of success, equal to the vehicle's current Integrity score. Failing this, an Integrity task check must be made or the vehicle loses 1 point of INT.

The Integrity score can be increased at a cost in maintenance equal to twice its current score. For example, to increase a vehicle's INT from 15 to 16 requires 30 degrees of success be achieved on cumulative attempts with the Maintenance skill. Remember that sufficient resources must be available for this to be carried out, and the PD is free to penalize accordingly, or even deny the chance to improve a vehicle's current condition.



LOADOUTS

These are made up of the following components:

1. Basic – common to all vehicle types.

(Weight 140.1kg with M3 tripod, 126.5kg with M122 tripod, less 3kg with PhostrEx extinguishers)
Tools: Shovel (3kg), pick (3kg), axe (3kg), sledgehammer (5kg), machete (2kg), one pair bolt cutters (2kg), vehicle tool kit containing spanners, wrenches, sockets and a jack (10kg). Tripod (M122 (6.35kg) or M3 .50 caliber (20kg)).

Camouflage/shade net (7x7m) with poles, stakes and guy ropes (4kg), M83 solar power unit (3kg, after 1987).

Safety equipment, cables and ropes: 20m Tow Chain (10kg), three Halon or PhostrEx (after 2014) fire extinguishers (2kg or 1kg each for PhostrEx), 50m 11mm nylon rope in bag (5kg), Large medkit (5kg), two pairs dust goggles with interchangeable lenses (clear, amber, polarizing tinted, total 0.2kg)

Communications and sensors: AutoNav vehicle navigation system (17kg), two AN/PRC-70 radios (17.7kg each), one radio direction finder (4kg), one set of CP-7 binoculars (1.7kg), two pairs AN/PVS-5 night vision goggles (0.8kg)

2. Team supplies - The following is issued per six people (155kg): Four ration packs (17kg each), one camp kit (21kg), one utility box (20kg), two trade packs (15kg each), and two contact kits (13kg each).

3. Team ammunition and weapons - This varies with the team type and weapons issued.

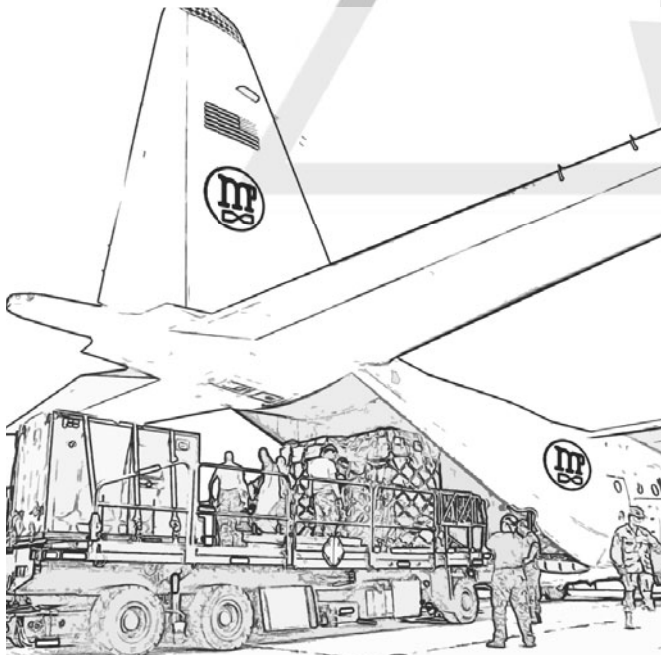
Demolition kit + two cases M112 explosive (100.7kg) is issued to all teams.

An example Recon team load: (weight 147.85 kg)

- Four M1 Rocket flares (.4kg each)
- One M79 grenade launcher & standard load of 36 40mm grenades in vest (13.04kg)
- Four M72A2 LAWs (2.4kg each)
- One metal can 9x19mm ammunition (1000rds, 20.3kg)
- One case 5.56x45mm ammunition (1640rds, 31.5kg)
- Two cartons of .357 magnum ammunition (100rds, 2.5 kg)
- One case (30) M67 fragmentation grenades (23.6kg)
- One case (16) M7A3 CS gas grenades (13.5kg)
- One case (16) AN-M8 smoke grenades (18.5kg)
- Two M18A1 Claymore mines (1.6kg each)
- One M183 demolition charge (10.5kg)

An example MARS load for a 12 man team: (weight 641.4 kg)

- Eight M1 Rocket flares (.4kg each, 3.2kg total)
- Two M47 Dragon sight systems, w/6 missiles (94.7kg)
- One M21 Sniper rifle, w/8 magazines (240rds) (14.1kg)
- One M240 machinegun (10.9kg)
- Ten M72A2 LAWs (2.4kg each)
- One case 9x19mm ammunition (2000rds, 40.6kg)
- Three cases 5.56x45mm ammunition (4920rds, 94.5kg)
- Three cases 5.56x45mm linked ammunition (2400rds, 63kg)
- Two cases 7.62x51mm linked ammunition (1600rds, 70kg)
- Two boxes of .357 magnum ammunition (100 rds, 2.5kg)
- Two cases 40mm HEDP (72 rds, 26.3kg each)
- One case 40mm CS (24 rds, 11.8kg)
- One composite case 40mm (12 multiple projectile, 12 stun bag, 6 parachute flares, 2 of each color star shell, 13kg)
- Two cases (60) M67 fragmentation grenades (47.2kg)
- One case (16) M7A3 CS gas grenades (13.5kg)
- Two cases (32) AN-M8 smoke grenades (37kg)
- One case (16) NICO stun grenades (15kg)
- Eight M18A1 Claymore mines (1.6kg each, 12.8kg total)
- Two M183 demolition charges (21kg)



VEHICLES

NAME	SK-5
CREW	4
LENGTH	12m
WIDTH	7m
HEIGHT	4m (skirts down), 5m (skirts up)
MAX SPEED	111km/h
GRADIENT	34% with 45km/h run-up speed; half this from standing start
VERTICAL OBSTACLE	1m
TRENCH	3m wide by 2.5 deep (running start)
MAX SEA STATE	5, wave height to 3m
ARMOR VALUE	40(B), 80(NB), 7520(EX)
MASS	47 (6500kg unloaded)
STATS	SP 2209 STR 145 (700kW fusion) DEX 8 PACE 18 INT 20
PAYLOAD	1500kg
ARMAMENT	1 Mk19 and M2 HB in front on rotating platform, M60 or M240 machineguns in waist positions, remote controlled M60 or M240 covering stern arc. Each position has one additional ammo reload.

COMMENTS

The SK-5 proved its mettle on the rivers of Vietnam. This hovercraft can float when the skirts are deflated. Like any air-cushion vehicle it is amphibious.

Crew: pilot, co-pilot/radio-operator, waist gunners. The cabin area behind the cockpit can seat up to eighteen people on bench seats. This can be converted to bunks for six and seats for two. Other cabin configurations include an ambulance variant (up to four stretchers) and a laboratory.

NAME	M35A1 2-1/2 TON TRUCK
CREW	2
LENGTH	6.98m
WIDTH	2.44m
HEIGHT	2.84m
GRD. CLEARANCE	.32m
TURNING RADIUS	10.7m
MAX. ROAD SPEED	96km/h
FORDING DEPTH	.762m
GRADIENT	60%
VERT. OBSTACLE	.2m
TRENCH	.25m
ARMOR VALUE	30(B), 60(NB), 1350(EX)
MASS	49 (7484kg unloaded)
STATS	SP 2401 STR 103 (150kW fusion) DEX 8 PACE 16 INT 25
PAYLOAD	2265kg carried, add 2720kg towed.
COMMENTS	A 6 x 6 medium truck that can carry 2.5 tons cross country. With a trailer it can carry double this on a roadway. The rear bed can carry another 14 people. A ring mount for a medium or heavy (.50) machinegun can be placed on top of the passenger side cab.



COMMANDO V-150

VARIANT	APC	20MM TURRET	81MM MORTAR	TOW	ARV (RECOVERY VEHICLE)
CREW	2(+10)	2	4	4	2
LENGTH	5.69m				
WIDTH	2.26m				
HEIGHT	1.96m	2.54m	1.96m	2.25m	3.38m
GRD. CLEARANCE	.38m				
TURNING RADIUS	8.38m				
MAX. ROAD SPEED	90km/h				
WATER SPEED	4.8km/h				
GRADIENT	60%				
VERTICAL OBSTACLE	.61m	.914m			
TRENCH	.5m				
ARMOR VALUE	40(B), 80(NB), 8640(EX)				
ARMAMENT	M2HB	Rh202, 2xM240	81mm mor- tar, M240	TOW launcher, M240	M2HB
AMMUNITION	2100 rounds	400rds 20mm, 3000rds 7.62	60rds 81mm, 2000rds 7.62	7 rockets, 2000rds 7.62	2100 rounds
PAYLOAD	1200kg carried	1180kg carried	1100kg carried	1200kg carried	1100kg carried
MASS	54 (~9760kg unloaded)				
STATS	SP 2916		DEX 6	INT 25	
	STR 90 (150kW fusion)		PACE 15		

PAYLOAD carried values in table, towed 1540kg for all variants.

COMMENTS

The workhorse of the Project is a 4x4 armored car with bulletproof tires. The APC version can carry 10 people besides its crew of two. There is also a special version that mounts a TOW missile launcher. It has a crew of 4 and 9 missiles. It is also armed with a MAG-58 with 2000 rounds of 7.62x51 mm ammunition. The V is fully amphibious without special modification or preparation.

The Armored Recovery Vehicle (ARV) variant has an A-frame, winch and hydraulic jacks. It can lift up to 4500kg when the frame and jacks are deployed. The vehicle can't move while lifting. The ARV also carries a Mk. 2 laser for cutting and welding purposes.



NAME	HMMWV HUMVEE	
VARIANT	M1025	M997A2 MAXI-AMBULANCE
CREW	1(+3)	2
LENGTH	4.84m	5.2m
WIDTH	2.16m	2.16m
HEIGHT	1.88m	2.59m
GROUND CLEARANCE	.4m	
TURNING RADIUS	10.7m	
MAX. ROAD SPEED	96km/h	
FORDING DEPTH	.762m; 1.5m with fording kit	
GRADIENT	60%	
VERTICAL OBSTACLE	.2m	
TRENCH	.25m	
ARMOR VALUE	30(B), 60(NB), 4560(EX)	20(B), 40(NB), 3040(EX)
MP DEPLOYMENT	1987	
PAYLOAD	1000kg, 1900kg towed	875kg carried, 1540kg towed.
MASS	38 (3700kg unloaded)	38 (3474kg unloaded)
STATS	SP 1444 STR 110 (100kW fusion) DEX 12 PACE 16 INT 25	

COMMENTS

The successor to the Jeep, the 'Humvee' is a 4x4 light truck with multiple configurations, two of which are Project issue; a variety of weapons can be mounted on the roof (machine guns, grenade and TOW launchers). The M1025 seats four; the ambulance variant has two front seats and can transport four stretchers or eight walking wounded in the rear. The ambulance also contains two large medical kits, a surgical kit and two drug kits in its inventory. Both variants have a recovery winch rated at 2700kg.

NAME	XR311
CREW	2
LENGTH	4.34m
WIDTH	1.93m
HEIGHT	1.6m
GRD. CLEARANCE	.335m
TURNING RADIUS	6.51m
MAX. ROAD SPEED	126km/h
FORDING DEPTH	.75m
GRADIENT	60%
VERT. OBSTACLE	.2m
TRENCH	.25m
ARMOR VALUE	20(B), 40(NB), 640(EX)
MASS	32 (2100kg unloaded)
STATS	SP 1024 STR 164 (100kW fusion) DEX 14 PACE 21 INT 25
PAYLOAD	680kg carried, 1540kg towed.

COMMENTS

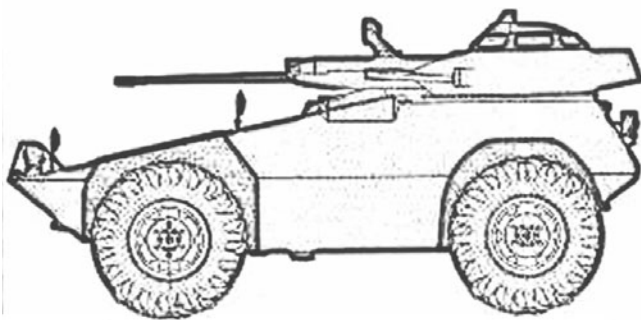
This four-wheel drive vehicle is highly maneuverable and acts much like a dune buggy. The basic configuration seats two and can seat three at a pinch. The tires are bulletproof, all-terrain balloon types.

A variety of weapon configurations are possible:

1. Twin TOW launcher with ten missiles on rear deck: 345kg
2. Ring mount (use by passenger) .50 M2 machine gun, 525 rounds (5 belts): 115kg
3. Ring mount Mk19 grenade launcher, 144 rounds (3 belts): 125 kg
4. Pintle (post on rear deck) or ring mount 5.56 or 7.62mm machine gun, 2000 rounds ammo: 40-80kg, depending on weapon and mounting system
5. Ring mount M174E3 grenade launcher, 108 rounds ammo (9 magazines): 60kg

NAME	COMMANDO SCOUT
CREW	2
LENGTH	4.7m
WIDTH	2.16m
HEIGHT	2.06m
GRD. CLEARANCE	.38m
TURNING RADIUS	7.62m
MAX. ROAD SPEED	96km/h
FORDING DEPTH	1.17m
GRADIENT	60%
VERT. OBSTACLE	.61m
TRENCH	.25m
ARMOR VALUE	40(B), 80(NB), 7520(EX)
MASS	47 (~6500kg)
STATS	SP 2209 STR 104 (100kW fusion) DEX 9 PACE 16 INT 25
PAYLOAD	680kg carried, 1540kg towed.
ARMAMENT	1 Rh 202 20mm; 1 M240/ MAG-58 in turret
AMMUNITION	300rds 20mm; 3000rds 7.62X51mm
COMMENTS	A very small, fast armored car designed primarily for Recon teams.

NAME	COMMANDO RANGER
CREW	2(+6)
LENGTH	5.34m
WIDTH	2.16m
HEIGHT	2.41m
GRD. CLEARANCE	.203m
TURNING RADIUS	7.93m
MAX ROAD SPEED	108km/h
FORDING DEPTH	.762m
GRADIENT	60%
VERT. OBSTACLE	.254m
TRENCH	.25m
ARMOR VALUE	30(B), 60(NB), 4920(EX)
MASS	41 (4536kg)
STATS	SP 1681 STR 127 (150kW fusion) DEX 12 PACE 18 INT 25
PAYLOAD	875kg carried, 1540kg towed.
ARMAMENT	1 M240/M60
AMMUNITION	2,000rds 7.62x51mm
COMMENTS	This vehicle is designed to protect the crew without looking especially threatening to outsiders. It is most often used by those teams not needing a heavy com- bat capability. It can seat up to eight people.

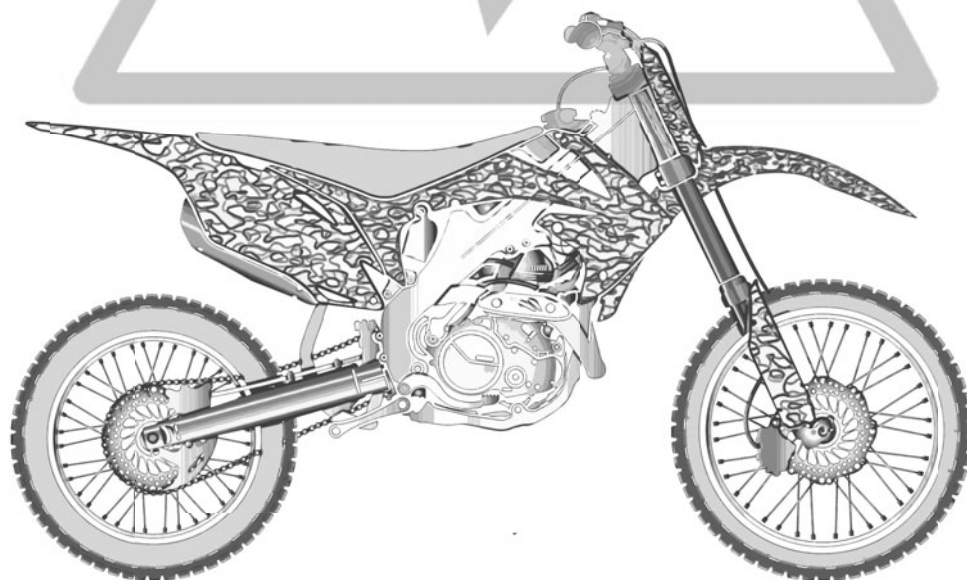


MORROW PROJECT VEHICLES

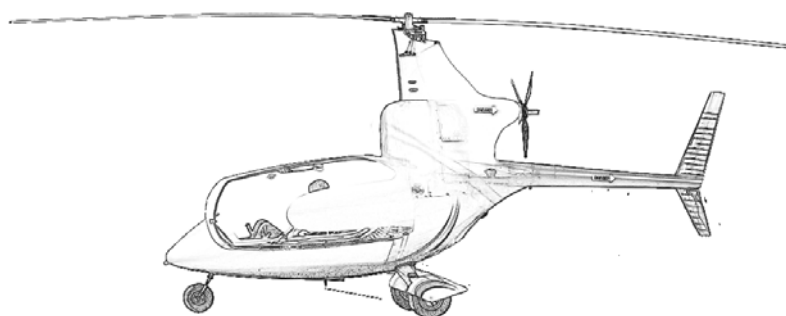
NAME	SCOUT MOTORBIKE
CREW	1
LENGTH	2.1m (wheelbase 1.45m)
WIDTH	0.35m
HEIGHT	0.94m
GRD. CLEARANCE	.3m
TURNING RADIUS	2m
MAX. ROAD SPEED	84km/h
FORDING DEPTH	.5m
GRADIENT	60%
VERT. OBSTACLE	.2m
TRENCH	.25m
RANGE	168km
ARMOR VALUE	15(B), 30(NB), 240(EX)
MP DEPLOYMENT	1999
MASS	16 (300kg unloaded)
STATS	SP 256 STR 105 (20kW electric) DEX 19 PACE 14 ENDURANCE 6 INT 25
PAYLOAD	160kg carried, 500kg towed.

COMMENTS

An electric powered trail bike. The high energy density batteries can be recharged in twenty minutes. The vehicle is built around the large battery pack. Two cargo boxes with a total capacity of 20kg can be fitted over the rear wheel. A trailer can also be fitted. The bike is usually issued with a tool kit and four spare tires.



NAME	AIRSCOUT
CREW	2
LENGTH	4.65m
WIDTH	1.8m
ROTOR DIA.	8.5m
HEIGHT	2.6m
WEIGHT (EMPTY)	260kg = MASS 15
MAX. TAKEOFF WEIGHT	530kg
LANDING GEAR	Wheels
MAX. SPEED	185km/h
MAX. CRUISING SPEED	144km/h
MIN. SPEED	24km/h
MAX RATE OF CLIMB	5m/sec
SERVICE CEILING	4,000m
TAKE-OFF RUN	61m
LANDING RUN	0-30m
RANGE	500km without reserve fuel tank, 750km with (+45kg).
ARMOR VALUE	15(B), 30(NB), 225(EX)
STATS	SP 225 STR 206 (86kW 4-stroke) DEX 19 PACE 24 ENDURANCE 9 (+3 with reserve) INT 20
PAYLOAD	270kg including weapons (66kg), fuel, crew
ARMAMENT	2 M207 machineguns, forward facing 4 2.75in Rockets
AMMUNITION	800 rounds per gun (10.4kg each)
COMMENTS	A small gyrocopter with an enclosed, tandem configuration cockpit. The helicopter-like horizontal rotating blades are powered only for take-off and the craft cannot hover unless it is facing into a 26kph wind. A pusher propeller generates thrust for forward flight. It is used for scouting and is lightly armed for its own defense. The aircraft breaks down into six small (man-portable) packages and is carried broken down in each of the Scientific-One vehicles. The crew normally consists of a pilot/gunner and an observer. After the maximum range is reached, or the craft has flown for more than 12 hours, a full lubrication and maintenance is required that takes about two hours to do properly. The range values assume ethanol fuel. The engine can use methanol and gasoline with a minor tune-up (1 hour). The engine and fuel lines are corrosion resistant to allow the use of alcohol-based fuels. Methanol has 2/3 the range of ethanol, gasoline 4/3 the range of ethanol.



CARGO TRAILERS

The Project issues two basic cargo trailers, as well as several special purpose trailer mounted items, three of which are described here. Trailers cannot be towed across water by amphibious vehicles.

NAME	LIGHT CARGO TRAILER
LENGTH	2m
WIDTH	1.9m
HEIGHT	1.6m
GRD. CLEARANCE	.49m
MAX. ROAD SPEED	60km/h
MAX. OFF-ROAD SPEED	20km/h
ARMOR VALUE	30(B), 60(NB), 2400(EX)
MASS	20 (600kg unloaded)
STATS	SP 400 INT 20
PAYLOAD	250kg carried.
COMMENTS	A single axle armored box trailer, 250kg capacity (1.8 x 1.7 x 1.4m).

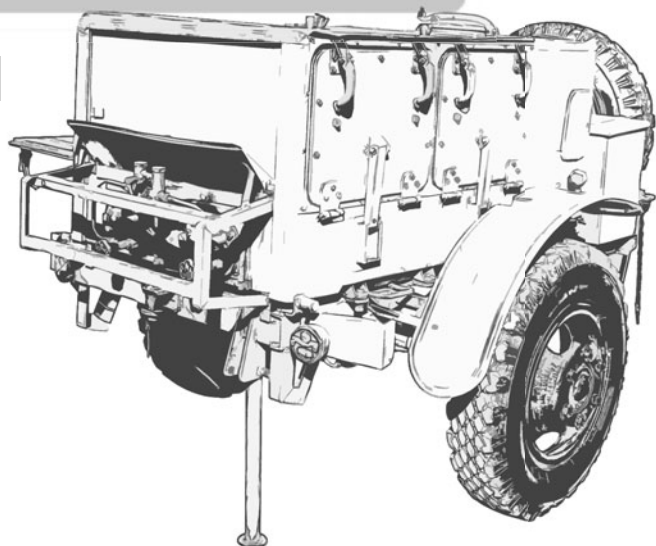
NAME	MEDIUM CARGO TRAILER
LENGTH	4m
WIDTH	2m
HEIGHT	1.8m (ramp; deck height 1m)
GRD. CLEARANCE	.4m
MAX. ROAD SPEED	60km/h
MAX. OFF-ROAD SPEED	5km/h
ARMOR VALUE	30(B), 60(NB), 690(EX)
MASS	23 (800kg unloaded)
STATS	SP 529 INT 20
PAYLOAD	1800kg carried.
COMMENTS	An open box double axle platform trailer with rear loading ramp.

NAME	FUSION POWER TRAILER
LENGTH	4m
WIDTH	2m
HEIGHT	1.8m
GRD. CLEARANCE	.4m
MAX. ROAD SPEED	60km/h
MAX. OFF-ROAD SPEED	5km/h
ARMOR VALUE	30(B), 60(NB), 3360(EX)
MASS	28 (1500kg)
STATS	SP 784

COMMENTS

A 100kW reactor mounted on a medium cargo trailer. It's intended to provide power for communities without tying up a project vehicle. Enough electricity is produced to run a 1000 square meter (10000 square feet) air conditioned building, a factory of half this size, thirty large climate controlled houses, or a larger number of smaller homes with modern amenities. This is more than a conventional generator of the same size would do. The reactor's fuel supply allows several years of operation without refueling.

The trailer includes 500 meters of cable, six industrial power outlets and a dozen domestic rated outlets.



NAME	WATER PURIFICATION TRAILER
LENGTH	4m
WIDTH	2m
HEIGHT	1.8m
GRD. CLEARANCE	.4m
MAX. ROAD SPEED	60km/h
MAX. OFF-ROAD SPEED	5km/h
ARMOR VALUE	30(B), 60(NB), 3360(EX)
MASS	28 (1500kg without water)
STATS	SP 784

COMMENTS

A portable flash distillation system that can produce 500 liters of potable (drinking) water per hour. It requires a separate power supply capable of providing 15kW. The trailer contains two 500 liter holding tanks for inflow and outflow. The unit comes with four ten meter hoses, each with standard 5cm/2 inch connectors. A filtration system is provided for the inflow side. A testing kit to detect common chemical and bacterial contaminants is also provided.

Flash distillation removes salt and most other particulate and dissolved contaminants. It will not sterilize water or remove chemicals with a similar boiling point to water. Precipitated material is collected in a sludge tank which needs to be cleared after every 5000 liters of sea water equivalent (175kg sludge!).

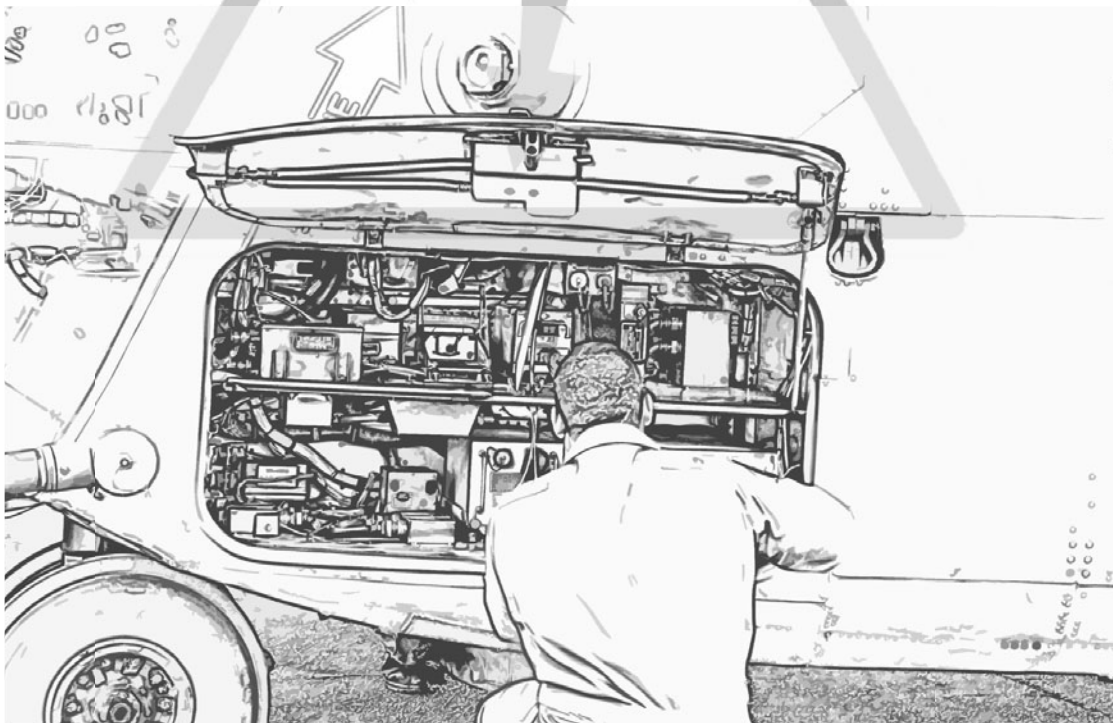
NAME	WORKSHOP TRAILER
LENGTH	4m
WIDTH	2m
HEIGHT	3m (ramp; deck height 1m)
GRD. CLEARANCE	.4m
MAX. ROAD SPEED	60km/h
MAX. OFF-ROAD SPEED	5km/h
ARMOR VALUE	30(B), 60(NB), 840(EX)
MASS	28 (1500kg loaded)
STATS	SP 784

COMMENTS

There are two main components carried on this trailer:

- An electric arc furnace which can produce 100kg of molten steel or other metal per hour. It is used to recycle scrap metal and requires a 50kW power supply. Weight 450kg.
- A portable forge with taps, dies and die-making materials (2m high, 1m wide, 1.9m long, weighs 229kg).

A basic toolkit with screwdrivers, hammers, files and measuring gages is also included.



NAME	HAAM SUIT
HEIGHT	2.2m
WIDTH	1.3m
ARMOR VALUE	35(B), 70(NB), 2660(EX)
MASS	19 (460kg fuelled)
STATS	SP 371 STR 50 (10kW electric) DEX 18 PACE 9 ENDURANCE 12 INT 25
PAYLOAD	300kg

COMMENTS

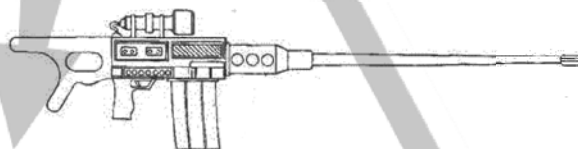
The HAAM suit (Hydraulically Assisted Armored Man) was originally designed to augment the work capacity of a laborer to reduce the requirement for excavators, bulldozers, cranes and forklifts. The military potential for the device was obvious.

The current version of the suit is powered by a variety of electric motors and myomeric polymer systems. The suit has an effective lifting strength of 50. The high density fuel cell system will provide the listed power output from ten liters of ethanol fuel for four hours.

A full set of environmental protective features are included. The suit is impervious to biological or chemical threats, has a burn protection rating of 480, will provide a 'shirtsleeve environment' across a temperature range of -80 to 200 degrees C (-112 to 392 F) and is watertight to 100 meters. The life support system is good for six hours.

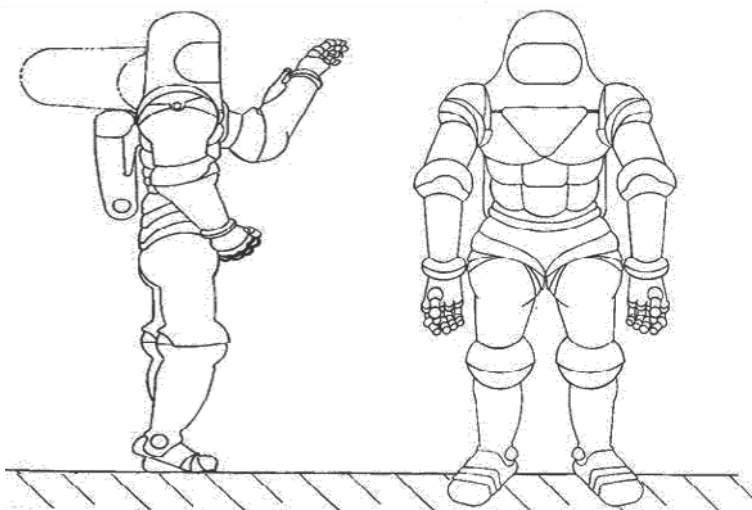
A variety of sensor systems are included – generation three night vision, thermal vision, and an integrated threat warning system coupled with a Mk. 2 laser module (150kg with harness and batteries for two minutes operation) or a 40x46mm HEDP grenade-based version (200 rounds, total mass 100kg) for point defense against anti-armor rockets and artillery. The warning system performs like the AN/PPS-05 radar. A radio system equivalent to the AN/PRC-68 is also included. There is no inbuilt navigation system.

Other potential weapon configurations include those listed in the XR-311 entry and a customized anti-materiel rifle which fires the 20x139mm ammo used by the Rh202 cannon. It weighs 80kg and has a twenty round magazine.



It's possible for a MARS or Science-1 computer to over-ride the suit's control systems and assume control. This is usually done if the occupant is injured and unable to operate the suit.

Most of the production runs of the suit went to the U.S. military. The Project was able to divert and produce a limited number for its own use. One was issued to each of the 'One' vehicles and major supply bases. There are rumors of specialized MARS units made up of squads of men issued with HAAM suits.

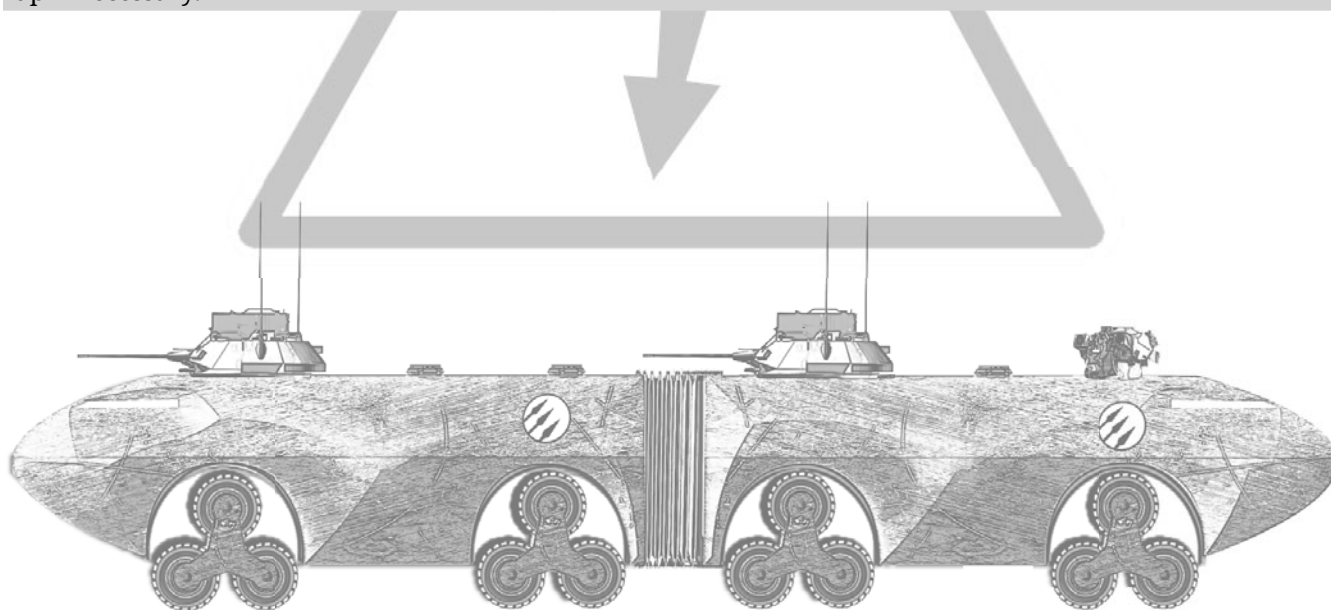


NAME	MARS-ONE AND SCIENCE-ONE
CREW	6-8
LENGTH	25.3m
WIDTH	3.2m
HEIGHT	3m
GROUND CLEARANCE	.6m
TURNING RADIUS	16m
MAX. ROAD SPEED	90km/h [70km/h Tracked]
WATER SPEED	10km/h
GRADIENT	50%
VERTICAL OBSTACLE	1m
TRENCH	5m
ARMOR VALUE	80(B), 160(NB), 28800(EX)
MASS	90 (45,250kg)
STATS	SP 8100 STR 60 (1000kW fusion) DEX 2 PACE 15 INT 30
PAYLOAD	6000kg carried.

COMMENTS

The ONE Series of Project vehicles were originally produced by a Canadian Manufacturer until they filed for bankruptcy in the early 1980's. During this early stage of the Project, there was one distinctive design for the MARS-ONE, and one for the SCIENCE-ONE. In the following years, at least four different manufacturing facilities were engaged in building ever evolving designs of the MARS and SCIENCE ONE vehicles. So, even with numerous designs in the field, the Project designation has remained, only the model numbers have changed.

Road train concepts derived from the transporter-launchers used as mobile ICBM bases, and the advent of fusion power, led to the development of these vehicles. Each Project region has a MARS-One and Science-One vehicle stored at separate installations. There is a number of support teams based nearby so that they can link up if necessary.



The craft are made up of tractor-hauler, mission module and logistics modules, linked by armored umbilicals that act as companionways and coupling devices. The vehicles are sealed against biological, chemical and most radiological threats and the integral life support system can provide a breathable atmosphere for a month without an air change.

The tractor-hauler contains a forward command area with seats for six (driver, commander, communications, sensor operator, two weapon stations). Behind this is a living area with two racks of three bunks each, a small kitchen and bathroom area. At the rear of this compartment are equipment lockers, an airlock on the right, and a rear hatch that connects to the other modules.

The tractor is armed with two roof-mounted turrets. The front has dual .50 machineguns; the rear has a Mk. 1 laser which is meant to be used in a point defense role.

The typical layout of each mission module is as follows:

Common features: two bed sick bay (each bed equivalent to a medical unit), a duplicate living area to allow the tractor to be used in other tasks and a 100kW fusion plant to provide an independent power supply. There are two side doors and connecting hatches fore and aft to the tractor and logistics module, respectively.

MARS: Situation room, fire direction center with radio and radar sets and computer system. Weapons bay with twin breech-loading 81mm mortars, and 120 shells. The mortars are mounted on a turntable and fire through a roof hatch.

On the roof is another weapons pod which mounts one of the following configurations:

- Eight ADATS
- Six TOW missiles
- Two Maverick missiles
- Four Chaparral missiles
- Two 2.75 inch rocket pods containing a total of 38 rockets

Reloading can only be performed from outside the vehicle.

There is also a dedicated radar and sensor system with a Mk. 19 in a vehicle defense role in a turret.

Science: The space is dedicated to laboratory work. It is configured to provide a BSL-4 biohazard/HAZMAT rated zone where highly infective and toxic hazards can be worked with. Six Mk. II Hazard suits are provided. A vehicle defense system (Mk. 1 laser or Mk. 19 grenade launcher) is mounted on the roof – there is no separate missile pod.

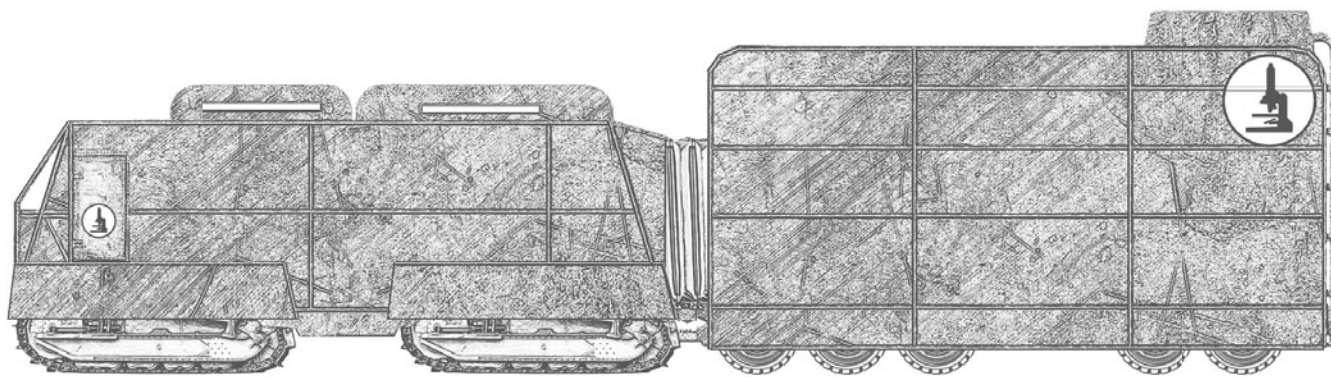
The logistics modules are primarily storage spaces.

Common features include:

- a rear hatch with ramp, side doors, fore hatch to connect with mission module;
- storage racks and boxes;
- a roof-mounted turret with twin .50 machineguns;
- an ethanol distillation rig to provide fuel for the HAAM suit and/or Airscout; and
- an oxygen compression and storage system to supply the vehicle and portable breathing systems.

MARS: HAAM suit, two scout motorcycles.

Science: HAAM suit, Airscout gyrocopter.



[REDACTED]

[REDACTED]

[REDACTED]

**++ CLASSIFIED PROJECT
MATERIAL ++**

**+ PROJECT DIRECTOR'S
EYES ONLY +**

[REDACTED]

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RUNNING 'THE MORROW PROJECT'

ABOUT THE MORROW PROJECT

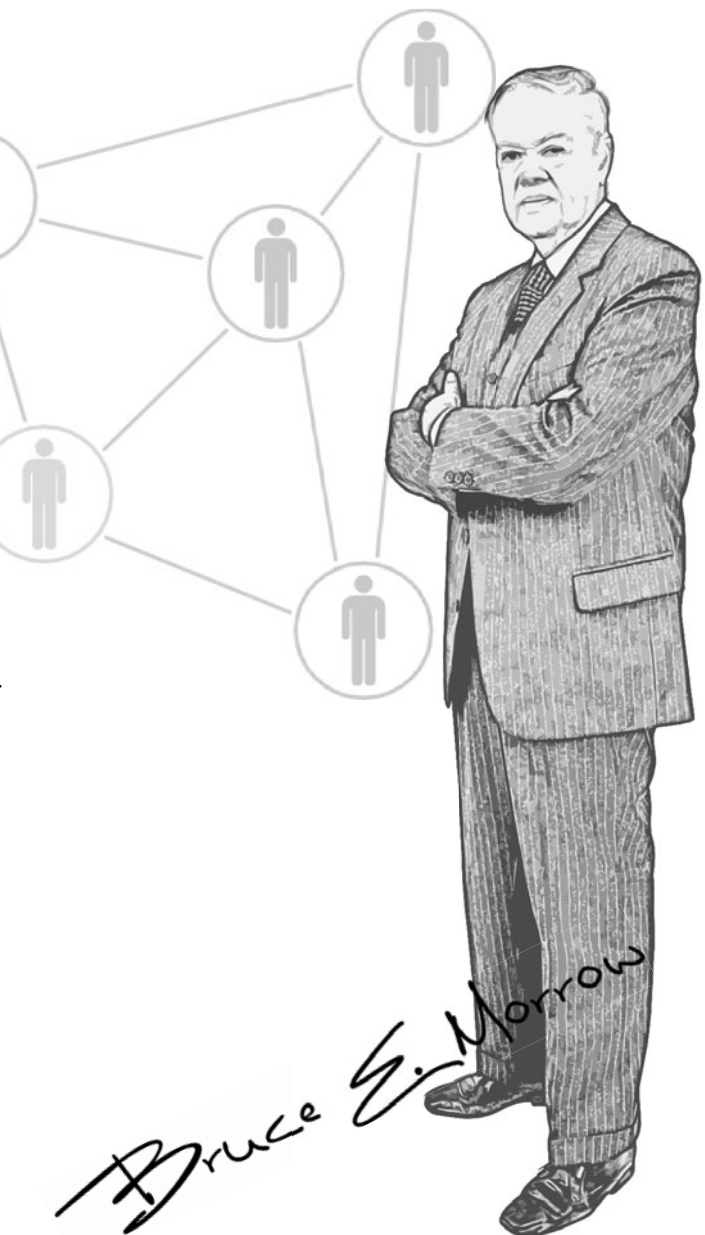
In 1972 a mysterious man known by the name of Bruce Edward Morrow, origin unknown, gathered nine of the country's leading industrialists into an organization known as the Council of Tomorrow. What method of coercion he may have used to achieve this feat remains a matter mostly for conjecture. The consensus of noted historians indicates that Morrow was a rare form of esper. He seemed to have possessed the ability to transport himself and some small amount of nearby matter into or out of the future. Building a convincing argument from the future, he and the council structured an organization dedicated to the continued survival of the human race beyond the point of destruction.

This organization brought forth the concept of the Morrow Project; an ambitious plan to cryogenically freeze special teams and equipment to aid in the reconstruction of the U.S. after nuclear war. For many years the Project secretly stored their teams to await the proper time for reawakening. Gradually their processes improved and their equipment became more advanced. In 1979 Morrow returned from a long absence bearing plans for a fusion power plant and advanced laser technology. In 1987 and on two additional occasions, the Project carried out a complete updating of all the previously "stored" equipment. The first time by opening the buried and sealed chambers of the sleepers without waking them and leaving behind new equipment, vehicles, and the instruction manuals on how to operate them. The second and third time things were done differently because of operational and security concerns. On these subsequent updates new caches were buried and the location was transmitted to the bolt-hole computer using references to existing cache locations.

The prime central base of the Morrow Project is a vast underground complex designed to sustain the lives of some one hundred and fifty people through the holocaust as they recorded the data linked with the war. Also to act as a central communications point for the rest of the Project when they should wake. So thorough was their recording that this base remains as the only comprehensive source of information on pre-war times. A few teams ventured out from Prime Base on reconnaissance missions shortly after the end of the war, and they soon found they could establish a viable community. It looked as if the mission of the Project was going to be completed without a hitch, but such good fortune was not to be theirs. A small war with a madman named Krell resulted in the destruction of the colony by a nuclear bomb and the loss of Prime Base to biological sabotage.

With their control base inoperative the Morrow teams continued to sleep for 150 years. When their long-delayed wakeup signal was finally sent by a damaged computer they found themselves in a hostile world. Survival was the key word for most of the remnants of the battered U.S.

This is the world of the Morrow Project as it runs in this game. The personnel of the Project are all well trained, but they are not all combat veterans, nor do they engage in wholesale slaughter. Pledged to help humanity recover in whatever way they can, they can easily lose sight of their own ideals and adopt the brutal code of survival. They must find Prime Base and each other in order to survive.



HOW BIG IS THE MORROW PROJECT?

The Project is a mammoth undertaking, on par with the Apollo program, or the Federal Interstate Highway system. It is a testament to the wealth and political, scientific and technical expertise of the United States that Morrow and the Council thought it possible at all - and could succeed in their task. The high level of secrecy required adds another degree of difficulty and expense to the process of recruiting, training and deploying Project personnel.

The potential number of personnel available is limited by several factors:

- The period the Project was recruiting for;
- The pool of potential recruits, given the high level of education and training required;
- The ability to draw from this pool without alerting authorities - unusual rates of people going missing or dying in the target age and occupational groups would soon be noticed;
- The duration of Project training;
- Access to limited training opportunities e.g. law enforcement and military skills, some medical and scientific specialties; and
- The ability of the Project to construct the necessary infrastructure (bolt holes, caches, bases) without being revealed.

At the low end, the Project has one or few small training centers. At the high end the Project has very large training centers - comparable to major universities - or a network that extends across Canada and the United States.

Small Projects have less than 10,000 personnel. A few regions, say three to six, have a useful Project presence, with large portions of the continent unattended. The implication is that teams can link up and rebuild in a timely fashion within their areas of operation.

More dispersed teams may be difficult to justify in terms of their ability to help survivors, but could represent far-flung Recon teams. These remote teams could form the basis for an episodic campaign a la 'Star Trek' or 'Stargate' where the characters travel from place to place.

Medium Projects have 10,000-50,000 personnel. Most or all regions have a useful Project presence. This is the default level assumed in these rules with the regions as outlined. Note that there's a lot of 'wiggle room' for the PD to customize their Project's organization and amount of equipment.

Large Projects have more than 50,000 personnel. All regions have a significant Project presence. There may be highly specialized teams and regional bases e.g. rocket launch facilities, blue water merchant fleets, large air or submarine bases with supporting infrastructure, etc.

WHY 150 YEARS LATER?

150 years after the war is an interesting world to role-play in. Everything the team have known has long since gone. Four generations of survivors have passed in this time, enough for knowledge of the old world to become one of legend and confused stories. Modern objects have some mysticism attached to them. A wide spectrum of technological capability has emerged. There has been enough time for the population to recover to a point that a sustainable modern industrialized society is possible with the aid provided by the Project. In many areas there is lawlessness, and in others justice is handed out in any way possible. Some dictators have risen and now have sufficient resources to build an empire. It is also a time when most of the background radiation from the war has long since dissipated, removing this hazard from the teams.

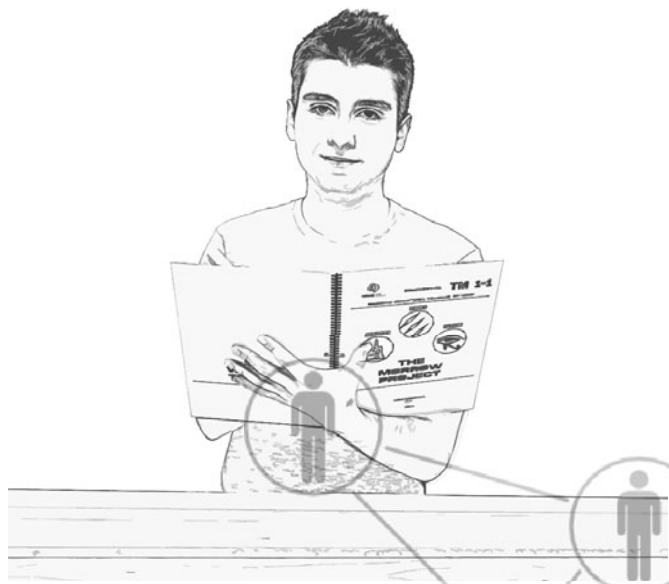
The Bolt-holes themselves, designed to continue operation for up to 200 years, begin to reach low power. 150 years after the war, the first of the facilities, having not received a wake-up call, switch over to emergency protocol and wake-up the sleeping team members. With only sufficient power remaining to wake-up the team, the bolt-hole would be rendered useless within a few hours. Bolt-holes left until power is critically low would continue to activate over a period of 30 or so years.

It is controversial to suggest that Bruce Morrow, the progenitor of the Project, may well have engineered the delayed wake up, knowing that the world could be rebuilt 150 years after the war, but would fail should the Project wake-up in the 3-5 year timeframe.



RUNNING THE GAME

Someone in the group needs to be elected 'Project Director' and be in charge of running the game. This chapter and all the following chapters are for the 'Project Director's' eyes only.



PROJECT DIRECTOR

In other role-playing games they would be known as the 'Game master', but in The Morrow Project they are referred to as the 'Project Director' (PD for short.) The PD doesn't have their own character, but is instead in charge of all the other characters (or Non-Player Characters) that the team may meet or encounter. The PD has the vision of the world 150 years after, they manage the environment, the people, and plots that the player's characters will encounter - from the moment they open their eyes from inside their cryo-tube, to their eventual end in the bleak future. The PD directs the vision of Bruce Morrow's Project. Just how successful will it all be? Who will live and die? Such answers are between the PD and the actions the players take. The PD also acts as arbiter between players and the rules, between characters and the world they exist in, and between the personnel of the Project and the rising cultures of the post-apocalyptic world.

STORY-TELLING

The primary duty of the PD is to paint a picture for the players. They need to set up motivation for the characters, develop a hook, followed by interesting and challenging encounters or events. Creating an atmosphere is essential in maintaining the interest of the players, and that comes from your description of the events. If you weave plots and sub-plots into your adventure, the players will become invested in the success of their characters and the team.

RULING

A critical element to running a game is interpretation of the rules. The PD needs to know the rules, but not everything is covered in this rulebook. As PD it is your duty to make fair rulings on 'what happens next'. It is also paramount, for a successful game, that players understand and respect the PD. The players need to abide by the PD's judgment, and therefore do not impede the flow of the game. Some people will say that the PD is always right, and that the rules are only there as a guide. That may be true, but only should the players trust the PD to make the right call, and that for the most part they honor the rules. Perhaps there are some house rules, additional or modified rules that the entire group agree to use. Those rules should be seen to be used. If everyone comes to the game assuming that all the combat modifiers are as written, there can be a number of confused or upset players should the PD start making up their own. If the PD is fair and honest, then the PD's rulings are always right.

MOTIVATION

The best way of ensuring the co-operation and invested interest of your players, and therefore their characters, is to plan a game with sufficient motivation for the players' tastes and for the characters involvement. Perhaps you know all the players love to plan out a military engagement, or just like a quick firefight. You can plan an encounter that will involve the team having to assault an enemy camp, or fight off ambushing marauders. For character's you can involve their personal interests by seeding back-stories, or creating encounters that will feed their desires and ambitions, such as the local community pleading that one of the team remain as sheriff to protect them from marauders.

For an example back-story, during their training a character has a brief affair with one of the instructors. The character is frozen as scheduled. Due to maintenance, the tubes are thawed a few years later. The character learns that as a result of his affair, he is now a father. Both mother and child have since been frozen with the regional base wake-up team. Upon waking up the character will have a motivation to seek out the regional base. If the character were then to learn that the regional base had been broken into, and the occupants removed, then you have a huge plot hook.



HOOKS

A hook is something that occurs within the adventure that gets the character's involved. Hooks can be as simple as encountering someone on the road with a tale of treasure, or finding an object in the ground. They can be rumors that spread around settlements, or requests for help on the radio using the MP frequency.

CHARACTER DEPTH

A PD may want to allow players to give their characters little quirks, a slight advantage here, a disadvantage there. Be careful what you permit, however, as some 'advantages' may unbalance the game.

CHARACTER CREATION

The trickiest part of character creation is determining the skills the characters have, and at what level. Generally, a PD needs to urge their players, especially new players, to allocate skills with levels up to 20%. If allocated in blocks of 20, Training Point's should be easily spent. Some players, however, may feel that they wish to focus on only a few choice skills. Rather than focusing on a more realistic allocation of skill levels, a player could end up buying, for example, Firearms at 60%. For your average person, this sort of skill level could take many years of training. In this instance, one could conclude that the character is a natural with firearms, a 'crack shot'. As PD it is your choice whether you want players allocating such large numbers of Training Points to their skills. Urging players that such a high allocation will reduce the points they will have available for other skills, is one tack. Calculating maximum skill levels by Age of the character is another.

ATMOSPHERE

We can't tell you every detail of your Morrow Project world. It should be whatever is enjoyable for you and your players. But, we can suggest some things that are likely to work for a Morrow Project PD and give the right sort of atmosphere.

THE TMP WORLD IS NOT JUST GOOD VS. EVIL

There are very few angels and only slightly fewer devils. Most people will do whatever they think is right for them, or their tribe, or their friends - and this might involve anything from kindness to cruelty. Not many people or groups have a fundamentally 'good' or 'evil' approach and, unlike some other role-playing games, there are no alignments in The Morrow Project.

THE TMP WORLD IS UNFAIR

It's a world of 'haves' and 'have-nots'; some people have wealth, power, technology, information and security. Unfortunately, they usually use these assets just to maintain their position. Most people live in poverty, ignorance and squalor - and in constant fear that things might get worse.

THE TMP WORLD IS DEADLY

Remember the quote "Discretion is the better part of valor"? Warning! The Morrow Project has a realistic combat system: any weapon can kill. Therefore, most NPCs in The Morrow Project universe don't treat combat as a game - because the risk (of death or infection) is just too great. Just remember, if people do fight, they'll try to 'fight dirty' and look for an advantage of any kind.

THE TMP WORLD IS SERIOUS

Grim humor has its place in the Morrow Project and we're not saying that you should treat the game as anything but fun. However, we recommend that the PD tries to avoid plot elements which involve fantasy, satire and slapstick (unless you're aiming for deliberate parody.)

THE TMP WORLD WANTS HOPE

This is where the players come in. Myths, legends, and even factual historical records show that the world was once a better place. The players are a link to that era - and the only chance to recreate it. Let them bring hope to the people! Just remember to keep very careful notes of how things are getting better - the players will want to know that they're achieving something.

STYLES OF CAMPAIGN

In planning your game, it may be beneficial to consider what has taken place over the last 150 years. Which Survivor groups are there nearby, what kinds of events have shaped their recent history? What has happened to the Project over the last few years has anyone else awoken ahead of the player's team? Below is a list of certain styles of campaign that you may elect to use.

LONE RANGER

This is classic style of game. The characters wake up first, or at least the same time as other teams, and have no contact with the Project personnel for some time - if ever. This sort of play can continue for some time, keeping the team as a 'lone' idealistic group striving to assess the state of the world, and perhaps to improve it.

LATE WAKE UP

The team has woken later than other teams, encountering groups already familiar with the project. This is especially true if the team members are not Recon. It was intended that Recon teams awake up to a year before the other teams. The first priority in such a situation is to make contact with all active teams. Of course they may already be in need of help themselves, or have met an end. You could still have a 'Lone Ranger' style game, but where the locals are already familiar with the Project, and may even have some ill feelings towards its personnel.

ACTIVE PROJECT

The team has been woken by their Regional Base with instructions on how to proceed and rendezvous points with other teams. Immediately you can involve the team with a more organized and coordinated effort to rebuild the world. The team can be issued orders to assess a threat, or solve a dilemma. Plot hooks can occur from within the Project organization, or from the environment.

RUNNING A LONG-TERM GAME

Eventually there comes a time when other Project teams have been activated, and rebuilding the world commences. The player's team is no longer the dominant role of the Project, but must now take orders from other Project personnel. The Regional Base is active, as may be Prime Base. So, what next?

In a sense things do not change a great deal. The focus moves from a single team making calls as to their next mission, to a regional organization determining where a team's personnel should be sent, and with what goals in mind. This is a great opportunity for the PD, since now they can provide new story hooks simply by issuing a Project Command order to go to Nav-Point 'X', and locate object 'Y', or intercept marauding band 'Z'. Now it is no longer what the team can see and hear, but what a wider network of personnel can gain intelligence on. With a Regional Base active, locations of other team bolt-holes are potentially available, as are a wide selection of additional caches.



Small single team encounters become Operations involving multiple teams. This is the ideal environment for Science, Agricultural and MARS teams, who begin to be of more use with a larger organization behind them.

Now, with more personnel, cures to plagues can be worked on, intel can be gathered on potential empire building societies... rebuilding the world can begin in earnest. This is a much harder job, given that many of the emergencies that the Project personnel were trained to control are just not there anymore. In fact, the Project now needs to rebuild a world that none of the survivors have any knowledge of. The mission must quickly move to one of building a new world where each group of survivors can unify together, where a legal system can be established, and outlaws processed. With sufficient food harvested to allow for a boost in population, there is additional manpower for restoring technology and industry. Yet, facing the Project is the challenge in unifying or assisting in the defeat of many warlike micro-nations. The Project must be a unifying government without actually being one, they are there to help rebuild, not to control and command.

Indeed, once the Project is at some level fully operational, things are far from over. They have only just begun. It is at this stage that all the really exciting things, all the political interactions and intrigue, start to happen.

AFTER THE GAME

As PD you want to give your players an opportunity to feel that they have achieved something during the game, and even reward them for attending the game. You can achieve this by handing out Training Points to each character. The amount given is purely up to each PD, although 2-3 points are recommended. You may want to reward good role-playing, or allow characters to gain skills much faster than usual, in which case throw additional points out there. These Training Points are not initially attached to any particular skill. You may wish to emphasize that they should be spend only on skills that were used during the game session. Some players may even save them up for later.

These are in addition to any in-game rewards. The Project team may have gained the thanks and acknowledgement from a local settlement. They may have located a secret lost cache. They may even have had some down time and spent a few hours here and there practicing and training their other skills. With in-game training, you can refer to the Training rules in the Skills chapter. Any points gained in this way are allocated towards that specific skill.

OPTIONAL RULE: KARMA

As PD you may feel that the post-apocalyptic world is a little too dangerous for your players, and just as you start to get a good story going, the entire team are terminated due to bad choices or bad luck. If this is the case, you may want to offer them Karma points.

Karma begins at 0. For exceptionally heroic actions, the sort of things the locals will talk about for many years to come, as PD you may award them with a Karma point.

A Karma point can be spent (even when they are at 0 Karma) in order to re-roll either one die or both. Once re-rolled, Karma cannot be reused for that action, and it can only be used for that Player's character.

Should Karma go into the negative, then there is some 'bad karma' due to the character. For each point of negative Karma, the PD may elect – at any time – to negate a player's roll, either forcing them to re-roll, or determining the outcome for story purposes. The outcome should usually be seen as unlucky initially, even if the eventual outcome may be positive.

A PD may, for purposes of story, override a player's roll, or present them with a situation that would normally have required a roll to avoid, in which case to balance the 'bad karma', the PD can grant those affected players with a Karma point.



THE WORLD AFTER

ARTEFACTS AND WEAR-OUT

Structures and other artefacts from the pre-End world will have decayed with time. The key factors in determining how much rot has set in are the item's construction and the local climate.

There are three broad classes of artefact:

Type 1 is made up of frame houses, built of soft wood and wood by-products, and light vehicles.

Type 2 structures include road surfaces, and reinforced frame buildings with brick or stone exteriors, and wooden or steel frames. Construction vehicles like bulldozers and cranes, large trucks, and armoured vehicles also fall into this category.

Type 3 structures are made of concrete or stone and steel e.g. bridges, office blocks, high rise apartments, dams, bunkers, some industrial plant, and the containment vessels of nuclear reactors.

Climate is divided into three groups based on humidity and temperature.

Dry climates include desert, steppe and frost types. Temperate climates have intermediate levels of temperature and rainfall.

Damp climates include all tropical ones, cold, sub-arctic and tundra types.

The following modifiers add to the artefact's base age:

Add one year for each year the structure or vehicle is occupied or used without repair.

If the structure or vehicle was in a nuclear blast zone, add the following:

DAMAGE ZONE	MODIFIER
Total	200
Severe	150
Moderate	100
Mild/light	75
Within 150km of any blast	25

Look up the artefact's condition on this table, using the adjusted age:

ARTEFACT CONDITION									
AGE	TYPE 1			TYPE 2			TYPE 3		
	DRY	TEMP.	DAMP	DRY	TEMP.	DAMP	DRY	TEMP.	DAMP
1-20	A	A	B	A	A	A	A	A	A
21-40	B	B	C	A	B	B	A	A	A
41-60	B	C	D	A	C	C	A	A	B
61-80	C	D	E	B	D	E	A	A	B
81-100	D	E	X	C	D	X	A	A	B
101-120	D	X	X	C	E	X	A	B	C
121-140	E	X	X	D	X	X	A	B	C
141-160	X	X	X	D	X	Z	A	B	D
161-180	X	Z	Z	E	X	Z	B	B	D
181-200	X	Z	Z	E	Z	Z	B	B	D
201-240	Z	Z	Z	X	Z	Z	B	C	E
241-290	Z	Z	Z	Z	Z	Z	C	C	E
291-350	Z	Z	Z	Z	Z	Z	C	D	X
351-400	Z	Z	Z	Z	Z	Z	D	E	X
401+	Z	Z	Z	Z	Z	Z	D	E	Z

RESULTS

A - Intact: structurally sound, all windows intact, needs cleaning. No penalties to use for an item of equipment.

B - Mostly intact: structurally sound, some windows intact, needs cleaning, removal of vermin, and minor repairs. Road surfaces have minor pot-holing. For an equipment item there is a 10% penalty to use, 10% probability of malfunction.

C - Partially intact: basic structure weakening, little glass unbroken, wood rotting, steel rusting, walls cracking, needs major repairs. A road surface needs to be cleared and re-built. A vehicle cannot be driven. For other equipment there is a 30% penalty to use and a 30% chance of malfunction.

D - Partially collapsed: horizontal structure sagging or collapsed, (upper floors, roof, wood flooring, etc.) gaps in concrete or stone, some salvageable building materials. A road is impassable. Some parts may be salvageable from a vehicle. For other equipment there's a 60% penalty to use and a 60% chance of malfunction.

E - Collapsed: horizontal and vertical structure collapsed. Building is a pile of rubble with an occasional standing wall. A vehicle is rusted scrap. Parts may be salvageable from other equipment items; they can't be used.

X - Destroyed: A building is a pile of rubble which is not even good cover. A vehicle is a burnt or rusted-out shell. Other equipment is scrap.

Z - Gone: slight mound where building was, some small foundation stones may still be visible. Roads and vehicles may have left remains that an archaeologist could find.

WEATHER

Weather is the daily variation in temperature, humidity and rainfall in a region. Climate is the longer-term trend or pattern in these variables.

Most catastrophes capable of ending civilization would have significant effects on weather and climate. For example, it is likely that temperatures would fall for months, possibly even years following an 'extinction-level' impact, volcanic eruption or nuclear exchange due to the debris pumped into the atmosphere. An ice age could ensue.

There are five basic climate types:

- Tropical: All average monthly temperatures over 18°C (64°F).
- Dry: Evaporation exceeds precipitation. Rainfall is less than 600mm/year (24").
- Temperate: Mean temperature of coldest month is between -3 and 18°C (27 to 64°F).
- Cold: Mean temperature of coldest month is less than -3°C (27°F).
- Polar: Mean temperature of hottest month between 0 to 10°C (32 to 50°F).

Tropical climate types are divided into rainforest, monsoon and savanna.

Rainforest has high humidity and rainfall: 150-300mm (6-12") per month. Temperatures vary very little across the year, about 2°C (3.6°F). The daily range is often larger due to sunny mornings and cloudy afternoons of

cooling rain. Early morning fogs and dew are common due to the humidity.

The monsoonal climate type is characterized by wet summers and dry winters. Rainfall is less than 60mm in the driest month, but usually exceeds 1000mm (39") at the peak of the wet. Temperatures reach a maximum just before the wet period begins. Once the rains start, the cloud cover acts to lower monthly temperatures. The dry season is short enough that there is enough moisture to keep the ground wet throughout the year.

In savanna, mean monthly temperatures range from 18°C (64°F) to above 25°C (77°F). Like the monsoon climate, the maximum temperature tends to occur in late spring to early summer prior to the onset of the rainy season. There may be a secondary maximum after the rainy period. Vegetation consists of a ground cover of drought resistant grasses with scattered trees. Rainfall isn't enough to make agriculture viable without irrigation. Southern Florida is currently the only example of this climate type in the United States.

Dry climates are found in steppe country (annual rainfall to 600mm/year) and deserts (annual rainfall to 300mm/year). Steppe borders desert terrain. The most notable examples of steppe in North America are the Southwestern U.S. and the plains of southern Alberta and Saskatchewan. Desert country is confined to the Southwestern U.S. The major division is made on the basis of average temperature. Hot or tropical steppe/desert has an average annual temperature of 18°C (64°F) or more; cold steppe/desert has an average annual temperature less than 18°C.

Temperate climates have subtypes based on the presence or absence of a dry season. West coast or Mediterranean climates have dry summers. The temperate climate types found in North America are those of the West Coast and Pacific Northwest (no dry season, cool summer for the latter), and the southeastern United States (no dry season, warm summer).

Cold climates are characterized by large annual temperature ranges and low average temperatures. The northern Mid-West, the Cascades and Rocky Mountains have this climate type.

Sub-arctic climates such as those found in northern Canada and Alaska are more extreme still.

Polar climates are divided into tundra and perpetual frost, based on whether snow and ice are present year-round or not. Tundra climates have greater amounts of precipitation than frost zones, which are effectively ice deserts. The highest peaks in the Rockies are the only examples of the tundra (alpine) climate type in the contiguous United States.

ENCOUNTER REGIONS

Hot Desert – region 13

Hot Steppe - west of region 10

Cold Steppe – east of the Rockies (AB, SK, western MB) from 55N to Kansas, part of region 11

Temperate: 1-5, 7, 8, 10

Cool Summer – BC and Alaskan coast to 60N

West Coast – region 14, 15

Cold and sub-arctic – 6, 9, 16

Tundra – high parts of Rockies in region 11, far north Canada, and Alaska.

The following tables have been created for the PD who wishes to include variations in the weather for their game.



ENCOUNTER REGIONS

NO.	TERRAIN NAME	STATES INCLUDED IN THE AREA
1	Northeast coast	Maine to Virginia, east of Appalachians. Southern Maritimes (Nova Scotia)
2	Southeast coast	Virginia, North Carolina, South Carolina, Georgia, Florida
3	Northeastern highlands	Vermont, New Hampshire, New York, Pennsylvania, West Virginia, Maryland, Kentucky
4	Southeastern highlands	South Carolina, Georgia, Tennessee, Kentucky, Alabama
5	Southeastern swamp	South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana
6	Northeastern lakes	New York, Pennsylvania, Ohio, Indiana, Michigan, Illinois, Minnesota, Wisconsin, southern Ontario, Quebec, Manitoba
7	North central	Ohio, Michigan, Iowa, Illinois, Missouri
8	South central	Missouri, Tennessee, Arkansas, Mississippi, Louisiana
9	Northern Midwest plains	North and South Dakota, Nebraska, Missouri, Minnesota, Iowa, southern Alberta and Saskatchewan
10	Southern Midwest plains	Kansas, Oklahoma, Texas
11	Northern Rocky mountain highlands	Idaho, Colorado, Utah, Washington, Oregon, Montana, Wyoming, western Dakotas, mountainous British Columbia and Alberta
12	Southern Rocky mountain highlands	California, Nevada, New Mexico, Utah, Colorado, Arizona
13	Southwestern desert	California, Nevada, Arizona, Utah, New Mexico
14	Southwest coast	California
15	Northwest coast	California, Oregon, Washington, British Columbia
16	Far North	All areas above 50 degrees latitude

1. DETERMINE BASE TEMPERATURE AND TEMPERATURE RANGE

This is influenced by climate type and the time of year.

TEMPERATURE BY REGION

Daily maximum temperature is determined by adding a die roll to the base temperature in degrees Celsius.

Daily minimum temperature is determined by subtracting the die roll from the base temperature.

Double the result of the roll and add it to, or subtract from, the degrees Fahrenheit values as required. For an exact result, multiply by 1.8.

CLIMATE TYPE

DIE ROLL

Rainforest

1d5 (1d10, divide result by 2 and round up)

Monsoon, savanna, sub-arctic, polar

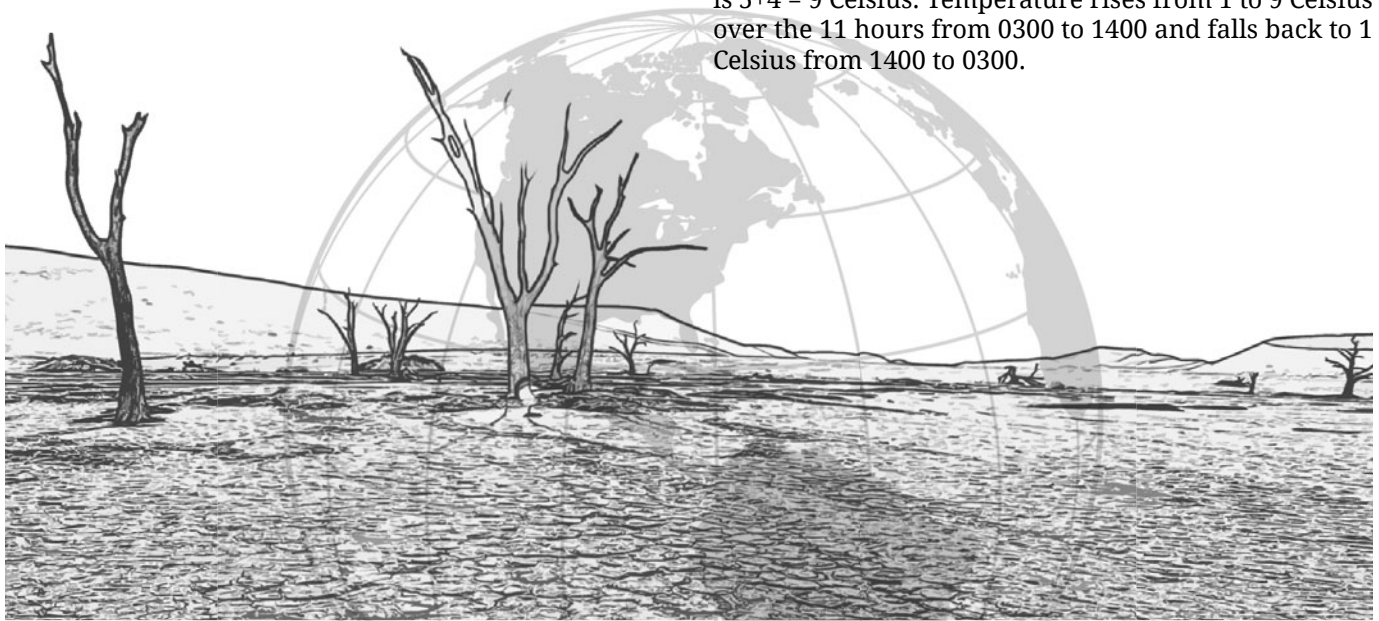
1d6

Dry, temperate or cold

1d10

For simplicity, the daily maximum temperature occurs at 1400 hours; the daily minimum at 0300.

Example: The base temperature in winter in a temperate, warm summer climate is 5 Celsius. The daily temperature range is determined with a 1d10 roll. On a roll of 4, minimum temperature is $5-4 = 1$ Celsius; maximum is $5+4 = 9$ Celsius. Temperature rises from 1 to 9 Celsius over the 11 hours from 0300 to 1400 and falls back to 1 Celsius from 1400 to 0300.



TEMPERATURE BY REGION

CLIME	RAIN FOREST		MON-SOON		SAVANNA		HOT DESERT		COLD DESERT		HOT STEPPE		COLD STEPPE	
SEASON	°C	°F	°C	°F	°C	°F	°C	°F	°C	°F	°C	°F	°C	°F
Winter	25	77	26	79	21	70	13	55	7	45	21	70	-12	10
Spring	26	79	30	86	22	72	20	68	18	64	29	84	5	41
Summer	26	79	26	79	27	81	35	95	33	91	30	86	18	64
Fall	26	79	26	79	27	81	24	75	20	68	26	79	7	45
CLIME	TEMPER-ATE WARM SUMMER		TEMPER-ATE COOL SUMMER		TEMPER-ATE WEST COAST		COLD		SUB-ARCTIC		TUNDRA		FROST	
SEASON	°C	°F	°C	°F	°C	°F	°C	°F	°C	°F	°C	°F	°C	°F
Winter	5	41	2	36	9	48	-6	21	-40	-40	-30	-22	-35	-31
Spring	16	61	10	50	13	55	13	55	-5	23	-15	5	-20	-4
Summer	28	82	19	66	17	62	25	77	17	62	5	41	0	32
Fall	19	66	11	52	16	61	13	55	-8	18	-10	14	-15	5

2. CHECK WIND DIRECTION AND SPEED

Roll 1d100 to determine direction. Check every 6 hours.

Wind speed is determined by: (2d10) + (current temperature in Celsius/10)

WIND SPEED

VALUE WIND SPEED

7 or less	Calm (<5 km/h)
8 to 13	Light (5-19 km/h)
14-17	Moderate (20-39km/h); +1 to next wind speed check; +10% to cloud cover roll.
18-19	Strong (40-62 km/h); +2 to next wind speed check; +20% to cloud cover roll.
20-21	Gale (63-87 km/h); +3 to next wind speed check; +30% to cloud cover roll.
22+	Storm (88+ km/h); +4 to next wind speed check.

Storm winds are accompanied by other manifestations of severe weather. These vary with climate type.

Roll 1d100 to determine the other elements of the storm.

Thunderstorms are associated with lightning and lots of rain. They are usually short-lived.

Tornadoes are erratic funnel-shaped storms with high wind speeds at their centre. They are usually parts of severe thunderstorms, and may last for an hour. Regions east of the Rockies are commonly affected. The north-central states are at greatest risk from July through September, the southeastern U.S. January through March. States not affected include West Virginia, Maryland, New Jersey, Delaware and the northern New England region. Strangely, western Massachusetts, Connecticut and southern New York are highly tornado prone.

Hurricanes are intense low pressure systems which form over bodies of warm water – typically ocean at low latitudes. They cause damage by their extreme circular winds (speeds greater than 118km/h or 75 mph) and flooding. They usually occur in summer. The East and Gulf Coasts are at risk, with storms coming ashore most frequently over the Carolinas, Georgia and northern Florida. In the southern hemisphere, these storms are called cyclones; in the northwestern Pacific, typhoons. Once ashore, these storms degrade to thunderstorms over a period of 1d3 days.

Dust devils are miniature tornado-like storms seen in dry climates.

Dust storms are clouds of dust borne on strong winds.

A blizzard is a violent, cold, snow-laden wind.

WIND DIRECTION

DIRECTION	TROPICAL	DRY	TEMPERATE	COLD	POLAR
N	01-10	01-10	01-10	01-20	01-20
NE	11-40	11-60	11-20	21-40	21-50
SE	41-70	61-75	21-30	41-45	51-60
S	71-80	75-84	31-40	46-50	61-65
SW	81-89	85-90	41-85	51-60	66-75
W	90-91	91-95	86-90	61-65	76-80
NW	92-00	96-00	91-00	66-00	81-00

OTHER ELEMENTS OF STORM

STORM TYPE	TROPICAL	DESERT	STEPPE	TEMPERATE	COLD	POLAR
Thunderstorm	01-84	01	01-90	01-79	01-75	01-75
Hurricane	85-94*	-	-	80-90*	-	-
Tornado	95-00	-	91-00	80-90[1]	-	-
Dust Devil	-	02-80	-	-	-	-
Dust Storm	-	81-00	-	-	-	-
Blizzard	-	-	-	91-00[2]	76-00[2]	76-00[2]

* If the area is hurricane-prone. Otherwise treat as thunderstorm.

[1] If the area is tornado prone, and the time of year is right, otherwise treat as thunderstorm.

[2] If the temperature is below freezing, otherwise treat as thunderstorm.

CLOUD COVER

CLOUD COVER	MODIFIER TO PRECIPITATION CHANCE	TROPICAL	DRY	TEMPERATE	COLD	POLAR
Clear (0%)	-20%	01-25	01-85	01-30	01-20	01-10
Scattered (<20%)	-10%	26-50	86-95	31-50	21-40	11-30
Partly Cloudy (<40%)	0	51-70	96-97	51-70	41-60	31-60
Mostly Cloudy (<80%)	+10%	71-90	98-99	71-90	61-80	61-80
Overcast (>80%)	+20%	91-00	00	91-00	81-00	81-00

PRECIPITATION CHANCE

SEASON/ CLIMATE	RAIN FOREST	MON- SOON	SAVANNA	DRY SUMMER (TEMPERATE)	NO DRY SEASON (TEMPERATE)	COLD OR SUB- ARCTIC	TUNDRA
Winter	30	10	5	30	25	10	20
Spring	30	15	5	35	30	25	5
Summer	10	35	25	5	10	25	5
Fall	10	25	20	25	20	15	15

3. CHECK CLOUD COVER AND CHANCE OF PRECIPITATION

Cloud cover is overcast (>80%) with any storm result. The chance of precipitation is 100% unless a dust devil or dust storm is involved.

Otherwise, roll 1d100 to determine the extent of cloud cover. This can be checked every 6 hours with the wind, or less frequently as desired.

Fog is cloud which is in contact with the ground. It reduces visibility to less than 1000 meters.

There are several mechanisms by which fog may be formed. Cooling of moist air is the most common, and is the explanation for autumn and winter fogs which occur with clear skies and light winds.

Cold air masses passing over warmer water can produce steam fog or 'sea smoke'. This is especially common around the Grand Banks of Newfoundland, making these waters among the foggiest in the world.

To check for fog, roll 1d100.

CHANCE OF FOG REGION

REGION	BASE CHANCE
Tropical Rainforest	40%
West Coast, Appalachians, New England	20%
Great Lakes	10%
Rockies and East Coast	5%

MODIFIERS:

Winter	+10%
Clear sky	+10%
Wind speed light or less	+10%
Early morning	+10%

Fog is light if cloud cover is 'partly cloudy' or less; it is heavy for higher levels of cloud cover.

Light fog carries a 20% visibility penalty for spotting purposes, heavy fog a 40% penalty.

Add the cloud cover modifier to the value below and roll 1d100 to determine if precipitation occurs.

Steppe climates have a constant 5% chance of precipitation.

Desert and frost climates have a constant 1% chance of precipitation.

Climate types need to match e.g. Dry Summer = West Coast, and No Dry Season = warm and cool summers.

4. CHECK PRECIPITATION TYPE AND AMOUNT

Roll 1d100. This can be checked every 6 hours with the wind, or less frequently as desired.

Sleet is a mixture of rain and snow.

Hailstones have a diameter of 5mm or more. Smaller ice or snow particles are called ice or snow pellets and can be regarded as sleet.

Roll 1d100. Add 30% if a storm has been rolled; results greater than 100 are treated as 100.

Light and moderate rain cause a 20% penalty to spotting; heavy or worse 40%. In addition, they respectively cause a 10% and 20% penalty to driving tasks.

Freezing conditions add a 10% penalty to driving tasks due to the presence of ice. Snowfalls may make roadways impassable.

5. DETERMINE FUTURE EFFECTS

The next day's base temperature is determined as follows:

Roll 2d6-7 to determine temperature change.

+1 for every 3°C/6°F below base

-1 for every 3°C/6°F above base

-3 for each day of rain

+2 for each day of cloud or snow and temperature 0°C (32°F) or less

PRECIPITATION TYPE

TYPE/ TEMPERATURE	LESS THAN -10°C (14°F)	-10°C TO 0°C (14°F -32°F)	1°C TO 10°C (33°F TO 50°F)	11°C TO 25°C (52°F TO 77°F)	25°C (77°F) OR HIGHER
Snow	1-98	1-80	1-20	1-2	-
Sleet	99-00	81-89	21-22	3-4	1
Hail	-	90-97	23-25	5-7	2-4
Rain	-	98-00	26-00	8-00	5-00

PRECIPITATION AMOUNT

AMOUNT/CLIMATE	TROPICAL	DRY	DESERT	TEMPERATE	COLD	POLAR
Trace	1-10	1-75	1-75	1-20	1-39	1-59
Less than 1mm per hour						
Light	11-45	76-97	76-00	21-70	40-69	60-97
1-2.5mm per hour						
Moderate	46-87	98-00	-	71-90	70-94	98-00
2.5-7.5mm per hour						
Heavy	88-95	-	-	91-97	95-99	-
7.5-10mm per hour						
Very Heavy	96-00	-	-	98-00	00	-
More than 10mm per hour						

CACHES

The Caches of equipment left for a Morrow Project team are their life-blood. With minimal equipment when they first wake up in the bolt-hole, the success of their future mission depends upon finding these caches. However, the caches were not intended to remain interred for more than 150 years. Time and the elements have taken their toll. If the PD wishes to keep a little mystery in the game, they can use the following tables for quality and contents of each cache.

CONDITION OF EQUIPMENT / CACHE

D10 CONDITION

- | | |
|-----|---|
| 1 | No equipment present. Position appears to have been compromised by locals or natural event. |
| 2 | Cache is not where the team was told it was. It takes 1D6 days to find the actual location. |
| 3-4 | Seals broken, equipment has been exposed to the elements. Food, clothing and medical supplies have spoiled. Some items may have rusted or are tarnished. With cleaning and repair, some equipment may be useable. FOCUS + Artisan Task check. |
| 5-9 | Cache is intact. |
| 10 | Cache is intact and secure. Entering cache requires REASONING + Operate Equipment Task check. |

AGE OF CACHE

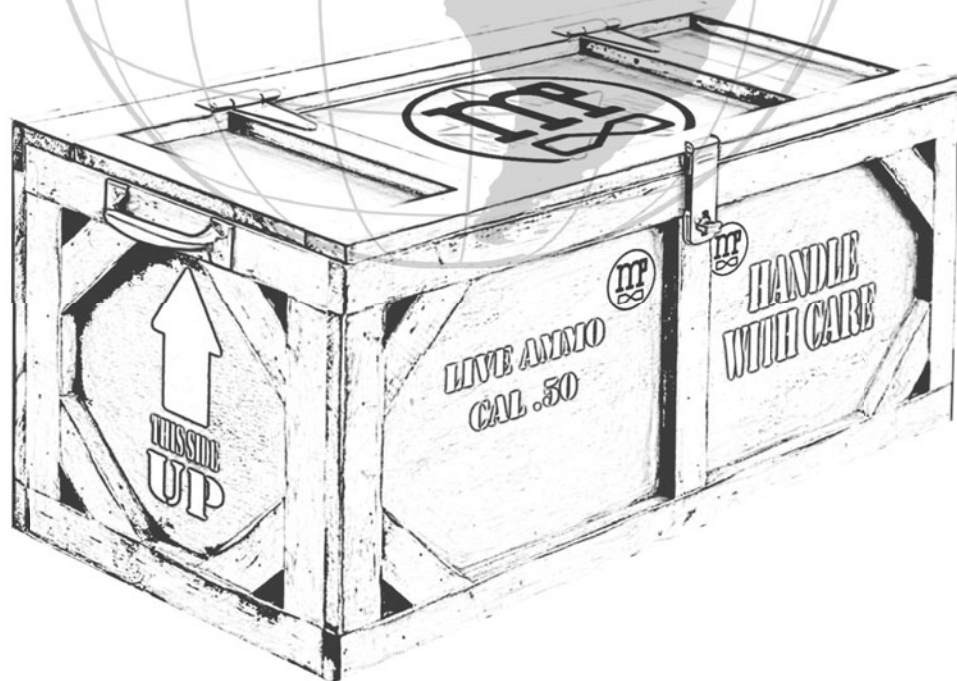
D10 AGE

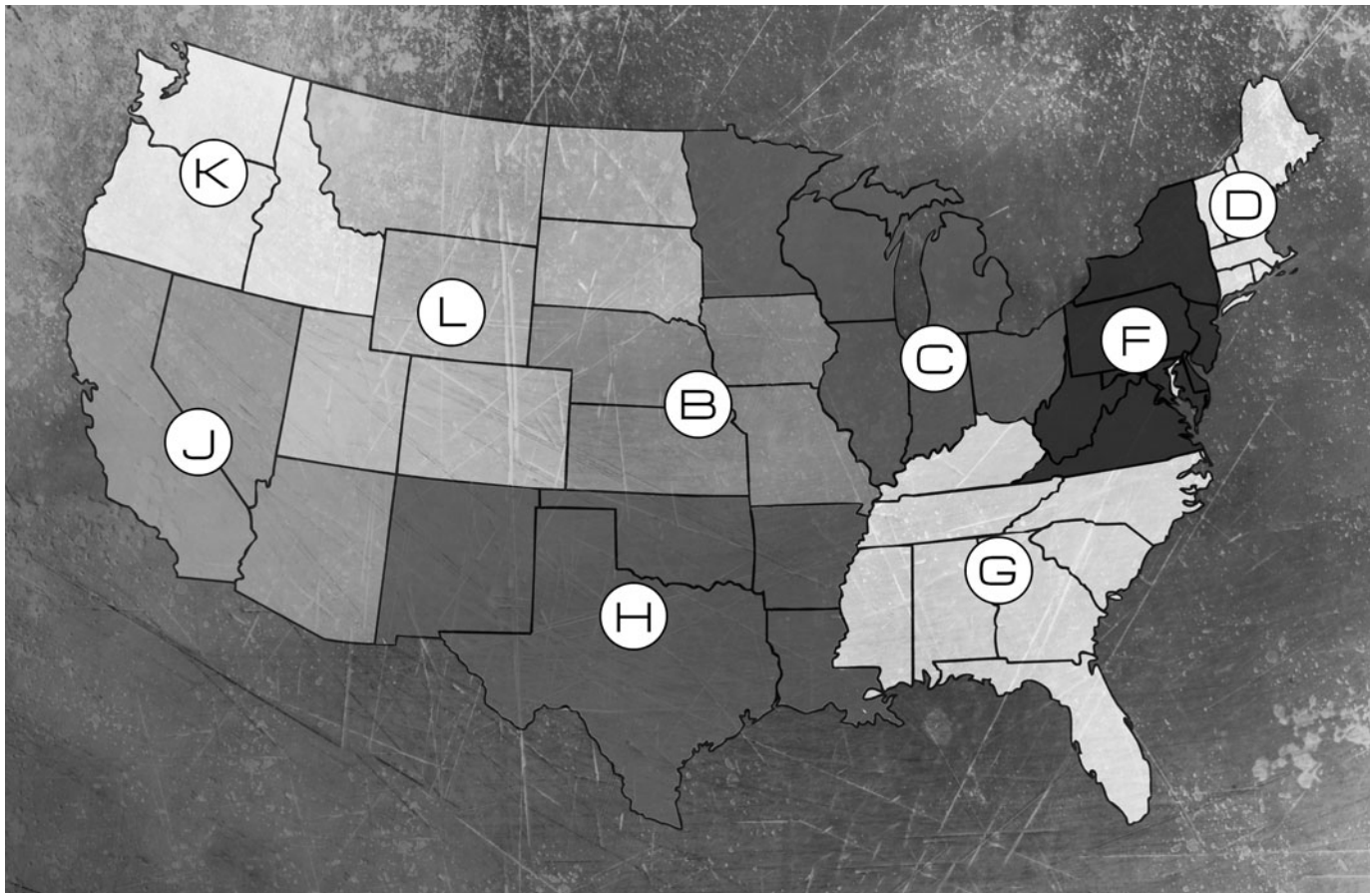
- | | |
|-----|---|
| 1-2 | Early issue or equipment. 1970's. |
| 3-5 | Mid era of equipment issue. 1980's. |
| 6-9 | Late era of equipment issue. 1990's-2000's |
| 10 | Final stage of equipment issue. May contain only partial amounts of the expected supplies. Technology may be cutting edge for 2017. |

PRIMARY FUNCTION FOR CACHE

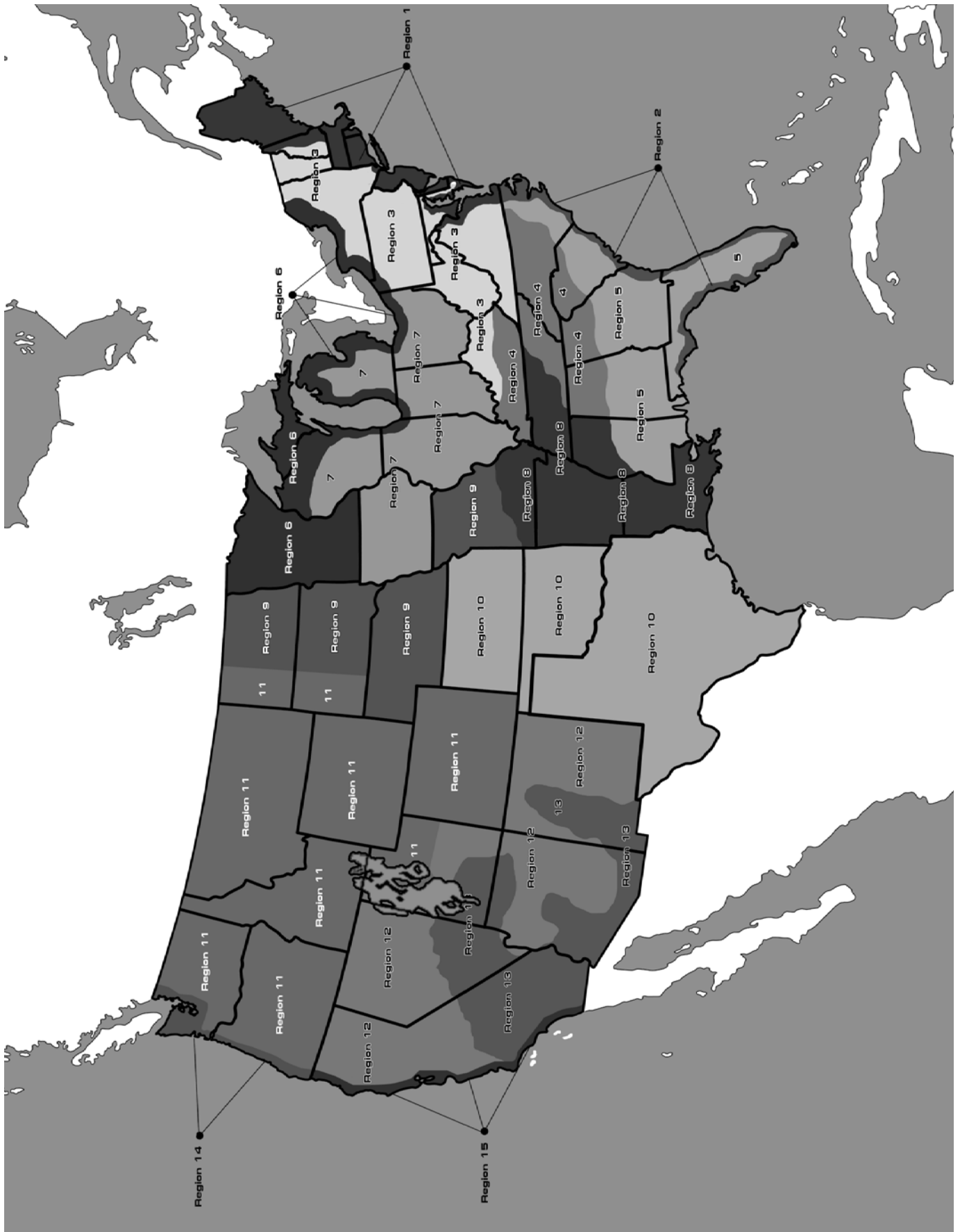
D10 FUNCTION

- | | |
|-----|--|
| 1 | Basic Survival Gear, dried & powdered food, water purification tablets, maps, etc. |
| 2 | Medical Equipment. |
| 3 | Clothing & Armor. |
| 4-5 | Trade Goods, including precious metals. Building equipment. |
| 6-7 | Military equipment: guns, ammunition and explosives. |
| 8-9 | Ammo. Medical Supplies. |
| 10 | Vehicles, spare parts for a variety of equipment. Fusion reactors, alcohol fuel cells, heavy water, distillation rigs. |





Region	State
Bravo (B)	Iowa, Kansas, Missouri, Nebraska
Charlie (C)	Illinois, Indiana, Michigan, Minnesota, Ohio, Wisconsin
Delta (D)	Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont
Foxtrot (F)	New Jersey, New York, Delaware, District of Columbia, Maryland, Pennsylvania, Virginia, West Virginia
Golf (G)	Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee
Hotel (H)	Arkansas, Louisiana, New Mexico, Oklahoma, Texas
Juliet (J)	Arizona, California, Nevada
Kilo (K)	Alaska, Idaho, Oregon, Washington
Lima (L)	Colorado, Montana, North Dakota, South Dakota, Utah, Wyoming



SURVIVORS

Cohkha pulled tightly on the reins.

As the two horses slowed, the horse-shoes clapping on the scattering of broken tarmac, Cohkha pulled up his hand-brake.

The truck squealed to a halt, for a moment the harnesses strained and then relaxed.

"Rachel's Hope," he muttered to himself, reading the painted sign up ahead, "452 souls. No Strangers Allowed." Cohkha chuckled. At least they had someone who could write.

"452 people. Pretty big town," he directed towards his horses, "let's just ignore the warning, and go see what they have to offer."

Cohkha reached down and released the hand-brake. The truck began to roll. He flipped the reins, calling his horses to move once again. They picked up the slack, pulling the truck over the fragments of aging road.

Looking around he could see a rusting wheel resting beside a nest of hornet-ants. He shuddered at the memory of having been stung by one of those back when he was a child.

He then remembered some of the stories his father would tell him.

"Cohkha, boy, did you know that before the days of darkness, there were more people living in one building than are in this town? Yes. They used to live in giant towers made of sheets of ice, and they could travel in an instant with the wonders of lightning, calling down a bolt to take them from one place to another. Usually this was a thing called the 'Mall', where traders grew food for everyone. People would come from all over the world to barter for food, and no one wanted for anything."

"Yet, men came, carrying guns, for they had nothing and demanded everything. The people from the ice towers refused, saying that they will not negotiate with evil men. They did offer that should the men live in the towers and destroy their guns, they will never want for anything. The evil men were furious at the offer, and destroyed the towers, and destroyed the 'Mall'."

"What else did the tower people have?" Cohkha would ask.

"They had flying cars, and boxes of light and sound. The boxes were the tower people's storyteller, and many would sit in rapture to

what the box would tell them of ancient times." Cohkha's father would often respond.

Cohkha's father had many great tales.

It was those stories that motivated Cohkha to venture out into the world and seek some proof of the 'tower people', trading as he did so. The evil gun men, it seemed, were still very much alive. There were tales of the army of five, and the army of Krell.

Up north, he was told, lays the ruins of the tower people's tower nation. A place called She-cargo. He was on his way there when he ventured on a group of strangely clothed men and women.

They were all dressed the same, brandishing the symbol of an eye on their sleeves. One was looking through a pair of compact telescopes that Cohkha was later to discover were called binoculars. All wore guns at their side, and Cohkha could only conclude that these were advance scouts for an invasion of the evil gun men.

They bid him halt, and Cohkha feared for his safety should he choose to flee. He brought his horse to a stop. A woman approached him, her arms raised and palms held open.

"Good day. My name is Lauren Coleman. This is my team." The woman with a strange accent indicated the others. "And, who may have the honor of speaking to?"

In the quiet that followed, the woman chose to clarify herself. "Tell me, what's your name?"

"Cohkha."

Lauren smiled. The other members of her team also smiled, having found something amusing out of what or how he said his name.

"Coca, is it?" She replied.

"No, it's Cohkha."

"Sorry, Coh-kha." Lauren quickly corrected her pronunciation. "Tell me, where did you get your name from?"

"What do you mean? My father gave it to me. It's supposed to come from one of the glass beakers used by the tower people. It's a name of one of those who lived before."

"Before what?" Lauren's smile faded, "What tower people?"

As it turned out, these weren't evil gun men, but were tower people from before the days of darkness, frozen in ice, to be thawed out when the day came to rebuild.

Cohkha smiled to himself. That encounter was two years ago. He never did make it to 'She-cargo'. There were more important things to do.

There it was, right in front of him, the gate to Rachel's Hope, made from the hammered out shell of a car. A man stood on top, watching Cohkha's approach.

"Be on your way stranger." The guard commanded.

"I'm here to trade."

"What do you have?"

"Antiquities from before the days of darkness."

"So, you're a scavenger. Where did you dig them up from?"

"I didn't. I was given them." Cohkha delved into his bag on the passenger seat. He held up a coin.

"Look. It's pure silver. It's marked with the tower people's god, 'liberty.' They gave it to me."

"Who? Who gave it to you?" The guard quizzed.

"They did. The last of the tower people. Some of them survived. They have risen from their frozen sleep to rebuild the world that was before. I've met some of them. They talk a little funny, but are here to bring an end to all the suffering."

There was silence, the guard had vanished, Cohkha grew nervous, but he had been through this many times before.

"I listened to their musical white boxes. They had string you put in your ears, and could hear all manner of music. No end of it. They called it a 'pod'"

Still there was silence. Cohkha waited.

Finally, there was a noise from behind the door. It opened slowly, scraping the ground as it did.

Cohkha relaxed. He would bring the good news to Rachel's Hope too.

SURVIVAL

The world went black for the sleeping Morrow Project Teams. Outside the silence of the bolt-holes, the world tore itself apart. All the comforts mankind once enjoyed – gone. Instead those few survivors of the catastrophe huddled together and attempted to scrape enough from the poisoned soil, so that they and their children could live another day. Some hoped that the government would come, others than the sun would one day shine once more through the dark skies. Plague and Famine continued to kill until only a few percent of the pre-war population remained. After 150 years, the population of North America has stabilized at about 20 million.

The world of the future is divided between those who control technology and those who do not. Those who found weapon caches quickly conquered others. Guns, ammunition, vehicles and fuel were treasures that were bitterly fought over. Some clever leaders invested in learning how to make their own ammunition, or distill alcohol in order to equip and fuel a mobile, heavily armed military force. They scoured the ravaged cities looking for spare parts and machinery that could maintain their precious weapons and vehicles.

Agriculture reverted to primitive methods without the gamut of technology and chemicals once available for farming. A square kilometer of land could support perhaps 100-200 people in the most fertile regions, where it once would have supported up to ten times that. In other areas, subsistence farming took the form of slash and burn agriculture, or nomadic herding. The struggle for survival meant that education became a luxury, and the knowledge of the world before was lost. Literacy was a redundant skill.

SURVIVORS

Those that survived those harsh times often grouped together with a common cause. Some found other ways to survive, others found the ruins of a city and tried to reclaim the old ways. The descendants of those brave souls have developed societies unlike anything the Morrow Project teams would be prepared for. The world has moved on in their absence.



TECHNOLOGY LEVELS

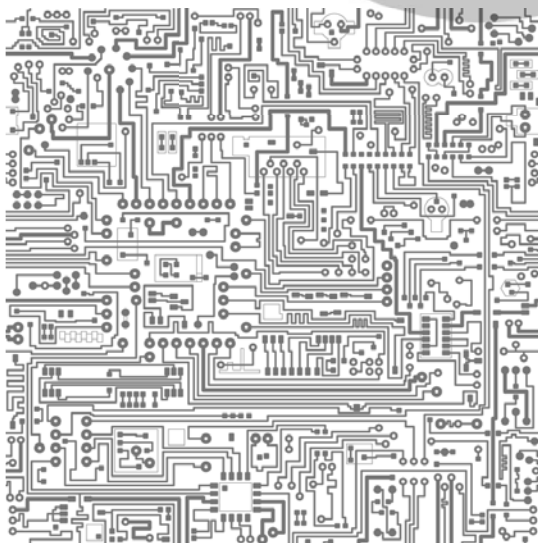
These are defined by the amount of human and physical capital available to the community. Human capital factors include the quality of education, nutrition and health; physical capital, the quality and quantity of infrastructure, machinery that can amplify human effort and energy supply.

Increasing sophistication enables farmers to support more people in a given area of land, and the growth in non-farm labor leads to further specialization. More people congregate in urban centers; life expectancies rise due to advances in sanitation and medical care.

If the PD rolls a random encounter and the result rolled is of the human variety, then he must decide not only how they will react but at what technology level they can use. Given this information it becomes relatively simple to equip NPCs with the appropriate weapons and equipment. To find the tech level of any group roll 1D100 and use the following table.

TECHNOLOGY LEVEL TABLE

1D100	TECH LEVEL	HISTORICAL EQUIVALENT
01	I	Stone-age
02-06	H	Metalworking
07-16	G	Late iron (~1610)
17-51	F	Early steam (~1840)
52-82	E	Late steam (~1880)
83-93	D	Early electric (~1920)
94-98	C	Late electric (~1960)
99	B	Early network (1980s+)
00	A	Late network (2001+). Project equivalent



TECH LEVEL DESCRIPTIONS – DEVELOPMENT EXAMPLES

AGRICULTURE: RAISING CROPS AND LIVESTOCK

- I The hunter gatherer lifestyle predominates. Some groups practice nomadic herding or shifting cultivation. The latter involves slash and burn techniques with little or no plowing. In any case wooden implements can only work light soils.
- H Non-moldboard plows are the primary farming implement. Seeding is by hand throwing (broadcast). Little to no irrigation occurs due to expense. There is no arable/pasture rotation; heavy soils are not worked. Stock is folded over land. Most stock is destroyed prior to winter – some breeding animals are retained for the following year. Heavy equipment is owned in common.
- G Iron shared moldboard plows and seed drills become widely available. Drainage techniques, arable/pasture rotation, and nitrogen fixing plants are used to maximize soil fertility. Heavy soils are worked when demand requires it. Stock is folded through fields and manure spread via cart or other mechanism. Fodder crops grown en masse for stock over winter. Seed merchants appear in organized areas. Food preservation using sugars, vinegars, pitch is practiced on a large scale.
- F Many labor saving devices are introduced which greatly reduce the time taken to plant and harvest a crop. As a result the number of laborers needed per farm is greatly reduced. Heavier soils are worked on a regular basis. Static steam engines become readily available. Market gardens appear near cities. Later in the period, reapers and thresher/winnowers appear where technology makes them available. At first these are hand-powered, but are soon adapted to horses and mechanical devices. Canneries open to produce tinned food. Artificial fertilizers (potash, phosphate) begin to be widely used.
- E Grain elevators, synthetic nitrogenous fertilizers (electrolysis, Haber synthesis of ammonia), combine harvesters, steam tractors, principles of plant genetics, and the systematic assessment of food quality and safety are widely used. Extensive market gardens built near cities. Advances in transport networks lead to grain being produced in ideal soil areas only – it is cheaper to freight into the cities than grow on ‘marginal’ land.
- D Internal combustion engine tractors and equipment are used by all farmers. Hydroponics, systematic hybridization (statistical genetics, heterosis), battery farming of poultry, industrial refrigeration, frozen foods, refrigerated food transport, self-tying hay baler are readily available. Extensive use of greenhouses enables year-round growth of ‘tropical’ crops.

- C Enhanced hybrid crops (e.g. triticale), non-selective synthetic pesticides and herbicides, intensive live-stock farming (e.g. pigs), sweep plows, self-tying hay baler, mechanical crop pickers.
- B No-till planting, point irrigation, genetically modified crops and livestock, 'selective' pesticides and herbicides. Integrated pest management, where the farmer has access to entomologists and agronomists, further reduces the amount of pesticides and herbicides used.
- A Genetically modified crops and livestock widely cultivated. Cellulosic ethanol production from modified plants possible.

EXTRACTION: MINING, FORESTRY, FISHING

- H Metal tools make rock mining possible. Deposits of native metal e.g. copper, gold are most readily accessible. Mineshafts are limited to a depth of 100m (325 ft) by the water table.
- G Percussion drilling enables natural gas deposits up to 150m (500ft) to be tapped. Mineshafts attain a depth of 200m (650 ft) but are limited from going deeper by pump technology.
- F Steam engines used to pump out mine shafts; depths routinely exceed 300m (1,000 ft). Coal becomes an important fuel source. Nitroglycerin-based explosives make mining and tunneling much easier.
- E Extensive drilling for oil and gas due to increased demand for fuel. Dynamite greatly improves explosive safety. With the advent of internal combustion engines, heavy machinery gets more common.
- D Refrigerated food transport revolutionizes fishing industry. Better understanding of geology of oil and gas formations improves accuracy of exploration. Principles of ecology begin to be applied to forest management.
- C Offshore oil and gas platforms. Sonar used by fishermen. Principles of ecology begin to be applied to fisheries management.
- B Further improvements in exploration technology with advances in sensors and computing. Horizontal and slant drilling allow more oil and gas deposits to be exploited.
- A 4D seismic imaging used for resource prospecting. Advanced ecological-climate modeling used for fisheries, forestry management.

MANUFACTURING: PROCESSING INPUTS FROM THE AGRICULTURE AND EXTRACTION SECTORS TO PRODUCE A VARIETY OF GOODS AND FEED STOCKS.

BROAD CATEGORIES:

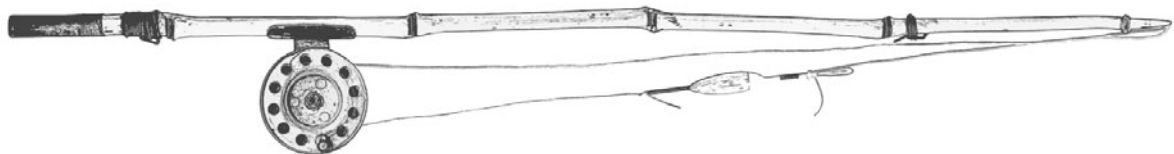
Material – raw material processing – food, chemical engineering, metal smelting, etc.

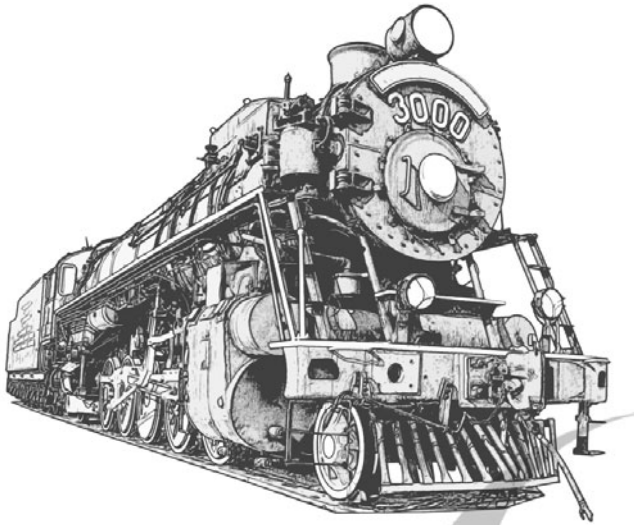
Structural – furniture, buildings, construction materials

Energy converting – transport, power generation, fuel production, distribution

Informational – information, communication, computing (from paper and printing presses to computers, medical and scientific instruments, etc.)

- G Individual craftsmen or small workshops. Crucible steel produced with wood or charcoal as fuel.
- F Factories. Steam-powered tools, screw-cutting lathes and micrometers become readily available. Large scale cement manufacture is commonplace. Industrial steelmaking relies on the Bessemer or open-hearth processes.
- E Assembly lines, electric tools, compressed gases, early plastics e.g. celluloid, vulcanization. Aluminum production on an industrial scale begins.
- D Chemical engineering (plastics, synthetic fibers, etc.) and cryogenic (e.g. production of liquid oxygen) processes become commonplace. Mass production of aluminum – energy efficiency of process has doubled. Catalytic cracking of oil allows production of high octane (80+) fuels by the end of the period.
- C Composite materials, early automation, synthetic rubber, advanced cryogenics (production of liquid hydrogen and helium). Further advances in oil refining allow fuels with octane numbers of 100+. There are continuing improvements in energy efficiency of ammonia synthesis, iron and steel manufacture. Basic oxygen furnaces and electric arc furnaces used extensively to make and recycle steel.
- B Flexible manufacturing, industrial robots, biotechnology, early 'fabs' - minifactories. Energy efficiency of aluminum production is twice that at tech level C.
- A Rapid prototyping equipment and minifactories commonplace. Widespread use of composite materials. Significant advances in machine vision and industrial automation.





**TRANSPORT: BUILDING NETWORKS (ROADS, RAILS),
NODES (PORTS, TRAIN STATIONS) AND VEHICLES.**

- H Chariot, stirrups, efficient animal harnesses. Sailing ships and galleys carry most of the available freight.
- G Carriages/wagons in common use, hot-air balloon possible, age of sail; use of inland waterways to move freight, horse-drawn rail carriages.
- F Steam engines used in railroads, the bicycle.
- E Steam turbine, internal combustion engines (Otto, Diesel), cars and motorcycles, pneumatic tires, iron-hulled ships, steamboats, gliders, rail networks, subways, submarines.
- D Aircraft, airships, automatic transmissions, disc brakes, power steering, all-wheel drive, tracked vehicles, sealed road networks commonplace. Electric cars become possible with contemporary battery technology. Fuel cells, electric and diesel locomotives appear.
- C Jet aircraft, helicopters, liquid-fuelled rockets, nuclear ships, submarines and aircraft, aircraft autopilots, inertial navigation systems, free-way networks, manned spaceflight possible.
- B High-torque electric motors, electric hybrid vehicles, electronic ignition, engine management and control systems, anti-lock braking systems, traction control, walking vehicles, remotely piloted vehicles.
- A Continued advances in vehicle control systems and sensors, aiming to optimize ease of operation and passenger safety. Renewed interest in hybrid and plug-in electric vehicles with advances in battery and capacitor technology. Project-issue vehicular fusion plants.

**ENERGY: GENERATION AND DISTRIBUTION OF
POWER AND FUEL TO RUN EVERYTHING.**

- G (or less) Muscle, wood, wind, water, oil lamps.
- F Coal/wood-fired steam boilers. Coal dust and coal gas used extensively. Substitution of coke for charcoal in iron and steel production.
- E Oil, natural gas use becomes significant; high-pressure oil cracking. Gas and electric streetlights. Dynamos to generate electricity. Steam and water turbines.
- D Electricity grids become possible, hydroelectricity, batteries; catalytic cracking of oil (enables production of high-octane gasoline). Wind turbines.
- C Fission power, photovoltaics (solar cells)
- B Fuel cells, improved power density batteries, ultra capacitors.
- A Continued improvements in photovoltaic and battery efficiency. Fusion power.

WEAPONS: OFFENSIVE AND DEFENSIVE EQUIPMENT

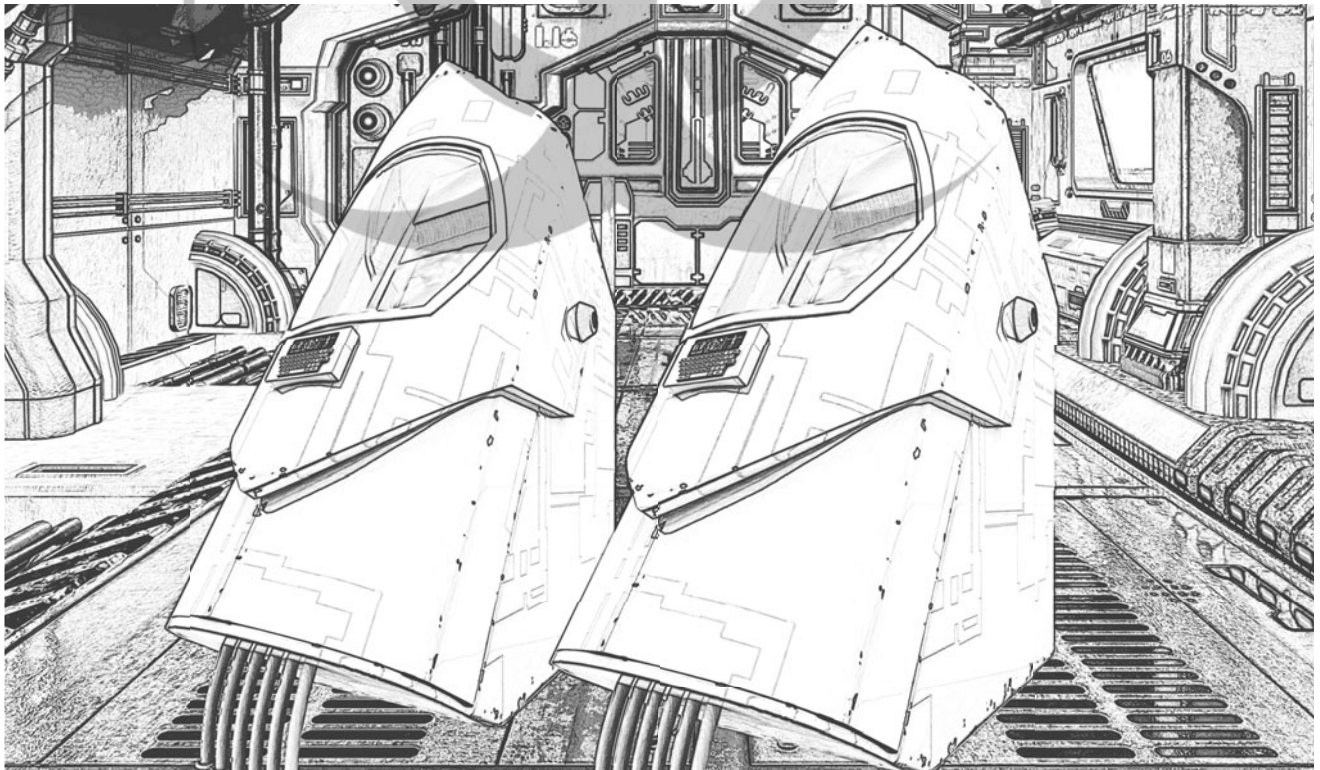
- I Stone, bone, wood. The bow, sling, spear-thrower.
- H Metal weapons – bronze, iron, steel. The crossbow.
- G Muzzle loading rifles, pistols (flintlock) and artillery.
- F Breech-loading rifles, revolver, shotgun, unguided rockets, nitroglycerine, percussion caps
- E Brass cartridge ammunition, lever action rifles, machine guns, telescopic sights, smokeless powder, breech-loading artillery, dynamite, modern primers.
- D Bolt-action rifles, semi-automatic pistols, pump action shotguns, sub machine guns, hand and rifle grenades, flamethrowers, flak jackets, tanks. Plastic explosives.
- C Automatic/assault rifles, ballistic cloth (nylon weaves), automatic grenade launchers, man-portable anti-armor and anti-aircraft missiles, napalm, thermobaric weapons (fuel-air explosives), guided missiles, recoilless rifles, radar, night and thermal vision sights, nuclear weapons, stabilization for vehicle mounted weapons, band tracks for armored fighting vehicles.
- B Precision guided weapons, ballistic cloth (Kevlar/Spectra), resistweave, composite and reactive vehicle armors.
- A Reactive material munitions, vehicle active defense systems, further advances to missile and sensor technology, combat exoskeletons (HAAM suit).

COMMUNICATIONS:

- H Written language, paper or papyrus, printing press.
 - G Runners, semaphore, heliograph, relay stations for runners and riders, signal towers, etc.
 - F Telegraph and wire nets. Photography.
 - E Universal primary education. Telephone networks. Mechanical typesetting. Underwater cables. Phonograph.
 - D Radio (broadcast, two-way). Note shortwave frequencies have best range for input power. Motion pictures. Television.
 - C Universal secondary education. Vehicle or installation based spread spectrum communications, satellite communications possible. Magnetic tape recording. Photolithography. Instant photography. Long-playing records.
 - B Man-portable spread spectrum communications (e.g. cellular telephony). Optical fibers. Laser printing. Compact discs and DVDs. Digital photography.
 - A Ubiquitous cellular telephony. Portable device convergence (phone, web browser, camera). Solid-state memory storage (Flash memory) in most electronic devices. Maturity of search engine software and wide use of databases to organize knowledge.
- Support infrastructure is assumed e.g. schools, relay stations for runners, telegraph and telephone cable networks, telephone exchanges, ground stations and launch facilities for satellite communications...

HEALTH CARE: INNOVATIONS AND DELIVERY SYSTEMS

- G Smallpox vaccination, obstetric forceps (rediscovered).
- F Anesthesia (chloroform, ether). Sanitation. Stethoscope. Mercury thermometer. Blood pressure cuff.
- E Antisepsis, hypodermic syringe and needle, sterile intravenous fluids, drug purification e.g. cocaine, morphine, heparin. Aspirin. Vitamin concept.
- D Sulfa drugs, insulin, thyroid hormones, anti-sera, blood transfusion, cardio-thoracic, vascular and neurosurgery, autonomic pharmacology (e.g. adrenaline/epinephrine derivatives), biochemistry, radiology (X-ray imaging). Mass immunization, cancer radiotherapy.
- C Penicillin and other fungal derived antibiotics, synthetic steroids, blood component separation, critical care medicine, kidney and heart transplantation, nuclear medicine (radioisotope assisted diagnostic imaging), disposable intravenous catheters and tubing, heart-lung machines, pacemakers, renal dialysis, cancer chemotherapy.
- B Biotechnology used to produce pharmaceuticals, molecular diagnostics, CT and MR scanning, ultrasonography, minimally invasive surgery, point-of-care laboratory analyzers, expert diagnostic systems, liver, lung and pancreas transplantation.
- A Point of care testing for rapid pathogen and chemical agent identification, improved resolution and acquisition time of imaging modalities. Cold sleep, early nanomedicines – universal antibody/antidote.



ENCOUNTERS

An encounter is an unexpected meeting between the player's characters and some PD controlled force. This could be something interesting, but ultimately harmless, like an abandoned building, or a weird change in the weather. It could be a pack of wild dogs, a giraffe with green stripes crossing their path, or an ambush by mutant beast-men. Most importantly, it may be first contact with a local community, either a lone merchant on the road, or an established settlement.

An encounter is usually something that puts the players on the spot, providing them with a challenge, whether against the natural environment, or an invading army on their tail. The PD may wish to pre-plan these encounters, certain events that are pertinent to his adventure, or they may choose to work with a random encounter.

There are 16 Encounter Regions; these can be found in the previous chapter.

Anything can happen out in the wilds. The PD may elect to roll a D6 for every couple of hours that pass by in game, or whenever a settlement or prominent feature is reached. On a 6, roll on the encounter table below.

ENCOUNTER TABLE

1D100 DIE ROLL	ENCOUNTER
01-09	Strange Natural Event or inclement weather pattern
10-19	Interesting Location, building, or plant growth discovered
20-69	Fauna – see Flora & Fauna Chapter
70-79	Small group of humans (roll 1D10 for number)
80-89	Small Settlement: Size 3+ (roll 1D100 for population)
90-96	Large Settlement: Size 4+ (roll 2D10 x 50 for population)
97-99	City: Size 6+ (roll 2D10 x 1000 for population)
00	Project Site, Regional base (1D100% operational) or Cache marker.

ENCOUNTER SIZE

Technology level influences settlement size. +2 to size if Tech level A-B; +1 if C-D; -1 for F-H; -2 for I.

ENCOUNTER SIZE TABLE

SIZE	DESCRIPTION	POPULATION	ORGANIZATION	LEADERSHIP	DOMAIN
0	Ruins / Signs of Decay	[0]	0	0	0
1	Single Person	[1]	0	0	0
2	Traveling Group	[2-12]	1d3x5%	1d3x5%	0
3	Stead/Farm	[4-20]	1d6x5%	1d3x5%	0.5 km ²
4	Small Settlement	[20-100]	1d6x5%	1d6x5%	2 km ² (2x1km)
5	Large Settlement	[50-300]	2d6x5%	1d6x5%	3 km ² (3x1km)
6	Reclaimed Town	[200-2000]	2d6x5%	2d6x5%	20 km ² (4x5)
7	Large Town	[1000-5000]	2d6x5 + 30%	2d6x5 + 15%	50 km ² (7x7)
8	Resettled City	[2000-8000]	2d6x5 + 40%	2d6x5 + 30%	80 km ² (9x9)
9	Moderate City	[6000-20000]	1d6x5 + 70%	2d6x5 + 40%	200 km ² (14x15)
10	Big City	[12000-100000]	1d6x5 + 70%	1d6x5 + 70%	1000 km ² (32x32)

Organization: is the likely level of stability within the community, the presence of formal legal codes, and the infrastructure necessary to support the settlement.

Leadership: is the strength of leadership the community has, how well established, how stable the structure, and how loyal the rest of the community is to their leaders.

Domain: is the area of land the settlement needs to control in order to provide food and resources to sustain the populace. It has a base value of two hectares per person and is modified by tech level; see chapter 12 for details.



SKILL LEVELS OF SURVIVORS:

Expect to see experts with a couple of skills around +30%, with the remainder at +10% to +20%. Experienced encounters may have a couple of skills at +20%, with others at +10% to +0%. Green or rookie type encounters will have a few +5% to +10% skills, with more complex skills at +0%.

BASIC SURVIVOR SKILLS:

These are skills available to all survivors. These are in addition to skills listed for any career the Survivor character may have, and the survivor group they may belong too. All skills available to the character through this, any career they may have, and their survivor group, are considered trained to at least 0%.

B: Athletics, Brawl, Climb, Observe, Persuade
A: First Aid, Hunt, Survival [select region]
C: Culture [own], Language [own]

CAREERS:

Soldier / Militia: A professional warrior for the community - may be a law enforcer in larger settlements.

B: Brawl, Observe, Persuade

A: Archery, Construction, Emergency Procedures, Hunt, Melee Weapons, Ride, Tactics

C: Martial Arts – if available, Special Weapons – if available

Artisan: A craftsman, such as carpenter, blacksmith, dowsers, cook, barber.

B: Bargain, Scrounge

A: Artisan, Create

C: Engineering – if available, Dentistry

Doc / Healer: A professional healer in the community - may serve as mid-wife and other such duties.

B: Observe, Persuade

A: First Aid, Research, Survival

C: Biology, Dentistry, Forensics, Medicine, Nursing, Pharmacology, Psychology, Surgery

Hunter / Tracker: An expert at locating and capturing or killing live food.

B: Athletics, Climb, Navigate, Observe, Stealth

A: Archery, Animal Handling, Hunt, Melee Weapon, Navigate, Survival, Thrown Weapon

C: Veterinary Medicine – if available

Farmer: Looks after the agricultural land, and responsible for producing most of the settlement's food.

B: Bargain, Observe

A: Agriculture, Animal Handling, Maintenance, Operate Equipment – if available

C: Biology, Geography

Herder: Looks after the settlement's livestock, ensuring their continued health.

B: Bargain, Observe, Persuade

A: Animal Handling, Hunt, Swim

C: Veterinary Medicine – if available

Trader: A merchant and sometimes diplomat for the community.

B: Bargain, Navigate, Observe, Persuade, Scrounge, Trade

A: Animal Handling, Commerce, Legal Procedures, Performance

C: Culture [other], Language [other], Mathematics

Criminal: Often an exile (or past-exile), or mistrusted by the community.

B: Acrobatics, Athletics, Bargain, Brawl, Persuade, Scrounge, Stealth

A: Artisan, Create, Melee Weapon, Performance, Survival

C: Forensics

Preacher / Teacher: The spiritual guide, storyteller, or teacher for the settlement. This may be the only 'educated' person in the settlement, and often sought for advice by others.

B: Navigate, Observe, Persuade

A: Create, First Aid, Instruct, Leadership, Legal Procedures, Meditation, Performance, Research

C: Biology, Chemistry, Commerce, Culture [other], Geography, Geology, Language [other], Linguistics, Literature – if available, Mathematics, Physics, Theology

COMMUNITY TRAITS

Using the Personality Traits to measure the overall community, or social group:

Volatile: How unpredictable is the survivor group. How aggressive and hostile can the survivors be when faced with outsiders or a difficult situation? Does the settlement explode into anarchy when order is challenged?

Extrovert: How much contact does the settlement have with others? Is there a strong trade with other settlements? Do the survivors marry or socialize with other groups?

Compassion: How does the group value human life? Are individuals disposable, is there a slave trade? Does the community value legal rights? Would they form a rescue party? Would they send aid to a nearby settlement should a disaster take them? Are punishments humane?

Discipline: Are there strict rules of conduct? Does the community expect, and deserve, loyalty from all sur-

vivors? Is the community well organized? Does everyone know their place, and what their duties are? How is order maintained? Is the settlement productive and profitable?

Curious: Is the community eager to hear news from local communities? Do they welcome strangers with tales to tell? Do they accept change, and reward those with new ideas? Do they send out merchants? Do they have messengers, and explorers? Are they attempting to rebuild? Are there craftsmen, or artists, who produce objects that are valued more than the basic tools? Do they have a library, are they literate?

The average rating is 50% for each of these. A peaceful non-violent community would have a 0% rating in Volatile, whilst one endlessly in anarchy would have a rating of 100%. These ratings may also rub off onto the individuals of that community, affecting their own personality trait values.



SURVIVOR GROUPS:

NAME:	AMERIND EMPIRE (NEW AMERICAN INDIANS)
TYPE:	Political
LOCATION FOUND:	6, 8, 10-14
TRAITS:	Volatile: 30% Extrovert: 50% Compassion: 80% Discipline: 60% Curious: 30%
ENCOUNTER SIZE:	1D100
TECH LEVEL:	E-G
POWER/RESOURCES:	Steam power if any/hunters, farmers, some mines
WEAPONS:	Edged and light firearms, explosives, gases, poisons
SPECIAL ATTRIBUTES:	Good trackers and hunters
TRADE:	Crafts, Pelts, Meat
SKILLS:	Athletics, Observe, Agriculture, Animal Handling, Archery, Hunt, Melee Weapon, Survival

DESCRIPTION:

After the war these people found it easy to revert to their old ways on their reservations. Their population grew rapidly through their tolerance of wanderers. Well organized and peaceful people who will fiercely defend what is theirs.



NAME:	BADGES
TYPE:	Nomad, Military
LOCATION FOUND:	Anywhere
TRAITS:	Volatile: 80% Extrovert: 70% Compassion: 20% Discipline: 80% Curious: 30%
ENCOUNTER SIZE:	1D6, usually one 'badge' wielder with his 'jury'.
TECH LEVEL:	D-F
POWER/RESOURCES:	No power, Basic survival equipment.
WEAPONS:	Repaired Shotgun, musket rifle, knife
SPECIAL ATTRIBUTES:	Sneaky, vicious and unpredictable
TRADE:	Justice, Mercenaries for hire.
SKILLS:	Firearms [Shotgun], Law [Badge Code], Intimidate

DESCRIPTION:

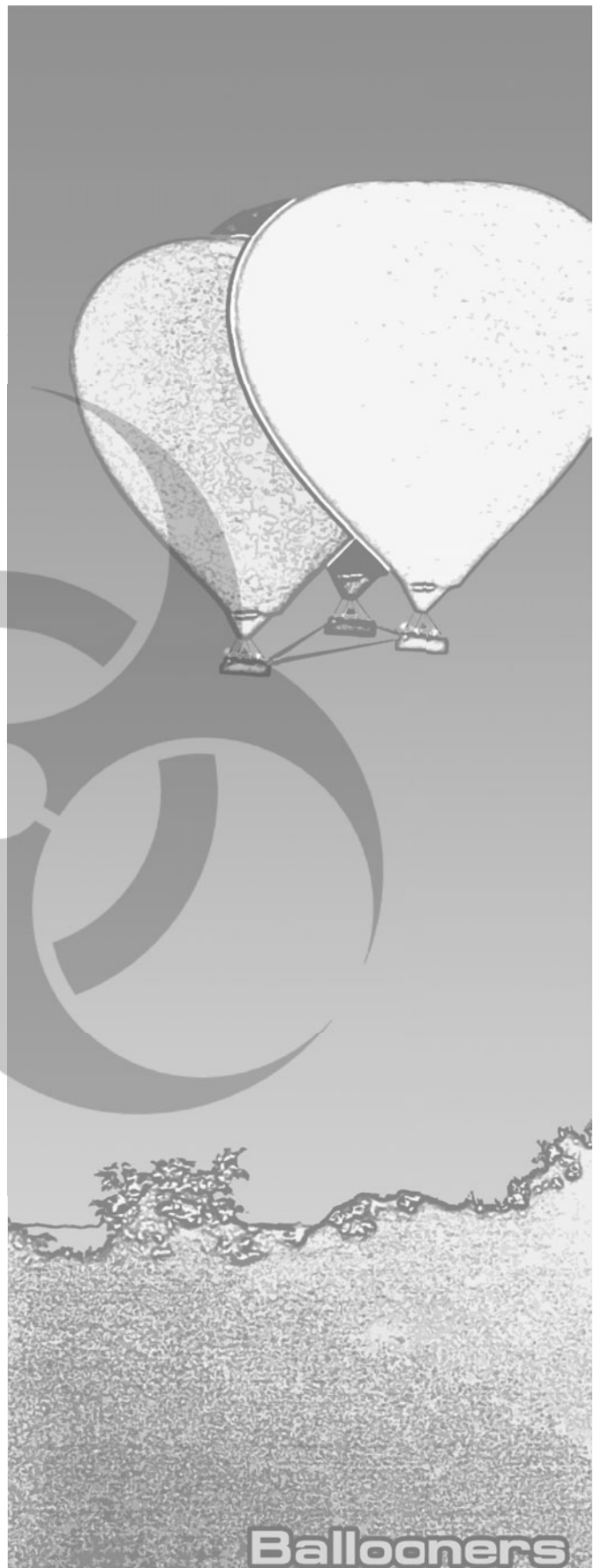
Badges are self-appointed vigilantes at best and fanatical judges and executioners at worst. There are loose confederations of 'Badges', with the right to wear the badge passed down from generation to generation. They believe themselves guardians of the law, deliverers of justice – a law and a sense of justice which died 150 years ago. Now that has been sullied, old laws corrupted, and new laws enacted. They are quick to descend upon a settlement, locate the guilty, and enact punishment. Sometimes they are right, sometimes it is the innocent who serves as an example. Larger settlements prohibit the 'Badges', whilst smaller ones often openly invite them in to find and punish a guilty party.



NAME:	BALLOONERS
TYPE:	Nomad
LOCATION FOUND:	Anywhere, often westward bound.
TRAITS:	Volatile: 40% Extrovert: 40% Compassion: 50% Discipline: 60% Curious: 70%
ENCOUNTER SIZE:	2D6 per balloon, usually 1 balloon.
TECH LEVEL:	D-F
POWER/ RESOURCES:	Solar power collectors, some battery power, methane gas collectors.
WEAPONS:	Small bombs and light firearms, explosives.
SPECIAL ATTRIBUTES:	Travel in flying 'cities' connected by ropes.
TRADE:	Maps, excess power.
SKILLS:	Pilot [Balloon], Navigate, Geography, Acrobatics.

DESCRIPTION:

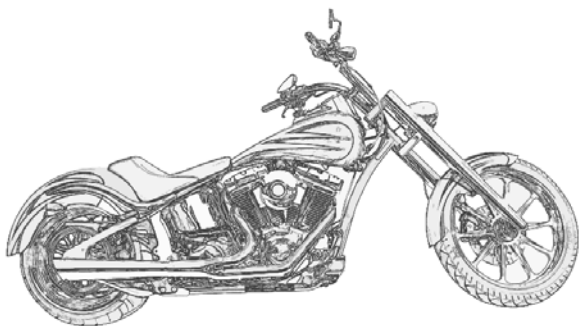
Realizing that low-tech balloons were a way to escape the misery of the days of darkness, the 'master sailors' took to the air. Finding that there was nowhere safe to settle, they instead remained afloat, taking turns to return to land to resupply. Their descendants travel the sky in flying cities bound by a web of ropes. Some have never set foot on the ground. Only their traders will return to land in order to obtain food and supplies, and in times of need they have been known to raid settlements. They do not permit outsiders, and will not accept passengers, although have been known to come to the aid of 'grounders' in distress.



NAME:	BIKERS
TYPE:	Nomad
LOCATION FOUND:	Anywhere, usually within close vicinity to active highways.
TRAITS:	Volatile: 70% Extrovert: 40% Compassion: 60% Discipline: 80% Curious: 40%
ENCOUNTER SIZE:	2D10
TECH LEVEL:	C-E
POWER/ RESOURCES:	Combustion engines (alcohol).
WEAPONS:	Shotguns, Rifles, Small arms, Grenades, Sabers, some bike mounted weapons.
SPECIAL ATTRIBUTES:	Very maneuverable and fast, +10% of defensive and Ride task checks.
TRADE:	'Moonshine' [fuel], Courier services, Guns for Hire, Mechanics.
SKILLS:	Ride [Motorcycle], Firearms [Shotgun], Brawl, Maintenance [Auto]

DESCRIPTION:

Some motorcycle gangs escaped the carnage of the days of darkness by being mobile, and by avoiding the ruined cities. The communities that evolved from these gangs retained the culture that kept their forefathers 'on the road.' They have a reputation of anarchy, which is not entirely true. They regard each other as 'brothers', and have perfected the technology to keep their bikes 'alive.'



NAME:	BREEDERS
TYPE:	Cult
LOCATION FOUND:	Anywhere. Based in 11.
TRAITS:	Volatile: 10% Extrovert: 30% Compassion: 30% Discipline: 80% Curious: 80%
ENCOUNTER SIZE:	2D6 in 'Field-work' patrol
TECH LEVEL:	B-D
POWER/ RESOURCES:	Combustion engines, some generated electricity and batteries.
WEAPONS:	Dart guns, shotguns, Rifles, gas grenades, explosives, 'net' gun.
SPECIAL ATTRIBUTES:	Semi-scientists with religious convictions.
TRADE:	Genetic-hybrid 'pets', refined pharmaceuticals.
SKILLS:	Pharmacology, Medicine, Biology
DESCRIPTION:	

Even the air carried with it an impure evil during the days of darkness. There were those scientists who remained in their bunkers with their families until the evil had done its work and left the land. Then they returned to the surface aiming to rebuild a utopian society. Anyone touched by the evil rays was beyond salvation. The descendants of the 'progenitor' Breeders now hunt throughout the country for pure, uncontaminated human stock. When found, they return these 'subjects' to their camps, for induction into their breeding program. They also take human eggs from female subjects for genetic manipulation, hoping to create a super-human species. The malformed mistakes are either destroyed, or sold off to slavers as docile pets. 'Disciples' of the Breeders take serums of genetic material, hoping to improve their own bodies, during a regular ceremony.



NAME:	CANNIBALS
TYPE:	Destructive, Cult
LOCATION FOUND:	Anywhere, usually in forested areas.
TRAITS:	Volatile: 80% Extrovert: 10% Compassion: 20% Discipline: 70% Curious: 20%
ENCOUNTER SIZE:	4D6 in hunting party
TECH LEVEL:	F-G
POWER/ RESOURCES:	None.
WEAPONS:	Edged and blunt hand weapons, some bows.
SPECIAL ATTRIBUTES:	Excellent woodsmen & trackers.
TRADE:	Timber, animal pelts, mushrooms, fruit, bounty-hunting.
SKILLS:	Melee Weapon, Stealth, Hunt.
DESCRIPTION:	

During the days of darkness, there were those that out of desperation consumed the flesh of their fallen comrades. Such action required secrecy, which in turn bound the perpetrators together. Once the line had been crossed, the next time was easier. Yet, the tight knit group realized that to revere those who sustain them would purge them of their guilt. What emerged was a community founded upon the sharing of human flesh, although its sustenance is no longer a necessity. Religious practices have been established, and the 'sacrifice' may be one of their infirm, a 'chosen' youth, or a captured outsider. All must partake or risk exile. Although they will venture out into other communities, they are looked at with distrust, and sometimes feared.



NAME:	CAVE RATS (IN SOME AREAS CALLED TUNNEL RATS)
TYPE:	Nomads
LOCATION FOUND:	Scattered
TRAITS:	Volatile: 60% Extrovert: 30% Compassion: 40% Discipline: 40% Curious: 30%
ENCOUNTER SIZE:	3D10
TECH LEVEL:	E
POWER/ RESOURCES:	Some animal, steam, and combustion
WEAPONS:	Firearms, Projectile weapons, Traps
SPECIAL ATTRIBUTES:	Expert trap-makers and will preserve ancient technology.
TRADE:	Recycled Technology, Iron Ore, Information
SKILLS:	Climb, Navigate, Scrounge, Artisan, Hunt, Thrown Weapon, Explosives, Geology
DESCRIPTION:	

After the war there were those who had sought shelter from the fallout in storm drains, service tunnels, basements, mine shafts, and old catacombs or caverns. There were also those who were lucky enough to be in a military bunker or bomb shelter. They existed on what supplies they could hoard, remaining subterranean for many years before venturing out on to the surface. By then they had already established a culture, one that had allowed their survival, and willingly returned to their domain under the ground. The descendants tend to be insular, but readily trade both goods and information. Following one of these individuals into a tunnel without being invited is tantamount to suicide. They are expert at setting traps for unwelcome guests. Occasionally these Cave Rats have located a Project Bolt-hole, and in a few instances have managed to breach the facility whilst keeping the Project team on ice.



NAME:	CHILDREN OF MORROW
TYPE:	Cult
LOCATION FOUND:	Scattered
TRAITS:	Volatile: 20% Extrovert: 60% Compassion: 80% Discipline: 60% Curious: 40%
ENCOUNTER SIZE:	1D6
TECH LEVEL:	D
POWER/ RESOURCES:	Steam Power, some Electricity.
WEAPONS:	Defensive weapons only.
SPECIAL ATTRIBUTES:	The Children of Morrow retain knowledge, although warped, of Project protocol.
TRADE:	Repairs to pre-war equipment, medical assistance.
SKILLS:	Persuade, Animal Handling, First Aid, Maintenance, Performance, Language (other), Theology.

DESCRIPTION:

There were those who survived that heard of the name Morrow, perhaps from surviving employees of Morrow Industries, or from teams that never made it to the freeze. They were reassured that within a few years the chosen men and women of Morrow would awaken from their slumber beneath the earth and restore the world to what it once was. They waited and waited. Legends grew; the descendants believing that Morrow only offers redemption to those who welcome peace and harmony. The Children of Morrow preach of the salvation of the world, spreading the word that one day the Angels of Morrow will rise to rebuild the world.



NAME:	CHILDREN OF THE NIGHT
TYPE:	Destructive
LOCATION FOUND:	Scattered
TRAITS:	Volatile: 90% Extrovert: 10% Compassion: 10% Discipline: 10% Curious: 10%
ENCOUNTER SIZE:	1D10
TECH LEVEL:	G
POWER/ RESOURCES:	None.
WEAPONS:	Edged and blunt hand weapons, some spears.
SPECIAL ATTRIBUTES:	Light sensitive, can only digest fresh blood. They can sense each other, even from a distance with a low-level telepathy. The infection requires a CON task check to avoid becoming one of them within 24 hours after a bite.
TRADE:	None.
SKILLS:	Observe, Stealth, Hunt, Athletics, Acrobatics.

DESCRIPTION:

Some people changed during the days of darkness. Rather than dying from radiation and disease, a few lived on with certain genetic abnormalities which strengthened their bodies but destroyed their minds, leaving them with a fear of light and an all consuming urge to feed on blood. These sorry souls are infertile; passing on their mutation as a plague to anyone they would bite. They form no cohesive community, travelling in packs, hanging around a settlement where they sense someone is about to succumb to the infection.



NAME:	EMDEES
TYPE:	Academic
LOCATION FOUND:	Everywhere
TRAITS:	Volatile: 10% Extrovert: 70% Compassion: 80% Discipline: 60% Curious: 70%
ENCOUNTER SIZE:	1D2
TECH LEVEL:	B-D
POWER/ RESOURCES:	Medical Supplies, Portable generators.
WEAPONS:	Edged hand weapons, possible sidearm.
SPECIAL ATTRIBUTES:	Unlike the Docs & Healers of a community, the Emdees offer a higher level of Medical knowledge.
TRADE:	Medical Knowledge, Surgeon, Healer, Medical Supplies
SKILLS:	Persuade, First Aid, Nurse, Medical, Surgery.

DESCRIPTION:

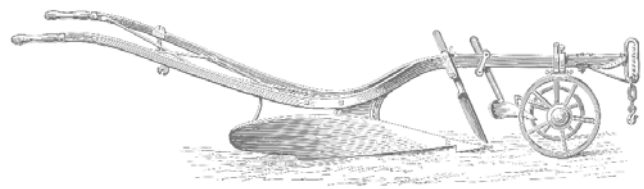
The surviving Doctors and medically trained personnel did what they could for others during the days of darkness. Some were absorbed into the fledgling communities. Some organized themselves, reclaiming a hospital here, a medical lab there, and began to recruit others to be trained. A society was formed, with each Emdee, as they became known, undergoing an old fashioned apprenticeship in medicine. Once a 'Master Doctor', they spend time travelling from settlement to settlement, often in the company of Truckers or Mailmen, offering support to local healers, trading their knowledge and supplies. The Emdees are highly respected, and often offered safe passage even in the most dangerous of territories. It is regarded as bad luck to harm an Emdee.



NAME:	FARMERS
TYPE:	Resource
LOCATION FOUND:	Everywhere
TRAITS:	Volatile: 50% Extrovert: 80% Compassion: 40% Discipline: 80% Curious: 30%
ENCOUNTER SIZE:	2D6 (family), 4D10 (settlement)
TECH LEVEL:	C-G
POWER/ RESOURCES:	Animals, Wind, Water.
WEAPONS:	Edged Weapons, Firearms, Explosives, Occasional Heavy weapons
SPECIAL ATTRIBUTES:	May possess heavy equipment, fortified homes & perimeter fences or walls.
TRADE:	Animals, Food, Alcohol, Rope, etc.
SKILLS:	Bargain, Agriculture, Animal Handling, Artisan, Hunt, Melee Weapon, Maintenance, Ride, Geography.

DESCRIPTION:

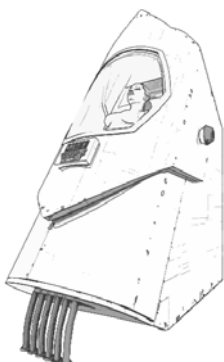
Amidst the chaos of the days of darkness, those who owned large areas of farmland in rural areas favored better. Those professional farmers who survived quickly adapted to a crueler world. They secured their land, often building perimeter fences in order to keep out the desperate and the militant. Communities formed within these zones, with the farmer's family and those chosen to help defend the land. Now, the Farmer settlements produce an abundance of food for other communities with insufficient arable land. Farmer settlements are often the backbone of local communities, resulting in peaceful coexistence. The head of the Farm estate can be a good host to those with good intentions.



NAME:	FROZEN CHOSEN
TYPE:	Cult
LOCATION FOUND:	8-11
TRAITS:	Volatile: 70% Extrovert: 60% Compassion: 30% Discipline: 90% Curious: 40%
ENCOUNTER SIZE:	4D10
TECH LEVEL:	D-F
POWER/RESOURCES:	Steam, some electricity, farming, shallow mines, a stock of modern vehicles.
WEAPONS:	Firearms, both homemade and some modern.
SPECIAL ATTRIBUTES:	Have some knowledge of freezing technology buried in their religion. Some references may allude to the Morrow Project within the texts of their "Books of the Chosen".
TRADE:	Iron ore, coal, some manufactured goods, education, literacy, security
SKILLS:	Persuade, Communications, Divination, Leadership, Theology.

DESCRIPTION:

They knew the world was coming to an end. Perhaps they saw it in a vision, or maybe they were instrumental in what befell humanity. It was a time of judgment, and this fanatical group of religious power-seekers chose to freeze themselves so they could arise once more and lead the people in a more tolerant age. The cryosleep technology was probably stolen from government or Project insiders. They awoke after a few years and their resources permitted a better life for those who followed the "Path of the Chosen". Now, they are rebuilding the world in their image and a mighty empire is being constructed, with converts made daily (voluntary or otherwise).



NAME:	GYPSY TRUCKERS
TYPE:	Nomad
LOCATION FOUND:	Anywhere
TRAITS:	Volatile: 50% Extrovert: 40% Compassion: 50% Discipline: 40% Curious: 30%
ENCOUNTER SIZE:	4D6
TECH LEVEL:	D-E
POWER/RESOURCES:	Combustion engines, some electricity.
WEAPONS:	Firearms in good repair, explosives and automatic weapons.
SPECIAL ATTRIBUTES:	Travel in large vehicles. Make own fuel and booze. Use CB radio for communication.
TRADE:	Freight/Cargo, fuel.
SKILLS:	Brawl, Navigate, Drive, Firearms, Maintenance, Operate Equipment, Survival, Explosives.

DESCRIPTION:

Like the Bikers, the Gypsy Truckers remained on the road, avoiding the chaos in the urban areas, travelling to various truck stops. There they renewed acquaintances with other surviving truckers, and those who shared similar outlooks allied to defend their limited resources. These 'clans' of truckers began to trade with local settlements, while they established ways to keep their vehicles on the road. Breeding with the locals – the 'fifth-wheelers' - the 'Gypsy Truckers' have expanded in numbers and continue their bloodlines. They live, work and party in their trucks, each distinctly painted according to their family and clan traditions. Trucker convoys tend to be heavily armed and people who attack Truckers tend to have short eventful lives. There are rivalries with other clans, and some have been known to use their vehicles for raiding. Truckers who turn to raiding are poorly regarded by their brethren.



NAME:	INQUISITORS
TYPE:	Cult
LOCATION FOUND:	6-11
TRAITS:	Volatile: 80% Extrovert: 30% Compassion: 10% Discipline: 90% Curious: 20%
ENCOUNTER SIZE:	2D10+20
TECH LEVEL:	E-F
POWER/RESOURCES:	Some combustion and steam engines.
WEAPONS:	Blunt and edged weapons, occasional firearm.
SPECIAL ATTRIBUTES:	Teach torture as a fine art.
TRADE:	None. Demand penance from local settlements in the form of donations so that their souls remain clean.
SKILLS:	Persuade, Instruct, Artisan [Torture], Performance, Biology

DESCRIPTION:

Out of the days of darkness came some who were convinced that the sins of man were the cause for the misery of those who remained. Indeed they viewed 'year 0' as the fall from heaven into the pits of hell. Their order now seeks to rid the world of evil, so that mankind can once more be saved, and climb back to the surface. They believe that the surface world has remained untouched these past 150 years, and just waits for the last drop of evil to be squeezed out, even if it means pain and torture to those who remain to be judged. The salvation of all is greater than the life of a single 'sinner'.



NAME:	INVADERS
TYPE:	Military
LOCATION FOUND:	Scattered
TRAITS:	Volatile: 40% Extrovert: 20% Compassion: 30% Discipline: 70% Curious: 30%
ENCOUNTER SIZE:	1D10
TECH LEVEL:	D-F
POWER/RESOURCES:	Steam and combustion/mining and farming
WEAPONS:	A few remnants of modern weapons from their original nations, home-made firearms and explosives
SPECIAL ATTRIBUTES:	Sometimes confused, but with a strong cultural identity.
TRADE:	Mercenaries, some crops, 'ethnic' luxury goods
SKILLS:	Brawl, Scrounge, Instruction, Melee Weapon, Survival, Tactics, Culture, History.

DESCRIPTION:

Descendants of foreign military and mercenary forces operating in the Americas during the Last Oil Rush and the 2017 war. Some groups maintain that they are still at war with the long-dead United States of America. Their fieldcraft skills make them difficult to capture. Truces and trade can be negotiated ; they are not fanatically devoted to their cause. The descendants of one group of Russian military forces call themselves the Rusky, keep a very strong cultural identity, and deeply distrust those who do not speak their language.



NAME:	KENTUCKY FREE STATE
TYPE:	Political
LOCATION FOUND:	3/4 (former state of Kentucky). Agents and traders may be found in the neighboring states.
TRAITS:	Volatile: 60% Extrovert: 40% Compassion: 40% Discipline: 70% Curious: 60%
ENCOUNTER SIZE:	Any, 2D6 patrol
TECH LEVEL:	A -C
POWER/ RESOURCES:	The KFS has copied the bigger MP fusion plants and also has access to vast amounts of Coal.
WEAPONS:	Any C or B technology, including some modern AFVs
SPECIAL ATTRIBUTES:	A functional, industrialised, high-tech nation. The KFS has extensive military and paramilitary forces including: County Sheriffs, a Secret Police, an Army and - uniquely - an Air Force (built around modern copies of the P-47 Thunderbolt).
TRADE:	Manufactured goods of Tech Levels D or lower, such as percussion/blackpowder Trade Rifles. The KFS also has a University which can train Emdees
SKILLS:	Bargain,

DESCRIPTION:

The KFS was founded by the 'Rich Five': a group of industrialists who made plans similar to the Morrow Project. However, the KFS has become a corrupt and decadent society with a hugely wealthy upper class, a small middle class and a form of slavery that is vaguely similar to the Roman system. Note: the KFS aristocracy is aware of the Morrow Project and has directed the Secret Police to suppress it.

R5

NAME:	MAILMEN
TYPE:	Nomad
LOCATION FOUND:	Scattered
TRAITS:	Volatile: 20% Extrovert: 80% Compassion: 70% Discipline: 70% Curious: 60%
ENCOUNTER SIZE:	1D2 usually.
TECH LEVEL:	D-F
POWER/ RESOURCES:	Horse ranches, limited electricity and telegraphy.
WEAPONS:	Some firearms, bows.
SPECIAL ATTRIBUTES:	Extensive local knowledge of their mail route.
TRADE:	Message delivery, local news, maps.
SKILLS:	Ride, Survival, Persuade, Observe, Animal Handling.

DESCRIPTION:

When the days of darkness had passed, there were a few visionaries who regarded the creation of communication between settlements as a calling. A loose organization began, devoted to the preservation of unadulterated news that could travel throughout what remained of the old United States. Some dark places were unwilling to be illuminated, and the new 'mail service' still struggles to this day. Local routes between like-minded settlements continue unhindered. Some militant groups even welcome them, occasionally attempting to bribe the mailman to deliver false news with little success.



NAME:	MAXWELL'S MILITIA
TYPE:	Military
LOCATION FOUND:	6, extending into 8
TRAITS:	Volatile: 70% Extrovert: 50% Compassion: 30% Discipline: 80% Curious: 30%
ENCOUNTER SIZE:	3D10+10
TECH LEVEL:	C-E
POWER/RESOURCES:	Hydroelectric, steam, some solar. Mining (especially coal) and farming.
WEAPONS:	Modern automatic weapons, explosives, some armored vehicles.
SPECIAL ATTRIBUTES:	Good repair of a few modern (M1 and M60) tanks and heavy guns.
TRADE:	None. Demand forced recruitment from local settlements by travelling 'press gangs.'
SKILLS:	Athletics, Observe, Firearms, Leadership, Melee Weapon, Tactics.

DESCRIPTION:

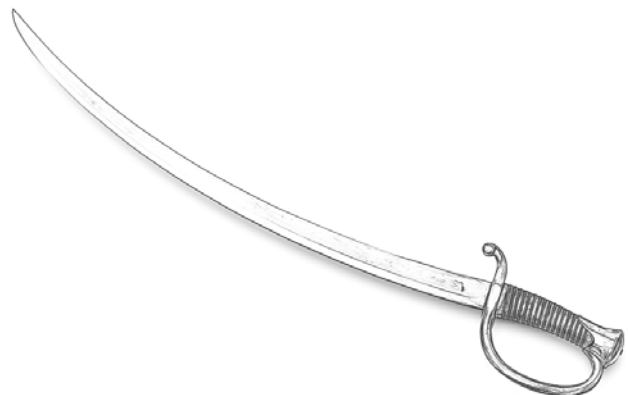
Maxwell was a ruthless business man who became the glorious leader (some would say tyrant) of The Maxwell Empire after the days of darkness. Realizing that to survive he must establish dominance in the region, he quickly formed Maxwell's Militia. Then, as now, service to Maxwell was mandatory. With the success of his army he pacified many of the settlements, who paid him tribute, and destroyed those who would oppose him. Yet those he crushed eventually caused his downfall. An aging Maxwell was assassinated, but his loyal soldiers remained resolute to continue his teachings. The feudal empire continued united under the military force of Maxwell's Militia. Recently a man claiming to be his grandson returned to the head of the Militia, promising a return to the days of glory.

MAXWELL INDUSTRIES

NAME:	MEDIEVALISTS (RECCIES, RENNIES, CIVVIES)
TYPE:	Political
LOCATION FOUND:	Scattered
TRAITS:	Volatile: 40% Extrovert: 40% Compassion: 50% Discipline: 60% Curious: 40%
ENCOUNTER SIZE:	3D10
TECH LEVEL:	D-F
POWER/RESOURCES:	Steam, some electricity and farming
WEAPONS:	Edged, blunt, ranged, and some firearms
SPECIAL ATTRIBUTES:	Skilled crafters, excel at primitive weapons and tactics, some cavalry
TRADE:	Craft Items, Archaic Weapons & Armor, Clothing, Beer & Wine.
SKILLS:	Scrounge, Animal Handling, Archery, Artisan, Commerce, Create, Divination, Hunt, Melee Weapon, History.

DESCRIPTION:

These people are the descendants of medieval and Civil War recreationists, Ren Faire enthusiasts and the like, who banded together after the War and found their knowledge of primitive technology well-suited to helping them survive. These groups have prospered in the chaos that followed the end of civilization. Some are relatively insular, while others are very interested in the outside world. Being well-versed in such traditional skills as brewing, carving, weaving and the like, many groups are havens for traders, and some are well-known for the materials they trade in.



NAME:	MONKS
TYPE:	Cult
LOCATION FOUND:	Everywhere
TRAITS:	Volatile: 10% Extrovert: 20% Compassion: 60% Discipline: 90% Curious: 50%
ENCOUNTER SIZE:	4D6
TECH LEVEL:	F-G
POWER/ RESOURCES:	Some possible steam power, farming.
WEAPONS:	None
SPECIAL ATTRIBUTES:	Monastic lifestyle in heavily fortified buildings.
TRADE:	Spiritual enlightenment, Food, Alcohol, Cloth.
SKILLS:	Bargain, Persuade, Artisan, First Aid, Instruct, Meditation, Language, Law, Literature, Theology.

DESCRIPTION:

There were those communities that withdrew from contact with others, avoiding the plagues that were to come. In these retreats they cultivated unique disciplines of faith, permitting only a select few to stay, turning away the unworthy – excepting the occasional trader. There are farming villages, libraries and places of learning, communities devoted to performing, creative and martial arts – and even those devoted to darker passions, whose members terrify nearby folk for miles around.



NAME:	NAPOLEON'S OWN
TYPE:	Special
LOCATION FOUND:	Scattered
TRAITS:	Volatile: 70% Extrovert: 30% Compassion: 50% Discipline: 20% Curious: 40%
ENCOUNTER SIZE:	1D10
TECH LEVEL:	C-I
POWER/ RESOURCES:	All but Nuclear Power
WEAPONS:	Any except energy or laser weapons
SPECIAL ATTRIBUTES:	Unpredictable
TRADE:	Crafts, Theater, Entertainment
SKILLS:	Artisan, Create, Meditation, Performance, Tactics, History, Literature, Psychology

DESCRIPTION:

Amongst those who survived the war were some of the inmates of secure wards or institutions, tortured by severe mental illnesses. Having to fend for themselves, they formed rather volatile social groups. The descendants of many do not exhibit mental illness, but others are deeply affected. Each community has built on the weird rules and laws enacted by their forefathers, making the group appear impossibly chaotic to outsiders. The most prevalent mental illnesses found within these communities are schizophrenia, bipolar and dissociative disorders. 'Napoleon's Own' are so called for their habit of imitating some admired person out of history or fiction. A group in upper Wisconsin even claim Napoleon as their hereditary leader.



NAME:	NEW CONFEDERACY
TYPE:	Political
LOCATION FOUND:	7 and 9
TRAITS:	Volatile: 50% Extrovert: 50% Compassion: 30% Discipline: 60% Curious: 50%
ENCOUNTER SIZE:	1D8 on patrol
TECH LEVEL:	C-F
POWER/ RESOURCES:	Steam, combustion engines, some electricity/ farming
WEAPONS:	Shotguns, automatic weapons on homesteads, rifles, explosives, light cannon
SPECIAL ATTRIBUTES:	Slave-using culture
TRADE:	Various Crops
SKILLS:	Bargain, Persuade, Agriculture, Firearms, Leadership, Ride

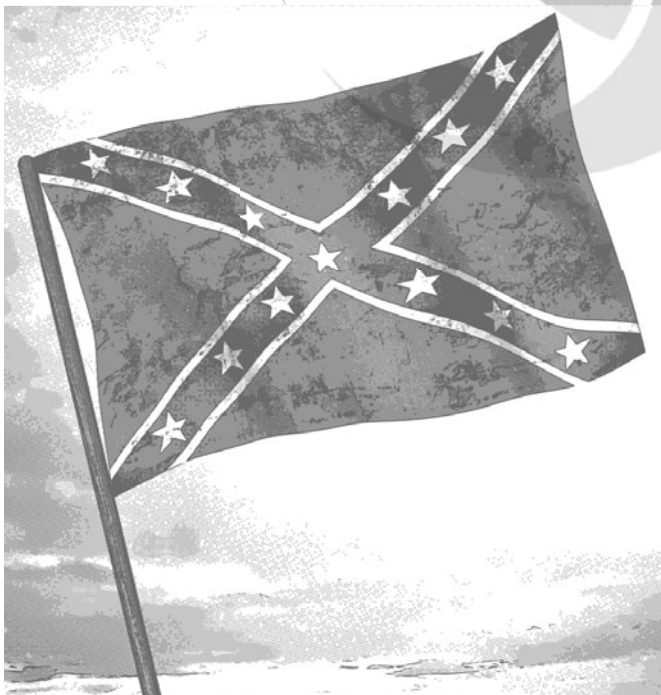
DESCRIPTION:

A loose-knit government adopting the creed of the earlier confederacy. Basically friendly but sensitive to any slur on their culture. They deal with slavers but rarely take any themselves as they consider it undignified.

NAME:	NEW PRESIDENCIES
TYPE:	Political
LOCATION FOUND:	Anywhere
TRAITS:	Volatile: 50% Extrovert: 50% Compassion: 50% Discipline: 60% Curious: 40%
ENCOUNTER SIZE:	1D100
TECH LEVEL:	D-F
POWER/ RESOURCES:	Steam, some electricity/mining, farming
WEAPONS:	Repaired modern weapons
SPECIAL ATTRIBUTES:	Possible heavy pre-war weapons
TRADE:	Various
SKILLS:	Artisan, Communications, Commerce, Drive, Firearms, Legal Procedures

DESCRIPTION:

After the war new mini-governments sprang up all over the country, each claiming to be the official U.S. government. Most are at best dictatorships while some still follow a democratic government style.



NAME:	OILERS
TYPE:	Resource
LOCATION FOUND:	9, 10
TRAITS:	Volatile: 30% Extrovert: 60% Compassion: 40% Discipline: 60% Curious: 40%
ENCOUNTER SIZE:	1D100
TECH LEVEL:	C-E
POWER/ RESOURCES:	Oil based, gasoline, some electricity/Oil
WEAPONS:	Good firearms of all types, some explosives
SPECIAL ATTRIBUTES:	Available petroleum products.
TRADE:	Propane, Lubricants, Paraffin, Sulfur, Tar, Asphalt, Petrochemicals, Gasoline, Kerosene
SKILLS:	Artisan, Communications, Commerce, Maintenance, Operate Equipment, Chemistry

DESCRIPTION:

These people gained control of the few surviving oil fields immediately after the war. They use the oil as trade goods and for their own needs. Their installations are well defended and they are wary of strangers



NAME:	OVERLORDS
TYPE:	Political, Individual
LOCATION FOUND:	Anywhere
TRAITS:	Volatile: 80% Extrovert: 30% Compassion: 20% Discipline: 60% Curious: 30%
ENCOUNTER SIZE:	1 + 1D10 followers
TECH LEVEL:	Any
POWER/ RESOURCES:	Any
WEAPONS:	Any
SPECIAL ATTRIBUTES:	n/a
TRADE:	Various
SKILLS:	Persuade, Instruct, Leadership, Tactics

DESCRIPTION:

Here and there an Overlord rises to power, usually by subterfuge or by conquest. They hold power over the few settlements unlucky enough to have fallen under their control. Atrocities are common. Some regions have been under the control of numerous continuous overlords, many not lasting more than a few years, being removed by an ambitious underling.



NAME:	RAZERS
TYPE:	Destructive
LOCATION FOUND:	Anywhere
TRAITS:	Volatile: 90% Extrovert: 30% Compassion: 30% Discipline: 80% Curious: 20%
ENCOUNTER SIZE:	2D10+10
TECH LEVEL:	F or less
POWER/ RESOURCES:	None/whatever they can pick up
WEAPONS:	Edged weapons, arrows, spears, fire a favorite
SPECIAL ATTRIBUTES:	Travel from place to place raiding, looting and burning.
TRADE:	Nothing
SKILLS:	Brawl, Scrounge, Hunt, Melee Weapon, Thrown Weapon, Explosives

DESCRIPTION:

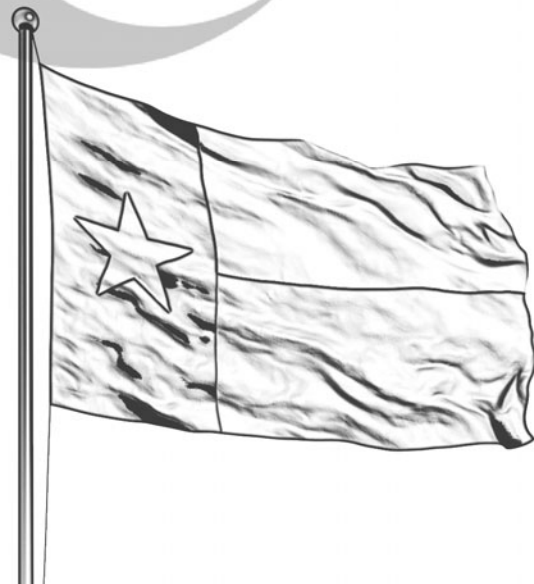
Razers are the destroyers of all technology. They would have mankind living back in the stone age. They burn books and libraries. They will use explosives to destroy things they cannot tear down with their hands or burn with fire.



NAME:	REPUBLIC OF TEXAS
TYPE:	Political
LOCATION FOUND:	10
TRAITS:	Volatile: 60% Extrovert: 30% Compassion: 40% Discipline: 50% Curious: 30%
ENCOUNTER SIZE:	2D10
TECH LEVEL:	E-F
POWER/ RESOURCES:	Steam, combustion engines/oil, farming (cattle) slaves.
WEAPONS:	Firearms, stockpiles of ex-military weapons used to threaten neighbors.
SPECIAL ATTRIBUTES:	Territorial with a rich supply of petroleum.
TRADE:	Petroleum, Cattle, Horses.
SKILLS:	Brawl, Animal Handling, Construction, Firearms, Operate Equipment, Ride, Geology.

DESCRIPTION:

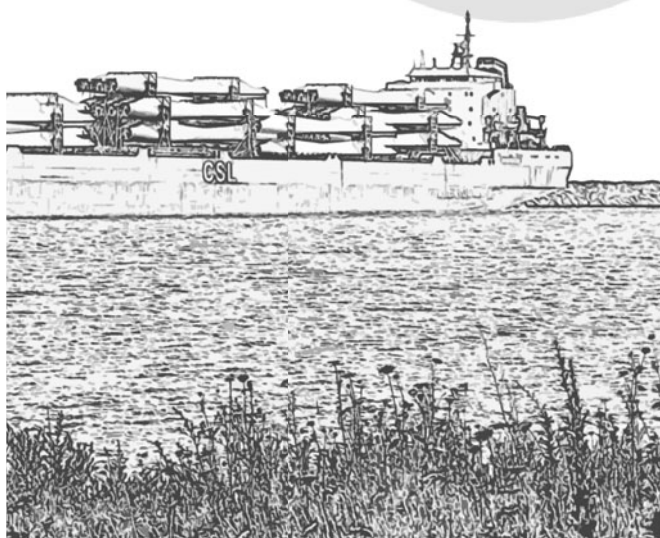
Run by a strained coalition between the 1st Cavalry Division at Fort Hood, and a formal government based in Waco, the Republic is a collection of small towns spread out across a smaller slice of the old State of Texas. The government itself is not taken too seriously, the citizens of the Republic putting faith in the military control of the 'Lonestar' Division. They are proud of their Republic, and are a people easily insulted.



NAME:	SHIPMEN
TYPE:	Nomads
LOCATION FOUND:	6
TRAITS:	Volatile: 30% Extrovert: 80% Compassion: 70% Discipline: 70% Curious: 40%
ENCOUNTER SIZE:	2D10+10
TECH LEVEL:	E-G
POWER/ RESOURCES:	Steam, some combustion engines/fishing and trading
WEAPONS:	Some breech loading cannon, good firearms, catapults
SPECIAL ATTRIBUTES:	Water based, well defended ships
TRADE:	Freight
SKILLS:	Bargain, Navigate, Commerce, Operate Equipment, Pilot Watercraft, Geography

DESCRIPTION:

Remnants of the Great Lakes shipping industry. Operating out of their freighters these people have established a fairly large trading empire. Good people who work hard for a living and respect people who do as well.



NAME:	SLAVERS
TYPE:	Destructive
LOCATION FOUND:	Anywhere
TRAITS:	Volatile: 50% Extrovert: 40% Compassion: 20% Discipline: 60% Curious: 20%
ENCOUNTER SIZE:	2D10
TECH LEVEL:	D-F
POWER/ RESOURCES:	Combustion engines, electric batteries/trade in people
WEAPONS:	Any, gases, nets, and darts as well.
SPECIAL ATTRIBUTES:	Sneaky and well equipped, trade with Kentucky Free State, New Confederacy, Breeders and anyone else who will buy slaves.
TRADE:	Slaves
SKILLS:	Bargain, Drive, First Aid, Hunt, Language, Melee Weapon, Observe, Persuade, Stealth

DESCRIPTION:

The slavers of the new world differ little from those of the old. They steal men, women, and children whenever possible. They prefer to take people with talents, skills or physical beauty (because these slaves are more valuable).



NAME:	SNAKE-EATERS
TYPE:	Military
LOCATION FOUND:	Anywhere
TRAITS:	Volatile: 20% Extrovert: 50% Compassion: 30% Discipline: 90% Curious: 70%
ENCOUNTER SIZE:	2D6
TECH LEVEL:	B
POWER/ RESOURCES:	A smaller version of the Project backed by the U.S. military
WEAPONS:	Any modern weapons including a possible laser
SPECIAL ATTRIBUTES:	Especially interested in the Morrow Project
TRADE:	Nothing
SKILLS:	Athletics, Stealth, Firearms, First Aid, Hunt, Melee Weapon, Special Weapon, Tactics, Thrown Weapon, Explosives, Martial Arts

DESCRIPTION:

American and Canadian Special Forces teams were frozen before the war by their respective governments with the express purpose to find out the scope and purpose of the Morrow Project. Their freeze tubes were set to revive them on the release of a Morrow wake up signal. They are reasonable men but can be fast and vicious when necessary, befitting their mastery of all forms of warfare.



NAME :	SONS & DAUGHTERS OF THE CONFEDERACY
TYPE :	Social group
LOCATION :	2,4,5
TRAITS:	Volatile 10% Extrovert 90% Compassion 30% Discipline 30% Curious 90%
ENCOUNTER SIZE:	1D8
POWER :	Coal and Wood fired Steam Boilers
RESOURCES :	Produce & Labor
WEAPONS :	Muzzle loaders and Sabre
TECH LEVEL :	F-G
SPECIAL ATTRIBUTES :	Very outgoing and polite
TRADE :	Information & Produce
SKILLS :	Agriculture, Firearms, Hunt, Melee Weapons, Ride

DESCRIPTION:

Originally these individuals were civil war re-enactors. Over time they adapted to a more primitive but not less civilized lifestyle. This includes apprenticeship and indentured servitude among other things, creating the Southern Gentleman and the Belle of the plantation, and all the best of the old south. They should not be confused with the hate mongers of the New Confederacy who use only forced servitude and oppression to serve their ends.



NAME:	TOWNSPEOPLE
TYPE:	Political
LOCATION FOUND:	Anywhere
TRAITS:	Volatile: 50% Extrovert: 50% Compassion: 50% Discipline: 50% Curious: 50%
ENCOUNTER SIZE:	1D100+10
TECH LEVEL:	Any
POWER/ RESOURCES:	Any but primarily agricultural
WEAPONS:	Firearms, edged and blunt weapons, rare heavy weapon
SPECIAL ATTRIBUTES:	This is the suggested Survivor Group for a Player Character.
TRADE:	Crops, Livestock, Ore
SKILLS:	Bargain, Animal Handling, Artisan, Construction, First Aid, Hunt, Melee Weapon.

DESCRIPTION:

The typical American small town type. These are the people the Project was most designed to help. Not necessarily under the domain of another political group or military force, they are usually self sufficient.



NAME:	TURING SOCIETY
TYPE:	Cult
LOCATION FOUND:	Widespread
TRAITS:	Volatile: 10% Extrovert: 40% Compassion: 30% Discipline: 80% Curious: 90%
ENCOUNTER SIZE:	usually only 1
TECH LEVEL:	C-D
POWER/ RESOURCES:	--
WEAPONS:	None
SPECIAL ATTRIBUTES:	Members of the Turing Society crave information, and serve as advisors and spies to local rulers.
TRADE:	Knowledge, Secrets, Tuition.
SKILLS:	Observe, Persuade, Instruct, Research, Tactics, Astronomy, Culture, Language, Mathematics, Philosophy.

DESCRIPTION:

There were those that understood that those who possessed knowledge could control those who possessed the might and the technology. In reverence to Alan Turing, this society built up a network to learn as much about those in power and the events that may affect them. They established codes, and broke the codes of others. Agents of the Turing Society will go to extreme lengths to obtain useful information, and almost any knowledge could be useful. They openly engage in positions of advisor to those in leadership, and are especially adept as infiltrators and spies. When necessary they will offer information to the highest bidder, but usually this is a ruse. Their goal is to manipulate and control all those in power.



NAME:	UNIVERSITIES
TYPE:	Academic, Political
LOCATION FOUND:	Anywhere
TRAITS:	Volatile: 40% Extrovert: 50% Compassion: 50% Discipline: 60% Curious: 90%
ENCOUNTER SIZE:	n/a
TECH LEVEL:	B-F
POWER/ RESOURCES:	Any/knowledge
WEAPONS:	Any including heavy vehicles
SPECIAL ATTRIBUTES:	Usually control a large surrounding area.
TRADE:	Education, Knowledge, small-scale, specialist, manufactured products (examples: tires, spark plugs, various chemicals.)
SKILLS:	Archery, Communications, Create, Firearms, Gunnery, Research, Tactics, [Any 3 Complex Skills.]

DESCRIPTION:

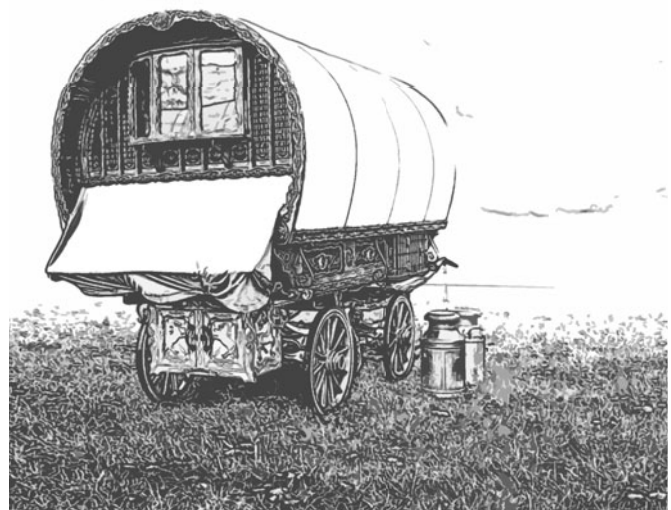
Universities, colleges and private schools were often self-sufficient communities with ample land even before the war. With nearby cities burning, some campus directors chose to close the gates, and secure the grounds. Through foresight these educational institutions managed to survive the chaos after the war. Focused on the preservation of knowledge, they accept new recruits willing to commit to a life of learning and defending the sanctity of that knowledge with their lives. Each student is trained heavily in protecting the campus from invasion, in addition to their other studies. Some facilities are controlled by dictators.



NAME:	WANDERERS
TYPE:	Nomads
LOCATION FOUND:	Anywhere
TRAITS:	Volatile: 50% Extrovert: 70% Compassion: 30% Discipline: 50% Curious: 50%
ENCOUNTER SIZE:	2D10
TECH LEVEL:	E-G
POWER/ RESOURCES:	Animal power
WEAPONS:	Some firearms, edged and blunt weapons
SPECIAL ATTRIBUTES:	wide-ranging. May have knowledge about areas hundreds of kilometers away.
TRADE:	Labor (especially at harvest time), Entertainment, Handicrafts, 'Found' items
SKILLS:	Animal Handling, Artisan, Commerce, Navigate, Performance, Pilot Watercraft or Ride, Scrounge, Survival

DESCRIPTION:

Wanderers are bands of nomadic people that - like the early Gypsies - do not fit into any other community. They travel by cart along the old roads or live upon the rivers in gaudily-decorated rafts. They are often unscrupulous in their trading with outsiders and are very competitive amongst themselves.



NAME:	WANDERING WARLOCK
TYPE:	Special, Not available for Player Characters.
LOCATION FOUND:	Anywhere
TRAITS:	Volatile: 30% Extrovert: 70% Compassion: 90% Discipline: 60% Curious: 90%
ENCOUNTER SIZE:	1
TECH LEVEL:	A
POWER/RESOURCES:	Unknown
WEAPONS:	Unknown
SPECIAL ATTRIBUTES:	Seems to have extensive knowledge of all subjects including the Morrow Project.
TRADE:	--
SKILLS:	[Classified]

DESCRIPTION:

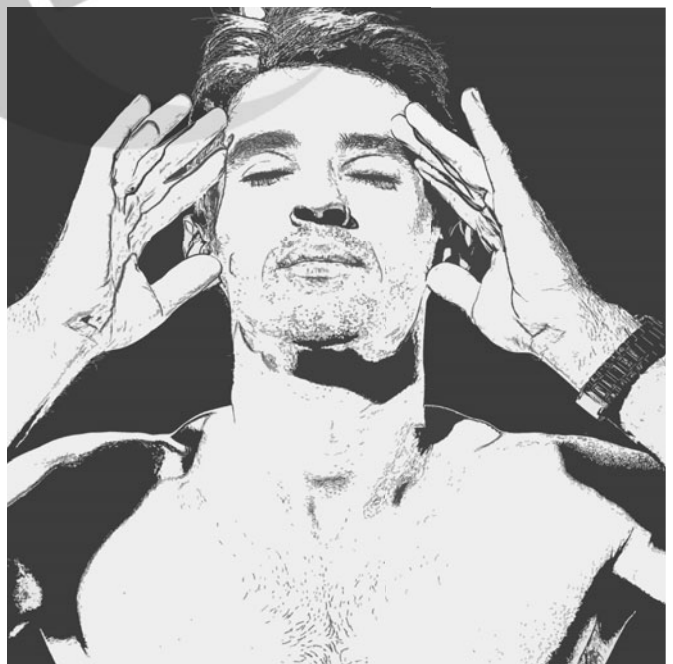
A figure out of the legends of the post-war world. This man seems to roam the country at will. He apparently travels unarmed but cannot be suprised and leaves all attackers either unconscious or dead. He always appears out of nowhere at times of crisis and seeks to help the common people. He has no tolerance of power seekers but will rarely become directly involved. Some Morrow reports state that this man might be Morrow himself.



NAME:	WARLOCKS, WITCHES, SHAMANS
TYPE:	Special
LOCATION FOUND:	Anywhere
TRAITS:	Volatile: 60% Extrovert: 60% Compassion: 50% Discipline: 30% Curious: 60%
ENCOUNTER SIZE:	1D4
TECH LEVEL:	Any
POWER/RESOURCES:	Any
WEAPONS:	Any
SPECIAL ATTRIBUTES:	PSI powers
TRADE:	Their Gift, Warding against Evil, Healing, Divination
SKILLS:	Psychic Talent [Roll 1D6+1 for Level of Talent], Persuade, Artisan, Divination, Meditation, Performance, Medicine

DESCRIPTION:

Growing more and more common as the years go by are the people gifted with the powers of the mind. They can be found in any community that will accept them. Most will appreciate being accepted for what they are, a benefit to mankind though some can be power seekers.



SURVIVORS

NAME:	WARRIORS OF KRELL
TYPE:	Military
LOCATION FOUND:	7
TRAITS:	Volatile: 50% Extrovert: 40% Compassion: 30% Discipline: 70% Curious: 50%
ENCOUNTER SIZE:	4D6
TECH LEVEL:	C-E
POWER/ RESOURCES:	Electricity, steam, solar/mining, farming
WEAPONS:	Modern weapons, heavy vehicles
SPECIAL ATTRIBUTES:	Knowledge of the Morrow Project and have some Project equipment, want more.
TRADE:	Nothing, Krell's warriors take what they need.
SKILLS:	Brawl, Persuade, Construction, Firearms, Gunnery, Melee Weapon, Sensor Operations, Survival, Artillery.

DESCRIPTION:

These formidable fanatical fighters are ruled by Krell, a mysterious man from the past whose ambition to create a repressive dictatorial regime was thwarted once by the Project. He struck back, destroying several Morrow facilities and capturing one base intact. From this "Base Zero" Krell arises from cryo-sleep every few decades to incite his followers to expand his empire. While he sleeps, the empire grows. Krell's minions have learned well from their master. Their brutality is legendary.

NAME:	WHALE WORSHIPPERS
TYPE:	Cult
LOCATION FOUND:	15
TRAITS:	Volatile: 30% Extrovert: 30% Compassion: 70% Discipline: 50% Curious: 30%
ENCOUNTER SIZE:	4D6
TECH LEVEL:	F-H
POWER/ RESOURCES:	Remnants only/fishing, hunting, farming.
WEAPONS:	Edged weapons.
SPECIAL ATTRIBUTES:	n/a
TRADE:	By-products of Whale, Fish.
SKILLS:	Navigate, Stealth, Archery, Hunt, Melee Weapon, Pilot Watercraft, Swim, Geography.

DESCRIPTION:

The sea provides, and the great whales are the holiest servants of Mother Ocean. When a whale beaches, it is a sign of divine favour - a bounty of food, bone and oil. Outsiders cannot interfere with Ocean's servants and the worshippers will protect whales and dolphins from harm. Washed up objects may become holy artifacts; Mother Ocean moves in mysterious ways.

OTHER SURVIVOR GROUPS

There are many other varieties of survivors out there for the Project team members to encounter. The PD is free to come up with their own.



SURVIVORS EQUIPMENT & ECONOMICS

"My name is Thompson. My grandparents told me that the name is famous, but I have no idea why. Both were Children of Morrow, strongly believing that one day we would all be saved. I don't buy into all that. It is you, each of you that will be destined to protect everyone in this settlement. I served my time on the militia, as will you. Today I've gathered you all here to show you one of the few prized possessions this community has — a rifle. We have three stored in the armory building, together with two handguns, and an assortment of bows, axes and spears. I am trustee of the armory, and you will be lucky enough to each get a turn handling this rifle. We have precious few rounds left, so only those who show promise will get the chance to fire it.

Now, I'm passing this around to each of you. Notice how old it looks. We must continue to maintain this and the other firearms this settlement has, else they rust away, much like all the other structures out there in the wilderness.

The rifle you are now holding was built by craftsmen back before the days of darkness, a skill that only some in distant settlements now possess.

With this rifle you will be able to take down an enemy long before he could ready his bow. If you are lucky, the shot will even hit its target. Even if it fails, the echo of the crack from the rifle is often enough to scare away any potential threat."

POST-APOCALYPSE ECONOMICS 101

Knowledge continues to be lost with every generation as survivors struggle to keep themselves fed. While there are some enclaves of relatively advanced technology in the new world, they lack the necessary population and resource base to maintain their status. Regression into a new Dark Age is inevitable without the intervention of the Project. Any recovery would be difficult, if not impossible, given that easily obtainable sources of energy (e.g. oil and coal) and minerals have been largely depleted before the war.

Communities are the key to any form of economic or social recovery. Using the Encounter Table as a guide, Size 3-4 settlements are going to be 'single theme' supply zones in the main: farming villages, or mining camps based around a 'proper' mineral deposit or scrounging through a landfill or pre-End settlement.

The latter may have some manufacturing industry based around what is mined. Trade volumes will be relatively low - supply products (food, wood, mineral ores) exchanged for spare parts and supplies that can't be made locally.

Size 5-6 settlements (large villages, small towns) will have greater diversity of activity. Farming is no longer the predominant industry; trade volumes are a bit higher than the smaller settlements, but these communities are still critically dependent on imports to maintain their tech level.

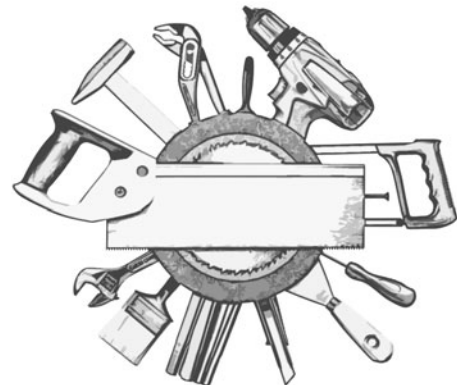
Settlements size 7+ (larger towns and cities) are the key to any reconstruction effort. They have diversified economies and serve as trade hubs to nearby smaller settlements.

Local currencies would be issued and regulated from these centers. What form they take is almost unlimited (metallic standards – e.g. gold, silver, copper, aluminum, etc; non-metallic e.g. drugs, antibiotics, gunpowder, ammunition, an hour of labor or fiat currency: "this note is legal tender for all debts, public and private"). As long as the supply of currency is stable, and there is general confidence in its value as a medium of exchange, a money based economy is viable.

Imports are mainly raw materials and luxury items that can't be locally produced or are too expensive to make locally. The latter are a large component of inter-city trade.

To quantify the size and productive power of a community, the following questions have to be answered:

1. How many laborers?
2. How much productive time is available?
3. How many work in the various productive sectors (farming, extraction, manufacturing, etc.)?
4. How much energy and infrastructure is required to keep the community functioning?



HOW BIG IS THE LABOR POOL?

This depends mainly on the community's tech level, which influences sanitation, health care and demographics – the age distribution of the local population.

SIZE OF LABOR POOL

TECH LEVEL	% LESS THAN 15Y	% 15-64Y	% MORE THAN 64
A-D	20-30	66	5-15
E,F	47	50	3
G or worse	50	49	1

The labor force is usually drawn from the 15-64 year age group; child labor is economically viable at tech levels F-I, but becomes counterproductive at higher ones.

The actual number of participants starts off as two-thirds of the 15-64 age cohort. Community traits influence this, for example universal childcare increasing female participation, sex and class discrimination, etc.

TRAIT	EFFECT
Compassion	+1% per 5% above 50
Discipline	+2% per 5% above 50; -1% per 5% below 50

EXAMPLES

Hope is a village of 200, with technology level D and no special community traits.

The labor pool is 2/3 of 2/3 of 200, or 89.

Grinder is a town of 1,000 with technology level F and a Discipline rating of 80.

The labor pool is 2/3 of 50% or 333, plus 60 for the discipline rating for a total of 393.

HOW MUCH PRODUCTIVE TIME IS AVAILABLE?

For these rules, the base unit of value is the labor-hour – the amount of effort a worker can exert in an hour. A labor-year is defined as 2,000 labor hours. Higher tech levels are far more productive due to the effects of machinery and knowledge. The multiplier below effectively acts as an exchange rate between tech levels and affects the Domain of a community – higher tech settlements draw from a larger area to get the resources they need.

TECH LEVEL MULTIPLIER

TECH LEVEL MULTIPLIER

TECH LEVEL	MULTIPLIER
I	1
H	1.5
G	2
F	2.5
E	4
D	8
C	12
B	30
A	40

Each laborer can contribute a base of 2,000 hours per year. This can be modified by community traits.

TRAIT EFFECT

Curiosity, Organization	+1% per 5% above 50
Discipline	+2% per 5% above 50; -1% per 5% below 50

EXAMPLES

Hope's 89 laborers create a pool of $89 \times 2,000 = 178,000$ labor hours per year. The tech level multiplier is 8.

Grinder's 393 laborers each work 2,240 hours per year (2,000 plus the discipline bonus of +12%). The pool is 880,320 labor hours. The tech level multiplier is 2.5.



WHO DOES WHAT?

The allocation of the labor force changes with advances in the tech base. The ranges below are given for 'average economies' at the stated tech levels. The proportions could be very different in specialized settlements.

LABOR FORCE DISTRIBUTION			
OCCUPATIONAL GROUP	TECH A-C	TECH D-E	TECH F OR WORSE
Agriculture	2.5-10	11-25	20-50+
Mining, Manufacturing + Construction	30	25	18-25
Distribution	25	20	9-17
Other Services	35+	32+	20+

Distribution = retail and wholesale trade, hospitality, transport, communications.

Other services = health care, emergency services, finance, government, etc.

EXAMPLES

Hope's 89 laborers are allocated as follows: 16 farmers, 22 in the mining/manufacturing group, 17 in distribution, the remaining 24 in other services.

Grinder's 393 laborers: 158 farmers, 96 in the mining/manufacturing group, 60 in distribution, 79 in other services.

HOW MANY FARMERS?

Until the advent of mechanization, farming is very labor intensive. To grow a crop, about one-third of the time required is spent tilling, half weeding, the rest harvesting.

In the Agriculture Sector table, time per hectare is the number of hours spent tilling, planting, weeding and eventually harvesting a crop. The figure in parentheses is the number of hectares a farmer can manage in a 2,000 hour labor-year.

Yield is in kilograms of wheat per hectare per year. To feed a person for a year requires 300kg. The figure after the slash is the number of people that can be supported with the given yield.

Base and input costs are expressed in labor years per worker at that tech level. They represent the cost of equipment and consumables (fuel, fertilizer, herbicides and pesticides, animal feed, etc.)

For other crops, the following conversion factors can be used to obtain a yield in kilograms:

CROP YIELDS

CROP	MULTIPLIER
Sugar (from beets or cane)	20
Cabbages, carrots, onions, tomatoes	7
Potatoes, melons	5
Corn	2
Apples, beans, citrus, stone fruit	2
Rice, peanuts, soybeans	1
Hemp fiber	1
Tea, coffee	1/2
Cotton fiber	1/3
Tobacco	1/10
Opiates (morphine, opium, thebaine)	1/50
Cocaine	1/100

Livestock and animal products are treated slightly differently. The area per animal is the space required for pasture as well as pens, barns, etc. It spans a range of potential pasture productivities.

AGRICULTURE SECTOR

TECH LEVEL	TIME PER HECTARE (H)	YIELD (KG)	BASE COST	INPUT COST
H or worse	1,200 (1.6)	375/1.25	1	0.25
G	1,000 (2)	750/2.5	2	0.25
F	800 (2.5)	1,000/3.3	3	0.5
E	80 (25)	1,300/4.3	6	1
D	40 (50)	1,300/4.3	15	2
C	21 (95)	2,200/7.3	30	2.5
A,B	14 (143)	2,200/7.3	40	3

LIVESTOCK AND AQUACULTURE

ANIMAL PRODUCT	AVERAGE YIELD PER HECTARE PASTURE, KG	MULTIPLIER	CORN REQUIRED PER KG PRODUCT	AREA PER ANIMAL
Milk	180	1/12	1	2-10 hectares
Eggs	150	1/14	3	160-800 square meters
Poultry	115	1/20	2.5	100-500 square meters
Pork and mutton[1]	50	1/44	6	0.4-2 hectares
Beef	25	1/88	13	2-10 hectares
Lamb	18	1/120	17	0.13-0.63 hectares
Aquaculture (shell-fish crustacea, fish) [2]	100-4,000kg per hectare; 10-100 tons with intensive systems		3	

[1] Adult sheep produce 5kg wool per animal per year.

[2] Intensive aquaculture has a minimum tech level of C. The usual multiplier is 1/10 (fish) to 1 (shellfish and crustacea like prawns, crayfish, etc.)

The range of meat and dairy product consumption ranges widely across societies. The current global average per person is 35kg meat and 80L milk equivalent. In wealthy nations the values are higher: 70-110kg meat and 300L milk. The threshold for adequate nutrition is 10-20kg meat and 100L milk for non-vegetarians.

For convenience assume that an average level of animal protein for nutrition is 50kg meat or 150L milk per person per year. About ten percent of a herd or flock is eaten in a typical year.

EXAMPLES

To feed its population, Hope needs at least $200 \times 300 \text{kg} = 60,000 \text{kg}$ grain equivalent and $200 \times 50 \text{kg} = 10,000 \text{kg}$ meat equivalent. One farmer could provide the grain, working full time ($60,000 \text{kg} / 1,300 \text{kg per hectare} = 46$ hectares or 1,840 labor hours per year).

To produce the grain needed for the animal products requires anywhere from 7.7 hectares (milk only) to 131 hectares (lamb for everyone!). We'll use 6kg corn per kg meat (pigs or sheep): $6 \times 10,000 \text{kg} / 2 \times 1,300 \text{kg per hectare} = 23.1$ hectares. This requires $40 \times 23.1 = 924$ labor hours. But only ten percent of the herd is eaten every year, so we need $924 \times 10 = 9,240$ labor hours or five full time farmers to grow the grain the animals need on $23.1 \times 10 = 231$ hectares.

So the area required to raise the livestock is $10 \times 10,000 \text{kg} / 50 \text{kg per hectare} = 2,000$ hectares. At Tech Level D, another four farmers are required to raise the herds (each farmer can 'harvest' 50 hectares each year). The last six farmers raise fruit, vegetables and fiber crops on their 300 hectares.

The setup cost for the 16 farmers is $16 \times 15 = 240$ labor years, and ongoing costs are $16 \times 2 = 32$ labor years per annum. The area of farmland is $46 + 231 + 300 = 577$ hectares. The area of pasture is 2,000 hectares or 20 square kilometers.

Grinder needs 300,000kg grain equivalent and 50,000kg meat equivalent. The grain needs 300 hectares of land, which requires $800 \times 300 = 240,000$ labor hours. This means $240,000 / 2,240 = 108$ full time laborers. To grow grain for eggs requires $3 \times 50,000 / 2 \times 1,000 = 75$ hectares - another 27 farmers.

To raise the hens, we need $50,000 \text{kg} / 150 \text{kg per hectare} = 333$ hectares and 119 farmers, for a total of $108 + 30 + 119 = 257$.

The overall set-up cost is $257 \times 3 = 771$ labor years, with expenses of $257 \times 0.5 = 129$ labor years per annum. The area of farmland is $300 + 75 = 375$ hectares. There is 333 hectares of pasture.

Grinder's 393 laborers are now allocated as follows: 257 farmers, 76 in mining or manufacturing, 35 in distribution, 25 in other services.

HOW BIG IS THE EXTRACTION SECTOR?

The following industries are grouped in this sector: forestry, fishing and mining.

EXTRACTION SECTOR

TECH LEVEL	BASE COST	INPUT COST	POWER (KW)	OUTPUT
G or worse	1	1	-	1
F	1.5	1	1	1.5
E	3	2	2	3
D	6	3	4	5
C	15	7	8	15
A,B	20	10	10	20

Base cost includes equipment such as buildings, excavators, dump trucks, tree-felling equipment, fishing boats, prospecting sensors, etc. Inputs are consumables like fuel and spare parts. These are per worker.

The power requirement represents the demands of machinery. Output depends on the commodity, but is roughly equivalent to tons per day for coal and ores. The metals listed below assume average concentrations in ore bodies. All require smelting to produce the metal, which is done by the manufacturing sector.

MATERIAL CONVERSIONS

MATERIAL EXAMPLE	FACTOR
Coal, tons per day, surface mining	1
Underground mining	1/2
Oil, barrels per day (TL E+)	40
Gas, cubic meters per day	500
Fish, kg per day	1
Iron, tons per day	1/2
Aluminium, tons per day (TL E+)	1/5
Wood, cubic meters per day	1/8
Zinc, tons per day	1/150
Copper, tons per day	1/200
Lead, tons per day	1/800
Nickel and uranium, tons per day	1/1,000
Tin, tons per day	1/3,000
Silver, tons per day	1/10,000
Heavy water, tons per day (TL D+)	1/340,000
Gold, tons per day	1/1,000,000

MINING

A mine and its workings use 100 square meters per output unit. Oil and gas wells and their associated machinery take half this.

FORESTRY

Use an average value of 500kg per cubic meter. Sustainable harvesting ranges from 4-10 tons per hectare per year for a temperate forest depending on productivity. Multiply this value by ten for clear-cutting.

FISHING

Only a small fraction of wild aquatic biomass is edible. Coastlines and rivers can support much more life than the ocean per unit area. On average, 1 hectare of coastal or river area will sustainably produce 1kg fish per day; multiply the area required by 100 for ocean. It is easy to overfish an area!

EXAMPLES

Hope has a small open-cut coal mine that employs eight people. It produces 40 tons of coal per day (8 x 5 x 1), requires 24 labor years worth of inputs annually, and 32kW of power. It cost 48 labor years to build in the first place, and covers 4,000 square meters.

Grinder's coal mine employs thirty people, produces 45 tons of coal (30 x 1.5 x 1) per day, and requires 30 labor years worth of inputs annually and 30kW of power. It cost 45 labor years to build and covers 4,500 square meters.



HOW BIG IS THE MANUFACTURING SECTOR?

Manufacturing transforms raw materials from agriculture and the extraction sector into a variety of finished and intermediate products. There are three broad classes of manufacturing plant:

1. Refineries process chemicals – distil crude oil, produce coal tar, and synthesize industrial chemicals like ammonia, acids and alkalis.
2. Smelters produce metal from ores.
3. Factories produce all other goods: processed food, clothing, paper, mechanical and electrical machinery, pharmaceuticals, etc.

MANUFACTURING

TECH	BASE CAPITAL	ENERGY (KW)	INPUTS	OUTPUT (ANNUAL)
G-	1	0.75	1	1
F	1.5	1.5	1.5	2
E	3	3	3	4
D	6	3	5	10
C	15	6	7	22
A, B	20	8	14	44

Base capital and output values are in labor-years. Inputs can be expressed in terms of output units from the extraction sector, person-years of food (300kg grain equivalents), or labor years. Energy needs to be provided by the power sector.

ECONOMIES OF SCALE

Larger manufacturing plants gain efficiencies of scale. The listed multiplier increases the energy requirement, inputs processed each year and the output produced.

NUMBER OF WORKERS

MULTIPLIER

Basic hand tools (1) X 0.5

Home, small commercial workshop (1-20) X 1

Small factory (21-100) or minifactory (1-20) X 2

Large factory (101+) X 4

HOW BIG IS THAT FACTORY?

Each kilowatt of power demand equals ten square meters of area for factories. Smelters are a little smaller at five square meters per kilowatt, refineries bigger at twenty square meters per barrel per day (ton per day for inputs other than oil) of capacity.

EXAMPLES

Oil refineries

A small modern oil refinery processes 10,000 barrels per day; the average facility processes 100,000 barrels per day. Using the manufacturing and scale tables:

- Each Tech Level A worker can process 560 (40x14) barrels of oil per day. For the small facility, $10,000/560 = 17$, so no scaling benefit accrues. $100,000/560 = 178$. If we assume x2 scaling modifier, 89 workers are required.
- The small refinery requires 340 labor-years of base capital, draws its power from 1,000 barrels of oil per day, and occupies an area of twenty hectares. The 100,000 barrel a day refinery requires 1,780 labor-years of base capital, draws its power from 5,000 barrels of oil per day and occupies an area of 200 hectares.

IRON SMELTERS BY TECH LEVEL

TECH LEVEL	TYPICAL DAILY PRODUCTION AT SMELTER, TONS PER DAY	COAL KG EQUIVALENT PER KG IRON	IMPLIED WORKFORCE	IMPLIED AREA, M ²
G, H	1-2	14	2-4	3.75-7.5
F	80	6	53	800
E	500	1.5	83	1,250
D	1,000	1.5	100	3,000
C	2,000	1	143	8,580
A, B	10,000	0.6	357	28,560

Every ton of iron requires 1,600kg of ore, 200kg limestone and the listed amount of carbon/fuel.

Enriching uranium and deuterium

To make one kilogram of reactor grade uranium from 10kg of ordinary uranium metal takes a lot of energy: 250kWh by centrifuge or 10kW per kg enriched uranium per day (TL C+), 12,500kWh by gaseous diffusion or 500kW per kg enriched uranium per day (TL D+). Use the energy requirement to calculate the plant's input and output. This process can be repeated to make 0.1kg of weapon-grade highly enriched uranium. Note that a separate facility is required to convert uranium ore to metal.

Refining heavy water to obtain deuterium for fusion involves a concentration factor of 340,000. Use the manufacturing table to build heavy water plants. Each unit of input is a ton of water. Each output unit is 1/340,000 tons heavy water – about three grams.

A Workshop for Hope

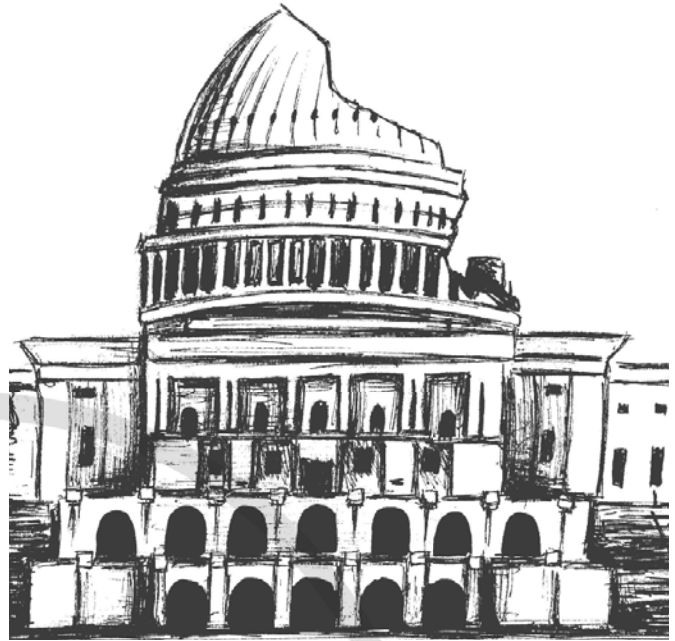
The coal miners need spare parts, blasting caps, explosives, etc. A small workshop employing three people will produce 30 labor-years worth of output, more than enough to meet the coal mine's requirements. However, the workshop needs 15 labor years worth of inputs in the form of metals and chemicals, and a constant power supply of 9kW. It costs 18 labor years of effort to build and occupies 90 square meters.

A Coal-to-Liquid plant for Hope

Some of the coal produced by the mine is used to make liquid fuel and feed-stocks for other chemicals. To process 30 tons of coal per day requires 6 people and 18kW of power. The plant cost 36 labor-years to build, and produces 60 labor-years worth of product, including 60 barrels of oil a day, 900 liters of coal tar and six tons of coke. It occupies 1,200(refining) + 180 (base factory size) = 1,380 square meters.

A Workshop for Grinder

The analogous facility for the Grinder mine employs 15 people. It needs 22.5 labor years worth of inputs and a power supply of 22.5kW. It costs 22.5 labor years to build and occupies 225 square meters.



SERVICES AND GOVERNMENT

The potential occupations covered in this group are very large, and get bigger as a community advances economically and technologically. The role of government varies with cultural factors and ranges from providing a minimal legal framework for society to operate in (high Volatility, low Discipline, high Curiosity) to authoritarian centrally planned societies where even personal activities are controlled (high Discipline, low Curiosity).

MERCHANTS, TRADERS AND TEAMSTERS

Throughout history, people have typically sold what they produce. As societies advance this relationship changes, so that people offer their labor or knowledge to others; farmers and manufacturers sell to middlemen who are involved in distribution or collective purchasing arrangements. In these rules it is assumed that the distribution pool of labor is broken up into merchants and traders and those who transport the produce of the farming, extraction and manufacturing sectors to places of sale or use.

EXAMPLES

Hope's 17 distribution laborers are divided between the farms (3), coal mine (5), forestry industry (2) and trading establishments in the village (7).

Grinder's 35 distribution laborers are divided between the farms (9), coal mine (9), forestry industry (9) and trading establishments in the village (8).

EDUCATION

Literacy and education are essential for tech level advancement. Communities with high levels of Curiosity, Compassion or Discipline will have more teachers and effectively perform better than what their tech level would suggest. The following table lists percentage of population that attends a given level of education by tech level.

EDUCATION AND TECH LEVEL

TECH LEVEL	A	B	C	D OR WORSE
Primary	100	100	70	50 or less
Secondary	90	60	20	5 or less
Tertiary	12-30	8-20	1-10	1 or less
Teacher to student ratio	1:20	1:30	1:40	1:40 or worse

EXAMPLES

Hope has 50 children under age 15 (25% of 200). About half will receive some schooling; there is one person involved in full-time education and child care (25/40, rounding up).

Grinder has 470 children under age 15. About half will receive some minimal schooling; there are six people involved in full-time education and child care (235/40, rounding up).

HEALTH CARE AND EMERGENCY SERVICES

In smaller communities, fire-fighting and ambulance services are run by volunteers. Figure one volunteer firefighter per 125-200 population, or 1 per 500-600 full time; for ambulance 1 per 1,700-2,000. The time and effort required to train specialists like nurses, doctors, etc. make them relatively rare in communities until societies become wealthy or make such personnel a priority (high Compassion or Discipline).

TECH LEVEL AND HEALTH SERVICE PROVISION

TECH LEVEL	A	B-C	D OR WORSE
Doctor	1:400-1,000	1:1,600-2,000	<1:10,000
Dentist	1:2,000	1:6,000-8,000	<1:10,000
Nurse	1:180-200	1:1,000-2,000	<1:2,000
Pharmacist	1:1,700	1:6,000-8,000	<1:10,000
Hospital Bed	1:125-300	1:300-600	<1:600

EXAMPLES

Hope has two volunteer firefighters (200/125). The village is too small to have a full time healer. There is a healer (midwife and herbalist) that can look after a single person at her residence.

Grinder has five volunteer and two full time firefighters. There is a healer-apothecary who can look after two people at their residence.

LAW ENFORCEMENT AND MILITARY

Communities with high Discipline and low Curiosity traits will have law enforcement and military personnel with far more arbitrary powers. The actual number will vary with local crime rate and the presence of conflict. Local militias may be drawn from the rest of the adult population. In the table below, 'Crisis' regions have active conflicts or insurgencies; 'Settled' areas have a crime rate typical of modern U.S. levels; 'Quiet' regions less than this.

HOW MANY POLICE/SOLDIERS?

TYPE	CRISIS	SETTLED	QUIET/MATURE
Judiciary[1]	<1:600	1:500	>1:300
Police[2]	>1:300	1:400	<1:500
Soldier[3]	1:40-150	1:150-200	<1:200

[1] Courts, prison, support personnel. Government functions in smaller centers.

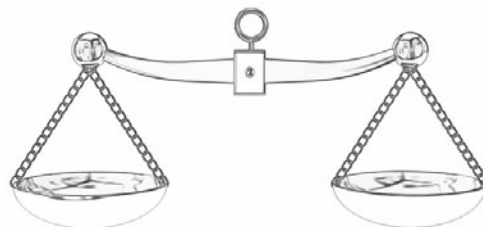
[2] Active patrol personnel

[3] Active forces – reserves may be up to ten times as numerous.

EXAMPLES

Hope has a part time Mayor and volunteer police force (1:200). Ten people can be deputized to form a posse or militia if required – they have some training.

Grinder has two headmen that act as judges. Using the 'Crisis' column to represent the town's high Discipline score, there are four full-time law enforcers (1,000/300, rounded up) and seven soldiers (1,000/150). Seventy people can be quickly mobilized to form a militia.



ENERGY AND INFRASTRUCTURE

People need somewhere to live, and energy to heat their homes, cook their food and provide other creature comforts.

The overall population density needs to be considered. The possible range spans several orders of magnitude:

SETTLEMENT POPULATION DENSITY

PEOPLE PER HECTARE	EXAMPLE
10-15: extreme low density	Suburbs of Los Angeles, Houston, Phoenix
15-40	Inner zones of sprawling cities e.g. LA, Chicago, Detroit, Boston, Sydney, etc.
40-100: medium density	London, Toronto, New York boroughs
100-350: high density	Manhattan, Hong Kong, Tokyo, Paris
350+	Some ancient cities ~500; third world slums 2,000-3,000

Higher density levels are associated with poverty and high levels of the Discipline trait. High levels of Extroversion reduce population density.



HOUSING

The values given below are in labor years per 20 square meters (220 square feet) per person. This is an average value. Four square meters is a bed with a small space around it. Ten square meters per person is similar to a barracks or hospital ward.

HOUSING BY TECH LEVEL

TECH LEVEL	COST	AMENITIES PROVIDED
------------	------	--------------------

I	1	Cave or lean-to
H	1.5	
G	2	Wood or dung for cooking and heating fuel, communal well or spring.
F	2.5	There is a communal water supply is within 200m of the dwelling. The wealthiest members of the community have direct access to running water and have indoor toilet facilities.
E	4	~10% of population have indoor toilet, 20% running water. These are usually urban populations with access to electricity. Most households have dedicated kitchen facilities. Telephones begin to appear.
D	8	Rural electrification and water distribution begins. 50% of dwellings have running water; about 30% have electric refrigerators. 20-25% have indoor toilets, 10% have bathrooms and some form of climate control in the form of central heating or air conditioning. Radios become available for home use.
C	12	The majority of households have refrigerators (90%), indoor toilets and bathrooms (70+%) and climate control (60%). Televisions become available for home use.
B	30	Nearly all (99+%) homes have electricity, climate control and the full gamut of appliances. Home computers and data networks begin to appear.
A	40	

Other amenities such as utility connections, drains and guttering are assumed to be included if the tech level permits.

TRANSPORT NETWORKS

Ten kilometers of road or rail per square kilometer of settlement area are required. For every ten square kilometers or 1,000 hectares of farmland or pasture, one kilometer of road or rail is required.

ROAD AND RAIL DATA

ROAD TYPE	BASE COST (LABOR HOURS)	MAINTENANCE PER YEAR	BASE CAPACITY PER LANE
Trail (1-2m wide)	10,000	500	0.25
Earth (3m wide)	50,000	2,400	0.5
Gravel (3m wide)	60,000	3,600	0.7
Surfaced (3m)	70,000	2,000	0.7
Sealed (3m)	90,000	2,000	1
Rail (TL G+) Twin track standard gauge	80,000	500	6

Base cost is per km of lane.

Maintenance values are in labor hours per km.

RAIL FIXTURES:

Siding (one platform each side of the track): 40,000

Water fueling station every 50km track (steam train TL D-F): 30,000

Coaling station every 160km track: 10,000

Electrification (TL D+), per km: 16,000

The total capacity required to carry freight and travelers is given by:

$$\frac{([\text{agriculture} + \text{extraction} + \text{manufacturing outputs in tons per year}] + [\text{population} \times \text{tech multiplier}])}{30,000}$$

You can mix road and rail types to get to the capacity required as well as adding extra lanes.

EXAMPLES

The cost of housing Hope's population is $8 \times 200 = 1,600$ labor-years. With a density of 40 people per hectare, the overall area of the village is five hectares, or 0.05 square kilometers. This means 0.5km of road is necessary within the village. The 26 square kilometers of farmland add another 2.6km of road, for a total of 3.1km.

The capacity of road required is given by:

$$70 (\text{agricultural output in tons per year}) + [110 \times 250 = 27,500] (\text{extraction and manufacturing output in tons per day, multiplied by number of days worked}) + [200 \times 8 = 1,600] (\text{population} \times \text{tech multiplier}) = 29,170/30,000 = 0.97.$$

A two lane network of earth roads is present (capacity 1); it cost $2 \times 3.1 \times 50,000 = 310,000$ hours to build and requires $2 \times 3.1 \times 2,400 = 14,880$ hours of maintenance per year.

Grinder's housing stock is worth 2,500 labor-years. With a density of 70 people per hectare, the overall area of the village is 14.3 hectares, or 0.143 square kilometers. Another 0.7km is required by farmland for a total of 2.2km.

The capacity of road required is given by:

$$320 (\text{agricultural output in tons per year}) + [144 \times 280 = 40,320] (\text{extraction and manufacturing output in tons per day, multiplied by number of 8-hour days worked}) + [1,000 \times 2.5 = 2,500] (\text{population} \times \text{tech multiplier}) = 43,140/30,000 = 1.44.$$

A two lane network of gravel roads and a trail lane is present (capacity $1.4 + 0.25 = 1.65$); the road cost $2 \times 2.2 \times 60,000 = 264,000$ hours to build and requires $2 \times 2.2 \times 3,600 = 15,840$ hours of maintenance each year. The trail costs $2.2 \times 10,000 = 22,000$ hours to build and $2.2 \times 500 = 1,100$ hours to maintain each year.



ENERGY

The total energy supply required by a community is the sum of the power demands of the extraction and manufacturing sectors, plus that required by housing. About one-third is required by transport and power machinery above tech level E.

ENERGY CONTENT OF VARIOUS FUELS

TYPE	ENERGY PER UNIT MASS	ENERGY PER UNIT VOLUME
Dung	8-14MJ/kg	8-14MJ/L
Wood	14-18MJ/kg	7-9MJ/L
Coal	18-29MJ/kg	15-24MJ/L
Natural gas	33-37MJ/kg	1kg = 1 cubic meter = 35.3 cubic feet
Petroleum/gasoline	42-44MJ/kg	31-33MJ/l
Methanol	20MJ/kg	18MJ/l
Ethanol	31MJ/kg	24MJ/l
U-235 fission	~86,400,000MJ/kg	~1L of uranium metal, 4% U-235
Deuterium fusion	~361,309,090MJ/kg	1L heavy water, 920MW-days



ENERGY REQUIREMENTS PER CAPITA

TECH LEVEL	POWER REQUIREMENT, KW	POSSIBLE ENERGY TYPES
I	0.1	Biomass, muscle
H	0.25	+Wind
G	0.5	
F	1.2	Coal, gas
E	2.5	Electricity, oil
D	5	Wind turbines
C	9.7	Fission, Photovoltaics
B	10	
A	9.7	Fusion

EXAMPLES

Hope needs a total of 1,000kW energy (200 x 5). Half is required for electricity, the other half is the fuel from the coal to liquids plant. A 0.5MW coal plant costs 50,000 labor hours (500kW x 100), occupies 100 (500/5kW/m²) square meters, and requires 11,000kg coal per day to run (22kg/kW-day).

Grinder requires 1,200kW energy (1,000 x 1.2). This is in the form of wood and coal burned to produce heat and some mechanical power. If we assume half wood, half coal then a 0.6MW coal plant costs 96,000 labor hours (600kW x 160), occupies 600 square meters, and requires 30,000kg coal per day to run (600 x 50kg/kW-day). 600kW from wood per day requires... a lot of wood at 20% efficiency – some 16,200kg, the equivalent of sustainably harvesting 2.5 hectares every day – or felling every tree in a forested hectare every ten days.

POWER PLANT CHARACTERISTICS

TYPE	COAL	OIL	GAS	FISSION
Min. Tech Level	F	E	E	C
Minimum size	0.1MW	10s of watts	<1kW	60MW
Maximum size	1,500MW	1,000MW	1,000MW	1,500MW
Area	1-10kW/m ²	5kW/m ²	3-6kW/m ²	1-1.5kW/m ²
Cost (h)	60-160/kW	62/kW	50-70/kw	125-250/kW
Fuel requirement	11-100kg/kW-day	5-20kg/kW-day	6-20kg/kW-day	27kg uranium /MW-year
TYPE	WIND	SOLAR	HYDRO	FISSION
Min. Tech Level	G, D (electric)	C	G, D (electric)	A
Minimum size	0.5kW	<1W	10kW	100kW
Maximum size	5MW/turbine	20MW	>10GW	1,500MW
Area	5W/m ²	30m ² /kW	0.1-50W/m ²	2kW/m ²
Cost (h)	50-100/kW	200/kW	70/kW	125-250/kW
Fuel requirement	Wind	Sunlight	Water, gravity	0.8kg heavy water/MW-year

Maximum size and efficiency increase with tech level. Price tends to decrease with tech level.

HOW MUCH DO THINGS COST, REALLY?

The most important influences are the cost of production – economies of scale accrue to larger facilities and mass production benefits also apply. Other determinants are the cost of importation (transport) and other social and legal factors (taxes, tariffs and prohibition).

Economies of scale have been listed above in the manufacturing section.

Mass production benefits/penalties:

- More than 101 copies produced annually: x1
- Less than 101 copies produced annually: x2
- Luxury/optimized (e.g. military): x5
- Prototype: x10

Some basic prices in labor hours:

Weapons:

- Personal weapon: 10-50 hours
- Squad weapon: 100-200 hours
- Heavy/siege weapon: 400-1,000 hours
- Ammunition: weapon cost/10 for 500 rounds.
- Body armor: 100-1,000 hours, depending on type.

EXAMPLE: A TL D bolt action rifle is worth 160 hours (8x20). It's an expensive purchase at lower tech levels. A tech level B assault rifle is worth 600 hours (30x20).

Vehicles:

- Sledge, wheelbarrow, handcart: 1-6 hours
- Bicycle (TL F+): 10-20 hours
- Animal drawn cart: 30-50 hours
- Motorcycle (TL D+): 90 hours
- Tiller-trailer combination: 500 hours
- Car/pickup (TLD+): 1,200 hours
- Light truck: 3,000 hours
- Heavy truck: 6,000 hours
- Locomotive (TL F+): 160,000 hours
- Motorized unit (e.g. electric subway car) (TL D+): 80,000 hours
- Passenger car (TL F+): 4,000+ hours
- Freight car (TL F+): 4,000-8,000 hours
- Armored fighting vehicle (TL D+): 180,000-720,000 hours
- Combat aircraft (TL D+): 500,000+
- Boat or ship: 1,000 hours per displacement ton.

Food:

- Bulk grain or meat, per kg: 0.006-3 hours (tech level A-I)
- Milled grain: x2
- Bread: x4
- Processed (cooked, frozen, and tinned): x8-20, depending on number of manufacturing steps and tech level.



TRANSPORT COSTS

MODE	COST (H PER TON-KM)
Shipping	1
Rail	2
Heavy truck (25-40 tons gross)	4
Medium truck (8-26 tons gross)	12
Small truck/car, wagon (<8 tons gross)	120
Heavy air (50+ tons cargo)	75
Medium air (20+ tons cargo)	135
Small air (5+ tons cargo)	280
Light aircraft (<5 tons cargo)	500

EXAMPLE ARMOR

TYPE	TL	WT. (KG)	RATING	PRICE
Cloth	I	1	0/1/F	50
Padded	I	3	1/3/F	100
Leather	H	4	2/4/F	250
Chain	G	10+5	2/10/F	400
Plate	G	20	5/14/H	600
NIJ I	D	6	6/1/F	75
II-A	C	1.2	10/1/F	100
II	C	1.85	12/2/F	150
III-A	C	2.1	14/2/F	200
III	B	4	17/3/H	300
IV	B	7.5	20/5/H	400

The weight listed for chain is torso plus limb protection. All other archaic suits protect torso and limbs. Ballistic armor protects the torso only.

EXAMPLE VEHICLES

The big problem with modern vehicles is spare parts, especially tires. Fluids (lubricants, coolants) are another issue.

The EMP from the nuke attacks will have variable effects on engine management systems - we could assume that these could be lucky vehicles that have survived intact, but the most likely option is that the engines have been heavily modified to work in more primitive conditions.

CHEVY SILVERADO PICKUP	
CREW	2
LENGTH	5.23m
WIDTH	2.05m
HEIGHT	1.88m
GROUND CLEARANCE	.25m
TURNING RADIUS	7.5m
MAX. ROAD SPEED	78km/h
FORDING DEPTH	.75m
GRADIENT	60%
VERTICAL OBSTACLE	.2m
TRENCH	.25m
ARMOR VALUE	4(B), 9(NB), 128(EX)
MASS	32 (2122kg unloaded)
SP	1024
STATS	STR 101 (60kW internal combustion) DEX 14 INT 15 PACE 13 ENDURANCE 12
PAYLOAD	770kg carried, 2265kg towed.
COMMENTS	This pre-war four wheel drive has been converted to run on alcohol or gasoline; the engine electronics were replaced long ago with balky mechanical parts to maintain timing. Additional armor in the form of metal plates can be fitted, but this significantly reduces the payload.

PRIME MOVER, TRUCK (SEMI)

LENGTH	~7m
WIDTH	max 2.5m
HEIGHT	max 3.5-4m
GROUND CLEARANCE	.25m
TURNING RADIUS	10-12m without load
MAX. ROAD SPEED	78km/h
FORDING DEPTH	.75m
GRADIENT	60%
VERTICAL OBSTACLE	.2m
TRENCH	.25m
ARMOR VALUE	4(B), 9(NB), 128(EX)
MASS	~49 (~7500kg unloaded)
SP	2401
STATS	STR 73 (100-180kW internal combustion) DEX 8 INT 15 PACE 13 ENDURANCE 12
PAYLOAD	1000kg carried, max 25,000kg towed.

AN EXAMPLE CURRENCY

Gunpowder production is quite slow until the development of modern industrial chemical techniques leads to the mass production of smokeless powders and other explosives. One unit of manufacturing output equals 125kg (275 pounds) per year or about a half kilo per work day. So eight hours of labor equals a kilogram of gunpowder at Tech Level F.

Other items can then be priced in terms of gunpowder. Gold production at Tech Level F is about 500 grams (17 ounces) per year, silver 50 kilograms (1,700 ounces). A kilogram of gunpowder is worth a gram of gold or 100 grams (~3.5 ounces) of silver. Use the hour costs listed above as a basis for other things.



SURVIVOR EQUIPMENT & ECONOMICS

EXAMPLE WEAPONS

TYPE	TL	E- FACTOR	RANGE (M)	WT. (KG)	AMMO WEIGHT	PRICE (H)	COMMENTS: RATE OF FIRE, EXAMPLES
Rock	I	1	10/20	0.1	-	-	
Razor	H	1		0.1	-	5	
Knife	I	1		0.2	-	10	
Sword/Saber	H	5		1.5	-	30	
Hatchet	I	4	3/5	1	-	15	
Throwing Knife	H	2	5/10	0.2	-	10	
Tomahawk	I	4	10/20	1	-	15	
Axe	I	6	10/20	2	-	20	
Blackjack	I	2		0.3	-	10	
Club	I	4		1	-	5	
Sledgehammer	H	6		2	-	20	
Spear	I	6	30/70	2	-	10	
Short bow	I	8	30/400	0.5	50g ea.	15	10 rpm
Long bow	H	14	60/600	0.75	60g ea.	30	10 rpm
Compound bow	C	16	80/700	2	70g ea.	40	10 rpm
Light crossbow	H	14	40/400	3	40g ea.	30	5 rpm
Heavy crossbow	G	18	100/800	6	80g ea.	40	5 rpm
Flintlock pistol	G	8[1]	10/500	1.13	15g ea.	40	.54, 6 rpm
Flintlock rifle	G	8[1]	50/300	5.03	37g ea.	50	.69, 12 rpm
Percussion revolver	F	10[1]	30/1850	1.13	72g/6	40	.44 New Model Army, 12 rpm
Percussion rifle	F	15[1]	70/1200	4.07	18g ea.	50	.50 Hawkins, 10 rpm
Cartridge revolver	E	8	50/1480	1.02	135g/6	50	Colt Peacemaker
Shotgun	F	7[2]	20/150	3.2	140g/2	40	10ga whipit, 2 barrel.
Breech-loader rifle	F	12	400/3200	4.5	40g ea.	30	.45 Springfield
Lever action rifle	E	15	200/2830	2.95	132g/6	30	.30-30 Winchester '94
Automatic pistol	D	8	50/1460	1.05	222g/7	20	.45 M1911
Bolt action rifle	D	17	600/3155	4.1	129g/5	20	M1903 Springfield, 15 rpm
Sub machinegun	D	8	200/1550	3.5	980g/30	30	.45 'grease gun'; 120rpm, CYCLIC 450
Assault rifle	C	15	300/2200	4.3	827g/30	40	AK-47; 100rpm, CYCLIC 600
Rocket launcher	D	400ex 210AP	30/100	3.2	1.6kg ea.	100	Faustpatrone
"	C	600ex 430AP	250/820	6.4	4.1kg ea.	100	M20A1 bazooka, 6 rpm
"	C	533ex 500- 900AP	300/920	7.9	2.5kg ea.	150	RPG-7

[1] Treat as wound enhancing.

[2] Per pellet (of buckshot in this case)

FLORA & FAUNA

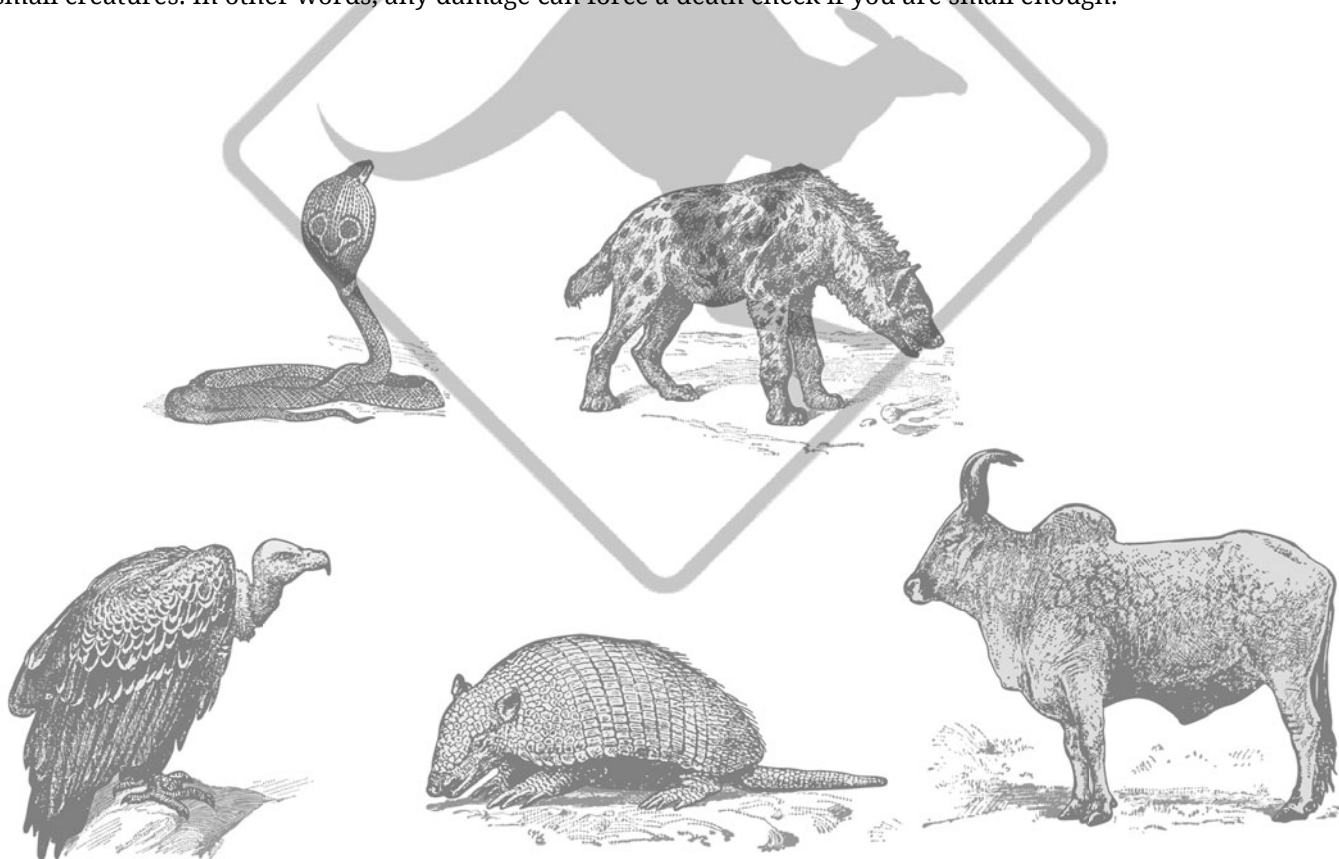
Sample statistics for a variety of birds, reptiles and mammals are presented here. Most are native to North America; inventive Project Directors could easily modify these values for some imported visitors. Generally animals will flee if able, fighting to the death only when backed into a corner or protecting their young.

THE FAUNA OF THE MORROW PROJECT

This is how we determined various animals' core ability scores.

- MASS is based on body weight.
- STR base = $2 \times \text{MASS}$. Carnivores get a +10% bonus.
- DEX starts at 20 unless unusually agile or large (about -1 per 2-4 MASS over 12).
- CON starts at 20 unless they are a noted endurance athlete.
- AWA base 10 - enhanced senses give +5 per modality.
- REA base varies with animal type: apes 13, 11 for pigs and parrots, 9 for carnivores, 7 for herbivores, 5 for fish and reptiles.
- EXP base starts at 7. With training, some of the smarter animals can use sign language (EXP 8+).
- FOC base FOC 15 for herbivores, 20 for carnivores; animals use morale rules in combat.
- Run speed is (PACE $\times$ 6) for most quadrupeds, double that of humans. Flight speed for birds also equals (PACE $\times$ 6).

When resolving damage, death check thresholds should be multiplied by (MASS/10), to a minimum of 0 points for small creatures. In other words, any damage can force a death check if you are small enough.



SMALL CREATURES (LESS THAN 1 KG)

CHIPMUNK

The chipmunk is a highly agile rodent. Weight range is 32-50g, average 44g, and 20cm long.

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
AVERAGE	0.5	1	20	30	15	7	15	5	3.2
RANGE	0.4-0.5	1						4-5	3.1-3.2

FLYING SQUIRREL

These are found throughout the forests of North America. Adults measure from 25-37cm in length and weigh 110-230g. They are accomplished gliders and climbers but are clumsy on the ground.

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
AVERAGE	0.6	1	20	20	15	7	15	6	2.2
RANGE	0.6-0.7	1-2						6-8	2.2-2.3

LEMMING

They can be found around the Great Lakes and across Canada and Alaska. Mass migrations in search of food have made these animals infamous. Weight range 30-60g.

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
AVERAGE	0.4	1	20	20	15	7	15	4	2.1
RANGE	0.3-0.5	1						3-5	2.2-2.2

MOLE

These burrowing animals are timid and mostly harmless. Weigh up to 200g.

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
AVERAGE	0.9	2	20	20	15	7	15	10	2.3
RANGE	0.8-1	1-2						8-11	2.2-2.3

MOUSE

One of the most closely studied animals in the world; this ubiquitous creature is a bane to farmers and house-holders everywhere. Weight range 30-50g.

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
AVERAGE	0.4	1	20	23	15	7	15	4	2.4
RANGE	0.4-0.5	1						4-5	2.4-2.5

MUSKRAT

A common sight across Canada and the north, these rodents average 330g and 35cm in length.

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
AVERAGE	1	2	20	20	15	7	15	11	2.3
RANGE	0.9-1	2						9-11	2.3

SMALL CREATURES (LESS THAN 1 KG)

PRAIRIE DOG

These highly social burrowing rodents are found across the Great Plains – between the Rockies and the Mississippi, and up into the Canadian steppe. Length range 33-40cm, weight range 465-730g. The tunnel systems or ‘towns’ can be quite extensive.

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
AVERAGE	1	2	20	20	15	8	15	11	2.3
RANGE	1-2	2-4						11-24	2.3-2.6

RABBIT

These stats are for brush, pygmy (370-450g) and scrub rabbits (500-900g). Prolific breeders, these burrowing rodents can be a good food source.

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
AVERAGE	1	2	20	25	15	7	15	11	2.8
RANGE	1-2	2-4						11-24	2.8-3.1

RAT

Man’s companion since antiquity, this intelligent omnivore has been a raider of granaries, carrier of plague, object of worship and robust lab animal. Adult weight range 200-450g.

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
AVERAGE	1	2	25	25	20	10	15	14	2.8
RANGE	0.9-2	1-4						12-29	2.8-3.1

SHREW

This is the smallest mammal, weighing 3-5g. With a heart rate of 1000 beats per minute, it represents the limit of size for a warm blooded animal.

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
AVERAGE	0.2	0.5	20	25	15	7	15	2	2.5
RANGE									

SQUIRREL

Grey and red squirrels can be found everywhere except the southwestern deserts. Weight range 340-750g, length 38-52cm.

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
AVERAGE	1	2	20	23	15	7	15	11	2.6
RANGE	1-2	2-4						11-24	2.6-2.9

WEASEL

A lot of attitude in a small package. The long-tailed weasel has a weight range of 80-450g.

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
AVERAGE	0.9	2	20	23	20	9	25	10	2.6
RANGE	0.6-1	1-2						6-11	2.5-2.6

MEDIUM (1 TO 20KG)

RODENTS:

BADGER

These animals live in burrows. They can be found everywhere except the south-eastern U.S. Average weight 12kg, length 60-79cm.

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
AVERAGE	5	11	25	20	20	9	30	90	3.6
RANGE	4-6	9-13						68-114	3.3-3.9

BEAVER

The largest rodent in North America, this industrious animal is famous for building dams and felling trees. Weight range is 16-30kg, length range 100-120cm.

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
AVERAGE	6	13	20	20	20	7	20	99	3.9
RANGE	6-7	12-14						96-119	3.8-4.1

PORCUPINE

The porcupine can be found everywhere except the south eastern U.S. They have a legendary appetite for salt. Length range 60-130cm (average 80), weight 3.5-18kg.

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
AVERAGE	3	6	20	20	15	7	15	39	2.9
RANGE	3-6	6-12						39-96	2.9-3.8

RABBITS AND HARES (LAGOMORPHS)

These statistics are for larger animals such as the marsh and swamp rabbits of the southern U.S. (1.2-2.6kg), the jackrabbit (2.5-6kg), endemic to the southern U.S. and the snowshoe hare, which can found across Canada (0.9-2.2kg).

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
AVERAGE	3	6	20	25	15	7	15	39	3.4
RANGE	2-4	4-8						24-56	3.1-3.7

WOODCHUCK, MARMOT

The woodchuck can be found across Canada and east of the Mississippi. Weight range is 3-4kg, length 40-70cm. The marmot or 'rock chuck' can be found west of the Rockies. Weight range is 1.6-5.2kg, length 47-62cm.

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
AVERAGE	3	6	20	20	15	7	15	39	2.9
RANGE	3-4	6-8						39-56	2.9-3.2



BIRDS:

CHICKEN

Commonly bred for eggs and meat, these birds average 3kg. Roosters tend to be bigger than hens.

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
AVERAGE	3	6	20	20	15	7	15	39	2.9
RANGE	3-4	6-8						39-56	2.9-3.2

DUCK

There are many varieties of this waterfowl. Weight ranges from 0.75-5.5kg.

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
AVERAGE	3	6	20	20	15	7	15	39	2.9
RANGE	2-4	6-8						26-56	2.8-3.2

RAPTORS

Birds of prey like eagles and hawks range from 1-7kg with 1.5-2.4m wingspans. They have keen eyesight.

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
AVERAGE	3	7	20	25	20	9	20	41	3.5
RANGE	2-4	5-9						25-58	3.2-3.8

TURKEY

Wild animals are smarter than their domesticated brethren, and are proficient flyers. Average weight is 8.2kg for males, 3.2kg for females. The largest wild turkey on record was 17.2kg.

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
AVERAGE	3-4	6-8	20	20	20	7	20	39-56	2.9-3.2
RANGE	3-6	6-12						39-96	2.9-3.8

VULTURE

These large birds eat carrion and can be found almost anywhere. They range in size from the lesser vultures up to the condors, which may weigh more than 12 kg.

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
AVERAGE	4	9	30	20	20	9	20	78	3.3
RANGE	3-5	7-11						56-103	3-3.6



CANIDS:

Pack hunters and endurance athletes with a superb sense of smell. They can live almost anywhere. Aggressive only if hungry or cornered, they will stalk an intended victim for long distances to size them up for an attack.

COYOTE

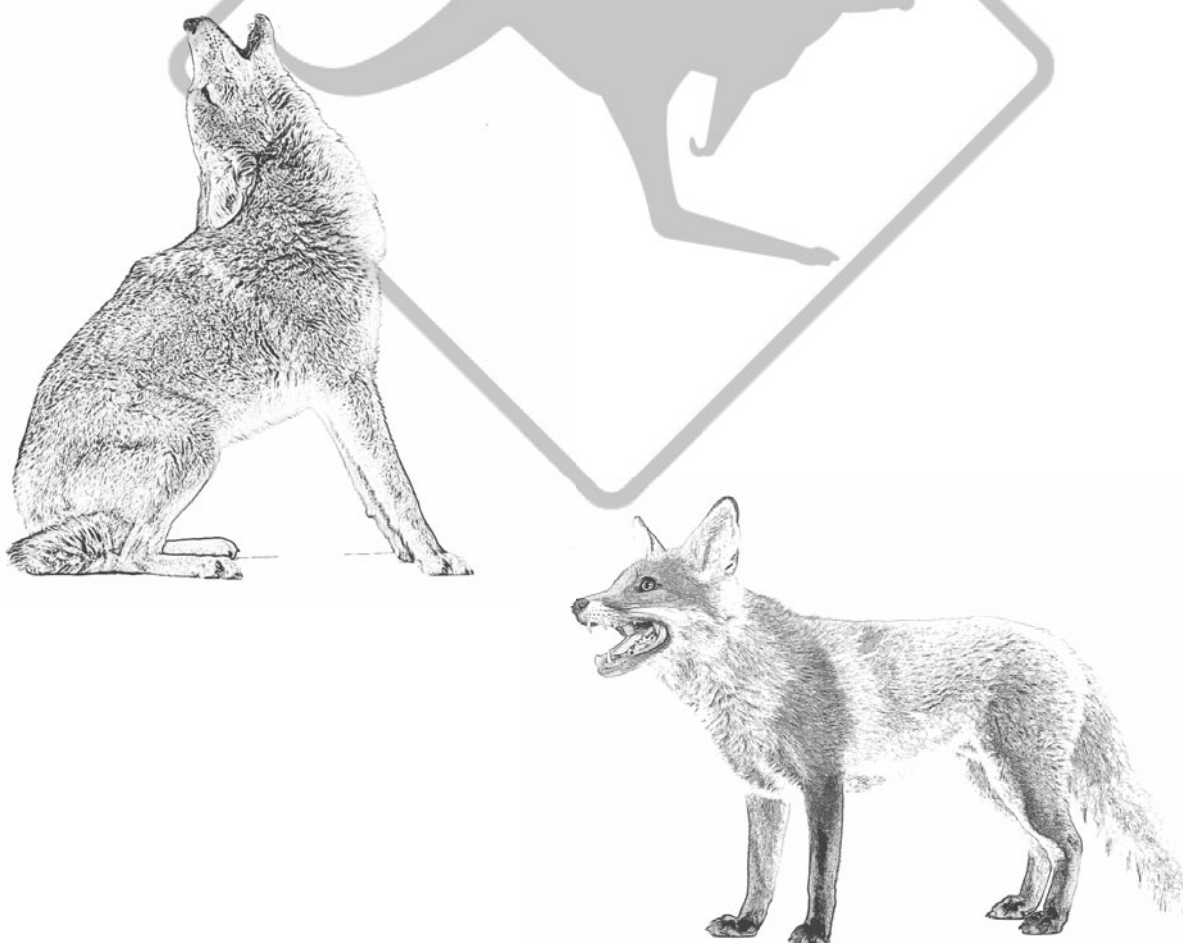
The coyote is an opportunist. It can be found everywhere except north-east Canada. Length range 75-100cm, weight 7-20kg. Medium-sized breeds of dog can use similar stats.

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
AVERAGE	5	12	30	25	20	9	20	105	4.2
RANGE	4-6	10-14						80-132	3.9-4.5

FOX

The grey fox can be found across the U.S., but not Canada. The red fox is everywhere except the most arid parts of the south-western U.S. Both are 3-7kg and 80-113cm in size.

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
AVERAGE	4	9	30	30	20	9	20	78	4.3
RANGE	3-4	7-10						56-80	4-4.4



FELIDS:

Cats are ambush predators that like to toy with their prey.

BOBCAT

The bobcat can be found throughout the U.S. and Mexico. Males average 87cm length and 12kg weight; females 80cm and 9 kg. Length range is 50-125cm; specimens up to 31kg have been captured.

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
AVERAGE	4-5	9-12	20	25	20	9	20	58-80	3.8-4.2
RANGE	4-7	9-15						58-123	3.8-4.7

CAT

Most breeds of domestic cat weigh between 2.5 and 7kg; some breeds such as the Maine Coon can exceed 11kg. The lynx, found throughout Canada, ranges from 4.5-17kg.

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
AVERAGE	3	7	20	25	20	9	20	41	3.5
RANGE	3-6	7-13						41-99	3.5-4.4



WEASELS:

MINK

Bred for its fur, the mink can be found everywhere in North America except the Pacific Northwest and the southwestern deserts. Length range 47-77cm, weight 0.5-1.3kg.

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
AVERAGE	2	6	20	25	20	9	20	26	3.3
RANGE	2-3	5-7						25-41	3.2-3.5

OTTER

River otters are not found in the central and southwestern U.S. but are present everywhere else. Length range 90-140cm, weight 5-14kg.

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
AVERAGE	4	9	20	25	20	9	20	58	3.8
RANGE	4-5	9-12						58-80	3.8-4.2

WOLVERINE

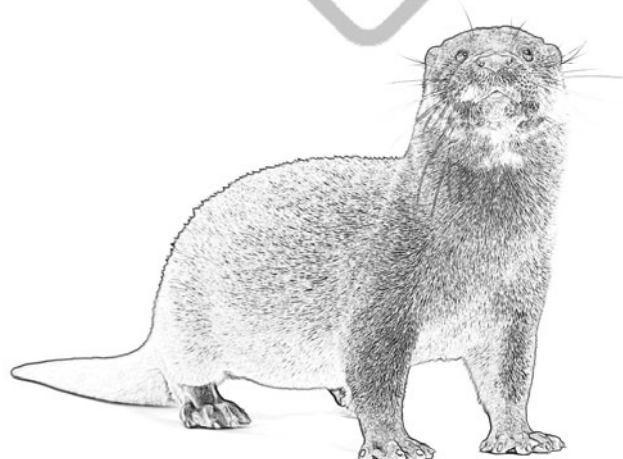
This fierce member of the weasel family is found in the Pacific Northwest and across northern Canada and Alaska. Weight ranges 12.7-14.2kg for males, 8.3-9.9kg for females.

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
AVERAGE	4	10	25	20	20	9	30	70	3.4
RANGE	4-5	9-11						68-90	3.3-3.6

SKUNK

The skunk is a relatively poor runner (10km/h), but it packs a punch in the form of its pungent spray. Length 0.6-0.8m, weight 1.2-5.3kg.

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
AVERAGE	3	6	20	20	15	7	20	39	2.9
RANGE	3-4	6-8						39-56	2.9-3.2



SNAKES:

These are North American natives. There are no native constrictors.

COPPERHEAD

Also known as the moccasin or death adder, this thick-bodied snake has an average length of about 1m, range 0.8-1.2. It can be found anywhere east of the Rockies.

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
AVERAGE	3	7	20	25	20	7	20	41	3.5
RANGE	2-4	5-9						25-58	3.2-3.8

CORAL SNAKE

Most species have distinctive stripes. Average length is 0.6m; some specimens up to 1.5m have been recorded. Range is the southwestern, gulf and southeastern coast.

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
AVERAGE	2	5	20	20	20	7	20	25	2.7
RANGE	2-3	5-8						25-42	2.7-3.1

COTTONMOUTH

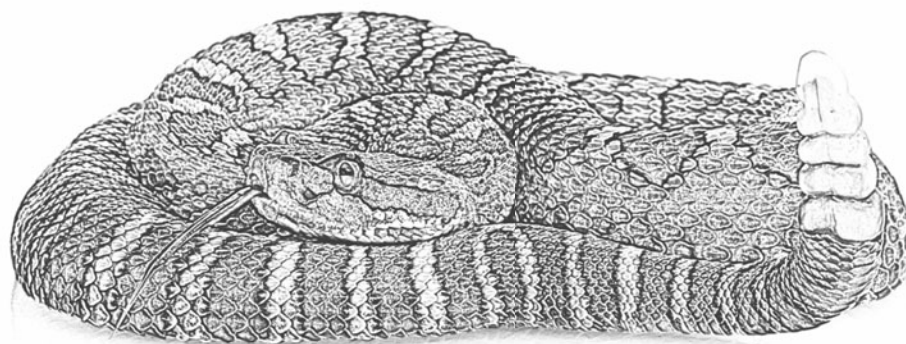
Also known as the water or black moccasin. Its range is everywhere east of Kansas. Adults range in length from 80-180cm; males are larger than females.

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
AVERAGE	4	9	20	20	20	7	20	58	3.3
RANGE	3-5	7-11						41-78	3-3.6

RATTLER

Rattlesnake species can be found in the southern U.S. and Mexico. The average size range is 110-170cm. Larger and smaller specimens have been found, giving a range of 0.9-2.1m and weights up to 10-12kg.

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
AVERAGE	5	11	20	20	20	7	15	78	3.6
RANGE	4-5	9-11						58-78	3.3-3.6



OTHER:
RACCOON

These inquisitive, dexterous omnivores can be found from southern Canada right down to South America. Weight range 2-11kg.

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
AVERAGE	4	7	20	25	20	11	20	54	3.6
RANGE	3-5	7-11						41-78	3.5-4.1

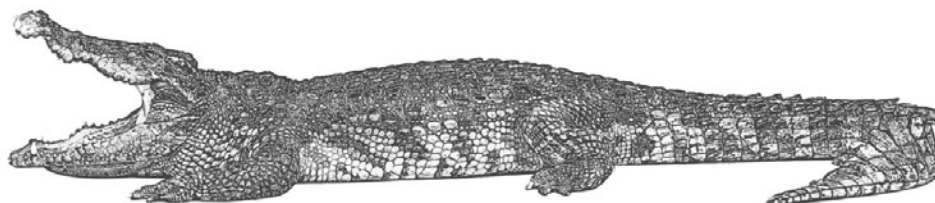

LARGE (MORE THAN 20KG)

REPTILES Hide has armor value 2.

ALLIGATORS AND CROCODILES

The American alligator can be found throughout the south east. On average an adult is 4m long and weighs 360kg. The crocodile is confined to the Gulf region and Florida. It is of similar size.

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
AVERAGE	17	38	20	17	15	5	20	323	7.2
RANGE	10-20	22-44	14-20					210-640	5.2-7.8



LARGE (MORE THAN 20KG)

BEARS A bear's thick fur has armor value 1.

BLACK OR BROWN

Average 1.5m tall, males weigh 120kg (47-409kg), females 80kg (39-236kg). They will not attack humans normally, but can be unpredictable, especially a female with cubs.

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
MALE AV.	12	30	25	20	20	9	20	330	6.2
RANGE	8-18	18-40	16-20					172-585	4.6-7.4
FEMALE AV.	10	28	25	20	20	9	20	250	5.8
RANGE	8-15	18-35	18-20					172-450	4.6-6.8

GRIZZLY OR KODIAK

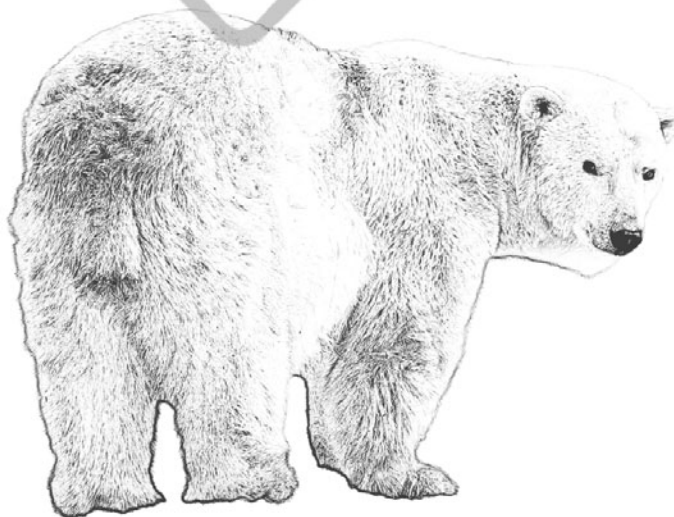
The second largest predator in North America. Length ranges from 1-2.8m, height 90-150cm at shoulder. Males weigh 390kg on average, females 210 (80-600kg). They are known to be bad-tempered and aggressive.

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
MALE AV.	18	40	25	18	20	9	30	585	7.6
FEMALE AV.	14	30	25	20	20	9	30	385	6.4
RANGE	10-20	22-44		16-20				235-690	5.2-8

POLAR

The largest predator in North America, likely to be an early victim of climate change as its arctic habitat disappears. Length ranges from 2.3-2.6m long for males, 1.9-2.1m for females. Weight range is 400-600kg for males, 175-300kg for females - who can get up to 500kg when pregnant.

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
MALE AV.	19	42	25	18	20	9	30	637	7.9
RANGE	18-20	39-44		17-18				576-690	7.5-8.1
FEMALE AV.	14	31	25	19	20	9	30	392	6.4
RANGE	13-19	29-41		17-20				351-627	6.2-6.7



LARGE (MORE THAN 20KG)

UNGULATES

These usually placid herbivores tend to flee from danger.

BIGHORN SHEEP

These agile animals are found in the Rockies. Males 1.6-1.9m long, 75-135kg; females 1.6-1.7m long, 48-85kg.

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
MALE AV.	11	22	20	25	15	7	15	231	5.8
RANGE	10-12	20-24						200-264	5.5-6.1
FEMALE AV.	9	18	20	25	15	7	15	171	5.2
RANGE	8-10	16-20						144-200	4.9-5.5

BISON

The North American buffalo was hunted to the point of extinction by the late 1800s. It is slowly returning to its former range across the Great Plains again. Male length range 3.1-3.8m, females 2.1-3.2m.

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
MALE AV.	22	44	20	15	15	7	15	704	8.1
RANGE	19-24	38-48		14-17				551-816	7.4-8.6
FEMALE AV.	18	37	20	17	15	7	15	513	7.2
RANGE	17-20	34-40		16-18				459-600	5.9-7.6

BUFFALO

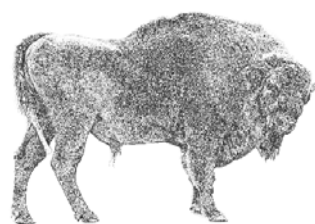
Animals like this are harnessed to plow fields across Asia, Africa and South America. Weight range 250-550kg.

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
AVERAGE	17	34	20	17	15	7	15	459	6.8
RANGE	15-20	30-40		16-18				375-600	6.3-7.6

CARIBOU/REINDEER

A famous inhabitant of the far north (above the 50th parallel of latitude). Female weight ranges between 60-170 kg. Males tend to be slightly larger, but can weigh up to 300kg.

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
AVERAGE	11	22	20	20	15	7	15	231	5.3
RANGE	9-13	18-26	19-20					171-299	4.7-5.8



LARGE (MORE THAN 20KG)**ELK**

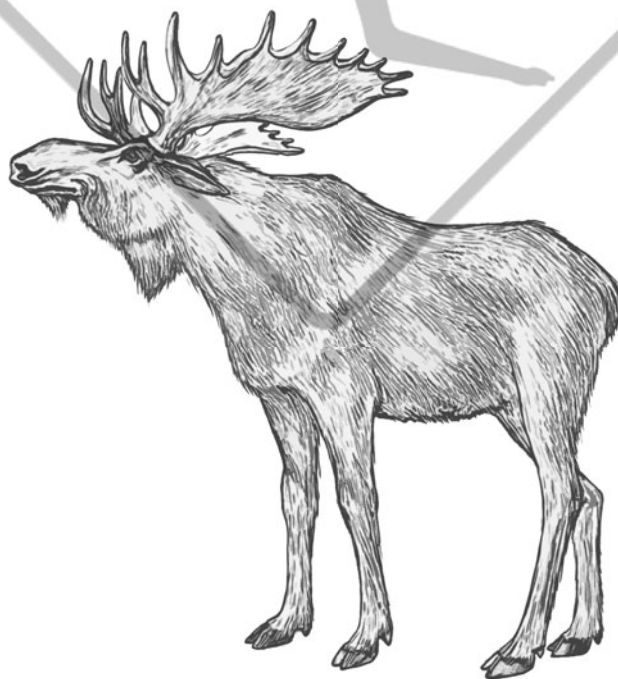
Only the moose is larger. Found west of the Mississippi and also north of the Great Lakes. Length 2.1-2.6m for males, 2-2.5m for females. Average weight 330kg (180-490) for males, 240kg (170-290) for females.

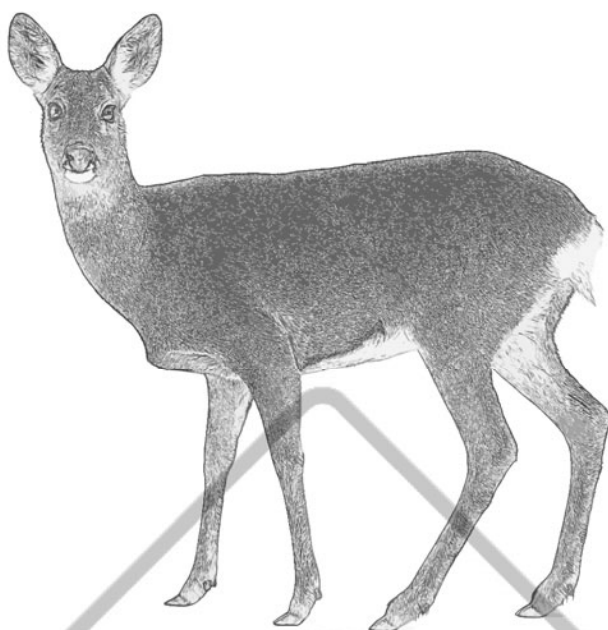
	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
MALE AV.	17	34	20	18	15	7	15	459	6.9
RANGE	13-19	26-38		16-19				299-551	5.8-7.3
FEMALE AV.	15	30	20	18	15	7	15	375	6.3
RANGE	13-16	26-32		18-19				299-416	5.8-6.6

MOOSE

The largest member of the deer family, found across Canada, Alaska and the northern U.S. Length average: 3.1m for males and females; range: 2.5-3.2m males, 2.4-3.1m females. Weight average: 430 kg males; 350 kg females; range: 360-600 kg males, 270-400 kg females.

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
MALE AV.	17	34	20	18	15	7	15	459	6.9
RANGE	13-19	26-38		16-19				299-551	5.8-7.3
FEMALE AV.	15	30	20	18	15	7	15	375	6.3
RANGE	13-16	26-32		18-19				299-416	5.8-6.6





LARGE (MORE THAN 20KG)

MULE DEER

These are found in the highlands west of the Mississippi and western Canada. The bucks can be dangerous during the rutting season. Length range 1.3-1.7m males, 1.3-1.6m females. Weight range 40-120kg males, 30-80kg females.

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
MALE AV.	10	20	20	20	15	7	15	200	5
RANGE	8-12	16-24						144-264	4.4-5.6
FEMALE AV.	9	18	20	20	15	7	15	171	4.7
RANGE	7-10	14-20						119-200	4.1-5

WHITETAIL

The most common deer, found everywhere except the southwestern deserts and far Northern Canada. They can be an excellent food source. Weight range 40-137kg.

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
AVERAGE	11	22	20	20	15	7	15	231	5.3
RANGE	8-13	16-26	19-20					144-299	4.4-5.8

PRONGHORN

An antelope with distinctive horns. Built for speed and endurance, pronghorns can run at speeds exceeding 70km/h. Only the cheetah is faster. Weight range 41-59kg, females are slightly smaller than males.

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
AVERAGE	8	17	35	35	15	7	15	208	6
RANGE	8-9	16-18						204-239	5.9-6.2

LARGE (MORE THAN 20KG)

CAMELIDS

CAMEL

The 'ship of the desert' is a famously bad-tempered animal. The U.S. Cavalry tried using them in the 1860s. Perhaps some still wander the South-West. Adults weigh 300-690kg.

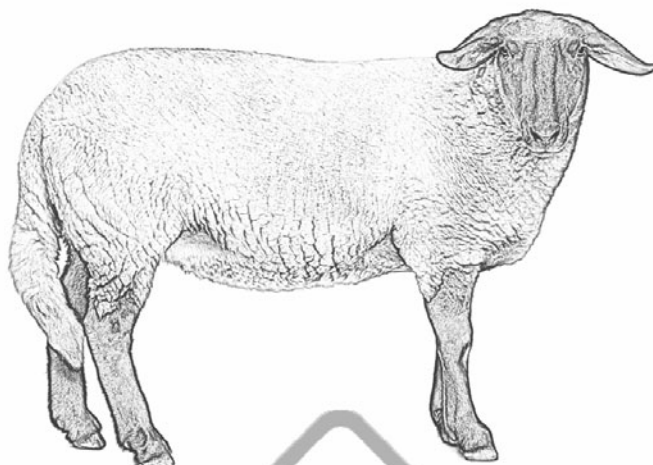
	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
AVERAGE	19	38	25	17	15	7	20	599	7.4
RANGE	16-22	32-44		15-18				456-759	6.6-8.1

LLAMA

A beast of burden in South America bred extensively in North America as a pet. Smart and even tempered, but quite territorial. Adults weigh 130-155kg.

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
AVERAGE	12	25	25	20	15	9	20	300	5.7
RANGE	12-13	24-26		19-20				294-332	5.4-5.8





LARGE (MORE THAN 20KG)

LIVESTOCK

CATTLE AND OXEN

Wide ranging, these herd grazers roam the countryside looking for food. Tamed animals are bred for milk, meat, hides or to pull plows and wagons in the case of oxen. Weight range 150-1300kg.

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
AVERAGE	17	34	20	17	15	7	15	459	6.8
RANGE	13-27	26-54		13-20				299-635	5.9-9.4

GOAT

This hardy omnivore ranges from 25-95kg in weight, and is usually bred for milk and meat.

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
AVERAGE	9	18	25	25	15	7	20	194	5.2
RANGE	7-11	14-22						137-259	4.6-5.8

PIG

Domesticated or wild, pigs are clever omnivores. Body size ranges from 1.1 - 1.5 m (3.6 - 4.9 ft) in total length, with a height of 0.9 m (3 ft) at the shoulder. Wild animals can get up to 300-500kg, domesticated breeds above 700kg. Average adult weight is ~150kg.

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
AVERAGE	13	26	20	20	20	11	20	299	5.9
RANGE	7-22	14-44						119-704	4.1-8.6

SHEEP

Bred for wool, meat and milk, these are a common domestic animal. Weight range 45-160kg. Males are larger than females.

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
AVERAGE	9	18	20	20	15	6	15	171	4.7
RANGE	8-13	16-26						144-299	4.4-5.9

LARGE (MORE THAN 20KG)

CANIDS

Like their smaller brethren, these are canny and tenacious hunters.

DOG, LARGE

The descendants of dogs bred for hunting or guard purposes. Examples include the German Shepherd (32-50kg) and Rottweiler (43-59kg). Females are smaller than males.

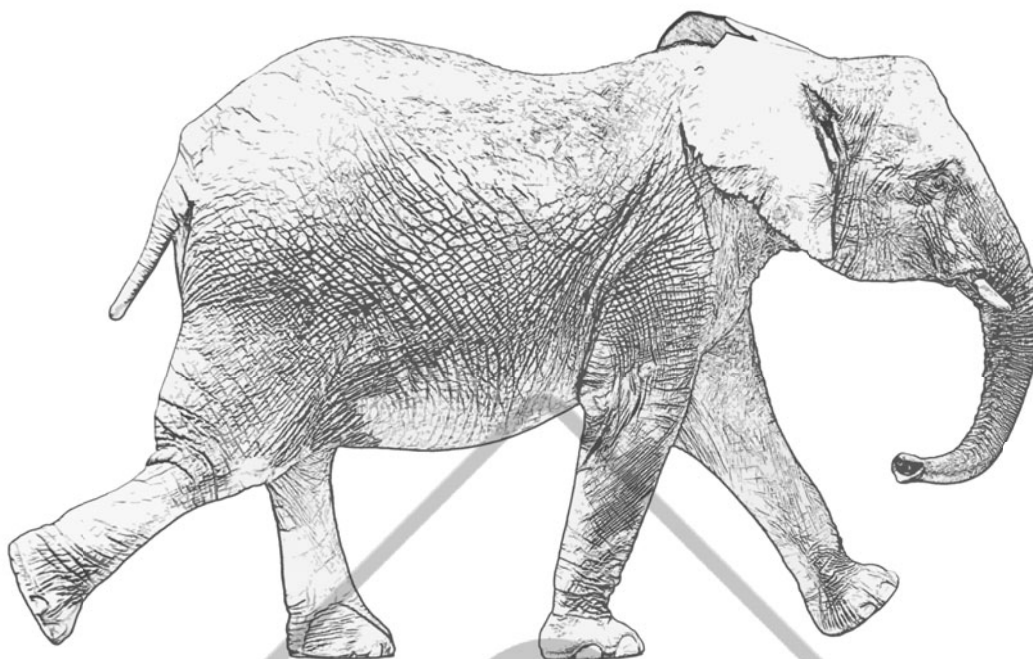
	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
AVERAGE	8	18	30	25	20	9	25	192	5.1
RANGE	7-9	15-20						158-225	4.7-5.4

WOLF

The wolf is spreading across North America after the end of civilization. Average weight 55kg for males, 45kg for females. Range 30-80 and 23-55kg respectively.

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
AVERAGE	8-9	18-20	30	25	20	9	30	192-225	5.1-5.4
RANGE	7-10	15-22						154-250	4.7-5.7





LARGE (MORE THAN 20KG)

EXOTICS

CHIMPANZEE

These apes are extremely strong and intelligent. Weight ranges from 26-70kg, height 0.7-1.2m. Males are slightly larger than females. They use tools and have a sophisticated social and behavioral repertoire.

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
AVERAGE	8-9	20-23	20	20	20	13	20	160-194	4.8-5.2
RANGE	7-10	18-25						133-225	4.5-5.5

ASIAN ELEPHANT

Maximum pace 25. The elephant's thick skin has armor value 3. Weight range 2500-5500kg, average 4000kg

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
AVERAGE	40	80	20	12	20	9	20	2000	13.2
RANGE	34-44	68-88		11-15				1496-2376	11.7-14.3

AFRICAN ELEPHANT

The largest land animal. Perhaps a few escaped from a zoo long ago, or you could use these stats for a mammoth! Maximum pace 25. The elephant's thick skin has armor value 3. Weight 2700-7000kg, average 5000kg

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
AVERAGE	43	86	20	11	20	9	20	2279	14
RANGE	35-48	70-96		11-15				1575-2784	12-15.5

LARGE (MORE THAN 20KG)

EQUINES

These endurance athletes will be found running wild in herds, or in human service as riding or draft animals.

DONKEY

Stubborn, but smarter than a horse, donkeys have been used for millennia as beasts of burden. 250kg, 0.9-1.4m tall.

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
AVERAGE	15	30	30	18	15	9	20	504	6.3
RANGE	14-16	28-32		18-19				406-646	6.1-6.6

HORSE

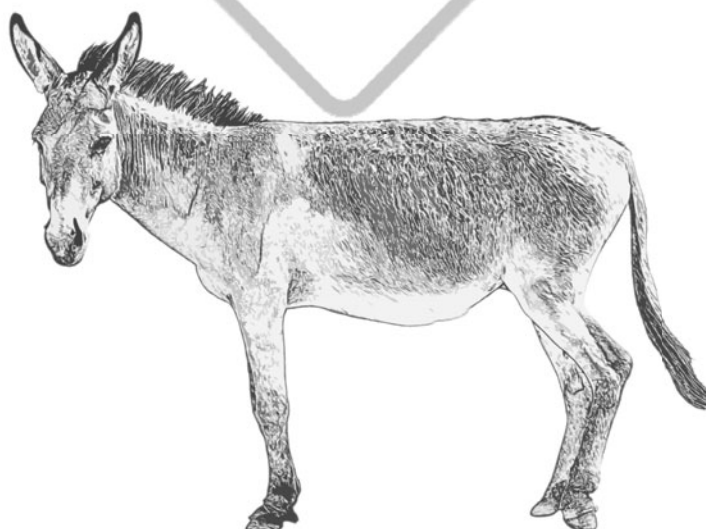
Wild horses tend to be 200-500kg in weight; stallions are larger than mares. Selective breeding has produced a wide variety of horses ranging from lightweight racers (180kg) to sturdy draft breeds (900+kg) that pull plows and wagons.

WILD	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
AVERAGE	16	33	30	18	15	7	15	504	6.7
RANGE	14-19	28-38		17-19				406-646	6.1-7.4
DOMESTICATED	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
AVERAGE	18	36	30	17	15	7	15	594	7.1
RANGE	13-24	26-48		15-20				364-936	5.9-8.7

MULE

This is a cross between a male donkey and a female horse. Adult weights range between 270 and 410kg.

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
AVERAGE	16	33	30	18	15	8	18	504	6.7
RANGE	15-18	30-36		17-19				450-594	6.4-7.1



LARGE (MORE THAN 20KG)

FELIDS

Of the big cats, only the cougar and jaguar are native to North America. Lions and tigers may represent zoo escapees, or the descendants of 'rewilding' programs. They are all stalk and ambush predators.

COUGAR

Also known as the puma, panther or mountain lion, it can be found anywhere west of the Mississippi and as far north as the Yukon. Average length 1.27m for males (1.02-1.54), 1.14m for females (0.86-1.31). Average weight 62kg males, range 36-120kg; females, 42kg range 29-64kg. An agile climber and sprinter.

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
MALE AV.	9	20	25	25	20	9	20	203	5.4
RANGE	7-12	15-26						140-306	4.7-6.3
FEMALE AV.	8	18	25	25	20	9	20	172	5.1
RANGE	7-9	15-20						140-203	4.7-5.4

JAGUAR

There were occasional sightings in the South-West prior to the war; the jaguar is found throughout Central and South America. Its range may have expanded since then. Jaguars prefer forested terrain. The cat's body is 1.6 to 1.8m long, with the tail adding another 75cm. Weights are normally in the range of 56-96kg, but specimens as small as 36kg and as large as 159kg have been reported. Females are slightly smaller than males. The jaguar likes to climb trees and swim.

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
AVERAGE	10	22	25	25	20	9	20	235	5.7
RANGE	9-11	20-24						203-270	5.4-6

LION

Head and body length ranges from 1.7-2.5m for males and 1.4-1.75m for females. Males weigh 180kg on average with a range of 150-250kg; females 125kg with a range of 120-180kg.

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
MALE AV.	13	29	20	20	20	9	20	319	6.2
RANGE	13-15	29-33		19-20				319-398	6.2-6.7
FEMALE AV.	12	26	20	20	20	9	20	276	5.8
RANGE	12-14	26-31						276-357	5.8-6.5

TIGER

Weights range from 120-230kg. Males are larger with an average weight of 210kg; up to 300kg has been reported. The average female weighs about 140kg. Tigers are avid swimmers.

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
MALE AV.	14	31	20	20	20	9	20	357	6.5
RANGE	12-16	27-35						282-440	5.9-7.1
FEMALE AV.	12	26	20	20	20	9	20	276	5.8
RANGE	12-14	26-31						276-357	5.8-6.5

FLORA

DOOMROT

The quest to produce industrial quantities of ethanol for fuel and plastics manufacture led to the development of a genetically modified fungus that rapidly converted cellulose to ethanol. Somehow it escaped from the lab it was created in. Doomrot infestation causes plants to dissolve over the course of a few days into puddles of gray slime with an ethanol content of around 20%. While doomrot spores can survive this concentration of alcohol, few other bacteria and fungi can. No plants can grow in a doomrot-affected area until the rain washes the ethanol out of the soil. Doomrot also attacks paper, wood, cotton and other plant-fiber based textiles including rayon, and cellophane. In some areas the fungus has made recovery impossible.

KUDZU

This perennial vine has grown extensively across the Southeastern U.S. It grows rapidly, up to 30cm (1 foot) per day in summer and will smother other plants. Some mutant varieties are frost tolerant and are establishing themselves in other non-arid areas. The leaves make good animal fodder and vine extracts may be useful herbal medicines. The root systems can be very deep and extensive (3+m/12 feet, weigh up to 180kg). The only way to rid an area of kudzu is to destroy the root crowns, which requires excavation. Herbicide resistance is common.

SUNDEW

These are common carnivorous plants which lure insects with sticky secretions that are produced from the tentacles that cover the plant's leaves, stem and branches. The larger varieties now grow to almost two meters. There are legends of varieties that somehow lure larger animals and humans to their doom in the plant's sticky embrace.

MUTATIONS

The end of the world pushed many plants and animals to the brink of extinction. Radiation and toxic wastes caused a great increase in mutation rates. While most of these mutations were lethal, a small number allowed survival. Some were actually beneficial. If they aided survival they would be passed on.

After 150 years there are communities of mutant flora and fauna scattered across the world. Some are radically different to their pre-apocalyptic ancestors. Smaller animals and plants have changed more rapidly due to their shorter generation times and tendency to produce more offspring.

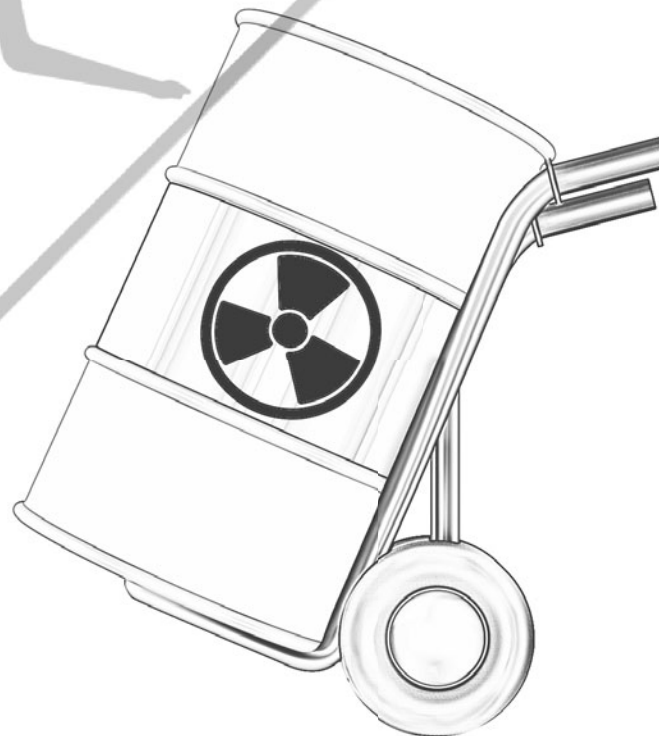
A list of potential mutations appears below. They can be applied to animals or even human characters.

- Altered Ability Scores
- Altered Diet
- Chimera or Hybrid
- Detachable Limbs
- Disease Host
- Enhanced Sense(s)
- Impaired Sense(s)
- Limb Structure Change
- Parthenogenesis
- Psionic
- Skin Structure Change
- Venom Production
- Web or Resin Production

ALTERED ABILITY SCORES

STR: can be higher or lower than average. Roll 2D6; multiply the result by 5 to get a percentage change (10-60%). CON, DEX, REA, AWA, EXP, FOC can also be higher or lower than average.

Roll 1D6 and add or subtract this from the base core ability score.



REA AND ANIMAL BEHAVIOR:

- REA 13: spontaneous tool use, will teach others of their kind, co-operative behaviors like pack hunting tactics can be learned.
- REA 11: can be trained to use tools, language.
- REA 7-9: can be trained to perform tricks and behave in certain ways.
- REA 6 or less: might be able to be taught a trick with sufficient conditioning.

AWA ENHANCEMENTS:

+5 AWA per enhanced modality (sight, hearing, etc.)

EXP EFFECTS FOR ANIMALS:

- EXP 10: Can communicate in 'sentences'.
- EXP 8: Can communicate in words or gestures.
- EXP 7 or less: Conveys emotional state e.g. tail wagging, hissing, fur standing on end, etc.

MASS:

Changes represent extremes of size - dwarfism and gigantism.

- Decreased MASS: subtract 1D10x5% (5-50%) from MASS. Subtract twice the MASS decrease from STR.
- Increased MASS: add 2D6x5% (10-60%) to MASS. Add twice the MASS increase to STR.

ALTERED DIET

An unusual dietary requirement has evolved e.g. feeding on blood or certain organs for carnivores, increased trace element requirements for ruminants e.g. eating rusty iron or steel, dirt or a complete shift in dietary pattern (vampire cattle?)

CHIMERA OR HYBRID

The animal has characteristics of two or more different animal types.

Optionally, the animal is a conjoined 'twin' - or classically a 'triplet'.

DETACHABLE LIMBS

Like lizards and salamanders, the creature can shed a limb to escape a life threatening situation. The limb will slowly regenerate (at a rate determined by the Recovery Table and the Structure Point value of the limb).

DISEASE HOST

The creature has developed a tolerance or immunity to a disease agent and they act as a carrier e.g. mosquitoes and malaria, rodents and plague.

ENHANCED SENSE(S)

these provide bonuses to AWA rolls as per the Acute Senses advantage.

ELECTRIC FIELD SENSE:

Aquatic creatures only.

Enables the creature to sense the presence of another animal within melee range (1-6m depending on size and speed).

HEARING:

- Enhanced acuity: offsets range and loudness penalties.
- Extended spectral range: into ultrasound (>20 kHz) or infrasonic (<20Hz) frequencies.

VISION:

- Enhanced acuity: offsets range penalties.
- Extended spectral range: into the infrared or ultraviolet. This confers bonuses to night vision (10 to 60%).

IMPAIRED SENSE

Penalties vary e.g. double range, size or loudness penalties for impaired sight or hearing. This usually leads to compensation in some other sense e.g. hearing enhancement to offset poor vision.



LIMB STRUCTURE CHANGE

The creature has an unusual number of digits or limbs, or altered joint distribution, muscle strength, dexterity, etc.

DECREASED NUMBER:

- Syndactyly: fusion of digits
- Meromelia: limb malformations leading to absent hands, feet, etc.
- Amelia: absence of a limb

INCREASED NUMBER:

- Polydactyly: extra digits
- Opposable digits: allow enhanced manual dexterity and tool use
- Extra limbs or tails

PARTHENOGENESIS

Females can spontaneously produce female offspring.

PSIONIC

Roll on the Psychic Talent table.

SKIN STRUCTURE CHANGE

- Altered Color - unusual pattern or color which may improve camouflage e.g. zebra or tiger stripes.
- Altered Texture - balding or excessive hairiness (hirsutism), scaling, hardening to leathery consistency, etc. May provide up to 3 points of armor for non-ballistic attacks.
- Claws, Horns and Spines - may be changes to hair, feathers, scales, skin or teeth. Increase melee strike damage by 1-3 points.
- Climbing Grip - skin texture on paws changes to greatly increase grip, like gecko setae. Bonus to Climb skill (10-50%).
- Gliding Membranes - skin folds between limbs permit gliding if the fold area is big enough and the animal small enough (less than 15kg or MASS 5 or less). The flying squirrel is an example.
- Swimmer - adaptations for an aquatic lifestyle e.g. waterproofing of fur, subcutaneous fat deposits to minimize heat loss, webbing between digits, streamlining.
- Variable Coloration - reptiles, possibly bald mammals. Pigmentation in skin can change color like a chameleon. Bonuses to camouflage (10-60%).

VENOM PRODUCTION

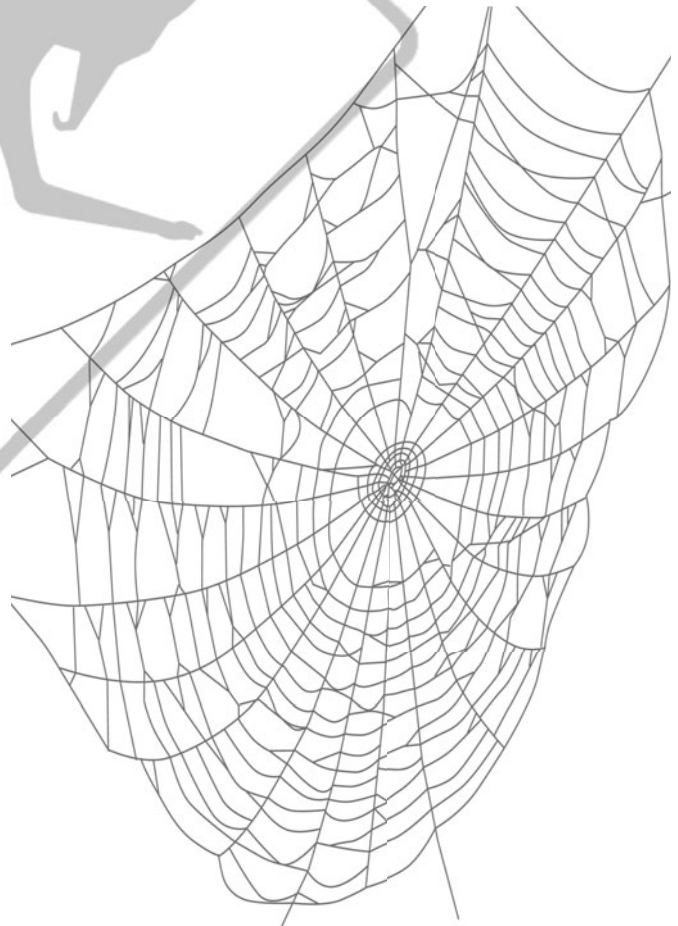
The animal has developed poison producing glands, which open either into fangs, claws or onto the skin.

WEB OR RESIN PRODUCTION

This is typically limited to insects. The creature exudes secretions that can be woven into webbing or used as a structural material e.g. glue or mortar.

PLANT-SPECIFIC MUTATIONS:

- Altered Diet - thrives in contaminated areas, can use heat or chemicals to boost photosynthesis or an analogous process, traps animals for nitrogen e.g. Venus fly-trap.
- Chimera or Hybrid
- Disease Host - or has symbiotic relationship with disease carrying insects, for example.
- Psionic - telepathic attraction? Strike power? Regeneration?
- Skin Structure Change - spikes, spines, Venus fly trap, woody texture
- Venom Production - acids, bases, drugs!
- Web or Resin Production



SOME EXAMPLE MUTANTS

DIRE WOLF

Ancestor: Grey wolf

Mutations: Altered Ability Scores (MASS +60%, REA +3).

These cunning hunters resemble their distant ice-age ancestors.

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
Average	13-15	29-33	30	22	20	12	30	384-473	6.4-7
Range	11-17	23-36						292-561	5.6-7.5

ELECTRIC CATFISH

Ancestor: Catfish

Mutations: Altered Ability Scores (MASS +30%), Enhanced Sense (Electric field sense), Limb Structure Change (muscle electric organ!)

This large bottom-feeding river fish has developed the ability to deliver electric shocks. Delivered current is above 100mA (3 Dp per combat turn, cardiac arrest on failed CON check).

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
Average	9	18	20	20	15	5	20	171	4.7
Range	7-10	14-20						119-200	4.1-5

GIANT BEAR

Ancestor: Grizzly bear

Mutations: Altered Ability Scores (MASS +40%, FOC +5)

They are very territorial and even more bad-tempered than their ancestors. Length ranges from 1.2-4m, height 100-200+cm at shoulder. A large male can weigh over 1,000kg. Maximum pace (run) is 30.

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
MALE AV.	25	55	25	16	20	9	35	1000	9.6
FEMALE AV.	20	42	25	18	20	9	35	670	8.1
RANGE	14-28	31-62		12-20				392-1218	6.5-10.2

GIANT RAVEN

Ancestor: Raven

Mutations: Altered Ability Scores (MASS +60%, REA +5)

This bird can use tools and has the linguistic ability of a parrot. It is much bigger than its forebears; the average adult weighs nearly three kilograms, and has a wingspan of 1.7 meters.

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
AVERAGE	3	8	30	20	20	14	20	57	3.1
RANGE	2-4	5-9						35-78	2.7-3.3

SOME EXAMPLE MUTANTS

HORNET-ANT

Ancestor: Eastern Yellowjacket

Mutations: Altered Ability Scores (MASS +30%, FOC +6), Hybrid, Resin Production

These mutant wasps build nests from wood or dirt. The mounds are like termite nests and are extremely hard. Workers and soldiers are nearly 2cm (0.8 inch) long and weigh 2 grams. They will attack in swarms to defend their nest and have poisonous stings.

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
AVERAGE	0.1	0.2	20	20	15	4	21	2	2

MINI-MOOSE

Ancestor: Moose

Mutations: Altered Ability Scores (MASS -30%, FOC +5), Berserk disadvantage.

This is an unusually aggressive dwarf variety. The males will attack on sight 50% of the time.

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
MALE AV.	11	22	20	19	15	7	20	231	5.1
RANGE	9-13	18-26		18-20				171-299	4.5-5.9
FEMALE AV.	10	20	20	19	15	7	20	200	4.9
RANGE	8-12	16-24		18-20				144-264	4.2-5.6

LAMPREY

Ancestor: Sea lamprey

Mutations: Altered Ability Score (MASS +60%)

These are descendants of the sea lampreys that invaded the Great Lakes. They have grown significantly over the years; an average specimen weighs nearly a kilo and is about 0.6m (2 feet) long. Lampreys have an unusual rasping mouth and tongue which allows them to bore into the flesh and suck the blood of whatever animal they latch on to. They secrete an anticoagulant to keep the victim bleeding. In game terms Blood Point loss from the bite cannot be stopped until the animal is removed and the wound cleaned.

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
AVERAGE	2	4	30	20	20	5	20	34	2.6
RANGE	1-3	2-6						16-54	2.3-2.9

PORCUPINE

Ancestor: Porcupine

Mutations: Altered Ability Score (MASS +20%), Skin Structure Change.

This is a bigger porcupine, with larger claws to aid climbing (+1 to melee damage) and more quills. The quills are barbed to make them harder to remove. The animal will try to stab an attacker as many times as possible if cornered. Weight range 4-30kg.

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
AVERAGE	4	8	20	20	15	7	15	56	3.2
RANGE	3-7	6-14						39-119	2.9-4.1

SOME EXAMPLE MUTANTS

RACCOONID

Ancestor: Raccoon

Mutations: Altered Ability Scores (MASS +30%, REA +5, FOC +4), Limb Structure Change (opposable thumbs)

Bigger, smarter and capable of using tools, these raccoons may be evolving towards sentience.

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
AVERAGE	5	11	20	25	20	16	24	78	4.1
RANGE	4-6	9-13						58-99	3.8-4.4

RATTLER

Ancestor: Rattlesnake

Mutations: Altered Ability Scores (MASS +50%, FOC +5), Psionic (Telepathy/Strike)

This is a larger version of the common rattlesnake. It uses its psionic ability to induce fatigue in its prey by draining Endurance, and then bites its stunned target as usual to finish the job.

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
AVERAGE	7	15	20	20	20	7	20	123	4.2
RANGE	4-8	9-17						58-148	3.3-4.5

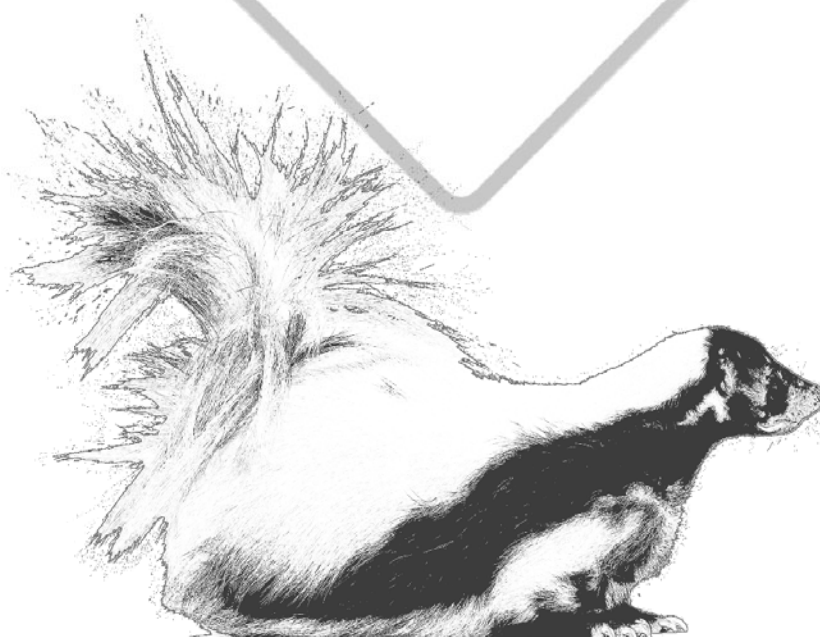
SKUNK

Ancestor: Skunk

Mutations: Altered Ability Scores (MASS +60%, DEX +3), Limb Structure Change (faster runner)

A larger, more agile version of the skunk.

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
AVERAGE	6	12	20	23	15	7	20	96	4.1
RANGE	5-7	10-14						75-119	3.8-4.4



SOME EXAMPLE MUTANTS

SLASHER

Ancestor: Wild pig

Mutations: Altered Ability Scores (STR +20%, REA+3, FOC +5), Skin Structure Change (+1 tusk damage).

This is a smarter, stronger, more vicious wild pig.

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
AVERAGE	13	31	20	20	20	14	25	332	6.4
RANGE	7-22	17-53						130-803	4.1-9.5

WOLVERINE

Ancestor: Wolverine

Mutations: Altered Ability Scores (MASS +60%, CON +5, FOC +5), Berserk disadvantage

This larger version of the wolverine is very aggressive, and may attack and kill prey for sport. It is extremely territorial. Weight range 16-50kg, length up to 1.3m.

	MASS	STR	CON	DEX	AWA	REA	FOC	SP/BP	PACE
Average	7	15	30	20	20	9	35	158	4.2
Range	6-8	9-17						117-188	3.5-4.5



RANDOM MUTANTS

For random mutant building, roll 1D6 and halve the result. This is the number of times you roll for mutant abilities on the following table. Apply the changes to one of the base creatures above, and you're done.

RANDOM MUTATIONS

01-40	Altered Ability Score
01-28	MASS (increase [2D6x5%] or decrease [1D10x5%] as desired)
29-34	Physical Abilities: STR, CON, DEX (pick one, +/-1D6 points or 2D6x5% for STR)
35-40	Mental Abilities: REA, EXP, FOC (pick one, +/-1D6 points)
41-46	Altered Diet
41-43	Increased amounts: (1D6x10%)
44-45	Extra requirements (e.g. trace element or vitamin)
46	Change type
47	Chimera/Hybrid
	Roll 1D6 and halve result – 1 to 3 extra creature attributes present (croco-duckapus!)
48-51	Detachable Limbs
48	Tail or digits only
49	Arms or forelimbs
50	Legs or hind limbs
51	All (not the neck!)
52-56	Disease Host
52-53	Diarrheal illness
54-55	Meningitis/encephalitis
56	Sepsis
57-64	Enhanced Sense(s)
57-59	Sight

RANDOM MUTATIONS

60-61	Hearing
62-63	Smell/Taste
64	New Sense
65-72	Impaired Sense(s)
65-67	Sight
68-70	Hearing
71	Smell/Taste
72	Multiple impairments (1-3)
73-76	Limb Structure Change
73-74	More complicated
75-76	Less complicated
77-78	Parthenogenesis
79	Psionic
80-89	Skin Structure Change
80	Chameleon
81	Color
82-83	Texture
84-86	Claws and horns
87	Climber
88	Glider
89	Amphibian/Aquatic
90-98	Venom Production
90	Blood Agent
91	Hallucinogenic
92-93	Sedative
94-96	Snake-like
97-98	Spider-like
99-00	Web (99) or Resin (00) Production

THE END OF THE WORLD

Global civilization is humanity's greatest achievement. Trade and communication networks enmesh the globe. Over six billion people are now sustained by advanced agriculture. Life expectancies and the overall standard of living have risen for most of the world's population.

What could bring all this crashing down?

NUCLEAR WAR

The arms race that began after World War Two led to the accumulation of massive arsenals by the United States and Soviet Union. Both sides had land and submarine based ballistic missiles and bomber squadrons on continuous alert. The specter of nuclear annihilation loomed for more than forty years.

With the end of the Cold War in 1991 the risk of a global nuclear conflict was greatly reduced. Nevertheless, the United States and Russia still have over 10,000 weapons each in their stockpiles, of which about half are ready for immediate use. This represents a large fall from the peak levels of the mid-1980s: 25,000 and 45,000 warheads respectively. Further force reductions are anticipated.

In 2012, there are at least seven other states which possess nuclear weapons: Britain, France, China, India, Pakistan, Israel and North Korea. Most are reducing the size of their arsenals. Israel does not officially acknowledge its nuclear capability and North Korea is difficult to gain accurate intelligence on.

Given the renewed interest in nuclear power generation as a means of combating climate change, proliferation appears inevitable without great effort by the international community. Theft or purchase of fissile material or weapons by terrorist groups would be much more likely in such an environment.

In the near term, detonation of a single weapon by a terrorist group appears more likely than either an accidental launch by a nation or an all-out exchange.

War plans divide targets into two types: counterforce and counter-value. The first are those essential to a strategic conflict - missile silos, bomber and sub bases, and command, control communications and intelligence (C3I) installations. Second-tier counterforce targets include large civilian airfields, ports and conventional military bases.

Counter-value targets are vital to continuing a war effort - oil refineries, power plants, key factories, and transport and communication centers. Most are close to or within cities and towns.

Air bursts would be used to maximize the area of blast damage and incendiary effects against large targets like port complexes or cities.

Surface or contact bursts would be used against 'hardened' targets such as dams, missile silos, nuclear reactors, and underground bunkers.

Widespread radioactive contamination is inevitable. The vast amounts of soot and smoke thrown up by all the fires would lead to cooling for several months (nuclear winter), then a rebound warming from injection of greenhouse gases into the upper atmosphere. Damage to the ozone layer would occur - 'ultraviolet spring'. The increased UV radiation could have carcinogenic or mutagenic effects on all life.

THE WAR THAT NEVER WAS

Bruce Morrow formed the Council of Tomorrow in 1972 and started the Project with their help. He had seen the world end in 1989. Recruiting, training and deploying teams would take time - and there was no guarantee that the Project could make the deadline.

There was a minor setback when Morrow disappeared for a year. When he returned in 1979 he had plans for fusion reactors and advanced lasers - technology which would greatly aid the Project's mission. Fusion power sources were much easier to build than the lasers, and a global update of bolt-holes and caches finally began in early 1987.

Time was running out. The update would not be completed in time. Out of desperation, Bruce acted to stop the war breaking out.

On Thursday, November 18 1989, the training computers at NORAD were accidentally shut down. There was a bug in a training program that would allow it to relay an attack warning to the early warning system - and Bruce was the only one who knew of this before the event. NORAD command would have reacted accordingly to the apparent massive attack, and a nuclear exchange would have ensued.

Nothing happened. The world kept on turning. Bruce thought that maybe he had actually undone the future he knew.

Bruce vanished again for two years on another mysterious mission. The Morrow Project continued.

Upon his return he was resolute, pained by terrible loss. The future could not be changed and the world would end in 2017. Bruce withdrew from the daily management of the Project, devoting his efforts to finding a man called Krell.

THE WAR OF 2017

Further updates to supply caches were carried out in 1999 and 2013. The final recruitment drive was announced in 2015.

During the final training cycle a new near-earth asteroid, 2016 EM9, was discovered. Further observations confirmed that it would collide with the Earth. Interception or diversion was impossible; at over five kilometers in diameter, the asteroid was too big and too close.

Impact was over a year away. People reacted in different ways to the news. Some founded doomsday cults; commodity prices soared on the world's financial markets as countries, corporations and wealthy individuals began to stockpile key materials. Military forces went on alert around the world.

War broke out on 12 June 2017 in the South China Sea. It was the culmination of a ten year resource rush by the major powers to secure the last of the easily accessible oil, accelerated by 'asteroid fever'.

The Sino-Russian alliance that grew out of the Shanghai Co-operation Organization had access to the vast oil and gas reserves of Russia and the 'stans'. The Russians provided military technology and energy, China its rapidly growing industrial base. Both nations modernized their militaries, funded by oil and gas revenues and favorable trade balances.

American and European efforts to secure energy supplies revolved around negotiations and aggressive exploration at home and abroad. Wherever oil companies could get permission to do so, they prospected and drilled for gas and 'black gold'.

Saudi Arabia was the most important of several nations to reveal irreversible declines in oil production that April. Financial markets around the world reeled at the news. Prices, already at record levels with the approaching asteroid, tripled over the course of the next month. U.S. and European forces were deployed to the Persian Gulf and North Africa to secure oil and gas supplies. The Chinese increased their naval presence in the South China Sea to protect their oil fields there, fearing U.S. military action. The U.S. Seventh Fleet was mobilized in anticipation of a strike against Taiwan or western oil assets in the South China Sea. Tensions were high, and neither side would back down.

The war began when a Chinese submarine launched a torpedo against the USS 'George Washington' off the Taiwan coast. The cause for the attack remains unclear; the low-yield nuclear warhead on the torpedo destroyed the carrier and a nearby cruiser.

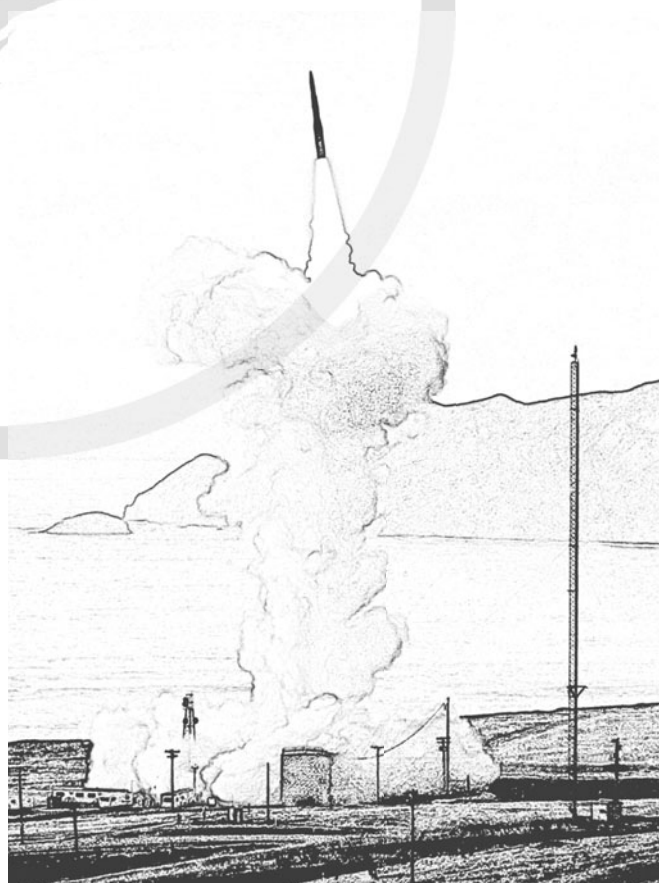
Efforts were made in Washington to communicate with the Chinese and Russian leadership over the 'hot line', but communication links were severed when the first wave of ICBMs detonated over the mid-Pacific and continental U.S.

The electromagnetic pulse wiped out the North American power and telephone grids. With the early warning and communication systems blinded or dead, the President declared DEFCON 1 and ordered a nuclear strike against China and Russia.

The cities and countryside burned for the first two weeks. Civilization collapsed in those early days, decimated by fire and fallout. Famine took its toll as food stockpiles ran out after the first two months.

The asteroid landed in the northern Pacific in September. Tsunamis washed up against irradiated shores. The earthquake triggered by the impact went unnoticed. The ten million megaton impact was almost an anticlimax as humanity had nearly destroyed itself well before the asteroid's arrival.

The ash and smoke from the impact and nuclear fires led to six months of near-darkness. Impact winter prevailed over nuclear autumn. A year after impact over ninety five percent of the pre-war population was dead. Somehow, humanity survived.



INSIGHT: WHY DIDN'T BRUCE STOP THE WAR AGAIN?

During his initial absence Bruce spent some time in the bleak future he strived to save. There he wandered the wilderness, assessing the condition. He also found a wife, and started a family.

Preventing the war of 1989 was a sacrifice for Bruce. He needed the extra time for the Project, but knowing that messing with the timeline could only cause disruption to the world he knew. Afterwards he traveled to the future once more, and found a world still devastated by nuclear war. He learnt that the end would come in 2017 rather than 1989. Bruce also looked for his wife and children, and found no trace of them. His own meddling had murdered them. For two years a desperate man wandered the wilderness.

The future also became rougher than it had been before. The armies of Krell had grown stronger, and Bruce was to come face to face with their leader. It was clear that Krell was also from the twentieth century, perhaps a Project recruit, or a Frozen Chosen.

Bruce returned, resolute that the Project should succeed. He swore never to interfere with the timeline again, the cost had been too great, but he also had to know who this Krell man was.

THE WEAPONS

ICBMS	WARHEADS AND YIELD	SLBMS	WARHEADS AND YIELD
SS-18M6 (12)	10x750kt	SS-N-23 (43)	4x100kt
SS-19 (8)	6x750kt	SS-N-32 Bulava (67)	37 6x100kt, 30 6x550kt
SS-27/29 Topol-M (60)	6x550kt	JL-2 (32)	22 3x100kt, 10 1x250-1000kt
DF-31A (36)	22 5x100kt, 13 1 MT		

kt = kilotons, or 1000 tons TNT equivalent, MT = megaton, or 1000 kilotons.

MIRV (multiple independent re-entry vehicles) missiles can attack targets within an ellipse 800x400km.

Total warheads: 1309; Total yield: 506MT. Compare with WW2 6MT, Korea 0.8MT, Vietnam 4.1MT.

NOTES

The table shows the Russian and Chinese weapons used to attack Canada and the United States. We have assumed that Russia and China continued to modernize their strategic missile forces and loaded multiple warheads where possible. Some of the enemy strategic weapons were used against targets in Eurasia. Most of these were bomber weapons, but also some ballistic missiles.

1. Russian nuclear forces, 2017

SS-18M6: 30
SS-19: 20
SS-27/29 Topol: 130
SS-N-23: 64
SS-N-32 Bulava: 96

2. Chinese nuclear forces, 2017

China fixed its ballistic missile submarine program and built four subs carrying 12 JL-2 missiles each. It increased the number of long range DF-31A missiles and added MIRV capability. The DF-21 does not have enough range to attack North America or Europe, but can reach India, Japan or Guam (2,500km).

DF-21: 100
DF-31A: 60
JL-2: 48

Eight DF-31A's were used to EMP North America and low earth orbit ('assassin's mace' strike).

DF-21s and other missiles were used against Taiwan, India and U.S. forces in Japan, South Korea, the Indian Ocean, Persian Gulf and western Pacific.

WEAPON EFFECTS

AIRBURST EFFECT

Fireball radii and burst height in meters, all other values in kilometers.

SURFACE EFFECT

Fireball and crater radii are in meters, all other values in kilometers.

BLAST EFFECTS

Blast effects are measured in terms of the overpressure generated. The area affected by blast can be increased by detonating the weapon in the air – an air burst. The altitude can be varied to maximize the area affected by a given overpressure. In the Weapon Effects table, the burst height was chosen to maximize the area affected by at least ten pounds per square inch pressure.

AIR BURSTS

YIELD (KT)	FIREBALL RADIUS	BURST HEIGHT	20PSI	10PSI	5PSI	3PSI	1PSI	FTB	PTB	SB
100	192	836	1.25	1.95	2.79	4.18	7.66	2.53	3.16	3.48
200	254	1052	1.58	2.45	3.51	5.26	9.64	3.58	4.47	4.92
250	277	1207	1.73	2.75	3.84	5.76	10.56	4.00	5.00	5.50
550	380	1467	2.20	3.42	4.89	7.36	13.49	5.93	7.42	8.16
750	431	1625	2.44	3.79	5.42	8.13	14.90	6.93	8.66	9.53
1000	483	1829	2.74	4.37	6.10	9.14	16.76	8.00	10.00	11.00

20psi to 1 psi - blast zone radii
FTB - full thickness burn radius

PTB - partial thickness burn radius
SB - superficial burn radius

SURFACE BURSTS

YIELD (KT)	FIREBALL RADIUS	CRATER RADIUS	20PSI	10PSI	5PSI	3PSI	1PSI	FTB	PTB	SB
100	269	84	0.97	1.42	2.09	3.14	5.75	1.79	2.23	2.46
200	355	105	1.25	1.87	2.70	3.53	7.39	2.53	3.16	3.48
250	388	121	1.34	2.00	2.89	3.79	7.92	2.83	3.54	3.89
550	532	147	1.71	2.49	3.67	4.93	10.12	4.20	5.24	5.76
750	603	163	1.90	2.76	4.07	5.47	11.18	4.90	6.12	6.73
1000	676	183	2.13	3.18	4.58	6.02	12.57	5.66	7.07	7.77

20psi to 1 psi - blast zone radii
FTB - full thickness burn radius

PTB - partial thickness burn radius
SB - superficial burn radius

BLAST EFFECTS

OVERPRESSURE EFFECT

20 psi	Total destruction. Reinforced concrete buildings leveled. Bridges collapse. Heavy vehicles destroyed. Peak winds over 700km/h.
10 psi	Severe damage. Most factories and commercial buildings destroyed. Heavy damage to bridges. Small wooden frame and brick dwellings destroyed. Heavy vehicles damaged. Light vehicles destroyed. Peak winds over 450km/h.
5 psi	Moderate damage. Lightly constructed commercial buildings and typical residences destroyed, heavier structures damaged. Light vehicles heavily damaged. Peak winds over 250km/h.
3 psi	Walls of steel frame buildings blown away. Severe damage to residences and other wood-frame buildings. Winds sufficient to kill exposed people. Peak speeds over 150km/h.
1 psi	Light damage to structures. Glass windows shatter. People endangered by flying debris. Gale equivalent winds over 50km/h.



THERMAL EFFECTS - BURNS

Thermal or heat effects are produced by the 'glow' of the fireball. These are intense enough to ignite distant objects or burn skin. In the case of very large yield weapons the thermal effects have a longer reach than the blast, especially with clear weather. Reduced visibility conditions such as overcast or fog will limit their range by up to five times.

Full thickness: Flash 'third degree' burns. More than 5% body surface area requires hospital-level treatment. Exposed newspaper and grass burst into flame.

Partial thickness: Flash 'second degree' burns. More than 10% body surface area requires hospital-level treatment. Tree leaves catch alight.

Superficial: Flash equivalent to bad sunburn ('first degree').

At ranges closer than the 'full thickness' radius, wood and fabrics burst into flame. Humans are unlikely to survive exposure, even ignoring blast effects.

MATCHING WEAPONS TO TARGETS

Surface bursts are directed at hardened targets such as missile silos and command bunkers. The aim is to literally dig the structure out of the ground, or crater a runway to render it unusable. Air bursts are directed at larger, 'softer' targets such as military bases, refining complexes, or cities. MIRV attacks against large targets are spaced so that 5psi overpressure zones touch, to maximize blast and fire damage.

NORTH AMERICAN TARGET LIST:

The table shows locations attacked in the war of 2017. Targets are ranked in order of strategic importance in the comments field:

1. Nuclear forces: ICBMs, sub bases, bomber fields, warhead storage facilities, nuclear weapon production and design complex, key C3I installations.
2. Leadership targets: federal/state/local, intelligence, space communications, telecoms, electronic warfare.
3. Conventional forces.
4. Key economic targets: weapons assembly, energy production and distribution (oil, nuclear, hydro) = war support industry
5. Population centers

Most of the attacking missiles were MIRVed. The weapons are labeled (1) to (n) to show which targets were hit by a given missile's warheads.



U.S. TARGET LIST

NAME	TYPE AND COMMENTS	NEAREST TOWN	ATTACK TYPE
ALABAMA			3 MISSILES
Birmingham	5: Population 1M+. 2x550kt air		Topol-M(1)
Mobile	4, 5: Population 500k+. Port. 550kt air		(1)
Montgomery	2: State Capital. Pop. 400k+. 550kt air		(1)
Tuscaloosa	5: Pop. 200k+. 100kt air		SS-N-23(2)
Anniston Army Depot	3: Major logistics center, tracked vehicle repair. 550kt air, 100kt air	Anniston (pop 100k+)	(1) (2)
Maxwell-Gunter AFB	3: Air University and airlift wing. 550kt surface.	Montgomery	(1)
Redstone Arsenal	3: Missile research center. 100kt air, plus 100kt airburst for Huntsville.	SW of Huntsville (pop 300k+)	(2)
Bellafonte 1, 2	4: Reactors. 2x550kt surface	NE of Scottsboro	Topol-M(3)
Browns Ferry 1-3	4: Reactors. 2x550kt surface	NW of Decatur (150k)	(3)
J.M. Farley 1, 2	4: Reactors. 2x550kt surface	SE of Dothan (140k)	(3)
ALASKA			4 MISSILES
Anchorage	5: Population 260k. Destroyed with Elmendorf AFB. 2x100kt air.		SS-N-32 (1)
Fairbanks	5: Population 82k. 2x100kt air.		SS-N-23 (2)
Juneau	2: State Capital. Pop. 30k+. 250kt air.		JL-2
Valdez	4: Oil shipping point. 2x100kt air.		(1)
Clear AFS	1: Early warning radar. 100kt surface.	SW of Fairbanks, N of Anchorage	
Eielson AFB	3: ANG tanker unit, fighter wing. 2x100kt surface.	SE of Fairbanks	(2)
Elmendorf AFB	3: ALCOM HQ, fighters, transports, major medical facilities. 2x100kt air.	NW of Anchorage	(1)
Naval Petroleum Reserve No. 4	3: Destroyed with Barrow. 2x100kt surface.	Barrow	JL-2
Point Barrow	1: North Warning System H.Q. 100kt surface.	N of Barrow	“
ARIZONA			4 MISSILES
Phoenix	2: State Capital. Pop. 4M+. 5x550kt air.		SS-N-32(1)
Tucson	5: Pop. 1M+. 4x550kt air.		Topol-M
Davis-Monthan AFB	3: Major USAF logistics center, over 5000 aircraft in mothballs on base. 2x550kt air.	Tucson	“
Luke AFB	3: Fighter training school: 550kt surface.	WNW of Phoenix	(1)
Yuma MCAS	3: Training for air-ground attacks and air-air combat. Major facility: 2x100kt air	Yuma (160k)	JL-2
Yuma Proving Ground	3: Extreme-weather test centre: 100kt air	Yuma	“
Palo Verde 1-3	4: Nuclear Reactors: 3x100kt surface.	58km W of Phoenix	JL-2

Table continues on next page

U.S. TARGET LIST

NAME	TYPE AND COMMENTS	NEAREST TOWN	ATTACK TYPE
ARKANSAS			1 MISSILE
Little Rock	2: State Capital. Pop. 185k. 550kt air		Topol-M
Little Rock AFB	3: Airlift wing and airlift training school. 2x550kt surface.	Jacksonville (30k)	“
Pine Bluff Arsenal	3: Chemical weapons and protective equipment production. 550kt air.	NW of Pine Bluff (53k)	“
Arkansas 1, 2	4: Reactors. 2x550kt surface.	WNW of Russellville (25k)	“
CALIFORNIA			10 MISSILES
Anaheim	5: Pop. 350k. 750kt air.	Greater LA	SS-18M6(1)
Berkeley	5: Pop.110k. 550kt air.	Bay Area	Topol-M(2)
Chico	5: Pop. 100k. 100kt air.		DF-31A(3)
El Segundo	4: Oil refining and storage. 750kt air.	Greater LA, just S of LAX.	(1)
Fresno	5: pop. 1M+, major agricultural center. 750kt air.		SS-19(4)
Glendale	5: pop. 210k. 750kt air.	Greater LA	(1)
Livermore	1: LLNL and Sandia Labs - nuclear weapons and high-energy physics research. 550kt air.	E of Fremont	(2)
Los Angeles	4, 5: Urban area has population of over 18M, so second largest city in U.S. 750kt air.		(1)
Long Beach	4: Oil refining and storage. Major port. 1MT air.	Greater LA	JL-2
Oakland	5: Pop. 420k. 550kt air.	Bay Area	(2)
Pasadena	5: Pop. 150k. 750kt air.	Greater LA	(1)
Redding	5: Pop. 100k. 100kt air.		(3)
Sacramento	2: State Capital. Pop. 2M+ 750kt air.		(4)
San Bernardino	5: Pop. 220k. 750kt air.		(1)
San Diego	3: Major naval base. Pop. 3M+. Atlas rocket manufacturing plant. 1MT air.		JL-2
San Francisco	5: Bay Area has population of 7M+. 550kt air.		(2)
Santa Ana	5: Population 350k. 750kt air.	Greater LA	(1)
San Jose, Sunnyvale, Mountain View, etc.	4, 5: Santa Clara county home of Silicon Valley. Regional population over 1.5M. 5x100kt air.	Bay Area	DF-31A
Torrance	5: Pop. 100+k. Airport. 750kt air.	Greater LA	(1)
Vallejo	5: Pop. 120+k. 550kt air.	Bay Area	(2)
Beale AFB	1, 3: 9th Reconnaissance Wing, refueling squadron, PAVE PAWS radar. 750kt air, 550kt surface.	E of Marysville	(2) (4)
Camp Pendleton	3: I Marine Expeditionary Force, amphibious warfare training. 750kt air.	Oceanside (200k)	(1)
Fort Irwin	3: National Training Centre. 100kt air.	NE of Barstow (20k)	JL-2(5)
March AFB	3: Air mobility wing (KC-135+Stratolifters) 750kt surface.	E of Riverside (300k)	(1)

U.S. TARGET LIST

NAME	TYPE AND COMMENTS	NEAREST TOWN	ATTACK TYPE
Naval Weapons Station Concord	3: Major naval ordnance storage facility. 550kt surface.	~56km NE of San Francisco (Concord!)	(2)
Sharpe Army Depot	3: Defense Distribution Depot – major logistics facility. 750kt air.	Lathrop (S. of Sacramento)	(4)
Sierra Army Depot	3: Munitions disposal, equipment repair. 750kt air.	Herlong	(4)
Travis AFB	3: Air mobility wing. 750kt surface.	Fairfield (107k)	(4)
Twenty-nine Palms MCB	3: Largest Marine base in the world. 100kt air.	N of Joshua Tree National Park	(5)
Vandenberg AFB	3: Satellite launch, missile testing. 100kt air.	W of Lompoc (41k)	(5)
Diablo Canyon 1, 2	4: Reactors. 3x100kt surface.	WSW of San Luis Obispo	JL-2
San Onofre 2, 3	4: Reactors. Unit 1 closed 11/92. 3x100kt surface.	SE of San Clemente	JL-2

COLORADO
4 MISSILES

Denver	2: State Capital. Region has 3M+ pop. Titan rocket manufacturing plant. 1MT air, 3x100kt air.		DF-31A DF-31A(1)
Fort Collins	5: Pop. 290k. 2x100kt air.		(1)
Pueblo	5: Pop. 150k. Delta rockets assembled here. 550kt air.		Topol-M(2)
Buckley AFB	1: Home of 460 th Space Wing. 550kt air.	E of Aurora	(2)
Cheyenne Mountain	1: NORAD H.Q. Inactivated 2006. 1MT surface.	S of Colorado Springs (600k)	DF-31A
Fort Carson	3: Armored cavalry, infantry brigade, special forces base. 550kt air.	SW of Colorado Springs	(2)
Peterson AFB	1: 1st Space Wing (1983-1992), then 21st 550kt air.	E of Colorado Springs	(2)
Schriever AFB	1: 50 th Space Wing (was Falcon AFB prior to 1998). Military space systems control facility. 550kt air.	E of Colorado Springs	(2)
USAF Academy	2: 550kt air.	N of Colorado Springs	(2)

CONNECTICUT
1 MISSILE

Bridgeport	5: Pop. 140k. 750kt air.		SS-18M6
Groton	1: Nuclear sub shipyard: 750kt surface.		“
Hartford	2: State Capital. Metro area 1.1M. 750kt air.		“
New Britain	5: Pop. 70k. 750kt air.		“
New Haven	5: Pop. 124k. 750kt air.		“
New London	1: Nuclear sub base. Pop.26k. 750kt surface.		“
Stamford	5: Pop. 125k. 750kt air.		“
Waterbury	5: Pop. 110k. 750kt air.		“
Millstone 2, 3	4: Reactors. Unit 1 closed down 4/11/95. 2x750kt surface.	WSW of New London (Waterford)	“

Table continues on next page

U.S. TARGET LIST			
NAME	TYPE AND COMMENTS	NEAREST TOWN	ATTACK TYPE
DELAWARE			1 MISSILE
Delaware City	4: Oil refining and storage. Pop 1.5k. 550kt air.		Topol-M
Dover	2: State Capital. Pop 35k. 550kt air.		“
Wilmington	5: pop. 70k. 550kt air.		“
Dover AFB	3: Airlift wings. 550kt surface.	S of Dover	“
Salem 1, 2	4: Reactors. 2x550kt surface.	S of Wilmington	“
DISTRICT OF COLUMBIA	1, 2, 3, 5: Washington DC. Pop. 5+M in metro area. 1MT air (DF 31A), 6x750kt air (SS-19)		2 MISSILES
FLORIDA			6 MISSILES
Cape Coral	5: pop 150k. 100kt air.		SS-N-32(1)
Jacksonville	3,4,5: Major naval base, oil port. Pop. 890k. 550kt air, 550kt surface.		SS-N-32(2)
Miami	5: Major city, pop. 4.9M. 4x550kt air, 100kt air.		(2), SS-N-32(3)
Orlando	5: Pop. 1+M. 2x100kt air.		(3)
St. Petersburg	5: Pop. 2M (incl. Tampa) 2x100kt air		(3)
Tallahassee	2: State Capital. Pop. 200k+. 100kt air.		(3)
Tampa	5: 100kt air.		(1)
Cape Kennedy	3: Space launch center. 2x100kt air.	Merritt Island	SS-N-23(4)
Eglin AFB	1: Aircraft systems testing and training, space tracking radar. 100kt surface.	Eglin	(3)
MacDill AFB	3: KC-135s and air mobility wing. 100kt surface, 100kt air.	S of Tampa	(1)
Patrick AFB	3: 45 th Space Wing. 2x100kt air.	Cape Kennedy	(4)
Tyndall AFB	3: 325 th Fighter Wing. 100kt surface.	SE of Panama City	(3)
Crystal River 3	4: Reactor and coal-fired stations. 3x100kt surface.	Citrus County, N. of Tampa	DF-31A
St. Lucie 1, 2	4: Reactors. 2x100kt surface.	SE of Ft. Pierce	“
Turkey Point 1-4	4: Reactors. 5x100kt surface.	S of Miami	DF-31A
GEORGIA			6 MISSILES
Athens	5: Pop.110k. 550kt air.		Topol-M(1)
Atlanta	2, 3, 4: State Capital. Metro pop. 5M+. Centers for Disease Control. Major biodefense facility. 6x550kt air.		SS-N-32
Columbus	5: Pop. 200k. 550kt air.		(1)
Savannah	5: Pop. 130k. 550kt air.		(1)
Atlanta Army Depot (Fort Gillem)	3: Major logistics centre. 550kt air.		(1)
Fort Benning	3: “Home of the Infantry”. 550kt air.	S of Columbus	(1)
Fort Gordon	3: “Home of the Signal Corps” Medical Corps training. 550kt air.	SW of Augusta (200k)	(1)

U.S. TARGET LIST

NAME	TYPE AND COMMENTS	NEAREST TOWN	ATTACK TYPE
Fort Stewart	3: 3d Infantry Division (Mechanized). 550kt air.	SW of Savannah (320k)	Topol-M(2)
King's Bay	1: Submarine base and weapons depot. 1MT surface.	Just N of Florida border	DF-31A
Moody AFB	3: 347 th Rescue Wing (CS&R). 550kt surface.	NE of Valdosta (120k)	(2)
Robins AFB	1,3: 116th Bomb Wing, air logistics center, PAVE PAWS radar, aviation museum. 2x 550kt surface.	Warner Robins (50k)	(2)
Turner AFB	3: Marine Corps logistic centre and industrial estate. 550kt air.	Albany (160k)	(2)
Hatch 1, 2	4: Reactors. 3x100kt surface	W of Savannah, N of Baxley	DF-31A
Vogtle 1, 2	4: Reactors. 2x100kt surface.	SE Augusta	"
HAWAII			3 MISSILES
Honolulu	1,2,3: State Capital. Pacific Fleet Command base at Pearl Harbor. 1MT air.		JL-2
Bellows AFS	3: Training facility. 100kt air.	N of Waimanalo	JL-2(2)
Hickham AFB	3: Major airbase. 1MT surface.	Honolulu	JL-2
Wheeler AFB	3: Schofield Barracks tropical warfare training facility (Army) part of complex. 100kt surface.		(2)
Kaneohe Bay MCB	3: Large Marine base (15,000 Marines). 100kt air.	20km N of Honolulu	(2)
IDAHO			1 MISSILE
Boise	2: State Capital. 100kt air.		JL-2
Mountain Home AFB	1, 3: Mixed air wing (fighters, bombers, tankers). Operations centre for West Coast OTH radar. Transmitter in Christmas Valley OR, receiver at Tule Lake CA. 2x100kt surface.	Mountain Home	"
ILLINOIS			6 MISSILES
Chicago	4, 5: Metro region 10+M. 6x550kt air.		Topol-M
Joliet	4: Oil refining and storage. Pop. 140k. 100kt surface.		DF-31A(1)
Metropolis	1: Uranium enrichment facility. 100kt air.		(1)
Peoria	5: Pop.115k+. 100kt air.		(1)
Rockford	5: Pop. 153k. 100kt air.		(1)
Springfield	2: State Capital. Pop. 120k. 100kt air.		(1)
Wood River	4: Oil refining and storage. Pop. 12k. Major oil distribution hub. 100kt air.	N of Kansas City IL	DF-31A(2)
Elwood Ordnance Plant	3: Army ammunition plant. National Guard training facility. 100kt surface.	Elwood (Joliet)	DF-31A(3)
Granite City Army Depot	3: C.M. Price support centre. Major logistic facility. 100kt air.	Granite City (70k)	(3)
Rock Island Arsenal	3: One of the largest facilities of its type in the world. Heavy weapons manufacture. 2x100kt air.	Rock Island (40k)	(3)

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U.S. TARGET LIST

NAME	TYPE AND COMMENTS	NEAREST TOWN	ATTACK TYPE
Braidwood 1, 2	4: Reactors. 2x100kt surface.	SE of Dresden, SSW of Joliet	(2)
Byron 1, 2	4: Reactors. 2x100kt surface.	SW Rockford (155k)	DF-31A(4)
Clinton	4: Reactor. 100kt surface.	E of Clinton! (7k)	(4)
Dresden 2, 3	4: Reactors. Dresden 1 closed down 1978. 2x100kt surface.	E of Morris (13k)	DF-31A(3)(5)
La Salle 1, 2	4: Reactors. 2x100kt surface.	W of Joliet, SE of Ottawa (18k)	(5)
Quad Cities 1, 2	4: Reactors. 2x100kt surface.	NE of Moline (45k)	(5)
INDIANA			2 MISSILES
Evansville	5: Metro region pop. 340k. 100kt air		SS-N-32
Fort Wayne	5: Pop. 570k. 100kt air		"
Gary	5: Pop. 103k. Steel making. 100kt air		"
Hammond	5: Pop. 80k. 100kt air.		"
Indianapolis	2: State Capital. Pop. 780k. 100kt air.		"
South Bend	5: Pop. 317k. 100kt air.		"
Whiting	4: Oil refining and storage. 100kt air.	Near Gary	SS-N-23
Grissom AFB	3: Air refueling, logistic support. 100kt surface.	105km N of Indianapolis	"
Naval Ammunition Depot Crane	3: Naval ordnance production and storage. 2x100kt surface.	SW of Bloomington (70k)	"
IOWA			1 MISSILE
Cedar Rapids	4, 5: Pop. 120k. Duane Arnold reactor 16km NW. 100kt surface to reactor, 100kt air to city.		SS-N-23
Des Moines	2: State Capital. Pop. 200k. 100kt air.		"
Iowa Army Ammunition Plant	3: Builds missile warheads, tank and artillery rounds and demolition charges. 100kt air.	Burlington (27k) is 227km SE Des Moines	"
KANSAS			2 MISSILES
El Dorado	4: Oil refining and storage. Pop. 13k. 100kt air.		SS-N-23(1)
Kansas City	1, 5: Major center. Region pop. 1.9M. DOE center that builds nuclear weapon parts in Bannister Federal Complex on Missouri side. 4x550kt air.		Topol-M(2)
Lawrence	5: Pop. 90k. 100kt air.		(1)
Topeka	2: State Capital. Pop. 120k. 100kt air.		(1)
Wichita	5: Pop. 360k. 100kt air.		(1)
McConnell AFB	3: Air refueling wings. 550kt surface.	S of Wichita	(2)
Wolf Creek	4: Reactor. 550kt surface.	S of Topeka, NE of Burlington, ESE of Emporia	(2)
KENTUCKY			2 MISSILES
Catlettsburg	4: Oil refining and storage. 100kt air.	On WV-KY border on route 79	DF-31A(1)

U.S. TARGET LIST

NAME	TYPE AND COMMENTS	NEAREST TOWN	ATTACK TYPE
Frankfort	2: State Capital. Pop. 30k. 100kt air		SS-N-23(2)
Lexington	5: Pop. 280k. 100kt air		(2)
Louisville	4, 5: Pop. 560k. Major transport nexus. 2x100kt air		(2)
Fort Knox	2,3: Federal gold depository. Army base. 2x100kt surface.	Louisville	(1)
Fort Campbell	3: Home of the 101st Airborne. 100kt air.	NW Clarksville TN	(1)
Paducah Gaseous Diffusion Plant	1: Uranium enrichment facility. 100kt surface.	W of Paducah (26k)	(1)
LOUISIANA			4 MISSILES
Baton Rouge	2: State Capital. Pop. 770k. 100kt air.		DF-31A(1)
New Orleans	5, 4: Pop. 350k. Large oil refining and storage facilities at Norco and Garyville W of city. 3x100kt air to city, 1 each to oil facilities.		DF-31A
Shreveport	5: Pop. 375k. 100kt air.		(1)
Barksdale AFB	1: Headquarters for the 2d Bomb Wing, Eighth Air Force and 917th Wing. Weapons storage nearby. 1MT surface.	E of Shreveport	DF-31A
England AFB	3: 2d ACR and port of embarkation. 2x100kt surface.	NW of Alexandria (50k)	(1)
Louisiana Ammo Depot	3: Heavy ordnance and components. 2x100kt air.	E of Shreveport	DF-31A
Belle Chasse	4: Oil refining and storage. 100kt air.	13km SE of NO	"
Convent	4: Oil refining and storage. 100kt air.	72km W of NO	"
River Bend	4: Reactor. 100kt surface.	NNW of Baton Rouge	"
Waterford	4: Reactor. 100kt surface.	32km W of New Orleans	(1)
MAINE			1 MISSILE
Augusta	2: State Capital. Pop. 19k. 100kt air.		SS-N-32
Bangor	5: Pop. 32k. 100kt air.		"
Lewiston	5: Pop. 36k. 100kt air.		"
Portland	5: Pop. 65k. 100kt air.		"
Columbia AFS	1: OTH radar. Transmitter at Moscow AFS; Receiver at Columbia AFS. 2x100kt surface.		"
MARYLAND			5 MISSILES
Annapolis	2: State Capital. Pop. 37k. 100kt air.		SS-N-23(1)
Baltimore	5: Major centre, pop. 3M. 6x550kt air.		SS-N-32
Aberdeen Proving Ground	3: Army weapons test centre. 100kt air.		(1)
Andrews AFB	1-3: 89 th Airlift Wing and Air Force One. 2x100kt surface.	SE of D.C. (Camp Springs)	(1)
Brandywine Receiver Site	1: Government communications hub. 100kt surface.	SE Andrews AFB	SS-N-32(2)

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U.S. TARGET LIST

NAME	TYPE AND COMMENTS	NEAREST TOWN	ATTACK TYPE
Davidsonville Transmitter Site	1: Communications hub for Presidential and military voice and data transmission. 100kt surface.	SE of Andrews AFB	(2)
Edgewood Arsenal	2: Biodefense research lab. 3: Chemical ordnance storage. 100kt air.	S of Aberdeen PG	(2)
Fort Detrick	2, 3: USAMRIID HQ. 100kt air.	Frederick (60k)	(2)
Fort Meade	3: 1 st Army H.Q. Major base. 2x100kt air.	NE of D.C.	(2)
Hagerstown	1, 2: Multiple FEMA/COG sites in vicinity: Boonsboro, Mercersburg, Camp David, and Site R near Sabillasville. 6x100kt surface.		SS-N-32
U.S. Naval Academy	2: 2x100kt air	Annapolis	DF-31A
Calvert Cliffs 1, 2	4: Reactors. 3x100kt surface.	NE of Lusby	“
MASSACHUSETTS			3 MISSILES
Boston	2: State Capital. Pop. Metro area 4.5M. 6x550kt air.		Topol-M
Fall River	5: Pop. 90k. 100kt air.		SS-N-32
Fitchburg	5: Pop. 40k. 100kt air.		“
Holyoke	5: Pop. 40k. 100kt air.	N of Springfield	“
Lawrence	5: Pop. 70k. 100kt air.		“
Lowell	5: Pop. 104k. 100kt air.		“
New Bedford	5: Pop. 94k. 100kt air.		“
Springfield	5: Pop. 155k. 100kt air.		SS-N-32
Worcester	5: Pop. 176k. 100kt air.		“
Cape Cod AFS	1: Early warning radar. 100kt surface.	Sandwich (north shoulder of Cape Cod)	“
Otis AFB (ANGB)	3: Part of military reservation. 100kt surface.	NW part of Cape Cod	“
Westover AFB	3: 439 Airlift Wing (C5-As). 100kt surface.	NE of Springfield	“
Pilgrim	4: Reactor. 100kt surface.	Plymouth	“
MICHIGAN			4 MISSILES
Ann Arbor	5: Pop. 113k. 100kt air		SS-N-23
Dearborn	5: Pop. 92k. 100kt air		“
Detroit	3, 5: Metro area pop. 4.6M; Detroit Arsenal in nearby Warren. 6x750kt air.		SS-19
Flint	5: Pop. 120k. 100kt air		“
Grand Rapids	5: Pop. 195k. 100kt air.		“
Lansing	2: State Capital. Pop 115k. 100kt air.		SS-N-23
Camp Grayling	3: National Guard training. Lots of live fire ranges; 77 M1 tanks on site. 100kt air.	Grayling (2k)	“
Selfridge AFB	3: Transferred to ANG in 1971. Major Army base. 2x100kt surface.	Mount Clemens (17k), 48km N of Detroit	“
Donald Cook 1, 2	4: Reactors. 2x100kt surface.	Bridgman (2.5k)	SS-N-32
Fermi 2	4: Reactor. Unit 1 breeder decommissioned 1972. 100kt surface.	S of Detroit. Newport	“

U.S. TARGET LIST

NAME	TYPE AND COMMENTS	NEAREST TOWN	ATTACK TYPE
Ludington	4: Hydroelectric dam. 2x100kt surface.	Ludington (8k)	"
Palisades	4: Reactor. 100kt surface.	Holland (35k), S of South Haven	"

MINNESOTA

2 MISSILES

Duluth	5: Pop. 276k. 100kt air.		SS-N-32(1)
Minneapolis	5: M-SP Pop. 2M+. 6x550kt air.		Topol-M(2)
Moorhead	5: Fargo ND/Moorhead 170+k. 100kt air.		(1)
Rochester	5: Pop. 170k. 100kt air.		(1)
St. Paul	2: State Capital		(2)
Prairie Island 1,2	4: Reactors. 2x100kt surface.	SE of St. Paul	(1)
Monticello	4: Reactor. 100kt surface.	NW of Minneapolis	(1)

MISSISSIPPI

2 MISSILES

Biloxi	5, 3: Pop. 50k. Keesler AFB. 100kt air.		SS-N-23
Gulfport	5: Pop. 70k. 100kt air		"
Jackson	2: State Capital. Pop. 170k. 100kt air.		"
Pascagoula	4: Oil Refining and Storage. Pop. 26k. 100kt air.		"
Columbus AFB	3: Pilot training facility. 100kt air.	Columbus (26k)	SS-N-23
Stennis Space Center	4: NASA propulsion testing facility. 100kt air	Slidell, LA	"
Grand Gulf 1, 2	4: Reactors. 2x100kt surface.	S of Vicksburg (26k)	"

MISSOURI

3 MISSILES

Columbia	5: Pop. 95k. 100kt air.		SS-N-32(1)
Jefferson City	2: State Capital. Pop. 40k. 100kt air.		(1)
St. Louis	5: Pop. 1M+ 4x550kt air.		Topol-M(2)
Springfield	5: Pop. 150k. 100kt air.		(1)
Fort Leonard Wood	3: Home of the U.S. Army Engineer, Military Police and Chemical Corps Schools, the Third Basic Combat Training Brigade, and Joint Training Detachments from the U.S. Marine Corps, Navy and Air Force. 2x100kt air.	W of Rolla	(1)
Lake City Army Ammo Plant	3: 5.56-20mm ammo facility. Largest small-arms ammo plant in the world. 100kt air.	Independence(114k)	(1)
Whiteman AFB	1: B-2 bomber base. 1MT surface.	Warrensburg(16k)	DF-31A
Callaway 1, 2	4: Reactors. 2x550kt surface.	NE of Jefferson City, SE of Fulton	(2)

MONTANA

26 MISSILES

Billings	5: Pop. 100k. 100kt air.		SS-N-23
Hamilton	3: BSL-4 biodefense lab. Pop 5k. 100kt air.		"
Helena	2: State Capital. Pop 30k. 100kt air.		"
Missoula	5: Pop. 65k. 100kt air.		"

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U.S. TARGET LIST			
NAME	TYPE AND COMMENTS	NEAREST TOWN	ATTACK TYPE
Malmstrom AFB	1: 341 st Space Wing (Minuteman). Over 200 silos and control centers. 126x550kt surface, 36x750kt surface.	Great Falls (57k)	3xSS-18M6 SS-19 13xTopol-M 8xSS-N-32
NEBRASKA			2 MISSILES
Lincoln	2,5: State Capital. Pop. 240k. 100kt air.		SS-N-32(1)
Omaha	5: Pop. 430k. 100kt air.		(1)
Sioux City	5: 100kt air.		(1)
Cornhusker Ammunition Plant	3: Explosives manufacture. 100kt surface.	W of Grand Island (43k)	(1)
Offutt AFB	1: 55 th Wing Air Combat Command; U.S. Strategic Command HQ. Reconnaissance, C3I ops. 1MT surface.	Omaha	DF-31A
Cooper Station	4: Reactor. 100kt surface.	S of Nebraska City (8k)	(1)
Ft. Calhoun	4: Reactor. 100kt surface.	N of Omaha	(1)
NEVADA			4 MISSILES
Carson City	2: State Capital. Pop. 60k. 100kt air		JL-2(1)
Las Vegas	5: Metro region 2M. 6x550kt air.		SS-N-32
Reno	5: Pop. 210k. 2x100kt air.		(1)
Nellis AFB	1, 3: Weapon storage (nukes in area 2) Home of 'Area 51'. 3x100kt surface.	N of Las Vegas	JL-2
Hoover (Boulder) dam	4: Hydroelectric dam. 3x100kt surface.		JL-2
NEW HAMPSHIRE NH AND RI ATTACKED BY SAME MISSILE.			1 MISSILE
Concord	2: State Capital. Pop. 41k. 100kt air.		SS-N-32
Manchester	5: Pop. 110k. 100kt air.		"
Seabrook	4: Reactor. 100kt surface.	S of Exeter NH, SW of Portsmouth	"
NEW JERSEY			5 MISSILES
Elizabeth	4, 5: Major port. Pop. 127k. 1MT air.		DF-31A
Jersey City	5: Pop. 240k. 100kt air.		SS-N-23(1)
Newark	4, 5: Major port, airport. Pop. 275k. 2x100kt surface.		(1)
Paterson	5: Pop. 150k. 100kt air.		(1)
Trenton	2: State Capital. Pop. 85k. 100kt air.		SS-N-32(2)
Fort Dix	3: Training and mobilization point. 2x100kt air.	Pemberton (1k)	(2)
McGuire AFB	3: 21 st Air Force, 305 th Air Mobility Wing. 2x100kt surface.	Wrightstown (1k)	(2)
Naval Air Warfare Centre	3: Test centre for naval aircraft. 100kt surface.	Lakehurst (2.5k)	SS-N-23(3)
Naval Ammunition Depot Earle	1, 3: Ammo storage for all naval weapon systems. 2x100kt surface.	W of Sandy Hook	(3)

U.S. TARGET LIST

NAME	TYPE AND COMMENTS	NEAREST TOWN	ATTACK TYPE
Picatinny Arsenal	3: Armament research center. 100kt surface.	NW of Newark	(3)
Hope Creek	4: Reactors. 2x100kt surface	25km N of Dover DE	DF-31A
Linden	4: Oil refining and storage. 100kt air	SW of Elizabeth	"
Paulsboro	4: Oil refining and storage. 100kt air	S of Philadelphia	"
Perth Amboy	4: Oil refining and storage. 100kt air	NE of New Brunswick (50k)	"
Oyster Creek	4: Reactor. 100kt surface.	NE of Atlantic City (50k)	(2)

NEW MEXICO

3 MISSILES

Alamogordo	3: Pop. 36k. Holloman AFB to W: 49 th Fighter Wing. 550kt surface to Holloman.		Topol-M(1)
Albuquerque	1, 3, 5: Metro. Pop. 840k. Kirtland AFB to SE; major facility, nuke storage. Biodefense facilities on Kirtland site. Sandia National Labs to south. 1MT air. 3x100kt air.		DF-31A SS-N-23(2)
Las Cruces	5: Pop. 74k. Agricultural center. 550kt air		(1)
Los Alamos	1: Pop. 12k. Research laboratories. 550kt air.		(1)
Santa Fe	2: State Capital. Pop. 62k. 100kt air.		(2)
White Sands Missile Range	3: 550kt air.	E of Las Cruces	(1)

NEW YORK

5 MISSILES

Albany	2: State Capital. Pop. 96k. 100kt air.		SS-N-32(1)
Buffalo	5: Pop. 260k. Metro 1.1M. 3x550kt air.		SS-N-32(2)
Hempstead	5: Pop. 750k. 750kt air.		SS-18M6(3)
New York City	5: Major center. Pop. 8M+ 7x750kt air.		(3)
Niagara Falls	5: Pop. 56k. Hydropower. 550kt air.		(2)
Rochester	5: Pop. 210k, metro 1.1M. 2x550kt air.		Topol-M(4)
Syracuse	5: Pop. 150k, metro 750k. 2x550kt air.		(4)
Utica	5: Pop. 60k. 100kt air.		SS-N-32(5)
Yonkers	5: Pop. 200k. 750kt air.		(3)
Griffiss AFB	3: Air Force Research lab and business park. 100kt air.	Rome (35k)	(5)
Knolls Atomic Power Laboratory-Schenectady	3: Naval propulsion research. 100kt air.	E of Schenectady (61k)	(1)
Knolls Atomic Power Laboratory-Kesselring	3: Naval nuclear reactor test facility. 3 operational reactors on site. 100kt surface.	NE of Schenectady	(1)
Guilderland Center	3: Strategic metal storage area and logistic depot.	N of Voorheesville	(1)
Watervliet Arsenal	3: "America's Cannon Factory" – guns, not ammo. 100kt surface.	Albany	(1)

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U.S. TARGET LIST

NAME	TYPE AND COMMENTS	NEAREST TOWN	ATTACK TYPE
U.S. Military Academy	2: 100kt air.	West Point (7k)	(1)
Fitzpatrick	4: Reactor. 550kt surface.	NE of Oswego (18k)	(4)
GINNA	4: Reactor. 550kt surface.	NE of Rochester	(2)
Indian Point 2, 3	4: Reactors; unit 1 closed down 10/74. 750kt surface.	Buchanan (N of NYC)	(3)
Nine Mile Point 1, 2	4: Reactors. 550kt surface.	NE of Oswego	(4)
Robert Moses	4: Dam. 550kt surface.	Niagara	(2)

NORTH CAROLINA

5 MISSILES

Chapel Hill	5: Pop. 50k. Famous University. 100kt air.		SS-N-23(1)
Charlotte	5: Pop. 630k. 4x100kt air		SS-N-23
Durham	5: Pop. 450k. 2x100kt air.		(1)
Greensboro	5: Pop. 250k. 100kt air.		SS-N-32(2)
Raleigh	2: State Capital. Pop. 375k. 100kt air.		(1)
Winston-Salem	5: Pop. 200k. 100kt air		(2)
Camp Lejeune	3: II MEF Base Camp. 100kt air.	S of Jacksonville (70k)	(2)
Cherry Point MCAS	3: 2d Aircraft Wing. Largest MCAS in world. 2x100kt surface.	Midway between New Bern (23k) and Morehead City	(2)
Fort Bragg	3: 82d Airborne, training facilities. 100kt air.	Fayetteville (121k)	(2)
Pope AFB	3: 43d Airlift Wing, 23d Fighter Group. 2x100kt surface.	Fayetteville	SS-N-23
Seymour Johnson AFB	3: 4 th Fighter Wing. 2x100kt surface.	Goldsboro (40k)	“
Brunswick	4: Reactor. 100kt surface	Wilmington (100k)	SS-N-32
Harris 1-3	4: Reactors. 3x100kt surface	SW of Raleigh	“
McGuire	4: Reactors. 2x100kt surface.	S of Charlotte	“

NORTH DAKOTA

22 MISSILES

Bismarck	2: State Capital. Pop. 59k. 100kt air.		SS-N-23(1)
Grand Forks AFB	3: Home of the 319 th Air Refueling Wing. 2x100kt surface.		(1)
Minot AFB	1: B52s and 19th SMW (Minuteman). Over 165 targets. 101x550kt surface, 32x750kt surface.		2xSS-18M6 2xSS-19 11xTopol-M 6xSS-N-32
Stanley R. Mickelson Safeguard Site	1: Perimeter acquisition radar near Concrete ND. 100kt surface.	Nekoma, 160km NW of Grand Forks	(1)

OHIO

4 MISSILES

Akron	5: Pop. 210k. Metro 700k. 550kt air.		Topol-M(1)
Canton	5: Pop. 80k. Metro 410k. 550kt air.		(1)
Cincinnati	5: Pop. 340k. Metro 2.1M. 3x550kt air.		Topol-M(2)
Cleveland	5: Pop. 500k. Metro 2.1M. 3x550kt air.		(1)

U.S. TARGET LIST

NAME	TYPE AND COMMENTS	NEAREST TOWN	ATTACK TYPE
Columbus	2, 3: Pop. 750k. Metro 1.7M. State Capital, Air National Guard and Ohio Military Reserve base at nearby airport (Rickenbacker International). 4x550kt air.		Topol-M(3)
Dayton	5: Pop. 160k. Metro 840k. 550kt air.		(2)
Lima	3, 4: Pop. 40k. Manufacturing plant for M-1 tank. Oil refining and storage. 100kt air.		SS-N-32(4)
Toledo	4: Pop. 320k. Oil refining and storage. 2x100kt air.		(4)
Youngstown	5: Pop. 84k. Metro 590k. 550kt air.		(1)
Fernald	1: DOE: storage of uranium, thorium, etc. Former enrichment and production facility. 550kt surface.	NW of Cincinnati	(2)
Mound Plant	1: Manufactures RTGs and isotope sources, isotope separation. 100kt surface.	SW of Dayton (Miamisburg)	(4)
Portsmouth Gaseous Diffusion Plant	1: Uranium enrichment facility. 550kt surface.	N of Portsmouth (21k)	(3)
Ravenna Training and Logistics Site	3: Training centre for combined-arms ops (infantry and armor). 550kt air.	SE of Cleveland, NE of Akron	(3)
Wright-Patterson AFB	2, 3: Premier R&D centre. Training, museum, 445 th Airlift Wing...it is home for more than 70 units representing 7 different Air Force commands. 550kt surface.	ENE Dayton	(2)
Davis-Besse	4: Reactor. 100kt surface.	W of Sandusky (30k), ESE of Toledo	(4)
Perry	4: Reactor. 100kt surface.	NE of Cleveland on Lake Erie, E of Painesville	(4)
OKLAHOMA			3 MISSILES
Cushing	4: Pop. 8k. Distribution hub for oil pipelines. 100kt air.	70km ESE Tulsa	DF-31A
Oklahoma City	2: State Capital. Pop. 538k. 3x100kt air.		"
Ponca City	4: Pop. 26k. Oil refining and storage. 100kt air.		"
Tulsa	5: Pop. 384k. 3x100kt air.		SS-N-23
Altus AFB	3: 97 th Air Mobility Wing. 100kt surface.	NE of Altus (22k)	"
Fort Sill	3: Army Artillery School. 100kt air.	N of Lawton (88k)	SS-N-23
McAlester Army Ammunition Plant	3: Ammo storage. Produces 20mm, 40mm and artillery shells, rockets, bombs and mines. 100kt surface.	McAlester (18k)	"
Tinker AFB	1: Logistic support and maintenance for bombers, transport aircraft. 100kt surface.	E of Oklahoma City	"
Vance AFB	3: 71 st Flying Training Wing. 100kt surface.	Enid (47k)	"
OREGON			3 MISSILES
Eugene	5: Pop. 154k. 100kt air		DF-31A(1)

Table continues on next page

U.S. TARGET LIST

NAME	TYPE AND COMMENTS	NEAREST TOWN	ATTACK TYPE
Medford	5: Pop. 80k, metro 200k. 100kt air (Chico and Redding, CA missile).		DF-31A
Portland	5: Pop. 570k. 2x100kt air		(1)
Salem	2: State Capital. Pop.153k. 2x100kt air.		(1)
Bonneville	4: Dam. 2x100kt surface		2xJL-2
Chief Joseph	4: Dam. 2x100kt surface	Columbia River	“
John Day	4: Dam. 2x100kt surface	Columbia River	“
PENNSYLVANIA			5 MISSILES
Allentown	5: Pop. 110k. 100kt air.		SS-N-32(1)
Erie	5: Pop. 104k. 100kt air.		(1)
Harrisburg	2: State Capital. Pop. 50k, metro 650k. 2x100kt air.		SS-N-32(2)
Philadelphia	3, 4, 5: Pop. 1.5M, metro 5+M. Major naval logistic support facility. Oil refining and storage. 5x550kt air.		SS-N-32(3)
Pittsburgh	4, 5: Pop. 2.3M. Major industrial center; Bettis Laboratory – nuclear propulsion research. 4x550kt air.		Topol-M(4)
Scranton	5: Pop. 76k. 100kt air.		(1)
Army War College	2: 100kt air.	Carlisle	(1)
Frankford Arsenal	3: 550kt air.	Philadelphia	(3)
Letterkenny Army Depot	3: Missile repair and development (man-portable, ground-air, air-air). Vehicle maintenance. Ammunition storage. 100kt air.	Chambersburg	(2)
New Cumberland Army Depot	3: Major logistic facility. 100kt air.	S of Harrisburg	(2)
Scranton Ammunition Plant	3: Large caliber (120mm, 5”, 155mm) shell production. 100kt surface.		(1)
Raven Rock	1: Alternate National Military Command Center. 550kt surface.	Waynesboro	(4)
Tobyhanna Army Depot	3: Electronic equipment repair, manufacturing, integration. 100kt air.	SE of Scranton	(1)
Beaver Valley 1	4: Reactor. 100kt surface	Shippingport	(2)
Peach Bottom 2,3	4: Reactors. Unit 1 closed down 1974. 550kt surface.	York Co. (SE of York, on river) Delta	(4)
Three Mile Island 1,2	4: Reactor. Famous meltdown in Unit 2. 2x100kt surface.	Harrisburg	(2)(5)
Limerick	4: Reactor. 100kt surface.	Limerick, NW of Norristown	SS-N-23(5)
Susquehanna 1, 2	4: Reactors. 2x100kt surface.	SW of Scranton, NE of Berwick	“
RHODE ISLAND	SS-N-32 also attacked NH.		1 MISSILE

U.S. TARGET LIST

NAME	TYPE AND COMMENTS	NEAREST TOWN	ATTACK TYPE
Newport	3, 5: Pop. 26k. Naval training centre. 100kt air.		SS-N-32
Providence	2: State Capital. Pop. 180k, metro 1.7M. 100kt air.		"
SOUTH CAROLINA			3 MISSILES
Charleston	5: Pop. 120k. Close to major army and naval bases. 550kt air.		Topol-M
Charleston Army Depot	3: Embarkation hub. 550kt air.		"
Columbia	2: State Capital. Pop. 120k, metro 750k. 550kt air.		"
Fort Jackson	3: Basic Training Centre. 550kt air.	Columbia	"
Naval Weapons Station Charleston	1, 3: Ordnance (including nukes) storage. Nuclear submariner training, army logistic support, etc. 550kt surface.	N of Charleston	"
Savannah River Site	3: Energy research laboratory, nuclear waste storage. 550kt air.	SE of Augusta GA	"
Catawba	4: Reactor. 100kt surface.	NW of Rock Hill (50k)	SS-N-23
Oconee 1,2,3	4: Reactors. 3x100kt surface.	S of Clemson, W of Greenville (56k)	"
Summer 1,2,3	4: Reactors. 3x100kt surface.	NW of Columbia	SS-N-32
Robinson	4: Reactor. 100kt surface.	SE of Cheraw, N of Florence (30k)	"
Lee 1, 2	4: Reactors. 2x100kt surface.	Gaffney	"
SOUTH DAKOTA			1 MISSILE
Pierre	2: State Capital. Pop. 15k. 100kt air.		SS-N-23
Sioux Falls	5: Pop. 150k. 100kt air.		"
Ellsworth AFB	1: 28 th Bomb Wing (B1). 2x100kt surface.	E of Rapid City	"
TENNESSEE			4 MISSILES
Chattanooga	5: Pop. 170k, metro 470k. 100kt air		SS-N-32(1)
Clarksville	5: Pop. 125k. 100kt air		(1)
Knoxville	5: Pop. 175k, metro 660k. 2x100kt air		(1)
Memphis	5: Pop. 670k. 3x550kt air.		Topol-M
Nashville	2: State Capital. Pop. 620k, metro 1.5M. 3x550kt air.		"
Holston Army Ammunition Plant	1,3: Explosives - including lenses for nuclear weapons - and solid rocket propellants. 100kt surface.	Kingsport (45k)	(1)
Milan Army Ammunition Plant	3: Makes fuses and other ammunition items such as demolition charges, mortar rounds, and 155-mm projectiles. It also stores and tests ammunition. 100kt surface.	Milan (8k)	(1)
Oak Ridge	1: DOE laboratories-uranium enrichment, weapon dismantling, waste storage. 5x100kt surface.	Oak Ridge (28k)	DF-31A

Table continues on next page

U.S. TARGET LIST

NAME	TYPE AND COMMENTS	NEAREST TOWN	ATTACK TYPE
Sequoyah 1,2	4: Reactors. 2x100kt surface.	NE of Chattanooga	SS-N-23
Watts Bar 1,2	4: Reactors. 2x100kt surface.	NE of Chattanooga, S of Spring City	“
TEXAS			13 MISSILES
Abilene	5: Pop. 120k. 100kt air.		SS-N-23(1)
Amarillo	5: Pop. 200k. 2x100kt air.		SS-N-32(2)
Austin	2: State Capital. Pop. 710k, metro 1.6M. 4x550kt air.		Topol-M(3)
Baytown	4: Pop. 66k. Oil refining and storage. 550kt air.		(3)
Beaumont	4, 5: Pop. 114k. Major oil pipeline hub. 100kt air.		SS-N-32(4)
Big Spring	4: Pop. 25k. Oil refining. 100kt air.		(2)
Brownsville	5: Pop. 140k. 100kt air.		SS-N-23(5)
Corpus Christi	3, 4: Pop. 280k. Oil refining and storage. Multiple military installations around city (NAS, army depot, etc.) Major port. 6x100kt air.		SS-N-32
Dallas	5: Pop. 1.2M. 6x750kt air.		SS-18M6(6)
El Paso	5: Pop. 610k. 550kt air.		Topol-M
Fort Worth	5: Pop. 700k, D-FW 6.8M+. 3x750kt air.		(6)
Galveston	3, 5: Pop. 60k. BSL-4 biodefense facility. 100kt air.		(4)
Houston	4: Major oil centre and port. Pop. 2.1M. 1MT air. 550kt air.		DF-41 (3)
Laredo	5: Pop. 180k. 100kt air		(5)
Lubbock	5: Pop. 200k. 100kt air.		(2)
McAllen	5: Pop. 130k. 100kt air.		(5)
Odessa-Midland	5: Pop. 250k. 2x100kt air.		(1)
Phillips	4: Oil refining and storage. 100kt air.	70km NE Amarillo	(2)
Port Arthur	4: Pop. 58k. Oil refining and storage. 100kt air.		(4)
San Antonio	2, 3, 5: Pop. 1.1M. Nearby Kelly AFB was major logistics centre until 2001. Communications hub at Kelly. BSL-4 biodefense lab. 5x550kt air.		Topol-M(7)
Sunray	4: Oil refining and storage. 100kt air.	N of Amarillo	(2)
Texas City	4: Pop. 45k. Oil refining and storage. 100kt air.		(4)
Waco	5: Pop. 120k. 100kt air.		(5)
Wichita Falls	5: Pop. 105k. 100kt air.		(1)
Carswell AFB	3: Joint Service Reserve Base. Fighter/attack and airlift units from Naval, Marine and Air Force Reserves here. 750kt surface.	Fort Worth	(6)

U.S. TARGET LIST

NAME	TYPE AND COMMENTS	NEAREST TOWN	ATTACK TYPE
Dyess AFB	1,3: 7th Bomb Wing, B-1 training. Airlift and refueling wings. 2x100kt surface.	Abilene	SS-N-23(8)
Fort Bliss	3: Air defense artillery training. 550kt air.	El Paso	Topol-M
Fort Hood	1, 3: 1 st Cavalry, 4 th Infantry Division. 2x100kt air.	Killeen (87k)	SS-N-23(9)
Lackland AFB	3: Training and medical wings. 550kt air.	SW of San Antonio	(7)
Lone Star Army Ammunition Plant	3: Manufactures grenades, mortar and artillery rounds, primers, fuses, detonators and tracers.	W of Texarkana (35k)	(4)
Pantex Facility	1: Nuclear weapons manufacturing. Only location in U.S. where nukes are assembled and disassembled (since 1975). 1MT surface.	E of Amarillo	DF-31A
Red River Army Depot	3: Ammunition storage, training, rubber production, service Bradley AFVs	W of Texarkana	(4)
Sheppard AFB	3: Training centre for pilots and ground crew. 2x100kt surface.	E of Wichita Falls	(8)
Comanche Peak 1,2	4: Reactors. 2x100kt surface	SW of D-FW, 8km N of Glen Rose	(9)
South Texas 1-4	4: Reactors. 4x100kt surface.	SW of Houston, SSW of Bay City (19k)	SS-N-23
UTAH			3 MISSILES
Logan	5: Pop. 70k. 100kt air		SS-N-32(1)
Provo	5: Pop. 120k, metro 480k. 3x100kt air.		JL-2
St. George	5: Pop. 70k. 100kt air.		(1)
Salt Lake City	2, 4: State Capital, major oil pipeline hub. Pop. 180k, metro 1.3M;1MT air.		DF-31A
Desert Test Centre	3: Dugway Proving Ground, bombing range. 100kt air.	Ft. Douglas	(1)
Hill AFB	3: Major logistics centre. F-16, C-130. 388 th Fighter Wing. 2x100kt surface.	56km N of Salt Lake City (Ogden – 80k)	(1)
Tooele Army Depot (Deseret Chemical Depot)	3: CW agent storage and destruction. Other conventional ordnance stored on-site. 100kt air.	Tooele	(1)
VERMONT			1 MISSILE
Burlington	5: Pop. 39k. metro 210k. 100kt air.		SS-N-32
Montpelier	2: State Capital. Pop. 8k. 100kt air.		“
Vermont Yankee	3: Reactor. 100kt surface.	S of Brattleboro (12k)	“
VIRGINIA			4 MISSILES
Newport News	1, 3: Shipyard builds and maintains nuclear-powered ships and subs for the Navy. 1MT air.		DF-31A
Norfolk	1, 3: Pop. 230k, metro 1.5M. Naval base. 3x750kt air.		SS-18M6(1)
Portsmouth	3: Naval fuel station (Craney Island). 750kt air.		(1)

Table continues on next page

U.S. TARGET LIST			
NAME	TYPE AND COMMENTS	NEAREST TOWN	ATTACK TYPE
Richmond	2, 3: State Capital. Pop. 200k, metro 1.2M. Defense Supply Depot. BSL-4 biodefense lab. 4x750kt air.		(1)
Virginia Beach	5: Pop. 440k. 750kt air.		(1)
Mount Weather	1, 2: Major FEMA installation, continuity of government shelter. 3x100kt surface.	SW of Bluemont and Winchester	SS-N-23(2)
Quantico MCB	3: Major training center; contains Corps Air Facility. 100kt air.	SW of DC	(2)
Radford Army Ammunition Plant	3: Propellant production for a variety of weapons systems. 100kt air.	Radford (16k)	SS-N-32(3)
Yorktown	1, 3: Naval Weapons Station. 750kt surface	N of Norfolk	(1)
North Anna 1-3	4: Reactors. 3x100kt surface	NW of Richmond	(3)
Surry 1, 2	4: Reactors. 2x100kt surface.	NW of Newport News	(3)
WASHINGTON			7 MISSILES
Olympia	2: State Capital. Pop. 45k. 750kt air		SS-19(1)
Seattle	4, 5: Major port. Pop. 600k. Metro 4.5M. 1MT air		JL-2
Spokane	5: Pop. 210k. 750kt air		(1)
Tacoma	5: Major port. Pop. 210k. 1 MT air		JL-2
Anacortes	4: Oil refining and storage. 100kt air.		JL-2(2)
Fairchild AFB	3: 92d Air Refueling Wing. 750kt surface.	Spokane	(1)
Grand Coulee	4: Hydroelectric dam. 1MT surface.		JL-2
Hanford	4: Plutonium production ceased 1991. Large quantities of plutonium, uranium and wastes on site. Fast neutron reactor, DOE research lab. 2x100kt surface.	N of Richland (40k)	JL-2(3)
McChord AFB	3: 62d Airlift Wing. 2x100kt surface.	Tacoma	(2)
Naval Ammunition Depot Indian Island	1, 3: Docks can accommodate a Nimitz-class CVN. 1MT surface.	W of Everett (105k), E of Port Angeles	JL-2
Puget Sound Naval Shipyard	1, 3: Very large facility! Sub base at Bangor to NW has large store of nuclear weapons. 750kt air, 2x750kt surface for Bangor.	Bremerton	(1)
Columbia	4: Reactor was known as WNP-2 until 2002. 100kt surface.	16km N of Richland on Hanford site	(3)
WEST VIRGINIA			1 MISSILE
Charleston	2: State Capital. Pop. 212k. 100kt air.		SS-N-23
Morgantown	5: River crossing. Pop. 28k. 100kt surface.		"
Parkersburg	5: River crossing. Pop. 34k. 100kt surface.		"
WISCONSIN			2 MISSILES
Green Bay	5: Pop. 100k. 100kt air.		SS-N-32
Madison	2: State Capital. Pop. 225k. 100kt air.		"
Milwaukee	5: Pop. 610k, metro 2M. 4x100kt air.		"
Badger AAP	3: Produces propellants for all bullets and shells. 100kt surface	56km NW Madison	SS-N-23

U.S. TARGET LIST

NAME	TYPE AND COMMENTS	NEAREST TOWN	ATTACK TYPE
Kewaunee	4: Reactor. 100kt surface.	E of Green Bay	"
Point Beach 1,2	4: Reactors. 2x100kt surface.	NNW of Manitowoc (83k)	"

WYOMING

20 MISSILES

Casper	4: Oil pipeline hub. Pop. 50k. 4x100kt air.		DF-31A
Cheyenne	2: State Capital. Pop. 55k. 100kt air.		"
Francis E. Warren AFB	1: 90 th SMW: Minuteman III ICBMs. Silos also based in Nebraska and Colorado. Over 150 targets. 96x550kt surface, 26x750kt surface.	Cheyenne	2xSS-18M6 SS-19 10xTopol-M 6xSS-N-32

CANADA

NAME	TYPE AND COMMENTS	NEAREST TOWN	ATTACK TYPE
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ALBERTA

3 MISSILES

Calgary	4, 5: Major center. Pop. 1M+. 2x100kt air		JL-2(1)
Edmonton	2: Provincial capital. Pop. 730k. 100kt air		JL-2(2)
AECO-C	4: Major gas hub. 100kt air.	E of Calgary	(1)
Empress	4: Major gas hub. 100kt air.	SE of Calgary	JL-2(3)
CFB Cold Lake	3: 4 Wing Fighter Group: 2 fighter training squadrons, one combat support, one fighter. Winter survival training facility. 100kt surface.	10km SW Cold Lake, 250km ENE Edmonton	(3)
CFB Edmonton	3: Land Force Western Area HQ. 100kt air.		(2)
CFB Suffield	3: Training facility for artillery, armor, infantry. 100kt air.	250km SE Calgary	(3)
CFB Wainwright	3: Training facility and support base. 700 personnel. Signals detachment, field ambulance, military police units. 100kt air.	Denwood, 190km ESE Edmonton	(2)

BRITISH COLUMBIA

4 MISSILES

Chilliwack	5: Major agricultural center. Pop. 80k. 100kt air.		JL-2(1)
Vancouver	4, 5: Major port. Pop. 615k, metro 2.2M. 1MT air.		JL-2
Victoria	2: Provincial capital. Pop. 80k, metro 330k. 100kt air.		JL-2(2)
CFB Comox	3: 19 Wing, maritime patrol, transport and rescue squadron. 100kt surface.	80km NW Vancouver	(1)
CFB Esquimalt	3: Maritime Force Pacific HQ. 100kt air.	5km W of Victoria	(2)
NRS Aldergrove	2: Communications facility. 100kt air.	59km E of Vancouver	(1)
Sumas Center	4: Major gas pipeline hub. 100kt air.	Huntingdon	(2)
W.A.C. Bennett Dam	4: 2GW hydro plant. 3x100kt surface.	19km W of Hudson's Hope	JL-2

MANITOBA

1 MISSILE

Table continues on next page

CANADA			
NAME	TYPE AND COMMENTS	NEAREST TOWN	ATTACK TYPE
Winnipeg	2, 3: Provincial capital, pop. 650k. HQ of 1 Cdn Air Div – command and control center of AIRCOM. 2x100kt air.		SS-N-23
CFB Winnipeg	3: 17 Wing, Training Command HQ. 100kt surface.		“
CFB Shilo	3: 1 st Regiment Horse Artillery, mechanized infantry battalion. 100kt air.	35km E of Brandon	“
NEW BRUNSWICK			1 MISSILE
Fredericton	2: Provincial capital. Pop. 80k. 100kt air.		SS-N-23
CFB Gagetown	3: 3 Area Support Group. 100kt air.	Oromocto	(1)
Point Lepreau	4: Reactor. 2x100kt surface.	Point Lepreau	(1)
NEWFOUNDLAND AND LABRADOR			1 MISSILE
St. John's	2: Provincial capital. Pop. 110k. 100kt air		SS-N-23
CFB Gander	3: 9 Wing search and rescue squadron. 2x100kt surface.	Gander (10k)	“
CFB Goose Bay	3: 5 Wing fighter group. 100kt surface.	Goose Bay	“
NOVA SCOTIA			1 MISSILE
Halifax	2: Provincial capital. Pop. 290k. 100kt air.		SS-N-23(1)
CFB Greenwood	3: 14 Wing maritime patrol, search and rescue. 100kt surface.	Greenwood	(1)
CFB Halifax	3: Maritime Forces Atlantic HQ. 100kt air.		(1)
CFB Shearwater	3: 12 Wing maritime helicopter support and training. 100kt air.		(1)
ONTARIO			8 MISSILES
Hamilton	5: Pop. 550k. McMaster University, research reactor. 100kt air.		SS-N-32(1)
Kitchener	5: Pop. 210k, metro 460k. 100kt air.		(1)
London	5: Pop. 350k, metro 460k. 100kt air.		(1)
Ottawa	2, 3: Pop. 850k, metro 1.3M; National capital, CFB Ottawa Canadian Forces HQ; CFS Leitrim comms monitoring and sigint center. 1MT air.		DF-31A
St. Catherine's	5: Pop. 140k, metro 300k. 100kt air.		(1)
Toronto	3, 4, 5: Major economic and population centre. Pop. 2.5M, metro 5M+. Land Force Central Area HQ. 6x750kt air.		SS-19
Windsor	5: Pop. 230k. 100kt air.		(1)
CFB Borden	3: 16 Wing, army and air force training, REGHQ bunker. 2x100kt surface.	Borden	SS-N-32(2)
CFB Kingston	3: 1 Wing, 1 st Canadian Division HQ, Communications and Electronics Branch HQ. 100kt surface.	Kingston (120k)	(2)
CFB North Bay	2, 3: 22 Wing Air Defense Command and NORAD HQ. 2x100kt surface.		(2)

CANADA

NAME	TYPE AND COMMENTS	NEAREST TOWN	ATTACK TYPE
CFB Petawawa	3: 2 Canadian Mechanized Brigade Group HQ. 100kt air.		(2)
CFB Trenton	3: 8 Wing Air Transport Command HQ. 100kt surface.	4km NE Trenton (20k)	3xSS-N-32(3)
Bruce	4: 8 CANDU reactors. 8x100kt surface.	Tiverton	(3)
Chalk River Lab	4: Research reactor, radioisotope production. 100kt surface.	180km NW Ottawa	(3)
Darlington	4: 4 CANDU reactors. 4x100kt surface.	Bowmanville	SS-N-23
Dawn	4: Major gas hub. 100kt air.	Chatham	(1)
Pickering	4: 8 CANDU reactors. 8x100kt surface.	Pickering	(3)

QUEBEC

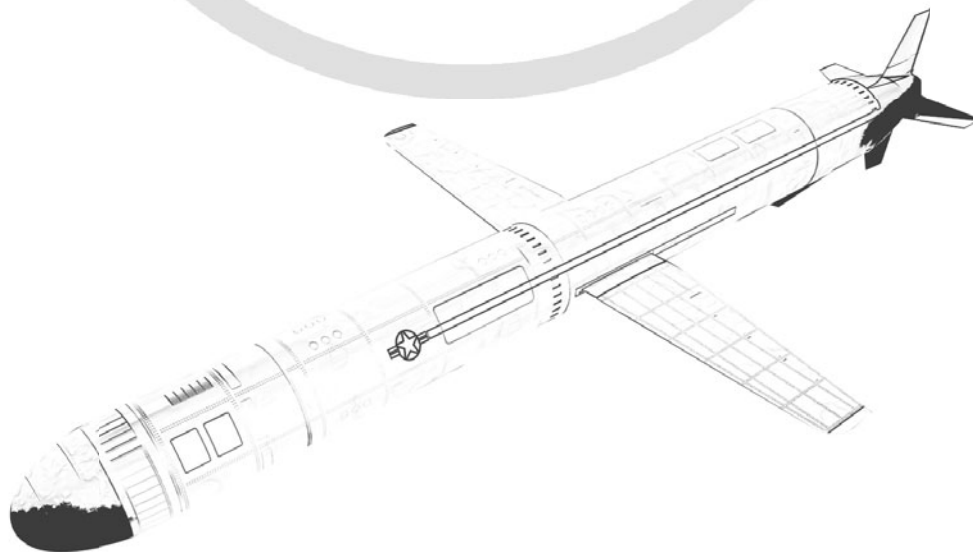
3 MISSILES

Montreal	3, 5: Land Force Quebec Area HQ, 5 Area Support Group, major population center. Pop. 1.7M, metro 3.8M. 3x550kt air.		Topol-M
Quebec City	2: Provincial capital. Pop. 500k, metro 750k. 550kt air.		"
CFB Bagotville	3: 3 Wing: fighter, search and rescue, radar, air maintenance squadrons. 550kt surface.	Saguenay	"
CFB Valcartier	3: 5 Canadian Mechanized Brigade Group HQ, defense research, REGHQ bunker. 550kt surface.	25km N of Quebec City	"
Brisay	4: Dam. 100kt surface		2xSS-N-23
La Grande 1-4	4: Dams. 4x100kt surface	26km W of LG2	"
La Forge 1, 2	4: Dams. 2x100kt surface		"
Robert-Bourassa	4: Dam. 100kt surface.		"

SASKATCHEWAN

1 MISSILE

Regina	2: Provincial capital. Pop. 185k. 100kt air.		SS-N-23
Saskatoon	5: Pop. 210k. 100kt air.		"
CFB Moose Jaw	3: 15 Wing, flight school. 2x100kt surface.	6km SSW Moose Jaw (35k)	"



RANDOM MISSILES AND ROCKS

PDs who want to destroy locations not given in the list have two options: some extra enemy ICBMs, or fragments of the asteroid.

The following missiles are available for custom targets: 10 SS-27/29 Topol; 5 SS-N-32 Bulava; 8 DF-31A; 4 JL-2. Use the warhead types given in 'The Weapons' table earlier in this chapter. MIRVs can attack targets within an 800x420km ellipse with their warheads.

Rock fragments: The asteroid traveled with a cloud of smaller bodies. Most of these are tiny – the fragments burn up in the upper atmosphere and provide a lightshow to watchers on the ground.

Larger fragments are required to cause damage on the ground. A fifty meter diameter rock would explode several kilometers above the ground – but the airburst would cause damage similar to the Tunguska incident in 1908. The following table assumes a stony asteroid (density 3g/cc) traveling at 17km/s.



EFFECTS OF ADDITIONAL MATERIAL										
YIELD (MT)	ROCK DIAMETER	BURST HEIGHT	20PSI	10PSI	5PSI	3PSI	1PSI	FTB	PTB	SB
10	60	4700	3.45	7.58	11.8	18.5	34.68	26.25	34.3	39.5
15	65	3470	5.56	9.58	14.14	21.56	39.89	31.18	40.6	46.2
20	75	1270*	5.44	8.06	11.92	17.99	33.04	24.86	32.29	36.54
30	80	277[1]	6.39	9.33	13.71	20.62	37.8	29.27	38	42.65
50	95	[2]	9.75	15.16	21.67	32.49	59.6	50.78	65.93	73.25
100	125	[3]	12.25	19.06	27.23	40.84	74.88	67	87	95

Rock diameter and burst height in meters, all radii in km.

20psi to 1 psi - blast zone radii

FTB - full thickness burn radius

PTB - partial thickness burn radius

SB - superficial burn radius

* crater 480m radius, 240m depth

[1] Crater 549m radius, 274m depth

[2] Crater 650m radius, 280m depth; 5.3MT surface burst.

[3] Crater 1050m radius, 448m depth; 39MT surface burst.

PDs can allocate up to twenty rock fragments of various sizes to North American targets.

THE DAY THE WORLD BEGAN

SAMPLE SCENARIO

INTRODUCTION

The players are members of Recon Team FR-W-12. The six-person team was frozen in 1999, in the foothills of the West Virginia Appalachians. A good mix of individual weapons for the team would be a grenade launcher, a light machinegun and four assault rifles or sub machineguns.

The team have a standard basic load of gear, plus two standard contact kits (one male, one female), and are issued two V-150 APCs mounting an M-2 .50-caliber machinegun for transport.

The team were to contact Prime Base on waking up, but were briefed on a series of likely objectives before they were frozen. These objectives were as follows;

- Conduct an initial survey of the West Virginia area, assessing the state of communities encountered and noting specific needs that the project specialist teams could meet once revived; and dangerous areas that they should avoid.
- Identify the major remnants of the US government or other authorities in the area; make initial contact with these authorities and lay groundwork for future cooperation with the project, where appropriate.
- Establish the status of locks, bridges and other crossing points across the Ohio River.
- Establish the current status of the Appalachian coalfield, and determine which if any mines are still usable, or could be brought back into use. If any such mines were located, the team was to identify possible routes to bring the coal to surviving population or industrial centers.
- Provide assistance to communities encountered, where this can be achieved without compromising the above missions. The team leader has the authority to provide assistance even when this would compromise the above mission, should he feel this necessary.



SUPPLY CACHES

The team has six standard caches, spread throughout their area of operations. These were intended to contain both supplies for the team, and items to help the locals.

The locations of these caches are marked on the AutoNav unit in the team vehicles. Most teams write down or memorize the locations of their caches, as insurance against the AutoNav being destroyed or lost.

Caches are usually buried 1-2 meters below a surface marker. Marker locations are listed in and on the team's AutoNav using a ten meter reference grid.

Each cache is a reinforced concrete box, about two meters per side, and filled with the same inert gas as boltholes, to keep stored equipment in mint condition. The cache door is a stainless steel hatch sealed by water-proof gaskets, with a small panel that must be pried out to expose an MP ID card reader to open the cache.

Details of the contents and condition of the team's caches can be found at the end of the scenario.



THE LAND & PEOPLE

West Virginia suffered relatively little direct damage during the war, as it contained few targets that were worth a missile, and the Appalachians shielded it from the worst effects of the missiles hitting military and economic targets along the east coast.

The population was decimated by fallout, starvation and disease. Most of the survivors living in the Appalachians were reduced to simple subsistence farming at an early nineteenth century level of technology.

In the west of the state, things are a little better – trade continues to flow along the Ohio River, and market towns have grown up at several points along it, where traders buy manufactured goods to move into the interior of the state by packhorse or wagon. Many of these towns are rough places, where lives can be lost as easily as fortunes can be made.

Most of the goods come upriver from the Kentucky Free State, which has managed to maintain a mid-twentieth century technology. Unfortunately, the KFS is a slaveholding oligarchy, and strongly hostile to the Project.



WAKE-UP

The team was frozen in a standard bolthole - essentially, a buried concrete box just big enough to hold the team's freeze tubes, vehicle & gear.

It has a hydraulic main door for the team vehicle to get out, plus two personnel exits, both currently coffer-dammed with sand. Beyond that, it holds only the "idiot box" computer that monitors them while they are in the freeze tubes and a combination periscope / antenna package. The last two items are meant to be abandoned when the team leaves the bolthole, and the team knows this.

The team is revived successfully, and a quick check by the team's medic shows no problems. Assembling and checking the team's gear takes a couple of hours. The vehicles and equipment all prove to be in good condition.

The bolthole computer tells the team that they have slept for over 150 years, rather than the 3-5 years they expected.

When the team is ready, they can raise the periscope, and see what is outside. The view through the periscope is of a pine forest, with no life apart from birds and squirrels visible. Contaminant monitors built into the periscope show no radiation or chemical hazards. When the team attempt to contact Prime Base, they get no answer; the radio is definitely working, but Prime isn't responding.

PDs that have the module "Bullets & Bluegrass" might like to have the team pick up commercial radio from the Kentucky Free State, or some other community of their own invention advanced enough to have radio.

OUT OF THE BOLT HOLE

The team should be aware that they should leave the bolthole - it is not intended to be a permanent base, and has no water supply, toilets or sleeping facilities.

In addition, their mission objectives are specifically intended to get them out and exploring.

The team should encounter locals fairly quickly - after all, wandering around without meeting anyone isn't going to make for an interesting game. These can include isolated farmsteads, men cutting wood, or the trader with his pack train.

It should be obvious both from whomever they meet and from their own maps that the nearest community is Evanstown, a small town with a population around 2,000 people, and this should be one of the first places to visit.

Evanstown is deliberately designed to be a relatively low-threat area, to allow the team to find out more about the world they find themselves in, and to plan their next moves. There are no immediate threats to the town, but it can still benefit from any help that the team care to give it.

EVANSTOWN

Population - 150 people (28 families)

Location - Low foothills of the Appalachians, off the main trade routes running along the Ohio.

Economic base - Central market place for surrounding agricultural area (roughly a day's walk/20 mile radius, containing something like 300 family farmsteads), trading agricultural products for services and manufactured goods brought up from the more advanced communities along the Ohio River.

Defenses - Earth & rubble wall, approx 10 feet high, with wall walk/firing step on inside. The one main gate turns through 90 degrees to prevent ramming attacks, getting a straight run at the wooden gates. Gates are normally open during the day, barred at night or when trouble shows.

Physical appearance - a few pre-war masonry buildings survive (roughly 5%, including the police station and a few houses), and about 20% of the houses and the old church are recognizably pre-war wood & drywall, often much modified over the years. The remaining 75% are post war wooden construction, though often using scavenged pre-war materials such as reclaimed windows.

Most were obviously carefully built by their occupants, and are of reasonable quality and well maintained

Security forces – All adults are on the watch roster. Two are on duty each night (one at the gate, one walking the wall walk), armed with their own weapons.

There is a part-time volunteer police force, run by the “chief” (currently Hank Morris), plus a half dozen deputies. They hold most of the towns’ modern firepower (Two M-16s, two pre-war pump shotguns and six revolvers, all with limited ammunition).

The town could raise a militia of about 40 people, mostly armed with KFS trade rifles and black powder shotguns. Weapon skills vary across a broad range with this group.

Government – There is no formal government. Issues affecting the whole town are thrashed out at a “town meeting” in the old church, where any citizen can speak. In the event of an attack, the chief of the police is in charge until the shooting stops.

The chief is elected by town meeting, and serves until asked to step down – Chief Morris is in his sixties, and has been chief as long as most people can remember. The chief appoints his own deputies.

Law & Order – Small matters are dealt with privately, or by the chief on an ad hoc basis. Appeals or trial for serious offenses are by town meeting.

The Police station has two cells, but imprisonment is rare – nobody wants to support criminals. The most likely punishment for people seen as beyond reform but not deserving execution is banishment.

Slavery is forbidden in town. Any suspected slavers are not admitted and asked firmly to “move along” out of the town’s hinterland.

Technology – Broadly early 19th century (Tech Level F), though the small size of the town means that it lacks the scale to support many specialists. It imports small amounts of late nineteenth century level goods via traders getting them from the Free State. There is no electricity or electrical devices in town.

Transport – The town has no powered vehicles, though most inhabitants have at least heard of them. Most farmsteads have at least one or two horses, and the town has a total of thirty horses and four wagons.

Religion – Most people have some Christian religious belief, and there is a Sunday service in the old church. There is no ordained minister, and the service is conducted by the head of one of a number of the local families, in rough rotation.

Education is generally poor, with literacy about 20%. This is concentrated among a few families who value reading, though most people can sign their name and do enough arithmetic to get by. What schooling there is happens at home, though one of the literate families teaches a few other people’s children, too. There are few books in town, all personal property.

Health & sanitation – There are a couple of women who usually act as midwives, and are competent at basic first aid, up to setting broken bones. Beyond that, you either go to the next big town, or hope you last until a travelling emdee makes his next rounds. The midwives know enough to boil things to sterilize them, but there are no real medicines available.

Basic public health such as digging latrines is fairly well understood, and the town water supply is kept clean as a priority.

IMPORTANT LOCATIONS

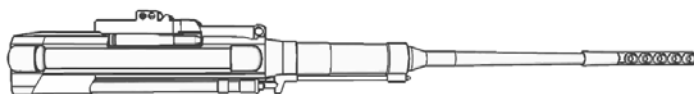
Evanston has few facilities beyond the very basics of a small agricultural community. People wanting more sophisticated goods need to go down to the river town, which serves five or six towns the size of Evanston.

WATERMILL & BAKE HOUSE

This is actually outside town, running off a fast-flowing stream. It is run by Bill Marchenko, and grinds the grain for most of the surrounding farmers. Marchenko’s prices are a constant gripe, but as he points out, if you don’t like them, you can grind your grain by hand. He also keeps the millpond stocked with catfish, which he sells in town.

TAVERN

The one inn is run by Richard Nixon and his wife Pat, who brews pretty good beer that’s practically a meal by itself, and keeps a still for moonshine. They do good if basic food, usually another plate or two of whatever the family is eating that evening. Mr Nixon has never heard of anyone else called Richard Nixon, and is likely to be offended if people make something out of it.



STORE

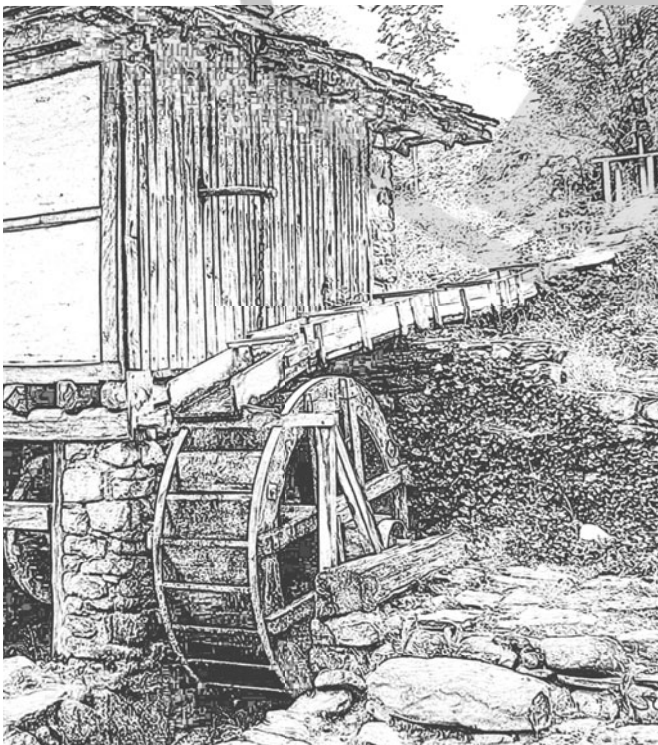
Run by Chief Morris' daughter Gwen. It holds a very limited stock of goods, bought on quarterly trading trips down to the river town. The stock is mainly small manufacturer items (needles, lanterns, cloth, gunpowder, flints & shot), plus a few luxuries like locally made jams. She also has a single trade rifle in stock, and will claim she can get most things (guns, sewing machines etc), provided you are willing to wait until she makes her next trip down to the river. Gwen opens when she's got customers – knock on the door when you want. She's also a good seamstress, and will make up clothes to order, as well as teaching Sunday school.

BLACKSMITH

Run by Bob Smith and his apprentice, Little Greg. (... who is a six foot five mountain of muscle. Local humor is basic). They mostly shoe horses and make or repair simple agricultural hand tools. They could theoretically make black powder rifles, but frankly, it doesn't make economic sense to compete on relatively complex work with the stuff coming up from the KFS.

CARPENTER

Most locals can do simple woodwork, but for big or complex things, like a wagon or the cogwheels for the mill, they go to Mick Garfelt. He is a master craftsman, and capable of doing everything from roof trusses to barrels and wagon wheels. The only downside is that he's universally agreed to be the most unsociable man in town, and has an unfortunate tendency to go on three-day benders.

**RUMOURS & SCENARIO HOOKS**

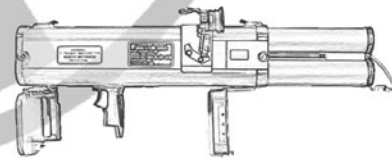
These are intended to flesh out conversations with the locals, and suggest things that the team might want to do. Notes for the PD are given afterward, in brackets.

Asking about "The War" gets very spotty answers about the "Death Years" – roughly what you'd get if you pulled an average American today off the street today and grilled them about the Mexican war of the 1840s. What memories people do preserve seem more connected with plague and starvation than nuclear strikes, at least up here in the foothills.

(True, there was little direct damage in this area, mostly restricted to bigger towns like Charleston.)

Most of the manufactured goods come up the Ohio, from the KFS. The big town on the river has a pretty firm stranglehold on the trade, though, and while you can go down there and try to get better prices, the people there aren't to be trusted. Three Evanstown men who went there to trade were murdered for their goods in a tavern there a few years back.

(True. The town by the river is several times larger than Evanstown, and has a higher level of technology, with intermittent electricity and some working vehicles. However, it is dominated by an often-fractionious cartel of six powerful families, who control most of the wealth and use their hired guards to deal with anyone who opposes them, usually by arranging for them to be killed or sold down the river to the KFS. Each of the six families have 20-40 guards and hired thugs with a mixture of weapons, but they are jealous of each other, and a clever team might be able to exploit this.)



There is a university someplace out west. That's where most of the Emdees round these parts train, and they produce some high-tech items that get out here via gypsy truckers.

(True. The University of Indiana has survived as an independent quasi city state, trading knowledge and technology for anything it can't produce locally. Most importantly, they can produce synthetic rubber tires for the gypsy truckers. While they could be very useful to the team, the trip would be a big undertaking, and the team would need a strong case for the university to divert resources from more local issues.)

Three small towns to the south of here are run by the Pagans. The Pagans used to be raiders, before they settled down, and now they hold the territory against all comers. Nothing goes through their lands without paying toll, and the locals have to pay a percentage of their crops. On the other hand, I hear that those towns haven't been raided in the years since the pagans took over either.

(True. The Pagans are the descendents of a motorcycle gang who have settled down to a something half way between the feudal system and a protection racket. Farmers in the area they rule are relatively heavily taxed, but Smart Bob, the Pagan's leader, is sensible enough to leave the farmers enough to live on, curb the worst excesses of his followers and make sure that merchants who pay the tolls are safe. A good number of townsfolk would be glad to see them gone, but at least as many more would need convincing that anyone else wouldn't be just as bad. The Pagans can muster about 10 well-armed core members, and 20-30 indifferently armed "prospects". They have horses, four ethanol-burning motorcycles and an old pickup mounting an ancient M-60 with very little ammo.)

This area gets raided by bandits from the hill country most winters. Towns are safe, more or less, but they'll take an outlying farm if they can, and travel isn't safe.

(Partly true. There have been some serious raids in bad winters, when the hill clans can't produce enough food to feed themselves, but this was desperation rather than malice. The most recent incident was actually the work of two local men, who killed a merchant and blamed it on hill clan raiders. The team should find that the problem is being blown out of proportion, and a smart team could probably deal with the problem without violence.)

Slavers come up river in the winter, from the Free State, and kidnap people to sell. We don't deal with them, but the town down by the river does. Maybe the Pagans do too.

(Partly true. Slavers definitely come up from the Free State, but they rarely kidnap people directly. One of the six families in the river town does organize occasional kidnapping raids, and the Pagans will sell any prisoners they take, or any locals who make trouble. Most of the slaves are farmers who've got into deep debt to one of the families, though, and had to sell themselves and their families or starve.)

You've heard about the Deadline? Well, right up in the hills, there's a line of trees, marked with skulls carved into their trunks. People who go past that line don't come back.

(True. The Deadline marks the territory of an isolationist anti-technological group, descended from a pre-war

Gaian commune. They believe that technology brought about the war, and anything above a late medieval level is intrinsically bad. Their gear is simple, but well made, and they have excellent woodcraft skills. The forest itself is laced with Punji pits and pitfall traps, while the locals are adept at firing one or two crossbow bolts, then disappearing back into cover; teams blundering into this could find themselves in real trouble. If the team does manage to make peaceful contact, they will find that the Gaians aren't stupid, and can argue cogently about the harms caused by technology, such as pollution and global warming. However, they are likely to remain convinced that the project's mission is fundamentally misguided, and may well work to actively oppose it.)

You say you're with the Morrow Project? I remember that there was a guy a few years ago who came through here looking for something called The Morrow Project.

(This is up to the PD whether it was a survivor from another Morrow team, a KFS agent hunting for the enemies of his government, or something else? Either way, it should interest the team, given that they can't contact Prime Base.



DETAILED CACHE LOCATIONS AND CONTENTS

Each cache contains the following, plus one set of special items to help communities the team encounters:

- Eight ration packs
- Two trade packs
- One case 5.56x45mm (1640rds)
- One case 5.56x45mm linked (1200rds)
- One case 9x19mm (2880rds)
- One case mixed 40mm grenades (36rds).
- One case (30) M67 fragmentation grenades
- One case (16) M7A3 CS gas grenades
- One case (16) AN-M8 smoke grenades
- Four M72A2 LAWs
- One M18A1 Claymore mine
- Two M183 demolition charges
- One case of M112 explosive charges
- A replacement set of coveralls, three replacement sets of underwear, replacement pair of boots and a replacement medkit per team member.
- Three 20kg plastic crates containing basic medical supplies, useful books etc for locals.
- Replacement parts for the team's gear – two spare tires for the V-150, spare bulbs, filters, batteries, two or three spare magazines etc.
- A "comfort pack" of small luxuries for the team (a case of beer, a case of soda, a box of Hershey bars or similar candy, and other small luxuries).
- Either a complete personal basic personal load, excluding weapons (i.e. rucksack and contents, PRC-68 radio etc) OR a spare personal weapon, plus basic load of ammo, OR a set of replacement electronic gear (PRC-70, AN/PVS-5 goggles & M9823 starlight scope).

The special items and current conditions of each of the caches are detailed below:

CACHE 1

Medical & school supplies; textbooks on medicine & public health, project surgical & drug kits, plastic crates of basic medical supplies, school-in-a-box kit.

It is buried under a fake USGS benchmark. The benchmark is a short concrete column, with a brass data plate attached to the top. The team will need to dig down several feet to find the cache, which is buried below the benchmark.

CACHE 2

Agricultural supplies; Textbooks on farming, hand tools, a plough that can be pulled by horse or the team vehicle, sealed plastic drums of seed, fertilizer etc).

It is buried under a USGS benchmark as above, on the edge of a field of grain. As the team start to dig, they see a small girl watching them. She runs as soon as she realizes that she has been spotted, but returns with her father, a farmer called Matt Grainger. He is cautious about the armed strangers, but not immediately hostile.

However, this is his land, has been for generations, and as far as he is concerned, anything under it belongs to him, too. He is willing to negotiate, but his initial assumption is that he's entitled to a 50% share of anything found on his land, and he will have to be bargained down from that. He has a single shot trade rifle and a bowie knife. He will retreat if threatened by a heavily armed group, but this will do the team's local reputation a great deal of harm.



CACHE 3

Tools & Tailoring gear; sets of carpentry, electrical and metalworking tools and instruction manuals, 2 treadle-powered sewing machines, bolts of cloth etc

This was buried below a USGS benchmark on a low bluff beside a river. However, 150 years of erosion have changed the course of the river, and flash floods five years ago washed the cache out into the stream-bed below. The cache is still intact, but lying on its side in the water (2ft deep in summer, 4 feet deep and fast flowing in the winter).

Someone has obviously tried to open it with a pickaxe at some point in the past, damaging the MPID reader in the hatch beyond repair, so the team will have to blow the door open. The cache contents are mostly intact. However, it will be difficult to extract the cache contents without getting them wet, as the cache will flood as soon as the team cracks the hatch, unless some form of dam is improvised.

CACHE 4

Light weapons for locals; 16 sets of basic webbing, twelve M-16 rifles, one MAG-58 machinegun, cleaning kits, ammunition etc.

This cache has been found and looted. Any cache marker that was present is now missing, leaving only a hole in the ground leading down into the cache itself. Soil trickling down from above has filled up the bottom six inches or so of the empty concrete box of the cache, along with some minor trash and the bones of a wild dog that fell in a few years ago.

If the PD feels that the team particularly needs the contents of this cache, he should feel free to change this so that the looted cache contained one of the other equipment sets.

CACHE 5

Vehicle supplies; tool kits, a complete set of common spares, replacement fusion pack, replacement PRC-70, AutoNav and M-2HB etc.

This is hidden in the graveyard of a rundown church in a ruined town. The gravestone is in the name of Bruce Morrow, with a date of death on the day the team was frozen. The epitaph reads "As I lie here, I put my hopes in the future". The team will need to dig down several feet to find the cache, which is buried beneath this grave and the equally fake grave next to it.

CACHE 6

Special Equipment; six cold kits, two mountain kits, drug kit & surgical kit, a spare PRC-70 radio, two electric chainsaws and two electric scout motorcycles.

This is buried near a war memorial in a park. The memorial is a granite obelisk, with an inscription chiseled into the front. It reads "They gave up their lives for a better world". The list of names starts with Bruce Morrow, followed by a list of the members of the team, listed as variously killed in WW2, Korea and Vietnam. When the team digs down, they will find a stainless steel plaque indicating that the cache is buried two feet behind the obelisk.



EPILOGUE

"Sir, we have to get you to Prime Base."

It was all but a droning noise to Bruce. This was the moment, the event he had planned for. The one he had resolved not to prevent...at least this time. The woman's hand was on his shoulder, trying to stir him into action. A gentle shake and he was supposed to lift up his head from his desk and ask for his jacket. He had seen this day was coming, had known that this woman would be in his room in the middle of the night attempting to wake him from his gin induced slumber. The missiles were launched, it was all over now. It was all in the hands of those with hope, not of one whose slumber was of self oblivion.

"Sir, the Helicopter is waiting. We have to go now sir...before it's too late."

There was the shake again. Her voice was distressed. She was scared. Even in these final moments he knew he must do something, if only to ease her mind. If she can be saved, then it might all have been worth it. No longer was it a question of the continued survival of the human race, but of the survival of just one. If he could directly save one life, then perhaps it was possible to save others.

"Please...sir...Mr. Morrow...Bruce...please."

He could make out her sobbing. It was already too late, he knew that. No Prime Base. No

cryo-sleep. This was not the way he saw himself when the end came. He would lift his head, smile, and offer words of comfort to the woman. She would cry with her head on his shoulder. This wasn't the way it was meant to happen. If he didn't lift his head now, then he was changing the future. His little act of defiance now could cost the Project any hope it had of success.

Damn you.

"Sir, you're awake."

He must have groaned that last thought.

Bruce opened his eyes. The office was still dark. A red light was flashing out in the corridor. A woman with tear soaked eyes was looking straight at him, crouched down by his side. He took her hand in his, mustering as much control of his body as he could, and then began to lift his head from the desk, his clammy flesh peeling away from the leather.

"Sir, will it all work?"

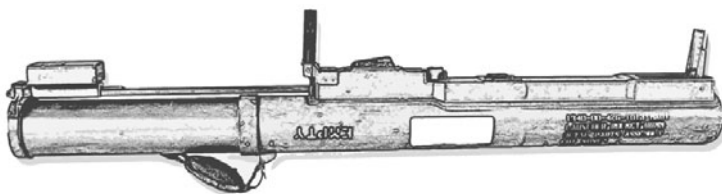
Good question. He turned his head towards the window, seeing the flashes of light off in the distance. There was only seconds to go now. He closed his eyes and concentrated. Then everything he knew was gone.



APPENDIX I

GLOSSARY OF TERMS & ABBREVIATIONS

AWA	Awareness, the measurement of a character's observation skills with all senses.	Kg	Kilogram, a measurement of weight equal to 2.2 lbs.
Av	Armor Value, a measurement of the relative protection of armor.	Km	Kilometer, a measurement of distance equal to 0.6 miles.
APC	Armored personnel carrier, a vehicle for carrying personnel safely.	m	Meter, a measurement of distance equal to 3.3 feet.
BP	Blood Points, a unit measuring the relative amount of blood that can be lost before death occurs.	MASS	A measure of weight used in-game.
Cal	Caliber, the size of a weapon's projectile.	MARS	Military Assistance, Rescue and Security, the military arm of the Project.
cm	Centimeter, a measurement of distance, equal to 0.4 inches.	MAX	Maximum, the upper limit.
CON	Constitution, the measurement of a character's hardiness and health.	MIN	Minimum, the lower limit. The closest distance a weapon can be used.
DEX	Dexterity, the measurement of a character's coordination and speed.	Mk	Mark, used to indicate the particular model of something.
DoF	Degrees of Failure	MPS	Morrow Project Security division.
DoS	Degrees of Success	n/a	Not applicable.
Dp	Damage point, a unit of inflicted damage, a negative SP.	NPC	Non-player Character, a character run by the GM or PD.
E	Efficiency, the measurement of the power of a projectile.	PACE	The number of meters a character can move per combat turn (3.6 seconds).
E-factor	Efficiency Factor of any given weapon. How much punch a weapon has.	PC	Player Character, a character run by the player.
Eff.	Effective, the best at which to use something.	PD	Project Designer, the coordinator and designer of a particular game.
Esper	Someone with psychic ability.	Rads	A unit of measurement for radiation.
EXP	Expression, the measure of a character's social skills.	REA	Reasoning.
FOC	Focus, the measurement of a character's mental discipline, courage, and determination.	Recon	Reconnaissance, a division of the Morrow Project.
GM	Game master, an alternative name for the PD.	RNG	Range.
HAAM	Hydraulically assisted armored man, a powered suit of armor.	SP	Structure point.
Ht	Height.	STR	Strength.
		Temp	Temperature.
		WP	White phosphorus.
		Wt	Weight.



APPENDIX II

COMMON METRIC CONVERSIONS

LENGTH:

The basic unit of length for the metric system is the Meter. For smaller units it is divided into decameter, centimeter, and millimeter. Each of these represents a factor of 10 making working with different units easy to convert. For larger distances a kilometer is used. The (kilo)-meter is 1000 meters.

Metric units:

Kilometer	1 km = 1000 m
meter	1 m = 10 dm
meter	1 m = 100 cm
meter	1 m = 1000 mm
decameter	1 dm = 10 cm
centimeter	1 cm = 10 mm

Conversion from and to US units:

From	Multiplied By	To
Inches	2.5400	Centimeters
Feet	0.3048	Meters
Yards	0.9144	Meters
Miles	1.6093	Kilometers
Centimeters	0.3937	Inches
Meters	3.2808	Feet
Meters	1.0936	Yards
Kilometers	0.6214	Miles

Example: Bill Faith's height is 182 cm. $182 \times 0.3937 = 71.65$ " Bill is about 5' 11½" tall.

TEMPERATURE:

The most commonly used metric temperature unit is a degree Celsius (some times called centigrade). This is based on the range of temperature between the freezing and boiling points of water. Freezing being 0 degrees and boiling being 100 degrees.



Conversion from and to US units:

From	Formula	To
Fahrenheit	$(F - 32) \times 5 \div 9$	Celsius
Celsius	$C \times 9 \div 5 + 32$	Fahrenheit

Example: Your post apocalyptic wine should be chilled to 59 degrees Fahrenheit. You don't want to get it wrong or the dinner party will be ruined. $59 - 32 = 27$, $27 \times 5 = 135$, $135 \div 9 = 15$! Serve the wine at 15 degrees Celsius.

VOLUME:

The metric system really shines when it comes to volume measurements.

From	Multiplied By	To
Cubic feet	0.0283	Cubic meters
Cubic yards	0.7646	Cubic meters
Gallons	3.7854	Liters
Quarts	0.9464	Liters
Pints	0.4732	Liters
Cups	236.588	Milliliters
Ounces	29.573	Milliliters
Cubic meters	35.3144	Cubic feet
Cubic meters	1.3079	Cubic yards
Liters	0.2642	Gallons
Liters	1.0568	Quarts
Liters	2.1136	Pints

Example: You open a very old cache and find 8 fifths of whiskey. Intending to trade this to a local merchant for food, you need to know how many liters you have. A fifth refers to 1/5 of a gallon. So you have 1.6 gallons. $1.6 \times 3.7854 = 6.05664$. You can confidently tell the merchant that you have 6 liters of fine whiskey.

WEIGHT:

Foot-pounds	1.3830	Newton-meters
Pounds	0.4536	Kilograms
Foot-pounds	1.3830	Newton-meters
Newton-meters	0.7380	Foot-pounds
Kilograms	2.2046	Pounds
Newton-meters	0.7380	Foot-pounds

Example: Bill Faith's Weight is 83kg. $83 \times 2.2046 = 182.9818$. So we can round Bill's weight to 183lbs.

APPENDIX III

ADAPTING 3RD EDITION CHARACTERS

For those who have characters from the 3rd edition, or PD's who wish to use NPC data published in earlier supplements and scenarios, here are rules for converting over to 4th edition:

Roll for MASS, or assume the default of 10.

CORE ABILITIES

As a general rule, core abilities have increased by 10 over their 3rd edition equivalent.

For STR, use the 3rd edition STR + the new MASS score.

For CON and DEX, use the 3rd edition scores, and add 10.

For AWA, new to 4th edition, use the ACC score +10. Or, if INT is used instead of ACC, then use LUCK + 10.

For REA use INT + 10, or, if that is not available, use LUCK + 10.

For FOC, use the PSI score and add 10.

For EXP, use CHA + 10.

From these new scores, rework the character's SP, BP & END using the 4th edition rules.

SKILLS

Skills in 3rd edition were represented purely as a percentage. You started out at 0%, and climbed up to 100%. In 4th edition the scale is slightly different. Core abilities are part of the equation. The Task Base counts for an average of 40% of that score. The Skill component is that level of expertise additional to that Task Base. Therefore, to accommodate this, there is a sliding scale between 3rd and 4th edition Skill values. In 4th edition the Task Base is separate.

For determining which skills a character should convert over to, identify the closest logical replacement. Consult your PD when a judgment call is needed. Some skills may be duplicated, either they are lost, or the PD may permit you to take the Training Points listed.

Also remember that certain skills will specialize at 0% or at 20%. 4th Edition Skill conversions of +25 or more may require 20 be on the root skill, and the remainder on one or more specialties.

3rd Edition Skill %	4th Edition Skill	Training Points
05-14	+0 [Trained]	3
15-24	+5	5
25-34	+10	10
35-44	+15	15
45-54	+20	20
55-64	+25	25
65-74	+30	30
75-84	+35	35
85-94	+40	40
95-100	+45	45

Using one of the Pre-Gen characters from the classic adventure 'Liberation At Riverton', we can see an example of a conversion:

Mike Dawson

St: 16, Cha: 17, Con: 12, PSI: 16, Dex: 15, Acc: 12, Luck: 13

End: 180, Sp: 292, Bp: 292, Move: 4

Because these sample characters were designed before the Skill system was added to the 3rd edition rules, we can assume Mike has a Rifle skill at 60%, and a Fast Talk at 85%.

4th edition:

STR: 26, CON: 22, DEX: 25, AWA: 22, REA: 23, FOC: 26, EXP: 27

MASS: 10, END: 22, Sp: 240, Bp: 240, Move: 6.

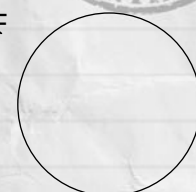
Firearms +20 = 64%

Rifle +5 = 69%

Persuade +20 = 74%

Intimidate +20 = 94%

Form 12-221: Morrow Project Operative Profile (Page 1)



Insert Branch Symbol

STR	CON	DEX	AWA	EXP	REA	FOC
23	23	20	24	16	20	24
46%	46%	40%	48%	32%	40%	48%

Mass:	10
Height:	182 _{cm}
Weight:	83 _{kg}

[illegible]

Volatility	.....%	.....	x1
Extroversion	.....%	.....	x2
Compassion	.....%	.....	x3
Discipline	%	Enc. Penalty	
Curiosity	%		

ENDURANCE

TRAINING POINTS

280

ENCUMBRANCE			
Light	13kg	Extreme	106kg
Medium	26kg	Max	147kg
Heavy	53kg	Total	

HISTORY/EDUCATION

Bill met Susan in college. He dropped out after two years, and became a paramedic. After completing his training, Bill gained valuable expertise on the street and with an aero-medical retrieval service.

WOUNDS/FLAWS

A black and white line drawing of a man's head and shoulders. He is wearing a U.S. Army uniform jacket with a name tag that reads "U.S. ARMY". The drawing is framed by a thick black border with the text "PORTRAIT/BUST" at the top.

SKILLS

[illegible]

HIT LOCATIONS

D100	Location	AV	SP's	Wounds
01-06	Head	.....	.....	.....
07-08	Neck	.....	.....	.....
09-10	Right Shoulder	.....	.....	.....
11-13	Right Upper Arm	.....	.....	.....
14	Right Elbow	.....	.....	.....
15-17	Right Forearm	.....	.....	.....
18	Right Wrist	.....	.....	.....
19-20	Right Hand	.....	.....	.....
21-22	Left Shoulder	.....	.....	.....
23-25	Left Upper Arm	.....	.....	.....
26	Left Elbow	.....	.....	.....
27-29	Left Forearm	.....	.....	.....
30	Left Wrist	.....	.....	.....
31-32	Left hand	.....	.....	.....
33-39	Upper Right Torso	.....	.....	.....
40-47	Upper Left Torso	.....	.....	.....
48-55	Torso	.....	.....	.....
56-62	Abdomen	.....	.....	.....
63-64	Groin	.....	.....	.....
65-66	Right Hip	.....	.....	.....
67-72	Right Thigh	.....	.....	.....
73	Right Knee	.....	.....	.....
74-78	Right Calf	.....	.....	.....
79	Right Ankle	.....	.....	.....
80-82	Right Foot	.....	.....	.....
83-84	Left Hip	.....	.....	.....
85-90	left Thigh	.....	.....	.....
91	Left Knee	.....	.....	.....
92-96	Left Calf	.....	.....	.....
97	Left Ankle	.....	.....	.....
98-00	Left Foot	.....	.....	.....

STRUCTURE POINTS

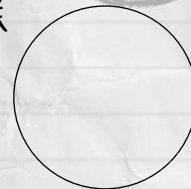
230

BLOOD POINTS

230



Form 12-221: Morrow Project Operative Profile (Page 1)



Insert Branch Symbol

STR	CON	DEX	AWA	EXP	REA	FOC
26	21	24	21	16	17	19
52%	42%	48%	42%	32%	34%	38%

Mass:	10
Height:	178cm
Weight:	86kg



SKILLS

[illegible]

HIT LOCATIONS

D100	Location	AV	SP's	Wounds
01-06	Head	.....	.....	.....
07-08	Neck	.....	.....	.....
09-10	Right Shoulder	.....	.....	.....
11-13	Right Upper Arm	.....	.....	.....
14	Right Elbow	.....	.....	.....
15-17	Right Forearm	.....	.....	.....
18	Right Wrist	.....	.....	.....
19-20	Right Hand	.....	.....	.....
21-22	Left Shoulder	.....	.....	.....
23-25	Left Upper Arm	.....	.....	.....
26	Left Elbow	.....	.....	.....
27-29	Left Forearm	.....	.....	.....
30	Left Wrist	.....	.....	.....
31-32	Left hand	.....	.....	.....
33-39	Upper Right Torso	.....	.....	.....
40-47	Upper Left Torso	.....	.....	.....
48-55	Torso	.....	.....	.....
56-62	Abdomen	.....	.....	.....
63-64	Groin	.....	.....	.....
65-66	Right Hip	.....	.....	.....
67-72	Right Thigh	.....	.....	.....
73	Right Knee	.....	.....	.....
74-78	Right Calf	.....	.....	.....
79	Right Ankle	.....	.....	.....
80-82	Right Foot	.....	.....	.....
83-84	Left Hip	.....	.....	.....
85-90	left Thigh	.....	.....	.....
91	Left Knee	.....	.....	.....
92-96	Left Calf	.....	.....	.....
97	Left Ankle	.....	.....	.....
98-00	Left Foot	.....	.....	.....

STRUCTURE POINTS

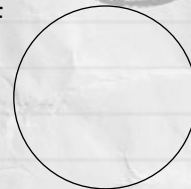
235

BLOOD POINTS

235



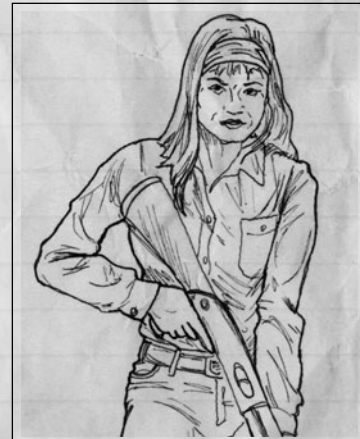
Form 12-221: Morrow Project Operative Profile (Page 1)



Insert Branch Symbol

STR	CON	DEX	AWA	EXP	REA	FOC
20	25	23	19	19	21	24
40%	50%	46%	38%	38%	42%	48%

Mass:	9
Height:	168cm
Weight:	64kg



SKILLS

[illegible]

HIT LOCATIONS

D100	Location	AV	SP's	Wounds
01-06	Head	.....	.....	.....
07-08	Neck	.....	.....	.....
09-10	Right Shoulder	.....	.....	.....
11-13	Right Upper Arm	.....	.....	.....
14	Right Elbow	.....	.....	.....
15-17	Right Forearm	.....	.....	.....
18	Right Wrist	.....	.....	.....
19-20	Right Hand	.....	.....	.....
21-22	Left Shoulder	.....	.....	.....
23-25	Left Upper Arm	.....	.....	.....
26	Left Elbow	.....	.....	.....
27-29	Left Forearm	.....	.....	.....
30	Left Wrist	.....	.....	.....
31-32	Left hand	.....	.....	.....
33-39	Upper Right Torso	.....	.....	.....
40-47	Upper Left Torso	.....	.....	.....
48-55	Torso	.....	.....	.....
56-62	Abdomen	.....	.....	.....
63-64	Groin	.....	.....	.....
65-66	Right Hip	.....	.....	.....
67-72	Right Thigh	.....	.....	.....
73	Right Knee	.....	.....	.....
74-78	Right Calf	.....	.....	.....
79	Right Ankle	.....	.....	.....
80-82	Right Foot	.....	.....	.....
83-84	Left Hip	.....	.....	.....
85-90	left Thigh	.....	.....	.....
91	Left Knee	.....	.....	.....
92-96	Left Calf	.....	.....	.....
97	Left Ankle	.....	.....	.....
98-00	Left Foot	.....	.....	.....

STRUCTURE POINTS

202

BLOOD POINTS

202



Name: Lauren Coleman

Form 12-221: Morrow Project Operative Profile (Page 1)

PERSONAL DETAILS

Assignment: Team Leader and Contact Specialist

Hair Color:

Eye Color:

Handed: L / R

Description/Distinguishing Marks

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Blood Type: O+

Ethnicity:

Age / Gender: 35 ~~M~~ / F

Branch:

Team / Role:

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Insert Branch Symbol

CORE ABILITIES

Core Abilities

Score

Task Base %

STR	CON	DEX	AWA	EXP	REA	FOC
14	16	22	20	26	21	25
28%	32%	44%	40%	52%	42%	50%

Mass: 9

Height: 170cm

Weight: 58kg

EQUIPMENT

Equipment Worn/Carried KG

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PERSONALITY TRAITS

Volatility % x1

Extroversion % x2

Compassion % x3

Discipline %

Curiosity %

ENDURANCE

16

MOVEMENT

..... x1

..... x2

..... x3

Enc. Penalty

.....

TRAINING POINTS

300

HISTORY/EDUCATION

Lauren majored in Finance before obtaining her J.D. She worked as a logistician for an aid agency in Central America prior to her postgraduate legal studies. After gaining her qualification, Lauren worked in immigration law before joining the Project.

WOUNDS/FLAWS

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PORTRAIT/BUST



ENCUMBRANCE

Light 5kg Extreme 40kg

Medium 10kg Max 68kg

Heavy 20kg Total

RADIATION EXPOSURE

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SKILLS

[illegible]

HIT LOCATIONS

D100	Location	AV	SP's	Wounds
01-06	Head			
07-08	Neck			
09-10	Right Shoulder	.....	.....	.....
11-13	Right Upper Arm	.....	.....	.....
14	Right Elbow	.....	.....	.....
15-17	Right Forearm	.....	.....	.....
18	Right Wrist	.....	.....	.....
19-20	Right Hand	.....	.....	.....
21-22	Left Shoulder	.....	.....	.....
23-25	Left Upper Arm	.....	.....	.....
26	Left Elbow	.....	.....	.....
27-29	Left Forearm	.....	.....	.....
30	Left Wrist	.....	.....	.....
31-32	Left hand	.....	.....	.....
33-39	Upper Right Torso	.....	.....	.....
40-47	Upper Left Torso	.....	.....	.....
48-55	Torso	.....	.....	.....
56-62	Abdomen	.....	.....	.....
63-64	Groin	.....	.....	.....
65-66	Right Hip	.....	.....	.....
67-72	Right Thigh	.....	.....	.....
73	Right Knee	.....	.....	.....
74-78	Right Calf	.....	.....	.....
79	Right Ankle	.....	.....	.....
80-82	Right Foot	.....	.....	.....
83-84	Left Hip	.....	.....	.....
85-90	left Thigh	.....	.....	.....
91	Left Knee	.....	.....	.....
92-96	Left Calf	.....	.....	.....
97	Left Ankle	.....	.....	.....
98-00	Left Foot	.....	.....	.....

STRUCTURE POINTS

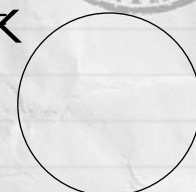
135

BLOOD POINTS

135



Form 12-221: Morrow Project Operative Profile (Page 1)



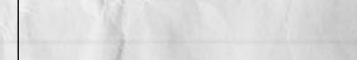
Insert Branch Symbol

STR	CON	DEX	AWA	EXP	REA	FOC
20	20	24	24	20	25	26
40%	40%	48%	48%	40%	50%	52%

Mass:	10
Height:	182cm
Weight:	80kg

PERSONALITY TRAITS		MOVEMENT	
Volatility	..... %	.....	x1
Extroversion	..... %	.....	x2
Compassion	..... %	.....	x3
Discipline	 %	Enc. Penalty	
Curiosity	 %		

ENDURANCE	TRAINING POINTS
20	323

HISTORY/EDUCATION	WOUNDS/FLAWS
Mike obtained a degree in Electrical Engineering and went on to serve in the Army Corps of Engineers. He is the team mechanic and resident genius. Not quite a MacGyver...but close...	
	PORTRAIT/BUST

A black and white sketch of a man in a U.S. Army uniform, looking serious. The sketch is on the right side of a lined notebook page. The man has short, curly hair and a stern expression. He is wearing a U.S. Army flight suit or jumpsuit with a "U.S. ARMY" patch on the chest. The background of the sketch is a crumpled paper texture. The left side of the image shows the lined paper of the notebook.

SKILLS

[illegible]

HIT LOCATIONS

D100	Location	AV	SP's	Wounds
01-06	Head	.....	.....	.....
07-08	Neck	.....	.....	.....
09-10	Right Shoulder	.....	.....	.....
11-13	Right Upper Arm	.....	.....	.....
14	Right Elbow	.....	.....	.....
15-17	Right Forearm	.....	.....	.....
18	Right Wrist	.....	.....	.....
19-20	Right Hand	.....	.....	.....
21-22	Left Shoulder	.....	.....	.....
23-25	Left Upper Arm	.....	.....	.....
26	Left Elbow	.....	.....	.....
27-29	Left Forearm	.....	.....	.....
30	Left Wrist	.....	.....	.....
31-32	Left hand	.....	.....	.....
33-39	Upper Right Torso	.....	.....	.....
40-47	Upper Left Torso	.....	.....	.....
48-55	Torso	.....	.....	.....
56-62	Abdomen	.....	.....	.....
63-64	Groin	.....	.....	.....
65-66	Right Hip	.....	.....	.....
67-72	Right Thigh	.....	.....	.....
73	Right Knee	.....	.....	.....
74-78	Right Calf	.....	.....	.....
79	Right Ankle	.....	.....	.....
80-82	Right Foot	.....	.....	.....
83-84	Left Hip	.....	.....	.....
85-90	left Thigh	.....	.....	.....
91	Left Knee	.....	.....	.....
92-96	Left Calf	.....	.....	.....
97	Left Ankle	.....	.....	.....
98-00	Left Foot	.....	.....	.....

STRUCTURE POINTS

200

BLOOD POINTS

200



Name: Susan Faith

Form 12-221: Morrow Project Operative Profile (Page 1)



PERSONAL DETAILS

Assignment: Contact Specialist

Hair Color:

Eye Color:

Handed: L / R

Description/Distinguishing Marks

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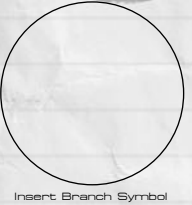
Blood Type: A+

Ethnicity:

Age / Gender: 29 ☒ / F

Branch:

Team / Role:



Insert Branch Symbol

ERA/FREEZE DATE

ACTIONS

3

CORE ABILITIES

Core Abilities

Score

Task Base %

STR	CON	DEX	AWA	EXP	REA	FOC
18	18	21	28	20	19	24
36%	36%	42%	56%	40%	38%	48%

Mass:	<u>9</u>
Height:	<u>159cm</u>
Weight:	<u>62kg</u>

EQUIPMENT

Equipment Worn/Carried KG

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PERSONALITY TRAITS

Volatility % x1

Extroversion % x2

Compassion % x3

Discipline %

Curiosity %

MOVEMENT

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Enc. Penalty

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ENDURANCE

18

TRAINING POINTS

273

HISTORY/EDUCATION

Susan completed a BA majoring in Psychology. She worked as a newspaper journalist before joining the Project, and is an avid photographer, swimmer and a green belt in taekwondo.

WOUNDS/FLAWS

PORTRAIT/BUST



ENCUMBRANCE

Light 8kg Extreme 69kg

Medium 17kg Max 100kg

Heavy 34kg Total

RADIATION EXPOSURE

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Name:



PERSONAL DETAILS

Assignment:

Hair Color:

Eye Color:

Handed: L / R

Description/Distinguishing Marks

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.....

Blood Type:

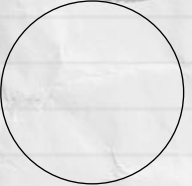
Ethnicity:

Age / Gender: M / F

Branch:

Team / Role:

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Insert Branch Symbol

ERA/FREEZE DATE

ACTIONS

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CORE ABILITIES

Core Abilities

Score

Task Base %

STR	CON	DEX	AWA	EXP	REA	FOC

Mass:

Height:

Weight:

EQUIPMENT

Equipment

Worn/Carried KG

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ENCUMBRANCE

Light Extreme

Medium Max

Heavy Total

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RADIATION EXPOSURE

.....

PERSONALITY TRAITS

Volatility %

Extroversion %

Compassion %

Discipline %

Curiosity %

ENDURANCE

MOVEMENT

..... x1

..... x2

..... x3

Enc. Penalty

.....

TRAINING POINTS

HISTORY/EDUCATION

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WOUNDS/FLAWS

PORTRAIT/BUST

[illegible]

01-06	Head		
07-08	Neck		
09-10	Right Shoulder		
11-13	Right Upper Arm		
14	Right Elbow		
15-17	Right Forearm		
18	Right Wrist		
19-20	Right Hand		
21-22	Left Shoulder		
23-25	Left Upper Arm		
26	Left Elbow		
27-29	Left Forearm		
30	Left Wrist		
31-32	Left hand		
33-39	Upper Right Torso		
40-47	Upper Left Torso		
48-55	Torso		
56-62	Abdomen		
63-64	Groin		
65-66	Right Hip		
67-72	Right Thigh		
73	Right Knee		
74-78	Right Calf		
79	Right Ankle		
80-82	Right Foot		
83-84	Left Hip		
85-90	left Thigh		
91	Left Knee		
92-96	Left Calf		
97	Left Ankle		
98-00	Left Foot		

BLOOD POINTS

