MEGATRAVELLER™

0216

COACC

CLOSE ORBIT AND AIRSPACE CONTROL COMMAND

Terry McInnes

Science-Fiction Adventure in the Shattered Imperium

AIRCRAFT AND FLYERS FOR MEGATRAVELLER

GDW

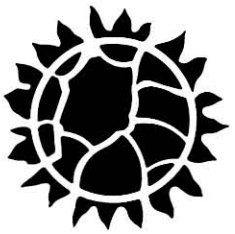
Terry McInnes

MEGATRAVELLER™

COACC

CLOSE ORBIT AND AIRSPACE CONTROL COMMAND

Science-Fiction Role-Playing
in the Shattered Imperium



GDW

Credits

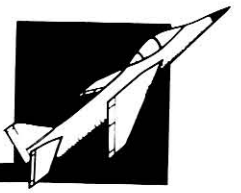
Design	Terry McInnes
Additional Design	Marc W. Miller
Cover Illustration	A. C. Farley
Interior Illustrations	A. C. Farley, Bryan Gibson
Art Direction	Mark E. Fisher
Text Manager	Michelle Sturgeon
Text Processing	Julia Martin, Julie Amdor, David Stephens

MegaTraveller
COACC

ISBN 0-943580-72-2
1 2 3 4 5 6 7 8 9

PO Box 1646
Bloomington, IL 61702-1646
USA

Table of Contents



Somewhere on the ridge ahead the rebels have dug in. You've had tough tickets before, but this assignment is one of nastiest ever.

The keening whine of incoming mortars scatters the troops as rounds hit all around. Your people fire back without much luck. Cries for "Medic!" tell you of casualties.

The powers that be have planned for this eventuality. A dark shape circles in the sky. Your commo man flips the channel selector to the FA's frequency.

"Misty, Beta 6 Actual requesting air strike, coordinates Alpha Delta Gamma Delta two one three four zero eight. Rebel infantry in the tree line 300 meters northwest of the streambed, over."

"Beta 6, Misty," the FAC circling above replies, "I have two birds inbound with high-drag and napalm. I see the target's muzzle flashes."

Misty, a light attack aircraft on FAC duty, swoops straight at the tree line. Smoke rockets streak forward, exploding in white streamers on top of the muzzle flashes.

Misty pulls out of his dive with the arrival of two medium attack jets. They begin beating up the tree line with their autocannons. Six black shapes separate from each aircraft; the jets jerk upward. In seconds, the tree line dissolves in ground-shaking blasts. Fragments of bomb casings whiz overhead at this close range. The two jets circle back and start another run, this time shallower and even lower. More shapes separate and tumble to the ground. Liquid fire splashes across the turf.

In the sudden quiet, you note there is no more incoming fire.

"Misty from Beta 6, check fire. That's got 'em. We're moving up."

A couple of minutes later, your company reaches what's left of the tree line: craters, burning pools of fire, charred stumps, cooked meat. You feel glad the rebels don't have air support.

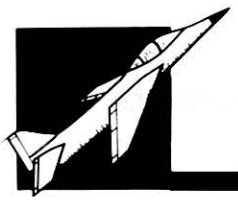
MEGATRAVELLER™

C O A C C

CLOSE ORBIT AND AIRSPACE CONTROL COMMAND

Control of the air is the technological equivalent of the first law of warfare: Control the high ground. High ground gives more advantages than can be numbered easily: It provides better vision, and is harder to hit, easier to defend, and easier to attack from. Castles are built on hilltops, not in canyons.

The Close Orbit and Airspace Control Command is the force that modern military organizations in the Imperium use to control the high ground. COACC is the air force and the space force that conducts reconnaissance, bombing, and ground-attack missions against enemy military forces on the ground, and strives to keep those enemy forces from doing the same in return.



The Origins of COACC

Armed forces exist to allow nations to wage war. All nations need them, if only to defend themselves against the aggression of a few nations with expansionist tendencies. For humans and most intelligent races, the first armed force was the army, which existed as a band of armed individuals who moved from place to place on foot. The army's territorial responsibility is dry land. For some sea-dwellers the first armed force was the navy, which existed as a band of armed individuals who swam from place to place. The navy's territorial responsibility is the sea. And for some winged flying creatures, the first armed force was the air force, which existed as a band of armed individuals who flew from place to place. The air force's territorial responsibility is the atmosphere. As technological level increases further and a culture reaches space, it is natural that a space force be established and given responsibility for military operations in space.

Notice that, because Anglic is a human language, it has distinct words for land military force (army) and sea military force (navy), but must use a coined word for air military force (air force). The language of a desert world's people probably includes no word for navy; the language of a water world's people probably has no word for army; and the language of a flying people probably includes a specific word for air force.

The march of technology eventually provides any civilization with the ability to establish and operate the armed forces which it does not initially have. Sea-dwellers and flyers soon find a need for, and establish, an army to patrol and control dry land. Cultures that use the sea for transportation need a navy to protect and control the seas. And all cultures which reach a technological level that allows them to venture into the air soon find a need to establish an air force.

EARLY AIR FORCES

Air forces originated historically for most cultures as a part of planetary armies or wet navies. The first military and naval use of aircraft has nearly always been for scouting and such unarmed chores as artillery spotting. The very earliest military aircraft, including fixed balloons, have been attached to various branches of the army, including the artillery, the cavalry (because of its scouting duties), and even in the case of a major nation on Terra, the signal corps!

The first armament that aircraft carried was restricted to small arms such as rifles and pistols, brought along when opposing pilots thought it might be a good idea to do something more offensive than wave at a passing enemy aircraft. In at least one early battle, historians report that pilots fought air-to-air combat with thrown bricks!

The first military aircraft are lighter-than-air vehicles: that class of aircraft which includes tethered balloons, dirigibles, and blimps. The latter two are used as long-range scouts and crude bombers on many primitive worlds. They are particularly valued as naval scouts and form the first component of the air arm of many a wet navy's fleet.

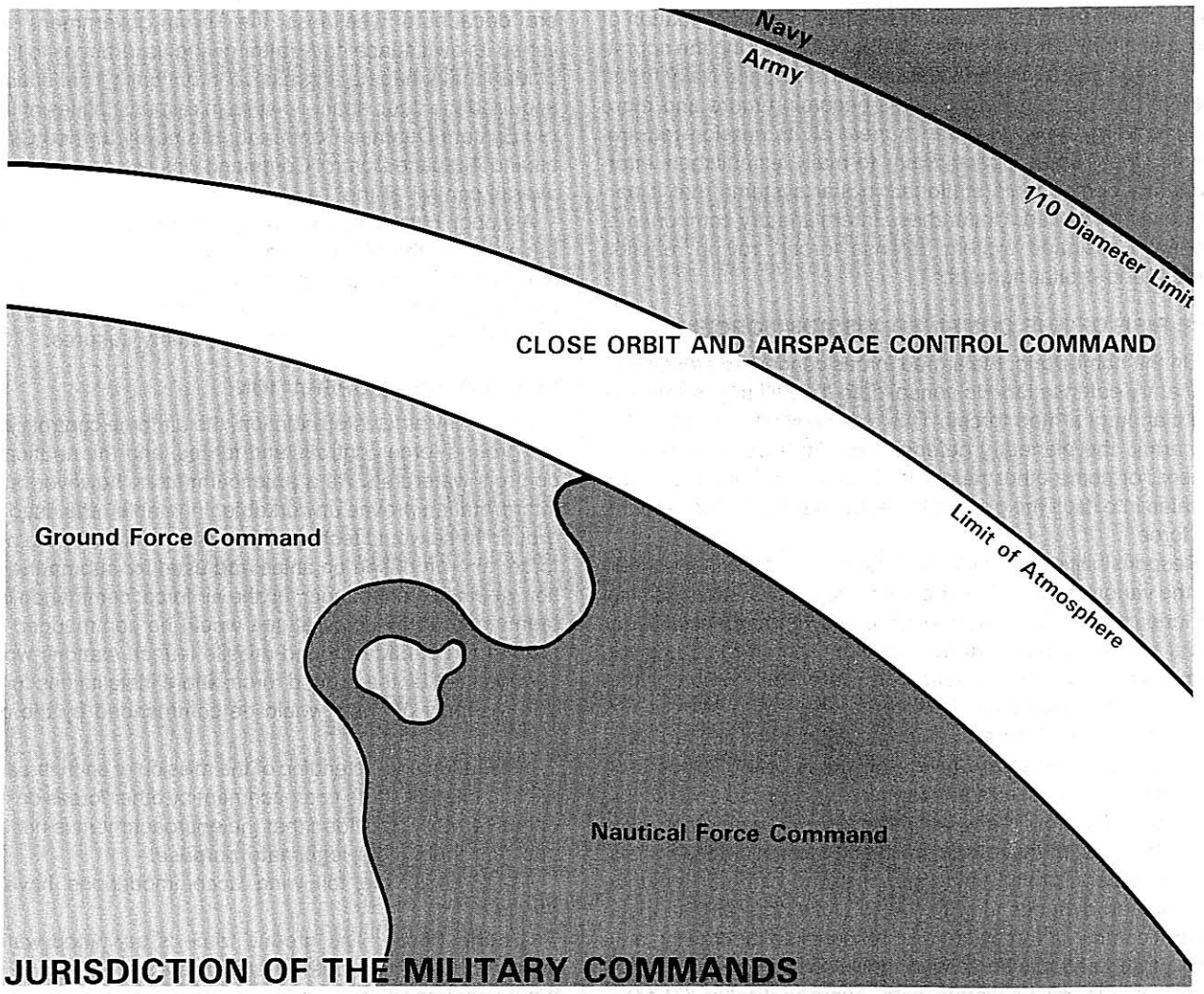
Gliders are also found as precursors to air power on primitive worlds, particularly those with dense atmospheres. They have been used as one-way attack aircraft, and larger versions have provided troop and cargo transport. Some gigantic examples have been constructed to carry armored fighting vehicles into combat.

As power plants became more efficient, aircraft designers built heavier-than-air vehicles that could carry heavier and increasingly sophisticated armament. Primitive machineguns soon replaced rifles and pistols at TL5, and the first fighters were born. Bundles of explosives were placed in steel or other metal cases, and the first bombers designed to deliver these deadly packages were developed.

With the rise of these more efficient, purpose-built aircraft came the independent air forces—some organized almost immediately after fighters and bombers were first built, others only after technology had advanced several levels. Organizationally, the rise of independent air forces has been resisted by the existing armed forces. An independent air force reduces the budget expenditure for the already existing army or navy, and an independent air force soon develops its own priorities, which may not be in line with the priorities of the army or navy. In one historic case, a major nation's independent air force was not organized until it had developed TL6 jet aircraft!

Air forces remain independent and assume new duties as technology advances. Air forces tend to take a major role in the development of the first rockets and, as spaceflight develops, become major developers and users of hypersonic orbital fighters and spacecraft.

The Lastenti: Troolian is a water world blessed with a very dense atmosphere, gentle climate, and an intelligent race of flyers (the Lastenti) living high in the clouds, forever gliding on broad, feathered wings. The first armed force of the Lastenti was the *aashiat* (roughly translated as "air force") which consisted of armed bands of Lastenti organized to protect the soaring flocks from rival flocks. At initial technological levels, the *aashiat* made use of fishbone spears and darts. Doctrinally, forces developed the tactics of the high ground and made use of altitude advantage to drop bone darts on adversaries. Individuals were trained for single combat against enemy forces, and these individuals refined the dogfight to a fine art. Various cultures of the Lastenti emphasized various doctrines. Some concentrated on lighter-than-air technology to hold military supplies near their flocks; the technology proved useful to them



commercially as well. Some Lastenti concentrated on the sea surface, eventually building ships from which they conducted large-scale fishing operations. Naturally enough, the operation of ships led to the establishment of a wet navy, naval tactics, and (quite early) antiair doctrine.

The Staln: Drist is a desert world characterized by many stark, young mountain ranges and extensive volcanic action. Its native intelligent race (the Staln) evolved from flyers adapted to Drist's steep mountain chasms. The first armed force of the Staln was the *tristaln* (roughly translated as "flying armed men"). Originally, military tactics involved a lot of swooping—from cave mouths down on enemies and from the sky down on cave mouths. Later, the evolution of tactics produced the organized military unit armed with spears, bows and arrows, and feathered deadfall darts. Flying creatures, domesticated as riding beasts, were adapted to a kind of flying cavalry used for scouting and shock actions. Ultimately, a surface army was organized to defend overland shipments of goods too heavy to carry by air. Large overland shipments eventually led to riverine and ocean navies to defend water shipments of goods too heavy to efficiently ship overland.

EARLY SPACE FORCES

Eventually, many worlds develop their technology to the point that they can reach space. The responsibility for space exploration and operations initially belongs to the already existing air force. The natural tendency is for any space force to claim as its responsibility all operations in space. Until the development of jump drive, no one contradicts this claim.

But once jump drive is attained and all the stars become accessible, a further distinction of armed forces becomes necessary. The navy becomes an interstellar force, and responsibility for local space operations near the homeworld is assigned to the close orbit and airspace control command. As technology and experience progress, the distinction between interstellar, interplanetary, and local space forces becomes greater and greater. Ultimately, close orbit responsibilities become part of the local air force mission.

The Terran Space Force: When Terran nations first reached space, the responsibility for operations in space was given to the various national air forces. As a greater presence was placed in orbit and then on the moon, many nations established

independent space forces to handle the responsibilities.

The creation of the Terran Confederation in response to clashes with the First Imperium resulted in a consolidation of the space forces into a Terran Space Navy. During the course of the various interstellar wars, the Terran Space Navy found that, to pursue its mission, it was becoming more and more an interstellar navy. In order to meet all its mission requirements, the Terran Space Navy formally established interplanetary components stationed in star systems that it permanently controlled. Under these interplanetary components, the navy assigned system defense forces, roving reaction forces, and orbital fighters.

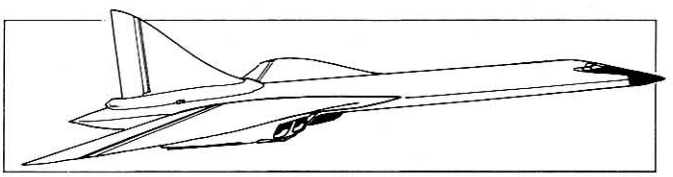
THE RISE OF THE COMBINED MISSION FORCE

On the homeworld, the armed forces concerned strictly with planetary defense tend to consolidate to fulfill this mission as the planetary armed forces. This organization may be called the army, the planetary defense force, the world armed defenses, or some other name. In all cases, however, it incorporates into itself the ground force, the nautical force, and the air force.

Responsibilities for various missions are carefully defined for the various forces. The ground force is given responsibility for land combat. The nautical force is given responsibility for naval surface and subsurface combat. The air force is given responsibility for atmospheric and close orbit combat within one-tenth of a planetary diameter.

The air forces which evolve into close orbit and airspace control command forces are given the broad role of close orbit defense, as well as intra-atmosphere air defense and tactical air support for ground and wet naval forces. Technology gives them the tools for these jobs, including system defense boats, orbital fighters, orbital battle stations, and high-performance gravitic and dynamic aircraft. Many close orbit and airspace control command forces are also responsible for crewing anti-aircraft and antispacecraft gun, missile, and energy weapon batteries. On many worlds with Average Stellar (TL11)+ technology, COACC personnel crew deep meson gun planetary defense installations far beneath the planetary surface.

Terran COACC: By the end of the interstellar wars, the Terran Space Navy was almost exclusively concerned with interstellar operations. Its interplanetary components were clearly stepchildren—not on the fast promotion career track and not the flashy services that attracted high-quality personnel. Responsibility for the defense of Terra was vested with the Terran System Defense Command. Once the Rule of Man was established, Terra effectively lost its space navy and its ability to project power on an interstellar basis. Although the Rule of Man was clearly not a threat to Terra, it was also clearly not a dependable ally and friend. The Terran System Defense Command assumed responsibility for atmospheric and orbital operations, as well as for roving in-system reaction forces and system defense boat operations. Deep space operations and close orbit operations were clearly two different responsibilities, with different goals and different equipment needs. After several decades of weakness, the Terran government reestablished its own space navy (after giving assurances to the Rule of Man that it had no aggressive intentions). That space navy acquired the deep space in-system responsibilities of the Terran System Defense Command; the newly formed Close Orbit and Airspace Control Command was established under the overall control of the Terran Army.



Although current Imperial usage clearly derives from the Terran example, the division of responsibility that places close orbit and airspace control under a single command answering to the overall command of the army was a logical evolution that has been repeatedly arrived at by many cultures.

INTERFORCE COOPERATION

Under any strict interpretation, the air force controls aircraft, the ground force controls land forces, and the nautical force controls watercraft. As a practical matter, however, such an interpretation proves unworkable. Inflatable rafts used by the ground force would technically be commanded by the nautical force; aircraft based on ships and used for submarine detection would be commanded by the air force; commando landing teams carried by ships at sea would be commanded by the ground force; underground missile launch stations would be commanded by the ground force; shore installations for repair and resupply of ships would be commanded by the ground force.

Instead, an understanding of the mission of each force allows each to tolerate some encroachment by other forces on its supposed territory, provided that the encroachment is not blatant and that it serves a legitimate purpose.

As a result, the following accommodations have been reached.

Ground Force: The ground force is permitted watercraft which enable it to cross water barriers between land areas. It may command craft which travel through the air within approximately 10,000 meters of a planet's surface, provided they operate in direct support of ground forces.

Nautical Force: The nautical force is permitted shore installations which provide harbor or docking for watercraft. It may use small units of troops for shore installation security and for commando landing operations. It may operate aircraft which are based on ships and which directly support and protect those ships.

Air Force: The air force is permitted land installations which provide basing, support, and maintenance for aircraft and missiles. It may command small units of troops for air base security, but commando landing operations (paratroopers) are ground force personnel. It is permitted aircraft which can land on water (seaplanes and amphibious craft) and small watercraft which can service them.

Orbital Force: The orbital force is permitted land installations which provide basing, support, and maintenance for orbital craft launch and recovery. It may command small units of troops for base security; it is permitted aircraft and watercraft for support of orbital operations.

Disagreements are adjudicated by the upper level military command having control of the several forces.

READING AIRCRAFT SPECIFICATIONS

Reading an aircraft specification is an easy task. Use the following format to help understand the process.

CRAFT NAME (TECH LEVEL) AIRCRAFT TYPE

CraftID: Aircraft Type or Description, TLN (N = tech level at which the aircraft was constructed), MCrX (X = cost of aircraft).

Hull: AA/BBB (AA = inoperative damage points; BBB = destroyed damage points), Displacement = CC (CC = displacement tons), Weight Loaded = DD tons, Airframe = airframe type, Armor = armor level and locations.

Power: E Mw (E = power available for systems on the aircraft, Endurance = FF hours (FF = hours of flight before refueling is required).

Loco: G/H (for each engine: G = inoperative damage points; H = destroyed damage points), Engine Type, Thrust = J tons, Cruise = KK kph (KK = cruising speed in kph = 75% of Top Speed), Top = LL kph (LL = Top speed in kph).

Commo: List available commo equipment.

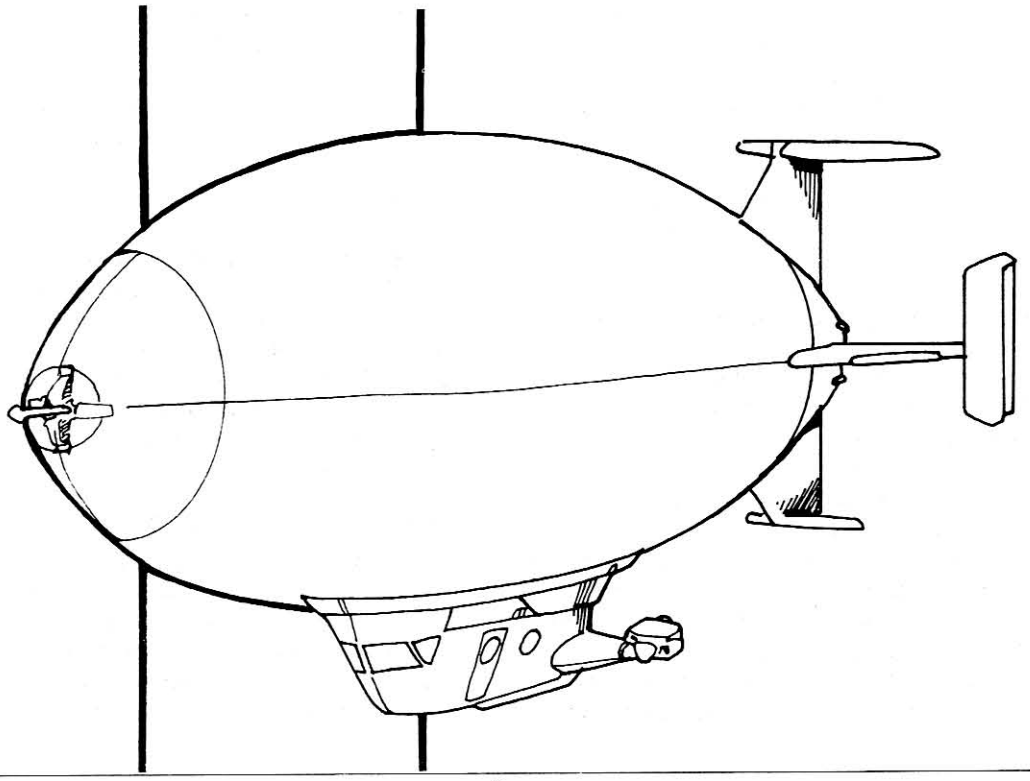
Sensors: List available sensor equipment.

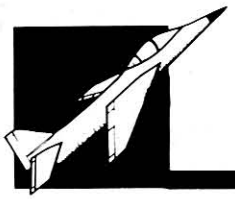
Off: List available offensive weapons.

Control: Indicate controls installed.

Accom: Crew = M (M = number of crewmembers; list all positions). Indicate all crew stations.

Other: List fuel tankage, cargo space, and other details. Indicate any special comments.





Military Control of Atmosphere

The Imperium organizes its armed forces into the navy (responsible for control of interstellar and interplanetary space) and the army (responsible for control of worlds). The army is further organized into three commands: the ground command (assigned the mission of world surface combat), the nautical command (assigned the mission of maritime or ocean combat), and the air command (assigned the mission of atmospheric combat). The formal name for the air command is COACC: the Close Orbit and Airspace Control Command.

All three army commands are concerned with two aspects of their mission: the conquest of individual worlds and the control of those worlds after they have been conquered.

Immediate Command: Virtually all armed forces within the Imperium are organized along the same lines. Thus, the armed forces within a star system will include ground command, nautical command (if any oceans are present), and air command. In some cases, those commands will answer directly to the Imperial military hierarchy; in other cases, the commands will answer to local Imperial nobility (for example, the duke of a sector who is in charge of military operations in support of the Imperium).

Most armed forces, however, are associated with worlds. That is, each world organizes and supports its own armed forces. As such, a world army has its own ground command, nautical command, and air command. Many present and former member worlds of the Imperium maintained their own planetary armies as well. Balkanized worlds commonly have one army per nation to either further national ambitions or to deter other nations from becoming too ambitious.

THE COACC MISSION

The Close Orbit and Airspace Control Command has the basic mission of atmospheric combat. This mission is further defined as:

- The achievement of air combat superiority over rival air commands.
- The attack of enemy forces and resources by air.
- The provision of air combat support to friendly ground commands and nautical commands.
- The operation of air transportation support to friendly ground commands and nautical commands.

Air combat superiority is control of the atmosphere to the exclusion of enemy air forces. Achievement of air combat superiority is the first priority of COACC in time of war. Before air combat superiority is achieved, all ground- and naval-based operations are at risk to enemy air attack; after air combat superiority is achieved, friendly air combat support can be provided with relative safety. Most COACC forces believe that air combat superiority should be pursued to the exclusion of all else, including providing ground support; they believe that the importance of controlling the skies is so great that it must be achieved first. Consequently, the early stages of a world surface conflict are marked by a great deal of air combat as each side strives to eliminate the other as a force to be reckoned with. Only later in the conflict (after one side has established relative air combat superiority) does ground attack become a higher priority mission.

Attack of enemy forces and resources by air refers to the use of aircraft to carry battle to the enemy. Strategic bombing is one form that this mission may take; another is the use of strategic ballistic or cruise missiles.

Air combat support refers to all support operations provided by the air forces to the ground command and the nautical command. Ground attacks in support of troops, bombing, reconnaissance, and driving off enemy attack aircraft are all aspects of air combat support.

Air transport support refers to the use of aircraft to move material and supplies about a world's surface. Aircraft can carry personnel, equipment, and supplies to the battlefield with a response time and a pinpoint accuracy that other transport methods have difficulty matching. Air transport support can also include reconnaissance activities.

Achieving the COACC Mission: Every world's COACC exists to achieve its mission. No one can tell precisely when the need arises for COACC, and it must be in place in order to attempt to achieve its mission. As a result, every world with a population above 6 (any world which does *not* have a trade classification of Nonindustrial) can be expected to have an air command.

Achieving air combat superiority and providing air combat support are battle-oriented missions; they are necessary only in the case of imminent hostilities or open warfare. Every COACC, however, can be expected to provide air transportation support on an ongoing basis in both peace and war. COACC air transportation support includes moving emergency supplies by air for disaster relief, transporting governmental and military personnel on official business (often to locations not serviced by commercial transport organizations), and supporting training exercises.

THE COACC ADVISORY GROUP

The vast majority of COACC forces are organized by and in the service of individual worlds. Because viable, efficient COACC forces are an important part of individual world defenses and because those forces require a great deal of training, maintenance, and properly designed equipment, it is in the best interest of the Imperium to oversee them. For this

purpose, the Imperium maintains the Imperial COACC Advisory Group.

The COACC Advisory Group provides two primary services:

- **Aircraft Design Support:** Through a subsidy system that funnels initial design funding to industrial corporations throughout the Imperium, the COACC Advisory Group assists individual air commands in the design and production of aircraft which meet the requirements of the specific organization. This subsidy support goes directly to the aircraft design and manufacturing industry on Industrial worlds and helps in the establishment of a viable local aircraft industry. The Imperium considers this expenditure of funding a good investment in stability for local industry and labor.

Lower population worlds, or those without the industrial base which would let them produce their own aircraft, are able to procure their aircraft from nearby Industrial worlds. Where an aircraft industry might not be able to invest in specific designs for alien environments or alternative technological levels, the aircraft design subsidy that the COACC Advisory Group provides allows for such aircraft to be designed and produced.

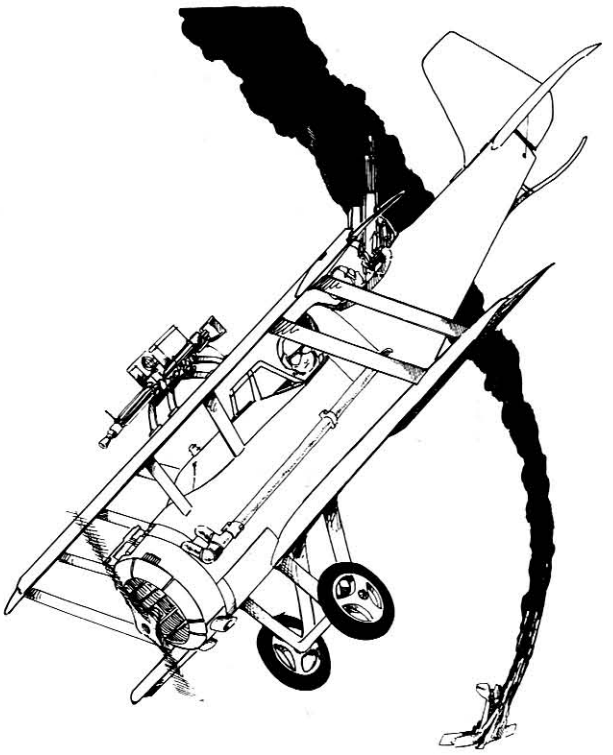
Much of the Imperium's aircraft industry is associated with the megacorporations which span the entire empire. As a result, there is a healthy competition for contracts between megacorporate divisions, and the knowledge gained in supplying aircraft to some worlds of the Imperium can be used to help produce aircraft for other Imperial regions and for export beyond the Imperial borders.

- **Training and Doctrinal Support:** The COACC Advisory Group assigns its own officers and noncommissioned officers to local air commands in order to help them understand the uses of their aircraft. COACC provides training in the doctrinal uses and technological aspects of the aircraft (including maintenance, improved use of technology, and fitting known missions and operations into the restrictions of specific technological levels). COACC advisors help in the formulation of proper organization of air commands so that missions can be accomplished efficiently, in the creation of strategies that make the best use of the available aircraft forces, and in the creation of tactics that allow individual aircraft crews to encounter and best their opponents.

Outside Support: In addition, the COACC Advisory Group provides contacts with existing mercenary air units available for hire by worlds in need of their services. Mercenary COACC forces provide a valuable service to the worlds of the Imperium: They allow world governments or nations to hire air command units that precisely fit their needs without going to the expense of establishing and training them. Hiring mercenary COACC forces is expensive but costs less than raising such a unit locally from scratch.

MERCENARY AIR UNITS

Battalion-sized and larger mercenary units often include at least a limited airspace control component (and sometimes a close orbit control component). Separate mercenary air and close orbit control units are for hire, although these are extremely expensive and can only be afforded by the wealthiest of clients. Finally, many individual veteran flyers of both official and mercenary units are available for hire with or without their aircraft or spacecraft.

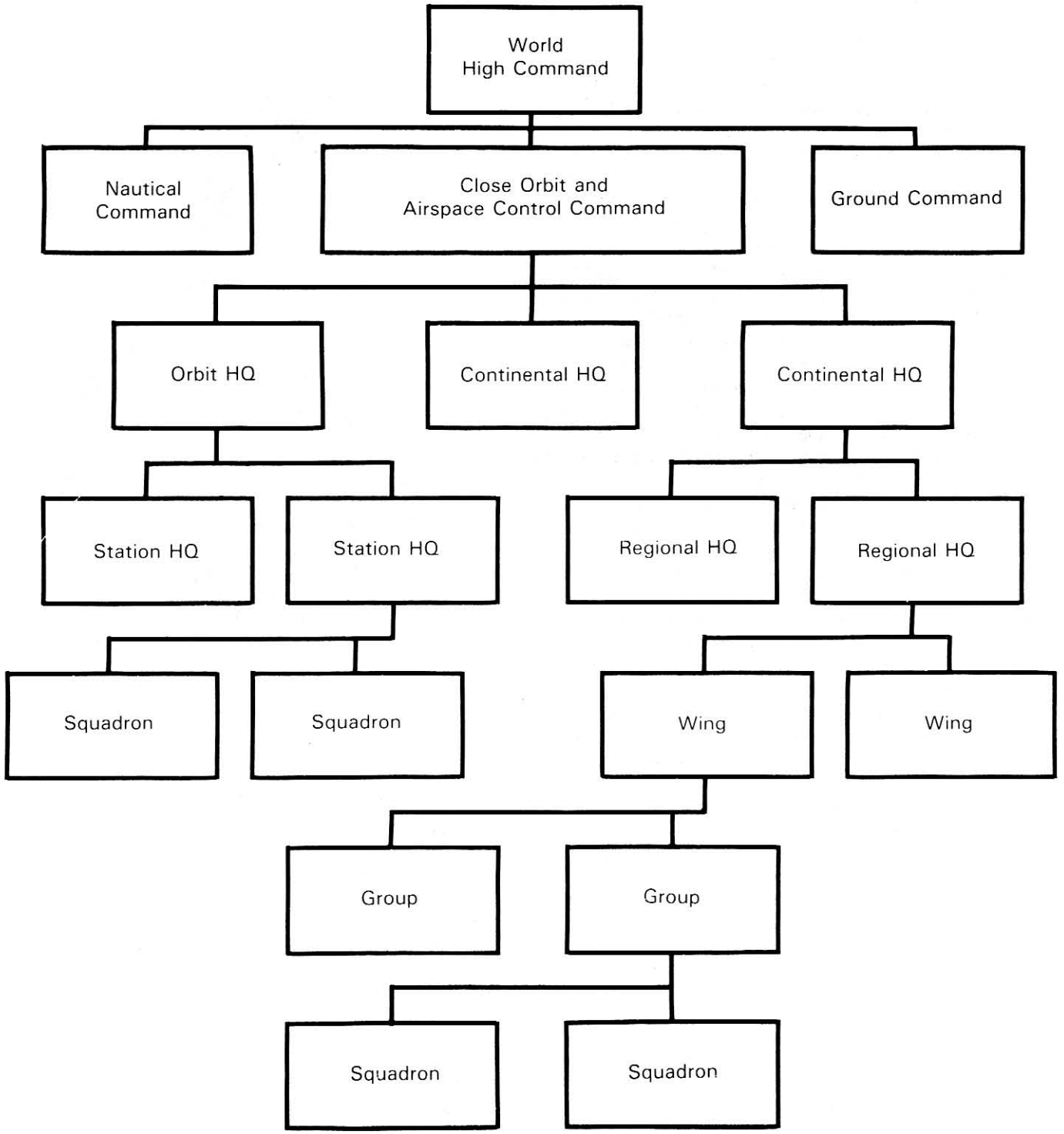


***YPRES* (TL5) PRIMITIVE FIGHTER**

CraftID: Fighter, TL4, Cr41,600
Hull: 8/20, Disp. = 2, Weight Loaded = 2tons, Airframe = Simple, Armor = 0
Power: 4/10 Internal Combustion, .25 Mw, Endurance = 8 hours
Loco: Basic Propeller, Thrust = 2tons, Cruise = 202, Top = 270, Agility = 2
Off: MMG × 2 fixed, forward-firing, MMG × 1 flexible mount rearward firing/100 rounds per gun
Control: Simple
Accom: Crew = 2, (Pilot, Gunner), Simple Cockpit × 2
Other: Fuel = 500liters

Essentially an armed reconnaissance aircraft used in the fighter role by societies just beginning to develop aircraft. Unarmed versions are used as couriers, mail carriers, and private sport aircraft.

COACC ORGANIZATION



TECH LEVEL

Imperial forces, including COACC forces, were typically equipped at the best possible level: the prevailing Imperial tech level of 15. However, with the assassination of Strephon and the onset of the Rebellion, successor units may be found at TL14 or even lower as their equipment deteriorates and replacements become hard to find. Main force Imperial and ex-Imperial COACC units have been equipped with ground-based, gravitic airspace and orbital fighters and with system defense boats. Beneath the planetary surfaces of many worlds they also crew deep meson gun sites to defend against invading star fleets.

Individual worlds' close orbit and airspace control command forces have a wide variety of equipment, depending on world tech level and resources, including available off-world hardware. This equipment can range from propeller-driven TL5 aircraft, to helicopters and supersonic jet aircraft, to hypersonic orbital fighters and system defense boats approaching Imperial technology levels.

Mercenary forces also vary widely in technology. At a minimum, however, mercenary air units will be equipped with helicopters, turboprop or jet attack aircraft, and/or jet fighters. As with mercenary ground units, the higher the tech level of a mercenary air unit, the more expensive it is to hire. That's why numerous mercenary air squadrons equipped to TL9 have found lucrative employment on moderate-technology worlds, especially those that are Balkanized.

A BRIEF GLOSSARY

Here is a brief list of terms which are often used in confusing ways.

Air Command: One of three organizations within the army of a world. The army is organized into three commands: the ground command (assigned the mission of land combat), the nautical command (assigned the mission of maritime or ocean combat), and the air command (assigned the mission of atmospheric combat).

Air Force: A military force concerned with the combat use of aircraft.

Army: The military forces concerned with worlds. The Imperium organizes its armed forces into the navy (responsible for control of interstellar and interplanetary space) and the army (responsible for control of worlds).

COACC: The Close Orbit and Airspace Control Command. The formal name for the air command is the Close Orbit and Airspace Control Command.

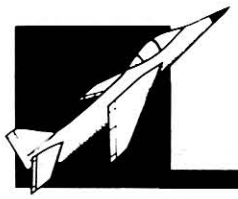
USING THIS MODULE WITH MEGATRAVELLER

This module is a comprehensive look at the personnel, aircraft, weapons, and tactics of the close orbit and airspace control command forces found in the **MegaTraveller** universe, as well as aircraft attached to regular and mercenary ground force units. It's designed to let players and referees generate advanced flyer characters for use as player characters and NPCs in their **MegaTraveller** campaigns. The rules and tasks in this module simulate air-to-air, air-to-ground, ground-to-air, and space-to-ground combat, and can be integrated into a **MegaTraveller** campaign.

***TUSCON* (TL6) FIGHTER**

CraftID: Fighter, TL6, Cr135,700
Hull: 16/40, Disp. = 5, Weight Loaded = 4tons, Airframe = Subsonic, Armor = Cockpit 8
Power: 4/10 Improved Internal Combustion, .40 Mw, Endurance = 3 hours, 45 min on internal fuel; 8 hours, 10 min with internal fuel and drop tank
Loco: High Performance Propeller, Thrust = 6.5tons, Cruise = 600, Top = 800, Agility = 6
Commo: Radio, Regional × 1
Off: HMG × 6 fixed, forward-firing/600 rounds per gun. 6 launch rails for 120mm rockets
Control: Simple
Accom: Crew = 1 (Pilot), Oxygen mask and tank
Other: Fuel = 1040liters; additional 1400liter drop tank may be carried beneath fuselage.

Ultimate development of the purpose-built, propeller-driven fighter. Used as interceptors against enemy bombers, as bomber escorts, and as air superiority aircraft. Also used in a limited secondary role as ground attack aircraft with rockets and machineguns as strafing weapons.



Air Units

Many see aircraft as the basis for COACC, but once those aircraft are produced and procured, they must be organized into military units which provide direction and control. Subordinate units respond to the chain of command which transmits orders from the highest levels to the actual operational air units. Organization allows each unit to know its mission and what superiors it must respond to.

Although both nautical and ground forces on a world have similar organizations, this section will address only those forces particular to COACC.

HIGH COMMANDS

High commands represent the supreme command structures for the military forces. For a world, the supreme military organization is the world high command. Within the world military organization, separate commands exist for nautical, COACC, and ground forces.

World High Command: The world high command is the supreme military organization on a world. Its leader is the highest military authority on the world, responsible only to political authority (in some cases, the leader of the world high command is also the supreme political authority).

The world high command is responsible for overall direction of all military effort. It plans strategy, determines priorities, and coordinates efforts by subordinate military units. Typically, the world high command is named for the world: Regina High Command, for example.

On Balkanized worlds, no unified world high command exists; instead, each nation has its own national high command.

Force Commands: Each of the three forces under the high command has its own force command—nautical command, ground command, and close orbit and airspace control command. Each force command is responsible for strategic planning and direction of its force in order to achieve its missions.

The three force commands are considered equal in importance, although each has its own provincial view of the value of its mission and ability.

The force commands are responsible for procurement of their equipment.

STRATEGIC COMMAND UNITS

Strategic command units are primarily concerned with the direction of broad activities within COACC. They may be established on a mission or a geographic basis. The following are typical COACC strategic command units.

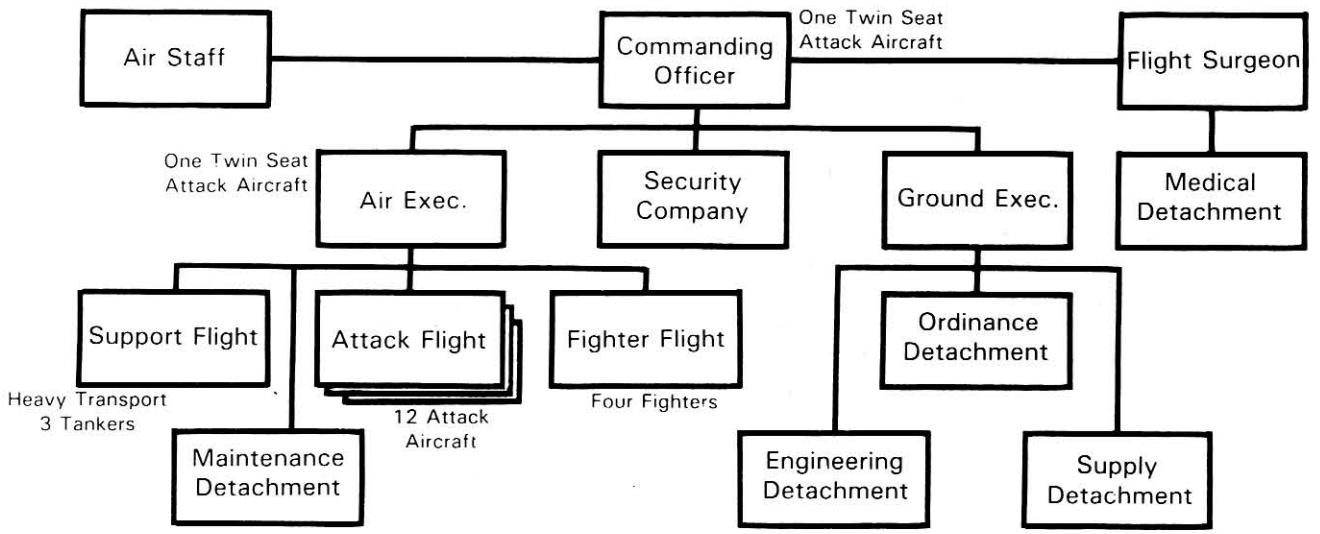
Continental Air Headquarters: Because a continent is a large fraction of a world's surface, it serves as a convenient geographic area over which an air headquarters can be established. Its shores serve as natural boundaries.

Continental air headquarters are an intermediate headquarters between the strategic headquarters and the serving units. Where continents are not a convenient geographic definition, alternatives have been found. On a world with no seas, its COACC might establish two hemispheric air headquarters.

On worlds with only one continent, the continental air headquarters may be omitted.

Orbit Headquarters: Established to be independent of the continental air headquarters, orbit headquarters is responsible for directing and operating the orbital forces within COACC.

Regional Air Headquarters: Established under the operating command of the continental air headquarters, the regional air headquarters distribute command authority and



responsibility further down the chain of command and allow greater supervision of operating units.

OPERATING UNITS

Operating units are the specific military units which accomplish the missions of COACC.

Wings: A wing is the largest operating unit in COACC. Generally, one wing is associated with one regional air headquarters. The wing plans specific operations and assigns its subordinate units to parts of those operations.

A wing consists of two or more groups.

Groups: A group is an intermediate operating unit in COACC. Typically, a group is stationed at a single air base, although that base may have outlying satellite fields in order to disperse its forces.

A group consists of two or more squadrons.

Squadrons: The squadron is the basic operating unit within COACC. In most cases, a squadron is homogeneous: It is equipped with only one type of aircraft, and it has a specific mission determined by the type of aircraft which are assigned it.

Nonaircraft Squadrons: Operating units smaller than groups (i.e., squadrons) may be nonaircraft units. They are assigned missions which do not need or provide aircraft. Such mission units include base hospitals, air defense units, security units, and maintenance and repair units.

UNIT DESIGNATIONS

COACC unit designations reflect the geography or the mission of the unit.

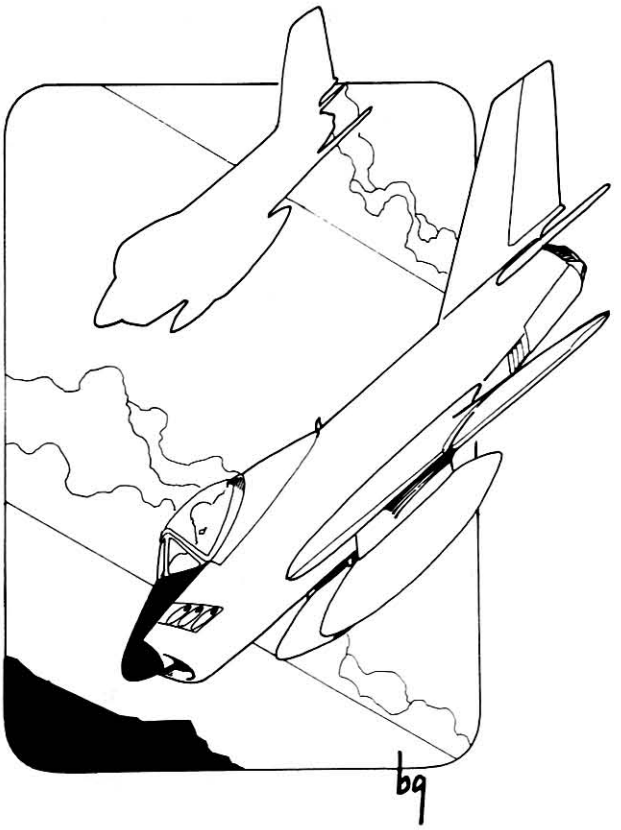
Strategic Command Units: Strategic command units are named for the world, continent, hemisphere, or region they are assigned to (for example, the North American Continental Air Headquarters or the Jewell Orbital Headquarters).

Operating Units: Operating units are numbered and may carry mission or aircraft names. Numbers are assigned within each COACC and usually contain four digits. The Imperial COACC Advisory Group insists that the first digit be the technological level of the world—the remaining three digits are arbitrarily assigned. Because units are generally not transferred off a world, the numbers are reused on each world. In addition, operating units may carry mission or aircraft names if the entire unit is consistent with the aircraft or mission.

Nonaircraft operating units also carry their mission as part of their designations; the name helps identify what the unit does. They are also numbered in a manner similar to aircraft operating units.

For example, a typical unit would be the 9084th Escort Squadron. Other units could be the 8877th Fighter Group or the 7821st Continental Bomber Group. The 8704th Wing consists of both fighter squadrons and bomber squadrons; since the wing has more than one aircraft type and mission, it does not use a mission or aircraft name. A typical nonaircraft unit would be the 9467th Hospital Squadron.

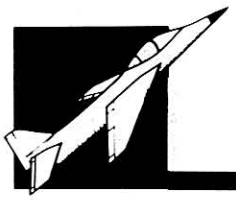
Mercenary Unit Designations: In order to allow easy identification of mercenary air units, the Imperial COACC Advisory Group insists that the second digit of air unit numbers be "9" if the unit is a mercenary unit. Such mercenary units often carry a name reflecting their combat leaders. For example, the 8901st Strike Squadron is also called Stephen's Strikers.



***CHEYENNE* (TL6) JET FIGHTER**

CraftID: Jet Fighter, TL6, Cr439,000
Hull: 28/70, Disp. = 11, Weight Loaded = 7tons, Airframe = Transonic, Armor = Cockpit 8
Power: 4/10, Gas Turbine, .60 Mw, Endurance = 1 hour, 6 min on internal fuel; 1 hour, 50 min with internal fuel and drop tank
Loco: High-Performance Turbojet, Thrust = 6.5tons, Cruise = 825, Top = 1100, Agility = 6
Commo: Radio, Regional × 1
Off: HMG × 6 fixed, forward-firing/600 rounds per gun. 2 × plumbed inboard wing hardpoints
Control: Boosted, 1 Maneuver Point
Accom: Crew = 1 (Pilot), Oxygen mask and tank. Complex armored cockpit with ejection seat
Other: Fuel = 2400liters; 2 additional 750liter drop tanks may be carried beneath wings.

Among the first jet-propelled fighters. Used as interceptors against enemy bombers and air superiority aircraft. Also used in a limited secondary role as ground attack aircraft with up to 750 kilogram bombs attached to hardpoints and machineguns used as strafing weapons.



Aircraft

Aircraft are the basis for COACC. Specific types of aircraft are designed, constructed, and procured for specific missions.

Aircraft Type: An aircraft's type is almost always associated with its mission; the type describes what the aircraft attempts to do. Typical aircraft types include fighter, bomber, or transport.

Aircraft Size or Capacity: Aircraft can be identified by their size or capacity. This type of identification ranges from light to very heavy. The Aircraft Size or Capacity Table shows the general meanings of the terms used.

AIRCRAFT SIZE OR CAPACITY

Descriptor	*Size (Passengers)*	*Capacity (Tons)*
Light	5	1
Medium	25	5
Heavy	50	10
Very Heavy	100	20
Super Heavy	300	60

Aircraft Range: Aircraft range indicates the total distance that an aircraft may fly before refueling or required maintenance. Range descriptors vary from regional to orbital. The Aircraft Range Table shows the general meanings of the terms used.

AIRCRAFT RANGE

Descriptor	*Range (km)*	*Operational Radius (km)*
Regional	50 to 500	16 to 160
Continental	500 to 5000	160 to 1600
Planetary	5000 to 50,000	1600 to 16,000
Orbital	Can reach orbit	Can reach orbit

Operational radius indicates the distance an aircraft can travel, perform a mission, and still return to its originating air base. Operational radius is one-third of range.

AIR SUPERIORITY AIRCRAFT

Air superiority aircraft are given the basic mission of achieving air superiority over enemy air forces. They are designed to find, track, and engage the enemy aircraft in combat.

Fighters: Fighters are aircraft designed to destroy other aircraft. High speed and agility are their main requirements so that they can both serve as lethal weapons platforms and survive in combat.

Fighters evolved from TL5 reconnaissance aircraft (originally used as unarmed scouts) when pilots began carrying pistols, rifles, and later machineguns to shoot at enemy recon aircraft. As tech levels advance, engines become more powerful, higher speeds are reached, aircraft become more agile, and more weapons and fuel can be carried.

At TL6 and TL7, many aircraft designers and users realize that fighters can be armed with external bombs, rockets, and missiles, and employed as ground attack aircraft. However, this impairs their ability to carry out their primary mission, and fighters are increasingly designed as air-to-air combat aircraft, while the air-to-ground role increasingly becomes the mission of specialized attack aircraft.

By TL8, fighters carry multibarrel autocannons and fire-and-forget homing missiles. At TL9 they are armed with the first air-to-air combat lasers and achieve close orbital as well as atmospheric combat capability. At TL13, fighters become fully grav powered, although much of their lift and agility continues to be derived from airfoils.

Ultimately, at TL15, fighters are truly space as well as atmospheric crafts. Larger versions can remain on station in far orbit and system space for as long as 30 days. The TL15 *Ramparts*-class Imperial fighter is widely used as a ground-based planetary defense fighter as well as a shipboard craft.

In a sense, the system defense boat is also a fighter, capable of operating in many environments for extended periods of time, with the fighter-like role of destroying hostile spacecraft.

Interceptors: Interceptors are specialized fighter aircraft which are designed with sufficient speed that they can overtake and attack enemy aircraft. An interceptor is characterized by a short range (because it is assigned to attack all enemy aircraft which enter its specifically defined territory) and heavy armament (in order to deliver a killing blow to the target).

The interceptor is typically a manned aircraft. Alternative approaches to accomplishing the interceptor mission include anti-aircraft missiles and the use of remotely piloted aircraft.

Escorts: Escorts are specialized fighter aircraft which are designed to defend other aircraft (typically bombers) from the interception mission. An escort is characterized by long range (because it must accompany other aircraft as they pursue their mission) and heavy armament (in order to deliver a killing blow).

The escort is typically a manned aircraft. Missiles do not perform well in the escort mission, but remotely piloted aircraft (often remotely piloted from the escorted aircraft) have sometimes proven successful.

Detection and Tracking Aircraft (DATA): The detection and tracking aircraft is assigned the mission of locating enemy aircraft so that they can be intercepted and destroyed. DATA serve as the eyes and ears of the air force.

STRIKE AIRCRAFT

Strike aircraft are dedicated to the strategic goals of the air force. They carry the destructive force of their weapons to the enemy and its resources. One strategy often favored by the air force is to "bomb them back to the stone age." Another is to systematically destroy those military targets which allow the enemy to carry on the war. A third is to attack civilian targets in order to demoralize the enemy population. But all of the strategies call for the air force to deliver weapons of destruction to the territory of the enemy.

Strike aircraft specialize in attacking ground targets in close support of friendly ground troops, interdicting enemy transport and supplies immediately behind enemy lines, and destroying enemy command and communications centers.

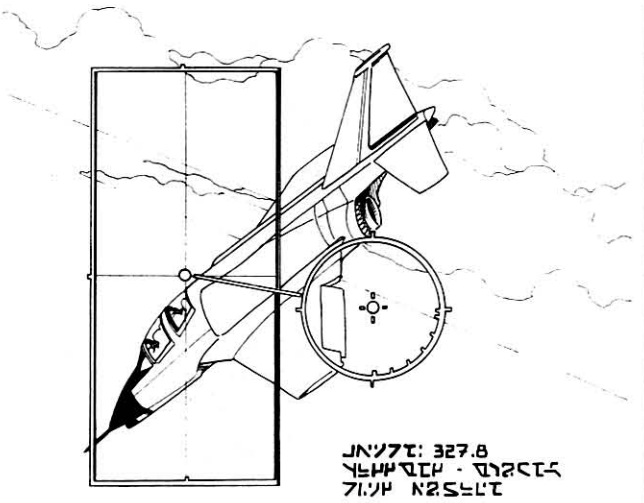
Strike aircraft are designed to carry external air-to-ground weapons such as armor-piercing autocannons, bombs, free-flying rockets, and tactical missiles, and deliver them accurately on target. Stability and the ability to absorb ground fire from enemy forces and still fight are major considerations in strike aircraft design. Strike aircraft are less agile than fighters, but they carry a heavy external weapons load and are armored around the engines and cockpit. Many strike aircraft—once they have dropped their weapons—are agile enough to engage enemy fighters and give a good fight. Some carry two or more air-to-air missiles for use in self-defense.

Early technology strike aircraft were derived from dive bomber designs originally used against wet naval targets. Others were derived from fighters (usually those fighters with one or two bombs hung beneath the fuselage or wings in place of drop tanks and a handful of rockets attached to launch rails).

Two schools of thought often emerge about strike aircraft.

One school believes they should be specialized aircraft. Early fighters burdened with bombs needed fighter escorts flying combat air patrol in hostile skies so that the fighter/bombers could reach their targets. The specialized strike aircraft school points to this and says if fighter/bombers need escorts anyway, why not make them fully specialized strike aircraft?

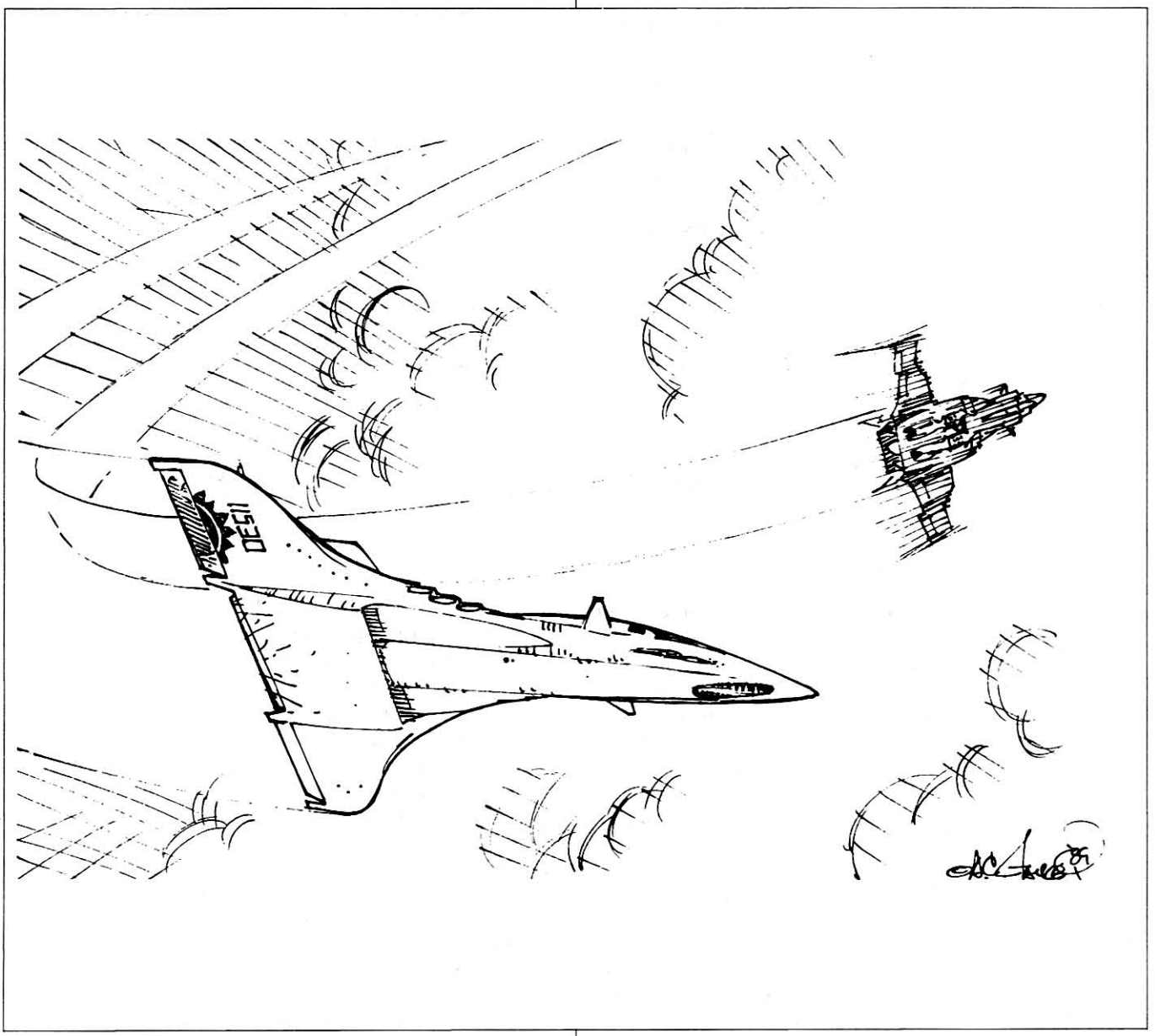
The other school points to the economy of combining two types of aircraft in one. If you are flying in a low-threat environment, they point out, you don't need a fighter. Besides, if a threat materializes, they say, the fighter/bomber can jettison external stores and instantly become a true fighter—never



LARAMIE (TL7) JET FIGHTER

CraftID: Jet Fighter, TL7, MCr1.9
Hull: 108/270, Disp. = 50, Weight Loaded = 27tons, Airframe = Supersonic, Armor = Cockpit 8, Engines = 8
Power: 4/10, Gas Turbine, .60 Mw. × 2, Endurance = 2 hours on internal fuel; 3 hours, 36 min with internal fuel and maximum drop tanks
Loco: Basic Turbojets w/Afterburner × 2, Thrust = 30tons (50 w/afterburner), Cruise = 900, Top = 1200 (1980 w/afterburners), Agility = 5
Commo: Radio, Regional × 2
Sensors: VDistant Radar × 1, Passive Infrared Sensor × 1, Radar Direction Finder × 1
Off: 6 barrel, 2cm autocannon × 1 forward-firing/600 rounds per gun. 100kg missile bays × 4, missile launch rails × 4, Plumbed Fuselage Hardpoint × 1, Plumbed Inboard Wing Hardpoints × 2, Outboard Wing Hardpoints × 2
Control: Powered, 2 Maneuver Point
Accom: Crew = 2 (Pilot, Weapon Systems Operator), Oxygen mask and tank, Complex armored cockpit with ejection seat × 2
Other: Fuel = 6326liters internal. Up to 5000liters additional may be carried in drop tanks mounted on the three plumbed hardpoints. Fitted with air-to-air refueling probe.

Among the first supersonic jet-propelled fighters. Originally developed as defensive interceptors. Later extensively used as air superiority and ground-attack fighters (truly a multimission aircraft).



mind the fact that this aborts the ground attack mission.

The first school tends to dominate military air thought on worlds, particularly Balkanized worlds, where strike aircraft face significant air and ground opposition. The second school seems to have held sway on worlds where COACC forces face little or no fighter opposition and mainly put down internal guerrilla opposition.

Multirole combat aircraft combining fighter and attack roles generally emerge around TL6 and reach their zenith of development around TL7. However, dedicated attack designs, out of favor since late TL5, return in late TL6 and flourish in TL7. Because of the need for increasing speed and agility in fighters, and the need for increasing ruggedness, stability, and weapons-carrying ability in strike aircraft, specialization generally wins over the combination design philosophy by TL8.

Two basic types of destructive devices can be brought into play against the enemy: bombs and beams. Bombs are carried by bombers or (as warheads) by missiles. Beams are fired by some form of projector either directly at the enemy or by reflection off an intermediate object.

Bombers: Bombers carry bombs to the enemy. Most bombers are rated by their size (or carrying capacity) and their range.

Bombers are aircraft designed to make deep strike missions into enemy territory. These missions disrupt and destroy industrial production, communications, and transportation. They are also meant to reduce civilian morale and support for the war effort. Occasionally, bombers are used to break up enemy troop concentrations near the front lines, with their missions overlapping those of strike aircraft.

Bombers and strike aircraft both undertake bombardment missions. However, the missions of the former are primarily strategic, the latter tactical—although both occasionally undertake either. Bombers are larger than strike aircraft and have far greater range. They also carry a much larger weapons load. Most of the time these weapons are nuclear.

The specific type of bomber in service is the result of doctrinal decisions made by the air force's high command.

Batteries: Batteries carry beam weapons. A beam weapon fires in a straight line (line of sight) and so cannot easily be fired over the horizon. The battery may be an aircraft (the weapon mounted on an aircraft), an orbital spacecraft, or a ground installation (if it is a ground installation, it fires at orbital reflectors which then direct the beam at the target).

Missiles: Missiles are the ultimate disposable remotely piloted craft. They carry a warhead (or several warheads) to a designated target. Missiles may be cruise, ballistic, or orbital.

Cruise Missiles: Cruise missiles are terrain-following missiles which travel to their target using nap-of-the-earth maneuvering. They are characterized by precise targeting, a long travel time (several hours), and the ability to evade enemy aircraft.

Ballistic Missiles: Ballistic missiles follow a high trajectory up to suborbital or orbital altitudes, and then dive back through the atmosphere toward their target. They are characterized by slightly imprecise targeting and a fast travel time.

Orbital Missiles: Orbital missiles are placed in low orbit to await a firing command. When launched, they proceed directly down to their target. Orbital missiles are characterized by a very short travel time, slightly imprecise targeting, and a vulnerability before launch.

COMBAT SUPPORT AIRCRAFT

Combat support aircraft are designed to provide assistance to military battles in roles other than the air superiority and strike missions. Thus, combat support aircraft are not fighters or bombers; their functions include many other missions, such as surveillance, jamming and deception, target designation, aerial refueling, and air assault transport.

Surveillance: Surveillance aircraft carry observers, cameras, or sensors that enable the operators (or analysts on the ground later) to evaluate intelligence information. Surveillance aircraft include observation helicopters, high-altitude photoreconnaissance planes, high-endurance airships, and low-altitude battlefield observation planes.

Jamming and Deception: Jamming and deception aircraft carry electronic equipment intended to jam enemy sensors or to deceive those sensors as to the nature of the aircraft they are fighting.

Target Designation: Target designation aircraft function as forward observers on the battlefield. They indicate targets to be attacked by using voice, dropped smoke, rocket-carried radio beepers, radar, or laser. Target designators are generally low-performance aircraft that evaluate a situation and then provide direction to the high-performance strike aircraft when they appear on the scene.

Aerial Tankers: Aerial tankers make it possible for aircraft to replenish their fuel in the air. Thus, short-range aircraft can cross large distances (over water or deserts) without landing. Use of aerial refueling also eliminates the need for aircraft to land for refueling; larger numbers of aircraft can remain on station.

Air Assault Transport: Air assault transport aircraft are designed to deliver troops into combat. They differ from ordinary transports because they must be able to land in unprepared areas or allow troops to exit the aircraft in flight. Air

***RENO* (TL9) HYPERSONIC FIGHTER/INTERCEPTOR**

CraftID: Hypersonic Ramjet Fighter, TL9, MCr17.7
Hull: 200/500, Disp. = 125, Weight Loaded = 50tons, Airframe = Hypersonic
Power: 4/10, Gas Turbine, .60 Mw with attached .20 Mw MHD generators × 5, Endurance = 3 hour, 7 min on turbofans; 20 min on ramjets on internal fuel. 5000liters in drop tanks adds 1 hour, 20 minutes on turbofans, cannot be used with ramjets because of drag
Loco: High-Performance Turbofans × 2, Thrust = 42tons, Cruise = 630, Top = 840; High-Performance Ramjets × 3, Thrust 117tons. Cruise = 1800, Top = 2400, Agility = 6
Commo: Radio, Regional × 1, Continental Radio × 1
Sensors: Regional Radar × 1, Regional Radar Jammer × 1, Radar Direction Finder × 1, Advanced Image Enhancement × 1, Laser Sensor × 1
Off: 1 Mw Beam Laser in fixed, forward-firing mount. 250kg missile bays × 2, Plumbed Fuselage Hardpoint × 1, Plumbed Inboard Wing Hardpoints × 2
Control: Computer Enhanced Fly by Wire, 6 Maneuver Points Computer = 3
Accom: Crew = (Pilot), Basic Life Support, sealed cockpit with vacc suit backup. Complex cockpit with rocket escape pod × 1
Other: Fuel = 12,000liters internal. Up to 5000liters additional may be carried in drop tanks mounted on the three plumbed hardpoints. Fitted with air-to-air refueling probe.

Hypersonic dash-capable interceptor. Patrols while flying on turbofans, then jettisons drop tanks and uses ramjets to quickly intercept and destroy hostile space and aircraft. MHD generators attached to all engines are used to charge laser capacitor banks.

assault transports may be orbital reentry vehicles, rough terrain-capable cargo aircraft, or helicopter transports.

AIR TRANSPORT AIRCRAFT

Air transport aircraft provide noncombat transportation services for the air force and the forces it supports. Air transport includes short- and long-distance transportation for personnel, equipment, and supplies. Special missions for air transport include heavy lift operations (moving and positioning heavy equipment that cannot be positioned quickly by water or land) and rough terrain transport (moving personnel, equipment, and supplies in areas where air transport is the only efficient method).

Cheap, reliable, rapid, long-range transportation is the major function of aircraft on most worlds. Unless they are in a first-hand air combat situation, this is the main reason characters will encounter and use aircraft in their adventures.

Personal and transport aircraft range from small, single-engine, personal aircraft that characters can rent or charter for basic transportation on moderate technology worlds (or as an inexpensive substitute for an air/raft on higher technology worlds) to gigantic suborbital liners that fly between cities thousands of kilometers apart in an hour or two.

This aircraft category also includes frontier transports capable of landing on rough dirt strips, amphibious craft that land on water or land, and vertical takeoff and landing (VTOL) transports which are similar to the frontier transports but which can take off and land vertically in a relatively small clear area.

Transports may be civilian or military. Civilian aircraft may be operated by a lone individual, a charter service, or an airline.

Military transports are flown by COACC transport squadrons to haul supplies among COACC and ground force units, to airlift troops into battlefield airstrips or landing zones, and to airdrop paratroops and supplies into battle.

Transports are rated by their capacity and their range.

UNUSUAL AIRCRAFT

When doctrine or strategy dictates the use of unusual types of aircraft, they are usually indicated in the aircraft type description. Unusual aircraft are helicopters or airships.

For example, the term "continental super heavy transport" is assumed to indicate a fixed-wing aircraft unless otherwise stated. If it were not a fixed-wing aircraft, then the description should state "continental super heavy transport helicopter" or "continental super heavy transport airship."

PERSONAL AIRCRAFT

Personal aircraft exist beginning in late TL4 societies. These are usually disarmed fighters of the type described under the Fighter section of this chapter.

Personal aircraft become both simpler to operate and sturdier at TL6 and TL7. Multiengine versions evolve, as do personal turbojets. Most personal aircraft are superseded by air/rafts and other grav vehicles—particularly the G-speeder—at around TL12.

A few personal airplanes remain at all tech levels as personal propeller- and jet-driven sport aircraft flown by hobbyists. However, flying individual aircraft on high-population worlds is severely restricted by safety regulations and lack of airfields. Transport safety authorities on high technology, high-population worlds prefer that their citizens use highly reliable grav taxis or grav busses under ground control for their transportation needs.

Transports began as TL5 multiengine aircraft holding 12 to 15 passengers willing to endure cold, deafening flights because they were faster than railroad trains. Fabric fuselages gave way to metal by TL6, and the number of engines increased from two to four yielding much improved speed and range. Accommodations became quite comfortable, and air travel became fashionable. By TL7, jet-powered transports had rendered passenger railroads obsolete. Meanwhile, large, turboprop, rough field-capable cargo aircraft have proven to be ideal frontier freighters.

At TL8, commercial air transportation split along two paths—massive jumbo jet liners hauling up to 400 passengers each at subsonic speeds as volume movers of the masses, and supersonic liners carrying the elite at two to three times the speed of sound in somewhat cramped, though luxurious, surroundings. Frontier freighters became jet propelled at this tech level, later becoming VTOL aircraft.

The first VTOL commercial airliners appear at TL9, giving passengers fast, short- to medium-distance air transportation from city center to city center. Supersonic and hypersonic transports become larger and more powerful, and by TL10 they are the long-distance transportation of choice for nearly every air traveller.

Suborbital transports are the last advance in technology before grav airliners begin take over at TL13. Suborbitals take off vertically on advanced hydrogen-fueled turbofans which rotate to a horizontal position for level flight. The transport flies into the beginning of a ballistic arc on its turbofans, then lights off one or more fusion rockets to thrust it out of the atmosphere and into space on a ballistic path to its destination. After reentry, the transport assumes a long, shallow glide approach to its destination. The turbofans are relighted to assist in landing. Flights from one side of a Size 8 world to the other last no more than two hours.

Thruster technology makes airfoil-supported transports obsolete at TL13. Grav airliners driven by high-G thruster plates supersede any reaction-powered transports, including the ballistic suborbitals.

HELICOPTERS

Small, primitive helicopters appear in late TL5 and prove to be the first workable VTOL aircraft. Helicopters evolve into useful search and rescue, and medical evacuation aircraft in TL6 as their ability to hover and to fly low and slow, as well as their VTOL capability, proves to be increasingly useful. However, engine power limits keep them in a specialized rescue and medevac role.

Helicopters become widely used transports and combat aircraft with the advent of practical gas turbine engines at TL7. The quantum leap in power-to-weight ratios greatly increases helicopters' lifting ability, yielding a much higher capacity to carry cargo, troops, and weapons. Helicopter gunships carrying machineguns, autocannons, autogrenade launchers, and air-to-ground rockets become potent close-in air support craft. Troop carriers, carrying from a squad to a platoon of infantry,

bring the first battlefield air mobility to ground forces.

Increasingly sophisticated tac missiles turn TL8 combat helicopters into agile nap-of-the-earth tank killers that complement fixed-wing close support aircraft on the battlefield—the helicopters pop up to pick off command tanks and antiaircraft AFVs, then fixed-wing attack aircraft finish off the rest.

Combat helicopters begin to have air-to-air combat capability at TL8, while other larger helicopters attached to wet navies become sophisticated hunter/killers of submersibles. Meanwhile, helicopter transports become larger and able to carry heavy loads for longer distances. Air-to-air refueling increases range and endurance.

At TL9, helicopters begin evolving into hybrid, high-speed VTOL aircraft that fly with fixed wings in normal flight. The first air/rafts appear on worlds that develop gravitic technology. They begin superseding helicopters, although their expense precludes general use. However, air/rafts' silent operation makes them ideal recon vehicles, and they can be used to insert or extract spies and commando teams in hostile territory.

At TL10 and beyond, helicopters remain in service as a low-speed, low-cost alternative to grav-powered vehicles for civilian users. However, the easy to fly air/rafts gain in popularity over difficult to handle rotary-wing aircraft that require trained pilots.

Grav AFVs and G-carriers take over the helicopter's combat attack and transport roles, eliminating them from general military service.

AIRSHIPS

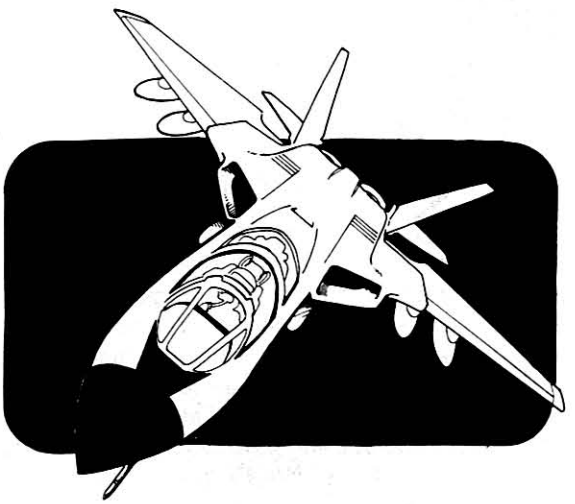
Lighter-than-air flight is the only type (other than crude gliders) to appear at TL3 not long after scientists notice that warm air rises. Lighter-than-air vessels are curiosities and playthings of the wealthy. Their paper envelopes often ignite; smoky wood and straw fires burning in the gondolas make early hot air balloons dangerous and uncomfortable conveyances.

The isolation of hydrogen and the discovery of its properties, along with the development of silk and latex envelopes to contain the gas, lead to the first practical free balloons around mid-TL3. These are used as reconnaissance and artillery-spotting platforms, as well as free-flying sport vehicles.

At TL4, balloons become powered airships with the advent of the internal combustion engine. Increasingly sophisticated construction techniques enable the design and building of increasingly larger and longer-ranged airships.

By TL5, economical diesel engines and rigid-frame construction techniques combine to build transoceanic air vessels that carry passengers through the skies in luxurious comfort across oceans in hours instead of days. Airships are at their peak. If helium is available on their worlds, they linger for a few years as passenger liners and later as military radar and reconnaissance platforms. Otherwise, their Achilles heel, the explosive properties of hydrogen, begins to force people on their worlds to look for safer methods of air travel.

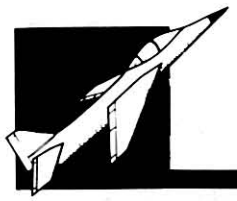
At TL7, they are virtually gone—although free-flying balloons remain as novelties for balloon sports enthusiasts. Lightweight propane tanks and burners bring balloons full circle to hot air ballooning by the end of TL7. And, where helium is present, helistats are developed—combining the balloon's lift with the helicopter's controllability to delicately lift heavy loads from remote wilderness sites and carry cargoes to civilization.



***ABILENE* (TL8) JET FIGHTER**

CraftID: Jet Fighter, TL8, MCr6.1
Hull: 100/250, Disp. = 50, Weight Loaded = 25tons, Airframe = Supersonic, Armor = Cockpit 8
Power: 4/10, Gas Turbine, .60 Mw × 2, Endurance = 1 hour, 50 min on internal fuel; 3 hours, 7 min with internal fuel and drop tanks
Loco: High Performance Turbofans w/Afterburner × 2, Thrust = 42tons (62 w/afterburner), Cruise = 1320, Top = 1760 (2400 w/Afterburner), Agility = 6
Commo: Radio, Regional × 2
Sensors: Regional Radar × 1, Regional Radar Jammer × 1, Radar Direction Finder × 1, Image Enhancement × 1, Video Recorder × 1
Off: 6-barrel, 2cm autocannon × 1 forward-firing/600 rounds per gun. 250kg missile bays × 4, missile launch rails × 4, Plumbed Fuselage Hardpoint × 1, Plumbed Inboard Wing Hardpoints × 2
Control: Fly by Wire, 4 Maneuver Points; Computer = 2bis
Accom: Crew = 2 (Pilot, Weapon Systems Operator), Basic Life Support, sealed cockpits with oxygen mask and tank backup. Vacc suits may also be worn as optional life support backup. Complex armored cockpit with advanced ejection seat × 2.
Other: Fuel = 7000liters internal. Up to 5000liters additional may be carried in drop tanks mounted on the three plumbed hardpoints. Fitted with air-to-air refueling probe.

Interceptor and air superiority fighter design found in the COACC forces of many moderate-technology worlds in the Imperium. Serves as an effective interceptor against most spacecraft in atmosphere except advanced grav fighters.



Overview

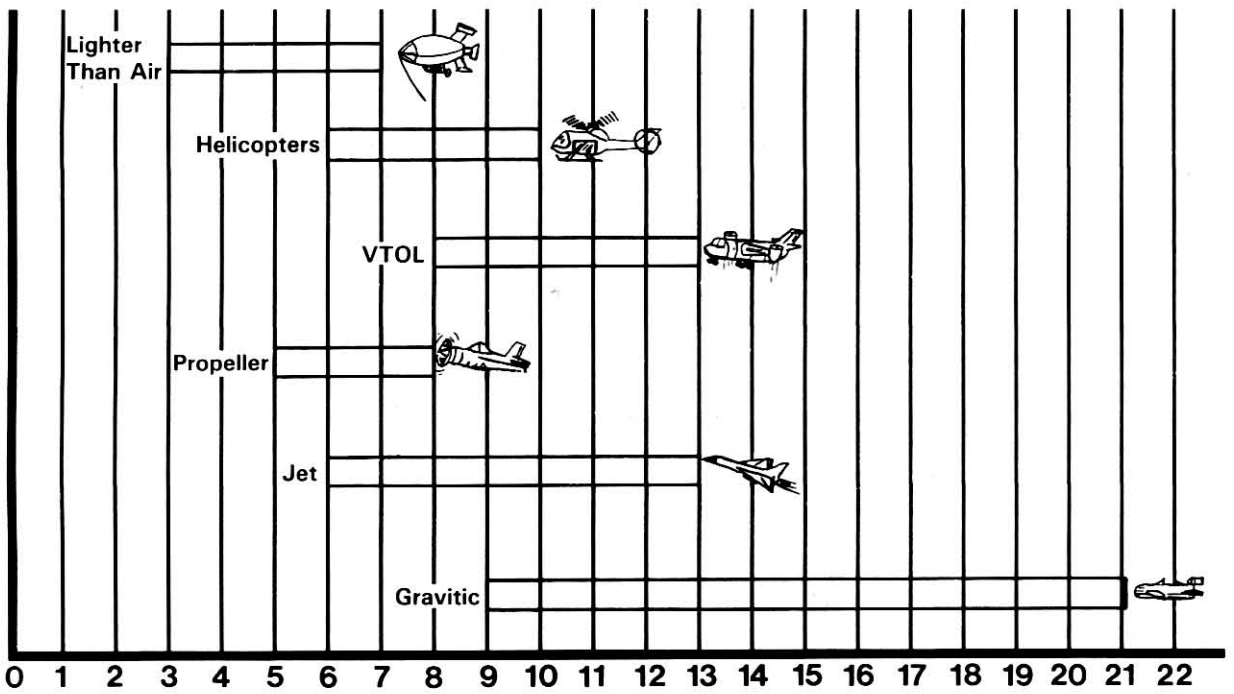
"Anything with wings is ours."

That's the motto of the Close Orbit and Airspace Control Command force. COACC pilots fly anything with wings and are responsible for killing anything with wings—even hostile spacecraft that venture too close to a force's homeworld.

Winged aircraft? In the Imperium? Where gravitics is common technology?

Gravitics may be common technology on many worlds, but it is expensive, and until TL13, gravitic transportation is relatively slow. Except for very expensive speeders, the effective speed limit for gravitic vehicles is 120 kilometers per hour. Winged private propeller-driven aircraft travel at 200 kilometers per hour on moderate technology worlds while commercial jet transports travel at speeds approaching 1000 kilometers per hour hauling hundreds of passengers at relatively modest seat-per-kilometer costs. Only with TL14 technology and above, when high-efficiency grav thruster plates become available for atmospheric craft, do gravitic airbusses replace commercial passenger aircraft. Military jet interceptors fly twice as fast as commercial transports, while hypersonic aerospacecraft—propelled by a combination of ramjets and rockets, often exceed 3000 kilometers per hour. Both types of combat aircraft—thanks to their high thrust engines, efficient streamlining, and atmospheric maneuverability—fly rings around most spacecraft which enter atmosphere. A hypersonic interceptor would give even a TL15 Imperial naval fighter a hard fight in the air.

Three basic types of aircraft, each with its advantages and disadvantages, exist. Below is a chart showing the technology levels at which they are used.



AVIATION TECH LEVELS

AIRCRAFT TYPES

The three types of aircraft include:

Fixed-Wing Aircraft: These receive at least some, if not all, of their lift from fixed wings moving through the air. Most require a runway to reach a minimum takeoff speed. Some are seaplanes capable of takeoffs and landings on oceans, rivers, and lakes. Others are amphibious, capable of using both runways and water for takeoffs and landings. Still others can take off and land vertically.

The major advantages of fixed-wing aircraft at most technology levels are that they are much faster than gravitic vehicles, and they are cheaper to build and operate. They do not depend on raw power to overcome gravity; therefore, their power plants can be smaller and cheaper than those of corresponding grav vehicles. Instead of directly overcoming gravity, fixed-wing aircraft power plants provide thrust to move the aircraft through the atmosphere. Fixed-wing aircraft's major disadvantages are their fragility and their need for runways.

Rotary-Wing Aircraft: These aircraft use rotating airfoils to create lift. Their advantages are their vertical takeoff, landing, and hovering capabilities, their extreme maneuverability, and a slight speed advantage over many grav vehicles. Rotary-wing aircraft also cost about one-third as much as grav vehicles.

Rotary-wing aircraft disadvantages include fragility, noise, and the relatively high maintenance requirement of their complex power plant, transmission, and control systems.

Rotary-wing aircraft are generally replaced by grav vehicles for military applications by TL10. Commercial rotary-wing aircraft remain available up to TL12 because of their cost advantage.

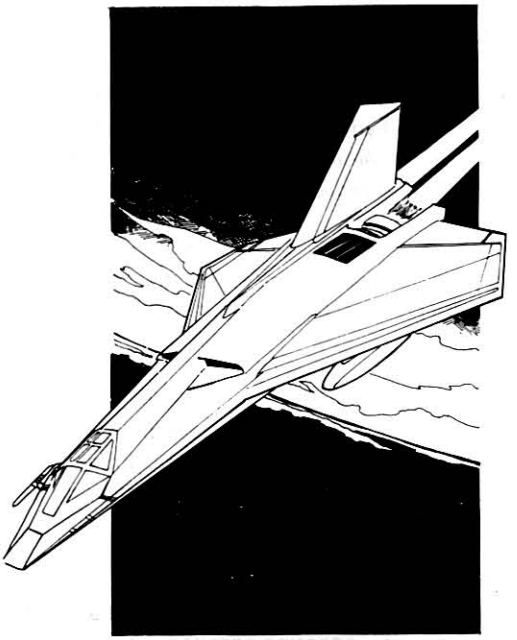
Lighter-Than-Air Aircraft: These aircraft obtain lift from bags of lighter-than-air lifting gases. They range from simple tethered balloons to massive multiengine dirigibles.

Their advantages are that a small amount of energy is needed for their propulsion and that no energy is needed for lift and long airborne endurance. In fact, aerostats that remain aloft indefinitely in a relatively fixed position have been constructed as habitats on several worlds.

Lighter-than-air aircraft disadvantages include low speed, poor maneuverability, and vast bulk which makes for easy detection.

NAMING CONVENTIONS

Thousands of aircraft models have been developed on the Imperium's moderate technology worlds, and it has become necessary for the Imperial government to develop a standard naming convention that uniquely identifies each aircraft model. The Intelligence Division of the Imperial Ministry of Industry (Air) has adopted the names of Earth's cities as names of aircraft classes so each class can be easily identified no matter where in the Imperium it flies. When possible, names have been selected that suggest special attributes of each aircraft class. For example, "Seattle" has been assigned to a class of all-weather attack aircraft because that city's inclement weather suggests the aircraft's all-weather capabilities. "Nairobi" has been assigned to a class of VTOL frontier transport because of the frontier wilderness still surrounding this African city.



DAYTONA (TL9) ORBITAL FIGHTER/INTERCEPTOR

CraftID: Orbital Fighter, TL10, MCr10.7
Hull: 100/250, Disp. = 125, Weight Loaded = 25tons, Airframe = Hypersonic
Power: 4/10, Gas Turbine, .60 Mw × 2, Endurance = 2 hours, 36 min on turbofan on drop tanks; 20 min on rocket on internal fuel
Loco: High Performance Turbofan × 1, Thrust = 21tons, Cruise = 810, Top = 1080; High Performance Rocket × 1, Thrust 39tons. Cruise = 1320, Top = 1760, Agility = 6
Commo: Radio, Regional × 1, Continental Radio × 1
Sensors: Regional Radar × 1, Radar Direction Finder × 1, Advanced Image Enhancement × 1, Laser Sensor × 1
Off: 250kg missile bays × 2, fuselage hardpoint, inboard wing hardpoints for drop tanks only.
Control: Computer Enhanced Fly by Wire, 6 Maneuver Points, Computer = 3
Accom: Crew = (Pilot), Basic Life Support, sealed cockpit with vacc suit backup, Complex cockpit with rocket escape pod × 1
Other: Fuel = 9000liters internal for rocket only, 5000liters in drop tanks for turbofan. Refueling probe fitted for refilling drop tanks.

Uses turbofans for atmospheric patrol and to climb to high altitude. Rocket motor ignited to reach orbital velocity and to maneuver to intercept enemy spacecraft. Fighter reenters atmosphere and glides to dead stick landing after final deorbit burn.

AIRCRAFT TECHNOLOGY

TECH LEVEL 3

Early hot air balloons appear. Built of silk and with their lift derived from straw-fueled fires, they are rich peoples' toys of limited practical value.

TECH LEVEL 4

The lifting ability of hydrogen is discovered, leading to the first balloons capable of remaining aloft for hours. Tethered hydrogen balloons are used as artillery observation platforms. Later at this level, self-propelled dirigibles are introduced, as are early gliders. The first powered airplanes appear late TL4.

TECH LEVEL 5

The first practical aircraft appear early in this tech level, including the first biplane fighters. Dirigibles evolve into major passenger-carrying, ocean-spanning transports. Seaplanes appear.

TECH LEVEL 6

Propeller-driven aircraft reach their zenith with metal fuselage monoplane fighters and long-range bombers as the major combat aircraft. Amphibious aircraft appear in specialized roles such as search-and-rescue aircraft. Transoceanic propeller-driven transport aircraft replace dirigibles as intercontinental airliners. Primitive jet-propelled aircraft are introduced late in this period. Helicopters make their first useful appearance late in TL6, primarily as search-and-rescue and medical evacuation (medevac) aircraft.

TECH LEVEL 7

Jet aircraft become supersonic—first combat aircraft then transports. Jet passenger liners are the long-distance transportation systems of choice, rendering passenger railroads and ocean liners obsolete on most worlds. Large, turboprop, short takeoff and landing (STOL) freighters capable of operating from crude, dirt airstrips prove to be ideal frontier transports. Helicopters evolve into large, rotary-wing transports and sophisticated, maneuverable weapons platforms. Specialized jet attack aircraft appear with smart weapons and computerized delivery systems. Personal ultralight aircraft make their debut.

TECH LEVEL 8

Vertical takeoff and landing (VTOL) combat aircraft appear and begin to eliminate the need for expensive, vulnerable airbases. Transport aircraft develop into massive jumbo jetliners carrying up to 500 passengers and into hypersonic liners carrying the social elite at up to 5000 kilometers per hour. Triphibian vehicles appear capable of operating in the air, on land, on water, and underwater. Laser-guided and "fire and forget" tactical missiles make helicopters lethal antiarmor weapons.

TECH LEVEL 9

The first orbital fighters appear as increasingly powerful ramjet/rocket propulsion systems become available. VTOL commuter transports make city center-to-city center air transportation common. Larger, more powerful hypersonic airliners become the globe-spanning transportation system of choice. VTOL frontier transports appear, designed to land and take off on small open patches of ground in rugged terrain. Primitive grav vehicles appear and, because of their silent operation, begin replacing helicopters in some covert military operations.

TECH LEVEL 10

Grav vehicles replace helicopters in low-altitude combat and transportation roles. Suborbital transports appear, using VTOL technology to lift off and then using fusion rockets at high altitude to propel them into a ballistic arc. The suborbitals can span a world in one to two hours.

TECH LEVEL 11

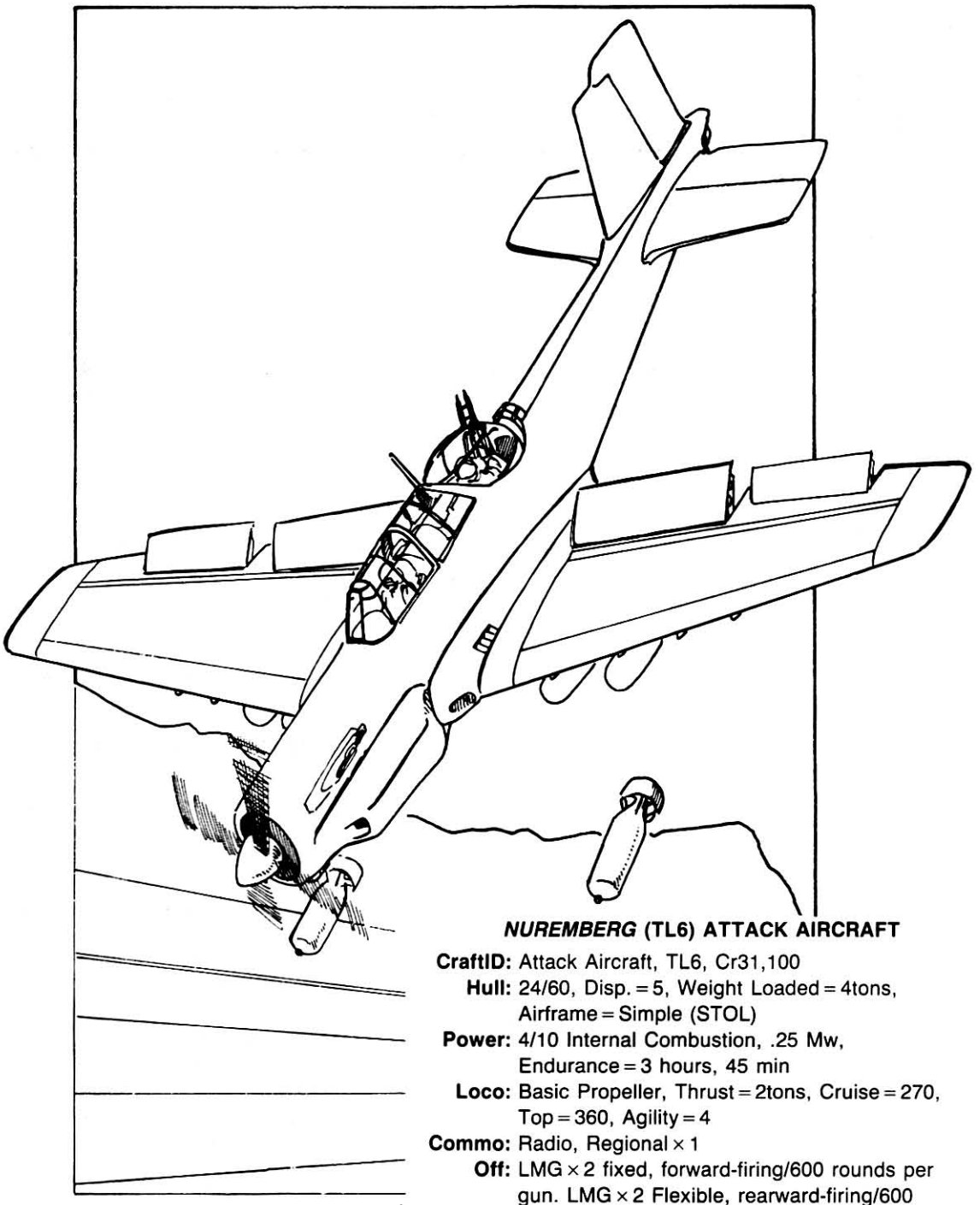
Grav vehicles dominate the air and other transportation functions except for specialized high-speed operations.

TECH LEVEL 12

Grav technology blends with aircraft design to create gravitically propelled, airfoil-supported, medium- to high-speed aircraft. Grav tanks effectively replace fighters at low and medium altitudes while maneuver drive-equipped space fighters replace reaction drive orbital fighters.

TECH LEVEL 13

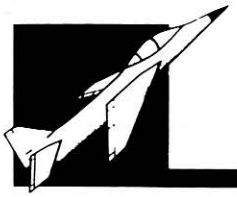
High-capacity grav thruster plates make high-speed grav transport and combat aircraft a practical reality. Airfoils, however, continue to be used for control purposes on some designs. Aircraft and grav vehicles are effectively merged at this tech level.



***NUREMBERG* (TL6) ATTACK AIRCRAFT**

CraftID: Attack Aircraft, TL6, Cr31,100
Hull: 24/60, Disp. = 5, Weight Loaded = 4tons, Airframe = Simple (STOL)
Power: 4/10 Internal Combustion, .25 Mw, Endurance = 3 hours, 45 min
Loco: Basic Propeller, Thrust = 2tons, Cruise = 270, Top = 360, Agility = 4
Commo: Radio, Regional × 1
Off: LMG × 2 fixed, forward-firing/600 rounds per gun. LMG × 2 Flexible, rearward-firing/600 rounds per gun, Fuselage Hardpoint × 1, Inboard Wing Hardpoints × 2, Maximum external stores = 2000kg
Control: Simple
Accom: Crew = 1 (Pilot)
Other: Fuel = 560liters

An example of one of the first purpose-built attack aircraft. They are easy to produce and are known to operate en masse in support of early armored fighting vehicle ground attacks. Similar designs have successfully operated against wet naval shipping from land bases and the decks of specially designed wet naval vessels.



Aircraft Design

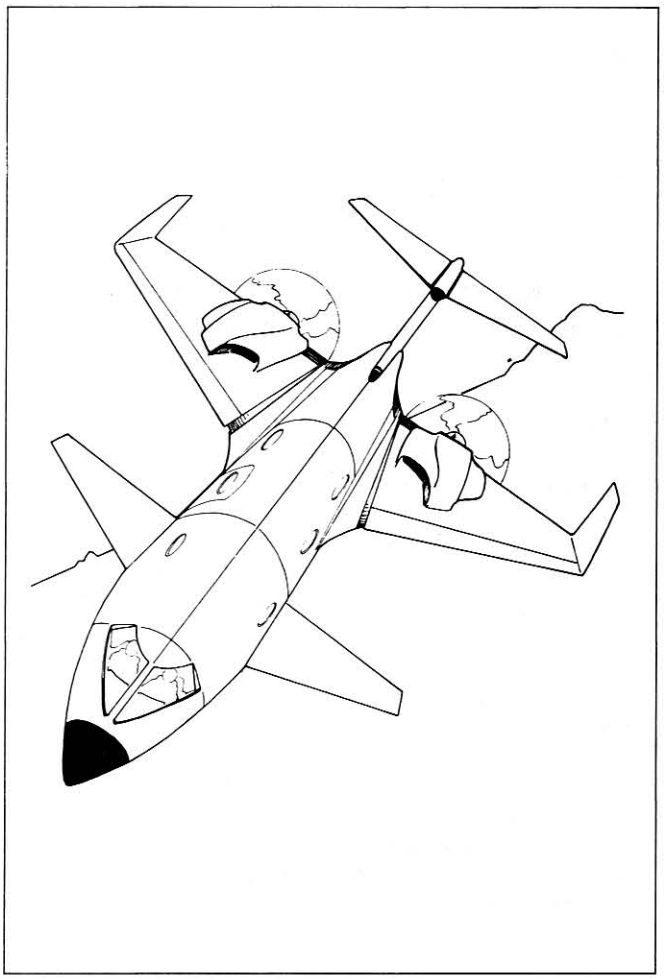
Three basic types of nongrav-powered aircraft can be designed for use in the **MegaTraveller** universe:

- Fixed-wing aircraft.
- Rotary-wing aircraft.
- Lighter-than-air aircraft.

The design sequence in this module addresses the details of their design. Grav-powered vehicles and spacecraft (including those which might be used by COACC) can be designed using the design sequences in the **MegaTraveller Referee's Manual**; they will not be discussed here. However, examples of spacecraft used by COACC forces are described in the aircraft and spacecraft description section later in this module.

FIXED-WING AIRCRAFT

Fixed-wing aircraft rely on their airframe (with its associated wings) to produce lift. Weight is the limiting factor in designing fixed-wing aircraft. The designer selects a maximum weight and then assigns the various components necessary for the aircraft mission and performance. The maximum weight for fixed-wing aircraft is 400 metric tons.



ROTARY-WING AIRCRAFT

Helicopters are rotary-wing aircraft that rely on lift generated by their rapidly rotating airfoils—rotor blades—in order to fly. Their design is limited by the amount of available lift which in turn is derived from the amount of available engine power. The designer selects the type and number of engines desired (or available) and determines their output and the takeoff weight they can support. The designer then assigns the various components necessary for the aircraft mission and performance.

LIGHTER-THAN-AIR AIRCRAFT

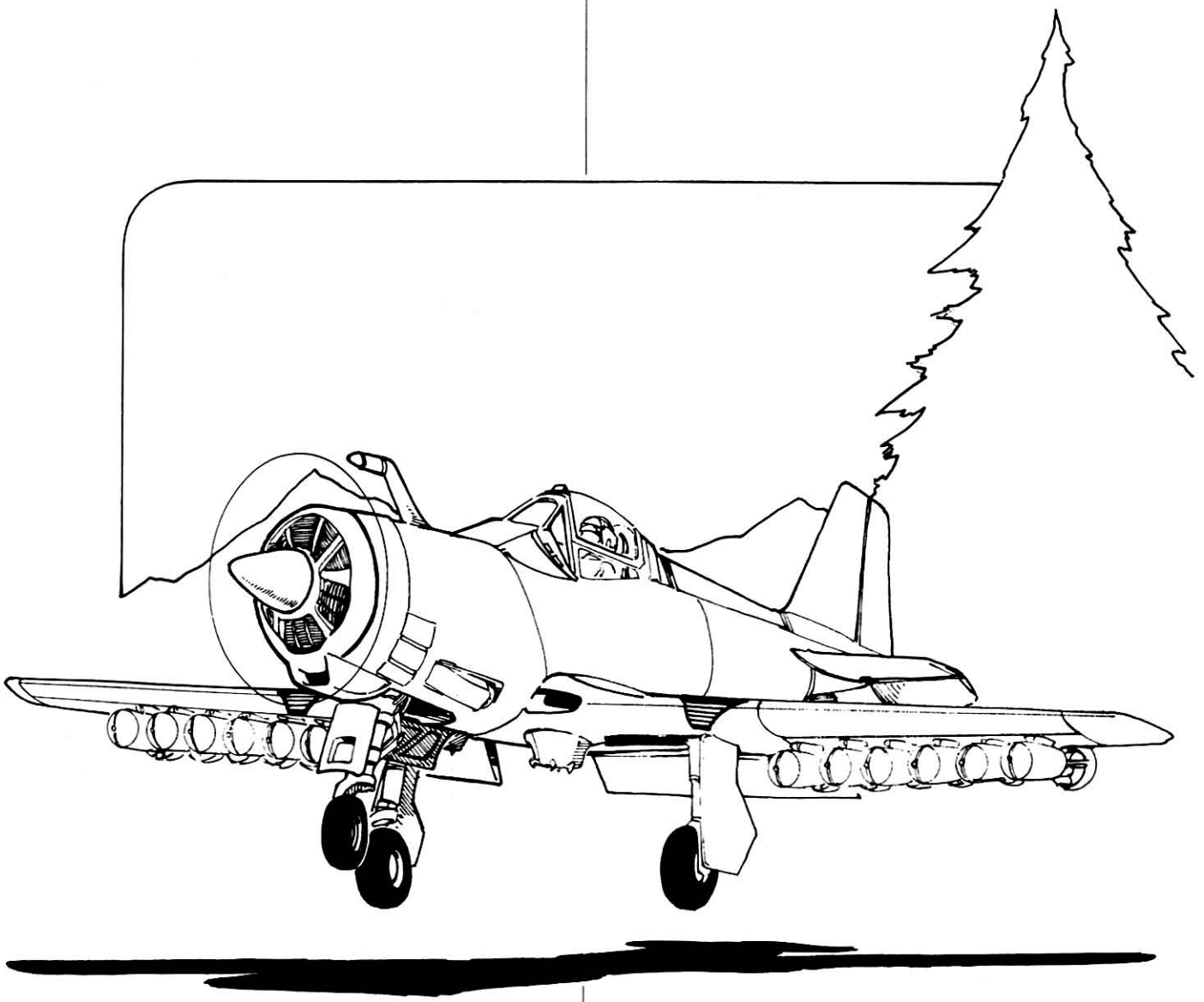
Lighter-than-air aircraft rely on lifting gases to hold them in the air. The limiting factors in airship design are the lifting gas compartment capacity and the lift associated with it. The designer determines the size of the lifting gasbag and computes the available lift for the airship. He then assigns the various components necessary for the airship mission and performance.

THE MISSION SPECIFICATION

Aircraft designs are made in order to produce aircraft which can accomplish specific missions. Before an aircraft is designed, a mission specification should be generated which indicates the nature of the mission, the requirements that the mission may have in terms of payload and aircraft performance, and any special information that must be taken into account. Only after a mission specification has been written should the design be attempted.

A mission specification is written in response to a specific need by a world COACC. That need takes into account the technological capabilities of the world, the known capabilities of existing aircraft, and the capabilities of aircraft possessed by enemy COACCs or by potential invaders.

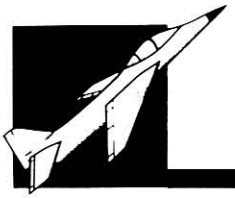
A Typical Mission Specification: Lastina, a TL7 world, has a need for a new generation of escort fighter. As a result, Lastina COACC has established a mission specification for a TL7 escort fighter capable of continental range with a light payload. No intelligence is available concerning potential enemy aircraft to be encountered, so designers are simply encouraged to maximize performance.



***CHICAGO* (TL6) HEAVY ATTACK AIRCRAFT**

CraftID: Attack Aircraft, TL6, Cr165,700
Hull: 28/70, Disp. = 10, Weight Loaded = 7tons, Airframe = Subsonic, Armor = Cockpit 8
Power: 4/10 Improved Internal Combustion, .40 Mw, Endurance = 7 hours
Loco: High Performance Propeller, Thrust = 6.4tons, Cruise = 486, Top = 648, Agility = 2
Commo: Radio, Regional × 1
Off: 20mm autocannon × 4 fixed, forward-firing/200 rounds per gun. Plumbed Inboard Wing Hardpoints × 2, Outboard Wing Hardpoints × 12, Maximum External Stores = 4tons
Control: Simple
Control: Simple
Accom: Crew = 1 (Pilot), Oxygen mask and tank, cockpit armor and ejection seat.
Other: Fuel = 2100liters

Ultimate development of the purpose-built, propeller-driven attack aircraft. This and similar aircraft have turned the tide of battle on many moderate-technology worlds with timely close air support of ground troops. This aircraft's boxy design and massive bomb load have earned it the nickname "Flying Dump Truck." Because it is effective and relatively inexpensive, and is rugged and can operate from frontier airstrips, it is a favorite of mercenary air wings operating on low- to moderate-technology worlds. However, it is vulnerable to TL7 + antiaircraft weapons and fighters, which limits its use on more advanced worlds.



Designing Fixed-Wing Aircraft

Fixed-wing aircraft depend on their airframes and their associated wings to produce the lift that enables them to fly. Fixed-wing aircraft may be propelled by bladed propellers or by jet engines.

Weight is the limiting factor in designing a fixed-wing aircraft. The weight selected by the designer is the aircraft's maximum weight without external stores. This includes the weight of the empty aircraft, a full internal fuel load, the crew, crew accommodations, passengers and their accommodations, cargo, internal weapons, and avionics (communications, sensors, and electronic navigational instruments). Weight is expressed in metric tons in one standard gravity (1G). The maximum weight for fixed-wing aircraft is 400 metric tons. The total weight of all components including fuel and cargo must not exceed the aircraft's maximum weight. Externally mounted weapons will increase the weight and add drag, affecting top speed. Up to 35 percent of the aircraft's maximum internal weight may be carried as external stores, depending on available hardpoints. The aircraft's maximum internal weight plus its maximum external stores equals its maximum takeoff weight.

AIRFRAME

Once the designer decides upon the aircraft's weight, he must select the airframe from the Airframes Table. Each type of airframe has its own price per ton of aircraft, minimum and maximum speed limit, and efficiency factor (used in determining the aircraft's cruising and maximum speed).

Airframes may be modified for VTOL aircraft, STOL aircraft, or seaplanes.

VTOL airframes add 10 percent to weight and 50 percent to the cost of the airframe.

STOL airframes add five percent to weight and 30 percent to the cost of the airframe.

Seaplane airframes add five percent to weight and 25 percent to the cost of the airframe.

VTOL and STOL airframes are mutually exclusive; seaplane capability can be added to either VTOL or STOL airframes.

ENGINE

Select the engine or engines to power the aircraft. Available engines are listed on the Engines Table. The first two are internal combustion engines. The remainder, except for rockets, are gas turbine or gas turbine-related engines. Rockets need both fuel and oxidizer, a requirement factored into their fuel consumption figure.

The Engines Table also indicates each engine's approximate rated thrust, weight, and fuel consumption measured in liters per hour, cost in credits, and the highest speed of airframe with which the engine type can be used. Afterburners (at no cost) may be added to turbojet and turbofan engines. Add 10 to the thrust when afterburners are used, but double fuel consumption.

Other factors notwithstanding, the more engine thrust you have for a given aircraft weight, the faster the aircraft will fly. You may install more than one engine per aircraft. If you do so, multiply the thrust, weight, fuel consumption, and cost figures by the number of engines you are installing. This will give you total figures for the aircraft in each category.

Engine compartments or nacelles (pods holding engines under the wings or along the fuselage) may be armored. Engine armor weighs one ton per engine and gives an armor factor 8 penetration resistance.

VTOL: Engine thrust must exceed the total weight of a VTOL aircraft if it is to hover, or to take off and land vertically. Otherwise, the aircraft is limited to STOL operations. VTOL aircraft may take off in STOL mode if they are over the VTOL weight limit, then land vertically after external stores are dropped or sufficient fuel is burned to bring them below the VTOL weight limit. This is called STOVL operation.

Engine Limitations: Some types of engines have limitations.

Ramjet-powered aircraft must reach a speed of 800 kilometers per hour before the ramjet will start. The ramjet may be launched from another aircraft at that speed, or the ramjet may also use one or more turbojets, turbofans, or rockets to boost it to that speed.

Rocket-powered craft are usually designed for vacuum or trace atmosphere operations where air-breathing engines cannot operate. Some hypersonic orbital fighter designs include a turbojet for takeoff and initial climb, a ramjet for reaching suborbital velocities, and a rocket for final boost and orbital maneuvering.

CONTROLS

Select controls for the aircraft from the Controls Table. Control types are limited by the airframe of the aircraft. Some types yield maneuver points which are added to the aircraft's agility rating for air-to-air combat and evading ground fire.

CREW AND PASSENGERS

Crew and passenger accommodations can range from a single seat for a fighter pilot to 500 seats for passengers and four crew stations aboard a jumbo jetliner. Note that, for convenience, regular passengers are seated in multiples of four; first-class passengers in multiples of two. Jumbo jetliners carrying passengers in 12-across rows would need three passenger sections per row. A small executive jet would only need one passenger section.

Pilots of aircraft without advanced electronics may be in

simple cockpits, and their crews may be at crew stations. Pilots must be in complex cockpits aboard aircraft equipped with radar, electronic countermeasures (ECM), infrared sensors, low-light vision devices, or enhanced controls.

A radar operator, or second pilot who can act as a radar operator, must be aboard an aircraft equipped with terrain-following radar, or target acquisition and fire control radar and high-performance, operator-guided missiles. This individual may also operate a laser target-designator system.

Two pilots are needed for aircraft over 25 tons. A flight engineer is needed for aircraft over 50 tons. The pilot acts as a gunner for any forward-firing, fixed weapons, bombs, rockets, and missiles. Turret-mounted and flexible-mounted guns require a gunner. One gunner may control any number of remote control turrets but may fire only one turret during a combat round. A gunner in a simple turret may only fire the guns in that turret. A gunner firing guns attached to a flexible mount may fire only those guns during a combat round, but may move to a second flexible and fire its guns in the following combat round.

A bombardier and a navigator must be carried aboard a bomber aircraft weighing more than 50 tons.

Armor and various escape devices listed in the Crew/Passenger Accommodations Table may be added to any cockpit or crew station. Transonic combat aircraft require ejection seats for each crewmember; advanced ejection seats are required aboard supersonic combat aircraft; and rocket-powered escape capsules are required aboard any hypersonic aircraft.

Cockpit armor has a rating of 8 against penetration.

LIFE SUPPORT

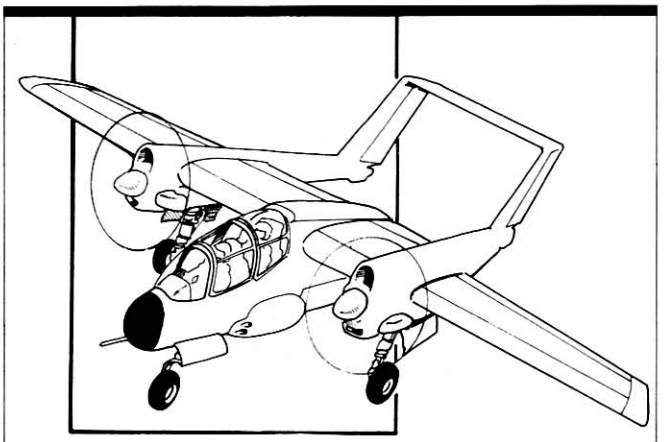
Aircraft flying above 3000 meters in a standard atmosphere (5000 meters in dense, 1500 meters in thin) require life support systems. These range from oxygen tanks and masks to sealed cockpits and full pressure suits aboard combat aircraft, to sealed cabins and basic life support systems for civilian airliners.

Select a life support system from the Life Support Table.

WEAPONS MOUNTS

The number of weapons mounts should be determined and the type selected from the Weapon Mounts Table. Fixed mounts have no weight or drag. Hardpoints only have drag when ordnance or a bomb rack is mounted. Drag disappears when weapons are dropped or launched. Turrets always incur a drag penalty.

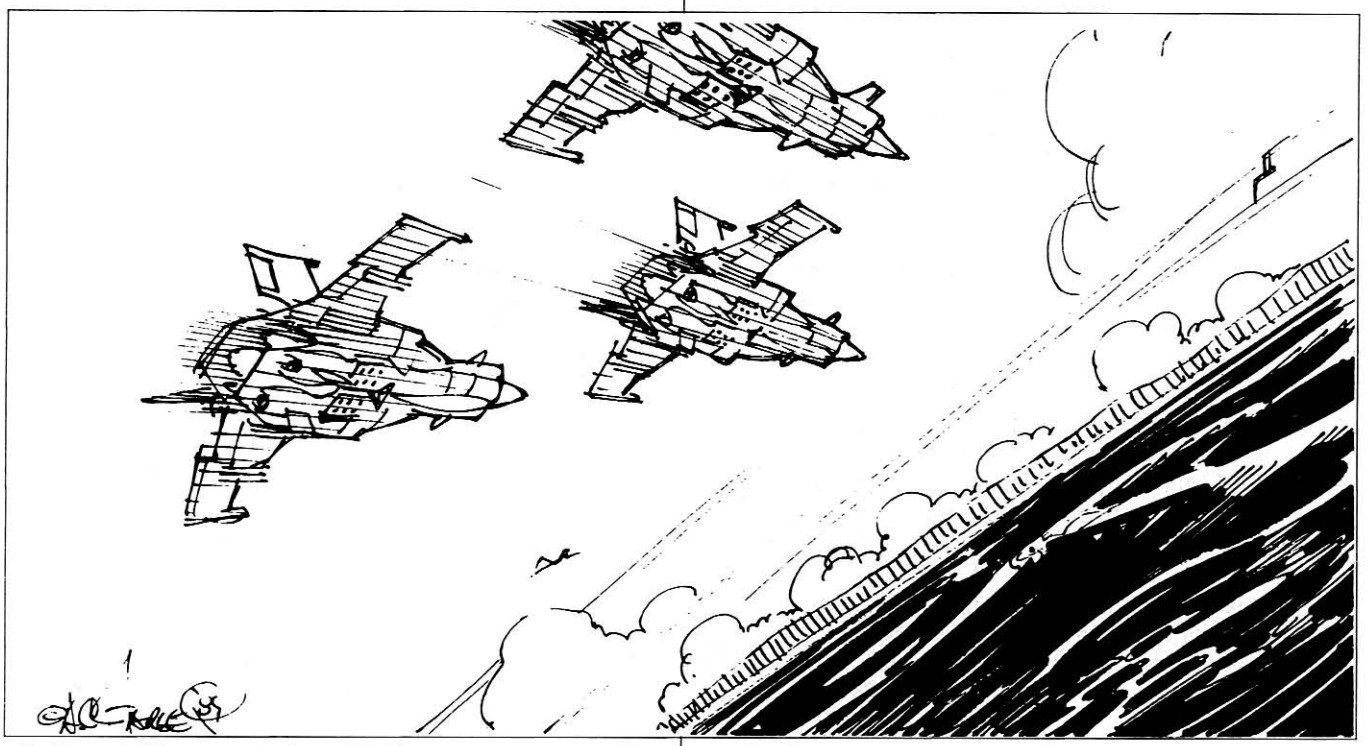
Hardpoints are generally located beneath the fuselage and wings. Normally an aircraft only has room for one fuselage hardpoint—usually the strongest of all the hardpoints. Fuselage hardpoints can carry up to 2000 kilograms of ordnance. Hardpoints can carry less of a load as you move outboard. Inboard wing hardpoints carry up to 1500 kilograms each, while outboard hardpoints carry up to 500 kilograms each. Up to two inboard and two outboard hardpoints may be fitted to each wing. Bomb racks, each carrying up to six bombs, three rocket pods, or three launch rails with their missiles may be attached to each hardpoint, as well as single weapons. Fuel drop tanks may be attached to the centerline hardpoint or the inboard wing hardpoints if they have fuel intake plumbing. Launch rails for



***PLEIKU* (TL7) LIGHT ATTACK AIRCRAFT**

CraftID: Attack Aircraft, TL7, Cr123,500
Hull: 22/54, Disp. = .075, Weight Loaded = 5.4tons, Airframe = Subsonic (STOL)
Power: 4/10 Gas Turbine × 2, .60 Mw, Endurance = 2 hours, 25 min on internal fuel, 4 hours with internal fuel and 1500liter drop tank
Loco: Light Turboprop × 2, Thrust = 8tons, Cruise = 600, Top = 800, Min = 80, Agility = 2
Commo: Radio, Regional × 1
Off: LMGs × 4 fixed, forward-firing in weapons sponsons with 500 rounds per gun. Plumbed fuselage hardpoint × 1, equivalent of outboard wing hardpoints × 4 on sponsons. If fuselage hardpoint is used, only two sponson hardpoints may be used. Maximum external stores = 1600kg
Control: Simple
Accom: Crew = 2 (Pilot, Observer), Ejection seats
Other: Cargo = 1 ton. Five passengers or two medevac patients on litters, or one ton of cargo may be carried in rear cargo compartment. Rear clamshell doors detach, and four paratroopers or cargo may be air-dropped. Fuel = 2332liters; additional 1500liter drop tank may be carried beneath fuselage.

All-purpose light attack, reconnaissance, liason, cargo, and airdrop aircraft designed to operate in a low-threat combat environment from rugged forward airstrips. Its high-wing, twin tail boom design gives high ground clearance for takeoff and landing. Low pressure tires and STOL capability enable this aircraft to operate from dirt airstrips. Simple, light-weight turboprop engines and controls make maintenance inexpensive and easy. This is a favorite design used by many mercenary battalions in their organic aviation platoons for scouting and on-call close air support. The rear seat observer often acts as a forward air controller, guiding in heavier attack aircraft onto targets spotted and first engaged by the LAA.



missiles weighing no more than 100 kilograms may be installed on wingtips.

WEAPONS

A wide variety of weapons may be installed aboard aircraft. Machineguns and autocannons may be installed either in fixed, forward-firing mounts, or in flexible or turret mounts. Lasers and energy weapons may also be installed in fixed, forward-firing mounts.

Bombs may be installed in internal bomb bays. One ton of bombs may be carried for each ton allocated for internal bomb bays. They may also be attached to hardpoints either singly or in multiple racks. Rocket pods, gun pods, electronic countermeasures pods, photo and radar reconnaisance pods, infrared sensor pods, flare dispenser pods, napalm tanks, and fuel tanks may also be carried by the hardpoints. Missiles and larger free-flying rockets may be carried on missile launch rails that are mounted separately or are attached to hardpoints. Ammunition for internally mounted guns is included in the overall aircraft weight. Ammunition for gun pods is included in the pods and counts as part of the external load. Ordnance and its uses will be discussed in detail in "Aircraft Ordnance" later in this rules module.

ELECTRONICS

Electronic systems may be installed on the aircraft. These include radios, radar, electronic countermeasures, navigation aids, forward-looking infrared (FLIR) and low-light-level television (LLTV) sensors. Combat aircraft of Pre-stellar technology (TL7)+ may also carry ECM systems, reconnaissance cameras, and radar reconnaissance systems in pods. Internal electronic systems count toward the total aircraft weight. External, pod-mounted systems incur a drag penalty and count toward the aircraft's loaded weight. Complete lists of available communications, detection, and ECM systems are found in the **MegaTraveller Referee's Manual**. Pod-mounted systems are discussed in "Aircraft Ordnance" later in this rules module.

CARGO

Aircraft may have weight allocated to cargo. Each ton of cargo capacity allocated enables the aircraft to carry one ton of cargo.

MANEUVER ENHANCEMENT

You may allocate any percentage of the aircraft's weight to maneuver enhancement. There is no cost. The higher the percentage, the more agile your aircraft will be.

FUEL

Fuel capacity is measured in liters. Aircraft burn either hydrocarbon-based petroleum distillates or alcohol-based fuels. Petroleum distillates are preferred because of their higher thermal energy; however, they may not always be available. When alcohol-based fuels are used, deduct 20 percent from the aircraft's thrust rating. Both petroleum distillates and alcohol-based fuels cost Cr.25 per liter.

Each ton of aircraft allocated to fuel storage will allow it to carry 1000 liters of fuel. This is the internal fuel capacity. Drop tanks with capacities from 500 to 2000 liters are available to increase range and/or endurance.

An air-to-air refueling probe may be included in an aircraft design. This lets the aircraft refuel in flight from a tanker aircraft or another aircraft carrying a refueling pod as an external store. Refueling probes cost Cr1000 and weigh one-tenth of a ton. Refueling pods include a wind-powered transfer pump attached to an extendable hose and drogue, and a tank holding up to 1000 liters of fuel for transfer. Refueling pods cost Cr5000 and weigh one ton.

FIXED-WING AIRCRAFT RATINGS

Once you have designed your aircraft, you need to determine and record its ratings. These include weight, thrust, speed, agility, damage points, fuel use, endurance, range, price, and volume.

Weight: An aircraft's full internal weight is the weight determined at the beginning of the design sequence. Be sure the total weights of all components including fuel, cargo, ammunition, and bombs in bays do not exceed the specified weight. Any extra space may be used as fuel tankage or cargo capacity. This is the aircraft's "clean" weight.

An aircraft also has a maximum gross takeoff weight. This includes the full internal weight plus the weight of maximum external stores attached to the hardpoints. As a rule, the aircraft's maximum gross takeoff weight—also called its "loaded" weight—should not be more than 135 percent of its "clean" weight. An aircraft with a fuselage hardpoint, two inboard hardpoints, and two outboard hardpoints fully loaded with weapons would weigh its full internal weight plus six tons.

Thrust: An aircraft's thrust is equal to the thrust of its engine type listed on the Engines Table times the number of engines on the aircraft. Thrust is listed in tons.

G Rating: An aircraft's G rating helps determine its top speed and agility. Calculate the G rating by dividing the aircraft's total thrust by its weight and multiplying the result by the airframe efficiency factor for the airframe type listed on the Airframes Table. Calculate the G rating using both the aircraft's clean and loaded weights (for two different ratings).

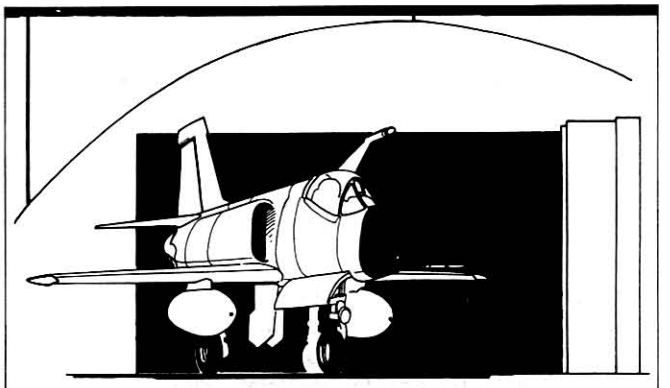
Speed: Find the aircraft's maximum speed by locating its G rating on the Maximum Speed Table and its corresponding speed in kilometers per hour. Do this using both G ratings to obtain maximum speeds for both clean and loaded weights. Maximum speed cannot be greater than the maximum design speed listed for airframe type.

Maximum speed is reduced by drag. Note the total number of drag points from the Weapon Mounts Table for the aircraft with and without external stores. Reduce the maximum speed by one percent for each drag point. As an example, an attack aircraft carrying four loaded, multiple-bomb racks under its wings and a drop tank under its fuselage would have 17 drag points. This would reduce its maximum speed while carrying these external stores by 17 percent. Once the bombs and tanks are dropped, the aircraft's maximum speed increases to its full internal weight speed or maximum airframe design speed, whichever is lower.

Cruising Speed: An aircraft's cruising speed is 75 percent of its maximum speed.

Minimum Speed: An aircraft's minimum speed depends on its airframe type. Note its minimum speed on the Airframes Table. The first number is for a standard airframe; the second for a STOL aircraft using that airframe. VTOL aircraft have no minimum speed. Minimum speed is reduced by one percent for every one percent of aircraft weight used for maneuver enhancement.

NOE Speed: Only VTOL aircraft and helicopters fly the contours of the ground at nap-of-the-earth (NOE) speeds. They may fly no more than 40 kilometers per hour without radar, and 120 kilometers per hour with radar.



***SAN DIEGO* (TL7) MEDIUM ATTACK AIRCRAFT**

CraftID: Attack Aircraft, TL7, Cr545,000
Hull: 40/100 Disp. = 16, Weight Loaded = 10tons, Airframe = Transonic
Power: 4/10 Gas Turbine × 1, .60 Mw, Endurance = 3 hours, 20 min on internal fuel, 4 hours, 30 min with internal fuel and 2000 liter drop tank, 5 hours, 20 min with internal fuel and two 1500 liter drop tanks
Loco: Basic Turbojet × 1, Thrust = 15tons, Cruise = 825, Top = 1100, Min = 176, Agility = 3
Commo: Radio, Regional × 1
Off: 20mm autocannon × 2 fixed, forward-firing w/200 rounds per gun, Plumbed Fuselage Hardpoint, Plumbed Inboard Wing Hardpoints × 2, Outboard Wing Hardpoints × 2, Maximum External Stores = 3.5tons; Nuclear capable.
Control: Boosted, 1 Maneuver Point
Accom: Crew = 1 (Pilot), Oxygen tanks and mask, Cockpit armor and ejection seat
Other: Fuel = 5150liters. Additional 2000liter drop tank may be carried beneath fuselage, or two additional 1500liter tanks may be carried on the inboard wing hardpoints. Refueling probe fitted for fuel transfer from aerial tanker or buddy fuel pack mounted on another aircraft.

One of the most popular aircraft designs used by mercenary air squadrons, this medium attack aircraft packs a massive punch but is relatively inexpensive to buy, maintain, and operate. It is sufficiently agile for close air support and has sufficient range for deep strike interdiction missions. Its small size makes it a hard target for both ground-based antiaircraft gunners and opposing pilots. Its size, speed, and agility make it survivable in a moderate-technology, high-threat environment. Flying clean without external stores, this aircraft can be a formidable air-to-air opponent. Some examples of the medium attack aircraft have been fitted with air-to-air missiles and used as interceptors. Its relatively small size makes it easily transportable in the holds of starships, another plus for mercenaries on the move.

WEIGHT

Aircraft weight is determined by the mission specification or arbitrarily by the designer. Design weight may be revised as a clearer picture of the final aircraft materializes. Weight is specified in tons; maximum weight is 400 tons.

AIRFRAMES

Tech Code	*TL*	*Type*	*Weight*	*Price*	*Min Speed*	*Max Speed*	*Efficiency*
Industrial	4	Simple	.01	10	150/ 75	300	.85
Pre-Stellar	6	Fast Subsonic	.05	20	160/ 80	800	.90
Pre-Stellar	6	Transonic	.10	30	176/ 88	1100	.95
Pre-Stellar	6	Supersonic	.20	40	280/140	2800	1.00
Pre-Stellar	6	Hypersonic	.30	100	350/175	5000	1.00

Units: *Weight:* Tons per ton of aircraft. *Price:* Thousands of credits per ton of aircraft. *Min Speed:* Minimum speed in kilometers per hour for normal aircraft/for STOL. *Max Speed:* Maximum design (do not exceed) speed for airframe type. *Efficiency:* Airframe efficiency used in determining maximum and cruising speeds.

VTOL airframes add 10% to weight and 50% to cost of the airframe. STOL airframes add 5% to weight and 30% to cost of the airframe. Seaplane airframes add 5% to weight and 25% to cost of the airframe. VTOL and STOL airframes are mutually exclusive; seaplane capability can be added to either VTOL or STOL airframes.

ENGINES

Tech Code	*TL*	*Type*	*Thrust*	*Weight*	*Fuel*	*Cost*	*Airframe*
Industrial	4	Basic Propeller	2	1	150	5000	Fast Subsonic
Industrial	5	Light Propeller	1	0.5	75	3500	Simple
Pre-Stellar	6	High Performance Propeller	6.4	1	300	20,000	Fast Subsonic
Pre-Stellar	6	High Performance Turboprop	15	1	1200	100,000	Fast Subsonic
Pre-Stellar	6	High Performance Turbojet	18	1	2160	150,000	Supersonic
Pre-Stellar	6	Basic Ramjet	30	1	9600	250,000	Hypersonic
Pre-Stellar	6	High Performance Ramjet	39	1	12,000	300,000	Hypersonic
Pre-Stellar	6	Basic Rocket	30	1	19,200	250,000	Hypersonic
Pre-Stellar	6	High Performance Rocket	39	1	24,000	300,000	Hypersonic
Pre-Stellar	6	Engine Compartment Armor	—	1	—	10,000	—
Pre-Stellar	7	Basic Turboprop	12	1	960	75,000	Fast Subsonic
Pre-Stellar	7	Light Turboprop	4	0.5	400	50,000	Fast Subsonic
Pre-Stellar	7	Basic Turbojet	15	1	1560	125,000	Supersonic
Pre-Stellar	7	Light Turbojet	6	0.5	700	100,000	Supersonic
Pre-Stellar	7	Basic Turbofan	18	1	1680	175,000	Supersonic
Pre-Stellar	7	High Performance Turbofan	21	1	1920	200,000	Supersonic
Pre-Stellar	8	High Bypass Turbofan	50	4	3840	250,000	Supersonic
Early Stellar	10	Fusion Rocket	195	4	5	350,000	Hypersonic

Units: *Thrust:* Tons. *Weight:* Tons. *Fuel:* Consumption in liters/hour. *Cost:* Credits. *Airframe:* Highest speed airframe with which this engine can be used.

Afterburners: Afterburner may be used with turbojet and turbofan engines. Add 10 tons thrust and double fuel consumption when in use. **Rockets:** Rocket fuel consumption includes both fuel and oxidizer. **Ramjets:** Ramjets must reach a speed of 800 kph before the ramjet will start.

Multiple Engines: The table shows information for one engine. If additional thrust or performance is required, additional engines must be installed.

Tech Level Effects: Thrust and cost for each engine increases by 2% per tech level above the basic stated tech level in the table. Weight and fuel consumption decrease by 2% per tech level above the basic stated tech level in the table.

CONTROLS TABLE

Tech Code	*TL*	*Type*	*Airframe*	*MP*	*Power*	*Weight*	*Price*
Industrial	5	Simple	Fast Subsonic	0	0.0	.05	20
Pre-Stellar	6	Boosted	Transonic	1	.1	.10	50
Pre-Stellar	6	Powered	Hypersonic	2	.1	.15	100
Pre-Stellar	6	Fly-by-Wire	Hypersonic	4	.2	.20	200
Pre-Stellar	6	Computer-Enhanced Fly-by-Wire	Hypersonic	6	.3	.15	1000

Units: *Airframe:* Highest speed airframe this type of control may be used with. *MP:* Maneuver points. *Weight:* Weight multiplier (weight multiplier × aircraft weight = weight of controls). *Price:* Price in thousands of credits per ton of controls. *Power:* Mw power required per ton of controls.

CREW/PASSENGER ACCOMMODATIONS

Tech Code	TL	Type	Capacity	Volume	Weight	Price
Industrial	5	Simple Cockpit	1	2	.10	5000
Industrial	5	Crew Station	1	2	.10	5000
Industrial	5	Passenger Section	4	4	.30	5000
Pre-Stellar	6	Complex Cockpit	1	2	.25	50,000
Industrial	5	Cockpit Armor	(1)	1	+.10	5000
Pre-Stellar	6	Ejection Seat (Transonic)	(1)	1	+.10	5000
Pre-Stellar	6	Advanced Ejection Seat (Supersonic)	(1)	1	+.25	10,000
Pre-Stellar	6	Rocket Escape Pod (Hypersonic)	(1)	1	+.50	15,000

Units: *Capacity:* Number of persons each station will hold (items with capacity in parentheses may be added to a cockpit or station at the designer's option). *Weight:* Tons. *Cost:* Credits. *Volume:* Kiloliters

LIFE SUPPORT TABLE

TL	Description	Volume	Weight	Price	Units
5	Oxygen Tanks and Masks	0.010	0.010	Cr100	Per person
5	Basic Environment (lights and heat)	0.005	0.005	Cr10	Per kiloliter of occupied space
5	Basic Life Support (sealed, atmosphere)	0.050	0.050	Cr300	Per kiloliter of occupied space

Units: *Volume:* Kiloliters (one kiloliter = one cubic meter). *Weight:* Kilograms. *Price:* Credits.

WEAPON MOUNTS TABLE

Tech Code	TL	Type	Drag	Weight	Capacity	Price
Industrial	5	Fixed Mount	0	0.00	1 slugthrower/energy weapon	0
Industrial	5	Launch Rail	(1)	.01	1 100kg missile/rocket	100
Industrial	5	Flexible Mount	1	.005	1 heavy machinegun	100
Industrial	5	Fuselage Hardpoint	(1)	.02	2000 kg	2000
Industrial	5	Plumbed FHP	(1)	.03	2000 kg or 2000-liter tank	2500
Industrial	5	Inboard Wing Hardpoint	(1)	.02	1500 kg	2000
Industrial	5	Plumbed IWHP	(1)	.03	1500 kg or 1500-liter tank	2500
Industrial	5	Outboard Wing Hardpoint	(1)	.02	500 kg	2000
Industrial	5	Triple Bomb/Missile Rack	(2)	.05	3 bombs/rocket pods/missiles	4000
Industrial	5	Multiple Bomb/Missile Rack	(4)	.10	6 bombs	8000
Industrial	5	Internal Bomb Bay	0	1.00	1 ton of bombs per ton of bomb bay	15,000
Industrial	5	Turret	4	.40	2 heavy machineguns	5000
Industrial	5	Remote Turret	2	.50	4 heavy machineguns	50,000
Pre-Stellar	6	Turret Autocannon	2	.50	2 autocannons/1 multibarrel	50,000
Pre-Stellar	6	Remote Turret	1	.50	1 multibarrel autocannon	20,000

Units: *Drag:* Drag points (values in parentheses only affect loaded aircraft). *Weight:* Tons. *Cost:* Credits.

Inboard hardpoints are located between the wing root and half the distance to the wingtip. Outboard hardpoints are located between the wingtip and half the distance to the wingtip. Aircraft may have no more than two inboard and two outboard hardpoints under each wing. Aircraft may have up to eight launch rails on each wing and one on each wingtip.

WEAPONS

A wide variety of weapons may be installed aboard aircraft. Ordnance and its uses are discussed in detail in the Ordnance Tables.

ELECTRONICS

Electronic systems may be installed on the aircraft. Complete lists of available communications, detection, and ECM systems are found in the **MegaTraveller Referee's Manual**.

Pod-mounted systems are discussed in the "Aircraft Ordnance" section of this rules module.

CARGO

Allocate tonnage for cargo. One ton holds one ton of cargo.

FUEL

Allocate one ton per 1000 liters of fuel.

MAXIMUM SPEED TABLE

G Rating	Max Speed	G Rating	Max Speed	G Rating	Max Speed
.10	120	.70	840	2.4	2400
.15	180	.80	960	2.6	2600
.20	240	.90	1080	2.8	2800
.25	300	1.0	1200	3.0	3000
.30	360	1.2	1320	3.5	3150
.35	420	1.4	1540	4.0	3200
.40	480	1.6	1760	4.5	3600
.45	540	1.8	1980	5.0	3750
.50	600	2.0	2000		
.60	720	2.2	2200		

Units: *Max Speed:* Maximum speed of aircraft in kph. Max airframe design speed may not be exceeded even if max G rating speed is higher. Cruising speed is .75 max speed.

Agility: Agility is used to help determine which aircraft has the advantage in air-to-air combat. Use the following formula to calculate an aircraft's agility rating:

$$(MS/100 + G \times 100)/100 - ME + MP.$$

MS is the aircraft's maximum speed.

G is the G rating.

ME is the percentage of weight devoted to maneuver enhancement.

MP is the number of maneuver points from the aircraft controls. Maneuver points for each type of controls are listed in the Controls Table.

Volume: *You need to calculate the aircraft's volume to determine* its damage point rating. Simply multiply its weight by 60 to determine its volume in cubic meters. This volume is also the space needed to ship an aircraft in combat-ready condition inside another vehicle such as a starship. If its wings have been folded or removed for ease of transport, multiply its weight by 20 to determine shipping volume.

Damage Points: Calculate the damage point ratings for the aircraft's airframe and its engines. The damage point ratings for each component consist of two numbers separated by a slash. The first number shows the number of damage points needed to make the component inoperable; the second, to destroy the component.

See "Air-to-Air Combat" for a discussion of damage effects.

Calculate the airframe's first damage point figure by dividing the aircraft's volume by 15. Then calculate the second damage point figure by dividing the volume by six. A 50-ton aircraft with a volume of 3000 cubic meters would have an airframe damage rating of 200/500.

Each engine has its own damage rating of 4/10.

Fuel Use: The fuel use of each engine type is listed in liters per hour on the Engines Table. Multiply the figure for the installed engine type by the number of engines installed on the aircraft to determine total hourly fuel use.

Endurance: Endurance is the number of hours an aircraft can remain aloft at cruising speed. Divide the total number of liters of fuel on board (including fuel in drop tanks) by the fuel use rate to determine endurance.

Range: Range is the distance an aircraft can fly at cruising speed. Calculate range by multiplying endurance by cruising speed. Do this for both clean cruising speed and loaded cruising speed.

Price: Total the price of the aircraft's components to determine its total price.

FIXED-WING AIRCRAFT DESIGN CHECKLIST

1. Determine maximum aircraft weight in metric tons.

A. Determine maximum weight of external stores (35 percent of maximum weight).

B. Determine maximum weight of internal stores (35 percent of maximum weight).

C. Add the weights from steps 1A and 1B to determine maximum takeoff weight.

2. Select airframe type from Airframes Table.

A. Determine weight of airframe.

B. Determine price of airframe.

C. Adjust A and B as indicated if designing an STOL, VTOL, or seaplane.

D. Determine minimum and maximum speed limits imposed by airframe.

3. Select type of engine from the Engines Table, and determine the number of engines for the design. If a jet engine is used, add afterburner if desired.

A. Note thrust.

B. Note weight.

C. Note fuel consumption.

D. Note cost.

E. Determine maximum airframe type that is compatible with selected engine.

F. *Note any engine type limitations*

4. Select controls. Note airframe limitations, weight, and price.

5. Select passenger (if any) and crew accommodations. Note crew requirements. Add armor and any escape devices, noting their weight and cost.

6. Select life support systems as needed.

7. Select weapons mounts, including internal mounts, bays, and hardpoints for external stores. Note price, weight limitations, and drag penalties.

8. Select permanently mounted internal weapons such as machineguns, autocannons, or lasers. Determine their ammunition loads. Note weights. Determine tonnage for internal bomb bays.

9. Select electronics—including communicators, sensors, and computers—from tables in the **MegaTraveller Referee's Manual**.

10. Allocate cargo tonnage.

11. Allocate a percentage of aircraft weight for maneuver enhancement.

12. Allocate tonnage for fuel. One ton holds 1000 liters.

13. Total the weight of all components, including cargo, fuel, and maneuver enhancement tonnage. This total should not exceed the weight selected in step 1.

14. Rate your aircraft.

A NEW FIGHTER FOR PRETORIA

The capital of Pretoria subsector in Deneb sector is an important world on the Imperial border with the Vargr states. Pretoria (Pretoria/Deneb 0406 B656967-9) is a Hi Pop world.

Pretoria developed a need for a new fighter later in the last century. On 024-1098, Pretoria's Close Orbit and Airspace Control Command issued a mission specification for what it called *Fighter 1100*.

That specification was the basis for the design and construction of the present mainstay of its aerial forces.

***Fighter 1100*:** This air superiority fighter is to be a TL9 fixed-wing fighter with Near Planetary range (at least 4000 kilometers), supersonic speed (at least 1200 kilometers per hour), and a medium (five ton) payload.

The Design Process

Fighter 1100 was designed in the following manner.

Weight: The armed aircraft will carry up to 5 tons of external ordnance and no internal ordnance or stores. Because external stores may be no more than 35 percent of maximum

weight, the aircraft must be at least 15 tons. The weight of the aircraft is planned at 15 tons.

Airframe: The aircraft is planned as supersonic, so a supersonic airframe is selected. The airframe weighs in at 3.0 tons (0.20 tons per ton of aircraft) and costs Cr600,000 (Cr40,000 times 15 tons).

It will have a minimum speed of 280 kilometers per hour and a maximum speed of 2800 kilometers per hour (if its engines can produce it). The airframe efficiency is 1.00.

Engines: The aircraft is given a TL9 high performance turbofan engine with an afterburner. Because the engine is TL9 (two levels higher than its introductory TL7), the engine is 4 percent costlier and has 4 percent more thrust; it is 4 percent lighter and has 4 percent less fuel consumption. The engine produces 21.84 tons of thrust and costs Cr208,000. The engine weighs 0.96 tons, and fuel consumption is 1843 liters per hour.

The afterburner adds no weight or cost. When in use, it increases thrust to 31.84 tons and fuel consumption to 3686 liters per hour.

The engine compartment is armored at a cost of Cr20,000.

Controls: The aircraft designers select relatively inexpensive powered controls for the *Fighter 1100*. The installation requires 2.25 tons (0.15 times 15 tons) of powered controls and costs Cr225,000. The controls provide two maneuver points and require 0.225 megawatts of power.

Accommodations: The aircraft is fitted with a complex cockpit (at 0.30 tons and a cost of Cr50,000). Cockpit armor is added (0.10 tons and Cr5000). An advanced ejection seat is also added (0.25 tons and Cr10,000). The volume of the accommodations installation is four kiloliters.

Life Support: The aircraft is provided with basic life support for the three kiloliters of accommodations provided. It weighs 0.2 tons and costs Cr1200.

Weapons Mounts: The designers allocate the maximum available number of launch rails to the wings of the aircraft: 18 (eight under each wing and one on each wingtip). The installation costs Cr1800 and weighs 0.18 tons. When loaded, the 18 launch rails will impose 18 drag points on the aircraft.

Electronics and Avionics: The designers select the following electronic equipment for the aircraft: All Weather VDistant Radar-9 (0.008 tons, 0.008 megawatts, 0.016 kiloliters, Cr12,000), Continental Radio Communicator-9 (.0015 tons, 0.0015 megawatts, 0.0016 kiloliters, Cr5000).

The engine can provide power in megawatts up to two percent of its thrust in tons. This aircraft's thrust is 21.84 tons; its power for accessories and electronics is .4368 megawatts (more than enough to power the electronics and avionics on the aircraft).

Cargo: No cargo capacity is allocated.

Maneuver Enhancement: No maneuver enhancement is provided.

Fuel: Fuel tankage for the aircraft must allow it to achieve its mission specification range of at least 5000 kilometers at a speed of 1200 kilometers per hour. Because fuel consumption is 1843 liters/hour, the aircraft must carry 7700 liters (7.7 tons) of fuel.

Rating

The *Fighter 1100* must now be rated and described.

Rated Weight: The aircraft's clean weight (excluding external stores) totals 14.9495 tons. Its maximum takeoff weight (including 18 100-kilogram missiles on the external launch rails) is 16.7495 tons; this is acceptable since 16.7495 is not more than 135 percent of 14.9495.

Thrust: The aircraft thrust is 21.84 tons standard (and 31.84 tons if the afterburner is in use).

G Rating: The G rating for the clean aircraft is 1.46 G; for the loaded aircraft, it is 1.30 G. If the afterburner is in use, the clean G rating is 2.12 G; the loaded G rating is 1.90 G.

Speed: The aircraft maximum speed is determined from the Maximum Speed Table as 1540 kilometers per hour clean (2000 kilometers per hour clean when afterburning). The loaded maximum speed (taking into account the 18-percent reduction in speed due to drag) is 1082 kilometers per hour (1623 kilometers per hour when afterburning). None of these speeds exceeds the maximum speed the airframe is capable of.

Cruising Speed: Aircraft cruising speed is 1155 kilometers per hour clean (75 percent of clean maximum speed) and 811 kilometers per hour loaded (75 percent of loaded maximum speed).

Minimum Speed: The aircraft minimum speed is determined by the Airframe Table as 280 kilometers per hour.

Agility: The aircraft's agility is computed as (1082/100 + 1.3 × 100)/100 − 0 + 2 = 3.4.

Volume: The aircraft volume is computed as 60 times aircraft weight (14.9495), or 897 kiloliters. Displacement of the aircraft is computed as kiloliters divided by 13.5 (which produces the result in displacement tons): 66.5 tons.

Damage Points: The aircraft airframe damage point rating is 60/150 (897/15)/(897/6). The aircraft engine damage point rating is 4/10.

Fuel Use: Fuel use of the aircraft is 1843 liters/hour.

Endurance: The aircraft carries 7700 liters of fuel; it can remain aloft for four hours and 10 minutes.

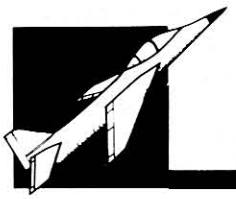
Range: The aircraft can fly up to 4824 kilometers clean and 3387 kilometers loaded.

Price: The total cost for the aircraft is MCr1.12.

PRETORIA (TL9) FIGHTER

CraftID: Fighter 1100, TL9, MCr1.12
Hull: 60/150, Displacement = 66, Weight Loaded = 16.7495tons, Airframe = Supersonic, Armor = Cockpit 8
Power: 0.4368 Mw (drawn from engines), Endurance = 4 hours 10 minutes
Loco: 4/10, High Performance Turbofan with Afterburner, Thrust = 21.84tons (31.84tons with afterburner), Cruise = 1155 kph (clean) and 811 kph (loaded), Top = 1540 kph (2000 with afterburner), Agility = 3
Sensors: All Weather VDistant Radar-9
Commo: Continental Radio Communicator-9
Off: Launch Rails × 18
Control: Powered, 2 Maneuver Points
Accom: Crew = 1 (Pilot), complex armored cockpit, advanced ejection seat, basic life support
Other: 7700liters internal fuel

Meets Pretoria *Fighter 1100* mission specification.



Helicopter Design

Helicopters are rotary-wing aircraft that rely on lift generated by rapidly rotating airfoils—rotor blades—in order to fly. Their design is limited by the amount of available lift which in turn is derived from the amount of available engine power.

ENGINES

The designer should select the type of engine from the Helicopter Engines Table and the number of engines he wants to use for his design. The two basic types are reciprocating and gas turbine—with their variations. Each engine listing includes power output, weight, fuel consumption, and cost.

Once the engine type and number are determined, total the power output in kilowatts. Then multiply the kilowatt rating by four. This yields the helicopter's maximum takeoff weight in kilograms. Divide the kilogram figure by 1000 to calculate maximum takeoff weight in tons. Increase the lift rating of a helicopter using tandem main rotors by 20 percent (see Transmissions and Rotors below).

As an example, a helicopter fitted with one standard gas turbine engine has a power rating of 1000 kilowatts. It has a maximum takeoff weight of 4000 kilograms or four tons. The weight of the airframe, transmission, engine, passengers, cargo, and weapons can never exceed the maximum takeoff weight. This includes any external load, such as weapons on external hardpoints or cargo carried as an external sling load.

TRANSMISSIONS AND ROTORS

Helicopters need gearboxes, transmission assemblies, and rotors to convert engine power to lift. Gearboxes reduce engine speed to rotor speed with reduction ratios of up to 90:1. Transmission assemblies link the engine(s) to the rotors, and rotors provide lift.

Rotors come in several configurations, which in turn affect the number of gearboxes and transmission assemblies needed in a helicopter design. All of these configurations prevent torque from rotating the helicopter in the opposite direction of the rotor's rotation. The most common rotor configurations include the following:

Main and Tail Rotor (MTR): This assembly is a large, single, main rotor and a much smaller, antitorque, tail rotor which is mounted vertically near the end of the tail boom. Gearbox and transmission weight equals 50 percent of the engine's weight.

Tandem Main Rotors (TAN): Two large main rotors that spin in opposite directions are mounted near each end of the airframe. Gearbox and transmission weight equals 75 percent of the engine's weight. Increase the lift rating of a helicopter using tandem main rotors by 20 percent.

Coaxial Main Rotors (COAX): Two large main rotors spinning in opposite directions are mounted on the same vertical axis. Gearbox and transmission weight equals 50 percent of the engine's weight.

Light gearbox and transmission assemblies weighing 20 percent of the engine's weight are available for helicopters weighing two tons or less.

Reduce gearbox and transmission weight by 10 percent per tech level for each tech level above 6. TL6 gearbox and transmission weight is 100 percent; TL7 gearbox and transmission weight is 90 percent; TL8 gearbox and transmission weight is 80 percent. The lightest gearbox and transmission assemblies are 50 percent of the table value.

Gearboxes and transmissions, including rotors, cost Cr10,000 per ton.

AIRFRAME

Helicopters require only a simple airframe. More advanced airframes may be selected if desired. Each type of airframe has its own price per ton of aircraft, maximum speed limit, and efficiency factor (used in determining the aircraft's cruising and maximum speed).

The airframe may be designed to make water landings by adding the seaplane weight tonnage and then calculating the cost using the seaplane cost modifier. Seaplane airframes add five percent to the weight and 25 percent to the cost of the airframe.

CONTROLS

Helicopters larger than 10 tons require boosted controls. Others may use simple controls.

CREW AND PASSENGERS

Helicopters larger than 10 tons require a pilot and copilot. Helicopters (of any size) that are armed require a copilot/gunner. Pilots and copilot/gunners are accommodated in simple cockpits. Troop carrier assault helicopters and search-and-rescue helicopters often have additional observer/gunners manning flexible mounted weapons and carrying out miscellaneous duties in the main cabin.

Passenger seats may be added in groups of four as with fixed-wing aircraft, with each group weighing .3 tons. Fully armed and equipped troops may be carried with .1 ton allocated for each soldier.

CARGO

Helicopters may carry one ton of cargo internally for every ton of available cargo space. Additional cargo may be carried as an external sling load provided its weight added to the helicopter's weight does not exceed available lift.

Helicopters may be designed with no internal cargo space

and function as flying cranes that carry their entire cargo externally.

Other helicopters may be designed with large internal cargo holds and rear ramps so they can carry vehicles or a large number of troops.

WEAPONS MOUNTS

Helicopters may be fitted with any weapon mount from the Weapon Mounts Table as long as the mounts and their load do not exceed available lift. These mounts may include plumbed hardpoints permitting the use of external fuel tanks for extended range or endurance. Specialized gunship helicopters often mount hardpoints and weapons on stub wings extending from the fuselage.

WEAPONS

Nearly any weapon carried by a fixed-wing aircraft may be carried by a helicopter. Machineguns and autocannons may be fitted in fixed, forward-firing mounts, flexible mounts, or, in Pre-Stellar tech levels, in remote turrets. Rocket pods or missiles may be attached to external hardpoints under stub wings or on the fuselage exterior. These missiles include anti-armor tac missiles, as well as air-to-air missiles for use against hostile helicopters and in self-defense against hostile fixed-wing aircraft. Free-fall bombs are generally not carried by helicopters, however, because these aircraft may have trouble avoiding blast damage due to their relatively slow speeds and low operating altitudes. Helicopters assigned to or supporting wet navies also may carry antisubmarine/antiship torpedoes in addition to acoustic submarine detection gear.

ELECTRONICS

Radios, radar, electronic countermeasures, and navigation aids may be installed aboard helicopters. Complete lists of available communications, detection, and ECM systems are found in the **MegaTraveller Referee's Manual**.

FUEL

Fuel capacity is measured in liters. Hydrocarbon or alcohol-based aircraft fuels cost Cr.25 per liter. Each ton of aircraft allocated to fuel storage will carry 1000 liters of fuel. This is the internal fuel capacity. Drop tanks with capacities from 500 to 2000 liters are available to increase range and/or endurance.

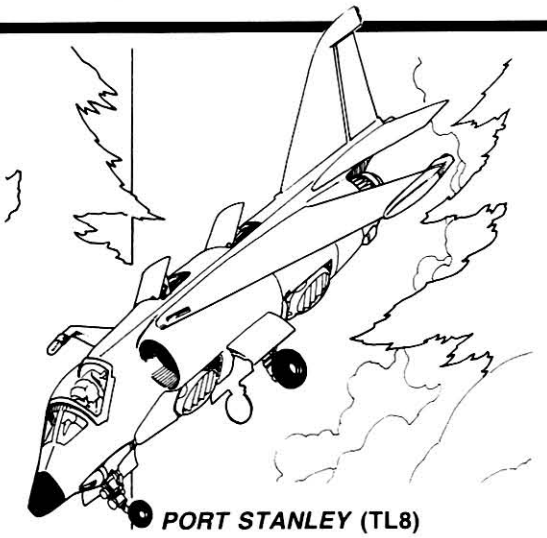
An air-to-air refueling probe may be included in a helicopter design. This lets the helicopter refuel in flight from a tanker aircraft or another aircraft carrying a refueling pod as an external store.

HELICOPTER RATINGS

Once you have designed your helicopter, you need to determine and record its ratings. These include lift, weight, speed, damage points, fuel use, endurance, range, price, and volume.

Lift: Calculate lift by multiplying your total engine power output by four and dividing the result by 1000. This gives you the amount of lift in tons. If you are designing a helicopter with tandem main rotors add 20 percent to the total lift figure.

Weight: Add up the weight of each component in your helicopter, including engine(s), transmission, gearbox and rotor assembly, airframe, passenger and crew accommodations,



***PORT STANLEY* (TL8)**
VTOL MEDIUM ATTACK AIRCRAFT

CraftID: VTOL Attack Aircraft, TL8, Cr1,170,000
Hull: 40/100 Disp. = 16, Weight Loaded = 10tons, Airframe = Transonic VTOL
Power: 4/10 Gas Turbine × 1, .60 Mw, Endurance = 2 hours, 20 min on internal fuel, 5 hours, 15 min with internal fuel, 2000liter drop tank, and two 1500liter drop tanks
Loco: Basic Turbofan × 1, Thrust = 18tons, Cruise = 784, Top = 1045, Min = 0, NOE = 120, Agility = 6
Commo: Radio, Regional × 1 Sensor = TL8 Avionics
Off: 30mm autocannon × 2 fixed, forward-firing w/100 rounds per gun, Plumbed Fuselage Hardpoint, Plumbed Inboard Wing Hardpoints × 2, Outboard Wing Hardpoints × 4, Maximum External Stores = 4tons; Nuclear capable
Control: Boosted, 1 Maneuver Point. Computer = 1, HUD
Accom: Crew = 1 (Pilot), Oxygen tanks and mask, Cockpit armor and ejection seat
Other: Fuel = 4020liters. Additional 2000liter drop tank may be carried beneath fuselage, and two additional 1500liter tanks may be carried on the inboard wing hardpoints.

A very popular attack aircraft design because of its VTOL capability, weapons load, endurance, and agility. This design has proven to be an outstanding fighter as well as an attack aircraft. Its in-flight vectored thrust capability yields high agility and the ability to survive in air-to-air combat. Only its relatively high price precludes it from becoming widely used by mercenary air units. However, because this design is an ideal close air support aircraft capable of operating without airstrips from an open patch of ground, some of the wealthier mercenary ground regiments and brigades may have a small number of these organic to their aviation companies. This design is also prized for its rugged construction and reliability.

AIRFRAMES

Tech Code	TL	Type	Weight	Price	Max Speed	Efficiency
Industrial	4	Simple	.01	10	300	.85
Pre-Stellar	6	Fast Subsonic	.05	20	800	.90

Units: *Weight:* Tons per ton of aircraft. *Price:* Thousands of credits per ton of aircraft. *Max Speed:* Maximum design (do not exceed) speed for airframe type. *Efficiency:* Airframe efficiency used in determining maximum and cruising speeds.

Seaplane airframes add 5% to weight and 25% to cost of the airframe.

HELICOPTER ENGINES

Tech Code	TL	Type	Output	Weight	Fuel	Cost	Airframe
Industrial	5	Light Reciprocating	300	0.5	175	3000	Simple
Pre-Stellar	6	Reciprocating	1250	1.0	375	20,000	Simple
Pre-Stellar	7	Light Gas Turbine	400	0.25	500	50,000	Simple
Pre-Stellar	7	Gas Turbine	1000	0.5	800	75,000	Simple
Pre-Stellar	8	High Performance Gas Turbine	3300	2.0	1600	200,000	Simple

Units: *Output:* Kilowatts. *Thrust:* Tons. *Weight:* Tons. *Fuel:* Consumption in liters/hour. *Cost:* Credits. *Airframe:* Highest speed airframe with which this engine can be used.

Engine Output: Multiply the total engine output rating (in kilowatts) by four to calculate the lift generated by each engine. Increase the lift rating of a helicopter using tandem main rotors by 20%.

This figure is the maximum takeoff weight.

TRANSMISSIONS AND ROTORS

Abbrev	Type Gearbox	Weight	Notes
MTR	Main and Tail Rotor	50%	
TAN	Tandem Main Rotors	75%	120% lift
COAX	Coaxial Main Rotors	50%	

Light transmission and rotor assemblies (20% of engine weight) are available for helicopters weighing two tons or less.

Gearboxes and transmissions, including rotors, cost Cr10,000 per ton.

Reduce gearbox and transmission weight by 10% per tech level for each tech level above 6. TL6 gearbox and transmission weight is 100%; TL7 gearbox and transmission weight is 90%; TL8 gearbox and transmission weight is 80%. The lightest gearbox and transmission assemblies are 50% of the table value.

CONTROLS TABLE

Tech Code	TL	Type	Power	MP	Weight	Price
Industrial	5	Simple	0.0	0	.05	20
Pre-Stellar	6	Boosted	.1	1	.10	50
Pre-Stellar	6	Powered	.1	2	.15	100
Pre-Stellar	6	Fly by Wire	.2	4	.20	200
Pre-Stellar	6	Computer-Enhanced Fly-by-Wire	.3	6	.15	1000

Units: *Maneuver points. Weight:* Weight multiplier (weight multiplier × aircraft weight = weight of controls). *Price:* Price in thousands of credits per ton of controls.

CREW/PASSENGER ACCOMMODATIONS

Tech Code	TL	Type	Capacity	Volume	Weight	Price
Industrial	5	Simple Cockpit	1	2	.10	5000
Industrial	5	Crew Station	1	2	.10	5000
Industrial	5	Passenger Section	4	8	.30	5000
Industrial	5	Troop Section	1	2	.10	500
Pre-Stellar	6	Complex Cockpit	1	4	.25	50,000
Industrial	5	Cockpit Armor	(1)	2	+.10	5000
Pre-Stellar	6	Advanced Ejection Seat	(1)	1	+.25	10,000
Pre-Stellar	6	Rocket Escape Pod	(1)	1	+.50	15,000

Units: *Capacity:* Number of persons each station will hold (items with capacity in parentheses may be added to a cockpit or station at the designer's option). *Weight:* Tons. *Cost:* Credits.

Advanced ejection seat and rocket escape pod must also be armored in order to permit installation. A standard ejection seat cannot be installed in a rotary wing aircraft.

A helicopter requires a pilot. If larger than 10 tons, it requires a pilot and copilot.

LIFE SUPPORT TABLE

TL	Description	Volume	Weight	Price	Units
5	Basic Environment (lights and heat)	0.005	0.005	Cr10	Per kiloliter of occupied space

Units: *Volume:* Kiloliters (one kiloliter = one cubic meter). *Weight:* Kilograms. *Price:* Credits.

WEAPON MOUNTS TABLE

Tech Code	TL	Type	Drag	Weight	Capacity	Price
Industrial	5	Fixed Mount	0	0.00	1 slug thrower/energy weapon	0
Industrial	5	Launch Rail	(1)	.01	1 100kg missile/rocket	100
Industrial	5	Flexible Mount	1	.005	1 heavy machinegun	100
Industrial	5	Fuselage Hardpoint	(1)	.02	2000 kg	2000
Industrial	5	Plumbed FHP	(1)	.03	2000 kg or 2000-liter tank	2500
Industrial	5	Inboard Wing Hardpoint	(1)	.02	1500 kg	2000
Industrial	5	Plumbed IWHP	(1)	.03	1500 kg or 1500-liter tank	2500
Industrial	5	Triple Bomb/Missile Rack	(2)	.05	3 bombs/rocket pods/missiles	4000
Industrial	5	Multiple Bomb/Missile Rack	(4)	.10	6 bombs	8000
Industrial	5	Internal Bomb Bay	0	1.00	1 ton of bombs per ton of bomb bay	15,000
Industrial	5	Turret	4	.40	2 heavy machineguns	5000
Industrial	5	Remote Turret	2	.50	4 heavy machineguns	50,000
Pre-Stellar	6	Turret Autocannon	2	.50	2 autocannons/1 multibarrel	50,000
Pre-Stellar	6	Remote Turret	1	.50	1 multibarrel autocannon	20,000

Units: *Drag:* Drag points (values in parentheses only affect loaded aircraft). *Weight:* Tons. *Cost:* Credits. Helicopter weapons mounts that assume wings also assume the mount produces rudimentary wings to serve the purpose.

Inboard hardpoints are located between the wing root and half the distance to the wingtip. Outboard hardpoints are located between the wingtip and half the distance to the wingtip. Helicopters may have no more than two inboard and two outboard hardpoints under each wing.

WEAPONS

A wide variety of weapons may be installed aboard aircraft. Ordnance and its uses are discussed in detail in the "Aircraft Ordnance" chapter.

ELECTRONICS

Electronic systems may be installed on the aircraft. Complete lists of available communications, detection, and ECM systems are found in the **MegaTraveller Referee's Manual**. Pod-mounted systems are discussed in the ordnance section of this rules module.

CARGO

Excess lift after all other components are assigned may be utilized to carry cargo.

Internal: Internal space must be allocated as part of the structure.

External: Excess lift not allowed for in the structure may be carried by external sling.

FUEL

Allocate one ton per 1000 liters of fuel.

MAXIMUM SPEED TABLE

G Rating	Max Speed	G Rating	Max Speed	G Rating	Max Speed
.01	60	.06	85	.15	180
.02	65	.07	90	.20	240
.03	70	.08	100	.25	300
.04	75	.09	110		
.05	80	0.1	120		

Units: *G:* G rating of helicopter. *Maximum Speed:* Maximum speed of helicopter in kilometers per hour.

Aircraft may not exceed maximum airframe design speed (see Airframes Table) even if the maximum G rating speed is higher.

Cruising speed is 75% of maximum speed.

Note on G Rating: The difference in G rating between two aircraft in combat is used as a positive or negative DM in gaining advantage.

weapons mounts, internal weapons, fuel, cargo, and electronics. Subtract weight from lift. The resulting figure is the additional weight available for external weapons and sling load cargo (loaded weight).

Thrust: A helicopter's thrust is equal to .25 times its total lift rating. Thrust is listed in tons.

G Rating: A helicopter's G rating determines its top speed. Calculate the G rating by dividing the helicopter's total thrust by its weight and multiplying the result by the airframe efficiency factor for the airframe type listed on the Airframes Table.

Speed: Find the helicopter's maximum speed by locating its G rating on the Maximum Speed Table and its corresponding speed in kilometers per hour. Do this using both G ratings to obtain maximum speeds for both clean and loaded weights. Maximum speed cannot be greater than 300 kilometers per hour because of rotor unloading.

Maximum speed is reduced by drag. Note the total number of drag points from the Weapon Mounts Table for the helicopter with and without external stores. Reduce the maximum speed by one percent for each drag point. Each ton of sling load cargo creates 10 drag points.

Cruising Speed: A helicopter's cruising speed is 75 percent of its maximum speed.

Minimum Speed: A helicopter has no minimum speed.

NOE Speed: Only VTOL aircraft and helicopters fly the contours of the ground at NOE speeds of no more than 40 kilometers per hour without radar and 120 kilometers per hour with radar.

Volume: You need to calculate the helicopter's volume to determine its damage point rating. Simply multiply its weight by 60 to determine its volume in cubic meters. This volume is also the space needed to ship a helicopter in combat-ready condition inside another vehicle such as a starship. If its rotors have been folded or removed for ease of transport, multiply its weight by 20 to determine shipping volume.

Damage Points: Calculate the damage point ratings for the helicopter's airframe and its engines. The damage point ratings for each component consist of two numbers separated by a slash. The first number shows the number of damage points needed to make the component inoperable, the second to destroy the component. See "Air-to-Air Combat" later in this module for a detailed discussion of damage effects.

Calculate the airframe's first damage point figure by dividing the helicopter's volume by 15. Then calculate the second damage point figure by dividing the volume by six. A 20-ton helicopter with a volume of 1200 cubic meters would have an airframe damage rating of 80/200.

Each engine has its own damage rating of 4/10.

Fuel Consumption: The fuel use of each engine type is listed in liters per hour on the Helicopter Engines Table. Multiply the figure for the installed engine type by the number of engines installed on the helicopter to determine total hourly fuel use.

Endurance: Endurance is the number of hours a helicopter can remain aloft. Divide the total number of liters of fuel on board (including fuel in drop tanks) by the fuel use rate to determine endurance.

Range: Range is the distance a helicopter can fly at cruising speed. Calculate range by multiplying endurance by cruising speed. Do this for both clean cruising speed and loaded cruising speed.

Price: Total the price of the helicopter's components to determine its total price.

HELICOPTER DESIGN CHECKLIST

1. Select the type and number of engines from the Helicopter Engines Table.

2. Total the engine power output in kilowatts.

3. Multiply the kilowatt rating by four. The result is the helicopter's maximum takeoff weight in kilograms. Divide by 1000 to calculate the maximum takeoff weight in tons.

4. Determine rotor configuration, and gearbox and transmission weight. Adjust for tech level. Determine gearbox and transmission price.

5. Determine airframe weight and cost.

6. Select type of controls.

7. Determine crew and passenger accommodations. Include life support.

8. Allocate cargo capacity, both internal and with external sling.

9. Select weapon mounts if the helicopter is to be armed or is to carry external fuel tanks.

10. Select weapons. Remember that the combined weight of weapons and helicopter must not exceed maximum takeoff weight.

11. Select electronics.

12. Allocate tonnage to fuel.

13. Total all weights and prices. Total weight must not exceed maximum takeoff weight determined in step 3.

HELICOPTERS FOR THE DUKE

The Duke of Regina has a subordinate fief on Yori (Regina/Spinward Marches 1910 C360757-A), and he maintains a small troop unit there which can reinforce local police and provide services to protect his property and the population. Recently, the unit has developed a need for a search and rescue vehicle to conduct patrols over the broad deserts which surround the major population centers. The mission specification describes a rotary-wing aircraft which is tentatively called *Rotary-X*.

***Rotary-X*:** This rotary-wing craft is to be a TL10 medium regional helicopter suitable for civilian missions and reinforcement of military forces. It should be able to carry a payload of 5 tons.

The Design Process

Rotary-X was designed in the following manner.

Weight: The helicopter must be able to carry a payload of 5 tons. Payload is generally not more than 35 percent of total weight. The weight of the helicopter is planned as 14 tons (which counts internal payload).

Airframe: The helicopter requires only a simple airframe. The designers do not see the need for any more sophisticated airframe. The airframe weighs in at 0.14 tons (0.01 tons per ton of aircraft) and costs Cr140,000 (Cr10,000 times 14 tons). It will have a maximum speed of 300 kilometers per hour (if its engines can produce it). The airframe efficiency is 0.85. No modifications for seaplane ability are made.

Engines: The helicopter requires a lift of 14 tons (14,000 kilograms); this number, divided by four, is the required output

of the helicopter engines in kilowatts: 3500 kilowatts. If the helicopter uses tandem main rotors, lift is increased by 20 percent; thus lift of 14,000 kilograms requires engines which produce only 11,666 kilograms of lift, or 2917 kilowatts. Three gas turbines are allocated for the engines. The trio of engines produces 3000 kilowatts of power. Total engine weight is 1.5 tons; cost is Cr225,000; fuel consumption is 2400 liters per hour. Thrust is 12,000 kilograms (12 tons) which will increase to 14,400 kilograms when used with tandem main rotors.

Transmissions and Rotors: The designers have selected tandem main rotors for this helicopter. The system weighs 75 percent of the engine weight: 1.125 tons. The transmission is produced at TL10, allowing a reduction in weight to 60 percent of this amount: Transmission and rotor weight is 0.675 tons. The transmission and rotor assembly costs Cr6750.

Controls: Because the helicopter weighs more than 10 tons, it requires boosted controls. The control installation requires 1.4 tons (0.10 times 14 tons) of boosted controls and costs Cr70,000. The controls provide one maneuver point and require 0.14 megawatts of power.

Accommodations: The helicopter requires a pilot and a copilot/gunner. Mission requirements call for an additional two crew and the ability to carry up to 12 people in addition to the crew. The helicopter is fitted with two simple cockpits (0.20 tons, Cr10,000), two crew stations (0.20 tons, Cr10,000), and one passenger sections (0.40 tons, Cr5,000).

The volume of the accommodations installation is 32 kiloliters.

Life Support: No life support is furnished.

Weapons Mounts: The designers allocate to the aircraft a basic array of protective weaponry: one remote turret (0.5 tons, Cr50,000, two drag points) and four launch rails (0.04 tons, Cr400, four drag points when loaded).

Electronics and Avionics: The designers select the following electronic equipment for the aircraft: All Weather VDistant Radar-9 (0.008 tons, 0.008 megawatts, 0.016 kiloliters, Cr12,000), Continental Radio Communicator-A (.0013 tons, 0.0013 megawatts, 0.0026 kiloliters, Cr5000).

The engine can provide power in megawatts up to two percent of its thrust output in tons before transmission is affected. This aircraft's thrust is 12 tons; its power for accessories and electronics is .24 megawatts (more than enough to power the electronics, avionics, and controls on the helicopter).

Cargo: Cargo capacity is allocated at 5 tons.

Maneuver Enhancement: No maneuver enhancement is provided.

Fuel: Fuel tankage for the aircraft must allow it to achieve its mission specification range of at least 500 kilometers at a speed of 200 kilometers per hour. Because fuel consumption is 1200 liters per hour, the aircraft must carry 3000 liters (3.0 tons) of fuel.

Rating

The *Rotary-X* must now be rated and described.

Rated Weight: The helicopter's clean weight (excluding external stores) totals 13.5143 tons. Its maximum takeoff weight (including four 100-kilogram missiles on the external launch rails) is 13.9143 tons.

Lift: The three 1000-kilowatt engines produce 12,000 kilograms of raw thrust; the tandem main rotors increase this by 20 percent to 14.4 tons of lift.

Thrust: The helicopter thrust is equal to 0.25 times lift: 3.6 tons.

G Rating: The G rating for the helicopter is 0.22 clean; the loaded G rating is nearly identical.

Speed: The helicopter maximum speed is determined from the Maximum Speed Table as 240 kilometers per hour. This speed does not exceed the maximum speed the airframe is capable of.

Cruising Speed: The helicopter cruising speed is 180 kilometers per hour (75 percent of clean maximum speed).

Minimum Speed: The helicopter has no minimum speed.

NOE Speed: The helicopter is equipped with radar and can fly at 120 kilometers per hour in NOE mode.

Volume: The helicopter volume is computed as 60 times helicopter weight (13.9143), or 835 kiloliters. Displacement of the helicopter is computed as kiloliters divided by 13.5 (which produces the result in displacement tons): 62 tons.

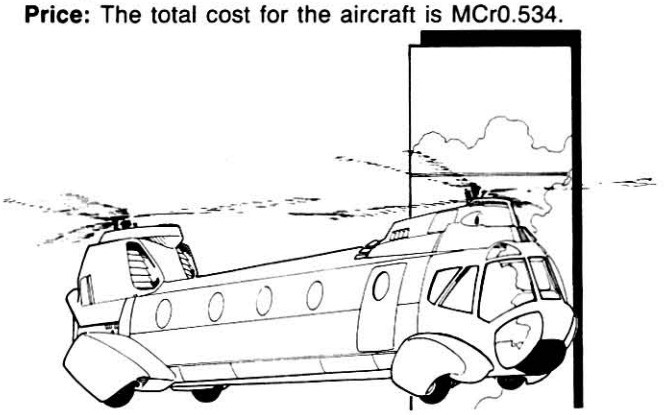
Damage Points: The helicopter airframe damage point rating is 56/139 (835/15)/(835/6). Each of the three helicopter engine damage point ratings is 4/10.

Fuel Use: Fuel use of the aircraft is 2400 liters per hour.

Endurance: The aircraft carries 3000 liters of fuel; it can remain aloft for three hours.

Range: The aircraft can fly up to 540 kilometers before refueling.

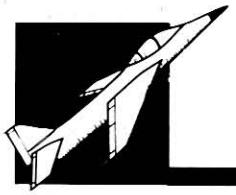
Price: The total cost for the aircraft is MCr0.534.



***LOMBARD* (TL10) HELICOPTER**

CraftID: Patrol Helicopter, TL10, MCr0.534
Hull: 56/139, Displacement = 62, Weight Loaded = 13.9143 tons, Airframe = Simple, Armor = none
Power: 0.24 Mw (drawn from engines), Endurance = 3 hours
Loco: 4/10, 4/10, 4/10 Gas Turbines, Thrust = 3.6 tons, Cruise = 180 kph, Top = 240 kph
Commo: Continental Radio Communicator-A
Sensors: All Weather VDistant Radar-9
Off: Launch Rails × 4
Control: Boosted, 1 Maneuver Point
Accom: Crew = 4 (Pilot, Copilot/Gunner, Crew1, Crew2), Simple cockpit × 2, Crew station × 2
Other: 3000 liters internal fuel, 5 tons cargo, passenger section (4 passengers)

Meets *Rotary-X* mission specification.



Airship Design

Adventurers may encounter, ride aboard, and pilot lighter-than-air aircraft on low- to medium-tech worlds. These may range from unpowered balloons to giant airships used as scheduled passenger liners or military reconnaissance and bombardment aircraft. In fact, adventurers may want to purchase their own lighter-than-air aircraft for use as exploration vehicles on low- to medium-tech worlds.

LIFT

Lift generated by lighter-than-air gases—most commonly hydrogen, helium, or heated air—and the volume needed to hold the lifting gases are the two constraints of airship design.

In Atmosphere Type 6 or 7 (Standard Atmosphere), 1000 cubic meters of hydrogen in a lift envelope provides 1.21 tons of lift; 1000 cubic meters of helium in a lift envelope provides 1.13 tons of lift; 1000 cubic meters of air (heated to twice ambient temperature) provides one ton of lift.

Lift is increased 20 percent in Atmosphere Type 8 or 9; lift is insufficient to produce a working airship in Atmosphere 5 or less.

Costs: Cr100 per cubic meter of hydrogen, Cr300 per cubic meter of helium (if available—roll 3+ on 1D for helium to be available on a given world).

THE ENVELOPE

Determine the volume of the balloon or the airship's main fuselage, known as the envelope. Then calculate its lifting capacity using the above information. Airship envelopes may be nonrigid and made of coated fabric, or rigid and made of metal.

Envelope Characteristics: A rigid envelope is constructed of metal with a fabric covering; it costs Cr50,000 per 1000 cubic meters of volume and weighs 0.8 tons per 1000 cubic meters. A nonrigid envelope is constructed of coated fabric without the metal reinforcement; it costs Cr10,000 per 1000 cubic meters of volume and weighs 0.5 tons per 1000 cubic meters.

Useful lift is calculated by subtracting the weight of the envelope from the lift of the volume of the envelope. For example, 1000 cubic meters of nonrigid airship envelope using helium produces 1.13 tons of lift; the envelope itself weighs 0.5 tons. The 1000-cubic-meter envelope produces 0.63 (1.13 − 0.5) tons of useful lift.

BALLOONS

Lighter-than-air aircraft may be either unpowered balloons that drift with the wind, or powered airships.

For a balloon, allocate one-tenth of a ton per passenger in a suspended gondola. If the balloon is lifted with hot air, allocate .05 ton for its burner system and .05 ton for four fuel gas cylinders capable of keeping a hot air balloon aloft for four hours.

Costs: Gondola, Cr1000; hot air burner system Cr1000; fuel gas cylinders Cr20 per cylinder. Each cylinder contains enough hydrocarbon-based fuel gas to keep a hot air balloon aloft for one hour.

Unpowered balloons need no controls. They require one pilot.

ENGINES

Powered airships require either propeller or turboprop engines for propulsion. They need at least one ton of thrust for each 10,000 cubic meters of volume. Airships powered by two engines or less may have them attached to the main control car. Airships powered by more than two engines require individual engine cars for each engine in addition to the first two. These weigh .25 tons each. Airships may be powered by any propeller or turboprop engines on the Airship Engines Table. The table includes a high-efficiency diesel engine usable only by airships.

AIRFRAME

In addition to the envelope, airships require one or more cars suspended beneath the envelope to hold crew and passengers. Rigid airships may have crew and passenger accommodations inside the main envelope as well. Airship cars require simple airframes. They weigh .01 ton per ton of airship weight and cost Cr10,000 per ton of aircraft (excluding envelope).

CONTROLS

Powered airships require the equivalent of simple controls. Allocate one ton of controls for every 10,000 cubic meters of airship volume. Airship controls are priced as simple aircraft controls.

CREW AND PASSENGERS

Crewmembers and passengers in unpowered balloons fly in an open gondola suspended beneath the balloon. Airship crew and passengers fly in one or more cars suspended beneath the fuselage. Some larger airships may have passenger and crew accommodations within their fuselages.

Airships require at least two pilots, a navigator, a flight engineer, and two engineering technicians stationed in the control gondola at crew stations, and one engineering technician in each engine car. Airships designed to remain aloft more than

12 hours require enough relief crewmembers to stand three eight-hour watches every 24 hours.

Military airships may also carry a bombardier and one or more gunners, depending on their weapon loads.

One steward is required for every 10 passengers. Passengers may be accommodated in standard passenger seating if flights last less than eight hours. Otherwise, passengers require single or double staterooms. A galley, dining area, and other common areas must be included aboard long-distance airships with one-tenth of a ton allocated per passenger.

LIFE SUPPORT

Because airships generally fly beneath 3000 meters, no life support systems are normally required. However, if a balloon or airship is to fly higher than 3000 meters (5000 meters in a dense atmosphere, 1500 meters in thin), it should be equipped with oxygen tanks and masks for each crewmember or passenger, or with sealed crew and passenger compartments and basic life support.

WEAPONS MOUNTS

The number of weapons mounts should be determined and the type selected from the Weapon Mounts Table. Airship weapons are usually simple gravity bombs or antisubmersible depth charges mounted on hardpoints on the control car or beneath the airship fuselage. Each hardpoint will hold up to 500 kilograms of weapons. Airships may have internal bomb bays (one ton of bomb bay holds one ton of bombs).

Airships may be armed with machineguns.

ELECTRONICS

Electronic systems may be installed on an airship. These include radios, radar, and navigation aids. Some airships are designed as radar pickets capable of remaining on patrol more than 200 hours.

CARGO

Airships may have weight allocated to cargo. Each ton of cargo capacity enables the aircraft to carry one ton of cargo.

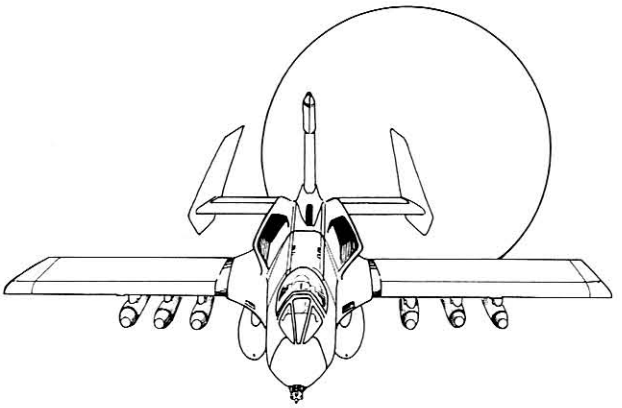
FUEL

Fuel capacity is measured in liters. Hydrocarbon or alcohol-based aircraft fuels cost Cr.25 per liter. Each ton of airship allocated to fuel storage will carry 1000 liters of fuel.

AEROSTATS

Aerostats are massive lighter-than-air aircraft available at Early Stellar technology levels which are used as permanent aerial habitats. Aerostats may be several kilometers in diameter and are supported by solar-heated hot air cells. Solar power cells are used to accumulate electricity for maintaining hot air cell temperatures in darkness, to power electric station-keeping motors, and to supply power for on-board uses. Surplus power may be sent to ground receiving stations via microwave.

These habitats float in the stratosphere where they can absorb a maximum amount of solar energy and remain free from any dangerous storms. Aerostats may accommodate several thousand dwellers. They are used as meteorological research bases, industrial platforms, and residences floating above



***BITBURG* (TL8) HEAVY ATTACK AIRCRAFT**

CraftID: Attack Aircraft, TL8, Cr949,000
Hull: 60/100 Disp. = 30, Weight Loaded = 15tons, Airframe = Transonic
Power: 4/10 Gas Turbine × 2, .120 Mw, Endurance = 2 hours, 15 min on internal fuel, 3 hours, 10 min with internal fuel and two 1500 liter drop tanks
Loco: Basic Turbofan × 2, Thrust = 36tons, Cruise = 748, Top = 1045, Min = 176, Agility = 6
Commo: Radio, Regional × 1
Off: 30mm 6-barrel autocannon fixed, forward-firing w/1000 rounds, Fuselage Hardpoint, Plumbed Inboard Wing Hardpoints × 2, Inboard Wing Hardpoints × 2, Outboard Wing Hardpoints × 6, Maximum External Stores = 6tons; Nuclear capable
Control: Boosted, 1 Maneuver Point
Accom: Crew = 1 (Pilot), Oxygen tanks and mask, Armored cockpit and ejection seat
Other: Fuel = 7380liters. Two 1500liter drop tanks may be carried on the inboard wing hardpoints. Refueling probe fitted for fuel transfer from aerial tanker or buddy fuel pack mounted on another aircraft.

One of the most effective ground attack aircraft in the antiarmor fighting vehicle role. This aircraft's 30mm hypervelocity autocannon can punch through all but the heaviest vehicular armor with its depleted uranium KEAP ammunition. Tac missiles launched by this aircraft take care of the rest. Because of cost, this aircraft is rarely operated by mercenary units. However, it is a mainstay of many COACC close air support squadrons.

AIRSHIP DESIGN

WEIGHT AND LIFT ENVELOPE

Lift: Lift generated by lighter-than-air gases—most commonly hydrogen, helium, or heated air—and the volume needed to hold the lifting gases are the two constraints of airship design.

In Atmosphere Type 6 or 7 (Standard Atmosphere), 1000 cubic meters of hydrogen in a lift envelope provides 1.21 tons of lift; 1000 cubic meters of helium in a lift envelope provides 1.13 tons of lift; 1000 cubic meters of air (heated to twice ambient temperature) provides one ton of lift.

Lift is increased 20 percent in Atmosphere Type 8 or 9; lift is insufficient to produce a working airship in Atmosphere 5 or less.

Costs: Cr100 per cubic meter of hydrogen, Cr300 per cubic meter of helium (if available—roll 3+ on 1D for helium to be available on a given world).

The Envelope: Determine the volume of the balloon or the airship's main fuselage, known as the envelope. Then calculate its lifting capacity using the above information. Airship envelopes may be nonrigid and made of coated fabric, or rigid and made of metal.

Envelope Characteristics: A rigid envelope is constructed of metal with a fabric covering; it costs Cr50,000 per 1000 cubic meters of volume and weighs 0.8 tons per 1000 cubic meters. A nonrigid envelope is constructed of coated fabric without the metal reinforcement; it costs Cr10,000 per 1000 cubic meters of volume and weighs 0.5 tons per 1000 cubic meters.

Useful lift is calculated by subtracting the weight of the envelope from the lift of the volume of the envelope. For example, 1000 cubic meters of nonrigid airship envelope using helium produces 1.13 tons of lift; the envelope itself weighs 0.5 tons. The 1000-cubic-meter envelope produces 0.63 (1.13 − 0.5) tons of useful lift.

Balloons: For a balloon, allocate .10 of a ton per passenger in its suspended gondola. If the balloon is lifted with hot air, allocate .05 of a ton for its burner system and .05 of a ton for four fuel gas cylinders capable of keeping a hot air balloon aloft for four hours. For a balloon the costs are: gondola, Cr1000; hot air burner system, Cr1000; fuel gas cylinders, Cr20 per cylinder. Each cylinder contains enough hydrocarbon-based fuel gas to keep a hot air balloon aloft for one hour.

AIRFRAMES

Tech Code	*TL*	*Type*	*Weight*	*Price*
Industrial	4	Simple	.01	10

Units: *Weight:* Tons per ton of aircraft. *Price:* Thousands of credits per ton of aircraft.

Seaplane airframes add 5% to weight and 25% to the cost of the airframe. For airships, a seaplane airframe allows the craft to land on water.

AIRSHIP ENGINES

Tech Code	*TL*	*Type*	*Thrust*	*Weight*	*Fuel*	*Cost*	*Airframe*
Industrial	5	Basic Propeller (Diesel)	2	1	15	15,000	Simple
Industrial	5	Basic Propeller	2	1	150	5000	Fast Subsonic
Industrial	5	Light Propeller	1	0.5	75	3500	Simple
Pre-Stellar	6	High Performance Propeller	6.4	1	300	20,000	Fast Subsonic
Pre-Stellar	6	High Performance Turboprop	15	1	1200	100,000	Fast Subsonic
Pre-Stellar	7	Basic Turboprop	12	1	960	75,000	Fast Subsonic
Pre-Stellar	7	Light Turboprop	4	0.5	400	50,000	Fast Subsonic
Pre-Stellar	7	Basic Turbofan	18	1	1680	175,000	Supersonic
Pre-Stellar	7	High Performance Turbofan	21	1	1920	200,000	Supersonic
Pre-Stellar	8	High Bypass Turbofan	50	4	3840	250,000	Supersonic

Units: *Thrust:* Tons. *Weight:* Tons. *Fuel:* Consumption in liters/hour. *Cost:* Credits. *Airframe:* Highest speed airframe with which this engine can be used.

Engine Cars: One or two engines may be attached to the main airframe. More than two engines require individual engine cars for each engine in addition to the first two. Engine cars weigh .25 tons each.

CONTROLS TABLE

Tech Code	*TL*	*Type*	*Airframe*	*MP*	*Weight*	*Price*
Industrial	5	Simple	Simple	0	.05	20

Units: *Airframe:* Highest speed airframe this type of control may be used with. *MP:* Maneuver points. *Weight:* Weight multiplier (weight multiplier × aircraft weight = weight of controls). *Price:* Price in thousands of credits per ton of controls.

CREW/PASSENGER ACCOMMODATIONS

Tech Code	*TL*	*Type*	*Capacity*	*Volume*	*Weight*	*Price*
Industrial	5	Crew Station	1	2	.10	5000
Industrial	5	Passenger Section	4	2	.30	5000
Industrial	5	1st-Class Passenger Section	2	2	.30	5000
Industrial	5	Passenger Stateroom	2	2	1.00	50,000
Industrial	5	Passenger Amenities (per passenger)	—	2	.10	1000

Units: *Capacity:* Number of persons each station will hold. *Weight:* Tons. *Cost:* Credits.

Passenger amenities provides a galley, dining area, and other common areas.

LIFE SUPPORT TABLE

TL	*Description*	*Volume*	*Weight*	*Price*	*Units*
5	Oxygen Tanks and Masks	0.010	0.010	Cr100	Per person
5	Basic Environment (lights and heat)	0.005	0.005	Cr10	Per kiloliter of occupied space
5	Basic Life Support (sealed, atmosphere)	0.050	0.050	Cr300	Per kiloliter of airframe

Units: *Volume:* Kiloliters (one kiloliter = one cubic meter). *Weight:* Kilograms. *Price:* Credits. *Units:* Application of price.

WEAPON MOUNTS TABLE

Tech Code	*TL*	*Type*	*Drag*	*Weight*	*Capacity*	*Price*
Industrial	5	Fixed Mount	0	0.00	1 slug thrower/energy weapon	0
Industrial	5	Launch Rail	(1)	.01	1 100 kg missile/rocket	100
Industrial	5	Flexible Mount	1	.005	1 heavy machinegun	100
Industrial	5	Fuselage Hardpoint	(1)	.02	500 kg	2000

WEAPONS

A wide variety of weapons may be installed aboard airships. Ordnance and its uses are discussed in detail in the "Aircraft Ordnance" chapter.

ELECTRONICS

Electronic systems may be installed on the airships. Complete lists of available communications, detection, and ECM systems are found in the **MegaTraveller Referee's Manual**. Pod-mounted systems are discussed in "Aircraft Ordnance."

CARGO

Allocate one ton per ton of cargo.

FUEL

Fuel capacity is measured in liters. Hydrocarbon or alcohol-based aircraft fuels cost Cr.25 per liter. Each ton of airship allocated to fuel storage will carry 1000 liters of fuel.

MAXIMUM SPEED TABLE

G Rating	*Max Speed*	*G Rating*	*Max Speed*	*G Rating*	*Max Speed*
.01	60	.06	85	.15	180
.02	65	.07	90	.20	240
.03	70	.08	100	.25	300
.04	75	.09	110		
.05	80	0.1	120		

Units: *G:* G rating of aircraft. *Maximum Speed:* Maximum speed of aircraft in kilometers per hour.

Aircraft may not exceed maximum airframe design speed (see Airframes Table) even if the maximum G rating speed is higher.

Cruising speed is 75% of maximum speed.

Note on G Rating: The difference in G rating between two aircraft in combat is used as a positive or negative DM in gaining advantage.

planets with inhospitable surfaces. Many aerostats are large enough to launch and recover subsidiary aircraft from landing decks around their equators.

Aerostats are quite rare and have been superseded at higher technology levels by cities built on massive grav platforms.

AIRSHIP RATINGS

Once you have designed your airship, you need to determine and record its ratings. These include volume, lift, weight, speed, damage points, fuel use, endurance, range, and price.

Volume: Determine the volume of the balloon or the airship's main fuselage, known as the envelope. If you are designing an airship, determine if it is rigid or nonrigid.

Lift: Calculate lift by multiplying your volume by 1.21 if you are using hydrogen as a lifting gas or by 1.13 if you are using helium. Multiply the volume by one if you are designing a hot air balloon. This yields the total lift in kilograms. Divide this by 1000 to determine total lift in metric tons.

Calculate the weight of the envelope and any gas cells in metric tons by dividing the volume by 1000 and multiplying by 0.88. Subtract the weight of the envelope from the total lift to obtain usable lift remaining for gondolas, engines, passenger and crew accommodations, and weapons.

Weight: Add up the weight of each component in your airship, including engine(s), controls, airframe, passenger and crew accommodations, weapon mounts, fuel, cargo, and electronics. This figure cannot exceed usable lift if the lighter-than-air aircraft is to fly.

Thrust: Multiply the thrust rating for the engine type used by the number of engines on the airship for the total thrust rating.

G Rating: A airship's G rating determines its top speed. Calculate the G rating by dividing the airship's total thrust by its weight and multiply by .85, the efficiency rating for a simple fuselage.

Speed: Find the airship's maximum speed by locating its G rating on the Maximum Speed Table and its corresponding speed in kilometers per hour. Maximum speed cannot be greater than 150 kilometers per hour because the envelope would sustain damage at higher speeds.

Maximum speed is reduced by drag. Note the total number of drag points from the Weapon Mounts Table for the airship with and without external stores. Reduce the maximum speed by one percent for each drag point.

Cruising Speed: A airship's cruising speed is 75 percent of its maximum speed.

Minimum Speed: A airship has no minimum speed.

Damage Points: Calculate the damage point ratings for the airship's airframe and engines. The damage point ratings for each component consist of two numbers separated by a slash. The first number shows the number of damage points needed to make the component inoperable, the second to destroy the component. See the "Air-to-Air Combat" section later in this module for a detailed discussion of damage effects.

Calculate the airframe's first damage point figure by dividing the airframe's volume by 15. Then calculate the second damage point figure by dividing the volume by six. A 20-ton airship with a volume of 1200 cubic meters would have an airframe damage rating of 80/200.

Each engine has its own damage rating of 4/10.

Fuel Use: The fuel use of each engine type is listed in liters per hour on the Airship Engines Table. Multiply the figure for the installed engine type by the number of engines installed on the airship to determine total hourly fuel use.

Endurance: Endurance is the number of hours an airship can remain aloft. Divide the total number of liters of fuel on board by the fuel use rate to determine endurance.

Range: Range is the distance a airship can fly at cruising speed. Calculate range by multiplying endurance by cruising speed.

Price: Add the price of the airship's components to determine its total price.

AIRSHIP DESIGN CHECKLIST

1. Determine the volume of the airship's envelope or balloon's gasbag.

2. Calculate total lifting capacity of that volume of hydrogen or helium gas.

3. Calculate the cost of the envelope or gasbag.

4. Divide the volume by 1000 to determine the weight of the envelope or gasbag in metric tons.

5. Subtract the weight of the envelope from the lifting capacity to determine usable lift.

6. If designing an unpowered balloon, go to step 10. If designing a powered airship, select propeller or turboprop engines, noting the minimum thrust requirements.

7. Add engine cars as needed.

8. Add airship cars as needed.

9. Allocate tonnage for controls.

10. Determine crew and passenger accommodations.

11. Select life support systems if needed.

12. Install weapon mounts if military airship.

13. Install electronics if tech level is 6+.

14. Allocate tonnage to cargo.

15. Allocate tonnage to fuel.

16. Total weight of components. It should not exceed available lifting capacity after the weight of the envelope has been subtracted from the total lifting capacity of the lifting gases.

LING STANDARD PRODUCTS WANTS AN AIRSHIP

LSP has developed several mining colonies with similar characteristics: TL6 or less, standard atmosphere, and standard gravity. Although many aspects of mining are high tech, it is more cost-effective to use low-tech equipment for secondary activities like equipment movement and resupply to remote areas. Consequently, the megacorporation has developed a mission specification for a common airship type: *Airship LSP*.

***Airship LSP*:** This lighter-than-air aircraft is to be a TL6 (or less) medium continental airship suitable for cargo and passenger service.

The Design Process

Airship LSP was designed in the following manner.

Weight: The airship must be able to carry a 5-ton payload. Additional airship weight is estimated at 15 tons. The airship must be able to lift 20 tons in addition to its envelope weight.

Lift Required: *LSP* has specified helium as the lifting agent: 1000 cubic meters of helium lift envelope produces 0.63 tons of

useful lift; 20 tons of useful lift requires an envelope of 31,000 cubic meters (Cr310,000, 15.5 tons).

Airframe: The airship requires only a simple airframe. The airframe weighs in at 0.355 tons (0.01 tons per ton of airship) and costs Cr200,000 (Cr10,000 times 20 tons). No modifications for seaplane ability are made.

Engines: The airship has 31,000 cubic meters of volume and requires engines delivering at least 3.1 tons of thrust. If more than two engines are used, they require their own engine cars; the designers avoid constructing engine cars by specifying two basic propeller (diesel) engines with a total of 4 tons of thrust (Cr30,000, 2 tons, 30 liters/hour fuel consumption).

Controls: The airship uses simple controls (1.775 tons, Cr35,500).

Accommodations: The airship requires two pilots, a navigator, a flight engineer, and two engineering technicians; all are at crew stations. Six crew stations are installed (Cr30,000, 0.6 tons). The volume of the accommodations installation is 12 kiloliters.

Life Support: No life support is furnished.

Weapons Mounts: No weaponry is allocated.

Electronics and Avionics: The designers select the following electronics: Regional Radio Communicator-6 (0.015 tons, 0.015 megawatts, 0.03 kiloliters, Cr1000).

The engine can provide power in megawatts up to two percent of its thrust output in tons. This aircraft's thrust is 4 tons; its power for accessories and electronics is .04 megawatts (more than enough to power the electronics, avionics, and controls on the airship).

Cargo: Cargo capacity is originally allocated at 5 tons; subsequent totals indicate that the total cargo capacity is 12 tons.

Maneuver Enhancement: No maneuver enhancement is provided.

Fuel: Fuel tankage for the aircraft must allow it to achieve its mission specification range of at least 5000 kilometers at cruising speed of 60 kilometers per hour. Because fuel consumption is 30 liters/hour, the airship must carry 2500 liters (2.5 tons) of fuel.

Rating

The *Airship LSP* must now be rated and described.

Rated Weight: The airship's weight is planned as 35 tons; all components are totaled as 35.245 tons.

Lift: The lift envelope produces 35 tons of lift.

Thrust: The two engines produce 4 tons of thrust.

G Rating: The G rating for the airship is 0.06.

Speed: The airship maximum speed is found on the Maximum Speed Table—85 kilometers per hour. This speed does not exceed the maximum speed the airframe is capable of.

Cruising Speed: The airship cruising speed is 64 kilometers per hour (75 percent of clean maximum speed).

Minimum Speed: The airship has no minimum speed.

Volume: The airship volume is computed as the volume of the envelope: 31,000 kiloliters. Displacement of the airship is computed as kiloliters divided by 13.5 (which produces the result in displacement tons): 2296 tons.

Damage Points: The airship airframe damage point rating is 80/200 (1200/15)/(1200/6). Each of the two engine damage point ratings is 4/10.

Fuel Use: Fuel use of the airship is 30 liters per hour.

Endurance: The aircraft carries 2500 liters of fuel; it can remain aloft 83 hours.

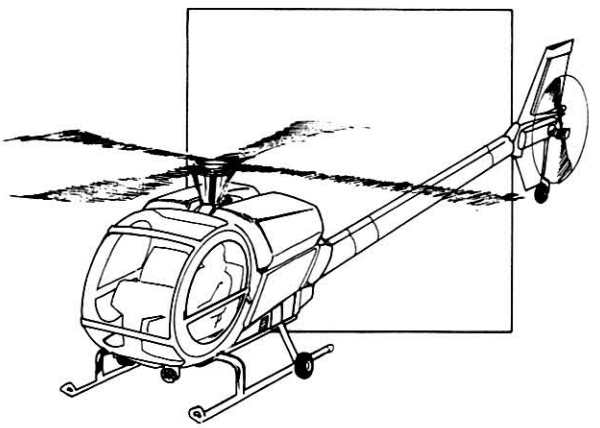
Range: The aircraft can fly up to 5300 kilometers before refueling.

Price: The total cost for the aircraft is MCr0.606.

GREENWICH (TL10) AIRSHIP

CraftID: Dirigible, TL6, MCr0.606
Hull: 80/200, Displacement = 2296, Weight Loaded = 34.745 tons, Airframe = Simple, Armor = none
Power: 0.04 Mw (drawn from engines), Endurance = 83 hours
Loco: 4/10, 4/10, Basic Propeller (Diesel), Thrust = 4 tons, Cruise = 64 kph, Top = 85 kph
Commo: Regional Radio Communicator-6
Sensors: None
Off: None
Control: Simple
Accom: Crew = 6 (Pilot × 2, Navigator, Flight Engineer, Engineering Technician × 2), Crew Station × 6
Other: 2500 liters internal fuel, 12 tons cargo

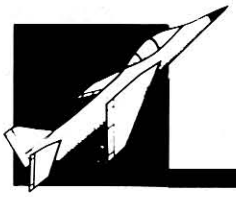
Meets *Airship LSP* mission specification.



SPRINGFIELD (TL5) LIGHT HELICOPTER

CraftID: Helicopter, TL5, Cr15,000
Hull: 4/10, Disp. = 1, Weight Loaded = 1.2tons, Airframe = Simple, Armor = 0
Power: 4/10 Internal Combustion, .30 Mw, Endurance = 1 hour, 20 min
Loco: Main and Tail Rotor, Lift = 1.2tons, Thrust = .3tons, Cruise = 225, Top = 300
Commo: VDistant Radio × 1
Control: Simple
Accom: Crew = 1, (Pilot, Observer), Simple Cockpit × 2, Passenger may ride in second seat
Other: Fuel = 250liters

A light, unarmed aircraft used as a utility vehicle for reconnaissance, VIP transportation, liaison, medevac, and training. Casualty may be carried on a skid stretcher when second seat is empty.



Air-to-Air Combat

Air battles have become increasingly frequent in the skies of the worlds in the disintegrating Imperium. Factions invade the worlds controlled by other factions and bring their COACC forces with them. Worlds are Balkanized with people loyal to different factions inhabiting different countries and continents. World COACC forces break down into national air forces, and air battles flare as one country attacks another. Mercenary air wings join any side with enough credits so that they can cash in on the increasingly lucrative war trade. Flyer characters are swept into this maelstrom, and some must fly and die in the wars above the worlds of the shattered Imperium.

AIR-TO-AIR COMBAT

MegaTraveller air-to-air combat is task based (as is all **MegaTraveller** combat). Two aerial combat systems are presented here—hasty combat, suitable for the referee and player group who do not have the time to plot and track the movements of a combat scenario, and standard combat for those who wish to use a fast-moving, yet realistic, air battle system.

Combat Rounds: Both aerial combat systems use the standard **MegaTraveller** combat round. Each combat round lasts six seconds. Ten combat rounds equal one minute.

HASTY COMBAT

Hasty combat is a series of tasks that quickly resolve an air battle. Each hasty combat task requires one combat round. Maps and markers are not required because distances are treated abstractly. Just two dice, paper, and a pencil are needed. These hasty combat rules work best when there are only a small number of aircraft in combat. If more than four aircraft are doing battle on each side, the standard combat system is recommended.

Spotting: Combat aircraft close in on each other at widely varying altitudes and angles. Whichever side spots the other first usually shoots first and enjoys a major combat advantage. Whenever the referee presents a possible aerial combat situation, characters and the referee should begin rolling the spotting task. If each character is flying an individual aircraft, each character should perform the spotting task each combat round. If one character spots the enemy, he may alert the others over his aircraft radio. If the referee is controlling the opposition, he should roll one spotting task for that side.

To spot enemy aircraft:

Difficult, Tactics, Sensor Ops, Endurance, 1 Combat Round, (unskilled OK).

Referee: DM + 1 if the spotter's aircraft is a two-seat, two-flyer fighter. DM + 1 if the spotter's aircraft has radar. DM + 2 if the spotter's aircraft is flying under ground-controlled intercept (GCI) radar control. DM – 1 if the sky is cloudy. DM – 3 if the sky is rainy.

Advantage: Fighter pilots constantly maneuver for advantage in battle as they try to get in position for a shot against the enemy. The aircraft that first spots an opponent has both the advantage and surprise for itself and its fellow aircraft. They may take the first shot. However, once the shooting begins and surprise is lost, each side must roll for the advantage in each combat round. If both sides spot each other simultaneously, each must roll the advantage task every combat round to represent continuously maneuvering for advantage in battle. The side that has the advantage may fire on its enemy in that combat round.

To gain air combat advantage:

Difficult, Aircraft, Tactics, Strength, 1 Combat Round (absolute).

Gun Combat

Three types of weapons may be used in COACC aerial gun combat: single-barrel machineguns or autocannons, multibarrel machineguns or autocannons, or lasers. The task to hit with each of these weapons is the same; however, the damage effects are different.

To hit an enemy aircraft in gun combat:

Difficult, Gunnery, Aircraft, Dexterity (confrontational).

Referee: DM + 1 if firing aircraft has radar. DM + 1 if firing aircraft has heads-up display (HUD). DM + aircraft computer level. DM + difference in aircraft agility rating (may be negative number). DM + 1 if attacking aircraft firing lasers.

Hits: Roll to succeed on the "To Hit" task for as many gun barrels or beam lasers firing. If one or more pulse lasers fired, determine the number of rolls to hit by multiplying the number of pulse lasers fired by the number of lenses in each laser. If beam lasers are fired, roll once to hit per laser, but double the number of hit points when calculating damage to the defending aircraft.

If two single-barrel autocannons are fired in the attack, roll the "To Hit" task twice. If a single six-barrel autocannon is fired, roll to hit six times to represent its high rate of fire.

Damage Effects: The ability of an aircraft to sustain damage is represented by two sets of numbers. Each set has two numbers separated by a slash. The aircraft's airframe is represented by the larger of the two sets. Each engine mounted on an aircraft has its own damage point set. The larger the

aircraft, the higher its airframe damage rating, and the harder it is to shoot down. Each engine will have an identical damage rating.

DAMAGE LOCATION TABLE

Die Roll	*Location*
1	Airframe
2	Electronics
3	Crew
4	Engine
5	Engine
6	Airframe

Roll for the location of each hit on 1D.

Airframe Hit: Subtract the number of damage points inflicted by the hit from the first airframe damage rating number. When the first number is reduced to zero, subtract the damage points inflicted by the hit from the second airframe damage rating number. When the first number is reduced to zero, the aircraft is no longer flyable, and the crew must either bail out or attempt a crash landing. If the second airframe number is reduced to zero, the aircraft sustains a catastrophic failure, and all aboard are killed.

To attempt a crash landing:
Formidable, Aircraft, Dexterity (fateful, hazardous).

Referee: If a mishap is rolled, roll separate wound levels for each crewmember. If **Destroyed** is rolled, the crewmember is killed. If **Destroyed** is rolled on the first roll, all crewmembers are killed.

To eject from a damaged aircraft:
Difficult, Endurance (fateful, hazardous).

Engine Hit: Subtract the number of damage points from the engine damage rating (see above). If the aircraft has more than one engine, randomly roll the dice to determine which engine is hit. If the first number is reduced to zero, the engine ceases operating. If the second number is reduced to zero, the engine catches fire and will explode on a 1D roll of 5+ (check each combat round).

Electronics Hit: An electronics hit destroys one electronic device: radio, radar, computer, etc. Randomly select the destroyed device.

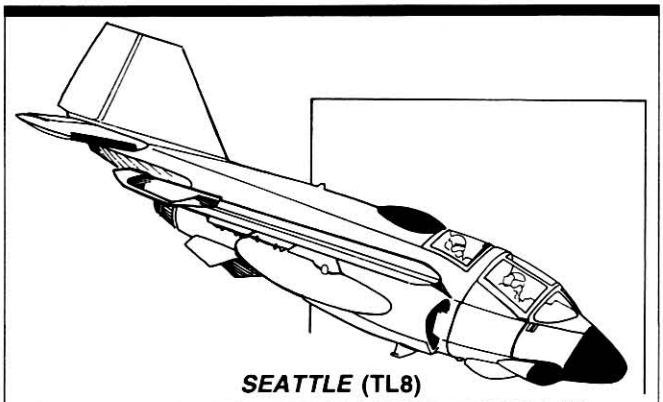
Crew Hit: Randomly determine which crewmember is hit, and make a mishap roll to determine wound level.

Air-to-Air Missile Combat

Three types of air-to-air missiles are available: infrared homing missiles (IRH), semiactive homing missiles (SAH), and active homing missiles (AH).

Infrared Homing Missiles (IRH): Infrared homing missiles lock on to and home in on either the hot exhaust and engine metal, or, in more advanced versions, the relative warmth of the entire aircraft. They are generally highly maneuverable "dogfighting" missiles.

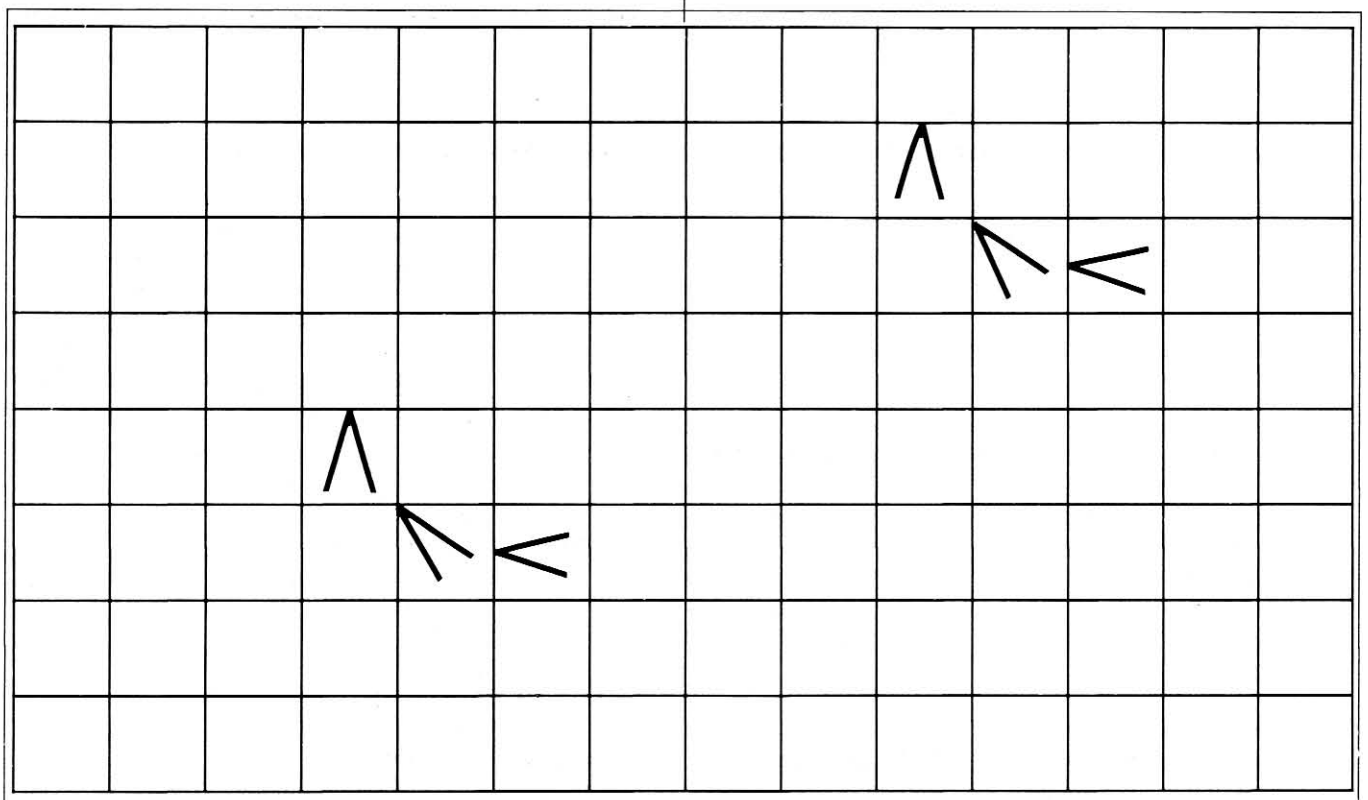
In hasty combat, two tasks must be successfully performed to hit an enemy aircraft with an IRHM. They include in sequence:



***SEATTLE* (TL8)**
ALL-WEATHER HEAVY ATTACK AIRCRAFT

CraftID: Attack Aircraft, TL8, Cr4,976,000
Hull: 80/200 Disp. = 60, Weight Loaded = 15tons, Airframe = Transonic
Power: 4/10 Gas Turbine × 2, .120 Mw, Endurance = 6 hours, 20 min on internal fuel, 10 hours, 10 min with internal fuel and 4 1500liter drop tanks
Loco: Basic Turbojet × 2, Thrust = 30tons, Cruise = 748, Top = 1045, Min = 176, Agility = 6
Commo: Radio, Regional × 1
Sensors: Radar = VDistant, Ladar = VDistant, Passive IR, Light Amplification, Image Enhancer, Radar Direction Finder
Off: Fuselage Hardpoint, Plumbed Inboard Wing Hardpoints × 4, Maximum External Stores = 8tons; Nuclear capable
Control: Boosted, 1 Maneuver Point, Computer 2, HUD
Accom: Crew = 2 (Pilot, Bombadier), Oxygen tanks and mask, Armored cockpit and ejection seat
Other: Fuel = 9900liters. Four 1500liter drop tanks may be carried on the inboard wing hardpoints. Refueling probe fitted for fuel transfer from aerial tanker or buddy fuel pack mounted on another aircraft.

The ultimate attack aircraft design combining a heavy weapons load, long range, and full sensor suite for all-weather, day and night attack capability. This aircraft can use its radar for precision guidance of smart bombs and missiles in close air support missions as well as deep strike attacks. Its computer, radar, and image enhancement systems give it accurate weapons delivery capability in foul weather and at night. Its range and bomb load make it as much a bomber as an attack aircraft. Its cost, however, precludes it from purchase by all but the wealthiest national or planetary governments. Two variants are available—one an electronic warfare variant with a complete suite of radio and radar jamming equipment and anti-radiation missiles, the other a tanker variant with all sensors removed, and a refueling package and extra fuel tanks installed.



Arrowheads drawn on the grid represent the change in the aircraft's position as the aircraft makes a 90° right turn in three squares using five Manuever Points.

To lock an infrared homing missile on an enemy aircraft:
Routine, Tactics, Dexterity (confrontational).

To successfully launch an IRHM:
Simple.
Referee: If launch is successful, the missile will impact in 1D – 3 combat rounds unless the defending aircraft breaks lock. The IRHM inflicts 16 damage points on impact.

The defending aircraft may attempt to break lock once per combat round with this task:

To break an IRHM lock:
Difficult, Aircraft, Tactics, Strength.
Referee: Add DM + 2 if the defending aircraft is equipped with infrared countermeasures (IRCM).

Semiactive Radar Homing Missiles (SARH): Semiactive radar homing missiles home in on radar energy reflected from the target aircraft. For an SARH missile to attack successfully, its launching aircraft must illuminate the target with its radar until impact. The launching aircraft must be radar-equipped to use this type of missile.

In hasty combat, three tasks must be successfully performed to hit an enemy aircraft with a SARH. They include in sequence:

To lock launching aircraft's radar onto target aircraft:
Difficult, Tactics, Aircraft, Sensor Ops.
Referee: Add DM + 2 if the launching aircraft has a radar intercept officer.

To launch SARH missile:
Simple.
Referee: If launch is successful, roll 1D for number of combat rounds to impact. Roll for damage on impact unless the defending aircraft successfully breaks radar lock. The SARH inflicts 28 damage points.

To radar illuminate target aircraft:
Difficult, Tactics, Aircraft, Sensor Ops.
Referee: Add DM + 2 if the launching aircraft has a radar intercept officer. This task must be rolled for each combat round the missile is in flight.

The defending aircraft may attempt to break radar lock once per combat round with this task:

To break radar lock:
Difficult, Aircraft, Tactics, Strength.
Referee: DM + 2 if defending aircraft is equipped with chaff dispenser, DM + 4 if equipped with radar jammer (internal or ECM pod).

Active Radar Homing Missiles (ARHM): ARHMs are similar to SARHs except that have their own on-board radar sets. The launching aircraft need only radar illuminate the target craft

until the missile is within three combat rounds of impacting the target. Then the missile's internal radar takes over the guidance function, and impact is automatic unless radar lock is broken as described above.

More advanced ARHMs (TL9+) automatically lock on to their targets at launch, freeing the launching aircraft for additional combat or breakoff. They are "fire and forget" missiles.

Resolve ARHM combat the same as SARH combat except for the less restrictive radar illumination requirements.

Break Off

Combat ends when aircraft:

- Shoot down all opposing aircraft.
- Successfully disengage (break off) from combat.

An aircraft may attempt to break off during a combat round by declining to fire its weapons and successfully attempting the "Breakoff" task.

To break off from combat:
Difficult, Tactics, Aircraft, Strength.
Referee: DM+4 if aircraft attempting to break off has the advantage.

STANDARD COMBAT

Standard air-to-air combat is a fast-paced, realistic simulation of air-to-air combat with movement plotted on a grid and altitude tracked through changes in flight levels. Movement may be plotted on square-ruled graph paper or on hex paper. Cardboard markers may be used to represent individual aircraft, or colored pencils may be used to plot individual aircraft positions during each combat round with a different color representing each aircraft. Aircraft facing should be indicated with an arrowhead drawn on the cardboard marker, or drawn directly on the square or hex as the aircraft position marker. Aircraft altitude logs should be maintained and updated each turn to track each aircraft's current flight level.

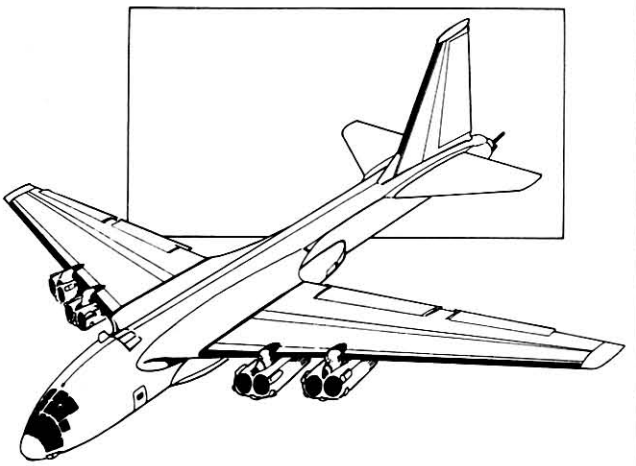
Scale: Standard air-to-air combat is played on a grid with each square (or hex) representing 500 meters. Aircraft may move and fire in each combat round. Each combat round represents six seconds of time. Aircraft fly at varying flight levels. Each flight level represents 500 meters. Flight beneath 100 meters is considered NOE flying.

Angle-Off: Angle-off arcs are used to measure deflection in gun attacks. They are measured from the rear to forward axis of the target plane as the zero angle. An aircraft approaching from dead astern of a target aircraft is on the target's angle-off zero line. An aircraft approaching a target aircraft from dead ahead is approaching on the 180-degree angle-off line. Other angle-off arcs are measured to the right or the left of the zero line.

Movement: Aircraft are granted maneuver points to be used in each combat round. To calculate available maneuver points, divide the aircraft's current speed by 250 and round off to the nearest whole number.

Maneuver Points: Each maneuver point (MP) may be used in a combat round to:

- Move horizontally one square (or hex).
- Climb one flight level.
- Dive one flight level.

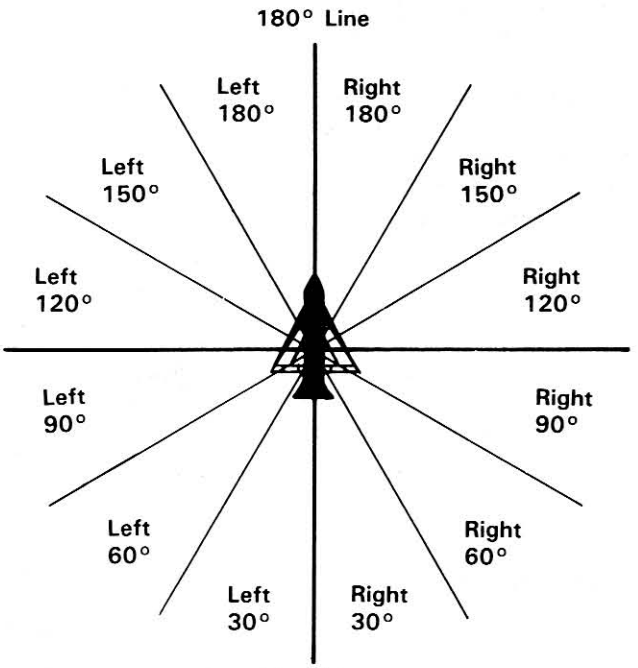


LOS ANGELES (TL8) BOMBER

CraftID: Bomber, TL8, Cr4,976,000
Hull: 1000/2500 Disp. = 800, Weight Loaded = 250tons, Airframe = Transonic
Power: 4/10 Gas Turbine × 8, 4.8 Mw, Endurance = 11 hours, 55 min on internal fuel
Loco: Basic Turbofan × 8, Thrust = 144tons, Cruise = 600, Top = 800, Min = 176, Agility = 1
Commo: Radio = Planetary × 2, Regional × 2, Radio Jammer = Regional × 1
Sensors: Radar = Regional, Radar Jammer = Regional Passive IR, Image Enhancer, Radar Direction Finder
Off: 28ton Bomb Bay, Inboard Wing Hardpoints × 4, Nuclear capable. 6-barrel, 20mm autocannon in rearward-firing remote turret.
Control: Boosted, 1 Maneuver Point, Computer 2, Avionics
Accom: Crew = 6 (Pilot, Copilot, Bombadier, Navigator, Electronic Countermeasures Operator, Gunner), Basic Life Support, Oxygen tanks and mask, Complex cockpits with ejection seats
Other: Fuel = 160,000liters. Refueling probe fitted for fuel transfer from aerial tanker.

A massive, lumbering strategic bomber that can be destroyed in normal, high-altitude flight by any sophisticated air defense system. However, if used as a missile platform launching missiles to destroy antiaircraft defenses and airfields in its path, this aircraft can strike deep and deliver nuclear bombs on enemy cities and other strategic targets. It can carry a massive load of both conventional and nuclear bombs and missiles.

ANGLE-OFF ARCS



- Turn 45 degrees.
- Accelerate one square per combat round (until the aircraft reaches its maximum speed).

Maneuver points may be used in any combination for horizontal flight, turning, climbing, or diving to the maximum amount available to each aircraft in each turn. Each maneuver point represents 250 kilometers per hour horizontal flight speed or the energy needed to complete the maneuvers stated above. Maneuver points may not be carried over from turn to turn.

Exceptions to the maneuver point rules include:

- By gliding, aircraft may reduce power to idle and descend 1/2 flight level per combat round as well as decelerate one square per combat round.
- VTOL aircraft with vectored in-flight thrust capability (VIF) may use one maneuver point to turn 90 degrees per combat round without rolling to avoid pilot/crew blackout.
- Helicopters may turn 180 degrees per combat round.

Blacking Out: Crewmembers aboard an aircraft turning more than 45 degrees while travelling more than two squares per turn risk blacking out. Each needs to roll the following task:

To avoid blacking out:

Routine, Strength + Endurance (fateful).

Referee: Roll on the Mishap Table if the task fails. If a mishap is **Superficial**, consciousness is regained in 1D seconds, and control is lost momentarily. If a mishap is **Minor**, consciousness is regained in 1D – 3 combat rounds. The aircraft will crash if it is below 1000 meters and the pilot blacks out. If a mishap is **Major**, consciousness is regained in 1D minutes. The aircraft will crash if it is below 10,000 meters and the pilot blacks out. If a mishap is **Destroyed**, the character requires medical attention to recover consciousness. The aircraft will crash if the pilot blacks out.

Spotting: Combat aircraft close in on each other at widely varying altitudes and angles. Whichever side spots the other first usually shoots first and enjoys a major combat advantage. Whenever opposing aircraft close to within 20 squares (10 kilometers), characters and the referee should begin rolling the spotting task. If each character is flying an individual aircraft, each character should perform the spotting task each combat round. If one character spots the enemy, he may alert the others over his aircraft radio. If the referee is controlling the opposition, he should roll one spotting task for that side each round.

To spot enemy aircraft:

Difficult, Tactics, Sensor Ops, Endurance, 1 Combat Round, (unskilled OK).

Referee: DM + 1 if the spotter's aircraft is a two-seat, two-crew fighter. DM + 1 if the spotter's aircraft has radar. DM + 2 if the spotter's aircraft is flying under ground-controlled intercept (GCI) radar control. DM – 1 if the sky is cloudy. DM – 3 if the sky is rainy. DM – 3 if opposing aircraft is in spotting aircraft's 30 degree angle-off arc.

Helicopters: Helicopters may engage in air-to-air gun combat with other aircraft using the tasks given below. Helicopters may launch infrared homing missiles at other helicopters and fixed-wing aircraft using the tasks given in the Air-to-Air Missile Combat section. Helicopters may not use radar-guided missiles.

Gun Combat

Guns are an important part of aerial combat.

Surprise: Fighter pilots constantly maneuver for advantage in gun combat as they try to get in position for a shot against

the enemy. The aircraft that first spots an opponent (see Spotting) has surprise for itself and its fellow aircraft. They may maneuver for the best first-shot position—as close as possible to the target's angle-off zero line—while their opponents continue to fly their previous courses. However, once the shooting begins and surprise is lost, each side must maneuver for its shooting position in each combat round. If both sides spot each other simultaneously, each must maneuver for advantageous shooting positions.

Combat Range: All aircraft autocannons have an effective range of three squares. Both heavy and light machineguns have an effective range of one square. Lasers firing in clear air have unlimited range.

Rate of Fire: Rate of fire is:

- One 10-round burst per machinegun.
- One 10-round burst per single-barrel autocannon.
- One 50-round burst per tribarrel autocannon.
- One 100-round burst per six-barrel machinegun or autocannon.

Gun Combat Weapons: Three types of weapons may be used in aerial gun combat: single-barrel machineguns or autocannon, multibarrel machineguns or autocannons, or lasers. The task to hit with each of these weapons is the same; however, the damage effects are different.

To hit an enemy aircraft in gun combat:

Difficult, Gunnery, Aircraft, Dexterity (confrontational).

Referee: DM + 1 if firing aircraft has radar. DM + 1 if firing aircraft has heads-up display (HUD). DM + aircraft computer level. DM + difference in aircraft agility rating (may be negative number). DM + 1 if attacking aircraft is firing lasers.

Hits: Roll the "To Hit" task for the number of gun barrels or beam lasers firing. If one or more pulse lasers fires, determine the number of rolls to hit by multiplying the number of pulse lasers fired by the number of lenses in each laser. If beam lasers fire, roll once to hit per laser, but double the number of hit points when calculating damage to the defending aircraft.

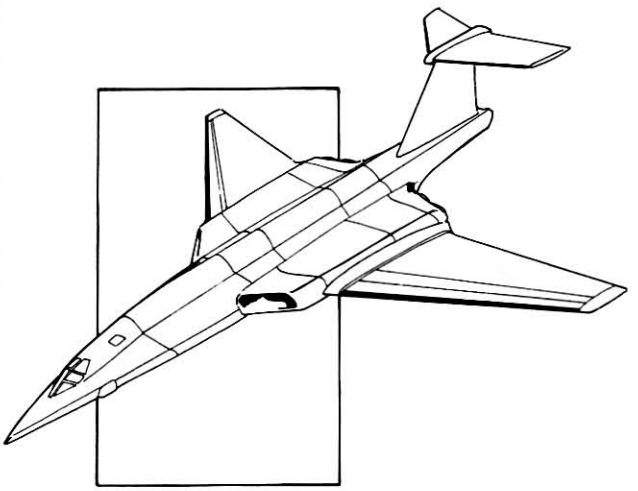
If two single-barrel autocannons fire in the attack, roll the "To Hit" task twice. If a single six-barrel autocannon fires, roll to hit six times to represent its high rate of fire.

Damage Effects: The ability of an aircraft to sustain damage is represented by two sets of numbers. Each set has two numbers separated by a slash. The aircraft's airframe is represented by the larger of the two sets. Each engine on an aircraft has its own damage point set. The larger the aircraft, the higher its airframe damage rating, and the harder it is to shoot down. Each engine will have an identical damage rating.

DAMAGE LOCATION TABLE

Die Roll	*Location*
1	Airframe
2	Electronics
3	Crew
4	Engine
5	Engine
6	Airframe

Roll for the location of each hit on 1D.



***MEXICO CITY* (TL9) BOMBER**

CraftID: Bomber, TL9, Cr10,582,500
Hull: 1000/2500 Disp. = 800, Weight Loaded = 210tons, Airframe = Supersonic
Power: 4/10 Gas Turbine × 4, 2.6 Mw, Endurance = 5 hours, 20 min on internal fuel, 7 hours with dismountable bomb bay tanks
Loco: High Bypass Turbofans × 4, Thrust = 200tons, Cruise = 900, Top = 1200, Min = 280, Agility = 2
Commo: Radio = Planetary × 2, Regional × 2, Radio Jammer = Regional × 1
Sensors: Radar = Regional, Radar Jammer = Regional, Passive IR, Image Enhancer, Radar Direction Finder
Off: 34ton Bomb Bay, Fuselage Hardpoints × 8; Nuclear capable
Control: Powered, 2 Maneuver Points, Computer 2, Avionics
Accom: Crew = 4 (Pilot, Copilot, Offensive Systems Operator, Defensive Systems Operator), Basic Life Support, Oxygen tanks and mask, Complex cockpits with ejection seats
Other: Fuel = 83,500liters. An additional 20,000liter, dismountable fuel tank may be installed in the bomb bay reducing the internal weapons load by 20tons. Refueling probe fitted for fuel transfer from aerial tanker.

Supersonic strategic bomber with advanced electronic countermeasures and standoff missiles capable of penetrating all but the most advanced air defenses. Its relatively low endurance requires that it operate in conjunction with aerial tankers on most missions.

Airframe Hit: Subtract the number of damage points inflicted by the hit from the first airframe damage rating number. After the first number is reduced to zero, subtract damage from the second damage rating number. When the first number is reduced to zero, the aircraft is no longer flyable, and the crew must either bail out or attempt a crash landing. If the second airframe number is reduced to zero, the aircraft sustains a catastrophic failure, and all aboard are killed.

To attempt a crash landing:
Formidable, Aircraft, Dexterity (fateful, hazardous).
Referee: If a mishap is rolled, roll separate wound level for each crewmember. If **Destroyed** is rolled, crewmember is killed. If **Destroyed** is rolled on first roll, all crewmembers are killed.

To eject from a damaged aircraft:
Difficult, Endurance (fateful, hazardous).

Engine Hit: Subtract the number of damage points from an engine damage rating (see above). If the aircraft has more than one engine, you need to randomly roll dice to determine which engine is hit. If the first number is reduced to zero, the engine ceases operating. If the second number is reduced to zero, the engine catches fire and will explode on a 1D roll of 5+ (roll each combat round).
Electronics Hit: An electronics hit destroys one electronic device: radio, radar, computer, etc. Randomly select the destroyed device.
Crew Hit: Randomly determine which crewmember is hit and make a mishap roll to determine wound level.

Air-to-Air Missile Combat

Three types of air-to-air missiles are available:
- Infrared homing missiles (IRH).
- Semiactive radar homing missiles (SARH).
- Active radar homing missiles (ARHM).

They are used as follows:
Infrared Homing Missiles (IRH): Infrared homing missiles lock onto and home in on either the hot exhaust and engine metal or the relative warmth of the entire aircraft. They are highly maneuverable "dogfighting" missiles.

Early-model IRHMs (TL7−) must be launched within the target aircraft's 60-degree or less angle-off arc to engage the target. Later all-aspect models may be launched at any target angle-off. IRHM seeker heads must lock on the target aircraft before it is launched.

To lock an infrared homing missile on an enemy aircraft:
Routine, Tactics, Dexterity (confrontational).

The IRHM has a 20-square maximum range and no minimum launching range. It has five maneuver points plus the maneuver points of the launching aircraft at launch. The missile's maneuver points are used as those of an aircraft. The IRHM remains in flight four turns.

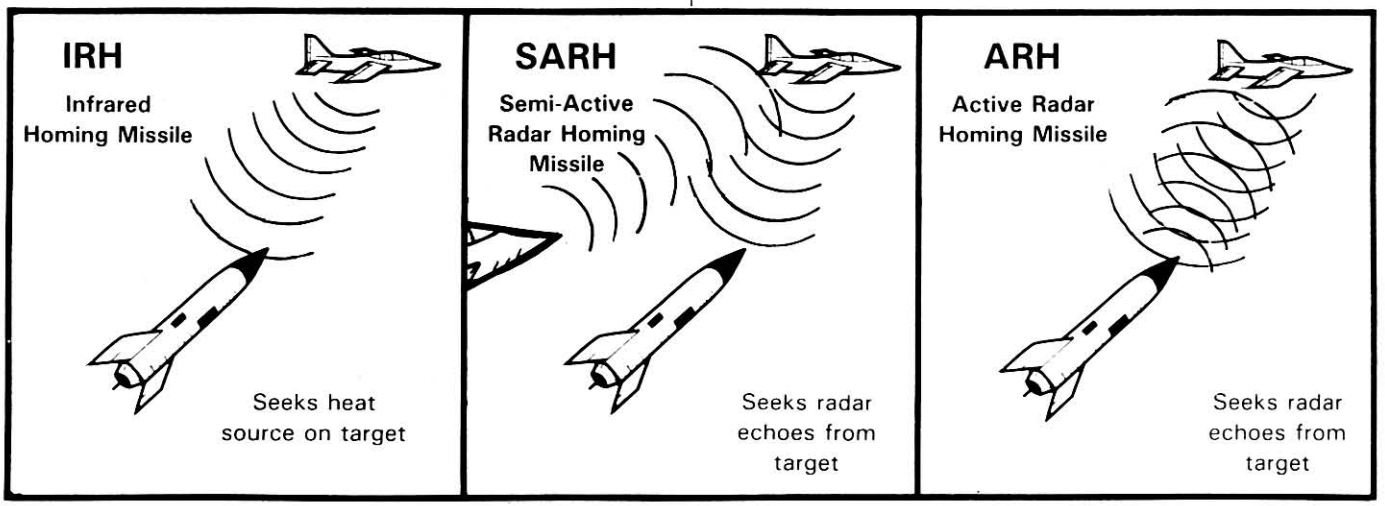
To successfully launch an IRHM:
Simple.
Referee: If launch is successful, the missile will impact unless the defending aircraft breaks lock. The IRHM inflicts 16 damage points on impact.

The defending aircraft may attempt to break lock once per combat round with this task:

To break an IRHM lock:
Difficult, Aircraft, Tactics, Strength.
Referee: Add DM+2 if defending aircraft is equipped with infrared countermeasures (IRCM).

Semiactive Radar Homing Missiles (SARH): Semiactive radar homing missiles home in on radar energy reflected from the target aircraft. For a SARH missile to attack successfully, its launching aircraft must illuminate the target with its radar until impact. The launching aircraft must be radar-equipped to use this type of missile. The target must be within the 150-degree+ angle-off arc of the launching aircraft and within missile range before the missile may be fired.

To lock launching aircraft's radar on target aircraft:
Difficult, Tactics, Aircraft, Sensor Ops.
Referee: Add DM+2 if the launching aircraft has a radar intercept officer.



The SARH missile has 10 maneuver points plus the maneuver points of its launching aircraft at launch. The missile's maneuver points are used as those of an aircraft. Its maximum launch range is 60 squares (30 kilometers), and it has a minimum launch range of six squares (three kilometers). It remains in flight for six turns.

To launch SARH missile:
Simple.
Referee: If the launch is successful, roll for damage on impact unless the defending aircraft successfully breaks radar lock. The SARH inflicts 28 damage points.

The launching aircraft must illuminate the target until the missile hits.

To radar illuminate target aircraft:
Difficult, Tactics, Aircraft, Sensor Ops.
Referee: The task is Routine when the range of the launcher to the target is less than 20 squares. Add DM + 2 if the launching aircraft has a radar intercept officer; DM – 2 if target aircraft is below 500 meters. *This task must be rolled for each combat round the missile is in flight or until the target breaks radar lock.*

The defending aircraft may attempt to break radar lock once per combat round with the following task.

To break radar lock:
Difficult, Aircraft, Tactics, Strength.
Referee: Add DM + 2 if defending aircraft is equipped with chaff dispenser, DM + 4 if equipped with internal radar jammer or radar jammer pod.

Radar lock is also broken if the target aircraft escapes the launcher's 150-degree + angle-off radar arc.

Active Radar Homing Missiles (ARH): ARHMs are similar to SARHs except that have their own on-board radar sets. The launching aircraft need only radar illuminate the target aircraft until the missile is within 20 squares (10 kilometers) of its target. Then the missile's internal radar takes over the guidance function, and impact is automatic unless radar lock is broken as described above.

More advanced ARHs (TL9 +) automatically lock on to their targets at launch, freeing the launching aircraft for additional combat or breakoff. They are "fire and forget" missiles.

Resolve ARH combat the same as SARH combat except for the less restrictive radar illumination requirements.

Breakoff

Combat ends when aircraft:
- Shoot down all opposing aircraft.
- Successfully disengage (break off) from combat.

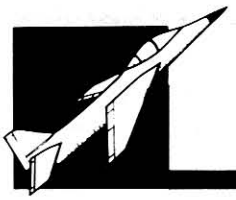
An aircraft may attempt to break off during a combat round by declining to fire its weapons and successfully attempting the breakoff task.

To break off from combat:
Difficult, Tactics, Aircraft, Strength.

***VAN NUYS* (TL6) PERSONAL AIRCRAFT**

CraftID: Personal Aircraft, TL6, Cr33,500
Hull: 6/15, Disp. = 1, Weight Loaded = 1.5tons, Airframe = Simple
Power: 4/10 Internal Combustion, .25 Mw, Endurance = 4 hours, 15 min
Loco: Light Propeller, Thrust = 1ton, Minimum Speed = 75, Cruise = 190, Top = 255, Agility = 2
Commo: VDistant Radio × 1
Control: Simple
Accom: Crew = 1 (Pilot), Passengers = 3, Simple Cockpit × 2, Passenger Seats × 2
Other: Fuel = 318liters, Cargo = .10ton

A small, economical personal transport aircraft. These are available for rent at airfields on many worlds, or may be purchased as a cheaper, somewhat faster alternative to the air/raft. They are equipped with dual controls so that a qualified passenger may function as copilot, or the aircraft may fly as a trainer with a flight instructor and student. Its relatively low speed and rugged construction let this aircraft take off and land from unprepared dirt airstrips. Variants are available with floats for water landings and takeoffs or with skis for landings on snow or ice.



Air-to-Ground Combat

Close air support of ground forces, aerial interdiction strikes, aerial bombardment, and their high technology analogs can play an important part in **MegaTraveller** combat scenarios as wars rage among the factions of the Rebellion. Mercenary units often have their own organic rotary-wing or light, fixed-wing combat aviation units available to supply "on call" air support. Air-to-ground combat is a prime task and specialty of many mercenary air wings. Planetary defense, Imperial, and rebellious COACC forces are constantly used to support their ground forces as the Imperium becomes increasingly fragmented.

COACC air-to-ground combat rules try to simulate the effects of tactical air warfare with an easily playable, fast-moving combat system.

These air-to-ground combat rules simulate air strikes by player characters on ground units controlled by the referee or in some cases by other player characters. COACC air-to-ground combat rules may also be used by player characters in control of ground forces who call in close air support on nearby enemy positions, and can be used to resolve the effects of air strikes on troop units controlled by player characters.

HASTY COMBAT

Like its air-to-air counterpart, air-to-ground hasty combat is a somewhat abstract version of the standard combat rules designed to enable the referee to resolve a combat situation with a minimum of delay. Maps are not required, ground units need not be placed, aircraft need not be maneuvered, nor are their positions plotted. Simply resolve air-to-ground combat by rolling the tasks indicated in the standard combat rules section, resolving weapons penetration and damage with **MegaTraveller** combat rules.

STANDARD AIR-TO-GROUND COMBAT

Air-to-ground combat uses the same time, distance, and altitude scale as the air-to-air combat rules. Aircraft movement is plotted on graph paper or hex paper as in air-to-air combat. Cardboard markers may be used to represent individual aircraft, or colored pencils may be used to plot individual aircraft positions during each combat round, with a different color representing each aircraft. Aircraft facing should be indicated with an arrowhead drawn on the cardboard marker, or drawn directly on the square or hex as the aircraft position marker. Aircraft altitude logs should be maintained and updated each turn to track each aircraft's current flight level.

Movement: Aircraft are granted maneuver points to be used in each combat round. To calculate available maneuver points, divide the aircraft's current speed by 250 and round off to the nearest whole number.

Units of Measurement: Each square or hex equals 500 meters; each flight level equals 500 meters in altitude; each aircraft maneuver point equals 250 kilometers per hour, or one square/hex per combat round or its energy equivalent; each combat round lasts six seconds.

Ground Scale: The 500-meter square/hex scale applies to target units on the ground. Many air-to-ground weapons are area weapons, including rocket salvoes, bombs, and napalm. Usually if a pilot knows he has hit the area of the target, his mission is successful. Often, this is all he will know.

Other weapons, including strafing with guns or lasers, laser-guided bombs, and various types of missiles are precision weapons, and the pilot will want to know if he has hit the precise target at which he was aiming.

To reflect these differences in weapons, COACC air-to-ground combat includes two different types of "To Hit" tasks: "To hit a designated target area," and "To hit an individual target within the target area." Area weapons use the former task, precision weapons the latter.

However, many referees and players, particularly those who have player characters on the ground, will want to know if particular individuals, vehicles, or structures are hit by area weapons. To determine this, a second "To hit an individual target" task with the DMs is included with each appropriate weapon.

For additional realism, the referee may want to break the 500-meter target square/hex into 50- or five-meter squares to more accurately place the characters, and plot the hits and effects of an air strike.

Placing Units: Either the referee or player controlling ground units shall mark the location of all ground units and terrain features on either graph paper or a hex grid map before play begins. Units are not identified nor are their types revealed until they are attacked or they open fire on the attacking aircraft. Ground units and installations must be spotted before they can be attacked.

Loadouts: The proper mix of weapons must be selected for the mission. Rockets, cluster bombs, and napalm are most effective against troops. Bombs—either free-fall or guided—are most effective against bunkers and structures. Missiles are effective against vehicles, single structures, and weapons installations.

Check each aircraft's specifications and make sure the total weight of the external weapons does not exceed the maximum external stores listing for that aircraft type.

Also, make sure the weapons or other external stores loaded on the aircraft's individual hardpoints do not exceed the weight limits listed below.

HARDPOINTS

Hardpoint	*Maximum Weight (kg)*
Fuselage Hardpoint	2000
Plumbed FHP	2000 (or 2000-liter tank)
Inboard Wing Hardpoint	1500
Plumbed IWHP	1500 (or 1500-liter tank)
Outboard Wing Hardpoint	500
Wingtip Launch Rail	100

Forward Observers: Forward observers are individuals specially trained in spotting targets and directing air strikes onto these targets.

Airborne FOs fly over the target area in light aircraft or sometimes as observers in two-seat attack aircraft. They are in radio contact with strike aircraft, and as the strike approaches, they mark targets with smoke rockets in daylight or flares at night. FO aircraft of TL7 and above also carry laser target designators used to illuminate targets for laser-guided bombs and missiles.

Ground FOs are COACC officers attached to the forward elements of friendly forces in need of close air support. They mark friendly forces' positions with colored smoke grenades and recognition panels and use aircraft frequency radios to guide strike aircraft to their targets. They also use laser carbines or other target designators to illuminate targets for laser-guided bombs and missiles.

FOs are usually experienced attack aircraft pilots assigned to this mission because of their knowledge of aircraft and air-to-ground ordnance. Forward Observer skill level is a positive DM to spot and to hit a ground target.

Spotting: Each type of unit or installation has its own spotting range. An aircraft must be within this spotting range before it can attempt to spot a ground unit or installation and begin its attack.

SPOTTING RANGES

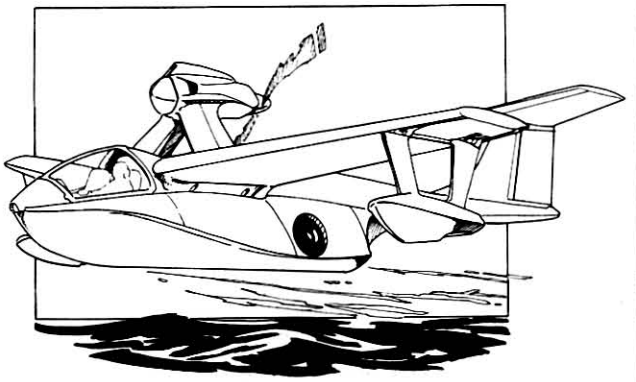
Object	*Spotting Range*
Infantry units	3 kilometers/ 6 squares
Armor/vehicle units	6 kilometers/12 squares
Artillery	9 kilometers/18 squares
Buildings/structures	9 kilometers/18 squares
Multistory buildings	12 kilometers/24 squares

To spot a ground unit or installation from an aircraft in line of sight within spotting range:

Routine, Forward Observer, Recon (unskilled OK).

Referee: This task becomes Difficult if the target is camouflaged. DM + 1 if observer aboard spotting aircraft. DM + Forward Observer skill of ground or airborne forward air controller if FO has target in his line of sight. DM + 4 if forward observer has marked target with smoke. DM + 6 if target is marked with a laser designator and spotting aircraft is equipped with either internal or pod-mounted laser sensor or ladar.

Spotting becomes Formidable if attempted at night unless target is illuminated with flares or the spotting aircraft is equipped with passive infrared, light amplification, or image enhancement sensors. If these devices are used, spotting at



***AVALON* (TL6) AMPHIBIOUS PERSONAL AIRCRAFT**

CraftID: Amphibious Personal Aircraft, TL6, Cr39,250
Hull: 6/15, Disp. = 1, Weight Loaded = 1.5tons, Airframe = Simple
Power: 4/10 Internal Combustion, .25 Mw, Endurance = 3 hours, 20 min
Loco: Light Propeller, Thrust = 1ton, Minimum Speed = 75, Cruise = 190, Top = 255, Agility = 2
Commo: VDistant Radio × 1
Control: Simple
Accom: Crew = 1 (Pilot), Passengers = 3, Simple Cockpit × 2, Passenger Seats × 2
Other: Fuel = 258liters, Cargo = .10ton

This is a personal transport aircraft built with a boat-shaped hull and retractable wheeled landing gear. It can take off and land at regular land-based airfields as well as on bodies of water, making it an ideal air vehicle for back-country exploration.

night is Difficult. The same DMs noted above apply except for the smoke target marking DM.

Ground Fire: Attacking aircraft are subject to random ground fire—of rifle caliber—when attacking at less than two flight levels (1000 meters) above ground. Each time a character's aircraft descends below 1000 meters to begin an attack, roll the following task.

To avoid ground fire:
Simple (hazardous).
Referee: Roll on the Mishap Table to determine level of damage. Apply damage as indicated with a 1D roll on the Damage Location Table in the "Air-to-Air Combat" chapter. A **Destroyed** result rolled on the Mishap Table results in the aircraft crashing; however, the pilot (and other crewmembers) have a chance to eject/bail out.

Attacking: Aircraft must spend three maneuver points aiming at ground targets they are attacking unless they have computers and HUDs. Computer/HUD-equipped aircraft need only expend one MP on aiming. This expenditure means either flying level at the target for three squares, diving three flight levels, or any combination of these, until the aircraft is within its weapons' firing/launch/release range. (See Strafing Range Table or Dive Bombing Release Points Table later in this chapter, or individual air-to-ground weapon tables for range.)

Slow-flying aircraft may expend the needed maneuver points to aim their aircraft during two or more combat rounds. *Exception:* Combat helicopters within one square of their targets may fire immediately.

Aircraft, except for helicopters or fixed-wing craft flying NOE, or fixed-wing craft making laydown attacks, must descend at least one flight level per combat round while attacking a ground target.

Strafing

Strafing is an aircraft attack on ground targets with machinegun fire, autocannon fire, or laser fire. The aircraft must be within range of the target as indicated on the Strafing Range Table below before it can begin a strafing attack.

STRAFING RANGE

Range	*Weapon*
3-square maximum	Aircraft cannon
1-square maximum	Heavy machineguns
1-square maximum	Light machineguns
Unlimited	Lasers in clear air

To hit a target with TL7 (or less) aircraft fire:
Difficult, Gunnery.
Referee: DM + level of computer. DM + 1 if using HUD. DM + 1 if attacking aircraft is a helicopter.

To hit a target with TL8 (or more) aircraft fire:
Routine, Gunnery.
Referee: DM + level of computer. DM + 1 if using HUD. DM + 1 if attacking aircraft is a helicopter.

Hits: Roll the "Strafing" task times the number of guns or gun barrels firing. As an example, if two one-barrel autocannons fire, roll twice to hit per target; if one six-barrel autocannon fires, roll six times for hits per target. If firing a pulse laser, roll times the number of lenses per laser. If strafing with beam lasers, roll once to hit per laser but double the number of hits when calculating damage.

Penetration and Damage: Calculate penetration and damage for each hit as indicated on the Guns Table in the "Aircraft Ordnance" chapter and apply as indicated in the **MegaTraveller Players' Manual**.

Autofire Targets: Up to the listed number of additional targets adjacent to the primary target may be attacked in a strafing attack as listed on Guns Table.

Gun Pods: Internal guns and gun pods may be used in a strafing attack either separately or together. The following gun pods are available:

GUN PODS

Type	*Weight (kg)*	*Rounds*	*Shots*
7mm gatling gun	150	1400	14
20mm single autocannon	400	200	20
20mm 3-barrel autocannon	300	300	6
20mm 6-barrel autocannon	750	1200	12
30mm 6-barrel autocannon	850	400	4

Laser Pods: Laser pods are available beginning at TL9 and may be used to strafe ground targets either separately or together with internal lasers.

Laser Pod: A 0.5-megawatt beam laser driven by a .8-megawatt integral gas turbine/MHD generator with 350 liters of fuel sufficient for one hour of continuous operation. Penetration = 5, Damage = 4. Weight = 1500 kilos, fuselage hardpoint only.

Rockets

Free-flying rockets may be fired singly or in pairs at a single precise target, or by full pod ripples for an area-wide shotgun effect. They either come singly or in pods. Pods may be fired one rocket at a time or in a ripple. The most common sizes include 80mm and 120mm rockets. The former come in pods of seven or 19, the latter in pods of three or singly for launching from underwing rails.

ROCKETS

Size	*Pen*	*Damage*	*Danger (m)*	*Range*
80mm HE	14	12	20	1000 m/2 squares
Flechette	3	3	100	
120mm HE	18	16	25	1500 m/3 squares
Flechette	4	4	150	

ROCKET PODS

Size	*Rounds*	*Weight (kg)*
80mm	7	60
80mm	19	200
120mm	3	200
120mm	1 (launch rail)	60

Danger Space: Multiply the danger space per rocket times

the number of rockets fired to determine the total blast radius per attack.

To hit designated target area with air-to-ground rocket attack: Routine, Gunnery.
Referee: DM + aircraft computer level. DM + 1 if aircraft has HUD. DM + forward observer's FO skill. DM + 1 if attacking aircraft is a helicopter.

To hit individual target within designated target area: Routine, Gunnery.
Referee: The difficulty level applies if the target is in the open. The task is Difficult if the target is under cover. DM + aircraft computer level. DM + 1 if aircraft has HUD. DM + 2 if attacking aircraft is a helicopter.

Penetration and Damage: Calculate penetration and damage for each hit as indicated on the Rockets Table and apply as indicated in the **MegaTraveller Player's Manual**.

High-Explosive Bombs

High-explosive bombs come in a number of sizes as indicated in the High-Explosive Bomb Table below. They are simple, effective, and cheap.

HIGH-EXPLOSIVE BOMBS

Size	*Penetration*	*Damage*	*Danger*
200 kg	30	34	45 meters
350 kg	32	38	50 meters
450 kg	34	40	55 meters
1000 kg	48	60	100 meters

High-explosive bombs are either finned, low-drag bombs or are retarded, high-drag bombs fitted with air brakes or parachutes. The latter are less accurate but may be dropped from lower altitudes because the aircraft has enough time to escape bomb blast damage.

Ballute bombs are available at TL8. At the pilot's discretion, these may be dropped as high- or low-drag bombs, slowed by a self-inflating, air-filled "ballute" (balloon/parachute) on the tail assembly. The pilot may select the drag mode prior to drop.

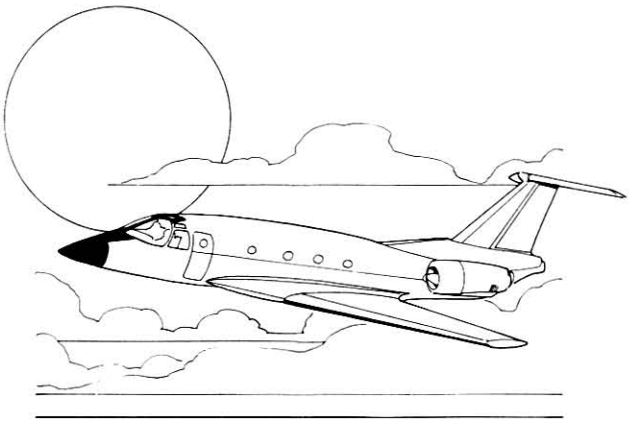
Release Points: Bomb release points vary with altitude, the range to the target square, and whether the aircraft is dive bombing or in level flight. Only high-drag bombs may be dropped below 500 meters.

DIVE BOMBING RELEASE POINTS

Range	*Altitude (meters)*	*DM*
0	500-1500	−2
1	1500-3000	0
2	3000-4500	+1

Units: *Range:* Squares from target square.

To hit designated target area with bombing attack: Routine, Gunnery.
Referee: DM + aircraft computer level. DM + 1 if aircraft has HUD. DM + forward observer's FO skill. DM + release point DMs. DM − if bombing with high-drag bombs. DM − 2 if bombing with napalm.

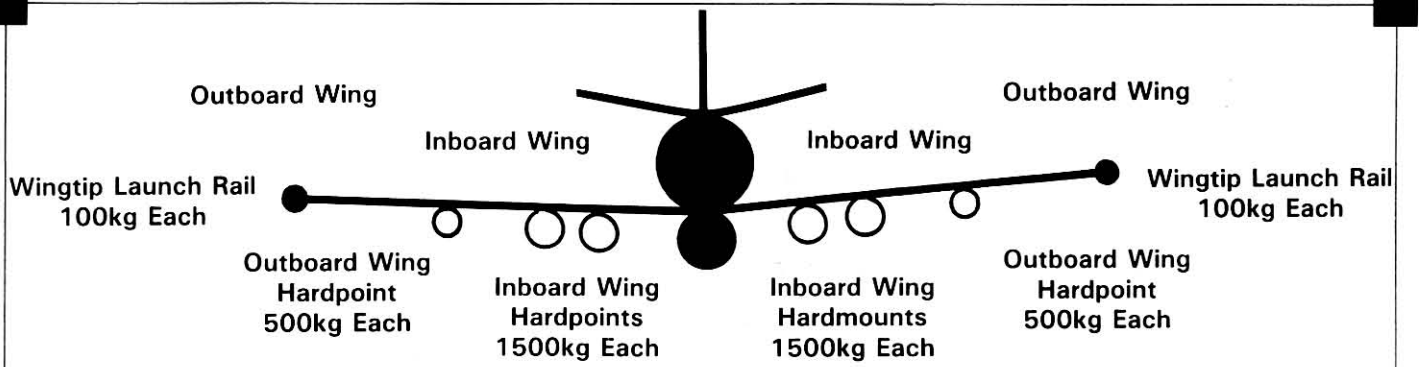


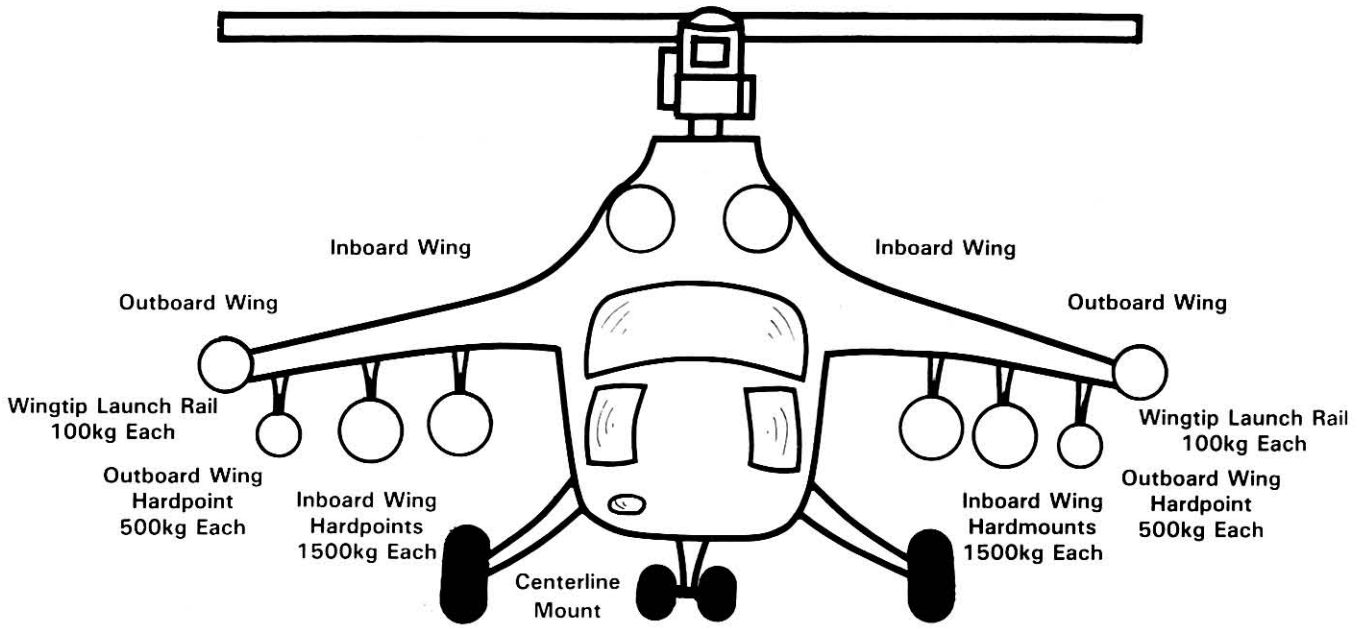
***BEVERLY HILLS* (TL7) PERSONAL JET AIRCRAFT**

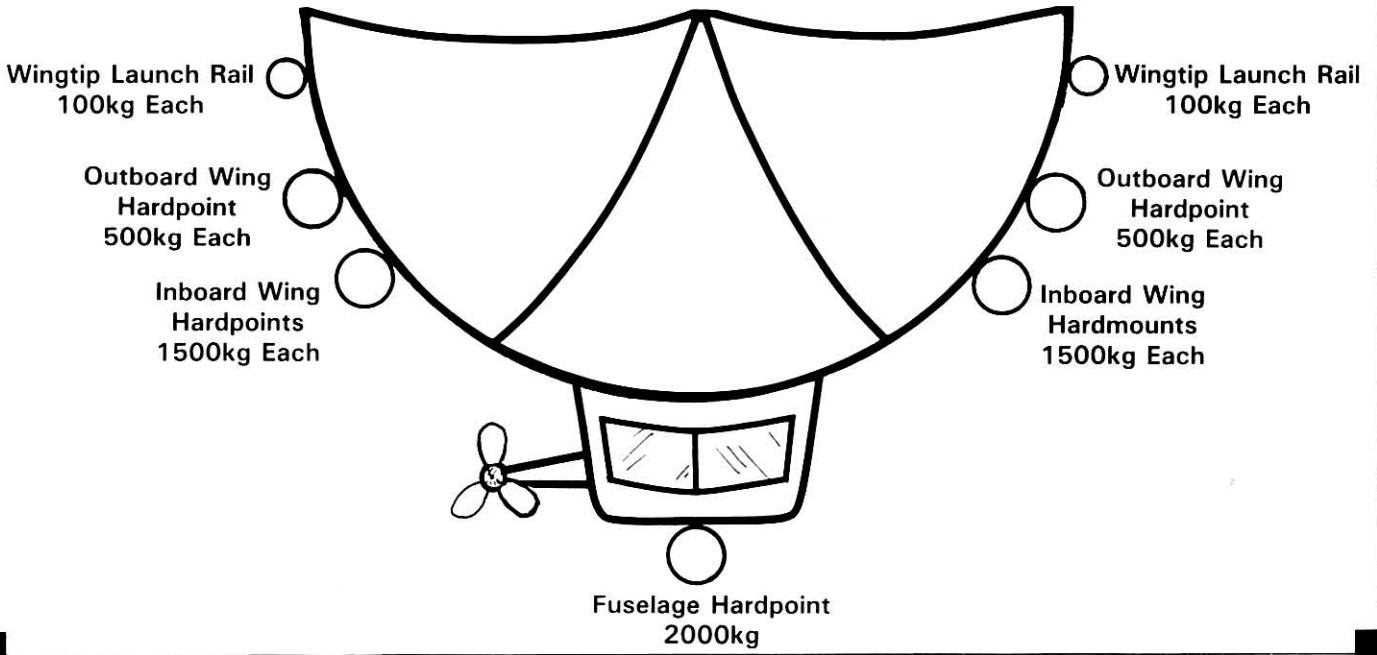
CraftID: Personal Jet Aircraft, TL7, Cr455,500
Hull: 40/100, Disp. = 16, Weight Loaded = 10tons, Airframe = Transonic
Power: 4/10 Gas Turbine × 2, .60 Mw, Endurance = 4 hours
Loco: Light Turbojet × 2, Thrust = 12tons, Minimum Speed = 176, Cruise = 825, Top = 1100, Agility = 1
Commo: Regional Radio × 1
Control: Boosted
Accom: Crew = 2 (Pilot, Copilot), Passengers = 4, Complex Cockpit × 2, Passenger Section
Other: Fuel = 5700liters, Cargo = .5ton

A small jet transport available for rapid, private transportation on many worlds. These may be chartered with crew or purchased by qualified jet pilots. Larger versions carrying up to 10 passengers with twice the endurance are also available for double the price. Both aircraft are substantially cheaper and faster than their grav-powered equivalents.

AIRCRAFT LOADOUTS







To hit individual target within designated target area in open terrain:

Routine, Gunnery.

Referee: DM + aircraft's computer level. DM + 1 if aircraft has HUD. DM + 4 if bombing with laser-guided bomb.

To hit individual target within designated target area under cover:

Difficult, Gunnery.

Referee: DM + aircraft's computer level. DM + 1 if aircraft has HUD. DM + 4 if bombing with laser-guided bomb.

Laser-Guided Bombs: If a forward observer, another aircraft, or the attacking aircraft has a laser aimed at the specific target and the attacking aircraft has dropped a laser-guided bomb, skip the task for hitting a designated target area and roll the task to hit an individual target.

Low-Level Bombing Hazard: If bombing with low-drag bombs below 1500 meters roll for the following task:

To avoid bomb blast damage to aircraft:

Routine (fateful).

Referee: Aircraft sustaining **Major** damage cannot return to base and pilot/crew must bail out. **Destroyed** aircraft crash immediately, and crew cannot escape.

Number Dropped: Bombs may be dropped singly, in pairs, in "sticks" (all bombs dropped in sequence with timed intervals), or in salvoes (every bomb on the aircraft dropped at once.)

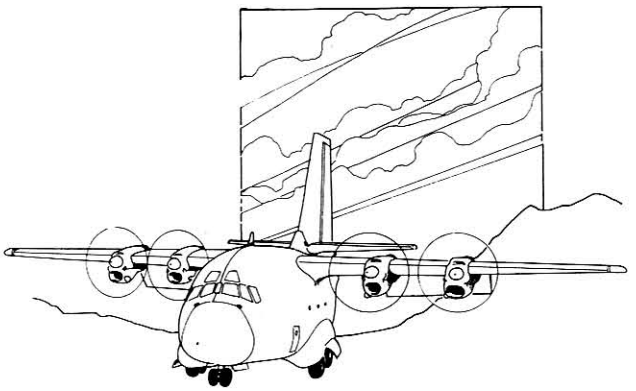
Danger Space: Multiply the danger space per bomb times the number of bombs dropped to determine the total blast radius per attack. If bombs are dropped in sticks, the attacking player has the option of plotting impact points in a straight line along the attacking aircraft's direction of travel. Bombs land approximately 50 meters apart.

Penetration and Damage: Calculate penetration and damage for each hit as indicated on the High-Explosive Bombs Table and apply as indicated in the **MegaTraveller Player's Manual**.

Napalm: Napalm is a petroleum-based fuel which has been mixed with powdered aluminum thickeners, white phosphorus, and charcoal. It is used to fill 350-kilogram firebombs with blunt ends and no fins. These firebombs are designed to tumble after they are released to cause maximum dispersion of the flaming fuel, and therefore napalm firebombs have only moderate accuracy.

Dive Bombing Attacks: Napalm bombs may be used in dive bombing attacks as described above with the indicated DMs. A napalm attack against dug-in troops is a Routine, not Difficult, task. Each napalm bomb used in a dive bombing attack has a 50-square-meter danger space.

Laydown Attacks: Napalm bombs may be used in laydown attacks by aircraft flying level in the NOE altitude band. A designated target area for a laydown attack consists of a "footprint" of 100 meters times the number of bombs dropped long × 20 meters wide parallel to the aircraft's line of flight. If this designated area is successfully attacked, individual targets within the footprint are automatically attacked.



***ANCHORAGE* (TL8) FRONTIER TRANSPORT**

CraftID: STOL Frontier Transport, TL8, Cr2,575,500
Hull: 420/1050, Disp. = 200, Weight Loaded = 70tons, Airframe = Fast Subsonic
Power: 4/10 Gas Turbine × 4, .60 Mw., Endurance = 10 hours, 40 min, 11 hours, 40 min with demountable tanks
Loco: Basic Turboprops × 4, Thrust = 48tons, Minimum Speed = 80, Cruise = 570, Top = 760, Agility = 1
Commo: Regional Radio × 1
Control: Boosted
Accom: Crew = 4 (Pilot, Copilot, Flight Engineer, Loadmaster), Complex Cockpit × 2, Crew Station × 1
Other: Fuel = 40,800liters internal, 4000 additional in 2000liter × 2 demountable external tanks, Cargo = 20tons

Cargo transport designed to operate from rugged wilderness airstrips hauling either civilian or military cargo. May haul up to 150 passengers in cramped seats or 130 troops to be either airdropped or combat landed into battle.

NAPALM BOMBS

Size	Pen	Damage	Danger
350 kg	10	40	100m × 20m danger space parallel to aircraft in laydown attacks, 50 m² in dive bomb attacks

Incendiary Bombs

Incendiary bombs are filled with a fire- and smoke-producing chemical, usually white phosphorus, that creates a cloud of white smoke, causes severe burn wounds, and ignites any flammable structures it hits.

Incendiary bombs are aimed and dropped with the same DMs to hit a designated area and a specific target as low-drag HE bombs. They are more accurate but have a smaller danger space than napalm. In many cases, they are used primarily to generate smoke screens or mark targets rather than being used as incendiary weapons.

Incendiary bombs generate a cloud of smoke 30 meters in diameter on impact. The cloud drifts with the wind and dissipates after 15 combat rounds.

INCENDIARY BOMBS

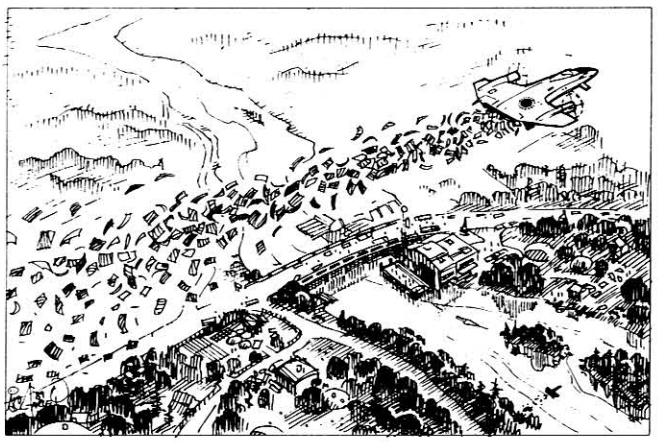
Size	Penetration	Damage	Danger
250 kg	10	30	30

Incendiary Rockets

Incendiary rockets (80mm) are also available. They have the same penetration and damage as incendiary bombs have but a danger space of 10 meters. They are mostly used by airborne forward observers for marking targets. Colored smoke rockets with half the penetration and damage of incendiary rockets are also used to mark targets.

Cluster Bombs

Two versions of cluster bombs are available—high explosive antipersonnel (HE) and high explosive armor piercing (HEAP). Both types consist of bomb-shaped low-drag canisters containing hundreds of bomblets that are scattered over a wide area as the canister opens after it is dropped. HE cluster bombs release spherical bomblets made of plastic explosive that release a cloud of flechettes as they explode. HEAP cluster bombs release small finned bomblets, each containing a shaped charge which detonates on impact.



CLUSTER BOMBS

Type	Size	Penetration	Damage	Danger
HE	250 kg	9	6	120
HEAP	250 kg	28	8	120

To hit designated target area with a cluster bomb attack: Routine, Gunnery, Forward Observer.

Referee: DM + aircraft computer level. DM + 1 if aircraft equipped with HUD. Also apply release point DMs.

To hit individual target within designated target area: Simple, Gunnery.

Referee: The task is Routine if the target is under cover. DM + aircraft computer level. DM + 1 if aircraft equipped with HUD.

Missiles

The four basic types of missiles are:

- Laser-guided.
- Command-guided.
- Homing.
- Antiradiation.

Laser-Guided Missiles: These are similar to laser-guided bombs in that they home in on a target illuminated with a laser target designator. The laser target designator may be aboard the launching aircraft, or a forward observer's aircraft, or may be aimed by an FO on the ground. Laser-guided missiles may be equipped with an HE warhead for use against structures such as buildings and bridges, or a HEAP warhead for use against armored targets.

Command-Guided Missiles: These weapons are guided to the target by commands sent by radio link or wire—in the case of some helicopters—from the launching aircraft. At TL6 and TL7, these missiles are manually guided by the pilot of the launching aircraft who manipulates a joystick in his cockpit to steer the missile to its target. At TL8 and above, optical tracking equipment tracks the missile after launch and guides the missile to the target as the pilot keeps the target centered on the screen of his missile-aiming system. At this technology level, the aircraft's missile-aiming mechanism is a flexible television-based device that enables it to turn away from the target immediately after missile launch and yet keep the missile aimed on target.

Homing Missiles: The four types of homing missiles are optical, infrared, active microwave, and neutrino homing.

Optical Homing Missiles: When firing optical homing missiles, the pilot designates the target on the television screen of his aircraft's optical targeting system. This lets the missile "see" and lock onto the target and retain its image in memory before launch. The missile remains locked onto the target image after launch until impact.

Infrared Homing Missiles: Infrared homing missiles lock onto the target's heat signature, such as exhaust or engine heat from a vehicle, and home in on target.

Active Microwave Homing Missiles: Active microwave homing missiles scan terrain with integral radar sets looking for metallic targets. When microwaves are reflected back off a metallic target, such as an armored fighting vehicle, the missile homes in on the reflection.

Neutrino Homing Missiles: Neutrino homing missiles lock onto a target's radiation source, such as a fusion power plant, and home in on the target.

Optical homing missiles may be used against vehicles and easily visible fixed targets, such as buildings, missile sites, gun emplacements, and bridges. Infrared homing missiles may only be used against targets with a significant heat source, such as vehicles and occupied buildings. Neutrino homing missiles are useful against fusion-powered vehicles and stationary power generators.

All are fire and forget weapons.

Antiradiation Missiles: Antiradiation missiles (ARMs) home in on radar and radio emissions, and are used to suppress early warning and fire control radars, as well as radio transmitters.

Target Acquisition: Laser-guided missiles, infrared homing missiles, and ARMs must acquire their targets before launch. Pilots firing command-guided or optical homing missiles must spot their targets before launch. Pilots firing optical homing missiles must also spot and designate their targets before launch.

To lock on laser-guided missile target, infrared homing target, or ARM target within 60 degrees of each side of the line of flight:
Simple, Gunnery, aircraft computer level.

To designate an optically guided missile target:
Routine, Gunnery, Instant.

Missile Launch: The launching aircraft must be diving toward the target, and descending at least one flight level per turn, and have the target within 30 degrees of either side of its line of flight for at least one combat round before launching a missile. The missile must be launched within its minimum and maximum launch ranges. Add the missile's speed to the aircraft speed to determine total missile speed at launch.

To successfully launch an air-to-ground missile:
Simple, Instant (fateful).
Referee: A "fumble" result indicates the launching system was improperly armed, and the missile is "hung up" on its launcher.

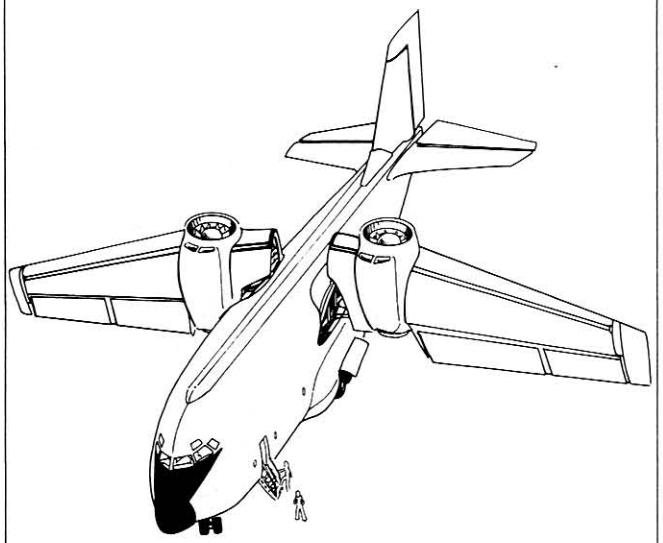
Missile Attack: Pilots who have launched a command-guided missile must roll the following task once each turn the missile is in flight:

To successfully guide a command-guided missile toward its target:
Routine, Gunnery, Aircraft, Dexterity, Instant.
Referee: DM – 2 if missile TL6 or TL7.

All pilots making missile attacks roll the following task in the turn the missile impacts:

To hit a missile attack target:
Routine, Gunnery, Instant (fateful).
Referee: DM – 2 if weather is hazy; DM – 4 if weather is rain; DM + 4 if laser-guided or ARM missile; DM – 4 if ARM target ceases transmitting and ARM is TL7 – .

Missile Attack Damage: See Air-to-Ground Missile Table for penetration and damage ratings.



***NAIROBI* (TL9) VTOL FRONTIER TRANSPORT**

CraftID: VTOL Frontier Transport, TL8, Cr3,095,000
Hull: 420/1050, Disp. = 200, Weight Loaded = 70tons, Airframe = Fast Subsonic
Power: 4/10 Gas Turbine × 4, .60 Mw, Endurance = 3 hours
Loco: High Bypass Turbofans × 2, Thrust = 100tons, Cruise = 570, Top = 760, Agility = 1
Commo: Regional Radio × 1
Sensors: VDistant Radar × 1, Image Enhancement × 1
Control: Boosted
Accom: Crew = 2 (Pilot, Copilot), Complex Cockpit × 2
Other: Fuel = 24,000liters internal, Cargo = 20tons or up to 150 passengers or 130 troops

Cargo transport designed to operate from small open patches of terrain without any need for conventional airfields. The transport's wings, each with a high bypass turbofan at the wingtip, swivel into the vertical position for takeoff and landing, then swivel into the normal horizontal position for flight. This aircraft's range is somewhat limited, however, because of the relatively high fuel consumption of the turbofans. Its radar and image enhancement sensors give it an all-weather/nighttime operations capability.

HARDPOINTS

Hardpoint	*Maximum Weight (kg)*
Fuselage Hardpoint	2000
Plumbed FHP	2000 (or 2000-liter tank)
Inboard Wing Hardpoint	1500
Plumbed IWHP	1500 (or 1500-liter tank)
Outboard Wing Hardpoint	500
Wingtip Launch Rail	100

SPOTTING RANGES

Object	*Spotting Range*
Infantry units	3 kilometers/ 6 squares
Armor/vehicle units	6 kilometers/12 squares
Artillery	9 kilometers/18 squares
Buildings/structures	9 kilometers/18 squares
Multistory buildings	12 kilometers/24 squares

NAPALM BOMBS

Size	*Pen*	*Damage*	*Danger*
350 kg	10	40	100m × 20m danger space parallel to aircraft in laydown attacks, 50 m² in dive bomb attacks

INCENDIARY BOMBS

Size	*Penetration*	*Damage*	*Danger*
250 kg	10	30	30

CLUSTER BOMBS

Type	*Size*	*Penetration*	*Damage*	*Danger*
HE	250 kg	9	6	120
HEAP	250 kg	28	8	120

HIGH-EXPLOSIVE BOMBS

Size	*Penetration*	*Damage*	*Danger*
200 kg	30	34	45 meters
350 kg	32	38	50 meters
450 kg	34	40	55 meters
1000 kg	48	60	100 meters

DIVE BOMBING RELEASE POINTS

Range	*Altitude (meters)*	*DM*
0	500-1500	−2
1	1500-3000	0
2	3000-4500	+1

Units: *Range:* Squares from target square.

STRAFING RANGE

Range	*Weapon*
3-square maximum	Aircraft cannon
1-square maximum	Heavy machineguns
1-square maximum	Light machineguns
Unlimited	Lasers in clear air

GUN PODS

Type	*Weight (kg)*	*Rounds*	*Shots*
7mm gatling gun	150	1400	14
20mm single autocannon	400	200	20
20mm 3-barrel autocannon	300	300	6
20mm 6-barrel autocannon	750	1200	12
30mm 6-barrel autocannon	850	400	4

LASER POD

A 0.5-megawatt beam laser driven by a .8-megawatt integral gas turbine/MHD generator with 350 liters of fuel sufficient for one hour of continuous operation. Penetration = 5, Damage = 4. Weight = 1500 kilos, fuselage hardpoint only.

ROCKETS

Size	*Pen*	*Damage*	*Danger (m)*	*Range*
80mm HE	14	12	20	1000 m/2 squares
Flechette	3	3	100	
120mm HE	18	16	25	1500 m/3 squares
Flechette	4	4	150	

ROCKET PODS

Size	*Rounds*	*Weight (kg)*
80mm	7	60
80mm	19	200
120mm	3	200
120mm	1 (launch rail)	60

AIR-TO-GROUND MISSILE TABLE

Type	*Weight*	*Range Min/Max*	*Speed*	*Penetration/Damage*
Light ARM	200	6/24	12	26/28
Heavy ARM	500	6/45	14	30/34
Laser Guided	350	3/20	6	HE 30/34, HEAP 51/24
Command	1000	3/18	8	HE 34/40, HEAP 55/30
Auto Cmd	1000	3/45	5	HE 34/40, HEAP 55/30
TV Homing	200	2/24	6	44/20
IR Homing	200	2/24	6	44/20
Microwave Homing	50	2/12	6	40/18
(pod of 12)	(1000)			

AIR-TO-GROUND MISSILE TABLE

Type	Weight	Range Min/Max	Speed	Penetration/Damage
Light ARM	200	6/24	12	26/28
Heavy ARM	500	6/45	14	30/34
Laser Guided	350	3/20	6	HE 30/34, HEAP 51/24
Command	1000	3/18	8	HE 34/40, HEAP 55/30
Auto Cmd	1000	3/45	5	HE 34/40, HEAP 55/30
TV Homing	200	2/24	6	44/20
IR Homing	200	2/24	6	44/20
Microwave Homing (pod of 12)	50 (1000)	2/12	6	40/18

Orbit to Ground Weapons: Fire support from orbit is a major mission of a COACC force's orbital components, including system defense boats, monitors, and orbiting artillery platforms. Orbital fire support may be conducted by space vessels, small craft, and orbiting platforms using lasers, energy weapons, missiles, particle accelerators, and meson guns.

Fire support from orbit is classified as long-range indirect fire. In spite of the distance, it is considered artillery rather than air support. Consequently, a forward observer trained in directing orbital fire—*not* just a forward observer—must be within line of site of the intended target for an orbital fire mission to be successful.

To hit a targeted location with indirect fire:

Difficult, Forward Observer, 1 combat round (absolute, fateful).

Referee: Indirect fire from orbit requires a trained forward observer who can see the target and adjust fire. Orbital fire called in by the observer begins arriving in the combat round after the fire mission is requested.

Indirect fire from orbit automatically scatters if the task fails. Indirect fire from orbit falls on friendly positions if a 2 (fumble) is rolled. Roll for a Mishap in case of failure. A **Superficial** mishap scatters the fire 500 meters (one square) in a random direction; a **Minor** mishap scatters fire 1000 meters (two squares); a **Major** mishap scatters fire 1500 meters (three squares); and **Destroyed** mishap scatters fire 2000 meters (four squares).

Reroll the task to correct fire on a target. Add a cumulative DM of +1 for each combat round fire correction is called to the orbiting artillery platform.

Orbiting starships and other vessels may provide laser, energy weapon, and particle accelerator fire support only while directly overhead. They are overhead one-third of the time of their orbital period. Their orbital period is equal to the UPP Planetary Size Code; e.g., a vessel orbits a size 8 planet in eight hours and would be overhead for only 2.6 hours every eight-hour orbit. Roll 5+ on 1D to determine if a given vessel is overhead and available for orbital fire support. *Note:* Particle accelerators may not fire through atmosphere. They are only effective against targets on a vacuum world's surface.

Missiles fired from orbit may be laser guided by the forward observer or other target designator, command guided via radio link from their launching vehicle, or preprogrammed to hit a specific target with a terrain-matching targeting system.

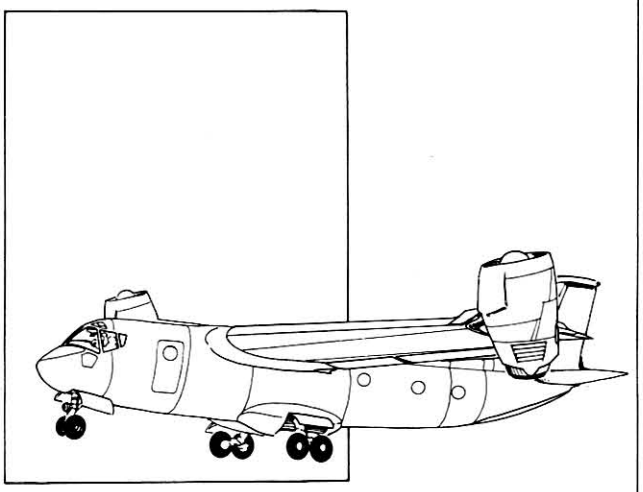
To hit a target with missiles launched from orbit:

Routine, Gunnery, Forward Observer, Instant (fateful).

Referee: DM – 2 if weather is hazy; DM – 4 if weather is rain; DM + 4 if laser-guided or ARM missile; DM – 4 if ARM target ceases transmitting and ARM is TL7 – .

Turret-launched missiles have a warhead equal to a 16cm howitzer round; bay-launched missiles have a warhead equal to a 24cm howitzer round.

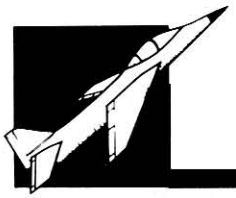
Orbital Fire Damage: Complete statistics for starship weapons used in orbit-to-ground fire—including damage, penetration, and commentary—can be found on page 80 of the **MegaTraveller Players' Manual**.



***PASADENA* (TL9) VTOL INTERURBAN AIRLINER**

CraftID: VTOL Airliner, TL8, Cr3,416,000
Hull: 420/1050, Disp. = 200, Weight Loaded = 70tons, Airframe = Transonic
Power: 4/10 Gas Turbine × 2, .60 Mw, Endurance = 3 hours
Loco: High Bypass Turbofans × 2, Thrust = 100tons, Cruise = 785, Top = 1045, Agility = 1
Commo: Regional Radio × 1
Control: Boosted
Accom: Crew = 8 (Pilot, Copilot, Flight Attendants × 6), Complex Cockpit × 2. Basic Life Support
Other: Fuel = 28,000liters internal, Passengers = 120, Cargo = 3.5tons

Short- to medium-haul VTOL airliner designed to fly from city center to city center avoiding the need for runways and congested airports. This design is highly popular on high-population worlds for quick travel between cities and remains viable economically until thruster-powered airbuses and airliners replace airfoil-based airliners.



Aircraft Ordnance

A wide variety of air-to-air and air-to-ground aircraft ordnance is available to flyers of all tech levels, ranging from light machineguns and crude hand-thrown bombs at TL5, to energy weapons and space-to-space self-guided thermonuclear missiles at TL15. Following is a sample of some of the aircraft weapons and related devices available to flyers on the worlds of the once-mighty Imperium.

AIR-TO-AIR WEAPONS

Air-to-air weapons are designed to be used by aircraft to destroy other aircraft. They include the following.

Machineguns: These are rapid-firing slug throwers designed to fire solid projectiles at target aircraft. Multiple hits are needed to damage and disable aircraft engines, control cables, and control surfaces. Slugs also wound and kill crew and passengers. Machineguns are useful for strafing unarmored ground targets. Light, medium, and heavy machineguns are available for aircraft beginning at TL5. They are generally superseded by aircraft autocannons at TL7.

Autocannons: These heavy-caliber, rapid-firing slug throwers fire explosive and incendiary shells. They cause damage by penetration, explosion, and fire. First introduced at mid-TL5, early aircraft autocannons are plagued with low muzzle velocities (thanks to their short barrels), short ranges, and an inability to penetrate enemy armor. By TL6, they have greater penetration and increased lethality. Multibarrel autocannons bring high rates of fire at TL7 and are the leading close-in dogfighting weapon at ranges under 1500 meters.

Lasers: The first airborne lasers appear at TL7 crudely mounted aboard larger transport aircraft converted to weapons platforms. Lasers increase in power and decrease in size so that by TL9 they are mounted as integral weapons or carried in pods by fighters and attack aircraft. They supersede slug throwers by TL10. By TL13, x-ray lasers yielding 250 megawatts are widely used air-to-air, air-to-ground, and space-to-space weapons by fighter aircraft and spacecraft.

Missiles: Infrared homing missiles appear at TL6. They home in on the hot exhaust and engine metal of their targets. They may only be fired from astern of the target aircraft. At TL7, all-aspect infrared homing missiles become available. These home in on the relative warmth of the entire target aircraft and may be fired at the target from any angle.

SARH missiles become available at TL7. These home in on reflected radar energy from the target aircraft as it is illuminated by the launching fighter. The launching aircraft must be radar equipped and illuminate the target the entire time the missile is in flight. SARH missiles are susceptible to jamming.

ARHMs first become available at TL8. These have their own miniature on-board radar sets and need the launching aircraft to illuminate the target only part of the way to the target. Once within range of their on-board radar sets, the internal missile radar takes over final guidance to the target. At TL9, true fire and forget missiles appear that lock onto their target aircraft immediately at launch.

AIR-TO-GROUND WEAPONS

Air-to-ground weapons include:

Machineguns: As indicated in the previous section, these slug throwers are also used against soft ground targets, principally troops and unarmored vehicles caught in the open. As more powerful and sophisticated helicopters are developed at TL7, both fixed, forward-firing and flexible, pintle- and turret-mounted machineguns were successfully fitted to these craft as air-to-ground weapons.

Autocannons: In addition to the dual-purpose autocannons discussed above, specialized air-to-ground autocannons firing hypervelocity armor-piercing shells are developed as a major antiarmor weapon. Their high rate of fire plus the kinetic effect of their depleted uranium slugs allow these autocannons to kill tracked battlefield tanks. Internal as well as pod-mounted versions are available.

Turret-mounted single- and multibarrel autocannons also prove to be effective helicopter-mounted air-to-ground weapons. Autocannons and guided missiles combine to turn helicopters into lethal tank destroyers at TL8.

Bombs: Explosive-filled bombs are cheap and simple to make. They are also the first purpose-built, air-to-ground weapons, appearing as simple, hand-thrown bombs at TL5. As aircraft become more powerful, they carry larger loads of heavier bombs, as well as increasingly sophisticated bomb sights. By TL6, various forms of incendiary, smoke, and chemical bombs are developed, as well as the first crude nuclear bombs. Fusion bombs weighing as much as 5000 kilograms are developed at TL7 but shrink rapidly becoming effective "tactical" weapons weighing as little as 350 kilograms by TL8. The latter thermonuclear weapons are sophisticated "dial-a-yield" devices that enable the pilot to select a yield of from 100 kilotons to one megaton while in flight.

Both optical and laser bomb guidance packages are developed by late TL7. The first enables the bomb to "see" the target with a television camera and transmit it to the pilot of the attacking aircraft, who steers the bomb onto the target with a small joystick controller in the cockpit. The second homes in on reflected laser light directed at the target by the pilot or a forward observer. Both packages attach guidance electronics and movable fins to standard "iron" bombs, con-

verting them to precision-guided "smart weapons." Although guidance packages can be attached to any size bomb, they are most commonly attached to 1000-kilogram and larger bombs, and used against hard targets such as bridges.

Cluster Bombs: The first cluster bombs appear at TL6 filled with magnesium incendiary bomblets. As explosives technology is developed, antipersonnel cluster bombs are built at TL7 containing spherical, high-explosive bomblets studded with flechettes. As they are dropped, the cluster bomb containers open releasing the bomblets in a wide pattern. The bomblets explode on impact, releasing a cloud of the dart-like flechettes over a wide area. Antiarmor cluster bombs are available at TL8 that release small, finned bomblets with shaped charge HEAP warheads capable of penetrating light to medium armor.

Napalm: Napalm firebombs become available at TL6 as antipersonnel/incendiary weapons. These are relatively inaccurate area weapons filled with a petroleum-based fuel mixed with powdered aluminum thickeners, white phosphorus, and charcoal. They are effective against personnel in the open and soft vehicle targets.

Rockets: Unguided rockets first appear as air-to-ground weapons at TL6, generally fired in pairs at specific targets, giving the launching aircraft a "standoff" capability. Standardized pods are developed at TL7, enabling rocket salvoes to be fired into a target area with an effect analogous to a giant shotgun blast. Rocket pods are highly effective helicopter (as well as fixed-wing aircraft) weapons. Rocket warheads include high-explosive, smoke, and flechette types.

Missiles: The first air-to-ground missiles appear in late TL6 as command-guided weapons tracked visually by the pilot and steered with a joystick control. Other versions include a television camera in the missile's nose and a television receiver in the launch aircraft's cockpit. These let the pilot see the target from the missile and guide it to impact with his joystick controller. Missiles are more accurate than bombs and give a greater standoff attack capability than guided bombs or free-flying rockets.

More sophisticated homing missiles that close in on reflected laser light or infrared radiation emitted by the target are available at TL7. Also at TL7, optically guided missiles appear. These need only to lock onto the target with an integral television camera. Once the target's image is in memory, the missile will home all the way to impact without further guidance, making it a true fire and forget weapon. This capability frees the pilot to take evasive action and leave the target area.

Specialized antiradiation missiles are also developed. These home in on radar emissions, and are used to destroy early warning and fire control radars by specialized air defense suppression aircraft that lead in a major air strike. Early TL7 versions are foiled by simply turning off the target's radar. Later TL8 versions remember the radar's location and continue homing even if the transmitter is turned off.

Automated command-guided missiles which only need the pilot to keep the target centered in the screen of his electro-optical missile aiming system become available at TL8.

Active microwave homing missiles appear at TL8. These have miniature radar sets that guide them to metallic targets on the ground, such as armored fighting vehicles, by the microwaves reflected from the target. They may be launched from behind a hill separating the launching aircraft from the target or from other remote locations as fire and forget weapons. Once launched, they automatically scan for and home in on metallic targets. Active microwave homing missiles are available in pods of 12, each weighing 1000 kilograms.

Neutrino homing missiles appear at TL10 and prove extremely useful against fusion-powered grav vehicles.

OTHER EXTERNAL STORES

A variety of external stores may be carried. These include:

Fuel Tanks: These 500-, 1000-, and 2000-liter external fuel tanks are widely available to extend aircraft range. They must be mounted on plumbed hardpoints (equipped with fuel intake piping) and are often dropped when empty.

Refueling Pods: These contain 1000 liters of fuel, a hose reel, and a drogue. When one of these is mounted and a control unit is installed in the cockpit, any aircraft is converted into a tanker that can refuel other refueling probe-equipped aircraft in flight. Refueling pods weigh 1500 kilograms.

Electronic Countermeasures Pods: ECM pods come in several varieties. Some weighing in the 250-kilogram range provide antiradar jamming for an entire flight of aircraft, protecting against early warning and missile fire control radars out to 50 kilometers (very distant). Others weighing about 20 kilograms eject passive radar jamming "chaff" and infrared decoy flares. These protect individual aircraft against radar-guided and infrared homing missiles. The pods are light enough to be mounted on the wingtips or conformally on the fuselage where the wings and fuselage join.

ECM aircraft are often purpose-built to provide up to 500 kilometers (regional) radar jamming coverage.

Target Designator Pod: Two versions of this pod are available and needed to control some varieties of smart bombs and guided missiles. Laser target designator pods enable an attacking pilot to illuminate a target from his aircraft for his own or another aircraft's ordnance. Optical target designator/data-link pods are needed for automated command-guided missiles if the aircraft does not carry an integral target designation and tracking system. The optical pod may operate in visible light or infrared. Either type weighs about 200 kilograms and requires one hardpoint.

Reconnaissance Pods: These weigh about 200 kilograms and require one hardpoint. They include their own power supply, as well as still, motion picture, and (beginning at TL8) video cameras and recorders. Depending on the cameras included, recon pods can be configured for high-altitude, vertical photography, or low-altitude, forward- and side-looking, still and motion photography. Cameras sensitive to infrared light are also carried. At TL8 and above, recon pods transmit images back to the aircraft's base in near real time. At TL10 and above, holographic images are captured and transmitted.

Flare Dispensers: Flare dispenser pods containing four flares each are available at TL7. Flares fired from these pods can illuminate 500 square meters for three minutes when dropped from 1000 meters above ground level. Night attack aircraft generally work in pairs—one dropping flares over suspected target locations, the other spotting targets and attacking. (See the "Spotting" task in the air-to-ground combat rules regarding the use of flares when spotting at night.)

AIR-TO-AIR MISSILES

TL	Type	Weight	Range Min/Max	Speed	Damage	Cost
6	IRHM	100	—/20	5	16	Cr1100
7	SARH	200	6/60	10	28	Cr3000
8	ARHM	200	6/60	10	28	Cr3500

AIR-TO-GROUND MISSILES

TL	Type	Weight	Range Min/Max	Speed	Penetration/Damage	Cost
7	Light ARM	200	6/24	12	26/28	Cr2200
7	Heavy ARM	500	6/45	14	30/34	Cr4500
8	Laser Guided	350	3/20	6	HE 30/34, HEAP 51/24	Cr2500
6	Command	1000	3/18	8	HE 34/40, HEAP 55/30	Cr7780
7	Auto Cmd	1000	3/45	5	HE 34/40, HEAP 55/30	Cr9000
7	TV Homing	200	2/24	6	44/20	Cr2000
7	IR Homing	200	2/24	6	44/20	Cr1300
8	Microwave Homing	50	2/12	6	40/18	Cr500
	(pod of 12)	(1000)				Cr6000 per pod
10	Neutrino Homing	200	2/24	8	44/20	Cr10,000

Units: *Range:* Squares. One square = 500 meters. *Speed:* Squares per turn. One square = 500 meters.

GROUND-TO-AIR GUNS

TL	Weapon	Ammo Notes	Rds	Pen/Atten	Max Dmg	Range	Ceiling	Cost
6	Heavy Machinegun	Belt	100	6/3	3	500m/ 1sq	1000	3000/ 250
6	20mm Autocannon	HE Belt	50	1	6	1500m/ 3sq	1500	4400/ 100/ 2
7	20mm 3-barrel	HE Hopper	2500	2	6	1500m/ 3sq	1500	6400/5000/ 2
7	20mm 6-barrel	HE Hopper	2500	2	6	1500m/ 3sq	1500	7600/5000/ 2
5	40mm Autocannon	HE Clip	10	5	8	5000m/10sq	2000	17,500/ 80/ 8
6	60mm Autocannon	HE Clip	5	9	10	5000m/10sq	2000	40,000/ 125/25
6	80mm AAA Cannon	HE Single	1	14	12	10,000m/20sq	10,000	52,000/ 55
6	100mm AAA Cannon	HE Single	1	16	14	10,000m/20sq	10,000	84,000/ 120
6	120mm AAA Cannon	HE Single	1	18	16	10,000m/20sq	10,000	120,000/ 160

GROUND-TO-AIR MISSILES

TL	Type	Weight	Range Min/Max	Speed	Ceiling	Damage	Cost
7	Portable SAM	16 kg	—/ 8	10	1500	13	Cr400
7	Light SAM	100 kg	—/ 20	5	2500	16	Cr1100
6	Medium SAM	625 kg	2/ 70	20	10,000	30	Cr142,000
6	Heavy SAM	5000 kg	5/200	20	20,000	32	Cr750,000
9	150mm Ships	250 kg*	Far Orbit	6G6	Far Orbit	**	Cr6000/1000

Notes: *Includes 200kg booster stage. **Calculate hits and damage with **MegaTraveller** ship-to-ship missile combat tables in the **MegaTraveller Referee's Manual**.

GUNS

TL	Weapon	Ammo Notes	Rds*	Pen/Atten	Dmg	Max Range	Autofire Targets**	Cost
5	Medium Machinegun	Belt	100	3/3	3	VLong	3	1500/ 120
6	Light Machinegun	Belt	100	3/3	3	VLong	2	1200/ 120
6	Heavy Machinegun	Belt	100	6/3	3	VLong	2	3000/ 250
6	20mm Autocannon	HE Belt	50	1	6	VLong	2	4400/ 100/2
6		KEAP		8	4			
7	20mm 3-barrel	HE Hopper	2500	2	6	VLong	7	6400/ 5000/2
		KEAP		8	4			
7	20mm 6-barrel	HE Hopper	2500	2	6	VLong	15	7600/ 5000/2
		KEAP		8	4			
8	30mm Autocannon	HE Belt	50	3	7	Distant	2	8800/ 250/5
		KEAP		13	5			8800/ 250/5
8	30mm 6-barrel	KEAP Hopper	2500	13	5	Distant	15	19,000/12,500/5

Notes: *Figure equals rounds in standard belts and standard hoppers. Multiple linked belts are usually loaded per aircraft gun. Aircraft hoppers hold a limited ammunition supply. See individual aircraft listings for actual ammunition supply. **Maximum air-to-ground strafing targets only. See combat rules governing number of hits per shot in air-to-air combat. *Cost Figure:* Cost per gun/cost per belt or hopper/cost per round (autocannon only).

GUN PODS

Type	Weight	Rounds	Shots	Cost
20mm single autocannon	400 kg	200	20	Cr5000
20mm 3-barrel autocannon	300 kg	300	6	Cr7200
20mm 6-barrel autocannon	750 kg	1200	12	Cr10,400
30mm 6-barrel autocannon	850 kg	400	4	Cr21,600

ROCKETS

TL	Type	Size	Penetration	Damage	Danger	Range
7	HE	80mm	14	12	20 m	1000 m/2 squares
7	Flechette	80mm	3	3	100 m	1000 m/2 squares
6	HE	120mm	18	16	25 m	1500 m/3 squares
7	Flechette	120mm	4	4	150 m	1500 m/3 squares

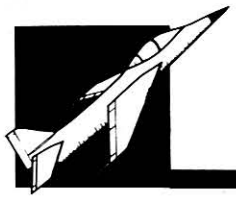
ROCKET PODS

TL	Size	Rounds	Weight	Cost
7	80mm	7	60 kg	Cr350
7	80mm	19	200 kg	Cr950
7	120mm	3	200 kg	Cr350
6	120mm	1 (launch rail)	60 kg	Cr100

BOMBS

TL	Type	Size	Penetration	Damage	Danger	Cost
5	High Explosive	50 kg	24	24	35 m	Cr135
6	High Explosive	250 kg	30	34	45 m	Cr285
6	High Explosive	350 kg	32	38	50 m	Cr720
6	High Explosive	500 kg	34	40	55 m	Cr1200
6	High Explosive	1000 kg	48	60	100 m	Cr2000
6	Incendiary	250 kg	10	30	30 m	Cr500
7	Cluster HE/Frag.	250 kg	9	6	120 m	Cr2500
8	Cluster HEAP	250 kg	28	8	120 m	Cr3500
6	Napalm	350 kg	10	40	50 m*	Cr750

Notes: *Indicated danger space is for dive bomb attack only. Danger space per napalm bomb in laydown attack is 100 × 20 meters parallel to aircraft track. *Cost:* Add Cr100 per bomb for high-drag airbrakes; Cr200 per bomb for pilot-controlled ballute low-drag/high-drag airbrake system (TL8+ only); Cr500 per bomb for laser guidance package; Cr1000 per bomb for television command guidance package.



Ground-to-Air Combat

Air defense—ground-to-air combat—is both a major function of many COACC forces and a major obstacle to the successful completion of many COACC air combat missions. Depending on tech level, characters may expect to run into (or be part of) air defenses consisting of aircraft and guns, missiles, and/or energy weapons. If serving in a COACC force on a sufficiently advanced world, a flyer may find himself serving far underground in a deep meson gun pit.

These rules may also be used by mercenary characters defending themselves against air attack. This section includes descriptions of some of the antiaircraft and antispacecraft weapons available in Imperial space.

GROUND FIRE

Ground fire is the simplest, least effective form of antiaircraft defense. It consists of defending troops firing their personal weapons and light machineguns skyward in a usually vain attempt to down an attacking aircraft. Mostly, ground fire is good only for morale. Rarely, however, a rifle bullet will sever a fuel line or control cable and bring about the end of a multimillion credit aircraft. On the whole, defending troops would be better off keeping under cover.

Note: Ground fire is a form of rapid fire. Units conducting ground fire empty their weapons in one combat round.

To hit attacking aircraft with ground fire:
Formidable, Combat Rifleman or Submachinegun, Dexterity.

Referee: The attacking aircraft must be below 1000 meters (two flight levels) and pass over the defenders' square before this task may be attempted. If successful, inflict the weapon's number of damage points per hit. Apply damage as indicated with a 1D roll on the Damage Location Table in "Air-to-Air Combat."

LIGHT ANTIAIRCRAFT ARTILLERY (AAA)

Light AAA includes automatic slug throwers fitted with antiaircraft sights, and mounted on tripods or pintles that allow high-angle, 360-degree fire. Heavy machineguns mounted on high-angle tripods, vehicle pintles, or multiple mounts of two or four are included in this category. So are 20mm and 30mm single- and multibarrel autocannons on towed or self-propelled vehicle mounts. VRF gauss guns fall into this category as well. Roll the following task to hit once for each barrel firing at an attacking aircraft.

To hit an attacking aircraft with light antiaircraft artillery:
Formidable, Heavy Weapons, Dexterity.

Referee: The attacking aircraft must be at or below three flight levels (1500 meters) and within a range of three squares before autocannons may open fire, and at or below two flight levels (1000 meters) and within a range of one square before heavy machineguns may fire. Some light AAA guns may have integral fire control radar and computing gunsights. If so, the task to hit becomes Difficult.

If the task is successful, inflict the firing weapon's number of damage points (see Ground-to-Air Guns Table) for each hit against the aircraft. Apply damage as indicated with a 1D roll on the Damage Location Table in "Air-to-Air Combat."

MEDIUM AAA

Medium AAA weapons include autocannons from 40mm to 60mm. These may be located in stationary gun pits and tied into radar-directed mass fire batteries or mounted on self-propelled vehicle chassis. One- and two-barrel weapons are common.

To hit an attacking aircraft with medium antiaircraft artillery:
Formidable, Gunnery, Dexterity.

Referee: The attacking aircraft must be at or below four flight levels (2000 meters) and within 10 squares range before autocannons may open fire. If a gun is equipped with fire control radar or is part of a radar-controlled battery, the "To Hit" task becomes Difficult.

If the task is successful, inflict the firing weapon's number of damage points (see Ground-to-Air Guns Table) for each hit against the aircraft. Apply damage as indicated with a 1D roll on the Damage Location Table in "Air-to-Air Combat."

HEAVY AAA

Heavy AAA guns are generally replaced with missiles by TL8. However, at more primitive tech levels they can be deadly. Heavy AAA guns range in caliber from 80mm to 120mm. They are generally fired in barrages using proximity-fused shells at altitudes up to 10,000 meters (20 flight levels).

To hit an attacking aircraft with heavy antiaircraft artillery:
Formidable, Gunnery, Sensor Ops.

Referee: The Gunnery and Sensor Ops skills of different gun crew members may be combined for the task roll. Heavy AAA gun batteries must be radar directed to fire against high-altitude targets. They may fire against targets flying at 10000 meters or below, and within 10 squares (five kilometers) of their location.

If the task is successful, inflict the firing weapon's number of damage points (see Ground-to-Air Guns Table) for each hit against the aircraft. Apply damage as indicated with a 1D roll on the Damage Location Table in "Air-to-Air Combat."

MISSILES

Ground forces can make use of several types of missiles for defense.

Man-Portable SAMs

Introduced at TL7, these shoulder-fired weapons gave the infantry the first dedicated antiaircraft weapon that provided a measure of battlefield air defense. They weigh approximately 16 kilograms, including launch tube. The target must be visually acquired and identified, and the infrared guidance system locked on before the missile is fired. These missiles are deployed with two-man teams, the gunner carrying the launch tube loaded with one missile and the assistant carrying two reloads. Two teams are deployed per company.

TL7 man-portable SAMs must be fired at the rear of their targets. TL8+ man-portable SAMs incorporate all-angle IR seekers. Both models may be decoyed by infrared flares dropped by the target aircraft.

To hit an attacking aircraft with a man-portable SAM: Routine, Heavy Weapons, Dexterity.

Referee: DM – 2 for each infrared countermeasures flare dropped by the target aircraft. Man-portable SAMs may be fired against targets flying at 1500 meters or below and within eight squares (four kilometers) of the launch point.

If the task is successful, inflict the missile's damage points (see Ground-to-Air Missiles Table) for each hit against the aircraft. Apply damage as indicated with a 1D roll on the Damage Location Table in "Air-to-Air Combat."

Light Vehicle-Mounted SAMs

Air-to-air IRHM are converted to light SAMs by mounting them on four-rail launchers aboard light, tracked, armored fighting vehicles. They usually operate in conjunction with multibarrel autocannons also mounted aboard tracked AFVs to provide a close-in antiaircraft defense for front-line headquarters units and air bases. Targets must be visually detected and locked on before firing. Light SAMs may engage targets out to 20 squares (10 kilometers) and up to 2500 meters (flight level 5).

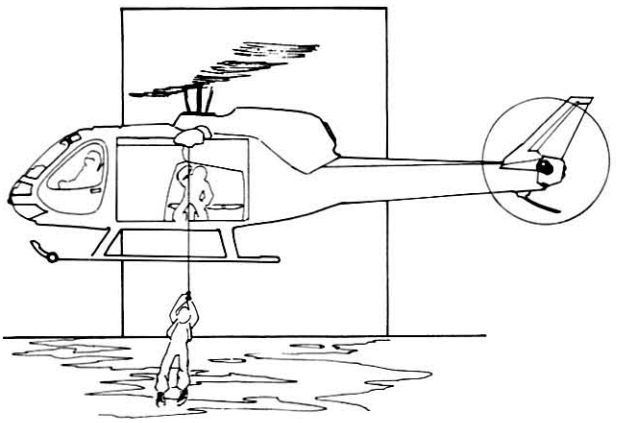
To hit an attacking aircraft with a vehicle-mounted SAM: Routine, Heavy Weapons, Dexterity.

Referee: DM – 2 for each infrared countermeasures flare dropped by the target aircraft. Light SAMs may be fired against targets flying at 2500 meters or below, and within 20 squares (10 kilometers) of the launch point.

If the task is successful, inflict the missile's damage points (see Ground-to-Air Missiles Table) for each hit against the aircraft. Apply damage as indicated with a 1D roll on the Damage Location Table in "Air-to-Air Combat."

Medium SAMs

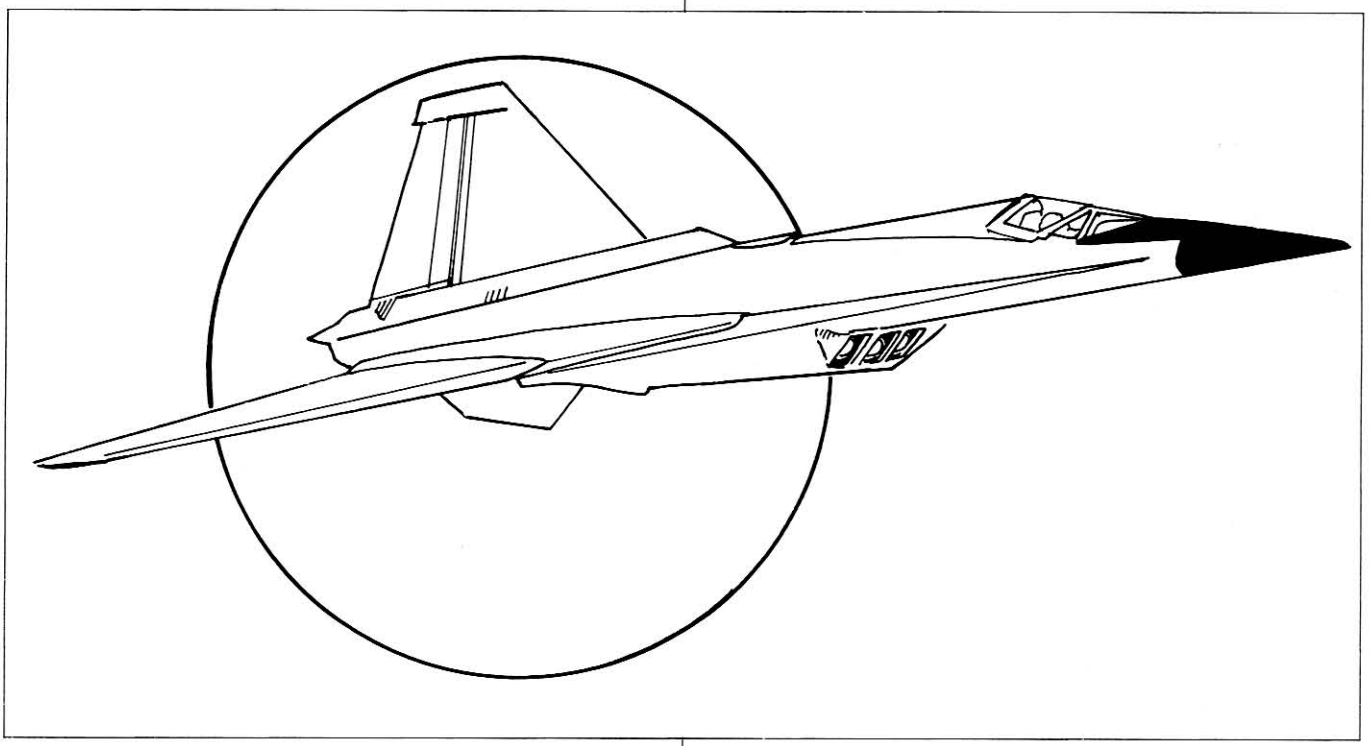
Medium SAMs are semistatic weapons employed to defend headquarters units, bases, and critical industrial sites from air attack. Medium SAM batteries employ three to four multirail launchers (each holding three missiles) and a radar control van. Targets are first acquired by separate early warning radar



***HARTFORD* (TL6) UTILITY HELICOPTER**

CraftID: Helicopter, TL6, Cr58,500
Hull: 16/40, Disp. = 5, Weight Loaded = 4tons, Airframe = Simple, Armor = 0
Power: 4/10 Internal Combustion, 1.25 Mw, Endurance = 2 hour, 10 min
Loco: Main and Tail Rotor, Lift = 5tons, Thrust = 1.25tons, Cruise = 225, Top = 300
Commo: Regional Radio × 1
Control: Simple
Accom: Crew = 3, (Pilot, Copilot, Observer), Simple Cockpit × 2, Observer rides in passenger/cargo compartment, 9 passengers + observer
Other: Cargo = 1ton internal in place of passengers + observer, 1ton internal + 1ton external sling load, or 2ton external sling load; Fuel = 850liters

A utility helicopter used as a search-and-rescue vehicle and to carry urgent cargo as well as troops for the first experimental airmobile units. This helicopter is equipped with a cable, sling, and hoist capable of lifting 120 kilograms. It's used to lift personnel into the passenger/cargo compartment while the helicopter hovers, enabling this aircraft to perform its search and rescue mission.



systems and passed down to the battery fire control radars. The missiles are launched once fire control radars lock onto the target and remain locked on for one turn. The missiles are guided by the fire control radars to their target. The lock-on must be maintained until impact.

To lock onto target aircraft with SAM fire control radar:
Routine, Sensor Ops.

Referee: DM – 2 for each chaff ECM cartridge fired by target aircraft in lock-on turn. DM – 4 if target aircraft or aircraft within 50 kilometers is using active jamming pod or if dedicated ECM aircraft is operating within 500 kilometers.

To launch a missile:
Simple, Gunnery.

Referee: **Superficial** or **Minor** mishaps result in the missile not leaving the launcher. **Major** and **Destroyed** mishaps result in the missile exploding on the launcher.

A missile may be launched after the target is tracked for one turn, and is within 35 kilometers (70 squares) of the launch point and at less than 10000 meters (flight level 20) altitude.

To maintain a lock on a target aircraft during missile flight:
Routine, Gunnery or Sensor Ops.

Referee: DM – target aircraft pilot's Aircraft and Tactics skills. DM – 2 for each aircraft chaff cartridge fired each turn. DM – 4 if aircraft active jammer pod is in operation within 50 kilometers or dedicated ECM aircraft is operating within 500 kilometers. This task must be rolled each turn the missile is in flight until the target breaks lock or is destroyed. If the lock is successfully maintained until impact, inflict the missile's damage points (see Ground-to-Air Missiles Table) for each hit against the aircraft. Apply damage as indicated with a 1D roll on the Damage Location Table in "Air-to-Air Combat."

Heavy SAMs

The heavy SAM is a static weapon designed to protect rear areas and population centers. Heavy SAM batteries include one fire control van and eight launchers. Each launcher holds four missiles ready to fire. TL8 heavy SAM batteries use phased array radars which perform the early warning function as well as provide guidance for launched missiles.

Referee: The tasks for obtaining a lock-on, launching the missile, and maintaining lock-on are identical to the same tasks performed for the medium SAM with these exceptions:

- The missile may be launched after the target has been tracked for one turn and is within 100 kilometers of the launch site and within 20,000 meters (flight level 40) in altitude.
- The chaff DM is – 1, rather than – 2, when attempting to avoid lock-on or attempting to break lock.

Standard Ship Missiles

Turret-mounted, standard, 150mm ship's missiles may be installed in ground emplacements as antispacecraft defense weapons. These installations are quite common at Class A and B starports and naval bases, along with laser turret installations.

These missiles may be targeted against ships in orbit out to far orbit range. They may not be targeted against aircraft. They include a booster stage to lift the missile clear of the atmosphere, a solid fuel 6G6 sustainer motor, a conventional 30-kilogram focused explosive warhead, a mass detector homing guidance package, and an initial radio command guidance package attached to the missile booster stage. Each emplacement includes a triple launcher with three reloads in the ready locker. Missile launchers are linked to a central active EMS/radar sensor and computer facility which performs initial detection and launch guidance. The missile's on-board mass detection guidance package takes over once the missile clears

atmosphere and its booster drops away. Hits and damage are resolved as in standard **MegaTraveller** space combat rules.

ENERGY WEAPONS

Several different types of energy weapons are utilized in ground-to-air combat.

Antiaircraft Lasers

Lasers may be installed on high-angle, rapid-slewing mounts as antiaircraft weapons at TL9+. These may be towed units designed for semifixed emplacement or mounted on self-propelled chassis. A point defense fire control package may be attached to enable lasers to engage incoming artillery shells and missiles, as well as aircraft. Lasers may be connected to a central early warning radar and targeting radar. They may also be fired over open sights. Self-propelled units generally include integral early warning and targeting radars on board their vehicles.

To hit an aircraft with an antiaircraft laser artillery:
Routine, Gunnery.
Referee: DM – 2 if fired through clouds; DM – 4 if fired in rain or snow; DM – 2 if radar directed and chaff is fired in firing turn by target aircraft; DM – 4 if radar directed and active ECM is operating within range.

Antispacecraft Lasers

These are ground-mounted, 250-megawatt ship's lasers in triple turrets used as space defense weapons primarily at starports and naval bases. They may be targeted against ships in atmosphere and in close orbit out to Planetary range (50,000 kilometers). They may also be used against aircraft. These ground laser installations are grouped in batteries controlled by a central active EMS/radar sensor and fire control station, and are rated as batteries according to the Beam Laser Turrets Table and Pulse Laser Turrets Table on page 73 of the **MegaTraveller Referee's Manual**.

Referee: Combat against spacecraft with ground-mounted laser batteries is resolved according to **MegaTraveller** space combat rules with the addition of the following DMs on the "To Hit" task: DM – 2 if fired through clouds; DM – 4 if fired in rain or snow.

Roll the following task if firing against aircraft.

To hit an aircraft with antispacecraft lasers:
Difficult, Gunnery.
Referee: A hit totally destroys the target aircraft.

Meson Guns

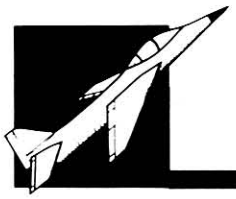
Ship-size meson guns buried in deep underground pits are major planetary defensive weapons. They may be fired out to Planetary range (50,000 kilometers), and since the planet is effectively transparent to them, they may fire at any angle toward any target desired from their pit. Deep meson guns are effectively impossible to silence. The only way to knock out these weapons is to locate and destroy their target acquisition and fire control sensors. This is a major mission for jump troop commando raids.

Meson gun combat between planetary deep gun pits and nearby starships is conducted exactly as space-to-space combat with one exception—only sensor hits have any effect on the deep meson gun site. However, large portions of countryside and urban areas are reduced to rubble by meson gun fire. These effects may be optionally applied by the referee.

***PALM SPRINGS* (TL7) PERSONAL JET HELICOPTER**

CraftID: Helicopter, TL7, Cr78,000 standard version, Cr83,000 executive version
Hull: 6/30, Disp. = 1, Weight Loaded = 1.6tons, Airframe = Simple, Armor = 0
Power: 1/2.5 Light Gas Turbine, .4 Mw, Endurance = 1 hour, 45 min standard version, 1 hour, 10 min executive version
Loco: Main and Tail Rotor, Lift = 1.6tons, Thrust = .4tons, Cruise = 225, Top = 300
Commo: Regional Radio × 1 (Executive version has Regional Radio × 2)
Control: Simple
Accom: Crew = 2, (Pilot, Copilot), Simple Cockpit × 2, Executive version is equipped with 4-seat passenger section. An additional passenger is often carried in place of copilot
Cargo: Up to .3ton of cargo may be carried in the standard version with a reduced fuel load.
Other: Fuel = Up to 875liters standard version, 575liters executive version

Gas turbine personal helicopter flown by individuals, by corporations for executive transportation, and for hire as air taxis or charters. Military versions exist as liaison and reconnaissance aircraft. Lightly armed versions are known but are uncommon.



Bases

All aircraft, ranging from a mercenary battalion's helicopters to massive transports and bombers, need bases to keep them flying. Bases provide maintenance, supplies of fuel and ammunition, and housing and support for aircraft crews and maintenance personnel.

The size and facilities needed for a base depend on the type of aircraft it will support. Light attack aircraft can operate from a dirt airstrip with maintenance performed under canvas. VTOL attack ships need only a flat patch of ground. On the other hand, a bomber wing needs an extensive base with long, paved runways and gigantic maintenance hangers.

RUNWAYS

Runways (or landing pads) are the heart of any base. Their length and surfacing depend on the weight and the required length of the landing/takeoff run of the aircraft expected to use them.

STOL Light Aircraft: STOL aircraft are designed to operate from short dirt airstrips. STOL-equipped, light aircraft weighing less than two tons require only a 150-meter dirt or grass airstrip to take off and less than 60 meters of strip to land.

Personal Aircraft: Non-STOL, light, propeller-driven, personal aircraft require approximately 300 meters of dirt, grass, or paved airstrip for takeoff and approximately half that for landing. Personal jet aircraft should fly from paved airstrips to avoid foreign object ingestion into the engines (unless debris screens are fitted) and require 1500 meters for takeoff and 1000 meters for landing.

Fighters: TL5 and some TL6 propeller-driven fighters can operate from grass airstrips. More advanced TL6 propeller-driven fighters require paved runways or runways covered with metal planking to avoid problems with mud and dust. Runway length should be no less than 1000 meters—longer if heavy fuel and weapons loads are anticipated.

Early TL6 jet fighters have low takeoff acceleration and require long runways. They need paved runways at least 2500 meters long. Required runway length is reduced for late TL6 and TL7 aircraft to 1500 meters thanks to increasingly efficient engines and high lift devices on the wings, such as triple-slotted flaps and leading edge flaps. However, TL9 and TL10 hypersonic and later orbital fighters need either runways at least 3500 meters long or 1000-meter runways with catapult or rocket-assisted takeoff because of their large size and fuel load.

Attack Aircraft: Light attack aircraft such as the *Pleiku*-class described on page 29 in this book have excellent short field performance. They require less than 250 meters of dirt airstrip for both takeoffs and landings. Heavier craft, such as the *Chicago*-class attack aircraft require 1000 to 1500 meters. The *San Diego*-, *Bitburg*-, and *Seattle*-class TL6 to TL8 jet aircraft should have paved or planked strips of at least 1500 meters. The *San Diego*-class is equipped for catapult launching and arresting gear recovery on short airstrips and from the decks of specialized wet navy ships.

VTOL attack aircraft require only a clear patch of hard-packed ground to operate from. This could be a forest clearing, a short length of road, a nautical ship's deck, or any other level landing space. VTOL capability allows building an easily concealed air base within a forest or even hidden among city buildings.

Bombers: Bombers are generally heavily loaded with fuel and weapons, and require long, paved runways. These should be at least 3000 meters long and sturdily built of reinforced concrete to resist the impact of up to 250 tons of aircraft as it touches down. Bomber bases are expensive and vulnerable.

Transports: Runway requirements vary widely for transports. The *Anchorage*-class frontier transport can operate from a 1000-meter, dirt airstrip. On the other hand, the *Tokyo*-class heavy airliner needs 3000 meters to get safely off the ground with its maximum fuel and passenger load. Interurban airliners such as the *Fresno*-class commuter airliner require only 2000 meters to operate safely. At slightly higher tech levels, the *Pasadena*-class VTOL commuter airliner can take off from landing pads in the heart of the city and fly downtown to downtown—noise regulations permitting. The *Nairobi*-class VTOL frontier transport can land anywhere with enough open space to clear its wingtips.

Units of a regular COACC force will have their own home bases built for them by their government. On a military campaign, they may need to quickly construct forward airbases with runways hastily graded and covered with pierced-steel planking or aluminum box planking. Mercenary air units need to have proper basing supplied by their employers and should know what is available before signing on for a ticket. VTOL-equipped squadrons command top prices because of their simple basing requirements.

CONTROL TOWERS

All bases require a form of control tower to direct arriving and departing traffic as well as aircraft movements on the ground. These may be manned towers or remote towers containing remote video cameras and surveillance radar atop a pylon. Mercenary air units are equipped with self-contained control centers that include extendable camera towers. These are housed in a standard three-meter × three-meter × six-meter cargo container-sized module that is air- and space-transportable, weighs three tons, and costs Cr150,000.

C³I CENTERS

Bases have command, control, communications, and intelligence centers that track friendly and enemy aircraft, and communicate with and control their own units' aircraft while in flight. Mission requests are called into this center and relayed to aircraft aloft. Air defense aircraft are coordinated from here as well. Mercenary air units travel with a three-ton portable C³I module costing Cr100,000. Their ground executive officers coordinate and relay missions to the unit commander and his subordinates aloft using this module.

HANGARS AND MAINTENANCE FACILITIES

Aircraft need proper maintenance facilities. This can range from a tarp-covered field maintenance pad to a gigantic hangar for a bomber or heavy transport. Generally, one hangar for every three squadrons should be available for heavy maintenance, such as engine changes and complete fuselage inspections, along with a maintenance workshop module mounted aboard a ground vehicle such as a truck or ACV for each squadron. These modules contain tools and spare parts for minor maintenance work on engines, airframes, electronics, and weapons systems. A workshop module weighs two tons, costs Cr50,000, and is configured as a standard three-meter × three-meter × six-meter cargo module.

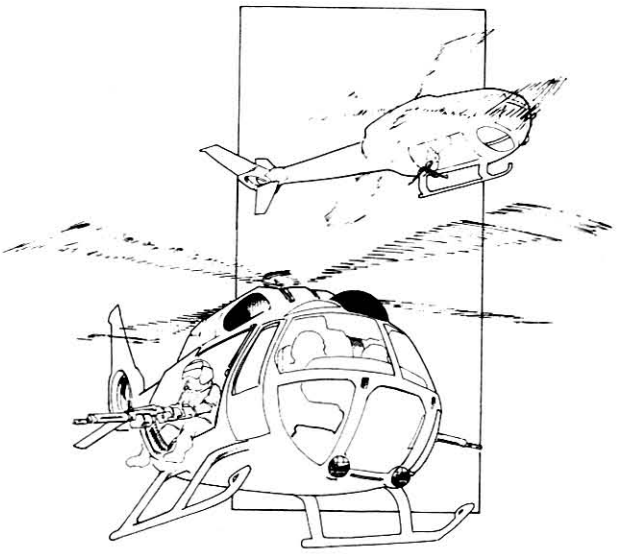
QUARTERS

Air and ground crews need living quarters and food service facilities. Combat air crews should have eight hours of sleep every 24 hours for maximum efficiency and at least two hot meals a day. Otherwise, their effectiveness suffers from fatigue and hunger. To reflect this, impose a DM – 2 on flight or air combat tasks if air crew members have missed a sleep period and an additional DM – 1 if they have not had a hot meal within the past 24 hours. Note that these DMs can lead to a fumble.

Mercenary air units include transportable quarters and food service modules among their equipment. Each quarters' module houses two officers or four enlisted personnel. They include beds (or two double-deck bunks), storage chests, writing desks, showers, and sanitary facilities. They may be sealed, linked together, and equipped with filter systems to operate in tainted atmospheres. They are fully air conditioned and insulated for use in any climate. Food service facilities include a field kitchen module and one or more dining modules that can be linked together to form a mess hall. Each dining module can feed 40 people at one sitting. A quarters module weighs one ton and costs Cr5000. A field kitchen module weighs two tons and costs Cr10,000. A simple dining module weighs one ton and costs Cr1000.

FLIGHT SURGEON'S MODULES

The squadron's flight surgeon is responsible for two modules—the office/surgery module and the infirmary module. These are set up and connected together when the base is established. The first module includes the flight surgeon's office, examination room, and a small emergency operating room equipped with an x-ray machine, plasma, drugs, and surgical tools. The infirmary module contains four cots, sanitary facilities, and additional medical equipment. The office/surgery

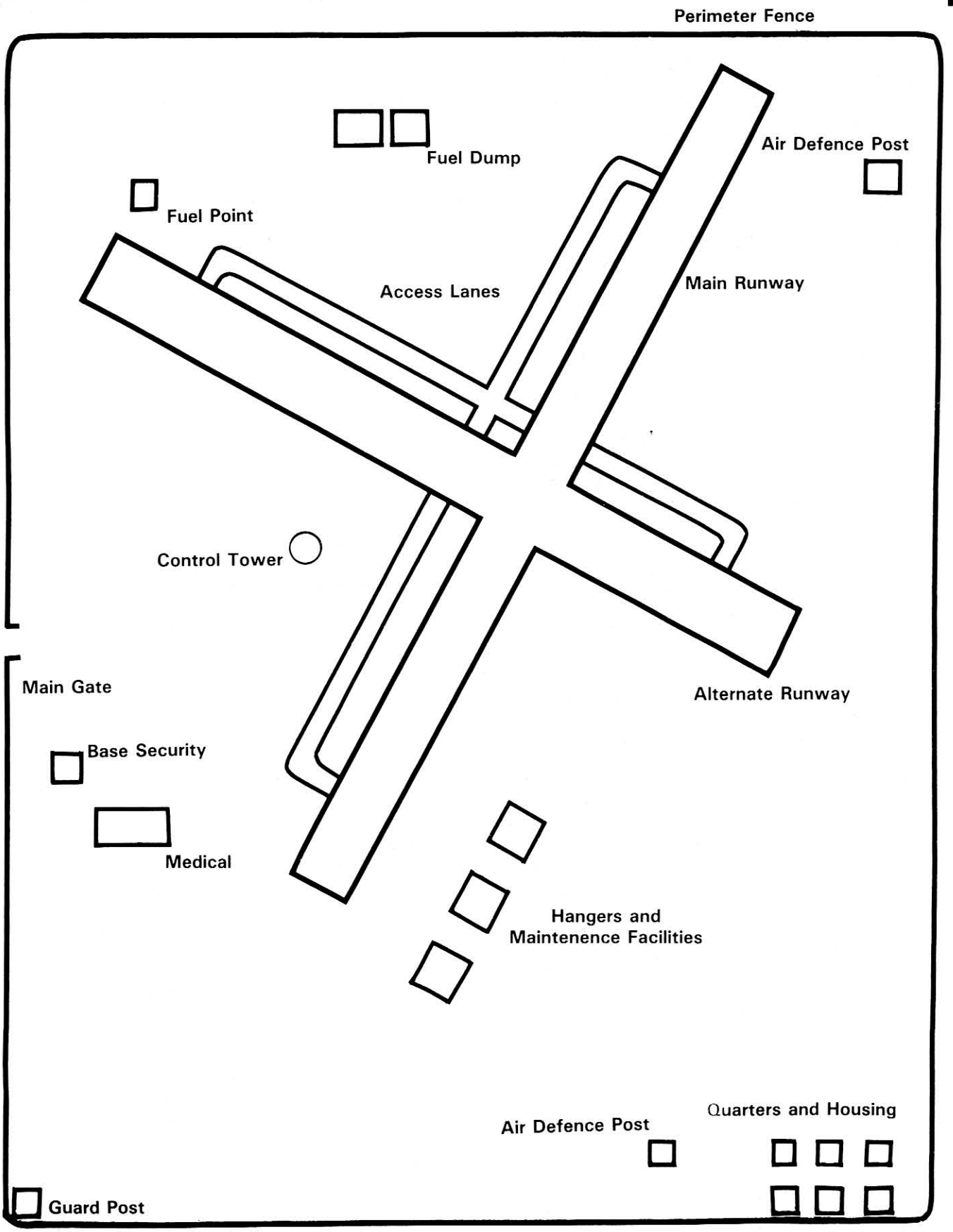


AN KHE (TL7) UTILITY JET HELICOPTER

CraftID: Helicopter, TL7, Cr97,600
Hull: 16/40, Disp. = 5, Weight Loaded = 4tons, Airframe = Simple, Armor = 0
Power: 2/5 Gas Turbine, 1 Mw, Endurance = 1 hour, 50 min
Loco: Main and Tail Rotor, Lift = 4tons, Thrust = 1ton, Cruise = 225, Top = 300
Off: LMG × 2 flexible mount firing sideways from cargo compartment doors/500 rounds per gun
Commo: Regional Radio × 1
Control: Simple
Accom: Crew = 4, (Pilot, Copilot, Gunners × 2), Simple Cockpit × 2, Gunners ride in passenger/cargo compartment. 10 passengers + 2 gunners, 4 medevac casualties on stretchers + medic + 2 gunners in medevac role
Cargo: 1.2ton internal in place of passengers + gunners, or 1.2ton external sling load
Other: Fuel = 1450liters

Widely used as a troop carrier and medevac helicopter in moderate-tech mercenary battalions' organic aviation platoons. Gunship versions are available with up to 500-kilograms of external weapons attached to hardpoints on each side of the fuselage above the landing gear. Unarmed civilian versions are available for purchase or charter.

BASES


Perimeter Fence
Fuel Dump
Air Defence Post
Fuel Point
Access Lanes
Main Runway
Control Tower
Main Gate
Alternate Runway
Base Security
Medical
Hangers and
Maintenence Facilities
Quarters and Housing
Air Defence Post
Guard Post

module costs Cr20,000, and the infirmary module, Cr10,000. These facilities are adequate for treating light wounds or injuries, and providing initial treatment for more serious casualties.

FUEL AND ORDNANCE

All bases must have fuel and ordnance storage dumps dispersed away from the flight line and quarters areas. Fuel may be contained in tanks or collapsible bladders, and be trucked or piped to the flight line to fuel aircraft. If the aircraft are equipped to burn hydrogen as fuel and there is a sufficient local water supply, fuel may be manufactured at the base with a fusion-powered water electrolyzer. See the fuel section of "Aircraft Design" for fuel pricing.

Ordnance may be purchased in bulk with the buyers receiving a 20-percent discount when buying one or more lots of 20 bomb, rocket pod, or missile rounds, 40 percent when buying lots of 100 rounds, and 60 percent when buying lots of 1000 rounds. Ordnance buyers also receive a 60-percent discount when buying lots of 10,000 machinegun or autocannon rounds.

Where possible, mercenary units purchase ordnance and ammunition locally to keep shipping charges to a minimum. However, most units carry a basic ordnance load sufficient for one week's operation, as well as a more extensive supply of higher technology items such as cluster bombs and missiles that local sources may not be able to supply.

BASE SECURITY

Bases need to be kept secure from ground and air attack. Base security troops, equipped and trained to fight as light infantry, are a major component of ground defenses. They occupy defensive positions around the base perimeter and control access at the base's gates. Security troops also patrol the base's interior to guard against sabotage and infiltrators. They may be army troops assigned to defend the base or COACC troops who are members of an integral base defense unit.

Smaller mercenary air units usually rely on local forces to provide base defense units. Moreover, mercenary flyers carry personal weapons wherever they go and are trained to fight with them if necessary.

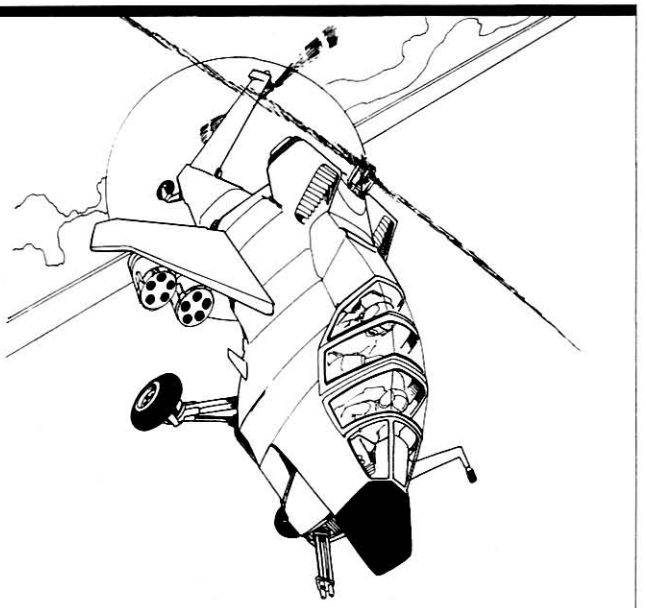
Larger units, such as a mercenary wing, may include a base defense battalion in their tables of organization. A base defense battalion would include an antiaircraft missile battery, a point defense gun battery armed with multibarrel autocannons, and a surveillance and early warning radar detachment. In addition, the battalion would include two or more companies of security troops.

THE MOBILE MODULAR MERCENARY BASE

With their services in increasing demand, mercenary air units are constantly on the move on worlds and among worlds. Mercenary squadrons are able to embark all their aircraft, personnel, and mobile base modules on one 10,000-ton interstellar bulk carrier, and land them on their destination world aboard standard 95-ton cargo shuttles.

The more wealthy squadrons include a 400-ton heavy transport among their aircraft. This aircraft is transported between the stars in eight 50-ton sections and is reassembled after landing on the destination world. It is used to haul ground personnel and base modules and equipment from the starport to the squadron's next base of operations.

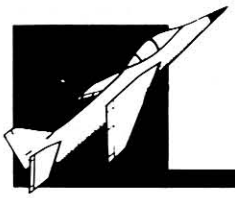
The heavy transport is equipped to land on unprepared airstrips. Upon landing at the proposed base site at the end of its first flight, it unloads earth-moving equipment and runway planking or fast-setting paving material. While the runway, taxiways, and flight-line aprons are being graded and paved, the C^3I and control tower modules are unloaded and set up. The base is operational in eight hours, in time for the first combat aircraft to arrive. Meanwhile, the transport has flown back to the starport, loaded quarters, field kitchen, and dining modules, and returned to the new base. These are set up and connected together. A third and final flight brings in the maintenance modules, medical clinic module, fuel bladders, ordnance, and remaining personnel. At the same time, locally chartered transports are hauling in additional fuel and ordnance. The base is fully established in less than 24 hours.



***DALLAS* (TL7) JET HELICOPTER GUNSHIP**

CraftID: Helicopter, TL7, Cr116,700
Hull: 8/20, Disp. = 2, Weight Loaded = 3tons, Airframe = Simple, Armor = 0
Power: 2/5 Gas Turbine, 1 Mw, Endurance = 1 hour, 20 min
Loco: Main and Tail Rotor, Lift = 4tons, Thrust = 1ton, Cruise = 225, Top = 300
Off: Tribarrel, 2cm autocannon in remote nose turret/750 rounds, 4 × 500kg hardpoints on stub wings, max external weapons load = 1ton
Commo: Regional Radio × 1
Control: Simple
Accom: Crew = 2, (Pilot, Copilot/Gunner), Simple Cockpit × 2
Other: Fuel = 1050liters

Early helicopter gunship designed to give close air support in low- to moderate-threat environment. Effective armor killer when armed with tac missiles.



Maintenance

Combat aircraft require four types of maintenance:

- Engine maintenance.
- Airframe and control maintenance.
- Electronic maintenance.
- Weapons system maintenance (including weapons loading, fusing, and arming).

Each type of maintenance requires technicians with specific skills. They include:

Engine Maintenance: Mechanical-2 or better.
Airframe and Control Maintenance: Mechanical-1 or better.
Electronic Maintenance: Electronic-2 or better.
Weapons System Maintenance: Mechanical-1 or better.

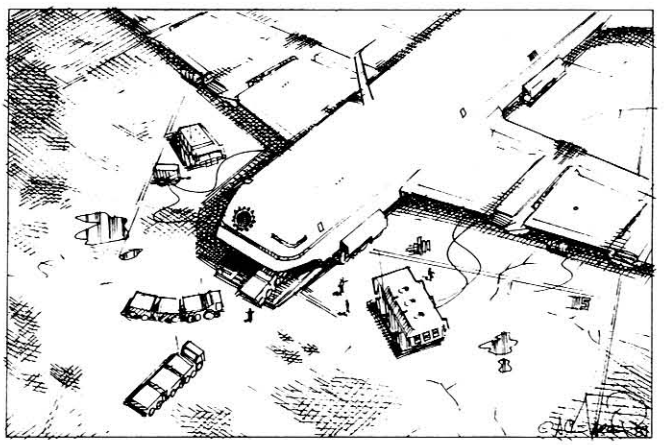
Collectively, these individuals make up the squadron aircraft's ground crew.

ROUTINE MAINTENANCE

Routine maintenance is performed daily when flight operations are ongoing. This type of maintenance is dealt with somewhat abstractly to determine whether sufficient resources are available to properly maintain a unit's aircraft during flight operations. Each technician provides 50 maintenance points in his specialty—engine, airframe, electronics, or weapons.

Each type of aircraft requires a certain number of maintenance points to keep flying, depending on the type and number of engines, its weight, its on-board electronic systems, and the number of its external ordnance hardpoints. Maintenance point requirements are listed on the daily maintenance point tables.

As an example, the *San Diego*-class attack aircraft requires six maintenance points for its one basic turbojet engine; 10 maintenance points for its 10-ton airframe, control surfaces, and systems; one maintenance point for its radio; 10 maintenance points for its two autocannons (five points each); and five maintenance points for loading and arming weapons and/or fuel tanks on its hardpoints, assuming one weapon or tank is loaded on each hardpoint. If triple or multiple ejection racks were fitted onto some or all of the hardpoints, the number of required maintenance points would increase as noted on the Ordnance Table in the daily maintenance point tables.



One *San Diego*-class aircraft would need 35 maintenance points. Because of the overlap in some skill requirements, a technician with Mechanical-2 would be able to service both the engine and airframe maintenance requirements (16 points) for three aircraft. One electronics technician would be able to service the electronics maintenance needs of an entire squadron of this aircraft class. One ordnance technician can service the autocannon and weapons hardpoints (45 points) of three aircraft of this class.

PERIODIC MAINTENANCE

Aircraft require periodic maintenance as well as daily maintenance. The two different types of periodic maintenance are 1000-hour maintenance and 10,000-hour maintenance.

The 1000-hour maintenance includes the exchange of engines for rebuilt ones, visual and x-ray inspection of key airframe points, testing and replacement as needed of electronic components, and inspection and testing of control systems. The 1000-hour maintenance may be performed in the field as long as rudimentary shelter from the environment and a complete maintenance workshop module are available. This maintenance requires 20 engine maintenance points per engine, five airframe and control maintenance points per ton of aircraft, and 10 electronic maintenance points per component.

The 10,000-hour maintenance is a complete rebuilding of the aircraft, including engine replacement, complete teardown and inspection of the airframe, complete teardown and replacement of control systems, and replacement and upgrading (if available) of all electronic components. The 10,000-hour maintenance must be performed in a fully equipped and dedicated maintenance hanger. This maintenance requires 20

maintenance points per engine, 20 airframe and control maintenance points per ton of aircraft, and 20 electronic maintenance points per component.

Helicopter Periodic Maintenance

Because of their complexity—primarily in the gearbox and transmission assemblies—helicopters require significantly more maintenance than fixed-wing aircraft. Periodic maintenance should be performed at 500 and 5000 hours for helicopters.

REBUILDS

Engines and electronic components may be rebuilt after they are removed from an aircraft during periodic maintenance. Each rebuild requires 1 × 1D days and takes 10 times the number of maintenance points listed for daily maintenance. Used engines and electronics may also be sent to commercial rebuilding facilities and refurbished at 2D × the original purchase cost.

FUEL AND ORDNANCE

Fueling aircraft is one major function for a ground crew. High-speed pumps and single-point refueling enable one person to refuel an aircraft using an airfield hydrant system or a fuel truck. At TL6 and above, external tanks may be filled through the aircraft's single refueling point via the internal plumbing system. At TL9 and above, fueling may be carried out by robots.

The ground crew is also responsible for loading, fusing, and arming ordnance aboard aircraft. They use either manual or remote-controlled weapons-handling vehicles to carry weapons from the ordnance dumps to the flight line and attach them to individual aircraft. Once loaded, fuses are inserted in bombs and rocket warheads, and firing and control cables are attached to rocket pods and missiles. Safety pins and flags are removed from fuses and firing circuits at a special arming pad near the end of the active runway immediately before an aircraft is launched. Ground crew members also reload ammunition trays or hoppers, and service machineguns, autocannons, and lasers aboard aircraft. Robots are available at TL9 to load weapons under human supervision. Fusing and arming are always performed by human ground crew members.

Individuals operating fuel trucks or ordnance haulers must have Vehicle-1. Individuals who fuse and arm weapons systems must have at least Demolition-1.

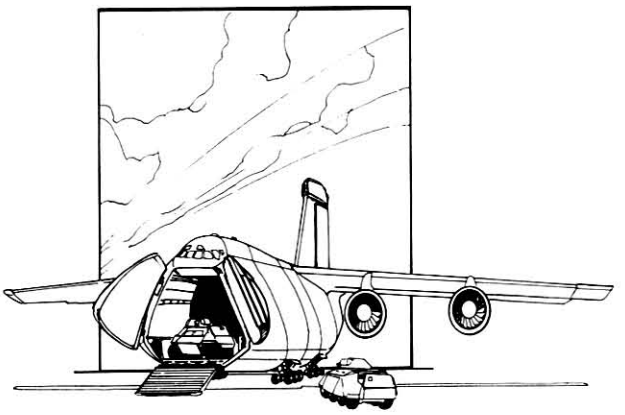
Two ground crew members or robots are required to load weapons or fuel tanks on hardpoints or in the bomb bay of one aircraft.

REPAIRING COMBAT DAMAGE

Damage can be repaired.

Engine Damage: An engine that has sustained enough damage points to reduce its first damage rating to zero cannot be repaired in the field and must be replaced. An engine that has sustained light damage (with its first damage rating not reduced to zero) may be repaired in the field.

Airframe Damage: An airframe that has sustained light damage that has not reduced its first rating number to zero may be repaired in the field. Each damage point requires one maintenance point to be repaired in one day. If insufficient



MEXICO CITY (TL8) HEAVY CARGO JET

CraftID: Heavy Cargo Jet Transport, TL8, Cr16,200,000
Hull: 1600/4000, Disp. = 1500, Weight Loaded = 400tons, Airframe = Transonic
Power: 4/10 Gas Turbine × 4, .60 Mw, Endurance = 8 hours, 36 min
Loco: High Bypass Turbofans × 4, Thrust = 200tons, Minimum Speed = 176, Cruise = 630, Top = 840, Agility = 1
Commo: Regional Radio × 1
Control: Boosted
Accom: Crew = 4 (Pilot, Copilot, Flight Engineer, Loadmaster), Complex Cockpit × 2, Crew Station × 1, 4 Passenger sections included aft of flight deck for relief of flight crew and 12 troops or vehicle drivers.
Other: Fuel = 132,500liters, Cargo = 150tons

Heavy cargo transport designed to haul oversized cargo such as armored fighting vehicles and construction machinery, as well as standard cargo modules. Main cargo deck has drive-through design with nose and tail hatches and ramps to facilitate rapid loading and unloading. Five hundred troops may be carried in lieu of cargo. These and similar heavy lift aircraft are often employed as logistics transports by mercenary air units to haul mobile base components and construction machinery from assignment to assignment.

DAILY MAINTENANCE POINTS

ENGINES

Tech Code	*Tech Level*	*Type*	*Maintenance Points*
Industrial	4	Basic Propeller	6
Industrial	5	Light Propeller	3
Pre-Stellar	6	High Performance Propeller	10
Pre-Stellar	6	High Performance Turboprop	8
Pre-Stellar	6	High Performance Turbojet	8
Pre-Stellar	6	Basic Ramjet	6
Pre-Stellar	6	High Performance Ramjet	8
Pre-Stellar	6	Basic Rocket	12
Pre-Stellar	6	High Performance Rocket	16
Pre-Stellar	7	Basic Turboprop	6
Pre-Stellar	7	Light Turboprop	4
Pre-Stellar	7	Basic Turbojet	6
Pre-Stellar	7	Light Turbojet	4
Pre-Stellar	7	Basic Turbofan	6
Pre-Stellar	7	High Performance Turbofan	8
Pre-Stellar	8	High Bypass Turbofan	8
Early Stellar	10	Fusion Rocket	20

Note: These are the maintenance points required for *each engine* aboard an aircraft.

HELICOPTER ENGINES AND TRANSMISSIONS

Tech Code	*Tech Level*	*Type*	*Maintenance Points*
Industrial	5	Light Reciprocating	8
Pre-Stellar	6	Reciprocating	12
Pre-Stellar	7	Light Gas Turbine	6
Pre-Stellar	7	Gas Turbine	8
Pre-Stellar	8	High Performance Gas Turbine	16

Note: These are the maintenance points required for *each engine* aboard an aircraft.

AIRFRAME AND CONTROLS

Fixed-wing aircraft and helicopters require one maintenance point per ton of aircraft to properly maintain their airframes, control surfaces, and hydraulic, mechanical, and electrical control systems.

ELECTRONICS

Type	*Maintenance Points*
Radar	5
Radio	1
ECM	5
Radar Direction Finder	5
Ladar	5
IR Sensor	5
Light Amplification	5
Image Enhancer	10
HUD	10
Computer	50
Autopilot	30
Laser	10

ORDNANCE

Type	*Maintenance Points*
Machinegun	5
Autocannon	5
Plumbed Hardpoint	2
Hardpoint	1

resources are available to repair a damaged aircraft and to simultaneously maintain flyable aircraft, the damaged aircraft should be considered a source of spare parts.

Electronic Damage: Electronic components that have sustained combat damage are destroyed and must be replaced. See the sensors and electronics tables in the **MegaTraveller Referee's Manual** for replacement cost information.

To meet an engine's routine maintenance requirement:
Routine, Mechanical, Dexterity, 30 min (fateful, hazardous).
Referee: A number of mishaps will result when characters fail to meet engine maintenance requirements. They include the following.

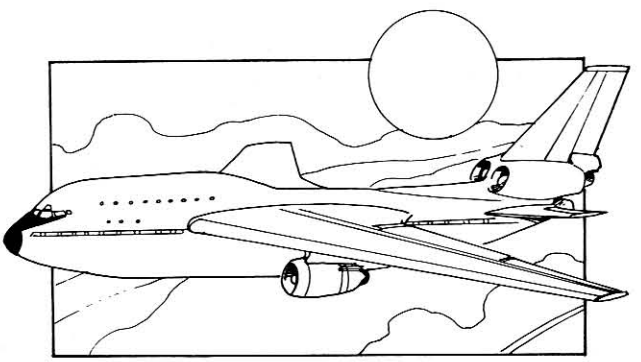
Superficial mishap results in failure of engine to start on ground. **Minor** mishap results in engine failing to reach takeoff power. **Major** mishap results in an in-flight engine failure. Roll 4+ on 1D to restart the engine in flight. **Destroyed** mishap results in a jet engine's hot compressor stage throwing a turbine blade that ruptures fuel and hydraulic lines and causes a catastrophic explosion; or in a propeller engine, losing lubricant in the engine, seizing up, and catching fire in flight—which may ignite fuel tanks.

To service, fuse, and arm an aerial weapon:
Routine, Demolition, Dexterity, 10 sec (hazardous, fateful).
Referee: A **Major** mishap results in failure to properly service, fuse, and arm the weapon. Bombs do not detonate when dropped; rockets and missiles do not launch; guns jam when fired. A **Destroyed** mishap results in the bomb or missile warhead immediately detonating when fuses are armed, destroying the arming character and the weapon-carrying aircraft. Cartridge casings rupture when a gun is fired, destroying the breech. To minimize such catastrophes, aircraft weapons are not armed until immediately before takeoff on an arming pad next to the end of the runway away from other aircraft.

To fuel an aircraft:
Simple, Dexterity, 2 min (hazardous, unskilled OK).
Referee: If a fumble failure occurs, static electricity ignites a fire leading to an explosion in 3D seconds. The aircraft and possibly any neighboring aircraft are destroyed by the explosion. The character/NPC refueling the aircraft is killed unless he is at least 20 meters from the fire when the explosion occurs.

To repair a battle-damaged engine:
Difficult, Mechanical, Dexterity, 1 hour (hazardous).
Referee: A number of mishaps will result when characters fail in an attempt to repair a battle-damaged engine. They include the following.

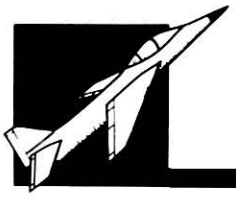
Superficial mishap results in failure of engine to start on ground. **Minor** mishap results in engine failing to reach takeoff power. **Major** mishap results in an in-flight engine failure. Roll 4+ on 1D to restart the engine in flight. **Destroyed** mishap results in a jet engine's hot compressor stage throwing a turbine blade that ruptures fuel and hydraulic lines and causes a catastrophic explosion; or in a propeller engine, in the engine losing lubricant, seizing up, and catching fire in flight—which may ignite fuel tanks.



***TOKYO* (TL8) HEAVY PASSENGER TRANSPORT**

CraftID: Heavy Passenger Transport, TL8, Cr16,700,000
Hull: 1600/4000, Disp. = 1500, Weight Loaded = 400tons, Airframe = Transonic
Power: 4/10 Gas Turbine × 4, .60 Mw, Endurance = 15 hours, 15 min
Loco: High Bypass Turbofans × 4, Thrust = 200tons, Minimum Speed = 176, Cruise = 630, Top = 840, Agility = 1
Commo: Regional Radio × 1
Control: Boosted
Accom: Crew = 15 (Pilot, Copilot, Flight Engineer, 12 Flight Attendants), Complex Cockpit × 2, Crew Station × 1, 400 passengers
Other: Fuel = 234,000liters, Cargo = 20tons

Long-range, heavy passenger transport designed for mass air transportation on medium-technology worlds. Its relatively low seat-per-mile cost helps bring transcontinental and intercontinental air transportation within reach of the common citizen on many TL8 to TL10 worlds.



Defending a World

Attacking a world is like peeling an onion—attacking forces have to cut through many defensive layers before reaching the surface. And each time they penetrate a layer, pieces of the attacking force are stripped away. Ultimately, there may not be enough force remaining to take the defending world. Two major components compose a world defense force—COACC and the navy. It's their job to strip away the invading force so that none remains to invade a world. Quite often, they succeed. The navy, whether a first-line fleet or local system squadron, sees action first.

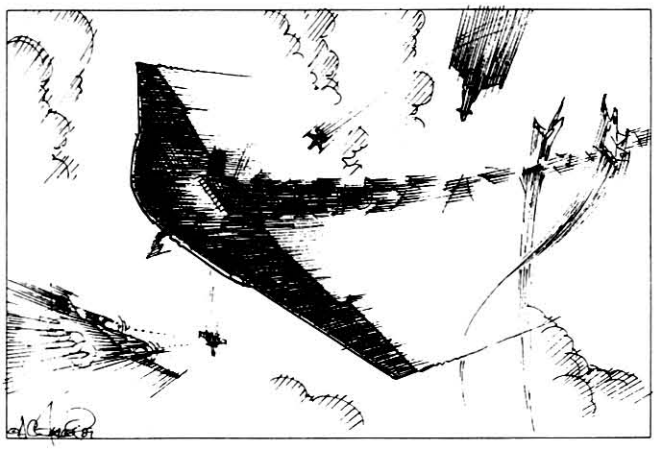
NAVY

Naval forces take the initial brunt of an assault. Invaders may encounter naval units ranging from first-line Imperial (or other faction) naval fleets to local system squadrons, depending on the importance, location, political situation, and technology level of the invaded system.

The mainstays of the local system squadrons are monitors and system defense boats (SDBs). Monitors are multikiloton naval vessels armed similar to a battleship but without jump drives. They are designed for system defense only. SDBs are heavily armored nonjump vessels displacing 200 to 1000 tons. They are heavily armed with missiles and other turret weapons. SDBs and monitors may hide in the outer system or in a planetoid belt for months awaiting an invasion. In addition, SDBs hide in a gas giant's atmosphere waiting to ambush refueling enemy starships or in a world's oceans waiting to defend the world.

The invading force must survive battles with battleships, cruisers, and system squadron monitors, while at the same time holding off assaults from system squadron SDBs. These battles usually begin as soon as sensors detect the invading fleet stepping out from jumpspace and heading toward the nearest gas giant to refuel. Naval ships, local monitors, and SDBs attack the invaders at their most vulnerable—while refueling from the gas giant. Battleships, cruisers, and monitors attack from above, while SDBs fire on refueling craft as they skim through the gas giant's atmosphere.

If these battles are successful, the defenders gain control of the gas giant, and the attackers must jump out-system with their remaining fuel. If the defenders fail, the battles continue inward as the invading fleet heads toward the target world. Surviving naval defenders conduct a running fight, continuously attacking and harassing the invaders, paying special attention to troop-carrying assault transports and cruisers assigned to surface bombardment missions.



COACC

COACC forces come into the picture as the battles move closer to the target world. COACC SDB squadrons join their naval counterparts in raiding the invading fleet as the invaders approach the Close Orbit zone one-tenth of a diameter out from the defenders' world. Once the invaders are within the close orbit zone, the COACC orbital component throws its full weight against the enemy fleet. All COACC SDB squadrons are committed to the fight, as are orbital patrol fighter squadrons and space fighter squadrons launched from the world below.

Within 50,000 kilometers, planetary deep meson guns open fire, tearing into the invaders' capital ships. Robot orbital battle stations in low orbit about 200 kilometers above the world form the last space line of defense. These devices cannot maneuver, but their fire control systems and missiles tipped with thermonuclear warheads can engage and seriously damage, if not destroy, portions of the incoming fleet.

Invading vessels, including troop-laden assault shuttles, are forced to slow as they enter atmosphere. They become easy prey for concealed supersonic VTOL fighters rising to intercept, and to COACC-manned, ground-based laser and missile batteries.

If invading troops successfully reach the ground, they face local ground forces with air support from COACC forces waiting to smash them on the landing zones. Meanwhile, COACC and naval SDBs ambush incoming transport and supply ships far away in the outer system. Unless there is overwhelming force in orbit, the invaders may find themselves cut off on the surface of a hostile world.

A well organized defense using the combined assets of navy and COACC forces makes an assault on a planet a very difficult and expensive operation.

COACC's ORBITAL CONTINGENT

Although many people only think of COACC in terms of its air force, it also has a powerful and effective planetary defense

contingent as well. The Close Orbit and Airspace Control force has a major orbital defense responsibility as well as its air superiority and ground force air support mission. It is responsible for the defense of Close Orbit space, the space out to one-tenth the diameter of its homeworld. Beyond that, the planetary navy (also known as the system naval squadrons), the subsector naval fleets, and the Imperial (or faction) Navy has primary defense responsibility. However, a world's COACC force often has an orbital base in geosynchronous orbit to monitor traffic, provide early warning sensor surveillance, and serve as a base for fighters and SDBs. As conflict widens in the Imperium, the planetary navy's monitors and SDBs are bearing an increasing system defense burden.

COACC forces from TL9 to TL11 worlds meet their orbital defense commitment with missile-firing orbital fighters and robot orbital battle stations. COACC forces from higher-tech worlds employ high-endurance orbital patrol fighters, orbital battle stations, and their own system defense boats to defend and patrol close orbit space.

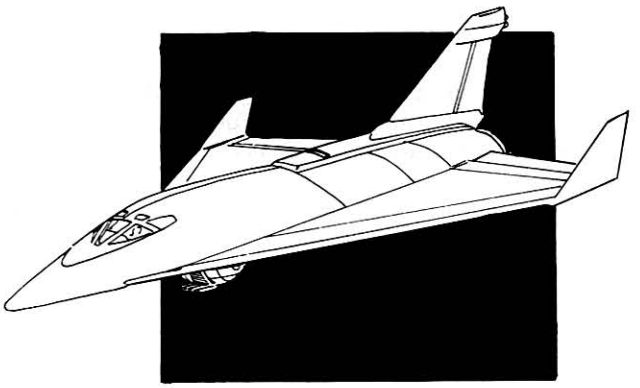
Responsibilities overlap in a combat situation. Naval SDBs pursue enemy craft anywhere near or on the system's main world. COACC SDBs and fighters assist naval units anywhere in the system their capabilities permit.

COACC has three types of craft to meet its orbital responsibilities.

Fighters: Depending on tech level, these range from rocket-powered, missile-firing, low-endurance orbital fighters to Imperial Navy-pattern *Ramparts*-class fighters and *Magnum*-class heavy fighters. The latter are high-endurance, two-person craft fitted for long patrols and capable of remaining on station for up to 30 days. Fighters may be surface based or based at orbital COACC bases in geosynchronous orbit. These fighters may also provide air support to local ground forces if an invading force reaches the surface.

Orbital Battle Stations: These are cheap, unmanned, mass-produced guardian satellites placed in low orbit around their homeworld. They are equipped with a fire control computer and an active sensor array, and are armed with a 100-ton missile bay. Orbital battle stations will automatically engage any hostile spacecraft with nuclear-tipped missiles out to Far Orbit range (500,000 kilometers). For safety considerations, these satellites are not deployed until hostilities appear to be imminent.

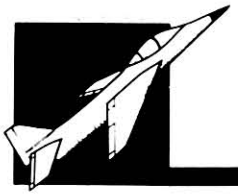
System Defense Boats: These heavily armed and armored gunboats are assigned to patrol Close Orbit space, conduct customs inspections, and perform rescue missions during peacetime. COACC SDBs assist naval forces during wartime and are responsible for defending Close Orbit space and the planet's surface. SDBs may be based in orbit, or at dispersed ground bases, or hidden beneath the planet's oceans or icecaps (if any) until ordered to strike at the enemy. Several models are available, ranging from 200 to 1000 tons displacement. They are primarily armed with nuclear-tipped missiles, with beam lasers as their secondary weapon. In addition to their antiship duties, SDBs attack enemy ground forces that have landed on their homeworld. If the invasion succeeds, the COACC SDBs disperse to hidden bases in the outer system to refuel, rearm, and fight again, harassing the enemy until friendly reinforcements arrive.



***MAGNUM*-CLASS TL15 HEAVY FIGHTER**

CraftID: Heavy Fighter, TL15, MCr105.33
Hull: 45/113, Disp = 50, Config = 3AF, Armor = 40G
Power: 2/4, Fusion = 560Mw, Duration = 30/90
Loco: 2/5, Maneuver 6, NOE = 120, Cruise = 2835 kph, Top = 3780kph, Agility = 6
Commo: Radio = System
Sensors: Passive EMS = Interplanetary, Active EMS = Planetary, ActObjScan = Diff, ActObjPin = Diff, PasEngScan = Rout
Off: Missile = x03
Batt 1
Bear 1
Def: DefDM = 10
Control: Computer 7 × 3, Holodynamic link × 98, Special = U, Environ = basic environment, basic life support, extended life support, grav plates, inertial comp
Accom: Crew = 2 (Pilot, Gunner), Seats = roomy × 2, Stateroom = 1
Other: Fuel = 750kliters, ObjSize = Small, EMLevel = faint

The heavy fighter is designed for long duration patrol. It may be carried and launched by a naval vessel or orbiting station, or launched from a planetary surface base. It includes accommodations designed to house its two-person crew in relative comfort for up to 30 days.



The Eddum Campaign

Eddum (Eddum/Dagudashaag 0531) is a relatively peaceful world situated deep in the Imperial sector of Dagudashaag.

EDDUM 0531 D797978-6 Hi In Im

Eddum is a stagnant world. It long ago reached the relative security of TL6 and has since remained there for more than 1000 years. Its technology produces a world of plenty for its population, and easily used and understood exports for surrounding worlds. Its exports pay for a modest degree of imports of essential high-tech products that enhance local medicine and safety.

Even the local starport is a reflection of the local population's desire to be left to its own devices. The Type D starport is enough to allow some interaction with the rest of the empire, but it does little to encourage trade or travel on a large scale.

The Rebellion: In the immediate polarization of the Imperium after the assassination of Emperor Strephon, the major factions tried immediately to seize and control the high-population worlds of the Imperium. Close to the centers of power, one faction or another was the clear winner. Near Ilelish, Dulinor's forces gained the upper hand; near Capital, Lucan's forces held fast; in outlying sectors, other factions took control. But at the borders between the factions, the worlds were up for grabs. Eddum was one such world.

THE SIEGE OF EDDUM

Immediately after Dulinor's return to Ilelish in 1116, his messengers carried the word of his rise to power to every world possible. Their announcements reached Eddum in late 1116. At the same time, news travelling from Capital told Lucan's side of the story. Naturally, the citizenry of Eddum was torn between two choices.

In the last days of 1116, both Dulinor and Lucan had stationed battle fleets in the Eddum system. The admirals in charge, however, found that the relative equality of the forces produced a stalemate with little chance for resolution. Further, until one side or the other achieved supremacy in space, they would not be able to begin a campaign to convince the local population of Eddum that it should give its loyalty to one of the factions of the Rebellion.

However, on Eddum, the population found itself divided in its loyalties. The old and well established western continent of Elantia sided with Lucan and the existing structure of the Imperium. The more recently settled eastern continent of Nostria sided with Dulinor and his philosophies. Yet, within the continents, not all nations agreed; often rivalries between nations colored public opinion enough to tip the local scales against one side or the other. Scattered smaller island nations spanned the range from absolute loyalty to utter neutrality.

Yet overall, the world of Eddum found itself undecided and unable to commit, as a world, in favor or Lucan or Dulinor. It remained up to the external forces to force a decision.

The Governor General of Eddum: In order to allow the Balkanized world of Eddum to interact with the rest of the Imperium on a consistent, united basis, its nations long ago appealed to the emperor to help find a solution. His solution was to appoint a governor general who could receive directives from the Imperial bureaucracy and then disseminate them to the world's nations. Over time, the position of governor general became a hereditary office which was the object of great respect and deference by the planetary population. In return, the governor general himself took on the role of elder statesman and leader on the world. Although without any specific powers to control or direct the nations of Eddum, his counsel is respected by nearly everyone.

The Governor General's Compromise: Because the besieging forces in space could be much better used elsewhere, both Lucan's Fleet and Dulinor's Fleet found it easy to accept a compromise offered by Eddum's governor general.

The governor general proposed that Eddum be allowed to determine for itself, through large-scale general elections, which side it would take in the Rebellion. The besieging fleets would be reduced to the bare minimum required to blockade the planet. A cease-fire between the two fleets would be imposed. The nations of Eddum would be allowed to determine for themselves which faction they would support in the Rebellion.

At the same time, the governor general proclaimed certain ground rules which would govern the battle for the hearts and minds of the people of Eddum.

1. A world-wide election would take place on Holiday 001-1120. This date nearly three years in the future would allow complete discussion of the relative merits of the choices facing Eddum.

2. Aggression was to be prohibited. No border changes would be allowed or accepted during the period, nor would invasions or the use of military force to impose government on other nations.

3. Armed force, violence, and military action were to be accepted only as reasoned responses to violence.

The governor general assumed a gentle, reasoned campaign through the media—radio, television, and the press. But instead, as one faction or another gained the upper hand in each nation, it suppressed its opposition's coverage and presentation of its case. After six months of intense campaigning, the nations of Eddum were effectively polarized.

The major nations then began to carry their cases for the factions they supported into other nations using radio and television broadcasts. Opponents reacted by jamming those transmissions.

By the end of 1117, the governor general's concept of a reasoned, gentle campaign had been pushed to its limits.

THE (ALMOST) BLOODLESS CAMPAIGN ON EDDUM

Prohibited from deploying military forces into the enemy's territory, yet allowed by the same proclamation to carry their arguments into those territories, the major nations of Eddum turned to their air forces to convince their neighbors of the rightness of their causes.

Each nation assigned to its air forces the responsibility of carrying radio broadcasts, television broadcasts, and print leaflets into the territory of the enemy in order to convince populations which way they should vote in the upcoming general election.

In turn, each nation found itself forced to defend its skies by driving off or destroying the invading aircraft, justifying such actions on the basis of article three of the governor general's proclamation.

Finally, nations defended their unarmed broadcast aircraft (also claiming justification from article three) with armed escort fighters.

Air War Over Eddum: The natural result was an intense air war in the skies of Eddum. Air forces campaigned to carry convincing arguments about the Rebellion to the populations of other nations. Dogfights in the skies became routine as fighters were deployed to eliminate intruding aircraft.

But the war did not extend to the ground. Bombing was clearly prohibited by the governor general's proclamation. Airfields and air bases were safe havens. Only in the skies was full-scale air combat allowed.

CAMPAIGN RULES

The following rules govern the conduct of the air campaign for the hearts and minds of the people of Eddum.

Eddum: The planet Eddum is a high-population, industrialized world whose territory is Balkanized into about a dozen nations (the actual number varies from time to time). Its surface is divided into two major continents and several smaller islands; virtually the entire planet was explored and settled millennia ago. As a result, the world has a mature culture with established economic and social conventions.

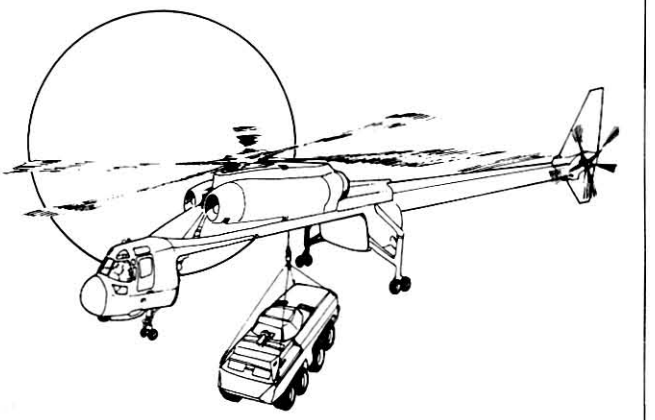
Yet the world has clung to distinct nations even though it is a member of the Imperium. The local populations have their own individual characteristics which they do not care to lose.

Map of Eddum: The map of Eddum shows the world surface of the planet using the standard geodesic hex grid. Each hex on the grid is 300 kilometers in width. Only those aspects of Eddum important to the campaign are shown. They include mountains, cities, populated areas, oceans, and national boundaries.

Intensely populated hexes (InPop) each have 10 million people living in them. These hexes represent the intensely industrial urban areas of the world. Such hexes are marked with the large city symbol.

High population hexes (HiPop) each have one million people living in them. These hexes represent the ordinary, well settled territories of the world. Such hexes are marked with the small city symbol.

Low population hexes (LoPop) each have 100,000 people living in them. These hexes represent the outlying rural areas of the world. Such hexes are marked as mountains or desert.

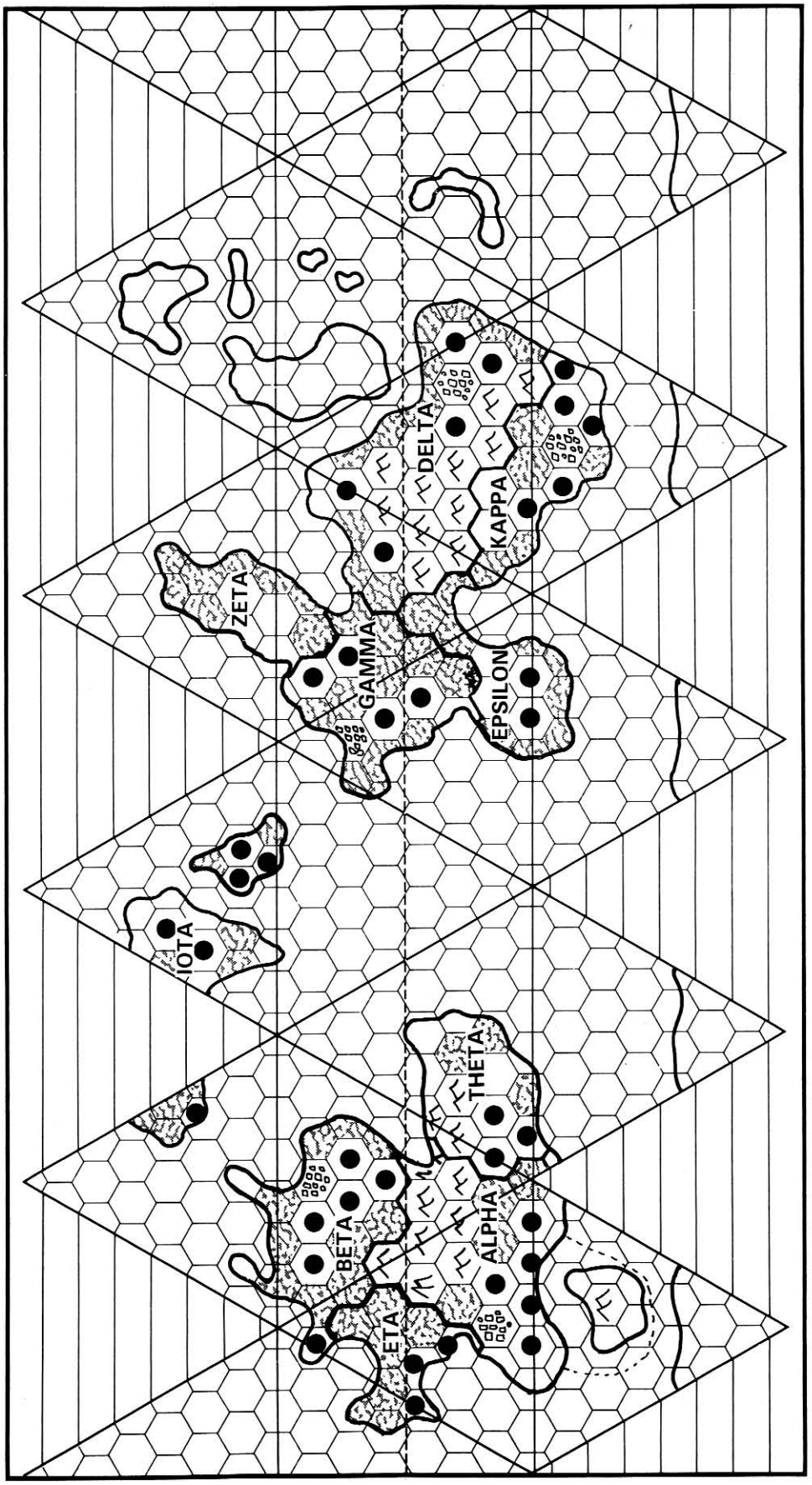


***BOISE* (TL8) JET SKYCRANE HELICOPTER**

CraftID: Helicopter, TL = 8, Cr338,500
Hull: 40/100, Disp. = 5, Weight Loaded = 26tons, Airframe only = 9.9tons, Airframe = Simple, Armor = 0
Power: 4/1 Gas Turbine, 3.3 Mw × 2, Endurance = 1 hour, 50 min
Loco: Main and Tail Rotor, Lift = 26.4tons, Thrust = 9.9ton, Cruise = 225, Top = 300
Commo: Regional Radio × 1
Control: Boosted
Accom: Crew = 3, (Pilot, Copilot, Cargo Lift Pilot; simple cockpits × 2, crew station × 1)
Cargo: 16.5ton sling load
Other: Fuel = 6000liters internal

The skycrane is heavy lift helicopter with no internal passenger or cargo capacity. It has only engines, rotors, controls, and a small crew pod forward. Cargo is hung by slings or cables from a central attachment point beneath the single main rotor while the skycrane hovers, and is carried externally while the skycrane is in flight. As civilian aircraft, these helicopters haul outsized cargo such as sling loads of timber from remote logging sites, hoist machinery to otherwise inaccessible locations, and carry cargo containers from starships direct to on-planet destinations, such as construction or industrial sites. Military skycranes retrieve downed aircraft—including other helicopters—and haul supplies and ammunition to forward bases. Customized pods containing command posts, medical and surgical facilities, communications equipment, and repair shops may also be attached to the skycrane and flown to forward locations.

CAMPAIGN MAP



World Name
EDDUM

UWP
D-797978-6

Hex Scale in km
320km

In Population
High Population
Low Population
No Population
Ocean
Desert
Mountain

The Nations of Eddum: Eddum is territorially divided into 10 nations of varying shape and population. The five largest nations, however, are all roughly equal in population and technological capability.

The nations of Eddum are named for the letters of the Greek alphabet: Alpha, Beta, Gamma, Delta, Epsilon, Zeta, Eta, Theta, Iota, and Kappa. They are shown on the map, which indicates their territories and the locations of their major cities.

Special Local Equipment: In addition to the aircraft equipment provided by the aircraft design sequence, the following equipment is specifically available for use on Eddum in the air campaign.

Radio Broadcast Module (RBM): A radio broadcast module produces radio broadcasts from prerecorded tapes presenting the message of a faction of the Rebellion. The broadcast can be received anywhere within a single 300-kilometer hex on the world map. *Weight:* One ton.

Radio Broadcast Jamming Module (RBJM): A radio broadcast jamming module jams or suppresses the output of an RBM if operated within the same map hex as the RBM. *Weight:* One ton.

Video Broadcast Module (VBM): A video broadcast module produces video broadcasts from prerecorded tapes presenting the message of a faction of the Rebellion. The broadcast can be received anywhere within a single 300-kilometer hex on the world map. *Weight:* One ton.

Video Broadcast Jamming Module (VBJM): A video broadcast jamming module jams or suppresses the output of a VBM if operated within the same map hex as the VBM. *Weight:* One ton.

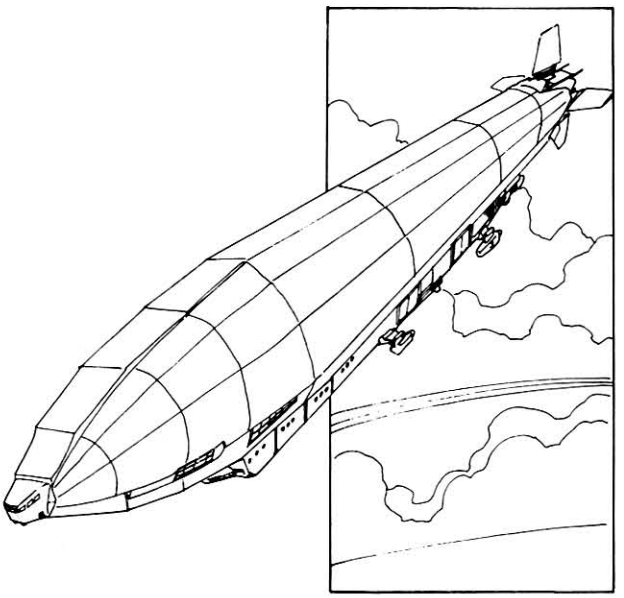
Leaflet Load: A leaflet load is a printed message pointing out a specific message for a faction of the Rebellion. *Weight:* 10 tons.

Any number of the modules shown are available. Only one may be carried in an aircraft.

PLAYING THE CAMPAIGN

"The Eddum Campaign" pits five players against each other in an effort to influence the ultimate vote for Eddum's allegiance in the Rebellion. That vote is scheduled to take place on 001-1120. The present date is 095-1117. In the coming 1000 days, each nation must commit its resources to turning the vote to its own benefit.

Each player is given control over a single nation on Eddum and provided with a copy of the map of Eddum, and with Eddum's world census figures which indicate its resources.



***AKRON* (TL5) NONRIGID AIRSHIP**

CraftID: Nonrigid Airship TL5, Cr31,100
Hull: 333/8333, Disp. = 4000, Volume = 50,000 cubic meters, Envelope Weight = 50tons, Usable Lift = 6.5tons, Airframe = Simple
Power: 3 × 4/10 Internal Combustion, .25 Mw, Endurance = 5 hours
Loco: Basic Propeller, Thrust = 6tons, Cruise = 90, Top = 120, Agility = 0
Commo: Radio, Regional × 1
Control: Simple
Accom: Crew = 5 (Pilot, Copilot, Navigator, Engineer, Flight Engineering Technician), 4 passengers or 300kg of cargo
Other: Fuel = 2300liters

Sport and tourist airship found on a number of worlds. Commercially available for use as minimum-intrusion exploratory craft on primitive worlds. May be collapsed and folded into a 335-kiloliter package displacing 25 tons and weighing 54 tons for carriage aboard a starship. Other larger versions feature increased range and endurance.

THE NATIONS OF EDDUM

Characteristics	*Total*	*Alpha*	*Beta*	*Gamma*	*Delta*	*Epsilon*	*Eta*	*Theta*	*Zeta*	*Iota*	*Kappa*
Population	993	168	128	127	175	49	37	40	39	72	158
Land Hexes	174	24	20	19	31	13	10	13	12	18	14
LoPop Shore	22	6	2	3	2	0	0	3	1	5	0
LoPop Desert	78	4	10	10	12	9	7	3	8	7	8
LoPop Mountain	33	8	6	4	11	0	0	4	0	0	0
HiPop Hexes	36	5	1	1	5	4	3	3	3	6	5
InPop Hexes	5	1	1	1	1	0	0	0	0	0	1

Units: *Population:* In millions.

The Goal: Each player has as the goal for his nation victory in the general election to be held on 001-1120. That election will provide each and every person on the planet with a ballot and the opportunity to mark the name of one faction of the Rebellion. All ballots must be cast, even if unmarked. Individuals who are undecided may cast an unmarked ballot.

When the ballots are tallied, the winning faction is determined by majority vote. In the event that a majority of ballots is not cast for one faction, the Lucan and Dulinor factions will assume that the governor general's method has not worked: Eddum will become a battlefield in which both Dulinor and Lucan's forces will fight for control of the world and its population.

Individual players win if the total vote at the general election selects the side that they have been supporting. More than one player may win in such a case. However, because the long-term campaign to determine Eddum's allegiance is an expensive undertaking, the true winner is the player whose nation has spent the least amount of money and is still supporting the winning side.

Initial Preparation: Each player secretly selects the faction which his nation will support. He may choose from Dulinor, Lucan, Strephon, Margaret, or Vland. Other candidates are not strong enough to be viable. Not all candidates need be supported. Once a faction has been selected, the player and nation may not change their choice.

Nations without players have no specific faction which they support. A 10-percent segment of the population supports each of Dulinor, Lucan, Strephon, Margaret, and Vland; the remaining 50 percent of the population is undecided.

Each player may select as initial aircraft equipment any aircraft shown as a sidebar in this COACC module. Any reasonable number of aircraft can be acquired and used in whatever ways are permitted or useful for the nation involved, provided that the governor general's proclamation is not violated. Interpretations generally accepted are that bombing or ground attacks are not allowed, but air-to-air combat is.

Once the initial air forces for each side are established, each player must publish a list showing 80 percent of his equipment. This information is made available to all other players. Players may, after learning this information, add up to 20 percent to their total forces in additional aircraft (also taken from sidebars in this module).

Budget: Players and nations have unlimited budgets and may spend any reasonable amount of money. The only restraint on military spending is the provision that the true winner is determined by the supporter of the winning faction who also spent the least amount of money.

Players may provide military aid to other players. The recipient of aid is charged with spending 75 percent of the cost of the aircraft transferred, regardless of their condition or age; the donor receives a 50-percent credit for the aircraft disposed of. Military aid can only be transferred between nations which support the same faction.

Design and Procurement of Aircraft: All aircraft required after the campaign begins must be designed and produced on Eddum. Such aircraft may have no components of a tech level higher than 6. The design process takes two months. Production of the aircraft then depends on available factories.

Factories: Each nation on Eddum has five factories, each capable of producing one aircraft design at a time. Preparation for production takes two months after the design has been finalized, after which the factory begins manufacturing the aircraft at the rate of one per day.

Airfields and Bases: Each InPop and HiPop hex can be used as an airfield or air base. LoPop hexes cannot be used as air bases. Aircraft can normally only be based in HiPop or InPop hexes within their native country. Aircraft can be based in foreign countries if the two countries share allegiance to the same faction. If the foreign country is operated by a player, the player must give permission (which may be withdrawn at any time).

PERSUASION

The populations of the nations of Eddum begin the campaign with 40 percent supporting the faction of the nation's choice, 10 percent supporting each of the other four factions, and 20 percent undecided. This preference has been established for each land hex on the world map (sea hexes have no population and are ignored).

Shaping Opinion: Virtually the only way to shape opinion on Eddum is through the use of aerial missions which carry the message of a faction to the public. Canny public relations organizations have developed entertaining programming for both radio and video, and presenting that programming to the public can shift public opinion by a few percentage points if properly administered.

Such programs must be carefully crafted, and as such they indicate both the target audience and the goal. For example, a Dulinor-to-Lucan radio program is crafted to appeal to supporters of Dulinor and to convince them that Lucan is the better faction to support. Such a program, when presented to an audience, will shift one percentage point of the audience from their original stand to the new stand.

Video programs shift two percentage points from their original stand to the new stand.

Leaflets: Leaflet delivery missions carry printed materials instead of radio or video programs. The effect of a leaflet delivery mission is the same as a radio program, but it cannot be jammed.

Inoculation: An inoculation program is also carefully crafted to reinforce presently held beliefs. When presented to an audience, it will prevent any shifts in that audience's beliefs for one week. For example, a Dulinor inoculation program will make the Dulinor-supporting population resistant to changing its opinion for a week.

Native Propaganda: The natural presentation of the case for a nation's preferred faction produces a gradual shift in preferences among the population. Native propaganda produces a shift of one percentage point per week from the undecided population to the nation's preferred faction.

An Operation in Action: A HiPop hex in Alpha is initially loyal to Dulinor (40 percent) with support for Lucan (10 percent), Strephon (10 percent), Margaret (10 percent), Vland (10 percent), and a portion of the population undecided (20 percent). Neighboring Beta (supporting Lucan) sends an RBM into the hex broadcasting a Dulinor-to-Lucan program. On the first two days, the mission is successful; on the third day, it is driven off.

The local authorities in Alpha mount a Dulinor inoculation program (which prevents any change in pro-Dulinor population opinions for the next seven days) on the fourth day of the week. On the fifth day of the week, Beta sends an RBM module into the hex broadcasting a Margaret-to-Lucan program. It is successful for the next three days.

Native propaganda in the hex produces shifts of one percent from the undecided group to the Dulinor faction.

At the end of the week, the preferences of the population in the HiPop hex are Dulinor (39 percent), Lucan (15 percent), Strephon (10 percent), Margaret (7 percent), Vland (10 percent), and undecided (19 percent).

MISSIONS

RBM delivers a radio broadcast program to a target hex. VBM delivers a video broadcast program to a target hex. RBJM jams all radio broadcast programs in a target hex. VBJM jams all video broadcast programs in a target hex. LDM delivers a load of leaflets to a target hex.

PROGRAMS

An audience-to-target radio program subtracts one percent of support from an audience and adds one percent of support to a target. An audience-to-target video program subtracts two percent of support from an audience and adds two percent of support to a target.

An audience inoculation program prevents the shift of support from an audience for seven days. Leaflets subtract one percent of support from an audience and add one percent of support to a target (they cannot be jammed).

RANKINGS

Although rankings can be determined every day, it is easier to note and publish them every week (every seven days).

BATTLES

The entire purpose of the campaign is to determine the political preferences of the population of Eddum. The method of shaping this opinion is through the use of COACC.

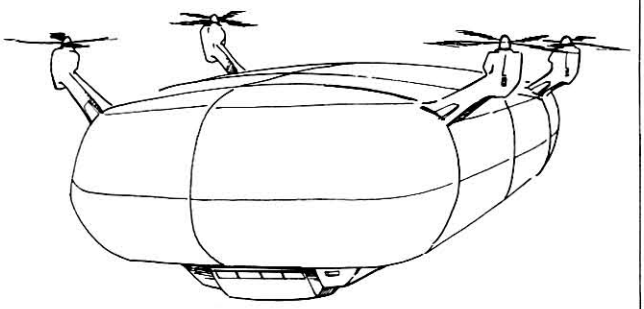
Air Battles: An aircraft in position to deliver a broadcast achieves its mission if it remains in the hex for one hour. If it is driven off or destroyed by enemy aircraft before the hour has elapsed, then it is unsuccessful in shifting public opinion. Air battles by interceptors and escorts are commonplace as each side tries to achieve its mission.

Strategic Placement: The limits of aircraft range and the positioning of various aircraft's home bases can clearly channel what can be done and the manner in which the enemy can attempt to counter those actions.

Attrition: Success in destroying enemy aircraft severely limits what actions and missions the enemy may take. As aircraft are destroyed, the limits on new aircraft production may make it difficult to replace them all.

Costs: Although all participating nations have effectively unlimited budgets, the ultimate victor is judged on cost-effectiveness as well as on success. Participants must carefully weigh the costs of aircraft needed.

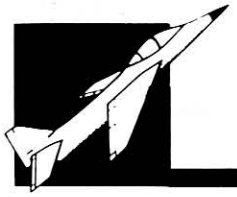
Diplomacy: Nations may negotiate with each other in an attempt to further the aims that each has. By pooling resources, it may be possible for all sides to make significant progress toward their goals. However, ultimately, such diplomacy may fail.



***CALCUTTA* (TL8) HELISTAT**

CraftID: Helistat TL8, MCr16.15
Hull: 13333/33333, Disp. = 4000, Volume = 200,000 cubic meters, Envelope Weight = 200tons, Usable Lift = 66tons with hydrogen, 50tons with helium, Airframe = Simple
Power: 4/1 Gas Turbine, 3.3 Mw × 8, Endurance = 1 hour, 50 min
Loco: 4 Sets Main and Tail Rotor, Lift = 26.4tons each, Thrust = 9.9ton each, Cruise = 110, Top = 150
Commo: Regional Radio × 1
Control: Boosted
Accom: Crew = 3, (Pilot, Copilot, Cargo Lift Pilot; simple cockpits × 2, crew station × 1), aboard control helicopter linked electronically to robot control sets aboard three slave helicopters
Cargo: 132ton sling load (hydrogen); 116ton sling load (helium)
Other: Fuel = 6000liters internal each helicopter

The helistat is a heavy lift air vehicle combining the lifting capacity of an airship with the maneuverability and increased speed of the helicopter. It is designed to carry sling loads of heavy equipment and construction material into wilderness areas.



Flyer Characters

Skilled individuals capable of operating craft in atmosphere are constantly in demand with the armed forces and with commercial endeavors on planets throughout civilized space. When travel is an essential part of modern star-spanning civilization and when the aircraft (as a part of modern activities) is more cost-effective than brute thrust-powered travel, an industry will arise to exploit it commercially and armed forces to make use of it militarily.

Flyers are those individuals who spend their lives and careers involved in air or atmospheric travel activities. Most worlds with atmospheres and sufficient technological levels maintain an air force as part of their armed forces, and they make use of flyers to operate the aircraft which serve in the air force. These worlds also have commercial aircraft companies which use flyers to operate commercial aircraft.

Flyer Ranks: Ranks for flyer characters serving in COACC are shown in the COACC Table of Ranks. Ranks O1 to O10 are called *officers* or *commissioned officers*. Ranks E1 to E9 are *enlisted personnel*. Within the enlisted ranks, ranks E3 to E9 are *noncommissioned officers*. Ranks for commercial flyer characters are shown in the Flyer Table of Ranks.

Flyers: The general term for individuals serving in COACC, regardless of rank or position, is *flyer*.

ADVANCED CHARACTER GENERATION

The advanced character generation systems in the **MegaTraveller Players' Manual** produce enhanced characters for the careers of: mercenary (including the army and the marines), navy, scout, and merchants. This chapter uses the same techniques to produce enhanced characters for the flyer career.

The process begins with the advanced character generation procedure (pages 44 to 47 of the **MegaTraveller Players' Manual**) and the homeworld generation procedure (page 13 of the **MegaTraveller Players' Manual**).

Homeworld: Any character from any homeworld may become a flyer. The individual is assumed to have served out his career on his homeworld.

A beginning flyer character must be aware of several things: the atmosphere code of the world he is on (always no less than Thin), the world's population code (always no less than Mod Pop), and the world's government type. These factors influence the type of COACC forces that are available to the character, and the type of aircraft and spacecraft the character may use in service.

If the character's homeworld does not meet the requirements of Thin+ atmosphere, Mod+ population, and Industrial+ technology code, the character must generate an adopted homeworld (using the procedures on page 13 of the **MegaTraveller Players' Manual**) and is assumed to have served out his career on that new world. If necessary, the character must continue to generate successive adopted homeworlds until an acceptable one for flyer service is found.

INITIAL ACTIVITIES

The individual may undertake any of the precareer options available in the **Megatraveller** basic game set. College, the Military Academy, the Merchant Academy, medical school, flight school, the Air Academy, AOTC, and COACC Flight School are available. The Air Academy, AOTC, and COACC Flight School are covered in detail in this section.

Air Academy: Any character with a Social Standing of 8+ may apply for admission to the Air Academy. The character must throw 10+ on 2D for admission with a DM of +2 for Dexterity of 9+. If the character fails the admission throw, he remains 18, and may enlist in COACC or another armed service.

A character must throw 9+ to succeed. Add a DM of +2 if the character's Intelligence is 8+. If the character fails the success throw, he ages one year and is immediately drafted into the COACC for a short three-year term.

The Education throw of 1D−3 with a DM of +1 if the character's Intelligence is 9+ indicates the increased level of Education gained during four years at the Air Academy.

A successful 9+ throw (DM+1 if Intelligence is 9+) for honors recognizes the character's scholastic and aviation accomplishments. A character earning Air Academy honors will be admitted to flight school upon application and may apply to medical school.

Air Academy graduates automatically receive Survival-1. Graduates throw 4+ on 1D for each of these skills: Navigation, Leader, Admin, Technical. Graduates may also throw 6 on 1D for Propeller Aircraft-1. They are commissioned in the homeworld (or adopted homeworld) COACC immediately after graduation. Air Academy graduates will have aged four years and will begin their first term of service or additional education at age 22.

AOTC (Air Officer's Training Corps): Individuals attending college may elect to take AOTC and, if they successfully complete it, they receive a commission as an officer in COACC. AOTC is identical to OTC.

COACC Flight School: COACC Flight School is open to COACC commissioned officers only. Any Air Academy honors graduate or college honors graduate who has successfully completed AOTC may attend COACC Flight School by applying. Other Air Academy or AOTC graduates may apply for admission, succeeding on a roll of 9+ with a DM+1 if the candidate has a Dexterity of 9+. COACC officers who fail the

admission roll report for immediate duty as officers in a nonflight branch and begin serving their first four-year term.

COACC Flight School students succeed on a roll of 8+ with a DM+1 if the student has Dexterity 9+. COACC Flight School students who wash out report to duty as nonflying COACC officers and begin serving a short three-year term in a nonflight branch. Successful flight school students automatically receive Propeller Aircraft-1 *and*, if the individual's homeworld has Pre-Stellar technology or higher, the successful flight school students also automatically receive their choice of Jet Aircraft-1 or Helicopter-1. COACC Flight School graduates also automatically receive Survival-1 (Air Academy graduates would thus have Survival-2 when graduating from COACC Flight School). If an individual's homeworld's tech level is Early Stellar+, the student may receive Grav Vehicle-1 instead of Helicopter-1. COACC Flight School students also receive Navigation-1, Tactics-1, and Gunnery-1 on a roll of 4+ on 1D for each skill.

COACC Flight School graduates report to active duty as officers (rank O1) and begin serving a short three-year term at age 23.

College, the Military Academy, medical school, and flight school are each covered in the **MegaTraveller Players' Manual**. The following modifications apply.

College: The college procedures are used without change, except that AOTC is an acceptable substitute for OTC or NOTC.

Military Academy: The Military Academy procedures are used without change, except a graduate may decide to take a commission in his homeworld COACC.

Medical School: The medical school procedures are used without change except that a graduate may automatically be commissioned as a captain (rank O3) in the homeworld COACC. The character is automatically assigned to the medical branch.

Flight School: A graduate of flight school can elect to transfer his commission in his homeworld COACC (instead of serving in the Imperial Navy, sector navy, or subsector navy). The character is automatically assigned to the orbit branch.

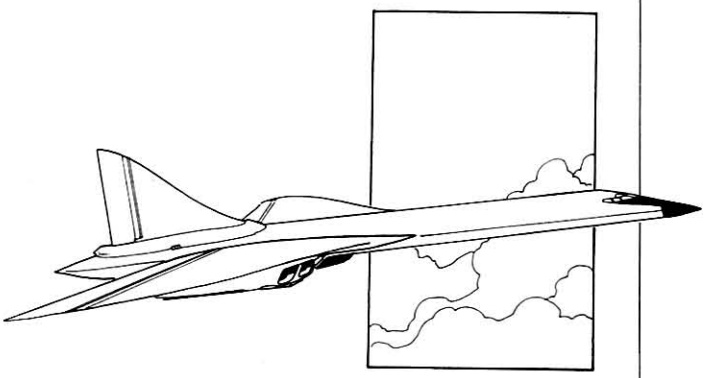
ENLISTMENT

The two different levels of COACC forces are the Imperial COACC Advisory Group and the world COACC (which encompasses the subordinate COACC of a nation on a Balkanized world).

All individuals initially join a world COACC. That world is described and defined by the homeworld (or adopted homeworld) characteristics of the individual. If the world is Balkanized, the individual has enlisted in one nation's COACC on that world.

Armed forces from worlds with Mod Pop or greater have their own COACC forces for patrol duties, counterinsurgency operations, support of world goals, and defense against planetary invasions. Depending on the world's tech level, these COACC forces may be equipped with aircraft and spacecraft ranging from jet fighters and attack aircraft to system defense boats.

Balkanized worlds' nations have COACC or air forces with the mission of defending their home countries or attacking their neighbors, and are seldom concerned with a unified system or world defense against outsiders. Depending on technology level, these worlds will have combat aircraft ranging from propeller-driven biplanes to suborbital rocket-ramjets. If technology permits, some nations may have orbital fighters and orbiting laser artillery platforms. Surface-to-surface cruise and ballistic missiles are found under the control of COACC forces



***MELBOURNE* (TL10)**
HYPERSONIC SUBORBITAL LINER

CraftID: Suborbital Liner, TL10, MCr15.2
Hull: 420/1050, Disp.=300, Weight Loaded=100tons, Airframe=Hypersonic
Power: 4/10 Gas Turbine×2, .60 Mw, Endurance=1.5 hours; 4/10 Fusion×2, 2 Mw, Endurance=1891 hours, 40 min
Loco: High Bypass Turbofans×2, Thrust=100tons, Cruise=1200, Top=900; Fusion Rocket×2, Thrust=390tons, Cruise=2400, Top=3200, Agility=6
Commo: Regional Radio×2, Continental Radio×1
Sensors: Radar Regional×1
Control: Boosted
Accom: Crew=8 (Pilot, Copilot, Flight Attendants×6), Complex Cockpit×2, Basic Life Support
Other: Fuel=11,350liters hydrogen internal, Passengers=12 First Class, 160 Coach, Cargo=3tons

The *Melbourne* is a hypersonic transport that takes off and lands vertically using deflected exhaust from high bypass hydrogen-burning turbofans for lift. Turbofans are also used to transfer to level flight and climb to 20 kilometers, where fusion rockets are ignited that propel the transport into a suborbital arc toward its destination. The transport reenters the atmosphere gliding toward its destination. The turbofans are restarted when speed drops below Mach 1. The transport gradually changes over to vertical flight and lands on a city center landing pad.

on Balkanized worlds outside Imperial control where international rivalry and tension are particularly high.

Ruie in the Spinward Marches is an outstanding example of this situation.

All characters enter COACC service through enlistment, the draft, or officer training. If all enlistment attempts fail, the character may not undertake COACC service unless he is subsequently drafted. Successful enlistment commits the character to a four-year term of service beginning at age 18.

Enlistment: Throw 8+ to enlist in the homeworld COACC; allow DM+1 if Intelligence is 8+, DM+2 if Education is 9+, and DM+1 if homeworld is Balkanized.

Draft: If an individual is unsuccessful in enlisting he may submit to the draft. A throw of 5+ (1D) results in the individual being drafted into his homeworld COACC.

Commissions: Air Academy graduates are commissioned with the rank of pilot officer O1 in the homeworld COACC upon graduation. AOTC graduates are commissioned as pilot officer O1 in their homeworld COACC.

BRANCH SELECTION

Each COACC is divided into five *branches*: orbit, atmosphere, technical, security, and medical.

Orbit: The orbit branch is concerned with operations beyond the atmosphere, including orbital combat by orbital fighters and system defense boats. This branch exists in COACC forces with homeworlds having Early Stellar+ technology (TL9+). An officer in an orbit branch commands orbital units.

Atmosphere: The atmosphere branch is concerned with operations in the atmosphere, including air-to-air combat and air-to-ground strikes. An officer in an atmosphere branch commands atmospheric units.

Technical: Ground support operations, including maintenance and the operation of air bases are the concern of a technical branch. An officer in a technical branch commands bases and missile units.

Security: The security branch is concerned with base security and ground-based air defense. An officer in a security branch commands air police, security, and air defense units.

Medical: Health support activities are the concern of a medical branch. An officer in a medical branch commands medical and hospital units.

Branch is assigned by COACC when the individual joins. If the character is a flight school graduate, he is automatically assigned to the atmosphere branch (if the homeworld is tech code Early Stellar+, he may choose orbit branch instead). If the character is a medical school graduate, he is automatically assigned to the medical branch. If the character attended and failed medical school, he is automatically assigned to the medical branch. A medical school attendee who is also a flight school graduate may choose between atmosphere or orbit branch and medical branch.

Cross-Training: An individual who has received cross-training in another branch may transfer to that branch when reenlisting.

Terms of Service: Characters serve four-year terms. When the term is completed, reenlistment is for additional four-year terms. Some characters serve short initial terms (three years).

Training: The first year of service is dedicated to training. Enlisted personnel make two rolls on the Branch Skills Table for their first year. Officers make two rolls on their choice of the Branch Skills Table, the Staff Officer column of the Service Stills Table (or Flight Officers column if they are in the flight branch).

CAREER RESOLUTION

A character's career begins once the character has graduated from all precareer schools and has officially joined the service.

Assignments: A character carries out four one-year assignments each term. As noted elsewhere, the first year of the first term is devoted to initial or officer training.

Each one-year assignment is resolved separately. Officers determine whether they hold a command in the current assignment; all characters determine their specific assignments; all resolve their assignments in terms of survival, decorations, promotions, and skills.

Command Determination (Officers Only): Any officer may consult the Command Duty Table. For each branch, a successful throw places the officer in a command position. Failure places him in a staff position. If the officer does not consult the Command Duty Table, he will automatically serve his next assignment in a staff position.

Specific Assignments: Two COACC assignment tables are used to determine the character's specific assignment: the Flight (Atmosphere/Orbit) Assignments Table and the Ground Assignments Table. The first is for personnel on flight status in the atmosphere or orbit branches, the second for all others.

Specific assignments for personnel on flight status include combat, patrol, transport, training, and special duty. Specific assignments for ground personnel include base defense, training, base operations and special assignment. Roll 2D for specific assignments on both tables.

Special Assignments: Characters who receive a special assignment are sent to service schools or are assigned to unusual duty.

Flight Status: Flight school graduates are automatically on flight status until they are grounded. Enlisted personnel gain flight status through cross-training or attending air crew specialist school and then joining the flight branch at the beginning of the following four-year term. Enlisted personnel also remain on flight status until grounded.

Wings: Flight school graduates are awarded and wear pilot wings. Officers on flight status who have reached flight lieutenant (rank O3) and who have served at least three terms are awarded senior pilot wings. Officers on flight status who have reached squadron leader (rank O4) and who have served at least five terms and at least five command assignments are awarded command pilot wings. The wings earned by a character are always mentioned in his resume.

Grounding: Personnel on flight status must roll to avoid grounding when beginning their second or subsequent four-year term. A roll of 6+ on 1D grounds the character. Add a DM of +1 on the grounding roll for every term served beyond two terms. Add a DM of +1 if the character has been wounded. Subtract a DM of −1 if the character's Dexterity is 8+. Grounded personnel must immediately begin rolling for their specific assignments on the Ground Assignments Table.

Assignment Resolution

For each specific one-year assignment, the character must resolve his survival, decoration, promotion, and whether he receives skills.

Survival: The character must pass a survival throw to see if he survives the current year. If he fails the throw, character generation is finished, and he is mustered out. Optionally, the character is dead. If the exact survival number is rolled, the character was wounded on duty. If the character's assignment was combat or base defense, he was wounded in action and receives a Purple Heart.

The character may choose to take a negative DM on his survival roll and apply it as an equal positive DM on the decorations roll.

Decoration: Characters may be decorated for heroism. If a character rolls the indicated number or higher, he is awarded the Meritorious Conduct Under Fire (MCUF) award. If he rolls at least three higher than the number stated, he receives the Medal for Conspicuous Gallantry (MCG) instead. If he rolls at least six higher, he receives the Starburst for Extreme Heroism (SEH).

If the character took a negative DM on his survival roll, an equal positive DM may be taken in an attempt to win a decoration.

This procedure may be reversed to gain a greater chance to survive by applying a positive DM to the survival throw. However, if the resulting negative DM applied to the decoration throw causes the decoration throw to fail by six or more (such as rolling a 4 when 10+ is required for a decoration), consult the Court Martial Table in the **MegaTraveller Players' Manual** (page 47).

Promotion: A character may receive a promotion by throwing the indicated number or higher on 2D. Where a number is listed in parentheses officers may not roll for promotion.

Normally, an officer may not be promoted more than once per term. Enlisted characters may be promoted as often as once per assignment. However, they may not be promoted beyond flight sergeant major (rank E9) except through attending Officer Candidate School (OCS).

Skills: A character may receive skills because of his assignment. If the character rolls the indicated number or higher, he may roll for one skill on any skill column available to him.

REENLISTMENT AND MUSTERING OUT

The character must reenlist or muster out at the end of a four-year term. To reenlist in the COACC force, the character must throw 6+ on 2D. If the throw fails, he must muster out and roll for the benefits on the flyer column of the Mustering Out Table in the **MegaTraveller Players' Manual** (page 20).

Changing Branches: Characters may reenlist in a different branch at the end of a four-year term if they have received cross-training in that branch during a prior term.

Transfer to the Imperial COACC Advisory Group: A character may be invited to transfer to the Imperial COACC Advisory Group once he has achieved skill level 4+ in any aircraft type. The individual is then assigned to staff college, cross-trained in atmosphere and orbit, and all further assignments are in atmosphere or orbit branches.

SPECIAL RULES

The following special rule applies to flyers.

Combat Ribbons: A character's resume should include details of combat experience. Each time a character receives a combat or base defense assignment, he receives a combat service ribbon. Each time an officer holds a command assignment in combat or base defense, he receives a combat command cluster on his combat service ribbon.

SKILLS FOR FLYERS

A number of skills have been expanded for use by flyer characters in this rules module. They include the following.

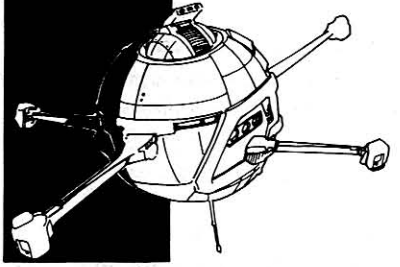
Forward Observer: Forward Observer includes skill in directing air strikes onto ground targets, as well as directing artillery fire and fire from ships in orbit.

Gunnery: Gunnery includes skill in the use of air-to-air weapons, air-to-ground weapons, antiaircraft weapons, and ground-based antistarship weapons, as well as starship/small craft weapons.

Navigation: Navigation is a skill in all forms of navigation, including aircraft navigation.

Recon: Recon includes skill at aerial reconnaissance and photo interpretation.

Tactics: Tactics now includes skill in air combat tactics and is used as a positive DM in some air combat situations.



***GUARDIAN*-CLASS (TL12) ORBITAL BATTLE STATION**

CraftID: Orbital Battle Station, TL12, MCr21
Hull: 90/225, Disp = 120, Config. = 4, Armor = 40F
Power: 1/2, Fusion = 6 Mw, Duration 120/360
Commo: Radio = Planetary, datalink only
Sensors: Active EMS = Planetary
Off: Missile = x09
Batt 1
Bear 1
Computer: 1 × 1
Other: Fuel = 120kliters, ObjSize = Small, EMLevel = faint

The *Guardian*-class orbital battle station is armed with a 100-ton missile bay containing two battery rounds of UCP Factor-9 nuclear missiles. Once activated in orbit, it automatically acquires and fires upon shipping that does not respond to the correct preprogrammed transponder code. It is easily and cheaply mass produced as a last line of defense in low orbit.

ENHANCED FLYER CHARACTERS

INITIAL GENERATION

Generate the basic character using the advanced character generation procedure (**MegaTraveller Players' Manual** pages 44 to 47) and the homeworld generation procedure (**MegaTraveller Players' Manual** page 13).

HOMEWORLD INFORMATION

A flyer character must know his homeworld. If that homeworld has a Vacuum atmosphere, an adopted homeworld must be generated which has a non-Vacuum atmosphere.

PRECAREER OPTIONS

A flyer character has the following options available before the career begins: College, Naval Academy, Military Academy, Medical school, Flight school, Air Academy, AOTC, COACC Flight School.

ENLISTMENT

Throw 8+ to enlist in the homeworld COACC; allow DM+1 if Intelligence is 8+, DM+2 if Education is 9+, and DM+1 if homeworld is Balkanized.

ENLISTMENT BRANCHES

Flyers each serve in a specific branch:

Orbit: The orbit branch is concerned with operations beyond the atmosphere. An officer in an orbit branch commands orbital units.

Atmosphere: The atmosphere branch is concerned with operations in the atmosphere. An officer in an atmosphere branch commands atmospheric units.

Technical: Ground support operations are the concern of the technical branch. An officer in a technical branch commands bases and missile units.

Security: The security branch is concerned with base security and ground-based air defense. An officer in a security branch commands air police, security, and air defense units.

Medical: Health support activities are the concern of the medical branch. An officer in a medical branch commands medical and hospital units.

BRANCH ASSIGNMENT

Die	*Enlisted*	*Officer*
1	Technical	Technical
2	Technical	Technical
3	Security	Security
4	Security	Atmosphere
5	Medical	Atmosphere
6	Atmosphere	Atmosphere
7	Orbit	Orbit

DM+1 if tech level Early Stellar+.

Automatic Branch Selection

Automatic atmosphere branch if flight school graduate (choice of atmosphere or orbit branch if homeworld is tech level Early Stellar+). Automatic medical branch if character is medical school graduate or failed medical school.

COMMAND DUTY

Officer's Branch	*Throw*
Atmosphere	7+
Orbit	8+
Technical	9+
Security	8+
Medical	10+

ASSIGNMENTS

Die	*Atmosphere/Orbit*	*Ground*
2	Combat	Base defense
3	Combat	Base defense
4	Patrol	Training
5	Transport	Base operations
6	Training	Base operations
7	Transport	Training
8	Training	Base operations
9	Combat	Training
10	Patrol	Base defense
11	Special assignment	Special assignment
12	Special assignment	Special assignment

ASSIGNMENT RESOLUTION

Atmosphere	*Training*	*Transport/Support*	*Strike*	*Superiority*
Survival	4+	3+	4+	6+
Decoration	none	12+	10+	6+
Promotion	6+	10+	8+	6+
Skill	6+	10+	8+	6+

DMs: For survival, DM+1 if any Flight skill 2+. For promo, DM+1 if Educ 7+.

Orbit	*Training*	*Transport/Support*	*Strike*	*Superiority*
Survival	4+	4+	6+	7+
Decoration	none	11+	9+	6+
Promotion	6+	10+	8+	6+
Skill	6+	8+	8+	6+

DMs: For survival, DM+1 if any Space skill is 2+.

Technical	*Training*	*Support/Base*	*Missiles*
Survival	auto	auto	6+
Decoration	none	12+	10+
Promotion	8+	10+	8+
Skill	6+	7+	8+

DMs: For survival, DM+1 if Combat Rifleman-1. For skill DM+1 if Int 8+.

Security	*Training*	*Air Police/Security*	*Air Defense*
Survival	3+	4+	7+
Decoration	none	10+	8+
Promotion	6+	8+	6+
Skill	7+	8+	8+

DMs: For survival, DM+1 if Combat Rifleman-1; DM+2 if base defense school.

Medical	*Training*	*Base*	*Hospital*
Survival	auto	auto	4+
Decoration	none	12+	10+
Promotion	7+	10+	8+
Skill	7+	10+	8+

DMs: For promotion, +2 if Medical 4+.

ENHANCED FLYER CHARACTERS

SPECIAL ASSIGNMENTS

Die	Enlisted	Officers: Flight	Officers: Ground
1	Cross-training	Flight school	Cross-training
2	Specialist school	Intelligence school	Flight school
3	Recruiting	Air attache/aide	Intelligence school
4	Air crew school	Recruiting	Base defense school
5	Base defense school	Forward observer school	Command school
6	OCS	Advanced air combat school	Staff College
7	Space school	Space school	—
8	Space school	Space school	—

DMs: *Enlisted and Flight Officers:* +2 if world TL9+.

SERVICE SKILLS

Die	Flyer Life	Flight Sgt	Flight Off	Grnd Off	Staff Off	Cmnd Off
1	Brawling	**Vice**	**Aircraft**	**Gun Cbt**	Computer	Handgun
2	+1 Dex	**Gun Cbt**	**Gunnery**	Admin	Admin	Leader
3	+1 Endur	Mechanic	Tactics	Computer	Instruct	Leader
4	Carousing	Electronic	**Gunnery**	Electronic	Liaison	Liaison
5	+1 Educ	Mechanic	Navigation	Mechanic	Handgun	+1 Endur
6	Leader	Demo	Handgun	Comm	SMG	**Inborn**
7	Vacc Suit	Instruct	Grav Veh	—	—	Tactics
8	Handgun	Leader	Vacc Suit	—	—	**Gunnery**
9	+1 Soc	Admin	—	—	—	—
DM:	+3 if O4+	+3 if E6+	+2 if TL11+			+2 if on flight status

BRANCH SKILLS

Die	Atmosphere	Orbit	Technical	Security	Medical
1	**Aircraft**	Ship's Bt	**Gun Cbt**	Cbt Rifleman	Admin
2	**Aircraft**	Vacc Suit	Mechanic	Hvy Wpns	Electronic
3	Tactics	Navigation	Mechanic	Recon	Medical
4	**Gunnery**	Engineer	Demo	Cbt Rifleman	Computer
5	Navigation	Ship Tactics	Mechanic	**Gunnery**	Medical
6	**Gunnery**	**Gunnery**	Electronic	**Gunnery**	Admin
7	Vacc Suit	—	Gravitics	—	Meson Gun
8	Grav Veh	—	—	—	—
DM:	+2 if TL9+		+1 if TL9+		+1 if TL11+

COACC TABLE OF RANKS

Enlisted	COACC	Officer	COACC	Traveller Rank
E1	Aircrafthand	O1	Pilot Officer	1
E2	Leading Aircrafthand	O2	Flying Officer	1
E3	Senior Aircrafthand	O3	Flight Lieutenant	2
E4	Crew Chief	O4	Squadron Leader	3
E5	Flight Sergeant	O5	Group Captain	4
E6	Leading Flight Sergeant	O6	Wing Commander	5
E7	Senior Flight Sergeant	O7	Air Commodore	6
E8	Master Flight Sergeant	O8	Air Vice Marshal	6
E9	Flight Sergeant Major	O9	Air Marshal	6
		O10	Air Chief Marshal	6

SPECIALIST SCHOOL

Die Roll	Specialist School Type
1	Mechanical
2	Electronic
3	Ordnance
4	Maintenance
5	Computer
6	Gunnery
7	Gravitics
8	Space

DMs: +2 if TL9+.

SPECIAL ASSIGNMENTS

Cross-Training: Select any branch and cross-train in it. Roll for one skill on that branch table.

Recruiting: Receive Recruiting-1.

Air Crew School: Roll 4+ (1D) for Gunnery, Navigation, Sensor Ops.

Base Defense School: Receive automatic Combat Rifleman-1. Roll 4+ (1D) for Heavy Weapons, Tactics, Leader, ATV, Gunnery.

OCS: Advance to rank O1; rank E7 advance to rank O2 (roll twice on Service Skills Table and once on Branch Skills Table). Rank E8 and E9 receive O3 (no new skills). OCS prohibited over age 38. (Reroll on the Special Assignments Table). If OCS is again received, a waiver allows attendance.

Space School: Roll 4+ (1D) for Ship's Boat, Ship's Tactics, Navigation, Vacc Suit, Gunnery, Engineering.

Flight School: The individual is admitted to flight school. See page 91.

Intelligence School: Roll 4+ (1D) for Interrogation, Interview, Sensor Ops. Flight officers only roll 4+ for Recon.

Air Attache/Aide: Roll 1D: 1-4 assigns duty as an air attache; 5-6 assigns duty as aide to an air marshal. Attache receives promotion of one grade and +1 Social Standing. An aide receives +1 Social Standing and may select command duty or special assignment other than attache/aide.

Forward Observer School: Roll 4+ (1D) for Forward Observer, Propeller Aircraft, Recon, Sensor Ops.

Advanced Air Combat School: Roll 4+ (1D) for Aircraft, Tactics, Gunnery.

Command College: Roll 4+ for Tactics, Leader, and Admin. If Early Stellar+ (TL9+) technology, roll 4+ for Ship Tactics and Fleet Tactics.

Staff College: Roll 4+ for Tactics, Admin, Liaison, Computer. If Early Stellar+ (TL9+) technology, roll 4+ for Fleet Tactics.

- **The thrilling *new* environment for Traveller—the Shattered Imperium.**
- **State-of-the-art role-playing rules and background materials.**
- **RPGA and SIGMA Award winner.**

The vast star-spanning Imperium has ruled for more than 1000 years, straining to guard its borders and keep the peace. Now, powerful forces are tearing the empire apart; rival forces are competing for the throne, and there is no clear winner in sight. The Rebellion is sweeping the empire.

MegaTraveller is a complete science-fiction role-playing game, based on three basic rule books:

The **MegaTraveller Players' Manual** contains the basic information any *player* needs to prepare for (and participate in) **Traveller** situations, scenarios, and adventures. Intended as a reference for every participant, it includes character generation, enhanced character generation, skills, task resolution, experience, personal combat, and psionics.

The **MegaTraveller Referee's Manual** is a basic reference for the *referee* which expands on the topic of tasks, and deals in depth with vehicle design and combat (including both surface vehicles and starships), worlds, and commerce.

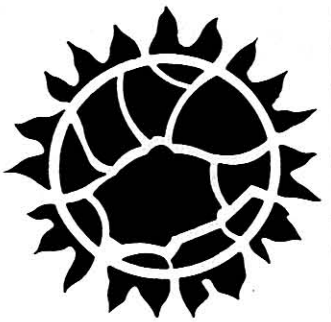
The **MegaTraveller Imperial Encyclopedia** is the basic reference for *every* **Traveller** participant. It deals with library data, maps, world data, and equipment. The **Encyclopedia** includes all of the raw information necessary to learn about the Shattered Imperium and role play within it.

The boxed **MegaTraveller** set includes all three of these books, plus a poster-size map of the Spinward Marches.

$30.00. Stock Number: 0210.
ISBN 0-943580-49-8.
Each book is also available separately.

The **Players' Manual**.
104 pages. $10.00. Stock #: 0211.
ISBN 0-943580-38-2.
The **Referee's Manual**.
104 pages. $10.00. Stock #: 0212.
ISBN 0-943580-47-1.
The **Imperial Encyclopedia**.
96 pages. $10.00. Stock #: 0213.
ISBN 0-943580-48-X.

THE SHATTERED IMPERIUM



The time is the distant future. Humanity has made the leap to the stars; interstellar travel is not only possible, but commonplace.

The ruling interstellar power is the Imperium, a large, human-dominated empire more than a thousand years old, encompassing 11,000 worlds in a region over 2,000 light-years across.

But while the Imperium's thousand-year reign has created an illusion of strength and lasting power, continued expansion and internal pressure have combined to strain the Imperium's ability to govern to the limit. The cohesive thread that has held the vast Imperium together has always been the person of the emperor, the one individual to whom all Imperial citizens ultimately owe their loyalty.

Now the emperor is dead at the hand of an assassin, leaving no immediate heirs and no clear successors. The Emperor's nephew claims the throne; so does his cousin. Even his assassin, citing an obsolete and obscure precedent, claims the throne. No one knows whom to follow; someone is following each of the claimants. Several border regions have lost their faith in the Imperium's ability to protect them and have declared their independence. A few neighboring interstellar powers, learning of the Imperium's internal chaos, have begun to advance into unprotected frontier provinces.

The Imperium has been shattered...

MegaTraveller

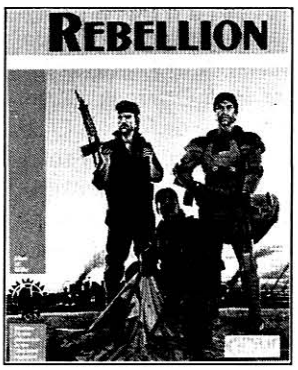
It is against this background of star-spanning rebellion and emerging splinter empires that **Traveller** is set. Its role-playing game rules provide an entire universe to be explored. Players can assume any role and undertake any mission in the universe of the future.

Traveller postulates that mankind has conquered the stars and that travel from one stellar system to another is commonplace. However, the tremendous distances involved dictate that interstellar voyages can take weeks, months, sometimes years.

In some respects, the situation is similar to Earth in the 18th century. Communication is limited by the speed of travel, setting the stage for adventure in a grand fashion with all the trappings of classic science fiction: star-spanning empires, huge starfleets, wily interstellar merchants (and equally wily interstellar pirates), complex diplomatic maneuvers, and larger-than-life heroes, heroines, and villains.

Traveller is the name of the overall game. **MegaTraveller** is the name of this rules set, and is used to differentiate it from the 10 years of development and earlier editions that preceded it.

MEGATRAVELLER™



REBELLION SOURCEBOOK

- **The battles for the Imperium have begun.**
- **You can join the Rebellion and shape the course of Imperial history!**

The Emperor is dead! Who will win the Iridium Throne? Many different factions have squared off in the impending struggle for ultimate power.

Rebellion Sourcebook covers the diverse factions of the Rebellion, their equipment, their goals and strategies, and (most of all) how players can get involved in the grandest adventures the stars have ever seen. Includes the short adventure: "Nail Mission."

96 pages.
$10.00.
Stock Number: 0214.
ISBN 0-943580-63-3.

FLASHBACK

- **Historical adventuring in the Imperium's past.**

Somewhere, ages ago, a squad caught the edges of a devastating radiation blast. Rather than die lonely deaths, its members swore a pact to seek out a cure; then they retired to cold sleep. Every time they awake, they come out in a nexus of history: They are there when the Long Night falls, when the Imperium is founded, when Nicholle is assassinated, when the Civil War ends, and more. They are travellers in time the only way possible: forward, ever forward. And their greatest challenge awaits them when they reach the present!

96 pages. Stock Number: 0217.
$10.00. ISBN 1-55878-034-3.

REFEREE'S COMPANION

- **Additional rules for MegaTraveller campaigns.**

Expand the universe of **MegaTraveller** with more rules, background, information, and materials for the dedicated referee. Materials that simply wouldn't fit into the grand, three-volume **MegaTraveller** rules set have now been brought together into this compilation.

MegaTraveller Referee's Companion covers all the major alien races in the **Traveller** universe, dealing with each one's homeworld, physical appearance and abilities, mental make-up, and interstellar territories. The **Companion** also covers large-scale combat, timekeeping, communications, in-system operations, research, mapping, megacorporations, technology, and robots for **MegaTraveller**.

96 pages.
$10.00.
Stock Number: 0215.
ISBN 0-943580-71-4.

GDW

ASLAN

- **The proud warrior race.**

The Aslan are a young race of intelligent beings, evolving on their own world of Kusyu to spinward of Sol, and their emergence on the interstellar scene has been relatively recent. Proud male Aslan are bent on the possession of land in large quantities, and the *ihatai*, or second sons, have propelled the race through the stars. Female Aslan, typically more business-minded and practical, administer the businesses of the clans, running a huge star-spanning nation known as the Aslan Heirate.

48 pages. Stock Number: 0254.
$7.00. ISBN 0-943580-03-X.

COACC

- **Close Orbit and Airspace Control Command.**
- **The air forces of the future.**

The army controls the ground! The navy controls space! But the interface between the two belongs to COACC—the fliers. Aircraft of all types—jets, props, helicopters, dirigibles—come under the Close Orbit and Airspace Command. **MegaTraveller COACC** provides rules for fliers in the **Traveller** universe. Coverage includes character generation, COACC organization, aircraft design sequences, example aircraft, and air-to-air combat rules.

96 pages.
$10.00.
Stock Number: 0216.
ISBN 0-943580-72-2.

ROBOTS

- **Complete design rules for robots in the MegaTraveller universe.**

The high-tech stellar civilization of the Imperium has been developing the science of robotics for centuries—improving, adapting, modifying robots for all types of tasks. At the lower end of the spectrum are common working robots, capable of carrying out a few routine tasks. At the upper end are pseudo-biological robots able to imitate human beings almost down to the finest detail. Get robots into your **MegaTraveller** campaign!

48 pages.
$6.00.
Stock Number: 0344.
ISBN 0-943580-10-2.

MEGATRAVELLER™

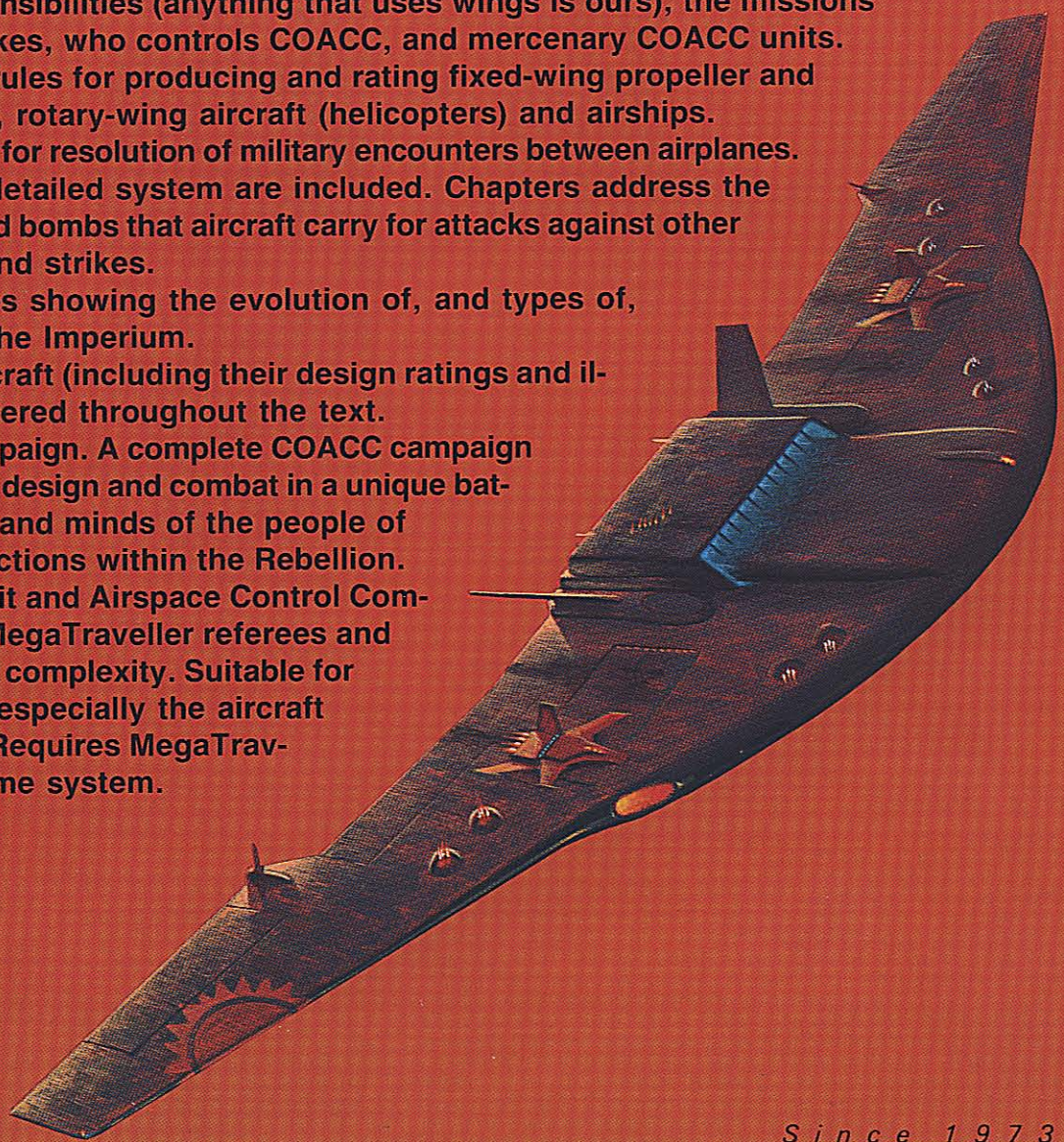
COACC

CLOSE ORBIT AND AIRSPACE CONTROL COMMAND

A detailed treatment of aircraft and the characters that fly them in MegaTraveller. This 96-page sourcebook includes:

- Character generation for flyers in MegaTraveller.
- Detailed analysis and description of the organization and operation of COACC, the definition of COACC responsibilities (anything that uses wings is ours), the missions that COACC undertakes, who controls COACC, and mercenary COACC units.
- Aircraft design rules for producing and rating fixed-wing propeller and jet-propelled aircraft, rotary-wing aircraft (helicopters) and airships.
- Air combat rules for resolution of military encounters between airplanes. Both a hasty and a detailed system are included. Chapters address the types of ordnance and bombs that aircraft carry for attacks against other aircraft and for ground strikes.
- Tech level tables showing the evolution of, and types of, aircraft throughout the Imperium.
- Examples of aircraft (including their design ratings and illustrations) are scattered throughout the text.
- The Eddum Campaign. A complete COACC campaign incorporating aircraft design and combat in a unique battle to win the hearts and minds of the people of Eddum to specific factions within the Rebellion.

COACC: Close Orbit and Airspace Control Command. Intended for MegaTraveller referees and players. Intermediate complexity. Suitable for some solitaire play (especially the aircraft design sequences). Requires MegaTraveller role-playing game system.



0 86079 00216 9

Printed in the U.S.A. Made in the U.S.A. ISBN 0-943580-72-2.

Since 1973

GDW

PO Box 1646
Bloomington, IL 61702-1646