

The Ether Calculator



SPACE

1889

THE ETHER CALCULATOR



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The Ether Calculator

By Dominic Hladek

Foreword

The adventure module **The Ether Calculator**, which you are holding in your hands or viewing on your screen, was my first work for the roleplaying game *Space: 1889*. Back then in 2012 the roleplaying game was quite new on the German market. I spotted it for the first time at an RPG convention and was fascinated right from the beginning. As a computer scientist who read “The Difference Engine” by William Gibson, it was obvious that I would write an adventure about analytical engines. Soon after, it was published at first in a German anthology and now, a few years later, was supplemented and translated to English. I hope that you and your party enjoy the plot and have fun finding some of the “computer science Easter eggs”!

Frankfurt (Germany), February 2017
Dominic Hladek

Overview

The adventure before you will take you and your players on a journey through the world of analytical engines in *Space: 1889*, testing the latest German calculator on its maiden voyage through the Ether. In the first chapter, ‘**A calculated Assassination**’, the characters are invited by industrialist *Guido Henckel von Donnersmarck* to tour the *Silesian Analytical Engine Productions* (*Schlesische Analysemaschinen-Produktion*) facility, to attend the unveiling of the mainframe ‘Old Fritz’. This prototype is to be installed aboard an ether zeppelin to provide certain calculations and break the calculation speed record. This confident demonstration of scientific spirit and engineering ingenuity will

be interrupted, however, by an assassination attempt on the lead scientist *Margarete Henckel von Donnersmarck*, daughter of the host. It will be up to the player characters to save her. Initial clues will indicate that one of the programmers of the analytical engine must be behind the cowardly attack. The player characters will be asked to quickly and discreetly investigate this crime and will be able to identify and seize the perpetrator by following the clues.

In part two, ‘**Attack of the Ether Bugs!**’, the characters will be joining the test flight of the ether flyer along with several other guests of honor and will journey into the near-earth Ether. During an evening gala intended to coincide with the breaking of the calculation speed record by the analytical engine, a meteoroid will slam into the envelope of the zeppelin. Disaster is narrowly averted as the meteoroid gets lodged in the breach, but a swarm of strange ‘Ether Bugs’ pours into the engine rooms of the zeppelin and threatens to damage the calculator and fully disable the zeppelin. The player characters are called upon again to help and go bug hunting.

In part three, ‘**The Von Neumann in flames**’, the loss of flotation gas will force a premature reentry into the atmosphere. Just before the unplanned landing in New York, the meteoroid will tear free of the hull of the zeppelin, causing a complete loss of control. For a final time, the player characters are called upon to be the heroes of the hour and to evacuate as many people from the hydrogen-filled vessel as possible and assist in the emergency landing attempt.

During all these exciting events, the player characters will encounter several historical individuals—though they may have grown up to be somewhat different people in the world of *Space: 1889* compared to our real history.

The **Appendix** includes maps, player handouts and an article on the role of analytical engines in the world of *Space: 1889*, as well as additional rules for their use in the game. This information can be used in other adventures as well.



A Calculated Assassination

Introduction

The adventure begins with an invitation by industrialist Guido Henckel von Donnersmarck or his scientist daughter, Margarete, to come to Wroclaw. This Silesian metropolis has become a rapidly growing industrial hub by the end of the 19th century; with half a million inhabitants, it has even become the fifth largest city in the German Empire. Guido is the majority shareholder of the local Silesian Analytical Engine Productions company, and his daughter is the lead scientist on the mainframe project '*Ordination Fabricate OF 2001*'. Everyone calls the machine '*Old Fritz*', however, after the Prussian king Friedrich II, who made Silesia part of the Empire. It is soon to be installed on the ether zeppelin '*Von Neumann*' for a test flight, which is why Guido and Margarete are now inviting the press, financial backers, friends, and anyone of status to gather support for the project. And indeed, the papers are reporting eagerly on the ambitious plans by the company. The groundbreakingly fast machine is specially adapted for ether journeys in several key ways:

- It is carefully constructed for optimum operating speed in zero gravity
- It is supplied with motive power by the same solar boilers that also power the engines
- It requires a large amount of space, such as can be found in the envelope of a zeppelin
- It is ideally suited to provide navigational calculations as well as to predict dangerous ether turbulences

Schlesische Analysemaschinen-Produktion

Invitation

Dear Mr. / Mrs.

I would be delighted to welcome you to Wroclaw for the presentation of our innovative analytical engine '*Ordination Fabricate OF 2001*'. After a tour of our facilities we will take off on board the ether zeppelin '*Von Neumann*' into an upper Earth orbit to test the machine which is specially designed for operation in zero gravity. There, you will witness how '*Ordination Fabricate OF 2001*' will revolutionize modern ether travel.

Guido Henckel von Donnersmarck

Guido Henckel von Donnersmarck,
director general

Character Recommendations

Why the group or individual player characters will be invited can be tailored to their specific backgrounds.

Nations: Characters from countries other than Germany are still well suited, as Silesian Analytical Engine Productions are specifically attempting to gain international support for this project by inviting foreign press, investors and celebrities.

Archetypes: Suitable archetypes include:

- A Reporter should be impressed by the technological marvel and will write accordingly for his paper
- An Academic, scientist or technician could be invited as an expert witness or have been involved in the development
- A Moneyman could have financed the machine and might even be a business partner of Guido Henckel von Donnersmarck
- A Soldier could be an old friend of Guido Henckel von Donnersmarck back from the Franco-Germanic war or otherwise know him through military channels
- A Celebrity or famous explorer would likely receive an invitation simply for publicity's sake
- An Officer of the law might be present as an official representative or evaluator on behalf of the city of Wroclaw
- A player character might know Guido or Margarete personally, such as from school (e.g. a doctor or a missionary)
- All guests are bringing their own staff, which might also include one or more of the player characters

The arrival and introductions can be drawn out or kept short as desired. As a preview of the adventure's themes, attention could be drawn to the punch-card-operated steam organs, which have been placed all over Wroclaw's gothic inner city for the amusement of strolling pedestrians. Surrounding the inner city lie the brick and stone estates of the industrialists, and beyond that the homes and housing for the workers for the many smoke belching factories found further out beyond that, including a facility of Silesian Analytical Engine Productions. It is here that the characters will, after a deep and thorough security check, be greeted by Guido and Margarete. If you wish, you can also hand out the article on '*Analytical Engines Then and Now*' from the **Appendix** (p. 33) to your players to provide them with some background information on the subject.

The Wroclaw Dwarves (Artifact 1)

The inventor *Chajim Slominski*, an expert on clockwork and calculators, lives and works in a futuristically-styled complex east of the river Oder. His small mechanical dwarves are currently very popular as souvenirs or gifts for the children of privileged parents and he is swamped by orders.

The wind-up metal figurines are all uniquely crafted and can, depending on the model, walk for a few steps, swing their axes, play tinny music or perform other such functions. These dwarf figurines can be found all across the city. Plaques near each announce the address of Slominski's workshop. If a player character wishes to purchase such a dwarf, it will be ready by the time of departure of the ether zeppelin, and can be used as bait during the Debugging (see p. 20) and even take a few wild swings.

Weight: 10 kg, Cost: £ 15

Wroclaw Dwarf

Health: 4

Primary Attributes

Body: 2 **Charisma: 0**

Dexterity: 1 **Intelligence: 0**

Strength: 2 **Willpower: 1**

Secondary Attributes

Size: -2 **Initiative: 1**

Move: 3 **Defense: 5**

Perception: 1 **Stun: -**

Skills	Basis	Levels	Rating	(Average)
Athletics	2	1	3	(1+)
Stealth	1	2	3	(1+)

Weapons	Damage	Size	Attack	(Average)
Punch	0 N	+2	2 N	(1) N

The Hosts

Guido Henckel von Donnersmarck,
Industrialist

"He who has his thumb on the purse has the power."

— Otto von Bismarck

Background

Born in Wroclaw to an Upper Silesian family of large landowners in 1830, Guido von Donnersmarck is now one of the most

important industrialists of the German Empire. This good friend of Otto von Bismarck owns countless mines and factories and has some time ago bought a major share of *Silesian Analytical Engine Productions*. He now personally directs a facility.

During his time as town commander in Metz during the Franco-German war, he married the infamous courtesan Marquise *Blanca de Paiva*.

After the founding of the French "République démocratique et sociale" they left France. Shortly thereafter his wife gave birth to their daughter Margarete. In 1884, Blanca died without further children, and one year later Guido sired a bastard son, *Odo Deodatus*. In 1887, he married a Russian woman 30 years younger than him, *Katharina Slepzow*. She does not hold these two children from the previous marriage and affair in high regard. She tried in vain to marry Margarete off, but finally succeeded in getting rid of her and making her happy at the same time by convincing Guido to use his investments into Analytical Engines to secure a man's job for his daughter.

Roleplaying

Guido is a straight-minded, authoritarian and prideful Grand Burgher and is used to giving the orders. Due to his power, no one dares to disrespect him openly. He is quite full of himself, but loves his wife and children above all and will grant them any wish. He acts as a progressive and views himself as a patron of the sciences. He will act as the contact of the player characters, be it as a friend, a business partner, or employer. As long as the player characters perform well, he will grant any aid that is in his power to give, even using his wealth and connections. He has a strong, commanding voice and a firm hand shake.

Archetype: Industrialist

Motivation: Greed

Style: 4

Health: 8

Primary Attributes

Body: 3

Charisma: 5

Dexterity: 2

Intelligence: 4

Strength: 2

Willpower: 5

Secondary Attributes

Size: 0

Initiative: 6

Move: 4

Defense: 5

Perception: 9

Stun: 3

Skills

Skills	Base	Levels	Rating	(Average)
Academics (History)	4	2	6	(3)
Brawl	2	1	3	(1+)
Bureaucracy	4	2	6	(3)
Con	5	3	8	(4)
Con (Bluff)	5	4	9	(4+)
Diplomacy	5	4	5	(4+)
Firearms	2	3	5	(2+)
Firearms (Rifle)	2	4	6	(3)
Intimidation	5	2	7	(3+)

Margarete Henckel von Donnersmarck, Engineer

"I never am really satisfied that I understand anything; because, understand it well as I may, my comprehension can only be an infinitesimal fraction of all I want to understand about the many connections and relations which occur to me."

— Ada Lovelace, née Byron

Background

Born the daughter of industrialist Guido Henckel von Donnersmarck in 1871, Margarete was able to secure a position with Silesian Analytical Engine Productions thanks to the influence of her father and so realized her dream of working on her own analytical engines. Starting at an early age, she began to show more interest in her colorful abacus than in pretty dresses, much unlike her mother, and soon developed a passion for science and technology. She is a dedicated fan of Ada Lovelace. The daughter of the poet Lord Byron, who worked for Charles Babbage, inventor of the analytical engine, is considered to be the first programmer ever.

After the death of her mother when she was 13, her father Guido allowed her a lot of freedom, which she used to deepen her studies into technology and to disgust several governesses. When she was 16 and Guido remarried, the matter of finding her a husband became overdue, but she managed to drive away any and all suitors, nearly sending her barely older stepmother into flights of rage. Her stepmother's suggestion of 'letting the girl earn her own living then' was as sudden as it was unexpected, and soon her father had secured her a position with Silesian Analytical Engine Productions.

Roleplaying

In this world of men, Margarete must assert herself as the 'Mistress of the Gears', as she is referred to by some, on a daily basis. As a defense against male arrogance, she has developed a tough skin and frequently abrasive attitude, even though in apparel and mannerism she ends up presenting herself as more male and distant as well. The 'Mechanical Maid' as others call her behind her back, enjoys presenting men with proof of the gaps in their knowledge. But someone who would meet her beyond the common gender roles and who can prove themselves her equal in intellect might just discover the vulnerable core to her being, and quite possibly win her heart.

Margarete is an ally of the player characters. She is proactive and willing to help in any way she can. She always speaks with a challenging, sarcastic tone. One can never be quite sure whether she is joking or not.

Archetype: Inventor **Motivation:** Discovery

Style: 3 **Health:** 6

Primary Attributes

Body: 2 **Charisma:** 3

Dexterity: 2 **Intelligence:** 5

Strength: 1 **Willpower:** 4

Secondary Attributes

Size: 0 **Initiative:** 7

Move: 3 **Defense:** 4

Perception: 9

Stun: 2

Skills	Base	Levels	Rating	(Average)
Con	3	1	4	(2)
Con (Fast Talk)	3	1	5	(2+)
Craft (Mechanics)	5	4	9	(4+)
Empathy	5	2	7	(3+)
Intimidation	3	1	4	(2)
Linguistics	5	3	8	(4)
Linguistics (Codes)	5	3	9	(4+)
Science (Engineering)	5	4	9	(4+)

Talents

Intelligent, Tinker

Resources

-

Flaws

Reformer (Women's rights)

Weapons	Damage	Size	Attack	(Average)
Punch	0 N	0	0 N	(0) N

A Tour of the Facilities

"The Analytical Engine weaves algebraic patterns, just as the Jacquard loom weaves flowers and leaves."

— Ada Lovelace, née Byron

After the introductions, the player characters will be brought to a lounge by the facility director's office, where they will be offered refreshments. They will then have some time to chat with the two hosts as well as the other invited guests, in particular with the representatives of the press and the public. Afterwards, Margarete will be leading the assembled guests on the tour while her father remains in the office. On said tour, the group will for the first time meet some of the Clackers (see p. 10) at work with the analytical engines. The following stops will be featured in the tour:

Entrance Hall

This area features countless display cases with punch cards, gears of all sizes and other machine parts. A staircase leads up to the lounge and the director's office.

Margarete knows everything there is to know about the exhibits. She will explain the basics behind the punch cards and their function: The thousands of holes are a code that can be read by analytical engines and used to initiate specific calculations.

Lounge

The tour will begin and end with drinks on the upper floor of the facility. Padded furniture from the Middle East offers relaxation, the bar provides a range of spirits and a stove allows for the brewing of coffee or tea. A semicircular wall-sized window offers a view onto the park in front of the factory.

The 'butler' of the lounge is an attraction by itself, as he is a mechanical man of iron and brass, controlled by a stack of punch cards in its mouth, just like the Golem of Prague.

He is thus capable of even complex tasks such as brewing tea, and this will be demonstrated to the guests.



Office of the Facility Director

Adjacent to the lounge is the office from which Guido von Donnersmarck enjoys his commanding view of the work floor through another semicircular window. A secretary desk and a specially installed printer with stacks of continuous paper make up the main furniture of the room. There is a mechanical typewriter on the desk. The factory side wall features a pneumatic post terminal that is connected to the major points of the facility. A locked door leads to the punch card archives.

Archives

Here many filing cabinets hold the archived programs that have been replaced by updated versions. All cabinets are neatly labelled so that older versions can be retrieved quickly by time and date. Margarete will allow the guests a brief look around the office and the impressive archives while explaining the procedures by which outdated algorithms are archived.

Factory Hall

In this large, two story high hall, welding work is being conducted on several analytical engines. Roughly 50 workers are toiling in this factory to assemble these analytical engines and to test their functions. Besides the common handymen, the factory also employs numerous watchmakers in smaller workshops tasked with designing the finer components of the analytical engines.

Margarete will demonstrate the gear-dominated interior of the machines to the guests. She will request mathematical tasks of any desired complexity, which she or one of the Clackers will then stamp into a punch card to be fed into a machine. The naturally correct result will then be printed shortly after by a nearby continuous paper printer.

The 'Strongbox Vacuum Network'

The lines on the map mark the tubes of the pneumatic post system mounted on the walls and under the ceiling. Their primary function in the factory is to distribute the constantly redesigned punch cards amongst the Clackers as well as to provide the director with archive copies. As several Clackers will often work on the same program, a version control procedure is thus necessary, with outdated versions archived by the facility director.

Margarete will explain the function and importance of this pneumatic post system during the tour.

The system's terminals are located:

- In the facility director's office
- At a central point on the factory floor
- In the room of 'Old Fritz'
- In all Clacker parlors
- In the basement near one of the steam engines

Worker Lockers

The workers enter the factory floor through a small annex where their lockers are located. From there, the workers enter and exit through one door with a time stamp clock. During shift changes, this door is very busy; at all other times, the lockers are locked.

Steam Engine Rooms

The basement rooms hold the steam engines whose power is needed for the construction and operation of the analytical engines. The brick pillars of these cavernous rooms and the barometer glasses are black with soot, the brass of the machines is tarnished and everywhere there are piles of coal. The furnaces produce a tremendous amount of heat and glowing-hot tubes crisscross beneath the ceiling. The 20 workers down here deliver hard work indeed.

Margarete will only allow the group a short look into this area. She will explain the very high energy consumption of analytical engines. If queried on alternative energies such as electricity or Martian artifacts, she will request that such questions be left for later when the group is presented with 'Old Fritz'.

Clacker Parlors

Among the workers, 'Clackers' or 'programmers' hold special status. Their profession is a newly evolved mixture of labor and scientific work. They are required to possess great technical knowledge but also to deliver reliable, if not physically intensive, work. They are considered loners and are neither accepted in the crowds of the common laborers nor seen as qualified scientists by the lead developers. In this facility, the five Clackers, including Margarete herself, have each carved out their own little corner. Each Clacker parlor holds various shelves full of punch cards and punching tools, as well as a 'Strongbox Vacuum Network' terminal. More on the Clackers on page 10.

Thorleif's Parlor

Thorleif Hendriksson (page 10) calls a corner of the steam engine basement his home. Paintings of ships and blueprints of ship and analytical engines cover the walls, as well as a small altar to Mary, the mother of God. The floor is covered in various tools and there is no natural light down here. A specially installed electric light provides weak illumination. He is well used to cramped ships' bowels and loud engine rooms and selected this location himself. The workers consider him a weirdo, but they respect him and even consider him a comrade on account of his chummy demeanor.

Margarete's Parlor

Margarete von Donnersmarck (p. 7) has claimed a small room that adjoins to that of 'Old Fritz'. It is marked by a 'creative chaos' and is adorned by many personal items. A portrait of Ada Lovelace dominates the wall. The large windows admit plenty of

light and are a sign of the preferential treatment she receives from her father. A locked closet holds old, discarded punch cards, notes and files on the workings of 'Old Fritz', but no valuable secrets. No worker will enter the office of the director's daughter without instructions to do so, as his authority is feared.

Steven's Parlor

Steven Craft's (p. 12) bright and open glass parlor seems downright purist and lies between 'Old Fritz' and the factory hall. It is painted white, features almost no furniture, and is kept tidy. Here as well, the windows provide plenty of light. Steven insists on the importance of a 'creative atmosphere' for his work. The parlor features several (barely visible) wonders, such as a gramophone built into the wall that allows records to be switched through a hatch. Guests are often surprised by the music that seems to come from nowhere at first glance.

Djaraboon's Parlor

Djaraboon (p. 13) has placed his parlor on the factory floor in a small area that is now almost superstitiously avoided by the workers. It is adorned with Martian objects such as rugs, paintings, and technological artifacts. The sharp scent of spices hangs in the air, as Djaraboon even takes his meals here. It also appears to resemble a small Martian library: every nook and cranny is filled with punch cards, printouts, and manuscripts in a pattern that only Djaraboon himself can still make sense of.

Wilhelm's Parlor

Wilhelm Tore's (p. 11) is a neat corner of the factory floor where everything seems carefully catalogued and sorted. He does not tolerate untidiness or changes and is extremely pedantic. In his attempt to mimic Steven's parlor in design, he falls short, however. In particular, the windows, of which he is so proud, collect a lot of soot due to their location inside the factory floor, and also get stuck a lot due to flaws in the craftsmanship. On top of that, many of the amenities of the parlor are of inferior quality and in urgent need of repair. Almost every week (including today) workers will arrive to attempt to fix the windows and amenities, but no end to these efforts ever appears to be in sight.

'Old Fritz'

The demonstration of the mainframe—officially '*Ordination Fabricate OF 2001*'—is the high point of the tour. The room-sized, multi-ton calculator shines with polished brass and purrs and clicks impressively quietly in its test operations. The press officials present will immediately set up cameras and fire off magnesium flashes now that they are finally allowed a first glimpse at this new analytical engine. Margarete will report that 'Old Fritz' is currently only operating at very low capacity, but will show off its true potential once in the Ether. It is planned to exceed the current calculation speed record of 5,000 mathematical operations per minute by almost 1,500 operations (a bold claim that will draw many surprised gasps from the crowd).

The Assassination Attempt

"The half minute which we daily devote to the winding-up of our watches is an exertion of labor almost insensible; yet, by the aid of a few wheels, its effect is spread over the whole twenty-four hours."

— Charles Babbage

After thoroughly answering questions in front of 'Old Fritz' for a while, Guido von Donnersmark will eventually begin to shoo out the press. However, the player characters will be invited to the lounge for a lunch and following tea and drinks. While the now at ease and relieved hosts ask the player characters for their impressions and explain the planned test flight for the new analytical engine in more detail, the guests will again be served by the mechanical man. After the lunch course, Guido will take a stack of punch cards and insert them into the slot in the clockwork man's mouth. It will then proceed to prepare and serve tea to the player characters, one at a time. When it reaches Margarete, who is seated in her usual seat across from her father, it will drop the tea set and close its iron hands around her neck in an attempt to throttle her.

The Mechanical Man

Health: 11

Primary Attributes

Body: 6 **Charisma: 0**

Dexterity: 3 **Intelligence: 0**

Strength: 6 **Willpower: 5**

Secondary Attributes

Size: 0 **Initiative: 3**

Move: 9 **Defense: 9 (12)***

Perception: 5 **Stun: -**

Skill	Base	Levels	Rating	(Average)
Brawl	6	5	11	(5+)

Talents

Diehard, Dual Wield, Lethal Blow

Weapon	Rating	Size	Attack	(Average)
Punch/Choke	1 N	0	12 N	(5+) N

*The mechanical man has a metal skin that provides a +3 bonus to its Passive Defense

The player characters are sure to intervene. The mouth is now closed, so that the punch cards can only be removed with a *Strength* roll (Difficulty 4). The arms can only be pulled back with a *Strength* roll (Difficulty 5) after which they will attempt to reestablish their hold. Otherwise only the destruction of the mechanical man or a called shot to the arms will end his attempts.

Margarete will pale, try to breathe and try to fight back in vain, about to suffocate. The player characters should, in the end, be able to save her, however. Should another person sit in her chair for whatever reason, that person will be attacked in the manner described. In this case, the incorrect conclusion might be drawn that this person was the target.

The Criminal Case

After everyone calms down a little and Margarete's injuries have been seen to, Guido will conclude that this was an accident at first, but between the two of them

and the player characters, the realization should be reached that the punch cards directed the mechanical man to act this way. A change to these cards could, besides Margarete herself, have only been done by one of the Clackers in the facility. Guido will therefore ask the player characters to investigate this incident immediately, preferably before the end of the Clackers' shift.

The shift of the Clackers will last for just under another 7 hours. After 6 hours, Guido will be forced to call in the police and risk the project's good reputation with the investors. The available time for the investigation is thus strictly limited. Who among the following suspects is the actual murderer may be set as desired now. That

person will from now on be referred to as 'the perpetrator'. The clues need to be adjusted as required for the chosen perpetrator. After his failed attempt to kill the target, the perpetrator now attempts to remain undiscovered, to raise suspicions against his colleagues, to silence the 'nosy people' if need be or to obstruct their efforts, until he finishes his shift and can then escape.

The Suspects

"Be cautious around those who would be programmers by choice."

— Arthur Conan Doyle

Thorleif Hendriksson, Ship Mechanic

"Human nature is weak, the influence of environment is strong."

— Arthur Conan Doyle

What Really Happened

8:00 a.m.: The murderer begins his 12-hour shift, alongside the other Clackers.

9:30 a.m.: Arrival of the player characters and drinks in the lounge. The mechanical man operates by the original, correct punch cards.

10:00 a.m.: Beginning of the tour with Margarete, Guido remains in the director's office.

10:15 a.m.: The murderer steals a set of worker overalls from one of the lockers.

10:30 a.m.: The murderer sends—disguised as a worker in these overalls—a new set of punch cards for the tea preparation routine of the mechanical man to the director's office via the 'Strongbox Vacuum Network' with the intent of directing it to attack Margarete during the announced tea session.

10:45 a.m.: Guido switches the old punch cards for the new ones, as usual, not suspecting anything amiss.

11:45 a.m.: End of the public tour.

12:00 a.m.: Shared lunch for the player characters with Guido and Margarete in the lounge.

13:00 p.m.: The mechanical man serves the tea—programmed with the new batch of punch cards. The assassination attempt begins and it attempts to choke Margarete.

13:15 p.m.: The player characters are asked by Guido to investigate the matter and begin to do so.

19:30 p.m.: The police will be brought in, should the player characters have failed to apprehend the murderer by this time.

20:00 p.m.: End of shift for the Clackers; if the police have been called in, interrogations will begin and the murderer will be identified and arrested.

Background

This Norwegian man born in Bergen, Norway, in 1844 is an expert in ship mechanics and operations. He has accompanied several expeditions through the icy seas of the Arctic and Antarctic, and has thus become a determined survivor. The other Clackers know only a little about the taciturn giant, but there are stories about his most recent expedition, during which his ship got stuck in the ice for several months, while a number of crew members went missing or froze to death. After his return from that journey as one of the survivors, he took on a position in steam and analytical engine maintenance in the factory of Silesian Analytical Engine Productions and also learned programming.

The huge, quiet man does not talk about what occurred during that expedition, but the other Clackers are ready to believe the wildest, often indecent stories about him and have taken to calling him 'penguin eater' or even 'penguin lover'. He takes this in stride, for the truth is even worse. He had to turn to cannibalism to survive and eat the deceased expedition members. That is why he often takes to silently praying for forgiveness from the Lord,

which grants him some peace. He will never forgive himself, but will do anything to keep his secret from coming out.

Roleplaying

The tall and strong, blonde Thorleif with his moustache and ice-blue eyes says little and mostly wants to be left alone. He is as cooperative as required and indulges the demands of his superiors. Thorleif speaks slowly and with a northern accent. His strong shoulders are hunched and he moves slowly, but with the strength and certainty of a man who knows he needn't fear anyone physically. His voice has a broken, depleted tone.

Thorleif as the Perpetrator

While he does not have a grudge against Margarete and only dislikes her as far as the usual prejudice against women holding jobs goes, she did recently accidentally walk in on him praying. He suspects that she listened in and now sees proof of this assumption in her every action. In truth, Margarete heard nothing of importance and is unaware of any reason for him to kill her.

Archetype: Technician		Motivation: Atonement		
Style: 3		Health: 9		
Primary Attributes				
Body: 4		Charisma: 1		
Dexterity: 1		Intelligence: 3		
Strength: 4		Willpower: 3		
Secondary Attributes				
Size: 0		Initiative: 4		
Move: 5		Defense: 5		
Perception: 6		Stun: 4		
Skills	Base	Levels	Rating	(Average)
Athletics	4	1	5	(2+)
Brawl	4	1	5	(2+)
Craft (Mechanics)	3	4	7	(3+)
Intimidation	1	3	4	(2)
Melee	4	2	6	(3)
Science (Engineering)	3	1	4	(2)
Survival	3	3	6	(3)
Talents				
Robust, Tinker				
Resources				
-				
Flaws				
Secret (Cannibalism)				
Weapons	Rating	Size	Attack	(Average)
Punch	0 N	0	5 N	(2+) N
Cudgel	2 N	0	8N	(4)N

Wilhelm Tore, Technician

"Diligence is the toilet of the scholar."

— **Kurd LaBwitz**

Background

The young Wilhelm (born 1867 in Upper Silesia) is a 'wonder boy' amongst the Clackers. His mathematical and logical skills

are exceptional, which even back in his school years ensured perfect grades and scholarships from rich benefactors. Silesian Analytical Engine Productions fought tooth and nail to hire this talented Clacker for their prestigious 'Old Fritz' project. Then, on his first day at work, the young man fell madly in love with his superior, Margarete, and now continues to obsess, awkwardly and introvertedly, over this affection.

Roleplaying

Small and with a patched up set of brass-framed glasses, Wilhelm does not look very impressive, rather unremarkable in fact. When nervous, the shy Clacker easily stumbles over his words and sometimes stutters as well. The hygiene and neatness obsessed Wilhelm speaks in a rushed manner, with a very high and quiet voice. His hands are always moving and adjusting things, like his glasses, his shirt, or his charcoal pens. Only rarely does he look a conversation partner in the eye—usually he instead looks at his shoes.

Wilhelm as the Perpetrator

His obsession with Margarete—which she is unaware of—and his raging jealousy led him to decide that 'if he can't have her, no one can'. He viewed the reserved politeness of Margarete as constant rejection and humiliation and he let his obsession with her build up right until the assassination attempt.

Archetype: Technician		Motivation: Love		
Style: 3		Health: 4		
Primary Attributes				
Body: 2		Charisma: 2		
Dexterity: 2		Intelligence: 5		
Strength: 2		Willpower: 2		
Secondary Attributes				
Size: 0		Initiative: 7		
Move: 6		Defense: 7		
Perception: 7		Stun: 2		
Skills	Base	Levels	Rating	(Average)
Bureaucracy	5	1	6	(3)
Con	2	2	4	(2)
Investigation	5	1	6	(3)
Linguistics	5	3	8	(4)
Science	5	5	10	(5)
Stealth	2	3	5	(2+)
Talents				
Calculated Defense, Skill Mastery (Science), Swift				
Resources				
-				
Flaws				
Obsession (loves Margarete)				
Weapons	Rating	Size	Attack	(Average)
Punch	0 N	0	0 N	(0) N

Steven Craft, Scientist

"I would trade all of my technology for an afternoon with Socrates."

— Steven Craft

Background

Craft was born in Britain in 1852, and migrated to Germany with the help of family relations. His ambition and enthusiasm have carried him far, and he chose to study the new profession of Clacker, seeing it as a jump off point to an illustrious career.

Roleplaying

Steven views himself as a visionary and pioneer of science, as a philosopher and a universal scholar. To some this appears as enthusiasm, to others as arrogance. He tackles any task with his full effort and is a self-taught jack-of-all-trades. He speaks with charismatic and inspiring élan, always looks his conversation partner straight in the eye and likes to resort to gestures such as nods of agreement and shoulder patting.

Steven as the Perpetrator

Inside, Steven is furious that Margarete was given the lead on the 'Old Fritz' project instead of him. He is jealous and views himself as the clearly superior candidate, while Margarete has, in his mind, only achieved her position due to her relationship with her father Guido. He refuses to let this resentment show (Margarete is not aware of it), but now believes the time has come to take her place. He reprogrammed the mechanical man in the hope of becoming her successor.

Archetype: Scientist		Motivation: Fame		
Style: 3		Health: 4		
Primary Attributes				
Body: 1		Charisma: 4		
Dexterity: 2		Intelligence: 4		
Strength: 2		Willpower: 3		
Secondary Attributes				
Size: 0		Initiative: 6		
Move: 4		Defense: 3		
Perception: 7		Stun: 1		
Skills	Base	Levels	Rating	(Average)
Academics (Philosophy)	4	3	7	(3+)
Arts (Photography)	4	2	6	(3)
Con	4	1	5	(2+)
Diplomacy	4	3	7	(3+)
Firearms	4	2	6	(3)
Investigation	4	2	6	(3)
Linguistics	4	1	5	(2+)
Science (Physics)	4	4	8	(4)
Stealth	2	1	3	(1+)
Talents				
Bold Attack, Charismatic				
Resources				
-				
Flaws				
Overconfident				
Weapons	Rating	Size	Attack	(Average)
Punch	0 N	0	0 N	(0) N
Pocket Revolver	2 L	0	8 L	(4) L

Djaraboon, Martian Scholar

"There are limits to the human capacity for deception. Not so for the Martians."

— Arthur Conan Doyle

Background

Djaraboon is a Canal Martian from the German colony of Dioscuria, where he used to be an expert on ancient technology and artifacts and a high-ranking member of the 'Technicians Guild'. Because of his extensive knowledge of old Martian technology, he was selected by a human patron to be trained as a 'talented exotic' and, as a highest reward, brought to Earth to aid in technical issues. He has done so in service to Silesian Analytical Engine Productions for some years now and has quickly learned the art of punch card programming in that time, even though he claims that his Martian descendants used to have far more advanced methods of data entry.

Roleplaying

Djaraboon wears the usual leather apron and gloves, but otherwise is a strange sight to behold: He is a slim Martian with pointed ears and ochre yellow skin, large, open-toed shoes, a kaftan and a strangely wound turban as a symbol of his membership in the Technicians Guild. The workers in the factory avoid him, the other Clackers remain reserved. Djaraboon is used to this treatment from humans, however. He speaks slowly, methodically and comes across as a little bit devious. He carefully studies his conversation partners and is particularly polite and subservient to the representatives of the 'great human civilization'. He frequently uses strange and unknown gestures instead of human ones: opening the palm instead of nodding, a blowing out of the cheeks instead of a handshake and other strangeness.

Djaraboon as the Perpetrator

In secret, Djaraboon hates the humans as devious conquerors of his home planet who spit on his great culture and strip-mine the world for its technological treasures. His career and apparent subservience serve only to provide him the opportunity to sabotage the human projects and to reclaim the knowledge that he considers to have been stolen from ancient Martian sources. By murdering Margarete—who is unaware of his schemes—he sought to stop the 'Old Fritz' project, for an analytical engine that would make ether journeys even easier for the humans would surely be bad news for his people.

Archetype: Academic
Style: 3

Motivation: Revenge
Health: 4

Primary Attributes

Body: 2

Charisma: 3

Dexterity: 4

Intelligence: 4

Strength: 2

Willpower: 2

Secondary Attributes

Size: 0

Initiative: 8

Move: 6

Defense: 6

Perception: 6

Stun: 2

Skills	Base	Levels	Rating	(Average)
Academics (History)	4	4	8	(4)
Acrobatics	4	1	5	(2+)
Con	3	3	6	(3)
Empathy	4	1	5	(2+)
Larceny	4	2	6	(3)
Linguistics	4	1	5	(2+)
Melee	2	3	5	(2+)
Science (Engineering)	4	1	5	(2+)
Stealth	4	2	6	(3)

Talents

Agile

Resources

Artifact (Sleeping gas)*

Flaws

Underprivileged

Weapons	Attack	Size	Attack	(Average)
Punch	0 N	0	0 N	(0) N
Glass Dagger	3 L	0	8 L	(4) L**

*The sleeping gas will affect an area with a 5-meter radius and is inhaled as a poison with Toxin rating 3 and 3 N damage.

**The glass dagger reduces the armor bonus of the target by 2 points and if it injures the target, acts as a level 4 poison that prevents healing. 4 successes on daily rolls of Body x2 or the Medicine rating of the treating doctor are needed to overcome the poison. Bed rest will allow two rolls per day.

Searching for Clues

"I wish to God these calculations could be executed by steam!"

— Charles Babbage

In this section the clues that the player characters might find will be listed and detailed. The order is interchangeable. Whether these clues are found or not and when isn't set in stone. Even a failure of the investigations is possible, as is addressed in the paragraph **An Embarrassing Defeat?**. The individual clues generally reduce the number of valid suspects a little—by how much can be adjusted on the fly. Who the perpetrator is and where he sent the pneumatic post box from should be set from the start, however.

The Punch Cards

Finding the Punch Cards

The first clue is the 'reprogrammed' mechanical man which clearly proves that one of the Clackers must be the perpetrator, as only one of them would have the necessary skills. The perpetrator sent out a new set of punch cards for 'serving tea' via the pneumatic post system. The usual process is that the director takes the outdated version into the archive and puts the new version into immediate active use, which is exactly what happened. It is therefore possible to compare the current set of punch cards with those in the archive next to the director's office, which Guido filed away there appropriately. An *Investigation* roll (Difficulty 2) will quickly show that several cards have changed from one version to the next.

The Edited Command

For a detailed analysis, more comprehensive skill in the area is required, which might be provided by Margarete as well. A *Linguistics (Codes)* or *Science (Engineering)* roll (Difficulty 3) taking 1 hour divided by the number of successes (a failed attempt results in the hour passing, after which a retry is possible) will reveal that these cards mostly deal with the movement commands of the mechanical man, which changed the tea serving motion to a choking motion near a specific location (Margarete's chair). One of these cards, however, shows an unusual piece of code that initiates this behavior. The section of this special punch card can be found in the Appendix (p. 32). Several versions can be found there. Each one has a different name, stamped into the algorithm in the form of a series of holes, for the function that initiates the mechanical man's choking procedure. Depending on the identity of the perpetrator, one of these code words should be selected. They are:

- "Töten" (the German command 'Kill', and a word that most likely implicates Wilhelm as the only German Clacker on the team.)
- "Choke" (This is both English and Norwegian for choking or throttling, which would indicate Thorleif or Steven as the primary suspect; the Martians have a similar word in Koline: 'chook', meaning 'invader', which means even Djaraboon could be implicated.)
- "Drepe" (This is the Norwegian word for 'killing' as well as the Martian Koline word for 'gripping', which leaves only Djaraboon and Thorleif as suspects.)

The foreign words can be understood by a player character passing a *Linguistics* roll (Difficulty 1 for German, 2 for Norwegian, and 4 for Martian Koline), or are automatically known to characters specifically fluent in the relevant language. If the perpetrator is especially clever, he may have deliberately used a word in another language to point suspicion away from himself. This might have led to incorrect spelling, such as with the Martian word 'Chook'.

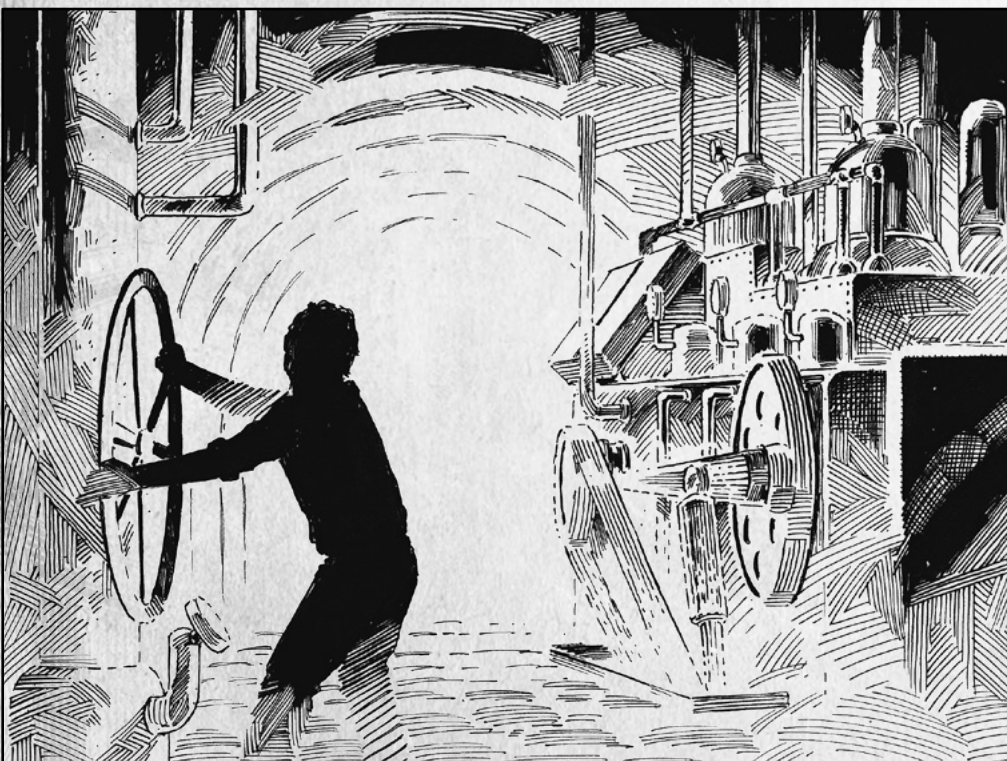
Coding of the punch card

Margarete can explain that the stamped holes in the punch cards are simple codes for numerical values (in the case of the mechanical man, vector graphs for his movements and similar data). The punch card with the function call, however, uses a coding technique that is unknown to her. Each succession of five holes / notches here represents a letter. As a decoding aid, there are several possibilities:

- *very easy*: The player characters find the complete code table (see p. 32), hidden in the Clacker parlor of the perpetrator (or deliberately left in the parlor of a scapegoat, but easily identified as planted evidence), with which it is easy to connect the five long groupings of stampings to letters. To make this path more difficult, the perpetrator might simply have thrown the table away, so that it now lies in the garbage or the basement.
- The player characters might also only find the abridged version of the table. The missing codes can be puzzled out at the gaming table (*medium*).
- *very difficult*: There is no code table. The player characters must decipher the code on their own.

Questioning

The player characters can question the Clackers and workers. As guests of the director, no one will turn them away, though the Clackers may take the opportunity to present themselves in a better light by twisting the truth and the workers might talk about all sorts of rumors, prejudices, and incorrect assumptions. The information from the background section of each suspect should be helpful, though they will likely be twisted, improved upon, or simply expanded on with untruths. *Diplomacy* rolls made by the player characters can improve the quality of the information depending on the number of rolled successes.



The Stolen Worker Overall

The workers near one of the pneumatic post terminals saw a Clacker send a box at about the pertinent time. This Clacker will have stolen a worker overall with a welding mask so as not to be recognized. This overall will be missing from the locker of a worker with similar physique (Thorleif is large and sturdy, Djaraboon tall and haggard, Steven average, and Wilhelm small and thin). The locker will have been broken open (Thorleif), had its lock picked (Djaraboon), or had its code lock cracked (Wilhelm or Steven). The overall can be found in the junk of the basement, in the parlor of

the perpetrator, or in the parlor of whoever the perpetrator chose to implicate.

The Pneumatic Post Box

It is possible to determine from which terminal the pneumatic post box was sent: In the office of the director, each box lands in an upright tube and rebounds up a little upon arrival. Guido von Donnersmarck has made it a hobby to mark how high these boxes jump and still remembers which mark represents the fatal box in question. There is indeed a correlation between the point of origin and the height of this leap. The visible markings on the transparent tube (*Investigation* roll, Difficulty 2) might give the player characters the idea. Either they or Margarete can decide to let 'Old Fritz' run the numbers and thus determine where the box came from.

Checking the Pneumatic Post Terminal

When investigating the pneumatic post terminal, partial footprints can be found in the sooty, dirty, or dusty floor (depending on the exact location). These can be spotted with an *Investigation* roll (Difficulty 2) and closely examined with an *Investigation* or *Survival (Tracking)* roll (Difficulty 3). The shape and size will indicate a possible perpetrator:

- Thorleif wears large and broad boots that will leave deep imprints.
- Wilhelm has small, dainty feet, and matching shoes.
- Steven's shoes are fairly normal and similar to those of Wilhelm, but the tracks are deeper as he walks more energetically and confidently.
- Djaraboon leaves very distinct shoe prints due to his Martian anatomy: the shape is somewhat reminiscent of a lizard because of the way the large toe pokes out sideways. His shoes are fairly large but the imprint won't be very deep due to his slight build.

The examination of the shoes can, depending on the successes rolled, point at one or more suspects. It is also possible that additional footprints from other Clackers or workers can be found. It is therefore possible to keep the net of suspects as wide or narrow as desired at this point.

Searching the Clacker Parlors

If the player characters chose to search the Clacker parlors, they can find, in addition to the items mentioned during **A Tour of the Facilities** (p. 7) further clues to the perpetrators identity: The worker overall that was worn during the sending of the pneumatic post box, the coding table for the punch cards or similar items. In addition, finger prints can be taken from all items for use in comparisons. Any and all clues might have been placed in a scapegoat's parlor by a clever perpetrator, though.

Finger Prints

This type of identification is still far from being an officially accepted standard in *Space: 1889*—and most player characters (including police officers) are unlikely to have heard of such a thing.

Even so, player characters may resort to this technique as the pneumatic post box should bear both the prints of Guido von Donnersmarck and those of the perpetrator. As the worker overalls include gloves, it could be that the perpetrator did not leave any prints. Otherwise, the prints can be collected in a variety of ways. For the pneumatic tube boxes, which are partially made of glass and plastic, charcoal powder is ideal (and can be found in vast quantities in the basement on the walls and steam engines), but other powders are suitable as well. On wood or paper (such as that of the punch cards), special chemicals are required. If in doubt, an *Investigation* roll (Difficulty dependent on the type of surface material) can settle the question.

Travel Time to Mercury

Action	approximate duration in minutes (per test)	
	manually	using 'Old Fritz'
Searching a Clacker parlor/pneumatic tube terminal/machine/location	each 15	—
Questioning a Clacker/worker	each 10	—
Spotting a general change in the new 'Tea' algorithm	10	—
Identification of the key functions of the new 'Tea' algorithm	60/successes	—
Decoding the 'Tea' punch card, using a full code table	15	5
As above, partial code table	30	15
As above, no code table at all	120	60
Calculating the correct pneumatic tube terminal	—	60
Collecting usable finger prints from an object	30	—
Comparing two persons' finger prints	30	10
Assessing a shoe print	10	—
Carefully analyzing a shoe print	—	60

'Old Fritz' can be tasked with comparing two collected prints (Margarete can suggest this), but a comparison by sight is also possible, if more time consuming.

'Old Fritz' as a Crime Fighter

Margarete usually strictly denies access to 'Old Fritz' to outsiders. In this particular situation, however, she will happily agree to ideas of a player character to use this calculation power for the investigation (and will suggest it herself, too, if need be). For tests, you should use the rules for the use of analytical engines (p. 36), treating 'Old Fritz' as an analytical engine prototype (Artifact 4). Possible types of tests and the durations of any and all such tests can be found in the following table.

The Solution

"Pray, Sir, if you put into the machine wrong figures, will the right answers come out?"

— Lord Bloomsworth, member of the House of Lords, Great Britain

Attack on the Investigators

When the player characters have collected sufficient clues to identify the perpetrator, they can apprehend him by any means desired. If the perpetrator learns of their progress ahead of time, through chatter or direct questioning, he will grow increasingly nervous. He might decide to obstruct or eliminate the player characters.

Djaraboon's Poison

The Martian uses vials of Martian sleeping gas that can knock out people in a room very quickly and which he can send via the pneumatic tube system. The sudden stop when arriving at the destination terminal will shatter the vial and the gas pressure will likewise force the tube post box open, so that the gas will spread. The gas works as a poison with a toxin level of 3 and 3N damage. As soon as the characters fall asleep or the commotion grows loud enough, he will attempt to flee and disappear. Djaraboon purchased the now broken vial from a local Wroclaw shop, it has no important features.

Thorleif's Attack

The Norwegian will send a worker or leave a mysterious message to attempt to lure the player characters into the basement. There he has prepared some of the steam pipes so that he can cause them to burst with only a mild pressure increase, which will pour scalding hot water and steam onto the player characters. A successful 'tragic accident' should give the investigators pause. The steam will cause 3 L damage.

Wilhelm's Trap

Wilhelm will arrange for an analytical engine on the factory floor to develop faults and then noisily begin the repair attempts. He will ask the player characters to assist him by holding some components in the machine's innards in place, and will then discreetly activate the engine. Treat the suddenly moving gears as a 5 L attack.

Steven's Deception

Steven will declare that he saw one of the player characters step aside during the tour and send a box via the pneumatic tubes. It will be statement against statement, so it will be necessary to use facts that only the perpetrator could know or contradict Steven's story to try and trick him into giving himself away. It is for example possible to gaud him into revealing that he knows the contents of the tube post box (i.e. a new code version). In particular, referring to the code as 'amateurish' or in some similarly disparaging way will enrage him and quite possibly drive him into revealing himself.

Alternatively, opposed *Diplomacy* rolls from Steven and the player characters might determine who Guido and Margarete will believe.

The End

A Bloody End


If the perpetrator is deliberately cornered and confronted with the proof, he might decide that the only way out is violence. In this case, there will be an immediate fight. The skill ratings and weapons of the perpetrator as well as some suggestions for combat tactics are included in the descriptions above. Whether the perpetrator will be killed or captured alive depends on the actions of the player characters.

A Classic Victorian Ending

Another option is to gather all suspects in one place, such as the lounge, and to use the classic tropes of Victorian crime stories of recounting the clues found in order in a manner that will leave everyone worried, until the perpetrator is finally named and the others present can immediately seize him without a fight. In this case, he should have a confession and a few last words for the 'meddlesome fools' before he is quietly handed over to the police. Even in this situation, the perpetrator might resort to hidden weapons or physical violence.

An Embarrassing Defeat?

It is entirely possible that the player characters will draw incorrect conclusions or fail to succeed within the limited timeframe, so that no certain identification of the perpetrator is possible. A disappointed Guido will then get all Clackers to stay in the factory



after the shift ends and call in the police. The police will then interrogate all Clackers and soon secure a confession, possibly based on evidence already gathered by the player characters. This will, however, reveal the incident to the public and ensure negative headlines even before the test flight. The second part of the

adventure will thus be far less glamorous, and critical opinions will be heard throughout the test flight.

Should the wrong Clacker be accused, the real perpetrator might optionally continue his plan later by conducting further sabotage.



Attack of the Ether Bugs

The Launch of the Zeppelin

"The purpose, to which we built this machine, is the calculation of nautical and astronomical tables."

— Ada Lovelace, née Byron

The Launch Festival

The day of the test flight has arrived. It can be set any time after the events of part one, ideally a few days or a week or two later. If the adventure needs to be split across several gaming sessions, this chapter break is an ideal time to call the first session to an end.

Wrocław's Etherport is situated in a meadow outside the city amidst fields, hills and forests. The launch will take place with great attention from the public. Many celebrities are expected to attend, and a festival is being held in the fields, featuring a marching band, fairground stalls and a merry-go-round. Many families will seize the opportunity for a picnic on the hills to watch the zeppelin launch and take off into the Ether. The press is already taking photo after photo of the ether flyer, onto which only invited guests are allowed. The player characters will have been invited as a reward for the aid they rendered in part one of the adventure. Again, this festival can be kept short or drawn out as desired. The flight plan is for a one day trip, during which the zeppelin will first rise up into the Ether, and then circle the globe during a soiree intended to coincide with 'Old Fritz' breaking the speed record of 5,000 calculations per minute. After one night aboard the vessel (the player characters will have been assigned luxury or standard class accommodations, depending on their performance in part one), the ether flyer is expected to descend back into the atmosphere above Wrocław for an afternoon landing.

Some of the Passengers

- *The von Donnersmarcks*: The player characters will already be familiar with Guido and his daughter Margarete, who will have traded her work suit for a dress in which she will appear significantly more feminine. A new acquaintance will be Guido's pre-school aged son *Odo Deodatus* as well as his 30 years younger wife *Katharina von Donnersmarck, née Slepzow*. More details on these two can be found on page 6.

- *The Clackers* (the three innocent ones). They will be working on the analytical engine on the engineering deck. Margarete will in fact call to them from the bridge even during the soiree to demand status reports. More details on them can be found on page 10.

- *Ether flyer Captain Udo von Kranewitz*, born 1845 in Hamburg. A sailor and captain, experienced in civilian and military seamanship, who now commands ether zeppelins. He speaks in a north German dialect and is a classic, responsible captain.

- *Concierge Johann Wessel*, born 1833 in Görlitz. He is the very proper, always polite 'kind soul' of the zeppelin. He will see to all needs of the guests.

- *Kurd Laßwitz*, born 1848 in Wrocław. He is a mathematics teacher and astronomical and philosophical author who is considered the face of German engineering literature ever since he published his short story anthology *Pictures of the Future*. He can dispense anecdotes on his current project, the novel *Two Planets*, which deals with the Martians, their ancient culture and a conflict with the British Empire that eventually leads to an invasion of Earth by the Martians.

- *Hans Dominik*, born 1872 in Zwickau. A studious protégé of Laßwitz on his way to becoming an author himself. His father is Laßwitz's publisher, and thus the man chose his star pupil to accompany him on this trip.

- *Mrs. Hildegard von Tatitz*, born 1810 in Opole. A Silesian Lady who has mastered the art of never interrupting others with questions or requests. Even in emergencies, she truly does not wish to 'be a nuisance to others'.

- The cavalry officer *Albert Freiherr von Richthofen* (born 1859) and his wife *Kunigunde* (born 1868) are aboard with their second son, *Manfred*. The toddler will someday become the famous ace fighter pilot 'Red Baron' and already appears impressed by flying machines. His parents sometimes tell him that 'when he's all grown up, he might also one day pilot one of these flying contraptions'.

- *Clara Immerwahr*, born 1870 in Wrocław. An admirer of Margarete's work. She will become the first German woman to earn a doctorate in chemistry. She is very curious, open minded, and a supporter of women's rights.

- *Georg von Caro*, born 1849 in Wrocław. An industrialist and business partner of Guido von Donnersmarck, who he has known since the Franco-German war.

- *Ferdinand Cohn*, born 1828 in Wrocław. A famous bacteriologist with many scientific awards, professor at the Wrocław University and director of its botanical museum. A pleasant, educated conversationalist.

- *Richard Pischel*, born 1848 in Wrocław. A linguist and expert on India and Mars. He speaks half a dozen Martian languages.

- *Therese Malten*, born 1853 in Insterburg. A mildly arrogant soprano from the Dresden Opera, famous across Europe in particular for her most recent performance as 'Kundry' in Wagner's 'Parsifal'. She is now researching for her role in Wagner's new 'Space Opera', in which she is set to play a Martian Amazon.

- In addition to the named guests there will be 6 representatives of the press on board, about 20 further invited guests including business partners of Guido and investors, as well as a dozen waiters and cooks, two dozen crewmen (mechanics and bridge crew) and three officers.

The Launch of the Zeppelin

To spice up the launch scene, here are some events that can be added to the story as needed:

- A brief moment of panic occurs when one of the steel cables doesn't properly detach on take-off. As it sits right outside one of the open windows, the player characters can assist in cutting it (using appropriate tools this is a *Strength* roll with a Difficulty of 2).

- During the ascent of the ether flyer, Mrs. von Tatitz is attempting to close a window. She is too shy to 'bother the crew

with such a minor issue'. The player characters can run across her and should help, as ascending too high with an open window is dangerous. This can be done with brute force (*Strength* roll with Difficulty 3) or through a combination of levers from the bridge, which even the captain could use some help with (*Craft (Mechanics)* roll with Difficulty 2).

- Odo Deodatus, Guido's young son, has decided to play hide and seek. His father is worried but must attend to other business. He will ask the player characters to find him. Odo has hidden himself in the kitchen's dumb waiter, which, as the kitchen staff will inform the player characters, reaches all the way up to the crew quarters in the envelope. Odo thus might have ended up in the dangerous engineering rooms.

- A technically apt player character will be asked by Margarete to help her with a problem with 'Old Fritz'. He or she can reach the envelope through an access port from the bridge and from there enter the engineering deck. The problem can be fixed with a *Craft (Mechanics)* roll (Difficulty 2) or a *Science (Engineering)* roll (Difficulty 4).

The Bug Hunt

"You wanted algebra, and now you shall have it over head and ears."

— Jules Verne

Introduction

Once the zeppelin has reached the Ether, there will be an unexpected incident. A meteoroid will strike the zeppelin—and from it, strange bug beings will swarm aboard and threaten the vessel.

The Soiree

"6.400 calculations ought to be enough for anyone."

— Guido Henckel von Donnersmarck

While the zeppelin will slowly rise from the atmosphere into the Ether, the guests will gather for the opening of the soiree. The highly skilled musicians will play Holst's 'The Planets', and the view of Earth is breathtaking. There is only a little time for chatting between the guests before Guido will officially begin the festivities. Events will take place roughly in this sequence (which can be adjusted to accommodate the actions of the player characters):

The Meteoroid Impact

While everyone is excitedly talking about the imminent new calculation speed record, while the kitchen is preparing an ice cream bombe and while champagne is being poured to celebrate the event, the 'Von Neumann' is suddenly struck hard (*Acrobatics (Balance)* roll, otherwise 3 N damage). The cabin is not hit, but a meteoroid is now lodged in the envelope. The bridge crew is desperately trying to get in touch with the engineering crew to find out what happened. It seems that the meteoroid is lodged firmly and only minimal amounts of gas are escaping. After this is established and the situation assessed, Guido, Captain von

Sequence of Events

09:00 a.m.: Begin of the launch site festival (see **The Launch Festival**)

15:00 p.m.: Launch of the 'Von Neumann'. Time for a few side events (see **The Launch of the Zeppelin**)

18:00 p.m.: The soiree begins. Champagne reception and dramatic unveiling of the calculation speed display (currently: 2,000 calculations per minute; see **The Soiree**)

18:30 p.m.: Dinner is served (3,000 calculations per minute)

20:00 p.m.: Dessert and after dinner drinks mark the end of dinner. Preparations begin for the breaking of the 'magic speed record' (4,000 calculations per minute)

20:15 p.m.: Meteoroid impact (4,500 calculations per minute; see **The Meteoroid Impact**)

20:30 p.m.: Reports of the ether bugs and subsequent bug hunt (calculations per minute will rise or fall depending on player character actions; see **The Hunt Is On, The Debugging, and Scenes on the Hunt**)

00:00 a.m.: End of the bug hunt (over 5,000 calculations per minute expected, and thus a new speed record)

00:30 a.m.: Unplanned atmospheric reentry (see **The Von Neumann in Flames – Reentry**)

02:00 a.m.: Emergency landing over New York (see **The Von Neumann in Flames – Crash Landing**)

Kranewitz, and the crew begin to try to calm the passengers. The worst is seemingly over, and order returns.

The Hunt Is On

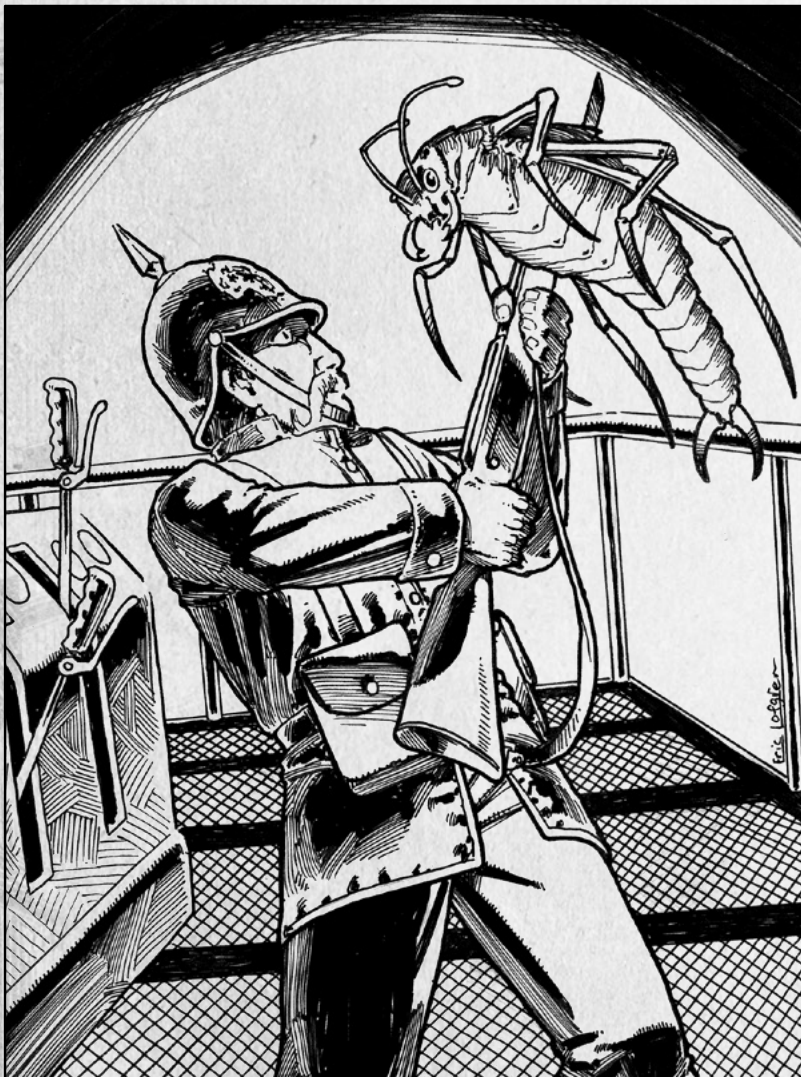
Wherever the characters are, shortly after the impact they will be discreetly asked to come to the bridge. Guido and Margarete will be present, but instead of explaining they will ask a crew member via speaking tube to repeat his report. The mate will say that bugs the size of cats crawled out of the meteoroid. They are very quick and immediately scuttled away to hide in the nooks and crannies of the zeppelin. He claims to have seen one dissolve a piece of metal with its mandibles. Then a call from 'Old Fritz' will come in: One of the Clackers reports the same bugs crawling into the mainframe. The first gears have already stopped and started to dissolve; the calculation speed is already dropping (well before reaching the 5,000 mark). Guido and the captain want to avoid a panic as this problem appears to be contained to the envelope, and need reliable, skilled people to hunt these bugs down. Guido will once again ask the player characters for aid. They are to climb up into the envelope, arm themselves in the vessel's armory, and join the crew in the bug hunt. While the breaking of the calculation speed record is important, the true danger behind these bugs is

the threat that their acidic mandibles present for the outer hull and the hydrogen containers. The entire zeppelin is threatened. Guido will appoint a suited player character (such as a soldier, explorer or big game hunter) to command this mission. That character is to assign the crew to search teams and direct their efforts. Regular progress reports on this 'debugging' are to be sent to the bridge using the speaking tube system.

The Debugging

How the player characters are going to proceed is up to the players. The search will begin in the crew quarters on the mainframe deck. Here eight crew members in red uniforms stand ready to aid in the search and to follow the commands of the player characters. They will first lead them to the armory to gear up. The three Clackers are standing ready near 'Old Fritz' and await the commands of the player characters as well.

The hunt can be played out as a free-form search of the envelope with bugs placed as desired. The unknown and hidden enemies should create a tense atmosphere: acid trails lead to places the bugs have been, clicks and hissing indicate their proximity, a bug might jump any player character at any moment, emerging from even the smallest crack.



Scenes on the Hunt

Here are a few scenes that could occur during the hunt. The chronological order isn't set in stone and greatly depends on where on the zeppelin the player characters are, but the drama of the encounters will increase from the discovery of the first traces of the bugs to ever larger threats to the final encounter with the brood mother.

The Missing Crew Member

When the player characters arrive, one crew member is already missing. He fell prey to the ether bugs. His corpse can be found, horrifically corroded, at the most inopportune moment or in the most unexpected place (such as the dining hall (M3) or the officer's mess (M4)), where the body will fall into the player characters' laps. Corrosive trails on the floor and walls allow the tracking of a bug—with a successful *Survival* roll (Difficulty 2): Enemy contact!

Running the Gear Gauntlet

The search will lead to a bug behind the gears in a shaft inside 'Old Fritz' (M7), where it can't easily be reached. A mad chase through the innards of the analytical engine begins between the bug and the crawling player characters in the shaft. Someone who knows what they're doing could (with a *Science (Engineering)* roll) lead the bug into a trap by beginning a specific calculation that will send a gear spinning to crush the bug.

The Fog Core

In the core of 'Old Fritz' (M7), fog is building up, caused by the many leaks from steam tubes caused by the corrosive bugs. Soon all sight will be blocked, and everywhere there are bugs that can only be detected with opposed *Perception* rolls against *Stealth*, in dim light (-2). If the bugs are not spotted, a player character will be surprised (**Core Rules**, p. 203), cannot act in the first turn of a bug attack, and will roll *Initiative* purely to perform reflexive actions and defenses. Be sure to create a threatening atmosphere for the hunt inside the core, such as by describing the continuous clicking of the bugs or the hissing of the acid. Let the bugs leap from anywhere, be it from cracks, acid burn holes, or crawling across the gears.

The Leak

The player characters will become witnesses to an ether bug 'gnawing' on an outer hull wall (such as in the corridors between the Haenlein nozzles and a cabin, or somewhere on the engine room floor). The acid will eat through the metal and threaten to cause a decompression. It's possible for the player

The Calculation Speed Put Into Rules

If you'd like the results to be discretely measurable, the following guidelines can help:

Potential Areas of Research

- The speed in calculations per minute will be at 4,500 at the beginning of the bug hunt.
- There are a total of 25 ether bugs on board (individually or in groups).
- 8 crew members and 3 Clackers stand ready to assist the player characters.
- **Every half hour**, each bug on board will reduce the calculation speed by 10 through its corrosive efforts.
- **Every half hour, each search team** may make an opposed roll of *Survival (Tracking)* or *Investigation (Search)* (in which case the Difficulty is 2) against the Stealth of the well-hidden bugs. The rules for Teamwork may be used here (**Core Rules**, p. 151). In these intervals, a number of bugs equal to the net amount of successes rolled are tracked down. Each destroyed bug will reduce the speed of the corrosion and thus also the loss of calculation speed. With the use of a metal Wroclaw Dwarf (see p. 6) as a well-suited bait, the roll gains 2 bonus dice.
- **Every half hour, each repairing player character** may make a *Craft (Mechanics)* or *Science (Engineering)* or *(Physics)* roll (the Difficulty of the Science rolls is 2), with **each success** raising the calculation speed again by 10.
- **Every half hour**, one leak will develop **per 500 lost calculations**, either in the outer hull or in the hydrogen tanks of the envelope.
- **Every half hour, each leak** will, on an even dice roll result, cause either a localized hydrogen explosion (3 L fire damage) or a decompression in one room/section (3 L damage per turn, space suits will protect against this).
- **Every half hour, each success** on an *Investigation* or *Science* roll to specifically search for leaks will find one leak.

Example

A big game hunter, a reporter, and the 8 crew members split into two groups, each led by a player character. In the first half hour, the big game hunter rolls *Survival* (Rating 8) in an opposed action against the *Stealth* of the bugs. For each assistant, he gains +2 (for a total of +8). He rolls 9 successes, the bugs roll only 4. His group therefore tracks down 5 bugs. The gamemaster decides that they trace 2 bugs to a maintenance shaft following their corrosive trails, where they will fight them. Afterwards, more trails lead to 'Old Fritz' where three more bugs are found inside the shaft of the analytical engine. These will also need to be fought.

The reporter is less fortunate: With a value of 5 he rolls only 5 successes, despite gaining +8 from his assistants. The Difficulty reduces these successes to 3. The bugs also rolled 5 successes on their *Stealth* roll, however, so the reporter's group does not find any bugs in this half hour. The gamemaster notes that 5 out of the 25 bugs have been destroyed and that 20 are left on board. This means that the calculation speed for this half hour will drop from 4,500 to 4,300, a drop of 200.

Meanwhile, all Clackers will be working to try and repair 'Old Fritz'. Thorleif has a *Craft (Mechanics)* rating of 7 and gains 3 successes, Steven also rolls 3 successes with his *Science (Physics)* rating of 8, but the Difficulty of 2 reduces these to 1. Finally, Djaraboon rolls *Science (Engineering)* (Rating 5) for 4 successes, i.e. 2 after adjusting for the Difficulty. The total of 6 successes increase the calculation by 60: $4,300 + 60 = 4,360$.

characters to stop the bug by killing it within 2 combat turns or by successfully using a combat maneuver to Grapple (**Core Rules**, p. 206) or Throw (**Core Rules**, p. 207) it, or by using some other means to get it away from the wall. Sectioned off rooms such as cabins can be sealed with the hatch, space suits can be found. An *Athletics* roll with a suitable Difficulty could decide, however, if this is done quickly enough. Otherwise the player characters might have to contend with 3 L damage per turn due to the sudden confrontation with the vacuum of space (see **Core Rules**, p. 216).

A bug could also use the same means to try to breach the hydrogen tanks, for example by biting a hole into the roof of the engine room (M) or near 'Old Fritz'. A loud hiss will announce the room filling up with hydrogen, so that even the smallest spark such as firing a gun or striking metal on metal can start a fire (**Core Rules**, p. 215).

The Steering Thruster

A bug has begun to devour a Haenlein nozzle (M5). While the player characters attempt to kill it, a surge protector is damaged by the corrosion causing the nozzle to fire randomly and the vessel will start to buck and shake. A repair requires 5 cumulative successes on a *Craft (Mechanics)* or *Science (Engineering)* roll (Difficulty 2). Until such a time, physical actions and combat maneuvers will suffer a -2 penalty and sudden strange effects may occur, such as a slanting of the entire ether zeppelin or a jolt that will knock the player characters off their feet, unless they succeed on an *Athletics* roll (Difficulty 2).

The Dead Officer

The player characters find a dead body lying on the table of the officers' mess (M4). He fled onto the table but was then grabbed through a hole etched into the table's surface, pulled down and killed. The body is covered in blood and any help will be too late. Or does he roll over one last time, grab one of the player characters and shout one last warning of 'Run, gentlemen, run!' before fading away? The bug, in the meantime, has begun eating the poor officer from underneath the table. When our heroes arrive, they might encounter the bug violently bursting upwards through the chest or stomach of the officer before attacking. Those who witness this gruesome act must succeed on a *Willpower* x2 roll to avoid throwing up or otherwise being unable to act out of shock for the first 2 combat turns.

The Bug in Space

It is possible for the bugs to reach the gondola. This is possible in particular if they manage to eat a hole into the outer hull (see **The Leak**) and crawl out through it to proceed along the outside of the vessel. The player characters or suddenly screaming guests might then spot these bugs on the outside of a porthole or, more dramatically, on the big window of the lounge (G5). The tapping sounds of bug steps on the outer hull of the gondola can probably be heard quite some time before then. It would be even more dangerous if the bugs were to break through here, as eating through this window would cause a decompression that would be much more dangerous to the passengers. This can only be prevented by suiting up with space suits (such as from the bridge (A1) or the storage room (M2)) and attacking them outside the ship. To get out there, a hatch must be opened, which can be done in the engineering room (M) or the entrance hall (G1), though the latter should be most thoroughly sealed and evacuated first.

The Roach in the Bath

Another possible way for the bugs to get into the gondola is through pipes such as the engine room (M) drainage pipes. A passenger (for example Mrs. Tatitz) will contact a crew member to report an 'unusually large cockroach' in the bath in her cabin. The characters might be called in to deal with this, at which point they may just spin a tale to keep the rumors from flying and prevent a panic (*Con* roll). But then ever more bugs will crawl into ever more baths. As per German tradition, the passengers will begin to complain. They will then badger the rather busy staff to ask for their money back due to the 'insect plague', will demand to speak to the captain, or otherwise get in the way and blockade important rooms that the player characters really need to get into. Before too long, they will begin to suffer bug attacks and realize—apart from a few lost causes—just in how much danger they really are. With umbrellas and canes, they will then begin to chase around the bugs all over the gondola.

Cockroach in the Kitchen!

The dumb waiter is another path by which the bugs can enter the gondola. In between hot oil, steam and too much staff trying to work in too little space, the bugs suddenly start crawling under the tables, over hot stoves, swim through the fryer fat, or jump

onto meal plates or even the ice cream bombe, which the head chef is desperately trying to save. Panic threatens to spread and the kitchen must first be evacuated as quickly as possible (and as quietly as possible too, if the captain has any say on the matter), before the player characters can effectively engage the bugs in here.

The Dwarfen Hero of Wroclaw

Even if none of the player characters acquired one of these figurines in Wroclaw, at least one of the guests will have. The dwarf will have been wound up and now stomps noisily through the gondola (G) of the Ether Zeppelin. When a few bugs appear, they will carefully and curiously examine this apparatus, unsure as to whether it presents a threat or not. If the player characters attack at this point, they will have *Surprise* on their side. Additionally, they may realize that the dwarf makes the perfect bait and distraction as it truly seems to fascinate the bugs for some unknown reason. The dwarf might even swing its metal axe into the head of one of the bugs. Though this will be a freak accident, it will still deal damage.

Under the Green Fairy's Spell

A group of Ladies will gather in one of the smaller lounges (G3) to enjoy a bottle of absinth. When the ether bugs emerge into the room, they will dismiss the apparitions as visions of the 'green fairy', the absinth, and ignore the suspected hallucinations. This continues until one of the Ladies mistakes one of the bugs for her friend's pug 'Hasso' and tries to pet, feed, and leash it—unaware that poor Hasso has already been sliced apart by bug mandibles and that she is offering herself as the next victim. It will take some convincing (*Diplomacy* or *Empathy*, Difficulty 2) to get the ladies to grasp the full extent of the situation. The real challenge, however, will be to prevent a panic when they finally accept the truth (Difficulty 4). In case of failure, the screaming of the ladies will cause the bugs to attack immediately.

Hurry, We've Got a Record to Break!

Guido Henckel von Donnersmarck or another investor might lose all sense of proportion in light of this threat. He will ignore the panic around him and obsess over the calculation speed indicator of 'Old Fritz'. For more on the rate of climb of the calculation speed see **The Calculation Speed Put Into Rules** (p. 21). He won't even notice that a big, ugly bug is sneaking up on him while everyone else has already fled the room. The unfortunate man needs to be rescued and helped back into the here and now with a bottle of strong rum.

Mechanical Maid in Distress

For the finale, it seems fitting that Margarete herself might come under the direct threat of the bug brood mother or a group of bug drones. Maybe she risks a climb into the envelope to help with the repairs on 'Old Fritz' (M7) despite her father's commands, maybe she will follow her favorite player character to aid in the debugging, or maybe the bugs will reach the gondola (G) and attack her there. Either way, a piercing scream will let the player characters know that Margarete has fallen into the hands of the fiendish ether bugs.

The Nest

The ether bug brood mother will seek out a warm place such as the solar boilers (M6) or the botanical garden in the gondola (G6) to lay her eggs. This will be the site of the final confrontation between the brood mother and the player characters. She will fiercely defend her nest and attack any human in sight. Several bugs will assist her in this and attack from the surrounding plants. They will leap from shrubbery, tree branches or from between palm trees, or they will dig into flower pots or otherwise use the environment to their advantage.

The Participants

Ether Bugs

These cat to dog sized, black, exoskeletal bugs are very tough insects that originate from the asteroid belt. They can exist in atmosphere and ether alike and are fully acclimatized to both gravity and zero-gravity. They resemble scarab beetles, though their mandibles are larger and secrete an acid that can eat through metal, as well as through humans. This corroded metal is their primary nourishment, which is why they view the zeppelin as a feast.

Animal Companion 2

Archetype: Insect Health: 5

Primary Attributes

Body: 3 Charisma: 0
Dexterity: 4 Intelligence: 1
Strength: 2 Willpower: 3

Secondary Attributes

Size: -1 Initiative: 4
Move: 6 Defense: 7 (8)*
Perception: 4 Stun: 3

Skills	Base	Levels	Rating	(Average)
Brawl	2	3	5	(2+)
Stealth	4	3	8**	(4)
Survival	1	3	4	(2)

Talents

Gravity Experience 4, Skill Aptitude (Brawl +2),

Weapons	Rating	Size	Attack	(Average)
Bite	0 L	-1	5 L	(2+) L***

*The chitinous exoskeleton grants the ether bug a +1 bonus to its passive defense

**The ether bug gains a +1 Size bonus for Stealth rolls

***The acid of the ether bugs works in the same way as caustic damage (Core Rules, p. 215)

Ether Bug Brood Mother

This particularly large and tough specimen is almost human-sized and as a result even more dangerous. As it is a brood mother, it is also far more aggressive and less picky in its choice of food than other ether bugs, and will even eat humans. There will be at most 1-3 of these specimens on board. They prefer warm areas and will seek out warm, secluded hiding spots to lay their eggs.

Animal Companion 3

Archetype: Insect Health: 8

Primary Attributes

Body: 6 Charisma: 0
Dexterity: 3 Intelligence: 1
Strength: 4 Willpower: 4

Secondary Attributes

Size: 0 Initiative: 4
Move: 7 Defense: 9 (11)*
Perception: 5 Stun: 6

Skills	Base	Levels	Rating	(Average)
Brawl	4	4	10	(5)
Stealth	3	2	5	(2+)
Survival	1	5	6	(3)

Talents

Gravity Experience 4, Skill Aptitude (Brawl +2)

Weapons	Rating	Size	Attack	(Average)
Bite	1 L	0	11 L	(5+) L**

*The chitinous exoskeleton grants the ether bug brood mother a +2 bonus to its passive defense

**The acid of the ether bugs works in the same way as caustic damage (Core Rules, p. 215)

Crew Member of the 'Von Neumann'

Archetype: Soldier Motivation: Survival

Style: 1 Health: 4

Primary Attributes

Body: 3 Charisma: 1
Dexterity: 3 Intelligence: 2
Strength: 3 Willpower: 1

Secondary Attributes

Size: 0 Initiative: 5
Move: 6 Defense: 6
Perception: 3 Stun: 3

Skills	Base	Levels	Rating	(Average)
Brawl	3	2	5	(2+)
Craft (Mechanics)	2	2	4	(2)
Firearms	3	2	5	(2+)
Gunnery	2	1	3	(1+)
Investigation	2	1	3	(1+)
Melee	3	1	4	(2)
Stealth	3	1	4	(2)
Survival	3	2	5	(2+)

Talents

Gravity Experience 1

Weapons	Rating	Size	Attack	(Average)
Punch	0 N	0	5 N	(2+) N
Revolver	3 L	0	8 L	(4) L
.22 Repeating Rifle	2 L	0	7 L	(3+) L
12-gauge Shotgun	3 L	0	8 L	(4) L
Boat Hook	3 L	0	7 L	(3+) L

Passenger

Archetype: Survivor Motivation: Survival

Style: 1 Health: 4

Primary Attributes

Body: 2 Charisma: 3
Dexterity: 2 Intelligence: 2
Strength: 2 Willpower: 1

Secondary Attributes

Size: 0	Initiative: 4			
Move: 4	Defense: 4			
Perception: 3	Stun: 2			
Skills	Base	Levels	Rating	(Average)
Athletics	2	2	4	(2)
Brawl	2	1	3	(1+)
Diplomacy	3	2	5	(2+)
Empathy	2	1	3	(1+)
Investigation	2	1	3	(1+)
Medicine	2	2	4	(2)
Stealth	2	1	3	(1+)
Talents				
Lucky 1				
Weapons	Rating	Size	Attack	(Average)
Punch	0 N	0	3 N	(1+) N

The Ether Zeppelin 'Von Neumann'

"Anything one man can imagine, other men can make real."

— Jules Verne

The ether flyer consists of two main sections: the much larger, hydrogen-filled envelope, which holds the engine room, including 'Old Fritz', and the crew quarters, and the smaller gondola where the passengers are quartered. There are several shafts that connect the two sections. These are usually only used by the crew; the passengers will remain in the gondola.

Gondola (G)

The lower of the two gondola floors mostly holds the cabins of the passengers, while the upper floor offers the most luxurious cabins as well as many means of whiling the hours on board away. The floors of the cabins and hallways are laid with fine carpets.

Entrance Hall (G1)

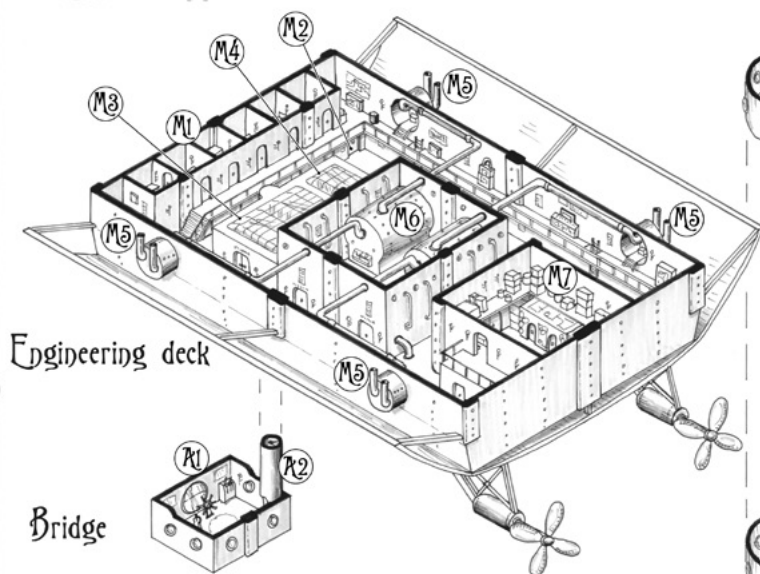
This classically designed room is where the passengers will first board the zeppelin. The reception is where cabins are assigned, which will either be located upstairs and accessible via the grand staircase (first class), or on the lower floor (third class). Bellhops will carry the luggage. Additionally, the hall offers a deck plan of the gondola floors and arm chairs to read newspapers in. The concierge Johann and his staff will attend to the needs of the passengers around the clock.

Cabins and Bathrooms (G2)

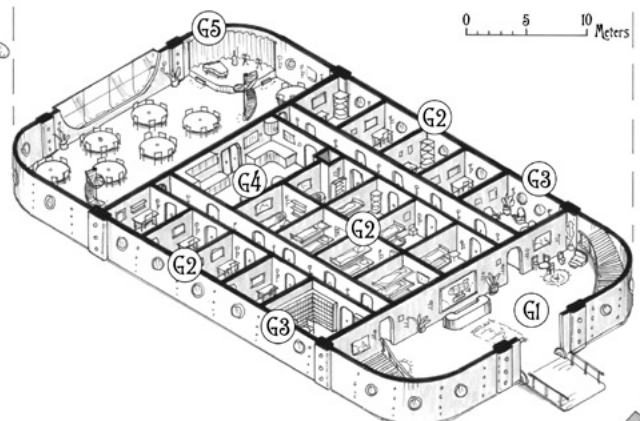
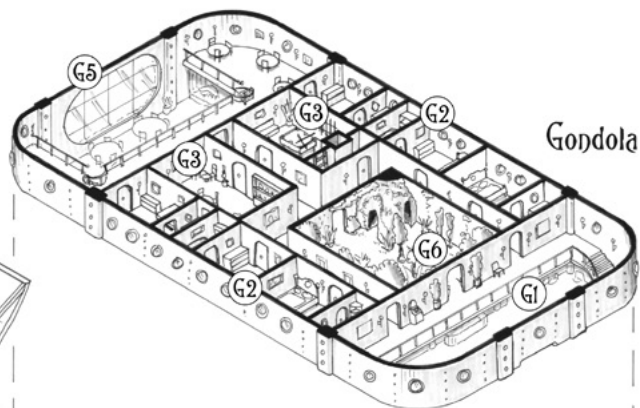
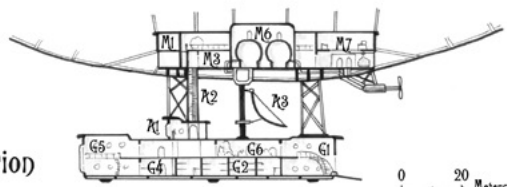
The simple cabins on the lower floor feature fold-out bunk beds and tables. They offer room for 2 to 10 people each. The cabins on the upper floor meanwhile are equipped with luxurious, tasteful and partially magnetic furniture and amenities. They offer more room and even include individual bathrooms. The lower floor passengers have to share public restrooms.

The bathrooms are equipped with vacuum-operated drainage systems which will deposit all waste out the back of the zeppelin into the Ether. This will allow the ether bugs to enter the gondola from the outside.

Ether Zeppelin 'Von Neumann'



Cross section



Small Lounges (G3)

A number of small rooms are available to enjoy a cognac, cigar or pipe, or to have a game at the magnetic pool table or read one of the books from the well-stocked shelves. Casual conversation on business and politics are also common. While most of the lounges are reserved for the men, one lady's lounge offers a bulbous water bottle with a tap at the bottom, suitable for thinning the drink ever popular with the ladies: absinth.

Kitchen (G4)

This is where all food aboard the zeppelin is prepared. The majority of the 20-strong crew is always at work in here. The modern kitchen features a dumb waiter into the envelope of the zeppelin where the crew eats their meals (room M3). Living beings of Size 0 and smaller can use it, which means that the ether bugs can reach the gondola through here, but also that the player characters can climb through it.

The Great Lounge (G5)

The spacious lounge and restaurant at the front of the zeppelin features a large panoramic window. This is where the social life aboard takes place and where today the soiree is being held.

Waiters will serve champagne and snacks, a highly skilled quartet will be playing classical and modern (for the time) music, countless conversations will take place. Above the panoramic window sits a brass number display, reminiscent of a pressure gauge. This is where the current calculation speed of 'Old Fritz' will be displayed. The upper section of the great lounge features a gallery on three walls (the panoramic window makes four). A set of stairs leads down along each side of the room. Here as well there will be excited conversation and champagne during the soiree. The view is even more impressive from up here. A ladder nearby in a corridor leads to a hatch to the bridge.

Botanical Garden (G6)

A botanical garden is required on board to produce the necessary oxygen. It is of course filled with many exotic plants (including many from Venus) and styled to inviting strolls, even featuring an artificial grotto and riverbank. Many visitors enjoy spending their time here.

Superstructure

The superstructure between the gondola and the envelope features several systems required for navigation, which can be monitored and controlled from the bridge.

Bridge (A1)

This is where Captain Udo von Kranewitz and his officers steer the ether flyer. The steering wheel and instruments dominate the room above the lounge. A speaking tube allows for acoustic

communication with the engine room, the cargo hold, and the Haenlein nozzles, so that orders and confirmations can be passed through them. A hatch in the floor leads into the gondola, near the great lounge. Two vacuum suits are stored here along with some other gear.

Shaft (A2)

A hatch in the roof leads to a shaft with metal ladder rungs that allows the crew access into the envelope.

Solar Sail (A3)

The solar sail can be turned around an axis and angled via controls on the bridge. It directs heat into the engine room directly above the bridge. If the Sun is located directly above the zeppelin, the sail cannot collect any solar rays, otherwise it functions from any angle.

Engine Room (M)

This entire deck holds the engines of the zeppelin and 'Old Fritz'. Unlike the gondola, it is fully inside the envelope of the zeppelin and is connected to the gondola by a shaft, the dumb waiter, and several smaller connections only accessible to beings of Size -1 and smaller. The cabins and corridors are barren and metallic, covered in pressure gauges, equipment, gears, and piping.

As soon as the celestial body has slammed into the 'Von Neumann', the ether bugs will pour forth into the ether flyer from it. The meteoroid will cause some damage, but get lodged and provide a stable seal somewhere between the engine room and the hydrogen-filled envelope. The hollow rock will contain remnants of egg-like cocoons and traces of the bugs' acid.

Crew Quarters (M)

This is where the crew (including kitchen staff, concierges, waiters as well as the technicians working in the envelope) sleeps in modest conditions, and currently also the Clackers. The cabins fill two entire floors, along with communal showers and toilets. The captain and the bridge officers have individual cabins near the officers' mess. One of these cabins may hold a vacuum suit.

Storage Room (M2)

In addition to all sorts of repair tools, 5 vacuum suits, and 10 pairs of magnetic boots, this is also where the weapons for defending the ship are stored. The selection includes several revolvers (such as the Webley Mk I) and a half dozen each of .22 repeating rifles and 12 gauge shotguns (**Core Rules**, p. 223) in various locked cabinets, with a few hundred rounds of standard ammunition.

Dining Hall (M3)

This large dining hall is supplied through the dumb waiter. The long tables, simple wooden chairs, and brass cutlery give it a very impersonal look.

Officers' Mess (M4)

The officers' mess adjacent to the dining hall is where the captain and the bridge crew take their meals. It is more comfortable, featuring fine wood paneling and a small selection of spirits.

Haenlein Nozzles (M5)

These four steam jets steer the ether flyer during maneuvers near celestial bodies and inside atmospheres. Each has a speaking tube nearby, allowing the crew to receive instructions from the bridge.

Main Engine (M6)

This room filled with machinery is where the ether drive (inactive for this flight) and the solar boilers that supply 'Old Fritz' with power are located. The boilers are heated via mirrors attached to the roof of the gondola. The space around them is very hot and humid. The steam is conducted via pipes to the two ether propel-

lers at the rear of the engine room as well as to the four Haenlein nozzles. A speaking tube allows for communication with the bridge.

Cargo Hold (M7)

This large space is usually used for storage of cargo and supplies, but was reconfigured for this flight to house 'Old Fritz'. The bolted-down analytical engine takes up most of the hold's space. Shafts inside the machine lead to the core where the central control station for the gears is located. This room has a steamy atmosphere and is only illuminated by a little electrical light. It is particularly dim inside the calculator. The important gears and clockworks are constantly clicking and humming. They snap together with lightning speed, but only zero gravity will allow them to reach the speeds necessary to break the current calculation speed record.

A large cargo lift at the rear of the ether flyer is kept fully sealed during every flight. This is how 'Old Fritz' was loaded on board. A few levers allow for this hatch to be opened. Mechanisms are in place to block this during flight, but can be circumvented with a *Craft (Mechanics)* roll (Difficulty 3). A speaking tube allows for communication with the bridge.



The 'Von Neumann' in Flames

"I firmly believe that if you show people the issue and the solution, they will act upon this knowledge."

— Captain Udo von Kranewitz

Atmospheric Reentry

As soon as the threat of the bugs is dealt with, Guido and the captain will decide to immediately begin the atmospheric reentry. This reentry will be successful, but the meteoroid will dislodge from the zeppelin's skin. Hydrogen now freely flows from the hole in the envelope and the captain will rush to begin landing preparations. As the trip through the Ether did not last for the planned 24 hours and the Earth hasn't turned 'all the way around' yet, the reentry will not occur above Wroclaw but instead near the east coast of the USA. The nearest etherport is in New York, near the New York World Building of the newspaper of the same name, which with its height of nearly 100 meters is one of the tallest buildings in the world. Even during its construction, the tall dome at its top served as a sightseeing attraction and as a 'tower' from which incoming ether flyers were directed to their landing fields in front of the building using flag signals. The escaping hydrogen is not only a fire hazard but also interferes with the ves-

sel's controls. Once again, the player characters will be asked for assistance, either to take control of one of the Haenlein nozzles during the **emergency landing**, by organizing an **evacuation**, or both—depending on the skill sets of the player characters. These tasks occur simultaneously, even if they are described in sequence. Their respective steps are roughly concurrent.

Alternative Landing Sites

If you desire, the crash landing can occur anywhere in the world—possibly as a transition into your next adventure: It could happen in the Amazon delta, along a railroad track in the Wild West, in the depths of the African jungle where the survivors might be worshipped as 'gods that fell from the heavens', in the Himalayas or wherever else you can think of. The following emergency landing can easily be adjusted to occur anywhere on Earth.

The Emergency Landing

Landing the Zeppelin

To ensure the crash landing is exciting and dangerous, consider adding the following events and setbacks.

1) Between the New York World Building and the Brooklyn Bridge

In this phase of the descent it is important to stay a course that's not too steep and moves away from the streets of the city. The New York World Building is located at 99 Park Row, on the southern end of Manhattan. Between this building and the towering Brooklyn Bridge lies a landing field for ether flyers, though landing here is difficult at the best of times. The captain will have the helm by default, though if one of the player characters has the *Pilot* (*Ether flyer*, *Aerial flyer*, or *Airship*) Skill, feel free to incapacitate or injure the captain during the bug hunt by some means so that the player character will be forced to take over. Regardless, the characters might well be put in charge of steering if they take control of the Haenlein nozzles.

Wind and steering problems will ensure that the zeppelin, if not too far off course, will drift either towards the bridge or the skyscraper. Only coordinated activations of the Haenlein nozzles (using the speaking tubes) can prevent a collision. Failure in this will cause the zeppelin to list dangerously, which might lead to passengers falling out of the hatch in the entrance hall (G1) or being crushed by shifting furniture. Even the player characters



might suffer such consequences. One or more player characters sliding out the entrance hatch and being rescued at the last second by a friend making an *Athletics* roll would be a classic moment.

Difficulty: 0-1

2) Haenlein Nozzle Failure

As if things weren't bad enough, one of the nozzles fails—possibly as a delayed result of the damage caused by the bugs. The ether flyer will drift off course. Again, precise coordination will be required to avoid a collision as the zeppelin is now flying quite low. There will be little time for repairs (only possible with a *Craft (Mechanics)* roll at a -4 penalty). A player character controlling the failing nozzle can relocate to another one and continue to try to steer the vessel from there.

Difficulty: 1-2

The Landing Put Into Rules

By the rules, the above events are each accompanied by *Pilot (Ether flyers, Aerial flyers or Airship)* rolls, with each difficulty depending on the specific threat. Whenever the crew needs to be coordinated, an additional *Diplomacy (Leadership)* or *Intimidation (Orders)* roll should be made at the same difficulty to determine how effectively they work together. These rolls can be made once for the whole crew or once per person controlling a Haenlein nozzle. As a ground rule, each event should call for an extended action to reach a certain number of successes (for the Haenlein nozzles always between 5 and 10). If one or more of the nozzles fail or fall behind in this, negative consequences should occur with a severity based on the difficulty. Such consequences might be damage to the zeppelin, injuries, or even deaths on board. Even an immediate crash could be possible, which would make an evacuation impossible. The player characters could suffer damage rolls.

3) Explosion in the Envelope

Explosions start rocking the zeppelin. Besides seeing to the injured, immediate and decisive action is required at the Haenlein nozzle control stations to correct the resulting course shift.

Difficulty: 2-3

4) Altitude Loss

The zeppelin starts losing too much hydrogen, accelerating its descent. Apart from using the nozzles to counteract this, casting

off excess weight could also help—weight such as the multi-ton 'Old Fritz', which was already damaged in the explosions and bug misadventures, and which is already threatening to come off its moorings anyway, though an *Athletics* roll is required to fully undo them. If the cargo doors are opened and a maneuver is coordinated with the captain, the big machine can be made to slide right out of the ship. This will require another maneuvering adjustment from the Haenlein nozzles to compensate for the sudden shift in balance. Margarete and the Clackers will need to be convinced of the absolute necessity of this action.

Difficulty: 3-4

5) Hydrogen Ignition

Finally, the hydrogen will ignite all across the envelope. This should not occur before the evacuation of the crew, as it will rapidly set the entire zeppelin ablaze.

Difficulty: 4-5

Evacuation

While the zeppelin is coming in for the emergency landing, the evacuation must also begin. The following steps will occur during the above events of the landing efforts.

1) Preparation for the Evacuation

First, the evacuation must be prepared. Due to the panic on board, player characters that are skilled in calming people and leading by example will shine here. The efforts to gather all passengers near the exits or to search the cabins for injured or trapped passengers will depend almost entirely on the player characters, as the captain and the crew are fully occupied trying to land the vessel.

Difficulty: 0-1

2) Fire, Bugs, Blood!

A few ether bug stragglers will join this chaos, threaten individual passengers and require a violent response. Next, the injured must be seen to, followed by attempts to calm passengers fighting over the first spot in the evacuation order or—on their honor—refusing to abandon their post, their dead loved ones, or their irreplaceable luggage. And during all of this, the zeppelin will rock and sway dangerously. Failure in these efforts will mean some passengers get left behind.

Difficulty: 1-2

3) Fire!

The explosions will start fires and cause damage all over the vessel. The player characters must now safely direct the last few hiding or cowering passengers towards the exits. In addition to trying to calm and encourage them, this requires braving fiery hallways and staying away from collapsing rooves and falling steel beams (*Athletics* rolls).

Difficulty: 2-3

The Evacuation Put Into Rules

Social skill rolls such as *Diplomacy (Leadership)*, *Empathy (Emotions)* or *Intimidation (Orders)* can be used, but *Athletics* rolls are also useful for overcoming difficult terrain or to dodge obstacles. Again, the ground rule is that each described step of the evacuation should require an extended roll to collect a number of successes (between 10 and 15 for each step), to successfully proceed to the next challenge. A failure will result in 10–20% of the still-living NPCs dying and the player characters suffering damage.

There are about 40–50 guests on board and another 40 crew members on top of that. The ether bug attack will likely have cost a few of those lives already. Everyone else now needs saving. Be sure to use the descriptions of the people on board (p. 18) to add color to the situations. You can also use this to keep a (rough) tally of how many people will have survived by the end.

4) Get Ready!

It's almost time to start the evacuation, as the zeppelin is now travelling very low. Ropes, ladders, and other climbing tools must be gathered and readied. The first few people can escape now. The zeppelin is low enough that some passengers will brave the jump, though still high enough that this can cause severe injuries or even be fatal. The altitude is now about 20–50 meters. At 30 meters and up, a player character will suffer 10 L damage. Below that, the damage is 1 N per 3 meters, though an *Acrobatics* roll (Difficulty 2) can effectively reduce this by 3 meters per success (see *Falling*, **Core Rules**, p. 216). For *Fire* damage aboard the zeppelin see **Core Rules**, p. 215.

Difficulty: 3-4

5) Jump!

Now jumps from a few meters are possible and should be done quickly. If those who escaped help from below by providing nets and padding, more passengers can jump and thus be saved. The envelope, after all, is entirely on fire now. Time is of the essence and the evacuation must be completed as soon as possible to es-

cape the fire. The player characters can coordinate this. Failures will lead to some of the passengers dying in the flames or being trampled in the panic and struggle. Those who escape will be aided by New York City emergency workers, and the fire brigade will arrive to put out the zeppelin. When the captain finally emerges as the last survivor from the burning wreck, the day is finally over.

Difficulty: 4-5

Epilogue

"I'd rather have a good friend than the admiration of the entire world."

— Otto von Bismarck

Over the next few days, the news will be reporting in depth on the 'Crash of the *von Neumann*'. Scientists will discuss the danger of the ether bugs, tabloids will focus on the heroic efforts of the player characters and the crew of the 'Von Neumann'. If the calculation speed record was broken, the news will feature this as a footnote. The economy reacts cautiously, but after the stock market threatens to crash, it will quickly recover. The 'Old Fritz' project will be redesigned from the ground up and, in due time, attempt another test flight. The player characters will have earned the gratitude of Margarete and Guido von Donnersmarck as well as that of the passengers on board. Even though the scientific outcome of the journey is still in question, many people now owe the player characters their lives.

Resource Points

The characters can gain a number of important friends and contacts. They can present themselves as the 'Heroes of the hour' and spend one point on a resource of their choice (such as Fame, Wealth, or Mentor).

Experience Points

They will also gain experience points

- Base points as per the guidelines in the **Core Rules**, p. 202
- 2 points for completing the adventure
- 1 point for successfully solving the attempted murder case (before the police are called in)
- 1 point for eliminating enough ether bugs to beat the calculation speed record (if successfully broken)
- 1 point for actively aiding in the evacuation of the passengers (should they save a sufficient number of passengers in your opinion)
- 1 point for actively helping out in the landing procedures (if they player characters provided outstanding aid).





Appendix

Invitation to the Silesian Analytical Engine Productions Factory

Schlesische Analysemaschinen-Produktion

Invitation

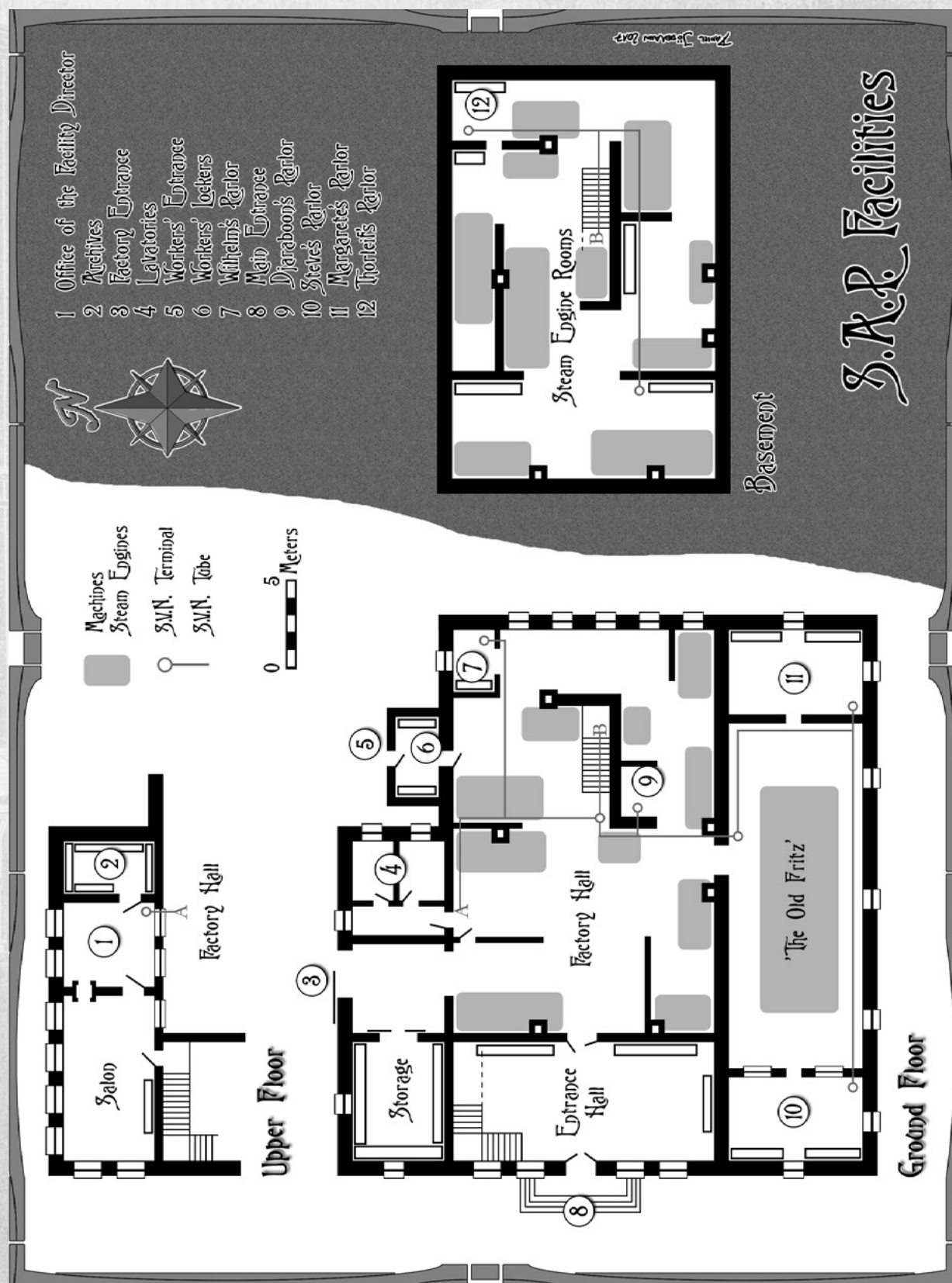
Dear Mr. / Mrs.

I would be delighted to welcome you to Wroclaw for the presentation of our innovative analytical engine 'Ordination Fabricate OF 2001'. After a tour of our facilities we will take off on board the ether zeppelin 'Von Neumann' into an upper Earth orbit to test the machine which is specially designed for operation in zero gravity. There, you will witness how 'Ordination Fabricate OF 2001' will revolutionize modern ether travel.

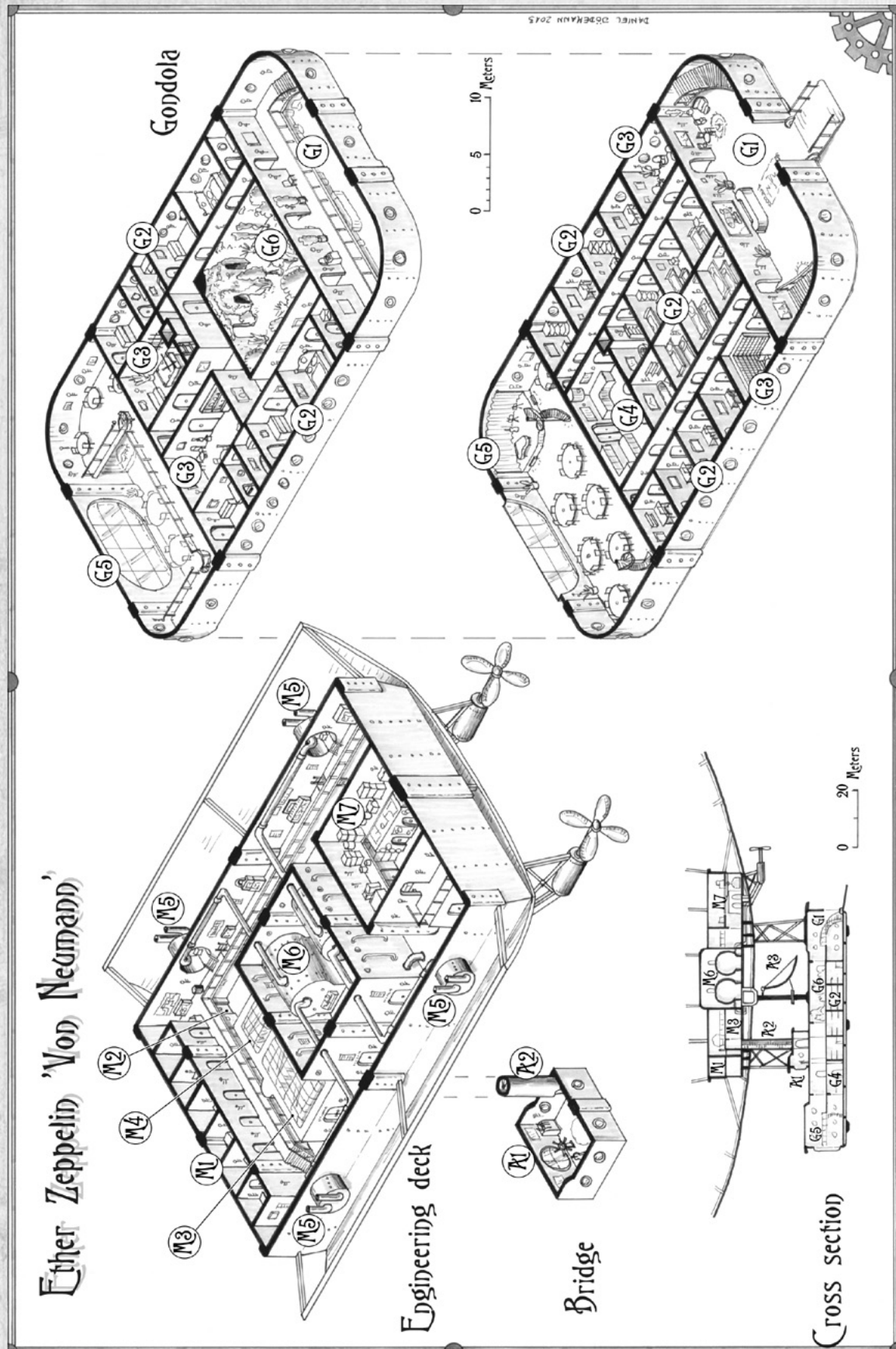
Guido Henckel von Donnersmarck

Guido Henckel von Donnersmarck,
director general

Map of the 'Silesian Analytical Engine Productions' factory



Map of the Ether Zeppelin 'Von Neumann'

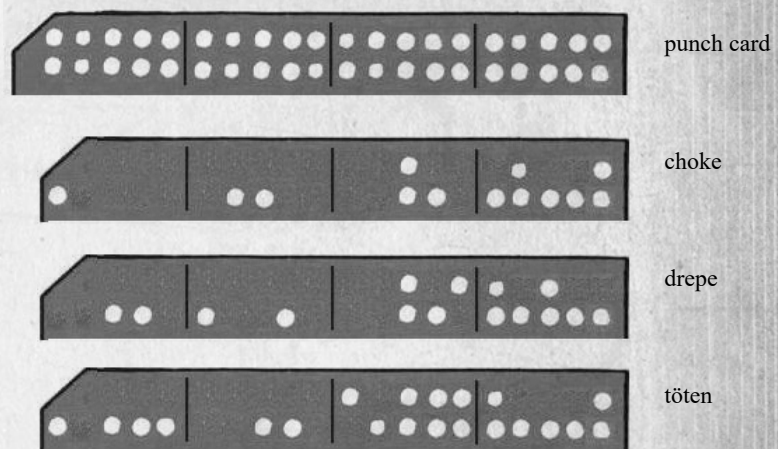


Code tables

00000	Start
0000●	A
000●0	Ä
000●●	B
00●00	C
00●●●	D
00●●0	E
00●●●	F
0●000	G
0●00●	H
0●000	I
0●0●●	J
0●000	K
0●00●	L
0●0●●	M
0●●●●	N
●0000	O
●000●	Ö
●0000	P
●00●●	Q
●0000	R
●000●	S
●0000	ß
●00●●	T
●●000	U
●●00●	Ü
●●000	V
●●0●●	W
●●●00	X
●●●0●	Y
●●●●0	Z
●●●●●	End

00000	Start
0000●	A
000●0	Ä
000●●	B
00●00	C
00●●●	D
00●●0	E
00●●●	F
0●000	G
...	
●●●00	X
●●●0●	Y
●●●●0	Z
●●●●●	End

Punch cards



Analytical Engines in the World of Space: 1889

Historically, difference and analytical engines weren't of much significance in our world in the 19th century, mostly due to a lack of application areas. But that didn't stop some brilliant and pioneering minds to think up designs for computing machines that would become the trailblazers of our modern computers. Many of these inventions, however, were never actually built in their time but only constructed on paper or as mere prototypes. Immature precision mechanics and lack of financing were the main reasons the groundbreaking inventions of pioneering engineers such as Charles Babbage or Georg and Edvard Scheutz never made it to production.

In the universe of *Space: 1889*, history has taken a different course. With the discovery of ether travel, there is a growing need for fast calculations of courses and ether turbulences, which lead to investors becoming interested in this new technology. The following article summarizes the development of analytical engines in the *Space: 1889* universe, and is written from an in-game perspective so you might as well hand it out to your players in advance to fill them in (or have it hand out to their adventurers when they visit the Silesian Analytical Engine Productions facilities). Following the article, you will find some optional rules on using analytical engines in the game.

Analytical Engines Then and Now

With the workers shoveling coal into the steam engine and the machine turning faster and faster, throwing thick smoke out from Charles Babbage's factory and into the grey London skies, it was finally time: Mr. Babbage gave his opening speech, carefully inserted several punch cards into the specially-designed opening and turned the wheel of the number memory to its base position, which represented the coordinates of Earth and Mars. With one pull on a lever, the monstrosity began to rattle:

19 meters long, 3 meters tall and made of 55,000 parts, the beast, in front of countless witnesses, calculated an exemplary, safe course between the two planets. The gentlemen of the assessment committee for the British Association for the Advancement of Science kept glancing from the metal colossus to their stopwatches and back while it calculated and calculated.

They could hear gears transmit the mathematical equations from the punch cards into the machine, how steel and brass whined like a school boy in a math exam. After a surprisingly short amount of time, though, it suddenly stopped.

An error? Forsooth! A brief hammering of metal punching on brass could be heard: the machine was printing its result into the tin. When even this sound ended and a little bell rang, one of the examiners rushed to the plate, drew and placed his monocle, and read with a squint. One impressed nod to his colleagues, and then their thunderous applause confirmed that on this day in the year 1871 the victory march of the analytical engines had begun! And

who today has not heard of these marvelous machines which are built, among others, by *Silesian Analytical Engine Productions*, the most successful manufacturer of the Empire?

Arithmometers and Difference Engines – The Beginnings

But let us take a look back. Mechanical calculators have been around since the 17th century, starting with *Blaise Pascal's* 'Pascaline' of 1645, followed by *Gottfried Leibniz's* 'wheels' of 1671. In 1820 the first mass production began with the 'Arithmomètre' of *Charles Xavier Thomas de Colmar*. In the late 18th century, the German mathematicians and engineers *Johann Helfrich* and *Albrecht Meister* laid the first groundwork for the difference engine. But in the end, it was *Charles Babbage* who in the years 1820 to 1822 constructed the first difference engine as part of a feasibility study for the Royal Society of England. It was slow, but convinced the investors to support the project. This enabled Babbage, along with his assistant *Ada Lovelace* and the metal worker *Joseph Clemens* to build further machines.

Until the 1860s many designers followed Babbage's example, such as *Martin Wiberg* and the brothers *Edvard* and *Georg Scheutz* from Sweden, *Willgodt Theophil Odhner* in Russia as well as the British *Alfred Deacon* and *George Bernard Grant*. Their machines could calculate ever more digits in ever less time, while technological advancements made production easier than ever before.

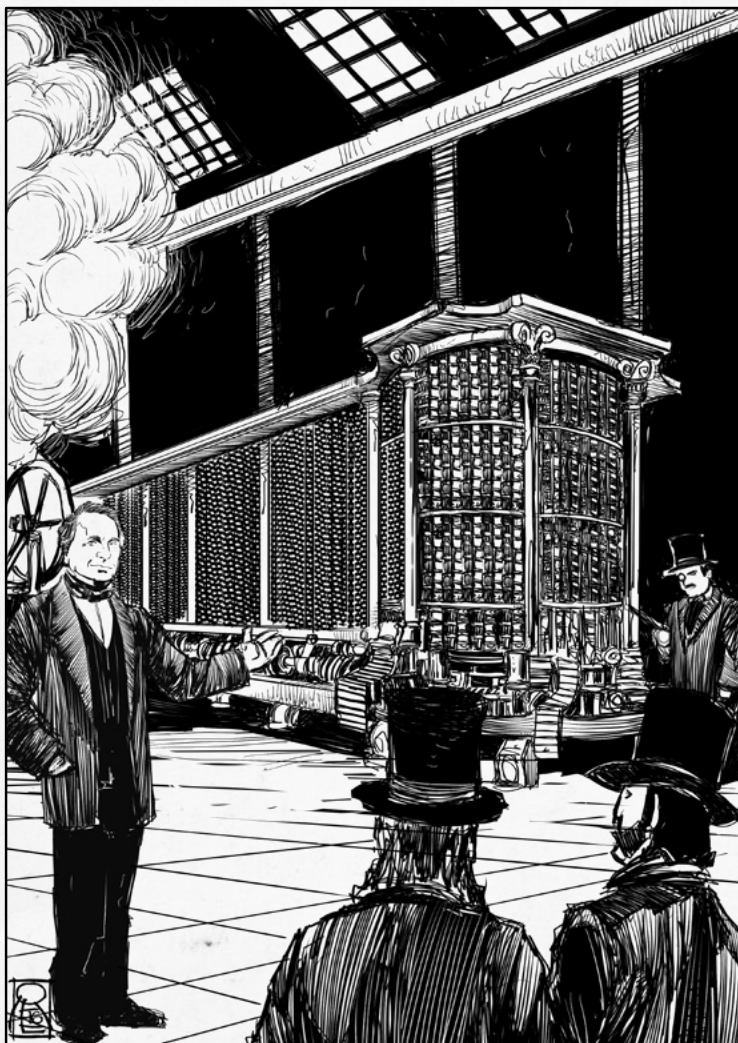
The applications were still limited. Sequences could only be calculated through addition, subtraction, and through polynomials in differentiable functions (hence the name). This primarily aided in expanding actuarial tables, and financial ministries and insurance companies began to use them.

Analytical Engines – The History

In the late 1840s, Babbage began work on a new generation of machines, the analytical engines. Unlike difference engines, these were meant to be able to master all arithmetic operations and be programmable. It took him three decades to develop a blueprint and a prototype. This project consumed vast amounts of money, but when *Thomas Edison* returned from his journey to Mars in 1870, both Babbage and his investors were gripped once more by a pioneering spirit, for the reports on the ether journey had made clear what Etheronautics needed above all:

Travelling at the tremendous speeds provided by the ether drive required fast and precise calculation of courses, ether turbulences, planetary orbits, and distances. Though these tasks can be done by hand, a machine can do them more easily, more precisely, and is far less prone to errors than a human navigator.

And so, just before his death in 1871, Charles Babbage was able to present his design. When he passed on shortly after, having achieved his life's



Glossary of Manufacturers

Silesian Analytical Engine Productions, Wroclaw – German market leader with customers in ether zeppelin yards, the Allianz Insurance company, the M. A. Rothschild & Sons bank in Frankfurt, the Commerz and Disconto banks in Hamburg, public institutions such as the Leopoldina Academy, the Police Precinct of Berlin, and the Colonial Department of the Foreign Ministry. Industrialist Guido Henckel von Donnersmarck acts as director of the main factory in Wroclaw.

Grimme, Natalis & Co, Braunschweig – A company founded in 1871 with a specialization in portable Arithmometers and difference engines. Director Franz Trinks is the inventor of the “Trinks-Arithmotype” and designer of the famous Brunsviga range.

Arthur Burkhardt & Cie, Glashütte – One of the first German manufacturers that focused solely on portable, mechanical calculators such as the Burkhardt-Arithmometer.

Carl Zeiss, Jena – Originally a fine mechanics and optical factory founded by Carl Zeiß, this facility has been refocusing on the development on analytical engines since his death under the direction of his son and heir Roderich. To this end, the company hired the 19-year-old ‘Clacker Wonder’ Christel Hamann who, during his studies at the Bremerhaven Technical School, had designed the analytical engines ‘Gauss’ and ‘Berolina’.

Imperial Babbage Machines, London – The company owned by Prevost Babbage, British market leader with customers such as Scotland Yard, the Royal Society, and the Aerial flyer yards of the Royal Navy.

Heaviside Parsons & Co, London – Mathematician and physicist *Oliver Heaviside*, with his knowledge of electricity and vectors, teamed up with the engineer *Charles Parsons*, and their company now focuses primarily on the design of vector-based plotting machines.

Difference Engine Corporation, New York, Parhoon, Tos-sia – An important American factory that builds analytical devices and astrogation calculators. Its Martian facilities study the designs of ancient Martian fine mechanics and calculators.

Edison Difference Systems, Port Progress – Newly founded by Thomas Edison, and engaged in diode research. Still stuck in the preliminary stages of said research.

Nintendo, Kyoto – A Japanese company, recently founded in 1889, that announced their intent to, alongside their range of *Hanafuda* playing cards, also produce punch cards based on the *Hollerith* techniques for the operation of analytical engines as well as a mechanical game based on these cards.

Gorovaan Ogygis Limitless Enigma, Gorovaan – A conglomerate of Martian mystics that claim to have smuggled ancient Martian technology based on obscure crystals from ancient graves near the war-torn region of Ogygis and into the British protectorate at Gorovaan. By combining these technologies with British technology, they wish to build analytical engines that will aid in their religiously motivated search for answers to existential questions on the nature of life. They have demonstrated a working model in the British Embassy, it is possible further machines exist.

dream, his son *Henry Prevost Babbage* inherited the company *Imperial Babbage Machines*, which had grown during the design process, along with full order books. Other manufacturers followed, each trying to improve the design of these analytical engines over previous specimens.

Operating an Analytical Engine – The Current State of Technology

1) Input

A programmer, commonly known as a ‘*Clacker*’, stamps a **punch card** with programs and numbers. Babbage copied this still dominant input method from a design by the Jacquard loom. The latest standard for this procedure is that of the American inventor *Hermann Hollerith*, who developed it for the US Census Bureau. It allows numbers (variables) and operators to be stamped into punch cards.

Typewriter keyboards are more convenient, but so far, they only allow for the entering of operators in special cases. They are typically used with portable difference engines and where user input is required during calculations.

2) Processing

Imagine an analytical engine as a box that, once put into motion with input, continuously calculates or accepts new input. Unlike a difference engine, an analytical engine can, thanks to its calculators, called **the mill**, perform all arithmetic operations. The operations and number values are also adjustable and programmable, which allows these machines to be more flexibly employed than difference engines. Since Babbage’s first design, a **number memory** has served the mill as the foundation for all calculations. Today the **gear memory** allows for small gears to be positioned to save calculation states, so that values and data can be preserved for use in later calculations or to serve in comparisons. Errors caused by stuck, fouled and warped mechanical parts are common, while the amount of data is limited and access to it is complex.

3) Output

Analytical engines can stamp numbers and letters into **punch cards** or **metal plates** that allow the results to be read. A **bell** usually indicates a completed calculation. Some designs even include a **mechanical number display**.

Printing machines that print numbers, letters, and tables are more convenient. So called **plotters** can even create drawings.

In the European capitals, such as London, Paris, Vienna, and Berlin, printers are also connected to the **pneumatic post systems**: This allows results to automatically be posted to one or more addresses. Further such networks in Prague, Geneva, and Trieste plan to implement similar setups.

One of the more fascinating output machines is the **differoscope**. The rectangular machine consists of many small cubes on rods that feature a different color on each facing. With a specifically designed analytical engine, these cubes can be turned into position so that as a whole, they display an image. By continuously feeding in punch cards, the cubes can be kept turning and produce moving, fantastic images, limited only by the number of cubes per square inch, the speed of the machine and the number of colors on each cube.

The Future

So far, analytical engines have all been very heavy and difficult to move, but engineers are hard at work to **miniaturize** them to one day reach sizes suitable for home or even portable use.

One field of research is both the input and output through **telegraphy**. Some prototypes are already capable of such operation, and it seems soon most analytical engines will be able to operate in this manner. The implementation of **tectroscopes** and other machines that can transmit images still lie far into the future, however.

Ideas for **specialized input methods** abound: Scotland Yard is experimenting with comparing fingerprints impressed onto discs with ink, while the US immigration department on Ellis Island is trying to transcribe the handwriting of its officers into printed documents using quills connected to wires—though this is currently still too error prone to be suitable for official documents.

Phonographs for acoustic output are in use alongside some differoscopes. The use of **telephones** for vocal input is still far-fetched future fiction for now.

While most are working on miniaturization and **improvements of gear technology** to allow for larger and less error prone memory capacity, Thomas Edison is working on a **diode-based memory**. He intends to use the light emissions that he discovered while working on his lightbulbs and patented in 1883—the so-called ‘Edison effect’—as an electrically-powered memory medium, but is so far only in the preliminary stages of the research.



Analytical Engines - Inventions and Rules

New Inventions

Arithmometer / Difference Engine (Artifact 0 / 1)

Mechanical calculators such as the Burkardt-Arithmometer or the de Colmar Arithmomètre support and assist mental calculations. The heavy but technically portable difference engines are capable of all simple mathematical functions and are manufactured by companies such as Grimme, Natalis & Co or by individual inventors. They are powered by a hand crank, use punch cards or typewriters for input, and display results on a mechanical display. They do not feature any memory and cannot be programmed. Rolls by a player character that contain calculations (e.g. *Science (Physics)* or *Bureaucracy*) gain +1/+2 dice when using an arithmometer/difference engine.

Weight: 10 kg / 150 kg, Cost: £ 150 / £ 400

Differoscope (Artifact 3)

A specialized machine that uses a mechanical display made up of small, rotating cubes, mechanical pixels in a way, to display images (using a crude grey-scale, although inventors are hard at work to crack the color problem). The number and size of the cubes vary from machine to machine: The larger the surface and the smaller the cubes, the better the image quality. One specially-formatted punch card forms the basis for decoding and displaying each image. By inserting many such punch cards, the differoscope can be made to show moving images. An additional phonograph programmed with its own punch cards often provides suitable musical accompaniment to the images. Stuck cubes and image glitches caused by faulty punch cards are common problems.

Weight: 700 kg, Cost: £ 5,000

Analytical Engine (Artifact 1)

A steam-powered, mechanical computer whose gears, stamp wheels and axles are programmed with punch cards. Common designs are manufactured individually and in small numbers by the companies described above. Output takes the form of stamped metal plates or is directed to printers. They can be flexibly programmed and might even feature small gear memories.

Problem Solving: Bureaucracy, Linguistics (Codes and Decoding), Pilot (Ether flyers), Science

Weight: 1 ton, Cost: £ 1,000

Analytical Engine Prototype (Artifact 2-4)

Only a select few manufacturers and inventors build such universally capable and fast prototypes, which often only work unreliably. They require steam engines to power them, and input is done via punch cards or other methods, even during a calculation. Output is done via printers or plotters, though telegraphy or

Rules on Using Analytical Engines

By using analytical engines in the game, you can provide logic puzzles to be solved at the gaming table, such as by using punch cards as handouts, as shown in this adventure. Alternatively, you can use the following method:

Step 1: Input

The gamemaster determines whether the desired task is even possible for the available analytical engine and by what means input is entered. As a guideline, see the *Problem-solving* section in the machine's description. The player must roll *Science (Engineering)* to design a program or parse the question into a suitable format. Alternatively, *Linguistics (Codes)* may be used, but only if that specialization was actually chosen. The gamemaster then sets a difficulty for the task based on the estimated complexity (see table in the **Core Rules** on p. 197). A failure will prevent successful processing of the input.

Step 2: Processing

As the technology is unreliable, a roll is made for the machine using twice its artifact rating. This roll is treated as an *Intelligence* Attribute roll and has the same difficulty as set in step 1. The rules for Taking the Average apply (**Core Rules**, p. 198): If the base artifact rating of the engine meets the difficulty, the desired result will be calculated with no need to roll. The duration of the task is set by the gamemaster and can be measured in hours, or more rarely minutes or days.

Step 3: Output

The output is determined by means of the analytical engine. The quality may be dependent on the number of successes rolled in step 2.

pneumatic post delivery is also possible. The machines feature gear memories that can hold tables and even simple knowledge databases. Their applicability is astounding: Calculations of all kinds, fact-checking, simple translations, (de)coding, astrologation and much more.

Problem Solving: Academics, Bureaucracy, Gambling, Investigation, Linguistics, Pilot, Science
Weight: 2.5 tons, Cost £ 3,000 - £ 20,000

Martian Crystal Technology Analytical Engine (Artifact 5)

The workings of these machines are hidden behind mysticism and superstition. The basics of their design and their impressive input and output capabilities are documented in ancient writings. The Difference Engine Corporation and the Gorovaan Ogygis Limitless Enigma conglomerate possess a few unique models.

More devices can be found in the highest circles of the Tossian bureaucracy and the ancient ruins of the Canal Builders. They all share crystal technology as a common feature: power is supplied by energy crystals, processing and memory functions are based on memory crystals, the input and output occur via image crystals (more on this in the chapter '*Wonders of the Martian Past*' in the book **Marvels of Mars**). The potential applications are limitless, but also unknown and only partially researched. You could easily build a campaign around this topic.

Problem Solving: To begin, one task from a freely chosen skill area. Once the technology is understood better, up to 5 more tasks can be added to this list.

Weight: 400 kg, Price £ 25,000



Everything Jules Verne could have written.
Everything H. G. Wells should have written.
Everything Arthur Conan Doyle thought of
but never published – because it was too fantastic.

SPACE 1889

The Ether Calculator

Analytical Engines are of special importance for the calculation of complex processes, especially in ether travel. The characters are invited to visit the *Silesian Analytical Engine Productions* facilities in Wroclaw where they are introduced to the innovative analytical engine '*Ordination Fabricate OF 2001*', specially designed for operations in the ether. For this purpose, the hosts are planning to test the '*Old Fritz*', as they fondly call the machine, on board the ether zeppelin '*Von Neumann*', where the analytical engine is supposed to break a calculating speed record and make the headlines of the world's newspapers.

What starts out as a simple publicity event suddenly leads the adventurers right in the middle of a criminal investigation and then onto an action-loaded maiden voyage, with demanding tasks for all types of player characters. It requires skills in social interaction, a sharp mind, quick reflexes—but also accurate marksmanship.

The Appendix includes an elaborate article on analytical engines in the alternate universe of Space: 1889 and provides optional rules for using these unique artifacts in the game.



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