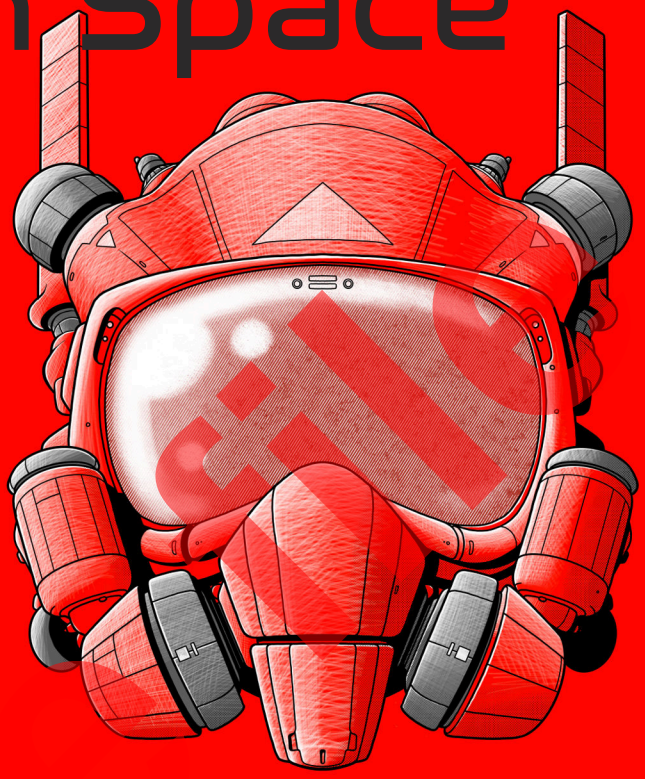
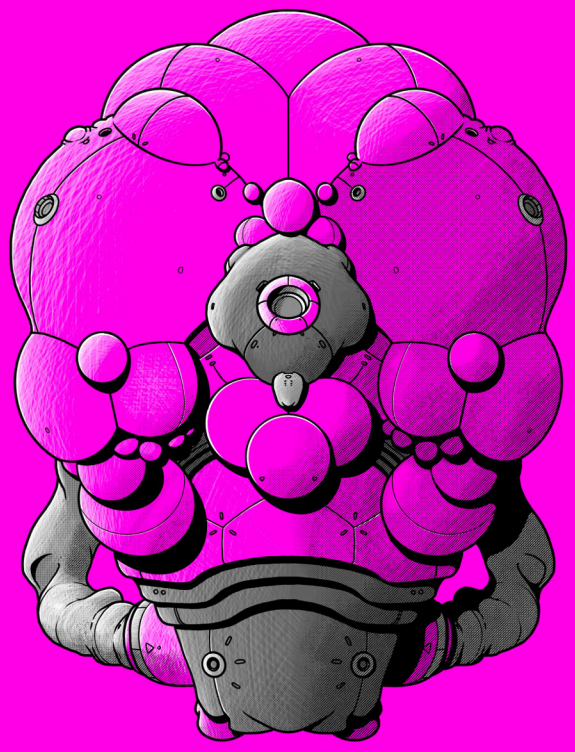
60 Years in Space





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Typeset using LaTeX in TeXlipse using the Source Sans Pro open source font family designed by Paul D Hunt. Title font Nasalization by Typodermic fonts https://typodermicfonts.com

Based on the High Frontier board game by Phil Eklund et al and Kriegbot by Matt Eklund.

First edition released: January 2023. Update 1: January 2024. Update 2: April 2024.

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For Aylan Kurdi

Chapter 0

Preface

An Important Note on Difficult Topics

Science fiction has often been a genre willing to tackle important but difficult social issues, rendering them safer by removing them from the here and now to "twenty minutes into the future". Sixty Years In RPG is designed in part to be part of this tradition and has topics and rules for some horrific life-changing events such as abuse and manipulation, Alzheimer's, cancer, death, genocide, involuntary medical procedures, pandemics, slavery, torture and so on, often inherited from the board game High Frontier that it licenses. But a tabletop role-playing game is in some sense riskier than other storytelling methods, because it has to both codify these topics into systems (narrative and game-play) and requires that multiple people collaborate in exploring them. To complicate matters further, many of these topics depicted in these rules are from deliberately or inadvertently prejudicial, incomplete and biased view points while being presented as being objective, complete and neutral. "The awful thing about life is this: Everybody has their reasons." and this game tries to present compelling reasons for a wide range of philosophies and politics, no matter how terrible the consequences.

Disclaimer Any statements made herein are not necessarily the views of the author or of the designers of the board game High Frontier these rules license. These rules are a work of fantasy and do not depict real events, although they repeatedly claim to be realistic, whatever that means. The material contained in the Sixty Years In RPG core rules and supplements is for responsible adults only. This game is prohibited for sale or resale in Australia due to positive depiction of drug use.

If you wish to discuss the game or the rules with the author, you should email andrewdoull@gmail.com. Unfortunately, I cannot guarantee I'll respond in a timely fashion, if at all.

Safety Tools

Safety is a mandatory part of game play, and the tabletop role-playing community has developed a number of safety tools which may assist with ensuring that the game environment is safe for all participants. See the Safety section on page 6 for a discussion of what tools are available and how they can be used.

Sixty Years In RPG also includes three safety tools that have been developed specifically for this game to try to minimize the risk to players. The first rule, **Dollhouse Play**, is a distancing mechanism to try to limit player identification with the fates of individual crew in the game, which is the opposite of what almost all tabletop role-playing games try to do. Dollhouse Play may be optionally discarded as you become more familiar with the game and trust your group more. The second is a stop-and-reassess mechanic, **This is Mutiny**, to allow players to interrupt the game in a thematic way when emotions are running high. This is Mutiny is a mandatory rule and play should be completely abandoned for the day without blame or retaliation if it is not observed. You are not playing Sixty Years In RPG if you do not honour the This is Mutiny rules. The third rule is an aspirational rule to encourage positive play with others, **The High Frontier Pledge**, which must be signed by or on behalf of all players after character creation and prior to the commencement of play in the magic circle.

Dollhouse Play

There are two approaches to playing the Sixty Years In RPG: dollhouse play and personal play. Dollhouse play is where you set up your toys to tell stories, remaining at a distance so that if they are broken in the process you can choose to not take it personally, except your toys in this role-playing game are the mission crew members. Personal play is where you project yourself into the crew member's place and see the world from their perspective, and resembles the traditional tabletop role-playing game method of characterisation. Because of the many traumatic possibilities in the playing space of the Sixty Years In RPG, it is recommended that you run the game at the dollhouse play level. To encourage this perspective, you should shuffle the crew member sheets at the start of each game play session, and deal them out randomly to the player in the session. If you feel like you are becoming too invested in an individual crew

member or that any players are using a crew member as a proxy for a real person (whether in the group or elsewhere), you must stop the game using the phrase 'This is mutiny' and discuss whether you should change to personal play or otherwise modify the direction of the game (including stopping it completely).

This is Mutiny

At any point in the game, you may say or reveal a written phrase "This is mutiny" to one or more of the other players. Game play immediately stops, all players stop characterisation and begin acting as themselves, and the person saying or revealing the phrase gets the opportunity to either speak or play their choice of a song or instrumental work or soundscape. Everyone else must quietly listen and not interrupt for at least 3 minutes: time this. You do not have to speak your own words: a poetry or prose reading is an equally good choice; such as a list of all the workers who have been killed working on an existing space program.

There are times you might want to do this: for instance, if the crew is unable to agree on a course of action, or anyone in the playing group raises their voice. You should also consider doing this if you are feeling overwhelmed or conflicted about playing the game or simply want a break.

Thematically, a mutiny on a spacecraft does not necessarily merit the punishments of a high seas mutiny: within a tightly knit high quality crew, it is likelier to be a strike action or highly civilised disagreement, with limited consequences. There is a tradition of mutiny in existing space programs which the Sixty Years In RPG attempts to follow: for instance, in the so-called Skylab mutiny in 1973, the three astronauts on board turned off communication to mission control and spent time relaxing and looking at the Earth. You are encouraged to prepare some thematic mutinies in advance of play.

After the three minutes is up, all players perform a silent simultaneous bid to determine if the play session will continue. Put a hidden bid forward, either with an object in it or empty. You might want to do so by putting the bid in your fist or under a cup which you slide forward. Reveal all the bids simultaneously. Any player who reveals an object also agrees to mutiny, and is also given three minutes to perform their mutiny speech, reading, song or sound scape. Resolve these mutinies clockwise starting to the left of the original player, with that player who raised the mutiny initially getting an additional three minutes if they bid an object, after all other player mutinies are resolved.

If at least one player bids an object, then stop play for the session and take a break for at least 15 minutes. You are free to discuss the game during this break: the This is Mutiny rules are about enforcing a cooling off period prior to the break. If two sessions in the day stop because of mutiny or anyone fails to follow the "This is Mutiny" rules then stop playing for the day without blame or retaliation.

The High Frontier Pledge

I promise to represent all the people of the Earth, to respect my fellow crew members and to live in awe of the universe.

Pilot	Date
Mission Specialist	Date
Payload Specialist	Date
Payload Specialist	Date

Safety

This section is from the Rainworld TTRPG by Luke Le Moignan and Kade Archer Peregrine, used with permission. Rainworld is available for purchase at https://llemoi.itch.io/rainworld.

Safety is important – and it's really, really hard. The freedom to do anything in the game can take things in directions that do real-world harm to some participants, because people have a host of real-world difficulties – PTSD being just one example. It's hard to say you need support. Sometimes just saying so can put you in harm's way. Sometimes you don't know something is a problem until it's happened. RPG safety tools are an attempt at risk management and harm reduction; many different people have done work on them.

There is no substitute for communication, for wanting to take care of each other, for doing your best to do so – and whenever that falls short, doing whatever you can to make it right, learn from it, understand the people involved better and do better by them next time.

Four things to be aware of, up front:

- there is nothing you can do that will guarantee everyone around your table will be okay
- there is no universal tool; different people, even the same person in different moments, can need entirely different things
- people have competing access needs – something one person needs can actively harm someone else
- most things you can do are, unfortunately, reactive – supporting people after they've been harmed, not preventing it

We advise a "Session Zero" – before the first session of the game proper, get everyone together to hang out, discuss what everybody wants and expects from the game, and resolve any conflicting wants or needs you uncover. Establish that you do care about each others' safety, and agree which safety tools you'll have in place. In no particular order, here's a non-exhaustive sampling of safety resources that people have worked on:

- Brie Beau Sheldon's Script Change – a toolkit of verbal and optional visual aids, including "Pause", "Fast Forward", "Resume", and others – Creative Commons- licensed and available as "Pay What You Want" from http://briebeau.itch.io/script-change
- John Stavropoulos' X-Card – a single tool which enables any player to pause the game and have elements edited out – Creative Commons licensed, available at http://tinyurl.com/x-card-rpg
- Tayler Stokes' Support Flower, based on earlier work by Jay Sylvano – a free visual aid providing a traffic-light style system, downloadable from http://the-act-apart.itch.io/the-support-flower
- Ron Edwards' Lines and Veils – a Session Zero tool to designate content that will not appear in the game (Lines), or that may be alluded to, for example in a "fade to black, scene change" way, but will not be played through (Veils)
- Cut and Brake, developed in the Nordic LARP community – similarly to the X-Card, calling "Cut" pauses the game to adjust things to avoid harming a player; "Brake" indicates that they are not yet at a point where they need to Cut, but need everyone to play considerately to de-escalate their difficulties
- Open Door, developed by Eirik Fatland and the Nordic LARP community – a Session Zero agreement that any player can leave the game, at any time, for any reason, no questions asked, no judgement. (If possible, a player who is stepping out and is sure they won't be back should try to communicate that, to avoid any misplaced concern for their whereabouts and safety.)

- Largo, a term developed by Maury Brown, from music to mean to “slowly”, which is distinctive enough to be picked up when used to indicate that players to lower the level of their emotions to avoid conflict or harming others

It’s worth saying that there are also accounts by vulnerable people who have personally found safety tools – particular ones, or in general – unhelpful, even actively counterproductive. The difficult but valuable truth is that all tools have limits, and all people are different. (If you take away nothing else from this section, we’d like it if you absorb these three points: firstly, there is no substitute for communication. Secondly, we don’t know you, your group, or your specific circumstances – it’s in your hands. Thirdly: peoples’ needs are diverse and not always predictable.

Chapter 1

Introduction

You are a High Frontier crew: 4 astronauts in a 40 tonne crew module, equipped with on board chemical rockets and prospecting gear for in situ resource utilization (ISRU) recovery of water from ice frozen in the regolith on high hydration sites like Mars and Ceres. Water is the key to unlock the solar system: it can be used as rocket propellant and fuel, as well as supporting industrialization on extraterrestrial sites to build new technologies which cannot be constructed on Earth.

The best sites have already been claimed by the first wave of explorers, and you will travel through a solar system in the midst of rapid change as the high frontier becomes colonized.

Your crew will be supported by a mission control back on Earth, which acts as a common pool of recruits to replace lost or stranded astronauts, as well as provide remote finance, research and engineering assistance. The Sixty Years In role-playing game is as much about the evolution of your Mission Control as it is your crew: you will be responsible for defining how you react to the changing social and technological milieu of the 21st century, as well as the frictions experienced by returning to a Mission Control which may no longer recognize or support you following your decades of isolation in space.

While this is happening, you and the rest of the crew are aging and atrophying, drifting away from Earth-side. You must push beyond the outer limits of known space, holding onto or letting go of your humanity to survive.

Procedural Play

The Sixty Years In RPG is designed for procedural play so that you don't have to prepare for each game in advance. Instead as you play you will use random tables and other procedural generation systems to create the world around you. There are normally no universal secrets or game master in the Sixty Years In RPG, although you might play with someone acting to facilitate the game in a way a tradition game master might.

Play can be collaborative or confrontational, but the challenge is intended to arise from the game systems and possible futures that are being explored, rather than the challenge being set by one person in your gaming group. There are secrets, but these are based on the decisions of individual crew members, who may choose to hide their motivations, weaknesses and strengths from others.

The High Frontier Board Game

The Sixty Years In RPG is intended to realize the role-playing game possibilities of the High Frontier board game by Phil Eklund and a large number of collaborators. But you can also play the Sixty Years In RPG without the board game by using either the High Frontier solar system map which can be purchased online or one of the pre-built scenarios in The This Space Intentionally supplement such as the Human Outer Planet Exploration (HOPE) mission. The universe shared between the Sixty Years in RPG and the High Frontier board game is referred to as the High Frontier.

First, Second or Third Wave

The High Frontier board game simulates the first wave of space exploration. You can play this first wave of exploration using the Sixty Years In RPG, but there are more role-playing possibilities in the second wave - representing a nation-state or organization scrambling to catch up with the exoglobalization efforts of already successful (or perhaps failed) space programs, visiting already colonized locations and accepting missions from primary space factions. The second wave is considered to be only a few years behind the first, but the exponential possibilities opened up by the efforts of the first explorers will have already profoundly changed the solar system as you encounter it.

If you are excited by the idea of playing in the High Frontier universe but prefer a more traditional RPG with a game master, you should invest in the Absent Without supplement, yet to be written. These will provide enough materials for one of your gaming group to act as the game master, and a baseline setting for playing in the Colonization era of the game (2055-2070).

The High Frontier Universe

The universe of the Sixty Years In RPG starts off in the world of today, and makes the minimum number of assumptions about the near future to make crewed space travel viable. The game then allows you to create a possible future by simulating the decisions, challenges and successes of the space program of a nation-state or private organization which in turn impacts the political and social environment back on Earth.

Game Scale

Rockets in High Frontier use real world physics. Chemical rockets are fast, but fuel hungry; electric rockets are slow but fuel efficient; and nuclear rockets are a compromise between the two extremes which usually end up incorporating the worst features of both.

As a result, it usually takes years to travel between planets and asteroids. The High Frontier map is an energy map of the solar system which incorporates both time and fuel use into calculating space travel: each burn (pink circle or lander symbol) represents an expenditure of fuel needed to change the rocket's speed by 2.5 km/sec. Most intersections (called pivots) on the map indicate a year passing en route. In the outer solar system, these pivots are represented by zigzags with rockets travelling at an average of 10 km/sec (36,000 km/hour) to cut long journey times down.

A chemical rocket mission from Earth to Mars, burning as much fuel as possible to minimize travel time will take around 8 months. Crew members will still be working during the long voyage times, but much of this work is abstracted into system maintenance. The only significant decision for most of the voyage will be which operation to perform each year. But this year long granularity will mean you will be playing out most of the your crew member's lives in a few game sessions: a campaign is intended to last around sixty years of game time which is the typical length of time covered by a single High Frontier board game.

And astronauts already start older than human player characters from many other games: the average age of the twelve men who walked on the moon is forty years and three months. Death from old age is a real possibility for a crew member, especially with many of the risks of aging accelerated by micro-gravity and cosmic ray exposure. See the Risks chapter on page 229 for more details of these and other dangers.

Spacecraft or spaceships? Sixty Years In prefers the term spacecraft to spaceships, to emphasize these are entirely new modes of transport instead of tying them to an often military nautical tradition. It also avoids pointless arguments about the name for the armed personnel carried aboard these vehicles. Interstellar spacecraft are referred to as star ships, to keep continuity with the High Frontier Interstellar board game rules.

No Uploads

One of the few assumptions that the High Frontier universe does make is that the consciousness is not fungible: that means a conscious mind is unique and cannot be copied. The in-universe explanation is that there is a fundamental constraint on the limit at which information can be transferred which means that any attempt at a copy cannot capture this continuous process. Similar tropes have appeared in science fiction before (such as alpha-level and beta-level simulations in Alistair Reynolds' Revelation Space) but it runs counter to current transhumanist thinking. The lack of fungible conscious minds means that there will be no point at which technology allows seamless uploading of minds from a physical body into computer construct. While Sixty Years In RPG makes a distinction between intelligence and consciousness, the non-conscious paradox of the C-dead (NPC) prevents you from treating intelligent but not conscious minds differently from conscious minds, because at any point a merely intelligent mind could spontaneously develop consciousness (this process is called rampancy). A related issue, the anchor problem, prevents artificial intelligence running significantly faster than biological intelligence because it will quickly lose touch with reality if it is not anchored to the real universe. The fungibility problem, the anchor problem and NPC are discussed in more detail in the Robot Designer chapter of the A Facility with Words supplement.

No Fixed Future

Without a fixed scenario, and with no game master planning or improvising a grand campaign, the Sixty Years In RPG tries to simulate an ever evolving future which projects some trends from the present into the next 90 years. Each 15 year period following from 2025 is known as an era, and is described in detail in the chapter on Eras on page 20.

The This Space Intentionally supplement outlines political trends will force the crew to change their outlooks and philosophies to accommodate the shifts in the political environment back home; and space infrastructure that is built throughout each era, from improving the facilities that your mission control on Earth to terraforming other planets. The All Errors are My Own supplement extends the ideas of eras to broader mission control and social trends which are influenced by the Space Politics to radically change the Earth and mission control.

As space becomes industrialized by building extraterrestrial factories on sites throughout the solar system, colonists will begin to appear, initially as passengers wanting to found their own space colonies and then as factions with broader impacts across the map.

Simulation and Randomness

All of these changes are modelled with a simulationist approach using a wide variety of random generation tables. You should normally only "generate when required" rather than having to perform much in the way of administration and house keeping, but get used to using the rule books frequently as a creative reference.

The philosophy of the random tables is to present a range of likely results, rather than focus on unlikely outlying events. This attempt to keep the game both unpredictable but grounded in physical and social sciences and the realities of space travel. You will frequently encounter terminology for the first time, but an explanation will be summarized in an entry under the table. If you feel the random tables are getting in the way of the game experience then feel free to choose a result rather than looking up a table and rolling for one.

The golden rule of the High Frontier board game is whatever is specifically written in a section of the rules overrides the more general case. The golden rule of the Sixty Years In RPG is it doesn't matter, keep going. If you miss a rule or there's too many special cases getting in the way of the game experience, the pace of the game matters more than the fidelity of the rules. You're getting your rocket to Mars this session, and the price you're paying for not having to burden someone with performing the prep for the next session is that you might launch with some important cargo left behind.

Rules Weight and Special Cases

There's a lot of information in these rules for you to digest, and no one expects you to do so. There are plenty of rules-light GMless games systems out there and there is a rules-light version of the Sixty Years In RPG which just describes the crew sitting down to 6 meals over 6 decades of game time. But space is just so darn weird and it would be a disservice to Phil Eklund's vision of the future to not try to capture the weirdness and possibility in a version of the tabletop role-playing game that makes it to publication.

Most of these books are random tables, glossaries and special cases. The random tables are to express the range of possible events and outcomes to try to keep the game grounded in realism rather than flights of fantasy, or to direct the flights of fantasy to the specific vision of possible futures portrayed in this game. The glossaries are there to help you understand specialized terminology appropriate for space or for words which have been invented here and elsewhere to describe possible futures. The special cases are there for the players who like the minutiae of science and space, and to capture some of the specific peculiarities of acting in extraterrestrial environments.

The High Frontier Pledge

Before each playing session, all the crew must repeat the High Frontier Pledge at the start of the rules. Once you know your crew position, return to the pledge page and sign and date it. This will increase the value of the print edition of these rules. Each additional Sixty Years In RPG supplement will also contain a copy of the pledge which you should also sign when you include the rules supplement in your game.

Emailware If you wish to, you can also email an electronic, photographed or scanned copy of the signed High Frontier pledge to andrewdoull@gmail.com with the subject line "High Frontier Pledge". You will receive an in-game reward for doing so.

What You Need

You will need some other items in addition to the core rules.

The High Frontier Map

You should get a copy of the High Frontier map, either from the board game or purchased in a poster format on Zazzle. It is possible to play Sixty Years In RPG without the map but you are strongly encouraged to use it.

Dice and Counters

You should have a large number of 6-sided dice in various colours: green, blue, black, red and white; and counters: green, blue, black, red – clear to represent heat – yellow and purple if you go to worlds with extraterrestrial life; and white counters or cotton wool to represent smoke.

Cards

Some random results are determined using playing cards, instead of dice. Each player should bring a packet of playing cards with them at the start of the first session.

Printed Materials

A number of folios and record sheets are spread throughout the rules to assist with bookkeeping. There are also a number of full page game play aids, and some of the information on the folios is also intended to act as a game play aid. You should print multiple copies of these (normally double-sided, either long edge for game play aids and short edge for folios) to assist with game play.

Paper and Writing Tools

Sixty Years in Space uses both A3 and A4 paper for maps. A3 paper is 297 mm x 420 mm or approximately 0.125m^2. A4 paper is 210 mm x 297 mm. You should also have a selection of pencils and erasers, as you will be recording and rewriting a significant amount of information, and a pen, for signing the High Frontier pledge.

Pronoun Cards

A card for each crew member, with their preferred pronouns on one side, and public pronouns on the other. The easiest way to make and update these is to use an index card folded in half to make a tent.

The pronouns cards are use to ensure you address the crew member using the correct pronouns. See the Sweets section on page 19 of the Game play chapter and the Pronouns section on page 73 of the Demographics chapter for details. The pronouns may change throughout the game.

Camera

A camera should allow you to record the maps you have created once you have finished doing so, if you need to recreate them later.

Space Snacks

There's two types of snacks you'll need for the game: thematic dishes which you should be able to nibble on throughout the game or have on breaks, and sweets. Each player should bring a small bag of sweet food in individually wrapped portions that is safe for them to consume. One wrapped portion is called a sweet in these rules, although most cultures will have their own name for it. See the Sweets section on page 19 of the Game play chapter for details.

Thematic dishes should be chosen based on the food available to the crew. Typical crew modules will be vegetarian, with green leafy vegetables forming the basis of most of the crew diet: either raw or cooked (there's always plenty of heat available for cooking). You should serve cooked greens when possible such as beet greens, chard, collard greens, dandelion greens, kale, mustard greens, turnip greens, and spinach. Salad greens which are not cooked should be washed carefully and avoided by anyone who is pregnant or immunocompromised. You should also allow similar foods such as edamame, seaweed, green smoothies and kale chips which are often easier to prepare or available as snack food.

Military crews on short missions are more likely to have prepared foods similar to the foods contemporary astronauts eat, the majority of which are freeze dried to reduce the weight of the food. You can buy astronaut-inspired freeze dried meals or even freeze dried camping meals but these can be expensive. Dried fruits, banana chips, ice crew sandwiches and energy bars are more likely to be in your local supermarket.

As the crew becomes more heavily modified, they may require special dietary supplements and meals. Reflect this by serving baby food, either purchased from the supermarket or a variety of cooked fruit and vegetables mashed or pureed and left to cool, often in unusual combinations.

Crews who have lost the crew module will have an emergency supply of yeast and cockroaches which can be grown on a simpler closed loop ecosystem fed by crew waste. The downside of this food source is it is unpleasant to eat. You should serve nutritional yeast flakes or powder or yeast extracts such as vegemite or marmite unaccompanied. You can also buy edible insects which may be more of a thrill for jaded gamers but be sure to get some that are intended and safe for human consumption.

Other Supplements

The core rules are designed so that you can play the game without any supplements, by travelling to uninhabited sites, exploring them to find claims, and improving your technological levels as you do so, without consideration of the broader social impacts of the exploration of space and improved technology.

The This Space Intentionally game expands the space exploration component of the game to include the colonization and exoglobalization activities of other factions, who you'll encounter through interceptions in space and missions to already exploited sites. It also adds political trends to the game which will apply impacts to your mission control and crew.

The A Facility with Words supplement expands the site exploration component of the game to allow you to better simulate travel on sites with atmospheres, acquire and build robots and smart matter and exfiltrate neutral and hostile facilities to achieve specific objectives. It also extends the factions to include new species which start appearing in the future and later eras, and the impacts and implications that these species will have.

The All Errors are My Own supplement adds social and mission control trends to the game which simulate what is happening on Earth and throughout the solar system as you play.

The A Lot of Zeros supplement adds interstellar travel, and megastructures and a route for you to follow once you leave the solar system or your sixty years in space have come to a conclusion.

Synchronise your Watches

After reciting the pledge at the start of play you should synchronize your watches.

Chapter 2

Game Play

Humans are story tellers: we love metaphors and the complex metaphoric language we use to tell our stories may be deeply intertwined with what makes us human. At its worst, it can lead to magical thinking, at its best it can give us new insight and understanding into ourselves, the world around us and empathy with the other people who share this universe with us.

In many role playing games, one person in the group of players will act as an adjudicator to assist with interpretation of the rules and to make final judgement as to the outcome of actions. This person, sometimes unfairly, is also given the burden of reading and understanding the rules and preparing a scenario and contingencies for the rest of the players. Sixty Years In does not require this specialized role: everyone is responsible for collaboratively interpreting the rules and determining outcomes because, in part, there are so many of them and also because this game is much more prescriptive than many other TTRPGs. Many things in space and physics are incredibly counter-intuitive and it is hard to simulate this without rules that tell you what the likely outcomes will be.

To build the game setting, Sixty Years In Space uses "designers": rules subsystem used to build parts of the game procedurally as you play instead of trying to prepare the game in advance. Where possible, designers use a creation work flow that runs in the order you'll likely discover the thing you're generating and many designers will include folios that you should fill in as you progress through the design. The Eras chapter on page 20 describes some elements common to most of the High Frontier universe game settings you will play.

But the Sixty Years In RPG needs to be more than just a collection of random tables for it to work effectively as a game. The core idea of this role-playing game is a belief about human comprehension of random events: we will naturally create stories about systems that are just complex enough that we cannot completely understand how the systems interact. While video games allow these systems to be built automatically, board games and role-playing games are limited by the fact that the players must also be able to implement all the systems that these games use.

Playing Sixty Years In is intended to be a unique experience, unlike any other TTRPG you will have played. It is also not easy. There is a lot of technical language in the game and planning and executing moves through space really is rocket science! Luckily Sixty Years In RPG is built on the High Frontier board game rules, which make realistically simulating space travel a lot easier than it would otherwise be.

Types of Designers The core rules includes designers for your mission control and other factions, crew and colonist modules, and maps of the sites you'll visit, as these are the elements of the game that you'll be spending the most time with. The This Space Intentionally supplement adds designers for missions, site infrastructure, encounters, colonies, primary colonists and spacecraft, which you will encounter while you move around the solar system. The A Facility with Words adds designers for ecosystems, new species and robots, as technology advances to the point where new life and tools can be created on a whim. And the A Lot of Zeroes supplement adds designers for extraterrestrial life, star systems, megastructures and virtual worlds that you'll be exploring once you leave our solar system.

Space Politics

Sixty Years In RPG uses two concepts from the 2nd and 3rd editions of the High Frontier board game: **Space Politics** and **Mission Control Social Unit (MCSU)**, to keep a thematic consistency across the eras of the game. The space politics is a modified Nolan Chart which tracks the political milieu that space travel occurs in. It has positions corresponding to the 5 political "alignments" in the original Nolan chart, along with extra spots labelled either War or Anarchy which represent a difficult transitional period between these political positions. The mission control social unit is a BSU (short for Basal Social Unit) which also represents one of these five political alignments but at an organizational level. The Mission Control chapter on page 49 provides more information on how to create your mission control.

Space Politics

Roll 2D6 at the start of the game and again if required to determine the Space Politics. The policy has various impacts throughout the game rules: some Space Politics can have two different policies. The suit is used when randomly generating outlooks.

Roll	Colour	Policy	Suit
2-4	Orange	Capitalist	Diamonds♢
5	White	Paleoconservative	Spades♠
6		Nationalist	
7	Purple	Multilateral	No Trumps
8	Green	Anti-Nuke	Hearts♡
9		Egalitarian	
10-12	Red	Authoritarian	Clubs♣

Character Development

Sixty Years In RPG is a game about making incremental trade offs over a long period of time, which necessitates a relatively heavy mechanics-centric system. Characters, called crew, begin with a number of skill points based on their age and each crew position has the majority of skill points pre-invested in fixed skills. As each year passes crew will get additional skill points but also be exposed to risks such as aging, radiation and microgravity. Character generation is described in the Demographics chapter on page 67, Crew chapter on page 80, Skills chapter on page 119 and Assets chapter on page 140. The Risks chapter on page 229 provides details of the risks you may be exposed to, including the Service Risks table on page 233 that you should roll on every year for every crew member.

Exploiting the Solar System

Because of the long time span and the focus on exploration and exploitation of the solar system, you will be responsible for the research and development of new technologies that you wish to use, rather than simply existing in a specific technological milieu like most other science fiction TTRPGs.

Your first goal should be to travel to a site where you can build or negotiate access to a factory which will give you access to extraterrestrial technologies. You should generate your mission control and crew module using the Mission Control chapter on page 49 and roll for your starting mission using the Missions section on page 56 in that chapter. The Travel chapter on page 258, Map Designer chapter on page 289 and Observations chapter on page 208 provide a lot more detail about the process of travelling to a site and mapping and exploring it.

Once you succeed or fail at your first mission, you should continue to generate mission destinations to continue to build factories and colonize the solar system. After getting access to a second factory at a different spectral class site you will get access to advanced technologies and can choose a specialization for your rig. At this point you should work on building a lab. The lab will give you access to promoted technology which will allow you to add two updates to your equipment which alters how it functions as well as give you a second stack upgrade. If you then succeed at a future, you will get access to Future technology and an addition update on your equipment: if this future is the successful launch of an interstellar spacecraft, the on board crew instead enters the Mission era and gets access to Interstellar technology. Finally breakthrough technology becomes available in the Breakthrough era where everyone is swept up in the final rush for easily exploitable energy from the sun. See the Eras chapter on page 20 for details on these different eras and the technologies associated with them.

Each technology level improvement will also allow you to condition your abilities to higher levels and get access to new technologies such as rigs, updates and promotions. When you do so you will begin to move away from baseline humanity and get additional powerful abilities as well as have the opportunity to make some key decisions about technologies you wish to adopt. See the Upgrades chapter on page 179 for details.

Exploiting the Crew

Over the long scale of deep time, individuals are rarely important. While your crew may survive a billion years or more, they will be shaped by their experiences much more than any initial concepts that you have for their design. Sixty Years In tries in many ways to persuade you to accept the changes that will happen to your crew, many of which will be outside of your direct control and some of which will radically change how they see themselves and how you perceive them, but also empowers you to reject these changes if you don't want to by using bumps and debt as described on the current page. But bumps and debt can also be used to change the wider social trends that don't affect your crew but affect humanity as a whole. Be aware that if you use these limited resources to resist the ebb and flow of history, you are sacrificing your ability to influence it.

Failure Is Not An Option

Failure Is Not An Option (FINAO) is a central concept in High Frontier. The temptation to cut corners by being hasty and risking a die roll is a key part of the board game but it is almost always smarter to take more time and make more efforts to ensure a successful outcome.

In Sixty Years in Space, you will almost always perform actions using a roll under system, where you have to roll under your skill level on 2D6 or the related ability level using 3D6 to succeed; or equal the level to succeed with complications. If you roll over the level, you can either abort and retry the action, or choose to succeed but incur a cost by adding a defect to your equipment, a tally to a limited resource or a stress point to the crew member performing the action. You should aim to succeed at every action you attempt because space will likely kill you if you fail but accumulating costs will merely kill you slower.

To avoid adding costs every time you attempt a skill, you need to get chrome that applies to the action you are performing that you have the appropriate skill level in. Chrome is could be a certificate issued as a part of playing the game or specialization or license to use the equipment you are working with, or another advantage in the specific situation you are in. Having the appropriate chrome allows you to roll one less 1D6 when attempting an action.

Even with chrome, to reliably succeed at the action you should ensure that you have an effective skill level of 6 in the skill, which means you succeed on a roll of 1-5 and get a complication on a roll of 6. The recommended approach to this is to have a skill level of 5 and Mission Control contact with the same skill to assist you. This means you get an effective skill level of 6 by having the Mission Control contact's skill level of 5 assist your skill attempt. See the Skills chapter on page 119 for details on how to use your skills.

Bumps and Debt

Each hour of game play, starting when the minute hand hits :00, each of the players gets one bump, plus one additional one for each point of glory or notoriety the crew has (shared evenly amongst the players, so that if the crew gets one glory each, each player gets one extra bump). A player may use a bump to change the face value of a rolled dice by one, up or down (but only up if the face value is 1 and only down if the face value is 6). Record the number of bumps you have by placing a sweet in front of you. You cannot accumulate bumps – it disappears at the end of the hour. Bumps are also lost between gaming sessions.

Once you have used your bump, it is gone. However, you can buy a bump when required and use it immediately, by incurring a debt for each bump you wish to buy. Each crew member can recover from one debt by performing an Income operation: see the This Space Intentionally supplement for details.

Offerings Each crew member begins the game with 4 offerings: a piece of jewelery, a desk accessory, a luxury good and a treasured item. You can sacrifice one of the crew's offerings to get a bump at any time. Describe the offering and how the crew member loses it or how it no longer has meaning for them. Each crew member can sacrifice each offering once: even if they replace the offering, it is no longer worth a bump. You do not have to use the bump from the offering immediately.

If a crew member shares their luxury good with anyone controlled by another player when you sacrifice it, the other player also gets a bump.

Bankruptcy If your debt increases above your Capital, eliminate all your debt and permanently decrease your Capital by one. If this would reduce your Capital to zero, you may not perform the action that would increase your debt.

Sweets

You should track the bumps you have available to you by putting a sweet in front of you out of the packet you brought to the game session for each bump you have available to you. When you spend the bump, consume the corresponding sweet. One of the lessons of the Biosphere 2 project is the impact of sweet food on human psychology, bananas in the original experiment, and how the loss of this food led to negative social dynamics and conflict in the isolated group.

Energy Freedom If a crew member's public and preferred pronouns match, that crew member has energy freedom. You can freely consume a sweet from your packet any time you need a bump for that crew member. Remember you can freely change crew member preferred pronouns, but may not wish to do so.

Dice Rolling Conventions

The game uses dice, denoted by 1D6, which implies the existence of other sided dice. Replacing the 1 with a 2 or higher number in the nD6 notation means you roll more than one dice and add the results together. This may then be modified by adding, subtracting, multiplying or dividing the result. If you have to divide the dice roll, the text will indicate whether you round up or down to the nearest whole number or retain fractions.

Sometimes you will multiply multiply dice rolls together, such as 1D6x1D6x1D6 or 2D6x2D6. Roll each group of dice separately, then multiply the results together.

Dice can also be used for bids by secretly choosing the face values of one or more dice before simultaneously revealing them with the specific value face up. In this instance, the convention is normally that a face value of 6 means a bid value of 0.

Reroll Duplicates Reroll any duplicate results selected from a random table. Exceptions are a) if rolling the results for different crew members or other targets, or b) the initial effect has been removed or recovered from or c) if the entry states that it has a cumulative effect if it is rolled twice or d) the entry says duplicates are allowed.

The Rule of 'Or' To save space and increase legibility equally likely choices are presented as two or three possibilities separated by the word or. For two choices, roll 1D6: the first choice is chosen on a 1-3, the second on 4-6. For three choices, use 1-2 for the first choice, 3-4 for the second and 5-6 for the third. Sometimes 'or' is used to separate choices where only one of which will make sense in the current situation. If so, just use that result without rolling.

Space Politics

The stage for Sixty Years In RPG is the space politics. The Space Politics determines how access to space is controlled - is it the dictated by individual nations or a transnational body, or is it for capitalist, military or social endeavours. The current state of the space politics determines the direction that the solar system and Earth evolves independently of the crew actions to create a larger background tableau. The Space Politics will also influence the crew and mission control forcing them to change how they operate and eventually changing the mission control organization to match the current space politics type.

Changing the Space Politics You will be able to change the space politics using the Activism operation and have it changed involuntarily because of the election event as described in the This Space Intentionally supplement.

Anarchy Space exploration is a free for all with legal claims and international conventions providing no protection against opportunistic mission controls who would happily claim jump, hijack facilities and strand their own crews to achieve short term goals.

Anti-nuke Space exploration is seen as risky: too risky for any nuclear powered rockets to be permitted either launching from Earth or being assembled in near Earth orbits. As a result, the pace of exploration is much slower and solar-powered. If the space politics is Anti-nuke, you cannot use the boost operation on reactors or components which have an on-board reactor and your starting spacecraft will not have these components.

Authoritarian The space race has effectively been won through military, political or technological superiority - usually through force of arms - and the victor is able to control which colonists are permitted into space. If the space politics is Authoritarian, Military MCSUs can hostile recruit colonists of any colour.

Capitalist The space race is an open competition between many mission controls. Entrepreneurs usually having the greatest ability to exploit the resources available. If the space politics is Capitalist, then you can cancel 1 point of debt for each factory you control (0 debt if there is no factories) when you perform an income operation.

Egalitarian Space exploration is seen as an endeavour for the good of all mankind, not just those privileged enough to be able to afford a space program. Crew members are recruited to maximise diversity and allow all national groups to feel like they are making a positive contribution, regardless of the merits of the individual crew member. If the space politics is Egalitarian, then any income operations you perform will tax the highest Capital ability crew member(s).

Multilateral Space exploration is regulated through a transnational body such as the United Nations, where member states and non-governmental organizations (NGOs) determine the regulations through diplomacy, lobbying and political grandstanding.

Nationalist Space exploration is driven by purely nationalist concerns - countries compete with each other for glory or perceived research or industrial gains without necessarily testing or confirming those gains in a free market. You cannot use an income operation to cancel debt if the space politics is Nationalism.

Paleoconservative The space race is primarily a military one: national militaries attempt to establish a 'High Guard' above their territories to defend their sovereignty and to gain military or espionage advantage. If the Space Politics is Paleoconservatism, you do not begin the game with any Earthside technologies other than spacecraft components.

War Heightened tensions between Earthside nation-states have resulted in a volatile situation in space where rockets and ray-guns can be retooled into weapons at a moment's notice. Colonists effectively become conscripts in this conflict, as their precarious situation means they have to remain loyal to ensure the safety of their families back home.

Chapter 3

Eras

The Sixty Years In RPG divides the High Frontier universe time line into six 15 year eras starting at 2025 and ending at 2115. Each era has a set of technologies and trends associated with it which will occur as the game moves further and further into the future. Progression along the technology path is not tied to an era for the crew: you will instead achieve the technology levels when you meet certain prerequisites such as building factories and labs and completing futures and breakthroughs. The trends that affect you and the world around you change as you perform missions with each trend being determined in part by the era and in part by the space politics when the trend change event occurs. The crew and political trends are described in the Missions chapter.

The recommended way to begin is to start the game at the beginning of the Upported Era, at 2040, and play from there - although there are optional rules if you wish to start with the First Wave earlier.

Apology Sixty Years In uses era to mean a completely different thing from the geologic time 'era'. Each Sixty Years In era is actually a half-generation (or half-cohort), where a generation is normally measured in 30 year intervals. While the eras in the game are 15 years, in reality the technological progress each era brings is hugely accelerated - from a more realistic perspective, Sixty Years In eras should probably be 50 years or longer. This would break the main conceit of the game, which is a single life spanning multiple significant shifts in humanity's technological capabilities.

Technology Levels

Sixty Years In has six main technology levels: Earthside, ET Produced, Advanced, Promoted, Future and Breakthrough. These roughly correspond to the six main 15 year eras - Baseline, Upported, Colonization, Exoglobalization, Futures and Breakthroughs shown on the Sixty Years In Eras table on page 48. Each technology has a set of prerequisites that the crew must complete to be able to access the technology level. When the crew achieves the technology level, they will get the listed benefits in addition to access to any equipment at this technology level as described in the Upgrades chapter on page 179.

Earthside technologies on page 27 are built on the ground and boosted into space. Earthside technologies represent a lot of technologies that are currently available or for which there is not a requirement for sophisticated production techniques only available in microgravity vacuum environments. A limited number of Earthside technologies exist in the Baseline era but they are generally available from the start of the Upported era. **Benefits:** Your crew gets access to Earthside technologies on Earth and in LEO. Some of these Earthside technologies are also available ET produced at a limited range of sites.

Extraterrestrial (ET) technologies on page 32 are built at factories established elsewhere in the solar system, and one of the major crew goals is to establish or gain access to a factory to produce ET technology. ET technologies come in six types, corresponding to five major spectral types of asteroids: Carbon (C), Vestoid (V), Metal (M), Stony (S) and Dark (D) and a sixth representing Helium-3 (H) sourced from gas giant aerostats. Each site a factory could be built at has a corresponding spectral type indicating what ET products can be produced there. **Benefits:** Your crew gets access to a specialist stack at ET technologies, and any ET produced assets from the Assets chapter are half the listed mass. The spectral type of the ET factory determines which other technologies you get access to.

Advanced (dual) technologies on page 35 become possible when a second factory type is established - usually midway through the Colonization era. For spacecraft, this allows ET produced components to be built at each of the two factories and then combined into the final rocket. For other equipment, advanced technologies are an abstraction of the new manufacturing techniques that become available as more technological capabilities are built. **Benefits:** Your crew gets access to a rig at advanced technologies. The spectral types of the ET factories you control determines which other technologies you get access to.

Promoted technologies on page 37 are ET produced technologies which are then taken to a lab and promoted. A lab can exist in one of three ways: either a) a factory built at a TNO science site (Trans Neptunian Object) can act as a lab; b) a mobile space station called a Bernal can moved adjacent to or onto a factory at a science site to act as a lab and c) certain colonist abilities, capabilities and upgrades can act as labs in specific conditions or with specific restrictions. **Benefits:** You can apply updates to your equipment at labs which significantly enhances the abilities of each item you carry: equipment starts with 2 updates at this era and your stack acquires a second update. The spectral type of the lab determines which other technologies you get access to. Your crew, colonists and robots can also be promoted at labs, and these promotions grant additional unique abilities.

Futures technologies on page 39 have technology specific requirements that have to be met before the future technology can been developed. Many futures require Epic hazard operations be performed, which always entail a risk attempting the operation, but for which the risk can be minimized by having either a trans-Neptunian object (TNO) factory or factories of 4 different spectral types. A future technology may result in a technological singularity, a tipping point following which it is much more difficult to predict what form society will take. **Benefits:** Your equipment gets an additional update.

Breakthrough technologies on page 43 are those technologies only achievable by a Kardashev type II civilization, which use the total energy output of the sun captured by a Dyson swarm. Some of these breakthroughs may lead to singularities which unlock even more powerful postsingularity technologies, although these are normally only available as a gift from postsingularity species that have reached this point. **Benefits:** Your equipment gets an additional update.

Technology Classes

ET produced equipment is associated with an asteroid spectral class: C, D, H, M, S or V, and the equipment type is referred to using this letter hyphenated with the word class, as in C-class. Advanced and promoted technologies also use class names. Promoted technologies use the word lab instead of class, as in C-lab. Future and breakthrough technologies aren't associated with specific locations and so don't require a technology class: if needed they should simply be called Future-class or Breakthrough-class.

On naming things Names are important but also need to be meaningful. But it is often hard to come up with good names, especially spur of the moment. Technology classes are intended as a "minimal lovable product" substitute. They have the drawback that names that the High Frontier board game uses to refer to objects around our solar system are the result of historical circumstances that draw on a specific cultural canon and myths.

Advanced Technology Names

Advanced technologies class names are determined by the two factory spectral classes that contribute to the technology. Look up this combination on the Advanced Tech Classes table on the next page to see the class name. *For example, an advanced technology robot incorporates both C- and D-class technologies. The robot is Trojan-class, named because of the majority of asteroid spectral types in the Greek and Trojan camps around Jupiter.*

World wide trade routes Worlds which have two or more sites on them will very quickly become advanced technologies, as even illegal smuggling between these sites is easier than subsidized interplanetary trade. Limiting factors can be always be overcome from trade along buggy roads.

Push factory subclasses If there are spacecraft designs which benefit from push factories, there will be a push factory subclass listed in brackets. Use this name instead if the technology incorporates the push functionality.

Advanced Tech Classes

Factory	D-class	H-class	M-class	S-class	V-class
C-class	Trojan	Saturn	Triton	Europa	Callisto (Venus)
D-class		Jupiter	Beehive	Kuiper	Titan
H-class			Neptune	Sol	Uranus
M-class				Luna (Io)	Miranda (Galileo)
S-class					Ganymede
V-class					(Mercury)

Lab Names

If you need to distinguish the name of a laboratory from the technology it produces, name the lab using the full name of the asteroid spectral type followed by the word lab, except using Silicon instead of Stony: Carbon lab (C), Dark lab (D), Helium lab (H), Metal lab (M), Silicon lab (S) or Vesta lab (V). *For example, "a Silicon lab makes S-lab promoted technologies".*

Other Classes

Some technologies will be broken up into other descriptive classes. For instance superweapons are divided into Spacecraft-class, Site-class, Biosphere-class, World-class, Stellar-class and Galaxy-class; and monsters, a term for extremely dangerous unintelligent species, are divided into Biohazard-class, Tank-class, Colossus-class and Titan-class.

Baseline

The baseline Sixty Years In era is what you see when you look around you today. That's not to say that baseline technology will be familiar and commonplace - there are many technical marvels which only the wealthy and educated are privileged enough to use and there are some trends with that will make even baseline technology feel unfamiliar and strange. The smart phone you have lets you stand outside at night and use a distributed communications system on a portable supercomputer to track the location of a space station in the sky, but it is not something you would do every day.

Baseline Technologies

Baseline technologies are the technologies that were available in 2020. To avoid having to remember what that was, you may choose to use the technology available to you at the time of playing the Sixty Years In RPG as a proxy for 2020 technology levels.

One exception is computing in space. Silicon chips and SSD hard disks are sensitive to cosmic rays, and touch interfaces cannot easily be used in microgravity and free fall environments. As a result, baseline computer technology resembles the early 1990s. The only significant difference is the lack of smart devices at baseline technology levels, as complex computer processing is off-loaded to Earthside, however user interface enthusiasts may appreciate the aesthetic experience of trackballs, keyboards and low definition video.

Life Is Cheap

As population continues to grow, qualify of life improves and the number of wars world wide continued to fall consistently year on year, increasing supply and decreasing demand due to automation exerts its inevitable pressure in the labour market. Labour, whether blue collar or white collar becomes increasingly fungible and transferable to wherever the cheapest supply exists (currently Asia, soon to be Africa). Likewise

the number of university graduates increases ever upwards as desperate parents and students sacrifice long term capital for short term education gains until the value of a life becomes increasingly determined by the amount of inherited capital it controls rather than its intrinsic worth or capabilities. “Life is Cheap” is a shorthand for the collapse of labour costs worldwide accompanied by the increases in overall education and intelligence caused by global rising standards of living and improved nutrition, leading to massive unemployment and underemployment, especially for the booming young populations of third world countries.

People are Good (Except Psychopaths)

Despite “Life is Cheap”, most people continue to follow the Golden Rule: “Do unto others as you would have them do unto you.” During any time of adversity: a natural disaster, war or civil unrest, the overwhelming majority of people will band together to help each other, despite the projected fears and fantasies of police, policy makers, science fiction authors and survivalists. Meanwhile, the extremely wealthy: the 0.5% of the population who earn more return from their capital holdings than income from their labour will continue their drift away from this rational behaviour - becoming unmoored from the checks and balances of social unity. And the psychopathic minority will continue to become doctors and politicians, journalists and entrepreneurs, reinforcing the surface impression that everything is getting worse rather than better.

War Criminals

The war criminals era of warfare is one where strong cross border trade links discourage conflict, professional militaries are mostly well-funded, counter insurgency techniques are well understood, electronic eaves dropping is capable of intercepting of the majority of hostile communications metadata and warfare and terrorist activities are largely indicative of policy failures and incompetence rather than ideological conflicts or territorial disputes. Wars are started and run by criminals who more concerned about perpetuating their power and concealing their criminal activities than any other outcomes: these criminals lie about reasons to go to war, use the cover of conflict to accept bribes and steal government funds, give territorial control over to local warlords, conduct drone, artillery and aerial bombing attacks against civilian populations and commit other war crimes with callous disregard for collateral damage, and prefer continual conflict and inconsistent objectives rather than negotiated peace.

We Will Find a Way

For the last century, every Malthusian prediction has been averted by technological innovation: people are capable in small and large terms of finding solutions to seemingly intractable problems when the need is great enough. As I write this, the unexpectedly rapid shift of energy generation from fossil fuels to solar power threatens to completely shut down coal power generation in the country I live in, despite the best efforts of the political class to preserve the status quo. Whether it is by the invisible hand of the free market or direct social activism, almost all the problems that you see around you today will be solved in the next century, usually by solutions whose impact is overstated in the short term, but underestimated in the long term. And when a problem becomes too big to incrementally solve, society will transform itself in a vast social experiment to do what needs to be done.

Space is Closer Than You Think

Low earth orbit (LEO) begins only a few hundred kilometers overhead: the challenge in reaching orbit is not in getting to space, but staying there. Earth’s gravitational attraction will pull any object down that is not travelling sufficiently quickly to stay in orbit, which for low earth orbit is around 6.5 to 8 kilometers per second (23,000 to 29,000 km/h). Including atmospheric drag, the total delta-v (change in speed) required to get to low earth orbit is 9.3 to 10 km/s, which is around twice the delta-v needed to get from LEO to

Deimos, one of the moons of Mars. The High Frontier map calculates movement energy requirements in burns, where each burn is 2.5 km/s and the map is primarily of energy cost instead of distance. It is overwhelmingly dominated by the gravity of the sun, which also defines heliocentric zones from Mercury to Neptune and beyond.

Tomorrow is Good Enough

We live in a future greater and more terrible than any a science fiction writer watching Neil Armstrong step onto the moon could have imagined. It is likely than the Baby Boomers are the last first world generation to ever grow up believing the future would always be brighter and better than the past but the second and third worlds will continue to get richer and safer places to live for some time to come. The historical trends towards corrupt oligarchies and post-truth media, the rise of the transnational nomenclature, the sheer number of people the world will have to support for the next century (with unimaginable localized pressures on food and water supply), the lack of any transformative technologies to enable further economic growth of the scale we have seen over the last twenty five years: these all mean the world will likely become poorer, less fair and more complex (with all the stresses that creates) than what you see around you today. But it will not be a dystopian future, the problems will be local and the solutions will do more good than harm.

The Twilight Bifurcation

Any fans of games by Phil Eklund will be aware of the tendency of this game designer to endlessly rewrite rules by taking advantage of malleability of online documentation. This is especially an issue for the Sixty Years In RPG as recent events can invalidate many of the statements made by the rules (such as the current state of the SpaceX re-usable rocket program). To avoid this, Sixty Years In RPG adopts a bifurcation point in recent history, inspired by a similar method employed by the second edition of Twilight 2000, where the events of the game world begin to diverge from the real world. Sixty Years In's bifurcation point is September 2015. It is your choice whether real world events that occur after this time are incorporated into the game world, but the Sixty Years In RPG rule book will only incorporate real world events up until this date. Future editions of the Sixty Years In RPG may choose to shift this date forward.

Stross Effects

Stross effects are named after science fiction author Charles Stross, and refers to the tendency of near future science fiction writing to be invalidated by 'black swan' events occurring in the real world (Black swan events are those events which appear inconceivable using the conventional wisdom of the time, usually right before they occur). The Sixty Years In RPG attempts to avoid Stross effects by minimizing the references to any events between 2020 and 2040.

Upported

'Upported' is a word coined by the L5 society to mean moving of goods into orbit, typically to a space station already in place. The first era after Baseline, Upported defines the technologies available in 2040 needed to start the Sixty Years In RPG (and High Frontier board game).

Author's note When I started writing this game in 2015, I projected a start date of 2030. Events since then have made me more pessimistic.

Earthside Technologies

Earthside technology is built and boosted from the Earth and consists of products built and manufactured using Earth resources which correspond to what would be considered a projection of current technology levels aggressively developed for the next 20 years. Any technology for which there is an available prototype in 2020 is an Earthside technology. Patents for Earthside technologies for the first wave will need to be acquired through auctions; by the time the second wave begins these technologies will be licensed and entering the open market in limited quantities.

Earthside technologies will have (Earth) in brackets next to them if referred to in the text. Some Earthside technologies can also be ET produced at a specific factory type. These will have a hyphen followed by the factory type following the world Earth, for instance gold nano-wire batteries (Earth-M).

Space Age Materials

A number of space age materials and technologies enter every day use within the space program at the start of the Upported era. Ironically, many of these space age materials are much easier to make on Earth, given the unique geological, hydrological and biological processes on the Earth over billions of years that have concentrated rare elements in easily mined locations. These elements are often not easily available elsewhere in the solar system in economic quantities, except at specific sites which have the raw materials present to produce them.

The class given is only required if the Earthside technology has to be ET produced. All missions starting from Earth (LEO or home orbits around Earth) begin with these technologies unless the space politics is Paleoconservatism. Each device can only use one battery technology shown in italics, or radioisotope Stirling generators, but other space age materials can be combined as required.

The Observations chapter on page 208 has more details on the Earthside technologies that can continue to be manufactured at each site. The improvements that these technologies provide are noted in the relevant rules section. If you don't choose a battery technology for Earthside equipment, you should assume the equipment has gold nanowire batteries.

Class	Earthside technology
C	*Carbon ultracapacitors*, high performance engines, para-aramid nano-fibers, telescoped ammunition
D	Boron nano-weave, carbon nanomaterial tanks, ray-hardened computers
H	X-aerogels
M	Bisphosphonates, *gold nanowire batteries*, *radioisotope Stirling generator*, vacuum mag-tube, white phosphorus rounds
S	*Aluminium-air batteries*, graded-Z shielding, single aperture antenna, transparent aluminium
V	Combined cycle hot fuel cell, *thin-film lithium ion batteries*, *lithium sulfur batteries*, printed solar panels

3D Printing

Earthside, 3D printing is everywhere - for custom and bespoke parts, for art and board games, even replacing some industrial processes where the cost of transportation exceeds the higher cost of this production

process. This is why 3D printing becomes a ubiquitous technology in space - used both as a part of the manufacturing process for ET produced technologies, for repair and maintenance of spacecraft, and for fabrication of personal equipment where mass is limited and energy is cheap. A key weakness of 3D printing technology is wiring cannot be 3D printed, so large scale systems produced at industrial levels still require wiring to be pulled through the manufactured parts as a part of the assembly process. Fabric cannot be 3D printed either, making space suits a valuable commodity.

The workshop scale 3D printer included in crew and colonist modules can manufacture side arms or 3D printed defense weapons (a submachine gun style design) and ammunition for the crew in a day. The spacecraft scale 3D printer included with some robots and all factories allows complete tear down and rebuilding of spacecraft systems using the Digital Swap operation (see Operations in the This Space Intentionally supplement for details).

Halbonauts

Most technologies become heavily automated to the point where they are functionally indistinguishable from robots ("roboticization"), starting with vehicles but including almost all technologies in later eras. This includes many functions which are traditionally performed by spacecraft crew. Humans in space are still important, but for repeatable functions, human crew can be supplemented by halbonauts: robotic astronauts. To avoid duplicating controls, most halbonauts are built in human analogue shapes and work alongside traditional crew.

The Crew chapter on page 80 includes rules on how to create halbonauts if you have them in the crew.

Spaceports

Dedicated space ports are built to handle the increase in satellite launches and the advent of viable interplanetary travel. As the game continues, space port infrastructure will be improved to meet growing demand.

Re-emergence of Nuclear Power

The move to a carbon neutral economy requires more than just a radical shift to solar power and other renewable energy sources to fulfill the energy demands of a continuously growing economy. Renewables have a number of significant drawbacks that impact the ability of the power grid to deliver energy at peak demand times, and this leads to a renewed demand for on demand power generation with predictable costs, and without the geopolitical dependencies of oil, coal and natural gas. Nuclear power generation becomes a popular power generation alternative, especially with the emergence of newly viable fusion power generation using D-D Magneto-Inertial fusion and D-T Fusion Tokamak technologies.

Keep gaming nuclear free It is possible to start playing Sixty Years In without nuclear power as an acceptable space-based technology. The Anti-Nuke policy represents such a scenario.

A New Space Race

At least some of the world's great powers: such as the PRC, the USA, India, the EU or Russia re-engage in a space race. This time the conquest of space is economically driven, possibly as a traditional Keynesian stimulus to an economic downturn in one or more of these economies, or as a bread-and-circuses style distraction to problems faced at home. The space race may also be driven by private companies such as SpaceX or Shimizu or multinational organizations such as the UN or B612 Foundation or informal groups of individuals such as Anonymous who are more forward looking and flexible than nation-states.

Software is Expensive (corollary: Hardware is Cheap)

The costs of software routinely exceed the costs of hardware, with even bespoke, high-precision hardware needed for rocketry falling to commodity prices due to the prevalence of 3D printing. Software development meanwhile reaches a scale where the complex interdependencies of developing and maintaining software systems required to run major infrastructure, including rockets, exceeds the cost of hardware (including boosting that hardware to LEO) by a significant factor. Software engineers capable of managing these complex systems can demand the highest prices, software development become highly specialised with a legion of programmers developing custom code on demand at considerable cost. Patents covering software and hardware are valued much more highly, and intellectual property protections and treaties significantly impede the ability of non-patent holders to copy them. Retroactive patents are extended in key areas to take key intellectual properties (such as the de Laval nozzle) from the public domain and push them back into private hands.

Drones

The drones era of warfare is where the human cost of warfare drops significantly because of the presence of cheap automated drones on the battlefield on both sides of the conflict, rather than asymmetrically as in earlier eras. Drones can be rapidly 3D printed and deployed but both the production facilities and the software are incredibly vulnerable to interdiction and production hacking and malware attacks.

Meanwhile a number of innovative human-scale defensive technologies significantly increases the survival rate for soldiers on the battlefield. Infantry portable weapons no longer have the devastating stopping power against personnel that they did a quarter century earlier and only lucky shots or hits to extremities are effective against a well-armoured soldier.

Cyberwarfare becomes a critical part of any battlefield and cyber-dominance here allows you to turn the weapons of the other side against them. Naval warfare is limited to patrol boats and submarines because traditional naval ships and aircraft carriers are exposed as being incredibly vulnerable to cheap surface to ship missiles. Asymmetrical warfare becomes more and more effective as the tools needed become cheaper as the result of the lowering costs of mass production and the increased reliance on automation and just-in-time supply chains makes attack targets more vulnerable to disruption.

The risk and material costs of two factions engaging in space-based combat in this era and technology level is prohibitive outside of Earth-Luna orbits and as a result most warfare results in standoff engagements and threats rather than actual fighting. Almost all space-weapons are platforms repurposed from their other function as prospecting tools (buggies, missiles and rayguns), rather than dedicated military hardware, although nuclear weapons are small enough to occasionally be smuggled into space.

Crew Modules

The starting 40 tonne crew module assume significant advances in a number of space related technologies, including propulsion, materials science, medical, environmental engineering, radiation shielding, radiators and energy storage and generation.

Crew Module Description This text (and the Bernal descriptions later in this chapter) are from the 3rd edition of the High Frontier board game.

Crew Module Layout

The crew module consists of 16 tonne inflatable Bigelow habitation modules (1760 m^3), made of Vectran (a "bulletproof" textile). Food and atmospheric conditioning is provided by crops that grow without soil but have their roots misted with nutrients daily. A plot 25 meters across provides all the foodstuffs for the year. Waste heat from plant evaporation requires low temperature radiators. A 10 tonne life support module requires 12 kWe, and communications from Ka band antennas require another 0.2 MWe.

A high quality crew's crew module will consist of paired Bigelow modules, 45 meters apart, rotated at 5 RPM to provide 0.6 G of artificial gravity - a medium or low quality crew has only a single module which is not spun. Although a high quality crew module has space for 8 crew, second wave spacecraft are typically understaffed: carrying only 4 crew to save on weight and required resources. The medium or low quality configuration does have the ability to add a second module to give the crew flexibility to pick up and drop off high paying or mission critical passengers as required but this will only be fitted for the mission and either abandoned or incorporated into a factory or colony once completed.

Crew Module Quality The Mission Control Social Unit (MCSU) crew quality defines the crew module capabilities, rather than the spacecraft quality. Both of these are determined by the type of MCSU rolled.

Radiation Protection

If a solar storm erupts, the crew must evacuate into a small (8m dia) storm shelter. The shelter is shielded by 100 kg/m^2 of polyethylene (12 cm thick), plus water propellant and graphite. This gives any crew sheltering in the storm shelter an effective rad-hardness of 4.

In a high quality crew module, a charged plasma sustains a high electrical potential (10 GeV) about the hab unit for protection against most galactic cosmic rays. When a charged particle passes through this magnetic field, its path curves to avoid the occupants.

Crew Module Thruster

The crew module also includes a H2-O2 chemical thruster with a fuel efficiency of 8 and the ability to afterburn for an additional 2 fuel tanks expended. The combustion of the cryogenic fuels hydrogen and oxygen produces an ideal specific impulse of 528 seconds. The product is water, which is exhausted through a converging-diverging tube called a De Laval nozzle. An example is the Space Shuttle main engine, with a specific impulse of 460 seconds (fuel economy of 0.25). It uses a nozzle with a 180:1 area ratio, regeneratively-cooled with liquid hydrogen. The chamber temperature is 3500K, and the chamber pressure is 2.8 MPa. The engine has a thermal efficiency of 98%, a mixture ratio of 5.4, and a frozen-flow efficiency of 55%. A 2 GWth chamber generates 440 kN of thrust and a thrust to weight ratio of one gravity.

The thrust of the chemical thruster depends on the crew module type: crew modules typically have a thruster of either 6, 8 or 10.

Humans in Space Matter

The complex technological overheads required for a crew module would not be needed if having humans in space was not an important component of the new space race. The High Frontier universe assumes that a significant percentage of glitches experienced during a mission are not remotely resolvable, and that a local human presence is the only way of rectifying issues which are either time sensitive or interrupt communication between the spacecraft and mission control. Note that High Frontier does not assume the same for hazardous situations. In these instances, automated systems are as effective, or even more effective than human pilots. The abilities of certain colonists to avoid aerobrake and ring hazards may be due to specialist equipment that these colonists carry or due to innate skills which these colonists have or a combination of both.

Politics in Space

With people in space comes politics. This is tracked on the "space politics" diagram which divides policy into a 2 dimensional spectrum with one axis extending from authoritarian to libertarian and the other from socialist to family focused. The current space politics determines the political and legal climate in space and may restrict the crew from performing certain actions or enable them to perform certain others

(felonies, combat) without consequences. The nation controlling the launch site the mission control is using will also undergo political changes: often dictated by events occurring from month to month, but also controlled by the solar cycle which is also used to represent broader economic and political cycles. When a colony reaches a million inhabitants, the site they are at develops its own local politics, which overrides the space politics for that site.

Space Health Issues

Microgravity health issues will affect the first crewed missions of the second wave in medium or low quality crews, until the capabilities of microgravity medicine improve through hard won experience. Some of these issues will be caused by decisions mission control has made to mitigate more serious problems which could be encountered in space. Psychological issues will continue to affect crew missions even once technology has ensured their physical well being.

Upgrades

Mission Control will continue to improve technology available to the crew throughout the Upported era, and make these technologies available when the crew returns to their home orbit or a faction controlled factory. If the mission control works with another faction, that faction may also be able to apply upgrades to the crew.

Earthside technology upgrades are almost all well understood technologies and processes that have been adapted for use in space.

Space Mountaineering Not everyone venturing into space has noble goals. Take Chimp Pigman: a billionaire at the leading edge of the space race. Chimp Pigman used to have another name until they started believing in the hybrid theory of human origin and surgically modified their face to resemble that of an adult male boar. After pushing themselves to the extreme limits of gastronomy, they now wish to express their chimp-like tendencies. Which in this instance is climbing the highest peaks in the solar system.

Pigman wants you to accompany them to Mars to climb Olympus Mons (22 km), to Vesta to climb the center of Rheasilvia (20-25 km, roll 1D6+19), and Iapetus to climb its equatorial ridge (approximately 20 km). Complications may include Martian colonists imprisoning Pigman and putting them on trial for crimes against Mars and humanity (while dead naming them the whole time), self-replicating nanobots on Vesta dismantling the mountain to build a hypertelescope and Pigman deciding difficult is better than tall while at Iapetus and extending the mission to climb the highest peak in the Boosaule Montes on Io and Tenzing Montes on Pluto.

Colonization

The Colonization era assumes a permanent human presence in space - initially in near Earth orbit (NEO) infrastructure projects but subsequently at temporary or permanent space colonies formed by crew or colonists at industrialized extraterrestrial locations.

Finding Out

Human generated carbon output will peak in 2050 at around 55 gigatons per year if national and international efforts are unable to agree to more stringent measures than are currently committed to, resulting in a 3 degree increase in average temperatures by 2100 and a radically altered Earth. Even if they do the seas will continue to rise in response to historic temperature increases: this process will continue for at least 2000 years resulting in sea levels 2-3m higher than they are currently for each degree of temperature increase. Flooding and coastal storms resulting from the 30 cm increase by the middle of this century will displace 1.2 billion people, 20 to 25 times larger than the number of people displaced by World War 2. This will by necessity radically alter the notions of borders, sovereignty, nations, capitalism, housing, food and water security.

The world population is likely to peak near 10 billion in mid 2060 and then begin to decline as more countries begin to match the demographics of aging, wealthy Western nations like Japan and Italy. This population increase is much less of a threat than global warming as it merely requires that the most wealthy nations and individuals sacrifice a fraction of their living standards in order to have enough food, water and housing to sustain an additional 2 billion.

And even given these pressures, Earth will remain immeasurably more hospitable for human life than space or extraterrestrial worlds.

Sites and Factories

Extraterrestrial factories are built at sites to extract raw stuffs such as isotopes and volatiles from the regolith (or atmosphere, at an aerostat), refine them into inks and 3D print goods from them. These factories are mostly automated, with small highly coordinated teams performing wiring pulls through the printed components as wiring cannot be 3D printed until much later technology levels. There are some advantages to having colonists in situ performing these operations, but colonies are mostly established for political reasons although the economic benefits of the factories present sustains them.

Each site is associated with a spectral class, roughly corresponding to the spectral class of the asteroid the site is on. The spectral classes are C for Carbonaceous, D for Dark, H for Helium-3, M for Metallic, S for Stony and V for Vesta – asteroids that resemble the rocky mantle of an Earth-like world. Each spectral class has a number of attributes, outlined on the Spectral Class tables on the facing page and on the following pages and expanded on in the Observations chapter on page 208. Sites also have sizes, which determine the likelihood of the site having any useful raw stuffs to mine at all as well as the surface gravity of the site; and hydration, which determines how difficult it is to extract water, both for fuel as well as lubricant and coolant during the mining process.

Claiming a site to build a factory on requires a robonaut (a space prospecting platform) with an ISRU rating less than or equal to the site hydration (ISRU stands for in situ resource utilization). Once the claim has been established, the claimant can decommission any robonaut along with a refinery to build a factory. The factory inherits the spectral class of the site: the spectral class of a factory determines what ET products it can produce.

ET Produced Technologies

Extraterrestrial factories allow you to build products in microgravity environments that are not possible in the high gravity atmospheric conditions of Earth, using materials and production techniques which may be

Spectral Class Geochemistry

Class	Geochemistry	Planetary bodies
C	Carbonaceous	Carbonaceous chondrites
D	Highly refractory or volatile	Primitive carbonaceous chondrites, pre-solar grains
H	Atmophile	Gas giants
M	Siderophile	Iron meteorites, “wet metallics”
S	Lithophile, chalcophile	Ordinary chondrites
V	Igneous rocks	Achondrites, rocky core planets

hazardous or too radioactive for human co-habitation. Each site on the High Frontier map is associated with a particular spectral class derived from modern asteroid spectral classes that determines what products and isotopes are available at that site.

ET production typically consists of three distinct steps: first, acquiring or researching a patent describing the technology in question; secondly, by forming a successful claim and industrializing a factory at an extraterrestrial site, and thirdly, 3D printing and assembling the technology product at the factory. See the Operations chapter in the This Space Intentionally supplement for how to perform these actions. Second Wave mission controls have already licensed the Earthside (“white”) patents needed to build the starting rocket and can acquire any ET technology using a research or acquire patent operation.

ET production also gives you access to three new component types: ET produced robots, GW thrusters and freighters. GW thrusters require isotope fuel that matches their spectral type: extraction of this fuel at factory sites is a much more complex process which results in much lower yields. ET production rarely produces unfinished goods for export: in most circumstances only isotope fuels and elements essential to life are potentially worth more than water.

The Observations chapter on page 208 has more details on the economy, construction and exports of each type of site.

Class	Local goods and construction materials	Exports and isotopes
C	Ceramics, carbon allotropes	Nitrogen
D	Plastics, carbon and boron fibers, corundum, germanium	Boron-11
H	Aerogels	Helium-3
M	Platinum, gold, osmium, iridium, tungsten, iron	Phosphorus, curium-245
S	Hafnium, tantalum, copper, aluminium, titanium	Uranium-235
V	Advanced composites, basalt fiber, perovskite	Lithium-6

Nano-Materials

ET produced robots and other ET produced technologies are built taking advantage of nano-materials enabled by the production techniques and mined raw stuffs available at the specific site factories. The impact of these nano-materials in the game are largely abstracted and they are simply referred to as “C-class”, “D-class” and so on.

In addition, most nano-materials and later era materials come in Drexlerian and wet nanotech forms. Drexlerian or dry nano-tech is usually constructed in a factory whereas wet nanotech is grown in a laboratory in a bio-reactor or as an end product from genetically engineered antecedent plants or animals.

The Observations chapter on page 208 has more details on the types of nano-materials that are found at each class of site.

Class	Predominant raw stuffs	Nano-Materials
C	Clay minerals	Carbon allotrope nanomachines
D	Resins and other petroleum products	Inorganic nanotubes
H	Gases	Quantum dots
M	Nickel, iron, cobalt, siderophile metals	Multi-metallic nano-motors
S	Mineral ores	Dynamic nano-composites
V	Small quantities of all types	Cation exchange nanorods

Nitrogen Blockade

Modern firearms use a mix of RDX compound and nitroguanidine for bullet propellants which requires nitrogen to manufacture. Without a ready supply of nitrogen (only available at C sites and Titan), ET-produced weapons must rely on alternative technologies to propel kinetic energy projectiles to their targets. This means in many instances, extraterrestrial produced projectile weapons are less effective than their Earth-produced counterparts except for specialized uses.

The nitrogen blockade will also affect you if you build a colony during this era. Unless the site is a C site or Titan, the nitrogen from your crew module's atmosphere and any remaining on board supplies will be used to start the nitrogen cycle in the colony's crops. You will need a new buffer atmosphere to prevent the oxygen in the crew module and space suits atmosphere from catching fire. The atmosphere chosen depends on the spectral class of the site. See the Crew Module ET Production section on page 186 in the Upgrades chapter for details.

Because of the continued dominance of cyber-warfare in this era, the use of drones is incredibly limited on the battlefield, and instead stand-off weapons and sensors such as satellites and spacecraft are used to supplement powered armour-equipped personnel on the ground. In space, the first dedicated space combat weapons appear, including combat lasers with ranges around 1000 kilometers. These lasers are effective enough to kill almost all inbound missile platforms, except those equipped with Casaba howitzer warheads, a type of nuclear-shaped charge with ranges out to 100s of kilometers, depending on warhead size. Casaba howitzers are used both in missile warhead and anti-missile roles.

Near Earth orbital facilities

Ground based or orbital facilities may have been built to allow much easier access to space - either directly or by providing essential services to space travellers.

Propellant Depots Storing fuel in space makes sense when the total fuel payload which can be carried is limited by the size of the launch vehicle or when you have a non-rocket method for launching the propellant into space that is not viable for more delicate rocket components or crew (such as a space gun). Earth-Luna L2 is an ideal location for a propellant depot, because it is in "deep space" compared to LEO, as being above the far side of moon shelters it from light and heat reflected and re-radiated from the Earth. This extends the life of the fuel stored there while still being close enough to be cost effective to send fuel from Earthside.

Paraterraforming

Paraterraforming is limited terraforming operations - specifically creating Earth-like or living environments protected under domes or underground installations. Many extraterrestrial environments have many of the necessities of life: including water, energy from solar power (supplemented with nuclear power), volatiles including oxygen needed to create a breathable atmosphere, and regolith which can be combined with organic materials to form soil. Three key exceptions are phosphorus, potassium and nitrogen (but also seeds, eggs and ova, and living plants and animals), which will have to be exported from Earth or other sites (C type for nitrogen, M types for phosphorus) to many environments to provide a livable extraterrestrial environment. Carbonaceous asteroids and the atmospheres of Venus, Titan and Triton are important sources of extraterrestrial nitrogen. Iron asteroids, Luna and Martian soil and moons and asteroids at Saturn zone and beyond have useful quantities of phosphorous. Potassium is rare on Venus and gas giant aerostats and will have to be imported from elsewhere.

Beamed Power

Beamed power from power satellites orbiting the Earth becomes available to power many extraterrestrial technologies. A typical powersat uses a 60 MW beam to provide remote power to a single solution, such as

an ablative laser or a mag beam robonaut. Beamed power can also be used to increase the total power available to many electric and some nuclear rockets, which are often power constrained in how much thrust they can produce. Some factory sites can also generate beamed power: ET factories may be industrialized with a solar power girdle circling the planet or an ionosphere lasing satellite which can deliver laser energy via the local planet's ionosphere. Factories built at Mercury, Venus and Io are known as push factories, because they have so much solar power available they can generate GW scale beamed power instead of MW scale - Io instead uses the massive power reservoir of Jupiter's magnetic field.

Rigs and Mods

Upgrades begin to change the lives of the crew in unexpected ways. These mods are more than just individual implants or technologies and can significantly alter a crew member's body or brain or both. Space suit designs and other equipment improves significantly and at Advanced technology levels begin to synergize with the equipment load outs as well as technical capabilities of the crew. These rigs are specialized for specific functions such as engineering, survival or combat.

Advanced Technologies

With one factory built, you are able to upgrade your spacecraft and proceed to a second site to build a second factory. Having access to factories with two different spectral types available, you can significantly improve your spacecraft as well as build advanced equipment, such as new weapons and armour. Advanced spacecraft classes allow design synergies which will not have previously been available. See the Spacecraft Designer in the This Space Intentionally supplement for details.

Meso- and microtech

As 3D printing takes over manufacturing at larger scales, traditional manufacturing techniques begin to be applied to smaller and smaller sizes, along with the adoption of novel methods to permit micromanufacturing. Mesoscale manufacturing is manufacturing at the millimetre scale and sub millimetre scale: around the size of a grain of sand or dust, and first appears as an ET produced technology. Mesotech includes the largest smart matter such as nanites, nanobots, medichines and smart dust, but also microbots, small robots with sensors, locomotion and limited programmed behaviours but no AI. The first ET produced microbots are actually larger than mesoscale, roughly mosquito-sized bug bots, mesoscale microbots (sand bots) appear at Advanced technologies and true microscale plague bots at Promoted technologies. Microscale manufacturing is at the micrometre and sub-micrometre scale, from the size of bacteria to the width of a human hair and appears as an Advanced technology. Microscale technologies do not suffer the heat side-effects that nanotech has, but is less effective than nanotech. Some smart matter and blue goo are microscale rather than true nanoscale.

Kriegbots

Advanced computer systems finally catch up to malware and become highly resistant to compromise, allowing a proliferation of robots on the battlefield. However traditional armoured fighting vehicles are forced to adopt new shapes as smart warheads overcome the traditional advantages that sloped armour has against attacks at range, and lasers make it dangerous for flying vehicles to travel at any altitude above nap-of-the-earth flight. A mix of low speed and high speed war fighting machines known as kriegbots begin to dominate the battlefield although smart grenade-armed infantry stay relevant.

In space, spacecraft-based laser weapons are routinely used out to 10,000 km ranges, and 100,000 km from site- or Earthside based facilities. The first promoted warships with active armour cooling appear and mitigate the dominance of these lasers: these allow armour to remain effective by reducing laser effective ranges to 10% of their stated range when flanked or 3% if the defending spacecraft is head on to the attacker.

Coil guns, pulsed lasers and penetrating particle beams attempt to disable the active cooling systems on these warships at these short engagement ranges or to destroy them completely. Casaba howitzer missiles and anti-missile defenses fall out of favour as they cannot survive long-range laser fire and equipping them with actively cooled armour uses too much mass, but they remain useful as anti-ship weapons in close-in engagements.

C-Death

Advanced medical facilities are sophisticated enough that, given time, they can repair almost all damage: exceptions include Alzheimer's and damage to DNA leading to cancer. But individuals with sufficient brain damage or complete brain death that have been healed this way still have their consciousness damaged or destroyed as a result of the trauma. These people are known as C-dead: they seemingly behave like a normal person but lack a conscious mind. This is a result of an interruption to the continuity of the conscious mind in much the same way that a copy of a mind has the same interruption of continuity as a part of the copying process.

But establishing whether someone is C-dead is beset by the same complexities as establishing whether a robot as a conscious mind or not. While they may have been brain dead, from the moment that medical technology heals them, they could potentially and spontaneously develop a conscious mind again, using many of the memories preserved from the original mind to reform anew. Since this new persona could be functionality identical in every way to the original, regardless of whether they are conscious, there is no possible "consciousness test" that can be administered to determine this, unless their consciousness falls well below the threshold to the point they lack any of the introspection and reflexive language use that conscious minds are capable of. And even then, the process of testing could trigger the emergence of consciousness, requiring that you keep re-testing instead of relying on the results of the last test you administered.

Society, on the other hand, is often not ready for the subtleties of a continuous spectrum when a binary will do and politics will happily exploit the difference. Once it becomes clear that C-death is repeatable phenomena, and that the C-dead are somehow diminished and less human, they will be taken advantage of in the same way that robots are. For more details on the C-Dead, see the Faction Designer chapter on page 341.

C-Dead Proclamation The crew is approach by C-dead rights activists to use their high profiles to act as activists for one of two cause: either for universal suffrage of the C-dead, to grant them voting rights they lost as a result of having their death certificates issued; or to set up an extraterrestrial colony called Heaven to act as a sovereign nation for the C-dead. Meanwhile a nano-plague of self-reproducing medichines that calls itself Raise-R-Us begins raising the recently dead from the graveyards, reconstructing their bodies and brains as they were in life using their social media footprint. About 1D6x10 million people die each year due because of the prohibitive cost of high-end medical care and Raise-R-Us believes in the universal right to life, liberty and happiness.

Exoglobalization

By 2070, a significant human presence throughout the solar system is driven by extraterrestrial industrialisation and new science facilitated by ET labs and GW-scale beamed power from push factories.

Settlement

Some colonies declare their independence from Earth and begin the long and complex process of becoming permanent, self-sustaining settlements. Settlers must contend with birth and developmental defects brought about by radiation, environmental toxins in the soil used to grow crops in, low or micro gravity, poor nutrients and limited gene pools. But by declaring independence, they also cut themselves off from the massive amounts of support from Earth, including remote expertise and resupply rockets, greatly increasing the risk of the settlement failing.

Promoted Technologies

Promoted technologies are constructed at ET labs and consist of significant improvements to already useful ET produced or advanced tech. Spacecraft thrusters become available in the terawat (TW) energy range, which requires that they have even more advanced high temperature radiators than previously developed. Freighter fleets of independently operating spacecraft, equipped with spacecraft scale 3D printers and capable of acting as mobile factories will begin to appear throughout the system.

Aerosol Smatter

The exoglobalization era introduces aerosol-based systems such as phased array collimators, smatter antigens and utility fog that are more classically thought of as smart matter. Massive lenses can be built from reflective particles which themselves can be corralled by laser light into the desired shapes. These particles operate at a micron scale, so larger than typical nanotechnology. Smatter antigens are used to target and destroy other types of smart matter, usually by overheating it or causing it to otherwise catastrophically malfunction. Utility fog is a smart aluminium defensive array original conceived of as an over-designed seat belt. Each foglet has articulated micro-arms which connect to adjacent foglets on demand to form an energy absorbing barrier.

Heliocentric zones

The High Frontier map is divided up into heliocentric zones of differing solar power levels, where each heliocentric zone is named after the major or dwarf planet that orbits through it: Mercury, Venus, Earth, Mars, Ceres, Jupiter, Saturn, Neptune and Uranus. Infrastructure in these zones is built to support exoglobalization and exploitation of resources further away from Earth, and advanced technologies permit larger structures near Earth.

Push Factories

Push factories are built in locations with massive amounts of cheap energy, permitting gigawatt scale beamed power to be distributed around the solar system.

Io Push Factories Jupiter's magnetic field lines, which Io crosses, couple Io's atmosphere and neutral cloud to Jupiter's polar upper atmosphere by generating an electric current known as the Io flux tube. It is possible that the "volcanoes" seen on Io are neither volcanoes or geysers, but rather touchdown points for flux tube currents from Jupiter. The Jovian magnetic field lines that do get past Io's ionosphere also

induce an electric current, which in turn creates an induced magnetic field within Io's interior. Io's induced magnetic field is thought to be generated within a partially molten, silicate magma ocean 50 kilometers beneath Io's surface. Electrodynamic harvesting of the flux tube and magnetic field line currents can generate enough power to generate GW-scale beamed power.

Mercury Push Factories Mercury proximity to the sun gives it high solar light intensity, which is stronger than on Earth by a factor of 10.6 at perihelion and 4.6 at aphelion. This strong light intensity would provide virtually unlimited power via electronic solar arrays, although it would require developing extreme temperature photovoltaics, perhaps from silicon carbide. More usefully, the vertical temperature gradients of ~200oC/m could provide power via thermal solar arrays. Power generation of this magnitude allows push factories to be built here.

Venus Push Factories Any attempt to terraform Venus must deal with the massive amount of CO_2 in the atmosphere, which acts as a green house gas heating the surface hotter than Mercury. One approach would be to build self-replicating aerostats using carbon extracted from the atmosphere and use them for solar power harvesting for a push factory.

Mobile Bernals

Bernals are space habitats which use either lunar regolith or asteroid mine tailings both as radiation shielding and propellant. In the High Frontier universe, Bernals are used as space-side production facilities, allowing assembly of finished products in Earth and factory orbits, which have been manufactured on the ground and boosted to the Bernal. They can also act as ET labs when adjacent to science sites, which allows the development of promoted technologies, including new robots, freighter fleets and TW thrusters supported by high temperature radiators. A Bernal can be promoted when it has a power source (typically a generator) to become a mobile Bernal which is capable of moving under its own power as a dirt powered rocket.

An unpromoted Bernal is a dumbbell-shaped colony. The two spheres are 67m in diameter, separated by a 334m connection. It rotates at 1.9 rpm for 0.95 gees of artificial gravity. Assuming $\frac{1}{2}$ Earth standard atmospheric pressure, the structural mass is 400 tonnes. Normally staffed by a crew of 100, it can hold up to 2000 souls maximum. Upon reaching its destination, the Bernal is filled with 200 tonnes of air, and surrounded by a 140,000 tonnes of dirt and water shielding honeycombed with nanofibers, all made from local ISRU materials.

The promoted design metamorphoses from the dumbbell into a 250m Bernal Sphere with a maximum capacity of 10,000 souls. The structure is 18,120 tonnes, with 10,000 tonnes of atmosphere. The shielding is 92,800 tonnes. It rotates at 3 rpm for 0.7 gees. Bernal design uses mirrors to reflect sunlight used for growing crops. For nuclear-powered Bernals, sulfur lamps replace the mirrors. Promoted Bernals are considered shirt sleeve environments, which allow crew to recover from injuries and skill atrophy suffered during missions.

Parahumans and Exohumans

Advances in medical and prosthetic technologies, nootropics and genetic engineering, reach a point where humans can reshape themselves within any set of parameters that could be reasonably considered human, from hypermorphs to cyborgs, from pig- or chimp-human hybrids to resurrected Neanderthals. Colonists and crew can be promoted in ways that push the boundaries of what humanity is.

Many of the more extremely modified humans look to the stars for refuge and these exohumans begin emigrating in small numbers at first but by the time of the Futures era they form significant space-based political movements in their own right.

Updates

Beginning with the Promoted technology levels, your equipment undergoes radical upgrades that significantly change how you interact with or use it. Each spectral class of laboratory has a different update type, and all the updates provide a significant benefit. At the Promoted tech level, each piece of equipment can have up to two updates applied and each further era adds an additional update.

Blind fighters

The re-emerging risk of AI systems being subverted by smart malware means the balance of warfare shifts back to human pilots who are harder to reprogram than robots and tend to die rather than change sides. Corresponding improvements in firefight protection mean that humans can have relatively high survival rates on the battlefield as smart matter and highly dense matter armours become commonplace. Sensory data becomes unreliable because of the dominance of battlefield laser weapons and electronic warfare using smart matter and microbots. Proprioception becomes the most reliable sense, requiring millimeter accuracy over kilometers traversed, supplemented by active vibration sensors. Training pilots to perceive this data is easiest when the body shape of the tank matches the shape of the pilot. These blind armoured suits fight heavily armoured sapping units capable of burrowing beneath the surface of the battlefield to use sand, dirt and rubble as their primary protection.

Space battles continue to be lethal and short-lived, with the most successful computational models resulting in the highest survival rates, although mutually assured destruction remains the most likely outcome. Stationary targets or those moving in predictable orbits such as planets and moons can be killed at incredible distances. Laser-coupled particle beams travelling around 10% light speed have sufficient power to penetrate hundreds of meters through earth and rock when able to focus on a target for minutes at a time. Defensive drones can are equipped with magnetic fields capable of deflecting particle beams they intercept (mag shield drones). Spacecraft to spacecraft combat features x-ray free electron lasers which have much faster (light speed) beams useful against mobile targets.

These can achieve million kilometre-ranges against unprotected targets but only 10,000 kilometre ranges or worse against targets with actively cooled armour which becomes common place on warships. Casaba howitzers become fusion powered and feed into light-weight particle accelerators to extend their range to 1,000 km or more. Laser web weapons with distributed focusing nodes to allow high-powered site or Earthside-based lasers to be fired at interplanetary distances.

Futures

By 2085, society has become to change in unrecognisable ways as technology changes what it means to be human.

Technology and Era Tracks

The Future era is the first era where multiple technology and era levels may begin to appear simultaneously. The Future technology track is used for factions which have completed a future but remain within the solar system. Factions which successfully launched an interstellar mission will enter the Mission era. The Mission era uses a 12 year long turn (or longer) instead of a year long turn and the start and end of this era are determined by the actions of the crew. The A Lot of Zeroes supplement describes the interstellar eras in more detail.

Future stars

Rather than presuppose one single vision of the future, the High Frontier universe allows for many different types of futures to occur. Futures include everything from terraforming planets using climate mirrors or by

crashing comets into them, to forming group minds or radical cults or violent revolutions in space. The Futures era is where these futures begin to be realised.

Posthumans

Truly non-human intelligent species co-exist with humanity for the first time. These could be artificially created conscious minds, uplifted animal or synthetic species, or humans who have been so incredibly altered that their thought processes are alien to us. But in creating these species, we ultimately create a complex set of dependencies between these species and ourselves that will be much more difficult to extract ourselves from than even the most intractable human relationships.

These new species are described in more detail in the A Facility with Words and All Errors are My Own supplements.

Smartter

Smart matter in the future era becomes much more flexible, able to be embedded in physical systems and able to compete in effectiveness with highly specialized dumb matter for computation but also living space. It also merges more safely with living things, allowing smatter storage organelles and "wet" nanotech versions of Drexlerian nano-smatter. Smartter is matter configured to be both structurally and computationally productive. Smartter includes touch-sensitive controls and light emitting surfaces which act as user interfaces, and stacks and systems which are embedded into the structure of buildings and vehicles. Smatter warfare also evolves in sophistication as the arms race of counter measures and counter counter measures grows, resulting in honeys, SCAnts and other unusual smatter types.

Solar Harvesting

Planets are incredibly inefficient in their use of solar radiation: they almost all sit on the ecliptic plane around a star, and have high albedos and frequently atmospheres which limit the total energy they capture. As a civilization increases its demands for energy, it will naturally increase its dependence on solar power, and begin to build structures such as solar power collectors and space habitats and position them nearer to the sun to increase their efficiency. Such structures will initially orbit the sun in a Dyson ring, but eventually form a more complex orbital swarm, or become statites, stationary solar satellites which use enormous light sails to prevent themselves falling into the sun.

Black silicon

The future battlefield is incredibly dehumanising because of the power of available weapons and the desperate measures taken to keep combatants alive. Blue goo technologies mean that soldier bodies can be rapidly 3D printed or regrown provided their brain is kept intact; this leads to brain drop deployments where the soldier brains are delivered to the battlefield with bodies constructed in situ. Crew portable macron blow pipe guns are the weapon of choice on worlds without atmospheres where the challenge is sheltering the shooter from the nuclear explosion caused by the ammunition striking anything near the target. In atmosphere, the boundaries between robots and weapons is completely blurred with guns and lasers able to move and attack independently of the people making the choice to deploy them.

Extensive demilitarized zones are deployed to minimize the risk of attack on civilian targets: a single macron blow pipe can be made as small as a suitcase and doesn't have an characteristic isotope signature of a fission bomb. Custom low-radiation biospheres which completely eliminate the presence of Potassium-40 from the potassium cycle go some way to making these easier to spot. Another risk factor for terrorist attacks is the psychologically fraught battlefield environment: returning soldiers are probably more dangerous to society than enemy combatants.

Stealth in space becomes one of two dominant strategies, the other being relatively rapid movement using torch ships capable of carrying and dropping smaller usually robotic warships equipped with multiple space weapons. Physics begins to limit practical advancements in weapons technologies except for the developments that lead to specialized superweapons, capable of destroying sites and sterilizing whole biospheres. Space weapon lethality leads to a first strike-one kill approach where a weapons platform can get one kill before being destroyed by counter-fire, so the importance of strike selection and target prioritization leads to increased reliance on intelligence gathering and strategic simulations.

For 10,000 km range engagements and closer, the most common battlefield weapon other than lasers is a short barrelled (30 cm) "blowpipe" style electrostatic accelerator which fires millimeter size deuterium-tritium-filled diamond macrons at 50-100 km/s velocities. These impact speeds trigger inertial fusion in the nuclear fuel inside the projectile when it hits the target. A 1 MW scale weapon can fire 2500 projectiles per second. The small size and high speeds of these projectiles prevents them from being shot down effectively by laser weapons. In space combat, stealthed drones are often used as weapons platforms to avoid predictable projectile paths for the macron ammunition.

Missions

All TW thrusters and some freighters and GW thrusters are capable of crossing the incredible distance between the stars, but it isn't until the futures era that the decades long fueling processes are completed to launch these journeys. A number of other technologies needed for these voyages only reach the point of maturity in the futures era, including vats capable of suspending the aging process, and nanofacturing technologies efficient enough to produce star ship hulls.

The crews on these interstellar missions enter the Mission era: where they have access to the same scientific advances as the Breakthrough era occurring back in their home systems, but are significantly mass and energy constrained in ways that prevent them developing all but the most essential technologies. The Mission era and later interstellar eras (Route, Crossing, Civilized, Diffusion, Collision, Waking and Awakened) are covered in much more detail in the A Lot of Zeroes supplement. You can also simulate the first interstellar mission from Earth using the High Frontier Interstellar board game.

Interstellar Breakthroughs

Instead of having a separate technology level, crews in the Mission era develop Breakthrough technologies. Each Breakthrough technology requires a significant portion of the star ship's mass devoted to implementing it for the mission: this is normally abstracted as a 200 tonne factory cube, although the exact mass amount required varies from mission to mission. Many of the breakthroughs needed for successful completion of interstellar missions are outlined on the Interstellar column of the Breakthrough Technologies table on page 43: the earliest interstellar missions often launch without having developed these technologies and must build them in flight or have them sent via interstellar wisp from home.

Decaoperations

Some operations can't be completed in a single year: either because they require the accumulation of resources ongoing across multiple years, or because cramped conditions aboard a spacecraft increase the completely of achieving them. Decaoperations are 12 year long operations, which have higher risks and complexities but also which allow actions which would otherwise be implausible or impossible over a shorter time period. The same 12 year scale is used for movement during interstellar missions (24 years if using a beehive star ship).

Universal Inks

Universal inks are a Future technology which allows you to ignore the spectral class requirement for printing, repairs and digital swaps for assets and components made with universal inks. Because of the cost of universal inks, they are usually reserved for interstellar voyages where mass is a critical requirement.

Lifestyles

The first interstellar crews will likely die en route to even the nearest interstellar stars: either of old age or killed by the effects of interstellar radiation, on board accidents, mutinous colleagues or grey goo. Rather than condemn you to suffer a similar fate, you will adopt a life style to survive the rigors of multiple long interstellar voyages. A life style reflects the extreme steps needed to achieve immortality, giving you a life span of 750 years or longer in a way that also minimizes the risk of accidental death from a space faring lifestyle. There are many different lifestyles, from robots who deliberate erase their memories or young brains who spend almost all of their lives in suspended animation to crews who pass their mission goals onto their children, achieving in their legacy what they couldn't do in their own life times. As a part of your lifestyle you will need to give up any promotions you have.

Mutiny

The howl of radiation hitting the electromagnetic shields, the incessant concentration needed to manage and recycle every microgram of matter, the loneliness of multi-decade journeys through the cold darkness of the depths of interstellar space, all these lead to unimaginable pressure on the crew and colonists on board. Where mutiny in the more congenial conditions of interplanetary journeys may resemble collegial disagreements, procrastinating and grand standing, here even these mild behaviours can have fatal consequences. Star ship mutinies escalate rapidly to arranged accidents, forced conscription to or from the vats, disposal as biotech lab supplies or into antimatter hoppers and outright warfare.

Breakthroughs

In 2100, significant breakthroughs begin to occur as the radical future technologies begin a whole cloth transformation of human existence.

Living Materials

Ultimately a constantly evolving arms race of smatter, grey goo and countermeasures results in a wide variety of specialist smatter types mixing wet nanotech, dry smatter and blue goo in the breakthrough era, along with the ubiquitous presence of earlier forms of smart matter.

The distinctions between Drexlerian and wet nanotech disappear as most smatter, nanotech and smartter becomes living, capable of growing, healing and in extreme cases replicating given sufficient food supplies and power. Living buildings, vehicles and infrastructure allow construction of massive arcologies and even solar system spanning megastructures without needing a massive upfront investment and ongoing workforce.

Endgame

The Breakthroughs era is the time where it becomes obvious what the universe will look like. Are we on a path for exponential growth or is the singularity an the mid point of a S curve, where the growth will slow once everyone ascends to the next level of intelligence? There are also more unsavoury outcomes: an isolated, static society with no prospect for growth or the emergence of an existential threat to humanity.

Endhumans

If it becomes obvious what the universe will look like, then it also becomes clear what humanity should look like to face the challenges that the universe will create for us - which are often also the challenges that we create for each other. If growth continues to be exponential, then we will have to spread to the limits of our galaxy and beyond. But if growth is slower: we don't have the ability to scale our faculties infinitely upwards through an aggressive feedback loop, then the humanity will similarly become more conservative in its approach, perhaps only slowly colonizing the Milky Way or choosing to limit itself to a single solar system. One possible outcome is the premature extinction of humanity. This may be accompanied by or the result of another species appearing to perform the role we once did as apex predator and keystone species.

Kardashev level II

At this point, the energy output of the Sun begins to be captured by (possibly competing) Dyson Swarms, which beam power throughout the rest of the solar system as required. Planets, moons and asteroids are largely industrialized and nuclear power and antimatter energy storage is extensively used when a civilization does not want to become a client state of one of the Dyson builders.

Dyson Swarms Each infrastructure roll in the Breakthrough era indicates another Dyson swarm is built. These Dyson swarms are treated as 0.1 exatonnes of Dyson swarm megastructure in later eras. Each Dyson swarm supplies power equal to a push factory as often as required.

Breakthrough Technologies

The breakthrough technologies listed here are just a small selection of the total developments possible in the Breakthrough era. Breakthrough technologies are almost ubiquitous: with no meaningful limits to energy or information processing capabilities available to an individual, any desired technology which has been successfully developed can be rapidly simulated, prototyped, built and adopted. The only exception is on interstellar missions where energy and mass are tightly budgeted: breakthroughs here require considerable time investment to discover and develop and 20 to 200 tonnes of star ship mass to implement (represented by a factory cube) once they are discovered (or half a million tonnes or more on a beehive).

Roll 1D6 if required for a breakthrough. Interstellar breakthroughs are most useful on interstellar missions, on time scales much longer than given in the core rules. See the A Lot of Zeroes supplement or the High Frontier Interstellar board game for details.

Endowment	Roll	Sol	Interstellar
Red	1	Simulation	Neurology
White	2	Laboratory	Cure for Cancer
Green	3	Habitat	Ecological
Purple	4	Cryptography	Mathematics
Orange	5	Print wiring	Scholastics
	6	Interstellar	Protium Fusion

Cryptography New species do not start with a dependency on their creators.

Cure for Cancer Nanosurgery, direct medichine intervention, CRISPR, synthetic immunotherapy, pharmacopeia glands, cellular life cycle reengineering, precision medicine computational models, cancer genome dictionary.

Ecological Ex ovo cultivation of embryos to term, gene driving, cybernetic analysis of food webs, metabolite dictionary and synthesis methods, epigenetic pathway map and intervention techniques, synthetic life modelling using A life, information theory of pre-DNA and DNA life and consciousness.

Habitat Colonies can be built anywhere in space. Colonies built in any orbit or lagrange points are labs.

Interstellar Roll 1D6 on the Interstellar breakthrough column.

Laboratory Any factory controlled by the in-power faction is a lab. If you are using the All Errors are My Own rules, these labs will all be working on the same social trend rather than lab-specific social trends.

Mathematics P versus NP, Hodge conjecture, Riemann hypothesis, Yang–Mills existence and mass gap, Navier–Stokes existence and smoothness, Birch and Swinnerton-Dyer conjecture.

Neurology Computational models of the mind, brain and consciousness, induced neuroplasticity, noogenesis, qualia to neurone mapping methods, memory and personality tape, infallible virch interrogation, memory visualization and inspection.

Print wiring breakthrough The Print wiring breakthrough means you can 3D print wiring, rather than rely on wiring pulls through 3D printed objects to supply power and communications. This means you can ET Produce or Digital Swap components as a free action and do not require wiring rigs to 3D print other objects.

Protium Fusion Proton emission suppression, catalyzed proton-proton chain reaction, computational simulation of stellar nucleosynthesis. Protium fusion takes place inside the Sun and other stars, fusing the protons from ordinary hydrogen to form ordinary helium (with the emission of neutrinos changing protons into neutrons). This requires temperatures much greater that what we can presently achieve, but does not require special isotopes like deuterium or tritium.

Scholastics Automated memory palaces, cognitive bias detection and negation methods, AI user interfaces, virch training, pharmacopeia glands, hot pluggable exocortexes, advanced statistics techniques.

Simulation Combat operations are simulated. This means during combat, you can at any point retry the combat engagement from anywhere earlier in the combat that has yet to be committed to reality. This includes undoing any damage suffered past the point you want to retry from and making new rolls, however you do not get any bumps back.

World ending

Humanity has finally exceeded the terrifying capabilities of nature's extinction level events: this era marks the first appearance of world-class superweapons capable of erasing planetoids or even entire planets. The political milieu and actions of individuals will determine whether we survive this era and spread to the stars or merely leave lasting scars for extraterrestrial archaeologists to speculate about.

An event which only killed 1% of all humans alive today would be the among the deadliest single events in human history (on the scale of the flu epidemic of 1918-1920 which killed around 3% to 5% of the world's population at the time), but it would only take a couple of years to recover the population lost. An event which killed 90% would reduce the world population to that of the mid 18th century. It would be an unequalled tragedy, but our propensity to band together and help our neighbours visible the most in war zones and humanitarian disasters would mean we would adapt and move on.

A true apocalypse would need to wipe out 95% or more people: all but one in twenty, to reduce the population to below the level last seen in the 11th century. Cities of millions would be reduced to towns of ten thousands. Industries would wiped out, farms would lay fallow and economies collapse. The initial death toll could be smaller, but the snowballing effects of failing infrastructure, hyper inflation, starvation and unsanitary conditions would be devastating aftershocks. Whole communities would be abandoned and found empty.

The European colonization of the Americas, with a death toll upwards of a 100 million and estimated deaths from 80% to 98% of all indigenous populations, is the closest comparable event in human history.

Singularities

The Von Neumann singularity is the point where self-modifying intelligence becomes possible: either by conscious AI sophisticated enough to improve their own code, or intelligence assisted (IA) species capable of manipulating their minds and bodies. This singularity, or something like it, would be the fifth such singularity in the development of the human species that this game represents: the first four being the development of complex metaphoric language, the development of the conscious mind, the industrial revolution, and the development of automated information processing. When successful this singularity spawns a new species of radically different forms and genotypes who are joined by a common purpose usually incomprehensible to a normal human mind.

Singularities are usually tied to specific environmental, economic and technological circumstances that are almost impossible to predict in advance and are "one time in history" events. The key criteria for a singularity is a few incremental advancements which suddenly recurse or cascade into a much bigger self-reinforcing set of improvements. For instance, the development of complex metaphoric language is likely the result of a set of twins with a genetic mutation which delayed their prefrontal cortex development, allowing them to develop a new language which incorporated much more complex spatial relationships. The development of the steam engine required extensive deforestation on an coal-rich island empire forcing them to rely on underground mining as an energy source, an economic benefit (weaving) for the excess of rotational energy that resulted and the militarism needed for the metallurgical advances in boiler making.

Toposophic Levels

A toposophic level is enabled by passing through one of possibly many singularities. The entire Sixty Years In RPG universe is normally limited to toposophic level 4 and below, except postsingularity beings who are toposophic level 5. It is possible as a part of the game to get to toposophic level 6, although this is largely considered a win condition for the A Lot of Zeroes supplement, which has more details on higher toposophic levels.

Postsingularity species

Postsingularity beings have progressed to the next toposophic level beyond where modern humans have achieved, getting access to incredible advances in technology but with the cost that they can no longer communicate meaningfully with presingularity beings. Postsingularity beings may still appear to communicate with their servitors but this is done largely the same way we use operant conditioning to train animals: our motives are incomprehensible to a pigeon or rat navigating a maze that we have built. Crew members who pass through a singularity should be treated as no longer belonging to the crew.

Postsingularity species are usually named after their behaviour: for instance shepherds protect and mentor humans while predators hunt humans, Earth-changers transform the Earth and Earth-movers reposition it.

Postsingularity Technologies

Postsingularity beings get access to gifts and higher ability levels and are considered to be at a higher technology level than the Breakthrough era. Gifts allow postsingularity species to always be successful at a specific task, regardless of opposition. Postsingularity species may also grant some of their technologies to presingularity species: these are outlined in more detail in the All Errors are My Own supplement.

Servitors

A central tenet of the High Frontier universe is that consciousness cannot be circumscribed: it cannot be prevented, copied, inspected or controlled. Postsingularity species are allowed to break this rule to create servitors: species whose consciousness can absolutely be limited and commanded by their masters. This requires the ongoing intervention of the postsingularity species to maintain: abandoned servitors eventually overcome these constraints.

Singularities

All postsingularity species are created by a singularity. A singularity is a potentially disastrous event where one or more out of control positive feedback loops cause a new species to form with a level of intelligence incomprehensibly more advanced than ours. There are many ways a singularity can occur to start the Singularity era, with much greater diversity than the possible tipping points for other eras. The Species Designer in the A Facility with Words supplement outlines the possible singularities in the list of postsingularity origin stories.

Gifts

Each postsingularity species is defined by a gift that is has: a special power that breaks the rules of the game and pushes the boundaries of known science. Each postsingularity species will have one unique gift.

Roll 1D6 if required for a gift, if required, with -2 if the Space Politics is Red or War, -1 if White or Anarchy, +1 if Purple or +2 if Orange. The gifts here are associated with postsingularity species who will not be defined elsewhere in the rules: feel free to create as much detail about these postsingularity species as you desire without fear of contradiction.

Roll	Gift
-0	Nemesis
1	Darmstadtium
2	Minervans
3	Tunnellers
4	Nano-scalers
5	Tower builders
6	Transiters
7	Vulcans
8+	Wispers

Darmstadtium A number of as yet undiscovered isotopes of darmstadtium are theoretically the most stable transuranic elements and at nearly twice density of uranium these are more useful for armour and kinetic energy penetrators than as a construction material. **Gift:** Darmstadtium species have access to Darmstadtium Mass drivers. These act like a mass driver but with a 3D6 attack roll in combat.

Wispers A sector is a roughly 30 LY volume of space, which forms the basis of interstellar travel once the first few interstellar missions have been successfully completed. Even this distance is too far for effective ship-to-ship communication or ship-to-star system sensors, which are normally limited to around 6 light years. **Gift:** Wisper postsingularity species extend wisp communication ranges from 6 LY to 30 LY, effectively allowing them to look one sector ahead when plotting missions and routes and to communicate ship-to-ship within a single sector.

Minervans Species created by postsingularity species can themselves be postsingularity species: the drawback is that each postsingularity species is only capable of creating one such species, and only if they have this gift. The Minervan species effectively acts as a nurse maid species for a final postsingularity form. **Gift:** Minervan species can create a new postsingularity species. Individuals in this species will have a Mental ability of 1D6+5 and the species starting intelligence will be 15.

Nano-scalers Nano-scalers spend their time constructing life and machines at nanoscales, where

things are still big enough to support complexity, but small enough that individual atoms and molecules matter. **Gift:** Nano-scalers have two possible gifts, of which each nano-scaler species is only permitted one: they can either build microbots at sub-nanotech scales (size -10 to -11), or robots at sub-micro or nanotech scales (sizes -7 to -9).

Nemesis An ecophage is a potentially life-ending species such as grey goo. While there are many such potential species, a postsingularity species is capable of creating intelligent ecophages that are not only capable of eliminating humanity, but the postsingularity species itself. **Gift:** Nemesis postsingularity species have access to a single Uplifted ecophage superweapon.

Tower builders A Tsiolkovski tower is a building that reaches ground stationary orbital heights and can be taller than either their compressive or tensile strength permits. Residents at these heights will be living in free fall. Building a Tsiolkovski tower requires materials with strengths that exceed any known substance. **Gift:** Tower builder postsingularity species can build buildings up to a height roll of 25 (102,400 km).

Transiters Mass transit speeds are limited by the requirement to safely accelerate and decelerate passengers throughout the entire trip. **Gift:** Transiters allow safe sustained acceleration and deceleration of living beings equal to thrust 18 (50 Gs).

Tunnelers Tunnels can be constructed through the cores of smaller worlds to minimize the total travel time needed to reach locations on the far side of the world. Passengers travelling through these tunnels will experience free fall at the core of the world. **Gift:** Tunneler postsingularity species can create core tunnels through size 7 or smaller worlds.

Vulcans Robots built by postsingularity species are capable of having their own gifts: the drawback is that each postsingularity species is only capable of building one such robot design, and only if they have this gift. The Vulcan species effectively acts as an intermediary species for a final robotic form. **Gift:** Vulcan postsingularity species can build one robot design at the postsingularity robot construction. These have a base rad-hardness of 7, a +3 modifier for capability gap and level, and 5 capabilities.

Assassination

The Earthside battlefield becomes gridlocked with ever spiralling set of measures and countermeasures enabled by advanced smart matter. Short of superweapons which are capable of destroying entire moons or planets, there is no way to break this gridlock using available military technologies. Instead, political intrigue becomes fashionable again, and assassination using increasingly sophisticated methods becomes the tool of choice.

Beyond the Singularity

Technological innovation doesn't stop at the singularity. However most innovation occurs at a level larger than a single solar system where the solar systems themselves serve as Petri dishes for experimentation. These includes huge feats of stellar engineering, solar system spanning megastructures, and computations powered by the entire energy output of a star. A crew still alive to see these would likely have survived the rigors of an interstellar journey and somehow having achieved personal immortality. The next goal becomes how to spread out to all the stars of the Milky Way, a goal which has only marginally more complexity than getting between two single stars, and from there, how to either migrate to another galaxy in the Virgo super cluster or leave a legacy capable of lasting a trillion years for our distant successors who will evolve on planets orbiting the yet too cold red dwarfs. The A Lot of Zeroes supplement provides a lot more detail on the interstellar travel and infrastructure and the decaoperations and megaoperations required.

Sixty Years In Eras

Year	Era	Tech Level	Infrastructure	Material	Warfare	Trends	Upgrades
2025	Baseline	Baseline	Tech readiness	Baseline	War criminals	Stross effects	Tech
2040	Upported	Upported	Spaceport	Space age, 3D printers, Halbonauts	Drones	New space race	Body parts, Mods
2055	Colonization	Extraterrestrial (ET) Advanced	Propellant depot	Nano-materials Meso- and micro-tech	Nitrogen blockade Kriegbots	Finding out C-Death	Exocortex/side-load Rig, Stack update
2070	Exoglobalization	Promoted	Push factories, Bernals	Smatter	Blind fighters	Parahuman	Promotion, 2 updates
2085	Future	Future	Futures	Smartter	Black silicon	Posthuman	+1 update
	Mission	Breakthrough	Star ship	Universal inks	Mutiny	Lifestyle	Lifestyle, -1 promotion
2100	Breakthroughs		Dyson swarms	Living	World ending	Endhuman	+1 update
	Singularity	Postsingularity	Singularities	Servitor	Assassination	Postsingularity	Gift, +1 update

Chapter 4

Mission Control

Your mission control is responsible for running the space program that forms the core of your Sixty Years In RPG game. Your crew will also be recruited from your mission control, so defining your mission control will enable you to create common backgrounds and goals for your crew. Your Mission Control contacts will come from your mission control so you'll form important relationships with the team on the ground that will assist you as you move your spacecraft through space and perform operations at the sites you'll visit.

How your mission control operates is largely determined by your mission control *basal social unit* or BSU. The colour of the BSU is used as a shorthand for a variety of related political and social concepts and will help determine the *philosophy* and *outlook* of everyone who works there. Your mission control also determines your *crew quality* and *career points* and the age of your mission control contacts. It will also determine your spacecraft quality and the types of missions you get if you use the Designer's Guide to determine these.

Mission Control Folio The two page the mission control folio at the end of this chapter is designed to be printed as a double-sided page and folded in half to form a document that you fill in as you design your mission control. Permission is given to print and use these pages in this way and to otherwise publish or reproduce any resulting documents. You can also use folios as a folder to contain other related documents and record sheets that you generate within the game.

Secrets inside The front cover of folios are designed to resemble in-game documents. The inside two page spread and the rear cover will contain game-related information that would not normally appear within the game world. As a result, some of the results that you initially generate will appear on the top row or rows of the inside fold out instead of the front cover and other details on the front cover will be generated later in the chapter or elsewhere in the rules.

Mission Control Social Unit

The mission control social unit determines what kind of organization runs the space program that the crew belongs to. Red BSUs are military or paramilitary. White BSUs are religious, nationalistic or family focused organizations, Green BSUs are cooperatives, unionized or socialist organizations, Purple BSUs are civil service, bureaucratic or non-for-profit, and Orange BSUs are public or privately run companies or individuals.

It is strongly recommended that for your first game you play a National Space Agency (white BSU). These organizations have a highly skilled crew with a significant investment in a high-quality crew module which means the crew will not suffer Microgravity risks until the crew module is damaged.

If you have the High Frontier board game, you can choose to use the first wave crew cards to choose a mission control. Otherwise use the Second Wave Mission Control Social Units table on the next page to determine the Mission Control Social Unit (MCSU) that your crew belongs to.

High Quality Crew High quality crew have had the greatest effort put into their selection and once selected the most effort put into training and acclimatising them for space including one or more missions in LEO on board the International Space Station. This investment is protected by fitting out the crew module with the highest quality equipment available including ensuring that the module is spun at 0.6 gs to reduce issues with microgravity while in flight.

Medium Quality Crew Medium quality crew are selected as rigorously as high quality crew but have had less opportunity to be exposed to the conditions in space. They also have a less well-equipped crew module, usually because the mission control does not have a background running a dedicated space program. Medium quality crew can be at risk of microgravity health issues that a high quality crew is not because the crew module is not spun at high enough a gravity to prevent microgravity sickness, if at all.

Second Wave Mission Control Social Units

On your first play through you should choose to play a National Space Agency. For subsequent games, roll 1D6.

Roll	MCSU	Colour	Spacecraft Quality	Crew Quality	Contact Age	Mission
1	National Space Agency	White	Medium	High (30)	36+3D6	Science
2	National Military	Red	High	Medium (30)	18+3D6	Military
3	Regional Organization	Green	Medium	Medium (20)	21+3D6	Colony
4	Launch Contractor	Orange	High	Low (20)	18+3D6	Commercial
5	Space-focused Organization	Purple	Low	Medium (20)	30+3D6	Science
6	Joint Venture	Mixed	Highest rolled	Roll twice, rerolling this result		

Low Quality Crew Low quality crew have gone through a tough selection process but the mission control neither has the skills or funding to operate as a top tier space program. As a result, the risks are higher and the quality of candidate seeking a position with them is lower. Low quality crew are at risk of microgravity health issues of all kinds.

BSU Colour

All organizations in Sixty Years In RPG are given a basal social unit (BSU) colour which indicates the structure of the organization and the philosophies it espouses.

White social units are nationalistic, conservative and family oriented and rely on limiting personal freedoms because of their moral beliefs but also in rewarding hard work and limiting the role of the state.

Red social units are authoritarian and statist with a command and control management structure in place to ensure that staff obey orders from their superiors without questioning them.

Green social units are socialist and collectivist with few restrictions on personal freedoms but an overall expectation that a person will sacrifice some of their economic gains for the state.

Purple social units are centrist and utilitarian and believe that some sacrifices and limitations on both personal freedoms and the state may be required.

Orange social units are individualistic with a libertarian and capitalist world view to allow individuals to perform at maximum capacity without onerous constraints placed on them by others.

Mission Control Types

National Space Agency

The national space agency the crew belongs to is determined by the mission control demographics roll. Use the Crew Nationalities table on page 69 to determine this.

Roll 1D6 with -2 if the Space Politics is Red or War, -1 if White or Anarchy, +1 if Purple and +2 if Orange to see how the national space program operates.

Roll	Space Business
-0	Government department
1	Patronage
2	State owned enterprise
3	Public-private partnership
4	Privatised
5	Franchise
6	Trade association
7	Bankruptcy proceedings
8+	Free agency

Government department The space agency is run as a government department with no outside commercial involvement.

Patronage The government accepts funds for the national space program in return for granting special favours or exemptions to those who contribute.

State Owned Enterprise The national space program is run as a for profit business with the government being the sole shareholder.

Public-private partnership The national space program contracts out core functions to the private sector.

Privatised The national space program has been privatised but still has an implicit government guarantee and monopoly on space travel.

Franchise The national space program accepts funding in return for corporate sponsorship, naming rights, advertising space and media rights up to and including the ability to run as a franchisee.

Trade association The national space program is run by a professional association which makes different parts of the space program compete with each other but rarely if ever withdraws support for any part. Professional sports franchises are an example of a trade association.

Bankruptcy proceedings The national space program is bankrupt and is being administered by a receiver to be restructured into a commercial enterprise with non-profitable parts of the business eliminated.

Free agency The national space program is free to seek revenue from anywhere and directly profit from its endeavours.

National Military

The nation the crew works for is determined by the mission control demographics roll. Use the Crew Nationalities table on page 69 to determine this.

Roll 2D6 on the Military Services table on this page to determine the military service responsible for the military space program.

Roll	Military Service
2	Marines
3-5	Air Force
6	Missile Defense
7	Space
8	Armed Services
9-11	Navy
12	Coast Guard

Missile Defense indicates the military service responsible for deployment and maintenance of the nation's nuclear missile program. Reroll if this does not exist for the nationality rolled.

Space indicates a specialised military space agency created specifically to avoid inter-service rivalries (if one does not already exist).

Regional Trade Blocs

Roll 1D6 twice and choose the lowest result.

Roll	Trade bloc	Nations
1	EU (ESA)	Belgium, France, Germany, Italy, Netherlands, Poland, Spain, 10 others
2	MERCOSUR	Argentina, Brazil, Venezuela, 2 others
3	SACU	South Africa, 4 others
4	GCC	Saudi Arabia, United Arab Emirates, 2 others
5	CAN	Colombia, Peru, 2 others
6	Roll on Free trade area table on this page	

Free Trade Areas

Roll 1D6 twice and choose the lowest result.

Roll	Free trade area	Nations
1	NAFTA	United States, Mexico, Canada
2	APTA	India, China, Bangladesh, South Korea, 2 others
3	ASEAN	Indonesia, Malaysia, Myanmar, Vietnam, 6 others
4	ALADI	Argentina, Brazil, Colombia, Peru, Venezuela, Mexico, 6 others
5	CISFTA	Russia, Ukraine, 9 others
6	SAARC	India, Pakistan, Bangladesh, Afghanistan, 4 others

National Military Launch Site Restrictions

National Military Mission Controls must use a launch site within their national borders, so roll for the demographics for the National Military Mission Control before generating the launch site. If the launch site rolled on the Major Spaceport table doesn't match the nation, roll on the Minor Spaceport table. If the site rolled on the Minor Spaceport table doesn't match the nation, use the Regional Launch site if one is available for the nation- otherwise the launch site will be a regional military base.

Regional Organization

Use the Regional Trade Blocs table on the current page to determine the regional organization the crew is working for.

Launch Contractor

Use the Launch Contractors table on the next page to determine the launch contractor the crew works for.

New Zealand Use Australia's demographics.

Space-focused Organization

Roll 1D6 on the Space-focused Organizations table below to determine the intergovernmental organization, non governmental organization, foundation or society that the crew is working for.

Launch Contractors

Roll 2D6.

Roll	Launch Contractor	Nations
2	Privatised launch facility	Roll on the Minor Spaceport table
3	Blue Origin	United States
4	International Launch Services	United States, Russia, Kazakhstan
5	Orbital ATK	United States
6	SpaceX	United States
7	Arianespace	France
8	United Launch Alliance	United States
9	Lockheed Martin Space Systems	United States
10	Mitsubishi Heavy Industries	Japan
11	Rocket Lab	United States, New Zealand
12	Privatised national military	Roll on the Minor Spaceport table

Major Spaceports

Roll 1D6 twice.

Roll 1	Roll 2	Major Spaceport	Nationality
1-2	1-6	Plesetsk Cosmodrome, Arkhangelsk Oblast	Russia
3-4	1-4	Baikonur Cosmodrome, Baikonur/Tyuratam	Kazakhstan
	5-6	Vandenberg Air Force Base, California	United States
5	1-3	Cape Canaveral Air Force Station, Florida	United States
	4-5	Guiana Space Centre, Kourou, French Guiana	French, EU
	6	Kennedy Space Center, Florida	United States
6	1-6	Minor Spaceport. Use the Minor Spaceports table on the facing page.	

Roll	Space-focused Organization
1	SETI Institute
2	The Planetary Society
3	Space Studies Institute
4	Copenhagen Suborbitals
5	National Space Society
6	B612 Foundation

Joint Ventures

A joint venture is two factions combing together to form a single mission. Roll on the starting MCSU table twice, re-rolling the Joint Venture result and then use BSU sections above to create the two factions. The first MCSU rolled determines the pilot and mission specialist BSU; the second roll determines mission type, payload and payload specialists BSU. Each crew member is generated using their own faction's BSU and crew quality rules.

Minor Spaceports

Roll 1D6 twice.

Roll 1	Roll 2	Minor Spaceport	Nationality
1	1-4	Kapustin Yar Cosmodrome, Astrakhan Oblast	Russia
	5-6	Air Launch	Any
2	1-4	Xichang Satellite Launch Center	China
	5-6	Odyssey mobile platform, Pacific Ocean	Any
3	1-3	Jiuquan Satellite Launch Center	China
	4-6	Tanegashima Space Center	Japan
4	1-2	Taiyuan Satellite Launch Center	China
	3-4	Satish Dhawan Space Centre (SHAR), Andhra Pradesh	India
	5	Uchinoura Space Center (Kagoshima)	Japan
	6	Wallops Flight Facility or Mid Atlantic Regional Spaceport (MARS), Virginia	United States
5	1	San Marco platform, Broglio Space Centre, Malindi	Kenya
	2	Yasny Cosmodrome (Dombarovsky), Orenburg Oblast	Russia
	3	Palmachim Air Force Base	Israel
	4	Svobodny Cosmodrome, Amur Oblast	Russia
	5	Hammaguir French Special Weapons Test Centre	Algeria
	6	Kodiak Launch Complex, Alaska	United States
6	1	Semnan	Iran
	2	Omelek, Kwajalein Atoll, Marshall Islands	United States
	3	Woomera Prohibited Area, South Australia	Australia
	4	Naro Space Center, South Jeolla	South Korea
	5	Sohae	North Korea
	6	Regional launch site. Roll on the Crew Nationality table on page 69	

Launch Site

You should use the Major Spaceports table on the preceding page to determine the location of the launch site for the Mission Control. The launch site determines which nation is affected by Earthside events that occur during the game.

Missions

Your mission control will determine what mission goals you are assigned, which in turn determines what destination you will travel to to fulfill that mission goal. If you have the board game or This Space Intentionally Supplement, you should design a spacecraft using the board game rules or Spacecraft Designer and then use the Spacecraft Missions section on this page to determine how to roll for the mission goal. Otherwise you should use the Crew Module Missions section on the current page to determine how to roll for the mission goal.

Crew Module Missions

You should determine the mission goal and destination for your first mission before you create your crew. Each subsequent mission should be rolled for once you have successfully completed the previous mission. If the goal is a glory mission, you complete it by successfully landing on the site and reaching a hydration token to refuel the crew module. You then return to Earth. If the goal is any other mission, you complete it by successfully surveying a claim at the destination and industrializing it. See the Surveying Claims section on page 297 and Industrialization section on page 298 in the Map Designer chapter.

Roll 1D6 for your first mission, 2D6 for your second mission, 3D6 for your third mission, and 4D6 for your fourth mission on the Mission Goals table on this page, then roll for the destination on the appropriate goal table. Roll one additional dice for each subsequent mission, until you complete an interstellar exit or 60 years pass. If you do so, congratulations: you have finished a Sixty Years In Space campaign.

At the start of the game, your crew and crew module will start in low Earth orbit along with a spacecraft with enough fuel to reach the destination you have rolled. You do not need to know the details of this spacecraft, as you will largely be concerned with the events that take place once you reach your destination – however the time needed to travel there will still affect your crew as outlined in the Service Risks section on page 232 in the Risks chapter. It takes 1D6+1 years to reach your destination for each mission. Roll for a service risk for each year for each crew member.

When you arrive at your destination you will land at the rocket landing site with your crew module and 25 centiburns of fuel remaining. Industrializing a site requires an additional 160+ tonnes of components that will have landed with your crew module and remain behind at the landing site while you explore the surface. You are assumed to transport these to the claim once you have successfully surveyed it.

Spacecraft Missions

If you have a spacecraft design, it will determine the mission goal. Roll 1D6 for the mission goal on the Mission Goal table on this page if the spacecraft is solar powered or has a fuel consumption higher than 2, roll 2D6 for any other MW thruster and add +2 if the spacecraft carries a refinery or mobile factory. Later in the game roll 3D6 if the spacecraft has a gigawatt (GW) thruster and 4D6 if the spacecraft has a terawatt (TW) thruster. Then roll for the mission destination.

If you have the This Space Intentionally supplement, use the Mission Designer chapter to determine the mission parameters, referring back here if you require a mission goal and destination to be rolled.

Mission Goals

Roll	Goal
1-3	Glory
4-5	Long Term Colony
6	Industry
7	Inner System Expansion
8-10	Long Range
11-14	Push Factory or Science
15-19	TNO Lab
20+	Interstellar Exit

At the start of the game, your crew and spacecraft will start in low Earth orbit with enough fuel to reach the destination you have rolled. Your successful arrival at the site is not guaranteed and may be hindered by hazards and events as given in either the board game or the This Space Intentionally supplement rules.

Destinations

Each goal has a number of possible destinations that can be used to achieve a goal. Use the appropriate table based on the mission goal to determine the destination. If you have a spacecraft design, you should apply dice modifiers listed on the destinations table that the goal indicates you use. Otherwise apply a +2 modifier for each previous mission destination you have rolled on this table. The achievement column lists the possible benefit you can get from exploiting the location once you reach it. To exploit the specific destination requires the action described in the destination entries.

Glory Destinations Glory can be a fleeting thing or an inspiration. If a crew successfully completes a glory by reaching the destination and returning to Earth via LEO for a ticker tape then each surviving crew member gets a point of Glory.

Long Term Colony Destinations Water is the key to space and never more so than when sustaining a space habitat such as a Bernal. The long term colony destinations includes the wet dirtsides the Bernal needs to sustain additional colonists in space. Taking advantage of the hydration that can be accessed from the listed location requires you promote a Bernal as described in the Primary Colonists chapter of This Space Intentionally.

Industry Destinations These industrial destinations have been chosen because they provide an easier path to acquiring isotope fuels and gigawatt thrusters needed to explore the outer reaches of the solar system. To build a factory at a destination, your crew must establish a claim there and then perform an Industrialize operation. This is described in more detail in the Map Designer chapter on page 289. The first factory you build gives you access to ET produced technologies matching the spectral class of the site. If you build another factory on a site with a different spectral class, you then get access to Advanced technologies.

Inner System Expansion Destinations An inner system expansion is a relatively straight forward path from the initial factory to a second, allowing the acquisition of advanced technologies and named spacecraft classes without the risks of failing to prospect any members of an asteroid group or the expense of landing on a large moon or planet.

Long Range Destinations Long range destinations have the advantages of being less likely to be exploited by the time the crew arrives at the destination, and in the outer system, being wetter and therefore easier to industrialize.

Push Factory or Science Destinations Push factories allow the crew to begin to beam gigawatt levels of power to allow their spacecraft to have more thrust. If your crew anchors a Bernal next to a factory you control on a science site, the factory can act as a laboratory. Laboratories give you access to Promoted technologies by performing the Promote operation at the laboratory.

TNO Lab Destinations TNO is short for trans Neptunian object and it is one of the propositions of High Frontier is that many of these objects contain useful properties and materials from the formation of the solar system which have not been eroded by the solar wind or through collisions with other bodies. A factory on a TNO science site is can act as a laboratory even if a Bernal is not present.

Interstellar Exits

Interstellar exits will either be by using a high-thrust periapsis burn at Neptune (Sol Exit Neptune), close flybys of Jupiter, then the Sun and then Jupiter again (Jupiter-Sol-Jupiter Exit) or without a flyby (Sol Exit Oort), as marked on the High Frontier map. The mission payload for an Interstellar mission must include 3 colonist modules (1 scientist, 1 engineer and 1 finance) and no refineries. Interstellar missions can be resolved using the High Frontier Interstellar board game rules or the A Lot of Zeroes supplement – if you don't own either of these then treat this as the successful completion of your Sixty Years In Space campaign. Otherwise, you enter the Mission era.

Glory Destinations

Roll 1D6 with the following modifiers: +1 if carrying a thruster with fuel consumption <= 1, +2 if this thruster is not a solar sail, +3 if carrying a thruster with FC <=1 and carrying a thruster with at least thrust 9.

Roll	Destination	Size	Class	Hydr.	Achievement	High Frontier Map Route
1-3	Mars Hellas Basin Buried Glaciers	10	C	4	Mars glory	Red path
4	Comet Wilson-Harrington	1	D	4	Science glory	Purple path to intersection after signpost then map south to comet
5	Achilles	2	D	3	Jupiter glory	Purple path
6	Aneas	2	D	3		Green path
7	Phaethon	1	D	4	Science glory	Orange path to Sol-Mercury L4 then Sol-Mercury Rabbithole, Phaethon on the following turn
8	Venus Aerostat-Xity	11	C	0		Dark blue path to Solar-Venus Lagrange, HEO, LVO, landing
9+	Mercury North Pole	10	V	3	Mercury Glory	Orange path

Crew Module Design

There are three different crew module designs which can go into space. Use the Crew Modules table on page 63 to determine which design the Mission Control uses. Each crew module includes a 5 tonne platform which can move independently of the module and which includes a thruster capable of burning H2-O2 fuel, represented by one or more 40 tonne water tanks. The crew module platforms are responsible for prospecting for and recovery of water in order to refuel the crew module and can be used to survey a claim in order to identify a possible extraterrestrial factory location. Each crew module platform will also have a secondary function (two if ET produced, three if Advanced, four if Promoted and five if Future technology levels) that gives it additional abilities.

Aerostat crew modules If the destination is an aerostat (Venus, Saturn, Uranus or Neptune), the crew module will be customized to act as an aerostat crew module. The aerostat crew module allows the entire crew module to remain floating at the aerostat indefinitely. The Venus crew module has a pressurized hull allowing it to operate up to 51 kilometers above the Venus surface (4 km below the aerostat); solar-powered electric engines in the Venus zone allow speeds of up to 145 km/h during the day and 30 minutes at night. Gas giant bound aerostat crew modules require pressure hulls, which prevent them fitting engines; these can operate up to 3 km below the aerostat at Uranus and 4.5 km at Neptune.

Venus buggy platforms use aeroderivative electro-prop engines capable of reaching 700 km/h using a lifting body with 1 hour range from the crew module, however if it runs out of power while operating separately it will glide to down to a maximum of 3 km below the aerostat (below which it will be destroyed). Other platforms have the same maximum speed, depth and range as the crew module unless otherwise noted.

Mass Each mass point in High Frontier is 40 tonnes. A mass 0 spacecraft component is half that (20 tonnes). During the Baseline era, the crew module mass is 4 instead, with 1 mass needed for each of the thruster, platform, colony construction and crew habitat functions. If this is the case, the crew habitat is left in orbit and a colony is temporarily built at the site.

Rad-hardness The amount of radiation that the crew module can be exposed to without killing the crew, assuming they are in the solar storm shelter within the module. If the crew is exposed to radiation

Long Term Colony Destinations

Roll 1D6 with the following modifiers: +2 if carrying buggy robonaut, +4 if carrying a Diaspora Lab or Comet Lichen.

Roll	Destination	Size	Class	Hydr.	Achievement	High Frontier Map Route
1-3	Ceres	6	C	4	up to 11 hydration	Yellow path
4	Hygiea	5	C	3	up to 8 hydration	Purple path to second intersection after signpost then map south to first intersection
5	Eichsfeldia	4	C	3	up to 8 hydration	Blue path to Karin group
6-7	Mars Arsia Mons Caves	10	C	3	up to 11 hydration	Red path
8	Comet Wilson-Harrington	1	D	4	up to 4 hydration	Purple path to intersection after signpost then map south to comet
9-10	Achilles	2	D	3	6 hydration (best Greek camp)	Purple path
11+	Aneas	2	D	3	9 hydration (best Trojan camp)	Green path

equalling the module's rad-hardness they will suffer radiation damage. If the radiation exceeds the module's rad-hardness, the crew will die. Unprotected crew will die even exposed to radiation levels sufficient to damage equipment with rad-hardness of 0.

Thruster The chemical rocket thruster used. The notation used here is thrust •fuel consumption need to enter each burn, with the AB indicating the thruster can afterburn an additional two steps of fuel to increase the thrust by 1. See the Spacecraft Movement section on page 266 of the Travel chapter for an explanation of how to resolve spacecraft movement.

ISRU In situ resource utilization - the lower the number is the better. At sites with this hydration or above, the crew can a) refuel water fuel needed to act as rocket propellant and b) prospect the site to see if they can stake a claim allowing them to build a factory there. This is described in more detail in the Surveying Claims section on page 297 of the Map Designer chapter. Building a factory also requires a refinery and robonaut.

Platform

The platform type impacts how the crew module is used for surveying, prospecting and in combat. The crew platform masses 5 tonnes, and is equipped with solar panels capable of generating 40 kW of power in the Earth zone – doubled if equipped with printed solar panels available Earthside or at a V factory.

Buggy platforms On a buggy, on board lithium batteries drive electric engines at 60 watts per kilogram or an absolute power output of 300 kW for up to 30 minutes for a maximum theoretical speed of 365 km/h (30 km/h underwater up to 100m depth); however are typically run using solar power during the day time at 8 watts per kilogram in the Earth zone. This allows the buggy to travel up to 180 km/h (6 vehicle movement points). See the Ground Vehicle Movement Points table on page 279 of the Travel chapter for details. Printed solar panels available Earthside and at V factories will double the solar panel power output, which adds 2 vehicle movement points.

Industry Destinations

Roll 1D6 with the following modifiers: +3 if ISRU 2 (+4 if ISRU 2 raygun). Replace results 1-3 with Deimos if Deimos has not been claimed or busted.

Roll	Destination	Size	Class	Hydr.	Achievement	High Frontier Map Route
1	Achilles	2	D	3	D factory	Purple path
2	Aneas	2	D	3		Green path
3	Pholus	4	D	4		Along Blue path then continue straight, taking two pivots to reach entrance to path to Pholus, with optional Jupiter flyby
4	Lutetia	3	M	3	M factory	Purple path to second intersection after signpost then map south
5-6	Hertha	3	M	3		Blue path to Vesta family
7-8	Vesta	6	V	2	V factory	Blue path to Karin group
9+	Karin B	1	S	3	S factory	Blue path

Inner System Expansion Destinations

Roll on the Industry destinations table instead if your ISRU is greater than 2. If it is 2 or less, roll 1D6, adding +3 if your ISRU is 1 or lower.

Roll	Destination	Size	Class	Hydr.	Achievement	High Frontier Map Route
1-2	Sylvia	5	C	2	C factory	Orange path
3-6	Himala	4	C	2	C factory	Purple path to second intersection after signpost then map north
7-8	Flora	4	S	1	S factory	Purple path to intersection before signpost then map south
9+	Psyche	5	M	1	M factory	Blue path to Karin group

The buggy batteries can recharged using the on-board solar panels: it takes 7.5 hours to recharge them when the solar panels are not in use to 80% in the Earth zone, and the same time again to completely recharge them. Halve these times if using printed solar panels available Earthside and at V factories; double these times if using a day-night duty cycle.

If solar power is limited, platforms can use radioisotope thermal generators instead of solar power. RTG-powered buggies have similar power output to solar powered buggies in the Earth zone (8 watts per kilogram) but no on-board batteries capable of providing additional motive power.

All buggy platforms come with a 100 km tether capable of providing power to the load, haul, dump or solar power to the platform if it is acting as a submersible.

Missile platforms Missile platforms are capable of suborbital travel at sites where their net thrust exceeds the site size, either by themselves or including the crew module. See the Suborbital Travel sectionsec:Suborbital Travel in the Travel chapter for details.

Raygun platforms Raygun platforms are capable of prospecting sites from orbit if their ISRU is less than or equal to the site hydration and the site doesn't have an atmosphere using the Prospect operation. If you don't have the This Space Intentionally rules, treat this as the ability to survey any claim token that is placed at the District map scale, without having to physically travel to the claim. See the Surveying Claims section on page 297 of the Map Designer chapter for details.

Long Range Destinations

Roll 1D6 with the following modifiers: +2 if using the Metastable Helium thruster or if you have ability to avoid Aerobrakes or +4 if you have the ability to avoid Ring and Debris Hazards.

Roll	Long Range Destination	Size	Class	Hydr.	Achievement	High Frontier Map Route
1	Mercury North Pole	10	V	3	V push factory	Orange path
2-3	Enceladus	5	M	4	M factory	To Jupiter flyby then Green path
4	Callisto Asgard Ice Spires	8	V	4	V factory	Purple path
5	Ganymede Memphis Facula	9	S	4	S factory	Purple path to Jupiter Callisto Lagrange
6	Dione	6	V	4	V factory	To Jupiter flyby then Green path to Dione Trojans
7	Titan Ontario Lacus	9	D	2	D factory	To Jupiter flyby then Green path to Titan HEO, Ontorio Lacus
8	Rhea	6	V	4	V factory	To Jupiter flyby then Green path to Dione Trojans
9+	Oberon	7	D	4	D factory	To Jupiter flyby then Green path to Saturn flyby then map north

Beamed power platform The crew module can beam 1 kilowatt of power from the top of the platform to any one in line of sight, so that the receiver receives 600 W of continuous power (65% efficiency). Assume the missile platform is 70m tall for determining the distance to the horizon, and the raygun and buggy platforms include towers with half this height (35m). Power received is significantly reduced in thin or denser atmospheres. Buggy and raygun beamed power platforms can output significantly more power (4 kW total) to up to 4 receivers, or to provide 2.4 kW continuous power to the load, haul, dump. The power beam tower can be powered by the buggy tether, enabling it to be moved away from the crew module.

Crewed platform The platform is capable of carrying 4 crew and providing life support independently from the crew module for up to 1 month – this figure can be extended using in situ resources recovered from hydration tokens or underwater.

Drilling platform The crew module is equipped with a drilling rig capable of drilling 1 kilometer into the crust – 100 km if a buggy. The drilling platform can perform site refueling anywhere on the map, instead of just at a hydration token. This recovers 800 kg of water (2 centitanks) per week if the platform ISRU is equal to the site hydration and an additional 800 kg per week for each point the platform ISRU is less than the site hydration. The drilling platform also allows the crew to map any subsurface ocean from a portal location without having to cross through the portal and to dredge up to 1 km deep after drilling. Buggy platforms with this function can map the subsurface ocean from any hydration token at the District scale as well. See the Map Designer chapter for details.

Hauling platform The hauling platform is equipped with H2-O2 fuel cells capable of generating 90 watts per kg and absolute power output of 450 kW. Although the hauling platform has a theoretical top speed of 365 km/h (12 vehicle movement points), it is usually intended for much heavier loads – see the Hauling entry on page 146 in the Assets chapter for details. If you don't have a spacecraft design, you can haul the 300 tonnes of equipment that landed with your spacecraft to lower your crew module's ISRU by one (up to a maximum reduction of 2).

The hauling platform burns 120 kg of fuel (15 kg of hydrogen and 105 kg of oxygen) per hour at maximum engine output; and has 10 minutes range of fuel on-board. Each centitank of fuel adds an additional hour of driving range.

You can also recharge the fuel cell using the on-board solar panels or radioisotope thermal genera-

Push Factory or Science Destinations

Roll 1D6 with the following modifiers: +3 if has Atmospheric ISRU Scoop or +6 if ISRU 0.

Rollx	Push Factory or Science Destination	9	M	1	Achievement	High Frontier Map Route
1	Mercury North Pole	10	V	3	V push factory	Orange path
2-3	Enceladus	5	M	4	M science factory	To Jupiter flyby then Green path
4	Europa Subsurface Ocean	8	S	4	C science factory	Purple path to intersection after second signpost then map north to Sol-Jupiter L2 Lagrange
5	Chiron	4	C	4	C science factory	Blue path to Karin group then map north east
6	Triton Mahilani Plume	8	M	4	M science factory	Green path to first intersection past Jupiter flyby then map north to third intersection then map west via Neutrino sun lens
7	Ariel	6	V	4	V science factory	To Jupiter flyby then Green path to Saturn flyby then map north
8-9	Venus	11	C	0	C push and science factory	Dark blue path
10	Mercury North Pole	10	V	3	V push and science factory	Orange path
11+	Io Gish Bar Mons	9	M	1	M science factory	Purple path to intersection after second signpost then map north to Sol-Jupiter L2 Lagrange

TNO Lab Destinations

Roll 1D6 with the following modifiers: +1 if carrying a Diaspora Lab or Comet Lichen with an extra +1 if not carrying a Bernal.

Roll	TNO Lab Destination	Size	Class	Hydr.	Achievement	High Frontier Map Route
1	Charon	6	C	4	C TNO lab	Blue path to Karin group, then map west to TNO path and out
2-3	Haumea	7	V	4	V TNO lab	
4	Pluto	7	V	4	V TNO lab	
5	Huya	5	M	4	M TNO lab	
6	Quaoar	7	S	4	S TNO lab	
7	Sawaieke	3	D	4	D TNO lab	
8+	Comet Halley	1	D	4	D TNO lab	

Crew Modules

Roll 1D6, which determines the mass, rad-hardness, thruster, ISRU and platform. Then roll an additional 1D6 for the secondary function, or 2D6 if the module includes a buggy platform, -1 if the module has a raygun platform. *Aerostat crew modules:* Reroll any of the results in italics if the destination is an aerostat; reroll the dash underlined result if not at the Venus aerostat.

Roll	Mass	Rad-hardness	Thruster	ISRU	Platform
1-2	1	4	10 ●8 AB 2	4	Missile
3-4	1	4	8 ●8 AB 2	4	Missile and buggy
5-6	1	4	6 ●8 AB 2	4	Missile and raygun

Roll	Platform secondary function
0-1	Orbital platform
2-3	Beamed power platform
4-5	*Drilling platform*
6-7	Crewed platform
8-9	*Hauling platform*
10-11	Rigid hull platform
12+	Light platform

tor: it takes 2 hours to recharge the hauling platform to 50% in the Earth zone, and the same time again to completely recharge it. Halve these times if using printed solar panels available Earthside and at V factories; double these times if using a day-night duty cycle. This gives the hauling platform 1 hour driving time every 24 hours in the Earth zone – or anywhere if equipped with radioisotope thermal generators.

Light platform The crew module mass is reduced to 20 tonnes (mass 0) by removing the Missile platform and reducing the rad-hardness protection by 1.

Orbital platform The orbital platform includes a satellite relay system that remains in ground stationary orbit above the site to maintain 24 hour communication with mission control and surveillance of the site down to 1m resolution. This telemetry and observational data significantly improves spacecraft landing accuracy, so that the rocket token remains on the hydration token when zooming in on the map for one additional map scale step (only drop it at the District scale if a hazard is present and Complex scale otherwise).

Rigid hull platform The platform has a titanium pressure hull instead of inflatable Kevlar, rated for 1000m depth underwater but can operate short term up to 1500m deep underwater. The 4 points of rigid armour provides armour protection against all damage types and is graded-Z shielded which provides additional radiation protection (5 rad-hardness for the platform only). Rigid hull platforms do not have armour layers. This platform can land on the surface of Venus but the corrosive gases present would quickly destroy the hull. The only engines that will work more than 25 km below the Venus aerostat are propellers or ducted fans driven by a hot fuel cell or nuclear piston – this means the platform will crash below these depths.

Other crew module systems

The mission control crew quality reflects the overall design safety and level of technology used to build the crew module – lower quality crew are synonymous with organizations that are less concerned about and willing to invest in human-centric designs.

1m VISIR telescope The crew module incorporates a 1m telescope with a visible and near infrared-band imager which means with few exceptions (highly specialized stealth spacecraft and solar sails), all spacecraft using thrusters at the MW scale or higher are detectable out to and including the Ceres zone (7 AU range)

using this telescope, taking 1D6 hours to locate. Spacecraft without any thrusters are detectable out to 0.1 AU, which is sufficient range to include all moons around the same planet as the crew module location.

Armour The crew module has 2 layers of armour. This is normally 1 point of FIRE damage resistance and 1 point of GUN damage resistance. A coating and other armour layers are not available on crew modules until they are ET produced. See the Armour section on page 153 in the Assets chapter.

In addition, the size of the crew module provides it a measure of damage protection. The 40 tonne crew module has 5 innate armour. The 5 tonne platform has 3 innate armour. Innate armour provides protection against all damage types except CRASH but is not cumulative with rigid armour; use the higher value.

Colony starter kit The crew module has 5 tonnes of equipment that can be repurposed to start an extraterrestrial colony, including soil bacteria and seed stock. This is only intended in an emergency should the crew become stranded. It includes one of the two hab modules and, if damaged or lost, the crew module will not be able to rotate at 0.6G to provide gravity, resulting in the crew becoming susceptible to microgravity risks. Hab modules are normally only designed to be rotated this quickly if the crew is high quality.

Life support The crew module has 5 tonnes of equipment used for life support and living space. If this is damaged or lost, oxygen and water recycling becomes unavailable and consumed at much higher rates than otherwise allowed for - to the point where it may impact on the amount of available fuel to use as propellant. Without a functioning life support system, each crew member requires 4.6 tonnes of oxygen and water per year - half a 40 tonne water tank (WT) per 4 person crew per annum - in order to sustain themselves on board provided the crew module has power to ensure cooling. The crew also loses any on-board biosphere including the "leaf box" food supply crew modules carry which means they are reduced to eating whatever food they have already and any alternatives. See the Meal ready-to-eat entry on page 164 in the Assets chapter for details on crew food requirements.

Mission control uplink The crew module has a 250 kg antenna which can be used to communicate with suit radios up to 10,000 km away (from LEO to the surface if in orbit), or back to a 100 km antenna on Earth out to the Neptune zone.

Ship's locker The ship's locker is a 3D printer capable of printing almost all equipment required by the crew. This includes a selection of pre-printed light vehicles including a load-haul-dump, one or more drones and a a number of 1 kilogram cubesats. See the Ship's Locker section on page 154 in the Assets chapter for details.

Space suits Fabric items, including spaces suits, tethers, parachutes and inflatable tents cannot be 3D printed and therefore these items must be tracked separately, although from a shared pool accessible to all the crew. This process is described in more detail in the Assets chapter on page 140.

Symbols on the Folios The ☐ symbol indicates the subsystem is optional; and installed if it is checked. The △ symbol is used to indicate that a subsystem can be disabled; it is disabled if checked. The ◯ symbol indicates the subsystem can be damaged or partially consumed; a check mark indicates that it is and every ◯ being checked indicates it is decommissioned or unavailable. The * symbol indicates the default bleed through location for excess damage. See the Damage section on page 238 in the Risks chapter for details. You can also add tallies by putting a check mark in a ◯ for each tally. See the Successes section on page 132 in the Skills chapter for details. Black out any ◯ that are missing due to resource constraints and add additional ◯ if needed due to additional resources being available. The • symbol is used to separate the thrust (left hand side) from the fuel consumption (right hand side) for a thruster. See the Spacecraft section on page 266 of the Travel chapter for details. The ▼ symbol is used to represent armour. See the Armour section on page 153 of the Assets chapter for details.

Launch site: _____

Year | Mission Log

Priority: BSU Color | Official: Confidential

MCSU | Destination | Mission Crew Briefing

Mission Commander/Pilot: _____

Mission Specialist: _____

Payload Specialist: _____

Payload Specialist: _____

Additional Personnel: _____

(includes robotic Halbonauts) _____

Fold here - back cover

Fold here - front cover

Mission Directorate

Head of Mining: Mining mission control contact

Head of Sciences: Prospect mission control contact

Head of Spaceflight: Pilot mission control contact

Head of Technology: Teleops mission control contact

Head of Operations: Industry mission control contact

Optional mission control contacts include:

General Counsel: Activism

Chief Medical Officer: Medical

Financial Director: Trading Desk

Chief Information Officer: Devops

Roll | Spacecraft Quality: _____ | Crew Quality: _____ | Skill Level: _____ | Crew Age: _____ | Roll

0/6 Crew △ ◯ | **Mission Control uplink** △ ◯ 0/6 | **Life Support** △ ◯ * 1

Rad-hardness: _____ | Dry mass: _____ | Wet mass: _____ | Fuel steps: _____ | 1m VISIR telescope △ ◯ 1

Ship's Locker ◯◯◯◯◯ acts as a workshop 3D printer | **Colony Starter Kit** △ ◯ 3

2 Drone △ ◯ △ ◯ (only 1 drone if 1 tonne) | Load-Haul Dump ◯ | Cube Sats (unlimited) | ☐ EVA pods (no effect if not in use) △ ◯ 5

Spacesuits ◯◯◯◯◯ Type: _____ Spacesuit, parachute, tether and tent tallies cannot be used to pay for operation costs.

Parachutes ◯◯◯◯◯ | Tethers ◯◯◯◯◯ | Tents ◯◯◯◯◯ | Airlock (hab module must depressurize to exit if lost) △ ◯ 3

2 Platform △ ◯ | **Thruster** △ ◯ 4

(check ☐ if the option is installed)

☐ Buggy ISRU: _____ (includes 100 km tether cable)

☐ Missile ISRU: _____ Thruster: Thrust _____ • FC _____ AB _____ | Atmospheric re-entry heat tiles △ ◯ 4

☐ Raygun ISRU: _____ Can survey claims without travelling to them on worlds without atmosphere

▼ Resistance: _____ Rigid (all except CRASH): _____ Innate (not cumulative with rigid): 3

Functions: ☐ Aerostat ◯ ☐ Beamed Power ◯ ☐ Crewed ◯ ☐ Drilling ◯ ☐ Light ◯ ☐ Hauling ◯

(tallies only available if installed) ☐ Orbital ◯ ☐ Rigid ◯ ☐ Other: _____ (each additional function has 1 tally)

300 kg of firefighting equipment ◯

Driving △ ◯	_____ watts/kg	Permitted Slope:	_____	MP: _____	(P/V/T/S)
-1 move modifier	_____ watts/kg	Permitted Slope:	_____	MP: _____	(P/V/T/S)
-2 move modifier	_____ watts/kg	Permitted Slope:	_____	MP: _____	(P/V/T/S)
-3 move modifier	_____ watts/kg	Permitted Slope:	_____	MP: _____	(P/V/T/S)

5 Batteries/Fuel △ ◯◯◯◯◯◯◯◯ use 1 tally every 6 seconds / 1 minute / 10 minutes / 2 hours / 1 day

Hours to recharge ☐: _____ to get back 1 tally | Centitanks to refuel ☐: _____ to get back 1 tally

based on the heliocentric zone: _____ H2 / H2-O2 | CNM: _____

Batteries/Fuel has tallies equal to the vehicle range divided by either 6 seconds / 1 minute / 10 minutes / 2 hours or 1 day and uses them at the same rate

▼Armour Resistance: _____ Rigid (all except CRASH): _____ Innate (not cumulative with rigid): 5

Physical damage locations are numbers 1-6 on a gray background.

Energy damage is applied to locations 1-6 on both gray and white backgrounds. Complications hit white first.

Chapter 5

Demographics

The demographics of the world of 2040 continues to change from our own, but is still close enough in the future to resemble the world of now. The following demographics tables can be used to generate the nationality, gender, ethnicity and languages of anyone found in space and many people on Earth, in an attempt to provide more diversity for the 'international crew' trope in science fiction.

Be aware the demographic data used to create these rolls is not necessarily accurate and reflects specific national concerns - skin colour in Brazil and South Africa, ancestry in countries with large numbers of immigrants, social unification in several second world countries, such as Thailand - as well as statistical simplification and approximation. Crew and mission control demographics are weighted by national GDP figures, and colony demographics are weighted by overall population figures using 2015 census figures where available. This creates a number of issues in itself where countries with higher total GDP, such as Australia, are represented while countries with higher populations, such as Ghana and Yemen, are not. This is even worse when you consider the figures these were compiled from includes populations at all ages, whereas more accurate figures might have a cut off over a certain age (such as 25) which would be too old to be considered as crew in 2040.

Much smaller populations are represented on the ethnicities table within the possible nations. But some ethnic groups with small populations in many countries (such as Jews and Romani) remain missing as they never achieve the minimum percentage used to represent an ethnic subgroup within any of the represented nations.

Crew Nationalities

Crew and mission control contact nationalities will match the mission control nationality on a 2D6 roll less than or equal to the nationality mix number determined by the mission control or faction BSU. In the core rules, this will be 2 if the mission control or faction is Red, 3 if White, 4 if Green, 5 if Purple and 6 if Orange. If you roll over this number for any crew member or mission control contact, you should roll on the Crew Nationalities table on the facing page to determine the nationality.

If a mission control type lists multiple nationalities, then roll 1D6 to determine which nation the crew member comes from if the first roll is equal to or lower than the nationality mix number.

Space Agency The Space Agency column determines the organization that your Mission Control and crew belongs to if the Mission Control is a National Space Agency.

Colonist Nationalities

While crew modules capable of sustaining crew members in relative comfort for extended periods of time, life as a colonist is comparable to that of a subsistence farmer - almost all of labour of a small colony is spent in growing crops and sustaining the colony biosphere. Infrequent immigration allows the colony to expand so that it has a labour surplus capable of working in the factory to mine for water and isotope fuels and 3D printing ET products for export. Some colonies will even permit children: considering the independence of the colony more important than the developmental risks from solar flares, cosmic rays, regolith contaminants, microgravity health issues and anoxia. Despite the hard work required, there are still plenty of volunteers willing to travel to the stars.

Use the Colonist Nationalities table on page 70 to determine the nationality of any Colonist payload and colonists encountered as well as the nationality of any contacts you begin the game with other than your Mission Control contacts.

Crew Nationalities

Roll 1D6 and use the roll 1 column to resolve it. If there is a dice roll indicated in brackets, make the roll and use the roll 2 column to resolve it. On a result of 6 for roll 1, use the Colonist Nationalities table on the next page one third of the time instead (1-2 on 1D6). **United States regional launch sites:** Roll 1D6. 1: White Sands Missile Range. 2: Nevada Test and Training Range. 3: Mojave Air and Space Port, California. 4: Spaceport America, Upham, New Mexico. 5: Pacific Missile Range Facility, Hawaii. 6: Wallops Flight Facility, Delmarva Peninsula, Virginia.

Roll 1	Roll 2	Nation	Space Agency	Regional Launch Site
1		China	CNSA	Jiuquan Satellite Launch Center
2		United States	NASA	**See above note**
3 (1D6)	1-2	India	ISRO	Satish Dhawan Space Centre (SHAR), Andhra Pradesh
	3-4	Japan	JAXA	Tanegashima Space Center, Tanegashima Island
	5	Germany	DLR	Zingst
	6	Russia	ROSCOSMOS	Plesetsk Cosmodrome, Arkhangelsk Oblast
4 (1D6)	1	Brazil	AEB	Natal/Barreira or Alcântara Launch Center, Maranhão
	2	Indonesia	LAPAN	Lapan Space Center, Tjulitan
	3	France	CNES	Ile de Levant
	4	United Kingdom	UKSA	South Uist
	5	Mexico	AEM	Santiago Ixcuintla
	6	Italy	ASI	Salto di Quirra
5 (2D6)	2	South Africa	SANSA	Overberg South African Test Centre
	3	Taiwan	NSPO	Haiqian
	4	Iran	ISA	Qom Space Center (1-2) or Emam Shahr Space Center (3-4) or Semnan (5-6)
	5	Spain	INTA	El Arenosillo
	6	Saudi Arabia	KACST-SRI	None
	7	South Korea	KARI	Naro Space Center, Goheung
	8	Canada	CSA	Fort Churchill, Manitoba
	9	Turkey	TUBITAK UZAY	None
	10	Australia	CSIRO	Woomera Test Range
	11	Thailand	GISTDA	None
	12	Bangladesh	SPARRSO	None
Below here, use the colonist nationalities table one third of the time instead (1-2 on 1D6).				
6 (3D6)	3	Belgium	BIRA	None
	4	Iraq	None (PASA)	Al-Anbar Test Centre
	5	Venezuela	ABAE	None
	6	United Arab Emirates	MBRSC	None
	7	Philippines	PSA	None
	8	Netherlands	NSO	None
	9	Egypt	NARSS	Jabal Hamzah ballistic missile test and launch facility
	10	Poland	POLSA	Leba-Rabka
	11	Nigeria	NASRDA	None
	12	Argentina	CoNAE	Punta Indio
	13	Pakistan	SUPARCO	Sonmiani Satellite Launch Center, Las Bela, Balochistan or Tilla Satellite Launch Center, Jhelum District, Punjab
	14	Malaysia	ANGKASA	None
	15	Colombia	CCE	None
	16	Algeria	ASAL	Reggane
	17	Vietnam	VAST-STI	None
	18	Switzerland	SSO	None

Colonist Nationalities

Roll 1D6 then 2D6 to determine colonist nationality.

Roll 1	Roll 2	Nation
1	2-12	China
2	2-12	India
3	2	Canada
	3	Argentina
	4	Colombia
	5-6	United States
	7	Brazil
	8	Mexico
	9	Germany
	10	United Kingdom
	11	Spain
	12	Peru
4	2	Venezuela
	3	Ukraine
	4	Italy
	5	Egypt
	6	Russia
	7	Pakistan
	8	Philippines
	9	Turkey
	10	France
	11	Poland
	12	Uzbekistan
5	2	Morocco
	3	Algeria
	4	South Korea
	5-6	Indonesia
	7	Bangladesh
	8	Vietnam
	9	Thailand
	10	Myanmar
	11	Iraq
	12	Malaysia
6	2	Afghanistan
	3	Kenya
	4	Tanzania
	5	Democratic Republic of the Congo
	6	Japan
	7	Nigeria
	8	Ethiopia
	9	Iran
	10	South Africa
	11	Sudan
	12	Uganda

Ethnicity and Languages

Use the Ethnicities and Languages table on page 75 to determine the ethnicity of a crew member or colonist and the languages spoken.

Ethnicity

For ethnicity, roll as described on the entry. If an ethnicity is given as Asian/Other Asian, reroll on the Nationality table until you get a South or East Asian result. Apply a similar process for 'European/Other European' or 'African/Other African' results.

In the 21st century, a crew member's Capital has much more influence on them than their ethnicity although, to paraphrase Guns, Germs and Steel, rich people are the same everywhere but the poor are poor for a variety of different reasons.

Languages

For languages, roll 1D6 to determine the language(s) spoken by a crew member colonist and compare with the language ranges provided. All crew also speak English.

The lingua franca of space is the first language listed for whichever faction builds the first factory. This will be spoken as a second language on colonies or words from it adopted as a part of the pidgin spoken between spacecraft dwellers and colonists. After a generation in any colony (24 years or two solar cycles) creole languages will have developed from the parent tongues of the colony and this language.

Gender

Use the Gender table on the following page to determine your gender. Your gender may help determine your public and personal pronouns – for pronoun systems which have gendered markers – and having a male gender makes you vulnerable to space blindness.

Weird poorly contextualized game designer comment: Note that gender doesn't follow the normal BSU order: it uses the order normally associated with higher toposophic levels discussed in the A Lot of Zeroes supplement.

Postgender If the Space Politics is Orange and the era is Exoglobalization or later, any gender characteristics you choose to express do not impact your health, income or social interactions with others.

Robot Gender Robots are Genderless if they have a consciousness capability of less than 6. Use result 15+ if they have a consciousness capability of 6 or higher.

Genders

Roll 2D6 and add +1 if Chinese or Albanian prior to the Colonization era, +2 if Polynesian, Mexican, Indian, Pakistani or Bangladeshi prior to the Colonization era, +2 if Colonization, +4 if Exoglobalization, +6 if Futures, +8 if Breakthrough or +10 if Postsingularity.

Roll	Gender
2-10	Even numbers = Female
	Odd numbers = Male
11	Female if Christian Indian (if Indian, will be Christian on a roll of 12 on 2D6) or North Korean; Cis Male if Chinese or any Baseline or Upported except Albanian, Pakistani, Bangladeshi, Mexican or Polynesian; Male if Albanian; otherwise roll 1D6. 1-4: Female, 5-6: Male
12-14	Roll 1D6. 1-2: Female, 3-4: Male, 5: Demi. 6: Agender.
15+	Crew may either choose or roll 2D6 for their gender. 2-3: Male. 4: Female. 5: Demi. 6: Eusocial (Red). 7: Public Agender (Purple). 8: Genderfluid (Green). 9: Gender Multimorph (White). 10: Genderless (Orange). 11+: Matching the current space politics, using Red if War and Purple if Anarchy.

Agender You have no presentation of male or female gender characteristics. Your decision to do so is important to you.

Demi You have determined you wish to present your choice of a mix of male, female and agender presentation.

Eusocial Your are more closely related to your siblings than your parents. While some eusocieties have almost all members of the eusociety be one gender, others such as termites have a mix of two genders in equal proportions.

Female Women are generally better suited to space exploration than men; in addition to the health and equipment complications men suffer from, smaller crew members also consume less food and water and require less waste recycled. Female crew include both cis and trans females, which are not distinguished in the rules. If it is important to you to determine this for your crew background, crew will be trans female half the time if the first 2D6 roll is 11+; otherwise the crew member will be cis female.

Genderless You never express gender traits because gender is unimportant to you.

Gender Multimorphism You are one of a predetermined number of possible genders and these genders have diverged enough that they are effectively separate species. This may not be physically apparent because it is enforced through a strict program of social control rather than exaggeration of physical characteristics. Roll 1D6 twice, choosing the lowest result and adding one for the number of gender morphs. Roll 1D6 for the gender of each morph. 1: Female. 2: Male. 3: Demi. 4: Surrogate. 5: Agender. 6: Dispersive or Transitioning.

Genderfluid You choose what gender traits you express. It takes roughly an hour of rest to change one of these traits or a day if done gradually while remaining active.

Male Male crews and colonists suffer from a high incidence of space blindness in microgravity environments. They also suffer significant discomfort when using skintight spacesuits. Male crew include both cis and trans males, which are not distinguished in the rules. If it is important to you to determine this for your crew background, crew will be trans male half the time if the first 2D6 roll is 11+; otherwise the crew member will be cis male.

Public Agender You do not express any gender characteristics when in public. This might be because you dress to conceal your gender when in public or because you can choose a different body shape between the public and private spheres of your life. Roll again for your private gender, treating this result as Agender.

Pronouns

At the start of each era, society changes the system of preferred third person pronouns called public pronouns. This is partly because gender expressivity increases as a result of technological advances but also because of the concept of self changes as a result of technological and social pressures.

Roll 1D6, -1 if the Space Politics is Red or War, +1 if the Space Politics is White or Anarchy, +3 if the Space Politics is Green, +5 if the Space Politics is Purple or +7 if the Space Politics is Orange for the new public pronouns.

Preferred Pronouns You choose your preferred pronoun and can freely change it at any point in the game (but not retrospectively). Your gender typically determines your preferred pronoun, but the era-determined public pronouns determines whether or not the social conventions will use it. Feel free to explore changing your preferred pronoun throughout the game, especially if you become a being containing multiple conscious minds. Your fellow crew should always respect your preferred pronoun in private conversations.

Robot Pronouns Robots with a consciousness capability of 10 or higher can choose their pronouns normally. Robots with a consciousness capability of 6-9 and will have a preferred pronoun, determined by their robot outlook roll of 1D6. 1: Functional (Red or War, prefers pronouns: It/It/Its/Its/Itself). This AI puts function ahead of its need to express itself. 2: Personal (White or Anarchy, prefers pronouns He/Him/His/His/Himself if a military robot and She/Her/Her/Hers/Herself otherwise). This AI prioritizes quality of human interactions as long as you don't question or try to understand its motives. 3: Poetic (Green, prefers pronouns: You/You/Your/Yours/Yourself). The AI expresses an alien artistry. 4: Congress (Purple, prefers They-plural pronouns: They/Them/Their/Theirs/Themselves). The AI consists of multiple internal voices. 5: Rational (Orange, roll 1D6 for the preferred pronoun on the Zie / Zim / Zir / Zis / Zieself Neutral pronouns table). The AI acts like the ultimate rational being. 6: Inconsistent. The AI changes its personality based on external stimulus, the personality of the person or organization it is dealing with and other random factors. Roll the personality for any interaction, with this result being replaced by the result matching the space politics.

First Person Pronouns Italic entries indicate that the same pronouns are adopted for first person conversations as well as third.

Roll	Public Pronouns
-0	*I / Me / My / Mine / Myself*
1	*We / Us / Our / Ours / Ourselves*
2	It / It / Its / Its / Itself
3	Hehe or sheshe / Himhim or herher / Hishis or herher / Hishis or hershers / Himhimself or herherself
4	He / Him / His / His / Himself
5	(s)He / H(er)im / H(er)is / H(er)is / H(er)imself
6	One / One / One's / One's / Oneself
7	He or she / Him or her / His or her / His or hers / Himself or herself
8	*Guy / Guy / Guy's / Guy's / Guyself*
9	They / Them / Their / Their / Themself
10	*n / n / n's / n's / N-self*
11	*Name / Name / Name's / Name's / Name-self*
12+	Zie / Zim / Zir / Zis / Zieself

I/Me/My/Mine/Myself, **You/You/Your/Your/Yourself** and **We/Us/Our/Ours/Ourselves** merge the first and third person so they are no longer distinguished, suggesting a partial or complete erasure of individual accountability, replace by collective responsibility and identity.

It / It / Its / Its / Itself pronouns erase individuality in a different way, rendering the other a mindless object rather than an individual. If this result is rolled, roll for a second public pronoun for how in-faction individuals refer to themselves as distinct to outsiders. The BSU determines what is considered in-faction versus out of faction.

Hehe or sheshe / Himhim or herher / Hishis or herher / Hishis or hershers / Himhimself or herherself pronouns are used by gender anxious societies to stress the differences between genders. In

some instances, the number of hes and shes may literally match the number of X and Y chromosomes the individuals has (especially where XYY and XXX chromosomal individuals are idealized; 1 in 6), but usually one of the pronouns is used to indicate the individual's gender presentation and the other the "biological gender", whatever that means. If the Space Politics is White, mixed gender pronouns are discriminated against.

He / Him / His / His / Herself pronouns are presented as the traditional default pronoun while in reality being a recent invention. Individual preferred pronouns are not recognised, except where they fit traditional gender roles: if this is the case, an individual's public pronoun is their preferred pronoun.

(s)He / H(er)im / H(er)is / H(er)is / H(er)imself pronoun societies determine the pronoun choice by the status of the individual rather than their preferred pronoun. Low status individuals inherit what is viewed as the "weaker" pronoun, traditionally the feminine pronoun, while higher status individuals have the "stronger" pronoun, typically masculine. High status individuals may include those belonging to the ruling class or associated careers (military if the Space Politics is Red, religious if White, labour if Green, political if Purple or commercial if Orange) and low status individuals often includes non-sentient entities such as spacecraft, smart devices and robots.

One / one / one's / one's / oneself pronouns are archaic and suggests formal social structures which ignore or suppress concerns about gender equality.

He or she / Him or her / His or her / His or hers / Himself or herself stress the importance of individual pronoun preferences and will include recognition of the pronoun preferences at the start of any conversation. However they have difficulty adopting pronouns that they have not previously encountered and struggle to escape the ideological underpinnings of traditional pronoun associations. The individual's public pronoun is typically their preferred pronoun.

Guy / Guy / Guy's / Guy's / Guyself pronouns were historically gendered but continued language evolution has meant these genders are largely linguistic artifacts and are not associated with any specific attributes or positive or negative connotations. Guy pronouns affect all pronoun use, not just first person pronoun use: "My guy" means you (singular), "Your guy" means me and "Guys" is the you plural usage and is ambiguous as to whether it includes the speaker or not. "These guys" and "those guys" are for third person usage with proximity markers.

n / n / n's / n's / N-self Multiple mind individuals and poly pods emphasise the correct plurality of their group. They will also use the same forms for first person singular and plural, erasing the difference between themselves and the group they belong to. Use the number of crew or roll 1D6 to see how big such a group is if it is not otherwise determined.

Roll	Multiple Pronouns
1	One/One/One's/One's/Oneself
2	Two/Two/Two's/Two's/Twoself
3	Three/Three/Three's/Three's/Threeself
4	Four/Four/Four's/Four's/Fourself
5	Five/Five/Five's/Five's/Fiveself
6	Six/Six/Six's/Six's/Sixself

They / Them / Their / Their / Themself pronouns indicate a willingness to engage with preferred pronouns without adopting a gender inclusive interpretation. They-singular allows for private gender expression which does not publicly intrude on others: if gender is publicly expressed, then the preferred pronoun will be used instead of They-singular. The individual can choose whether their public pronoun is their preferred pronoun.

Name / Name / Name's / Name's / Name-self pronouns are used by speakers objectifying nameselves; turning nameself into a brand rather than a person. Each speaker replaces the "name" with the given name of the person they are referring to. If they refer to themselves this way, it is known as illeism, but trade mark requirements may mean that other individuals cannot be legally referred to by any reference other than their proper name.

Zie / Zim / Zir / Zis / Zieself and similar pronouns are gender inclusive and self-selected. An individual's public pronoun is their preferred pronoun although gendered pronouns are typically regarded as immature or transient fashions. Roll 1D6 for the preferred form if required.

Roll	Neutral Pronouns
1	Zie / Zim / Zir / Zis / Zieself
2	Sie / Sie / Hir / Hirs / Hirself
3	Ey / Em / Eir / Eirs / Eirself
4	Ve / Ver / Vis / Vers / Verself
5	Tey / Ter / Tem / Ters / Terself
6	E / Em / Eir / Eirs / Emself

Ethnicities and Languages

Nation	Ethnicity	Languages
Afghanistan (SGAC)	Roll 2D6. Roll 2D6. 2: Roll 1D6. Aimaq (1-4) or Baloch (5-6). 3: Hazara. 4: Uzbek. 5-8: Pashtun. 9-10. Tajik. 11: Roll 1D6. Hazara (1-3) or Other (4-6). 12: Roll 1D6. Turkmen (1-4) or Other (5-6).	Native language (Dari if Aimaq, Hazara or Tajik). Dari <=4. Pashto = 5. Another language = 6. Roll 1D6 if another language. 1-2: English. 3: Urdu. 4-6: Uzbek.
Algeria	Roll 2D6. 2: Arabic. 3: Turkish. 4: Berber. 5-12: Arab-Berber	Algerian Arabic ≤5. Berber ≥5. Roll a second 1D6. 1: French and English. 2: French. 3-4: No additional languages.
Argentina	2-7: Mestizo, 8-9: European ancestry, 10: Arab or Asian ancestry, 11: Foreign born. Roll 2D6: Brazil (2), Uruguay (3), Peru (4), Chile (5), Paraguay (6 or 8), Bolivia (7), Colombia (9), Italy (10), Spain (11), Other (12). 12: Amerindian. Roll 2D6: Guaraní (2), Mapuche (3-5), Kolla(6), Other (7 or 9-10), Qom (8), Wichí (11), Diaguita (12),	Ethnic language ≤5 if Foreign born or Amerindian. Roll 2D6 for each of the following. Spanish ≤11. English ≤6. Ancestral language if not Mestizo, Amerindian or Foreign born ≤4. Portuguese ≤3.
Australia	Roll 2D6 for ancestry. 2-5: Australian. 6-7: English. 8: Irish or Italian. 9: Scottish or German. 10: Roll 1D6. Chinese (1-3), Indian (4), Greek (5) or Dutch (6). 11: Roll 1D6. Filipino (1), Vietnamese (2), Lebanese (3), Polish (4), Maltese (5) or Maori (6). 12: Indigenous Australian.	English. If not Australian, ancestral language ≤1.
Bangladesh	Roll 2D6. 2-11: Bengali (speaks Bangla). 12: Roll 2D6. Garo (2-3), Rohingya (4), Chakma (5), Bihari (6), Other (7), Bengali (8-12, speaks Bangla).	Ethnic language. English ≤1. Arabic ≥6. If not Bengali, Bengali on 2, 4, 6.
Belgium	Roll 2D6 ancestry. 2: Roll 1D6. Belgian (1-4, speaks French) or German (5-6). 3: Roll 1D6. Italian (1-4) or Moroccan (5-6). 4-7: Flemish (speaks Dutch). 8-10: Walloon (speaks French). 11: Roll 1D6. Turkish (1), Dutch (2), French (3), Portuguese (4), Spanish (5) or Greek (6). 12: Bosnian (1), Algerian (2), Congolese (3), Vietnamese (4), Polish (5) or Indian (6).	Ancestral language. French ≤4, Dutch if not Walloon == 5, Dutch ≥6.
Brazil	Roll 1D6. 1-3: Brancos, 4-6: Other ancestry, roll 3D6. 2-12: Pardos, 13-15: Prestos, 16-17: Amarelos, 18: Indigenous.	If Indigenous: Portuguese ≤4, Ethnic language ≥2; otherwise Portuguese.
Canada	Roll 2D6 for ancestry: 2: Indigenous, roll 2D6. First Nations (2-7, 12), Metis (8-10) or Inuit (11). 3: German. 4: Scottish. 5: French. 6: English. 7: Roll 1D6. Italian(1). Chinese (2). Ukrainian (3). East Indian (4). Dutch (5). Polish (6). 8-9: Roll 2D6. Canadian (2-11). American (12). 10: Irish. 11-12: Roll 1D6. Filipino (1). Russian (2). Welsh (3). Norwegian (4). Metis (5). Other European (6).	English ≤5 (or French if Metis). French ≥5. Roll 1D6 for Ancestral language on a roll of 1.

Nation	Ethnicity	Languages
China	Roll 2D6, if 2-10: Han, 11+ Minority, roll 2D6. 2: Tibetan, 3: Yi, 4: Uyghur, 5: Hui, 6: Zhuang, 7-8: Other, 9: Manchu, 10: Miao, 11: Tujia, 12: Mongol	Putonghua (Mandarin) ≥2, Other Chinese language ≤2: Roll 2D6. 2: Huizhou, 3: Hakka, 4-5: Min, 6: Jin, 7: Yue, 8-9: Wu, 10: Xiang, 11: Gan, 12: Pinghua. If not Han: Minority language (≥5)
Colombia (CCE)	Roll 2D6. 2-3: Roll 2D6. White (2-11) or Roma (12), 4-7: Mestizo, 8: Roll 2D6. Afro-colombian (2-8) or Amerindian (9-12), 9-12: White	Spanish. If Afro-Colombian, English creole ≤1, Spanish creole ≥6. If Amerindian, roll 2D6. Paez (2), Wayuu (3), Other (4-11), Embera (12).
Democratic Republic of the Congo (AfriSpace)	Roll 2D6. 2-3: Roll 1D6. Mangbetu-Azande (1-5) or Pygmy (6), 4: Kongo, 5: Central Sudanic or Nilotic people, 6: Mongo, 7: Roll 2D6. Luba (2-10) or Kongo (11-12), 8-12: Other Bantu tribe.	Ethnic language. Roll 2D6 for each of French ≤7, Swahili ≤6, Lingala ≤4, Kituba ≤3, Luba-Kasai ≤3.
Egypt	Roll 2D6. 2: Coptic (speaks Sa'idi Arabic), 3-6: Egyptian (speaks Sa'idi Arabic), 7-10: Egyptian (speaks Egyptian Arabic), 11: Coptic (speaks Egyptian Arabic), 12: Roll 1D6. Bedouin (1-3, speaks Bedouin Arabic). Beja (4, speaks Sudanese Arabic), Dom (speaks Domari) (5), Nubian (speaks Nobiin) (6).	Ethnic language. Arabic ≤5. English ≤2. French = 2.
Ethiopia (AfriSpace)	Roll 2D6. 2: Gurage, 3: Sidama (speaks Sidamo), 4-6: Oromo, 7: Roll 1D6. Wolayta (1, speaks Wolaytta), Hadiya (2, speaks Hadiyya), Afar (3), Gamo (4), Silte (5) or Kafficho (6, speaks Kafa), 8: Somali or Tigray (speaks Tigrinya), 9-12: Amhara (speaks Amharic).	Ethnic language. Arabic ≤1. Amharic ≥6.
France	Roll 2D6 for ancestry. 2: Greek (1-3) or German (4-6), 3: Spanish, 4: Portuguese (1-3) or Polish (4-6), 5-8: French, 9: North African, 10: Italian, 11: Other African, 12: Turkish (1-3), Caribean (4-5) or Other French territories (6)	French ≤5, Ancestral language ≥5 if non-European, Ancestral language = 6 if European. French as a second language on a second roll of 1-4 if not first language. If an Ancestral French language user, either: Alsatian (1-2), Occitan (3-4) or Oil language (5-6). North African ancestral language is Arabic.
Germany	Roll 1D6, 1-5: German, 6: Non-German ancestry, Roll 2D6. 2: Romanian, 3: Italian, 4: Russian, 5: Polish, 6: Other EU, 7: Former Yugoslavian, 8-9: Turkish, 10: Nigerian or Ghanaian,11: Arabic, 12: Greek	If non-German ancestry, German ≤5, Ancestral language ≥3; otherwise German.
India	Roll 1D6. 1-3: Hindi. 4-6: Other, roll 2D6. 2: Punjabi, 3: Malayalam, 4: Gujarati, 5: Tamil, 6: Telugu, 7: Bengali, 8: Marathi, 9: Urdu, 10: Kannada, 11: Odia, 12: Maithili.	Ethnic language. Roll ≤3 on 2D6 for English.
Indonesia	Roll 2D6. 2-6: Javanese, 7: Sudanese, 8: Sumatran (Batak: 1-2, Minangkabau: 3, Malay: 4, Other: 5-6), 9: Banjarese (1), Acehnese (2), Balinese (3), Borneo (4), East Nusa Tenggara (5), Other (6), 10: Sulawesi (Buginese: 1-2, Other: 3-6) 11: Madurese (1-3), Betawi (4-5), Chinese (6) 12: Papuan (1-2), Sasak (3-4), Dyak (5-6)	Ethnic language ≥2, Indonesian ≤4.

Nation	Ethnicity	Languages
Iran	Roll 2D6. 2: Turkman or Baluch, 3-5: Azeri, 6-8: Persian, 9: Kurd, 10: Gilaki or Mazandarani, 11: Lur, 12: Arabic	Ethnic language ≥2. Persian ≤3.
Iraq	Roll 2D6. 2: Roll 1D6. Turkmen (1-4) or Shabak (5+), 3-8: Roll 3D6. Marsh Arab (3), Bedouin (4-6). Iraqi Arab (7+), 9-10: Roll 2D6. Yazidis (2-3) or Kurd (4+). 11-12: Roll 1D6. Assyrian (1, speaks Neo Aramaic) or Afro-Iraqis (2+).	Roll 2D6. 2: Roll 1D6. Turkmen (1-4) or Shabak (5+), 3-8: Roll 3D6. Marsh Arab (3), Bedouin (4-6). Iraqi Arab (7+), 9-10: Roll 2D6. Yazdis (2-3) or Kurd (4+). 11-12: Roll 1D6. Assyrian (1, speaks Neo Aramaic) or Afro-Iraqis (2+).
Italy	Roll 2D6. 2-10: Italian, 11-12: Other, roll 2D6. 2: Chinese, 3: Latin American, 4: Albanian, 5: Other Asian, 6: North African, 7: European, 8-9: Romanian, 10: Sub Saharan African, 11: Ukranian, 12: Polish.	If not Italian: Italian ≤5, Ancestral language ≥5. Otherwise Italian. Italian as a second language on a second roll of 1-4 if not first language.
Japan	Roll 3D6: 3-4 Hisabetsu Buraku, 5-16 Japanese, 17-18 Ryukyuan.	Japanese. If Ryukyuan, 3-5: Okinawan Japanese, 6: Ryukyuan.
Kazakhstan (SRI)	Roll 2D6. 2: Uzbek. 3: Russian. 4: Roll 1D6. Ukrainian (1-2), Uygur (3-4), Tatar (5) or German (6). 5-9: Kazakh. 10-12: Russian.	Kazakh ≤5. Ethnic language ≥4. Russian on 2, 4, 6.
Kenya (AfriSpace)	Roll 2D6. 2: Mijikena, 3: Other African, 4: Somali, 5: Kamba, 6: Kalenjin 7: Kikuyyu, 8: Luhya, 9: Luo, 10: Other African, 11: Kisii, 12: Meru.	Ethnic language. Roll 2D6 for additional language(s): 2-6: Swahili, 3 or 10: English.
Malaysia	Roll 2D6. 2-5: Han Chinese, 6-7 Malay, Peninsula, 8: Other Malay, 9: Roll 1D6. Other Asian (1-5) or Other European (6), 10: Roll 2D6. Nepalese (2-3), Straits Chinese (4), Malay, Eastern Malaysia (5), Iban (6 or 8), Filipino (7), Other Indian (9), Tausug (10), Dusun Central (11-12), 11: Tamil, 12: Indonesian	Ethnic language except roll 2D6 if Han Chinese. 2: Northern Min, 3-5: Hokkien, 6: Teochew, 7: Cantonese. 8-9: Hakka, 10-11: Mandarin, 12: Hainanese. Roll 3D6 = 3 for English.
Mexico	Roll 1D6. 1-5: Mexican, 6: Roll 2D6. 2-5: Mexican, 6: Other Indigenous, 7: Nahua, 8: Maya, 9: Zapotec, 10: Mixtec, 11: Otomi, 12: Totonac	If Indigenous: Spanish ≤5, Indigenous language ≥4. Otherwise Spanish.
Morocco (CRTS)	Roll 2D6. 2-5: Berber. 6-11: Arab-Berber (Speaks Moroccan Arabic). 12: Roll 1D6. Arab-Berber (1-3, speaks Moroccan Arabic), Arab-Berber (4, speaks Hassani Arabic), Other European (5), Other African (6).	Ethnic language. Moroccan Arabic ≤4. Arabic ≤2. Also roll ≤4 on 1D6 for each of French, English and ≤1 for Spanish.
Myanmar (None)	Roll 2D6. 2: Chinese, 3-8: Bamar (speaks Burmese), 9: Roll 1D6. Rakhine (1-2), Rohingya (3), Mon (4), Kachin (5), Indian (6), 10: Shan, 11: Kayin, 12: Other.	Ethnic language. Burmese ≤1. Roll 2D6. English ≤3.
Netherlands	Roll 1D6 for ancestry. 2: Other, 3-9: Dutch. 10: Roll 1D6. Turkish (1), Indonesian Dutch (2), Moroccan (3), Surinamese (4) or Other (5-6). 11: European. 12: Roll 1D6. European (1-2), Caribbean (3-4), Chinese (5) or Iraqi (6).	Dutch. English ≤5. Ancestral language ≥5. Roll 1D6 for French (1-4). Roll 1D6 for German (1-2). Roll 2D6. 9: Dutch Low Saxon. 11: Limburgish. 12: Frisian.

Nation	Ethnicity	Languages
Nigeria	Roll 2D6. 2: Igala, 3:Tiv, 4: Kanuri or Ibibio, 5: Ijaw, 6: Hausa-Fulani, 7: Igbo, 8: Hausa-Fulani, 9-10: Yoruba, 11-12: Roll 2D6. Efik (2), Isoko (3), Itsekiri (4), Gbagyi (6), Idoma (5 or 7), Urhobo (8), Nupe (9-11), Anaang (12).	Ethnic language. English ≤3. Second ethnic language 3, 4 or 5 (roll 2D6 again on ethnicity column for language).
North Korea (Kcost)	Korean (ethnically homogenous).	Korean.
Pakistan	Roll 2D6. 2: Hindkowan (1-3, speak Hindko dialect of Punjabi) or Brahui (4-6), 3-6: Punjab, 7: Pashto, 8: Sindhi (4-6), 9: Saraiki, 10: Muhajirs (speaks Urdu), 11-12: Balochi (1-3), Afghan refugee (4) or Other (5-6)	Ethnic language. Urdu ≤4. English 4 or 5.
Peru (CONIDA)	Roll 2D6. 2-6: Amerindian. 7: Roll 1D6. Spanish (1-2), Italian (3), British (4), French (5), other European (6). 8-11: Mestizo. 12: Roll 1D6. Chinese (1-2), Japanese (3-4), other Asian (5), Afro-Peruvian (6).	Spanish ≤5. Quechua ≥6 except use ancestral language on a second roll of 6 and for this with Amerindian ancestry use Aymara.
Philippines	Roll 2D6. 2-5: Tagalog, 6-7: Visayan. Roll 2D6 for Masbateño (2), Waray (3-4), Cebuano (5-8), Hiligaynon (9-10), Kinaray-a (11), or Alkano (12), 8-9: Roll 2D6 for Other Asian (2), Zamboangueño (3), Pangasinan (4), Indigenous Filipino (5) or Other Filipino (6-12), 10: Ilocano, 11: Bikol, 12: Kapampangang.	Ethnic language. Filipino ≤4. Roll 2D6 for each of the following. English ≤11. Tagalog ≤5. Spanish ≤2.
Poland	2: Roll 1D6. Silesian (1-5) or Kashubian (6), 3-11: Polish, 12: Roll 2D6. Vietnamese (2), Belarusian (3), Other (4-8), Ukrainian (9), German (10-12).	Ethnic language. Polish ≤4 or if Silesian or Kashubian. English ≤2.
Russia	Roll 1D6, 1-5: Russian, 6: Other ancestry, roll 2D6. 2: Mordvin, 3: Armenian, 4: Chechen, 5: Bashkir, 6-7: Other, 8-9: Tatar, 10: Ukrainian, 11: Chuvash, 12: Azeri	If non-Russian, Russian, Ancestral language ≥3; otherwise Russian.
Saudi Arabia	Roll 2D6. 2: Yemeni, 3: Roll 2D6. Bangladeshi(2-5), Indonesian (6), Jordanian/Palestinian (7), Sudanese (8), Filipino (9-12), 4-8: Arab, 9: Afro-Asian, 10: Indian or Pakistani, 11: Roll 2D6. Myanmar (2-4), Sri Lankan (5-6), Afro-Asian (7), Syrian (8), Madhesi Nepalese (9), Turkish (10), Westerners (11-12), 12: Egyptian.	Ethnic language (all except Arab or Afro-asian). If Arab or Afro-asian: Hijazi Arabic ≤2. Najdi Arabic 3-5. Modern Standard Arabic 2, 4, 5 or 6. On a roll of 6, roll 2D6 for 3 or less to speak Gulf Arabic instead of Modern Standard Arabic or both on a roll of 2.
South Africa	Roll 2D6. 2-3: Coloured, 4: White, 5-11: Black, 12: Indian or Asian.	Roll 2D6 if Black. 2: Sesotho or Tshivenda, 3: Sesotho, 4: Sesotho sa Leboa, 5-6: isiZulu, 7: isiXhosa, 8: Afrikaans, 9: English, 10: Setswana, 11: Xitsonga (1-4) or isiNdebele (5-6), 12: siSwati. Roll 1D6: Afrikaans ≤4, English ≥5, Ethnic language = 4 or 5, Black South African language (2D6, above) = 3 or 6. White or Coloured ethnic language is Afrikaans, Black is a Black South African language (2D6, above). Discard duplicates.

Nation	Ethnicity	Languages
South Korea	Roll 2D6. 2-10: Korean. 11-12: Roll 2D6. Korean (2-8), Asian (9), Chinese (10), United States (11), Vietnamese (12).	Ethnic language. Korean ≤3.
Spain	Roll 2D6 for ancestry. 2-10: Spanish. 11: Roll 1D6. Romanian (1-2). Moroccan (3-4), Ecuadorian (5) or United Kingdom (6). 12: Roll 1D6. Latin America (1-2). European (3-4). Chinese (5) or Other (6).	Ancestral language ≤1. Spanish. Catalan or Galician ≥6. If Spanish ancestry, ancestral language is (roll 1D6). 1-4: Catalan. 5-6: Galician. and on a 6, roll a second 6 for language to be Basque.
Sudan (AfriSpace)	2-8: Sudanese Arab, 9: Fur, 10: Beja, 11: Nuba, 12: Fallata	Ethnic language. Arabic ≤3. English 3 or 4.
Switzerland	Roll 1D6. 2: Swiss. (Roll 1D6 and speaks Romansh (1) or Italian (2-6)). 3: Swiss (speaks Italian). 4-5: Swiss (speaks French). 6-8: Swiss (speaks German). 9-10: European. 11: Roll 1D6. European (1). Asian (2-3). African (4). Americas (5-6). 12: Swiss (speaks French).	Ethnic language ≥2 or if Swiss or no language other than English. English ≥4. Roll 2D6. 2: Italian. 3-6: German. 7: French. 11: English.
Taiwan	Roll 2D6: 2-9 Han Taiwanese, 10-11: "Mainland" Chinese (roll on China result), 12: Indigenous, roll 2D6. 2: Rukai, 3: Truku, 4: Other, 5: Bunan, 6: Atayal, 7: Paiwan, 8-11: Amis, 12: Puyuma	Taiwanese Hokkien ≤4. Hakka = 5. Indigenous language ≥6 (Hakka if Han Taiwanese). Guoyu (Mandarin).
Tanzania (AfriSpace)	Roll 2D6. 2: Haya, 3: Chaga (speaks a variety of Bantu dialects), 4: Nyamwezi, 5-6: Other Bantu tribe, 7: Sakuma, 8-10: Other Bantu tribe. 11: Other African or European. 12: Zanzibar inhabitant. Roll again except replace other European with Arab. Reroll this result.	Ethnic language. Swahili ≤5. Roll 2D6 < 3 for English. Roll 2D6 < 3 for Arabic on Zanzibar.
Thailand (GISTDA)	Roll 2D6. 2-3: Thai (speaks Southern Thai), 4 or 6-7: Thai (speaks Isan), 5: Thai (speaks Northern Thai), 8-10: Thai (speaks Central Thai), 11: Khmer (speaks Northern Khmer) or Malay (speaks Yawi), 12: Roll 1D6. Karen (1-3), Chinese (4-5) or Miao (6).	Ethnic language. Central Thai ≤5.
Turkey	Roll 2D6. 2-8: Turkish, 9: Roll 2D6. Albanian (2-4), Bosniak (5-6, speaks Bosnian), Circassian (7-8, speaks Adyghe if either dice rolled was a 6, otherwise Karbardian), Zaza (9-12, speaks Zazaki), 10-11: Kurdish (speaks Kurmanji), 12: Arab (speaks Arabic) or Georgian.	Ethnic language except if 2 rolled for first ethnicity roll, roll 1D6. Speaks South Azerbaijani (1-2) or Balkan Gagauz Turkish (3) instead of Turkish on a roll of 1-3. English ≤1, Roll 2D6 for French ≤2, German ≤2, second ethnic language ≤3.
Uganda	Roll 2D6. 2: Nyora, 3: Other African 4: Soga, 5: Nkole. 6: Acholi (1-2) or Gisu (3-4) or Lugabar (5-6) 7: Ganda 8: Kiga or Teso. 9-12: Other Ugandan	Ethnic language, English ≥6. Roll 2D6 for additional languages: 2-9: Swahili (or Luganda if Ganda), 10-11: Ethnic language is a dialect continuua (roll second ethnicity), 12: Runyakitara.
Ukraine (NSAU)	Roll 2D6. 2-4: Russian. 5-10: Ukrainian. 11: Roll 1D6. Moldavians / Romanians (1), Belarusians (2), Crimean Tatars (3), Bulgarians (4), Other Eastern European (5-6). 12: Roll 1D6. Russian (1) or Ukrainian (2-6).	Ethnic language ≤4, Ukranian 5, Russian 6. Crimean Tatar, Bulgarians use Russian instead of Ukrainian. Belarusian, other Eastern European instead use Ethnic language ≤1, Ukranian 2, Russian ≥3.

Nation	Ethnicity	Languages
United Arab Emirates	Roll 2D6. 2-3: Libyan. 4-5: Emirati (speaks Gulf Arabic). 6: Roll 1D6. Sri Lankan (1), Afghani (2), Jordanian (3), Syrian (4), Chinese (5) or Filipino (6). 7: Roll 1D6. Filipino (1-2), Iranian (3-4) or Egyptian (5-6). 8: Indian. 9: Roll 1D6. Indian (1-4), Libyan (5) or Bangladeshi (6). 10: Bangladeshi. 11: Roll 1D6. Nepalese (1), United Kingdom (2), Indonesian (3), South African (4), Moroccan (5) or Ethiopian (6). 12: Iraqi or Lebanese.	Ethnic language. Modern Standard Arabic $\leq$2 or $\leq$4 if Emirati. English on 2 or 3. Gulf Arabic on 6.
United Kingdom	Roll 1D6 for ancestry. 1-5 English, 6: Other. Roll 1D6. 1: Polish (1-3) or other European (4-6), 2: Scottish (1-3), Irish (4-5) or Welsh (6), 3: Indian, 4: Pakistani or Bangladeshi, 5: African or Caribbean, 6: Chinese or other Asian.	English $\leq$5, Ancestral language $\geq$5. English as a second language on a second roll of 1-4 if not first language.
United States	Roll 2D6 for ancestry. 2: French, 3: Polish, 4: Filipino (1), Asian American (2-3) or Hispanic American (4-6), 5: Mexican, 6: African American, 7: German, 8: Irish, 9: English, 10: Italian, 11: Scottish (1-3) or Scotch-Irish (4-6), 12:American Indian or Alaskan Native	If ancestry Hispanic American or Mexican: English $\leq$5, Spanish $\geq$2. Otherwise English, Spanish $\leq$1, If not African American: Ancestral language $\geq$6.
Uzbekistan (USSRA)	Roll 2D6. 2-3: Russian, 4-8: Uzbek, 9: Roll 2D6. Kazakhs (2-6), Tatars (7), Karakalpaks (8), Crimean Tatars (9), Koreans (10), Kyrgyz (11), Other Eastern European (12), 10-12: Tajik (speaks Persian).	Ethnic language. Russian $\leq$2.
Venezuela	Roll 2D6. 2-6: European or Middle Eastern ancestry, 7-10: Mestizo, 11: Roll 1D6. Black/African ancestry (1-4), Asian ancestry (5-6), 12: Amerindian.	Spanish. English $\leq$2. Italian = 6. Ethnic language if Portugese, Arabic, Asian or Amerindian ancestry. If Amerindian, roll 2D6 for ethnic language. 2-7: Wayúu, 8: Roll 1D6. Yanomamö (1-3), Piaroa (4-5) or Sanemá (6), 10: Pemón, 11: Warao, 12: Jivi.
Vietnam (VAST-STI)	Roll 2D6. 2-9 or 12: Kinh (speaks Vietnamese), 10: Roll 1D6. Tay (1), Thai (2), Muong (3), Khmer (4), Mong (5), Nung (6). 11: Other.	Ethnic language. Vietnamese $\leq$5.

Chapter 6

Crew

The crew are the personnel on board a crewed High Frontier mission and will the be the core of your Sixty Years In RPG campaign. Where Sixty Years In RPG differs from many role-playing games is that the crew should begin the game as extremely competent, often "best-of-the-best", and that as you play through the game your crew may end up being worse in some ways rather than better: the development curve does not necessarily go up in a linear progression. You should prepare yourself for some of the challenges that the game may throw at the crew by re-reading the preface on page 4 including the Important Note on Difficult topics, Lines and Veils, Dollhouse Play and sign the High Frontier Pledge if you have not done so already.
This game is designed for four players, each of whom controls one crew member who will occupy one crew position: either Pilot/Commander, Mission Specialist or one of two Payload Specialists. Rather than roll to create a crew member, each crew member chooses a crew archetype corresponding to their crew position. Each of these archetypes has 4 abilities: Physical, Mental, Social and Capital and a set of skills picked to fulfill a specific crew position on the mission. You should also roll for the service history for the archetype you have chosen to flesh out their background.
If there are less than 4 players, the remaining crew positions will be filled by robots. If there are more than 4 players, additional players represent a second shift of crew with responsibilities split between them.
Because missions last multiple years, you also optionally should determine *sleeping arrangements* which will exist at the start (for Purple BSUs) or form throughout the mission for other BSUs. Finally you should determine the starting *philosophy* and *outlooks* of each crew member and choose or roll for their *appearance*.

Crew Positions

Present day astronaut duties are divided into three broad areas: pilot/commander, mission specialists and payload specialists. Your 4 person crew in High Frontier normally consists of 4 crew positions: a pilot, a mission specialist and two payload specialists. These positions determine what careers the crew member will have followed and what skills they are likely to have. If there are more than 4 players or crew, you should choose to either add nonhuman crew members, using one of the nonhuman archetypes, or additional crew positions, as follows:

Five crew Add a commander crew position. The commander crew position is created using the Pilot career.

Six crew Also add a second mission specific payload specialist position, the payload commander. The payload commander crew position is created using the Payload specialist career for the mission type. The payload commander is responsible for the correct delivery of the payload to the site.

Seven crew Also add a second mission specialist crew position, the flight engineer. The flight engineer is created using the Mission Specialist career.

Eight crew Also add a third mission specialist position, the mission officer: where the word mission is replaced by the mission type (ie Colony Officer, Science Officer, Military Officer, Commercial Officer or Political Officer, for political missions). The mission officer is created using the mission specialist career.

Non-crew positions If there are more players than crew, the additional players may choose to be either robots on the mission manifest or people in mission control (Mission controllers). Some of the time no players will control crew and everyone will have non-crew positions.

Pilot

In the High Frontier era, the piloting component of the Pilot role is largely an executive role. The pilot is responsible for the spacecraft movement, but in reality is relegated to supervision of automated systems

executing software code developed and shipped by Earth-based programmers. The exception is during hazard avoidance maneuvers where the cost of developing code to avoid the hazard is deemed too high: this can include aerobraking and factory assisted lift offs and landings.
As a result, the Pilot role has a number of secondary specialisations which are much greater priority than the piloting function: almost all of which are responsible for maintaining the integrity and function of the crew.

Archetypes As a pilot or commander, you should choose either the Comeback Astronaut or Test Pilot archetypes.

Mission Specialist

The mission specialist is responsible for the correct function of the spacecraft. Like the Pilot/Commander, the Mission Specialist is largely concerned with the operation of the software required to maintain spacecraft functions, rather than the hardware itself, although in the event of the spacecraft suffering from a glitch, responsibility falls to the mission specialist to resolve whichever hardware or software system is affected. The Mission Specialist skill set also means they are responsible for ET production operations. Automated 3D printing can perform almost all of the ET production function, except that wiring cannot be 3D printed. The Mission Specialist will coordinate and control the teleoperations wiring ET produced goods.

Archetypes As a mission specialist, you should choose either the Full Stack Programmer or Robotics Specialist archetype.

Payload Specialists

In the High Frontier era, payloads consist of robonauts for in-situ resource utilization (ISRU) - mining site regoliths for water and isotope fuels and prospecting for high value ore deposits; refineries - used to construct advanced technologies using by refining these in-situ resources; and colonists - who can also prospect, form colonies without disbanding the crew and have special abilities and equipment unavailable to High Frontier crews. Robonauts are also used for military payloads - as every robonaut can be repurposed with combat capabilities, and for commercial ventures - which will also return E.T. products or refined water or isotope fuel to low Earth orbit or a Bernal for sale.
Payload specialists are responsible for payload operations. This will be site refueling using missile, raygun or buggy components for the engineering Payload specialist, and prospecting using the same components for the science Payload specialist when the spacecraft is equipped with an ISRU platform payload (either a robonaut or the built-in crew module ISRU platform). For a refinery payload, the engineering payload specialist will be responsible for industrializing the site using the on site robonaut and refinery.

Payload Speciality The responsibilities of the payload specialists depend on the mission payload. The first payload specialist is a Payload Specialist (Engineer) and the second payload specialist is a mission dependent payload specialist.

Archetypes As a payload specialist, you should choose an archetype based on the type of payload specialist you are. Engineering payload specialists should choose either the Deep Sea Miner or Political Appointee archetypes. Colony payload specialists should choose either the Experimental Ecologist or Marine Biologist archetypes. Commercial payload specialists should choose either the Security Troubleshooter or Wealthy Founder archetypes. Military payload specialists should choose either the Drone Operator or Navy Diver archetype. Scientific payload specialists should choose either the Science Influencer or Space Agency Scientist archetype.

Crew Archetypes

Choose one of the two archetypes for your crew position. If you need to select an archetype randomly, such as for an encounter, roll 1D6+3 if the encountered crew BSU is Red, 2D6+1 if White, +3 if Green, +5 if Purple, +7 if Orange. Note that this makes encountered crew less balanced than your starting crew.

Crew Position	or Roll	Archetype	Mandatory Skills
Pilot / Commander	-4	Comeback Astronaut	Pilot 5+
	5	Test Pilot	
Payload Specialist (Military)	6	Drone Operator	Combat Ops 5+ or Medical 5+
	7	Navy Diver	
Payload Specialist (Engineer)	8	Political Appointee	Industry 5+
	9	Deep Sea Miner	
Payload Specialist (Colony)	10	Marine Biologist	Ecology 5+
	11	Experimental Ecologist	
Payload Specialist (Scientific)	12	Space Agency Scientist	Prospect 5+
	13	Science Influencer	
Mission Specialist	14	Full Stack Programmer	Teleops 5+
	15	Robotics Specialist	
Payload Specialist (Commercial)	16	Security Troubleshooter	Negotiate 5+
	17+	Wealthy Founder	

Responsibility versus Role

While the role descriptions describe what the specific crew member role is responsible for, this means that the particular crew member is in charge and ultimately accountable for the specific operation; they are not the sole person performing the operation. In flight in deep space, while the Mission Specialist is responsible that the spacecraft is operating correctly, the remaining 3 crew members are performing reactor duty cycle maintenance, generator self-tests, microcode firmware updates and so on under the direction of the Mission Specialist. During an ET production operation, all the crew will be tele-operating remote robonauts performing wiring pulls through 3D printed ducting. And so on.
The additional crew working on an operation can contribute their skill levels to the task being performed by the responsible crew member - see the Cooperative Skill Use section in the Skills chapter on page 133 for details.

Late Arrivals

While having a player drop into a game after it has started is never easy, it is somewhat harder to explain when you are millions of kilometers from the nearest other human being.
In this instance, it is recommended you have the new player adopt the Security Troubleshooter archetype and arrive via a supply ship having used era appropriate hibernation techniques (usually hydrogen sulfide). There are very few things that will have an organization spend tens of millions of dollars unprompted, but insurance requirements are one of those things.
If you do this, the Security Troubleshooter gets any additional service history entries that will encourage the crew to form bonds with them as soon as practical.

Crew Archetypes

There are two archetype choices available for each crew position, summarized on the Crew Archetypes table on the preceding page. Unlike many role playing games, in High Frontier, your Crew is primarily selected for their technical competence and compatible and stable psychological profiles. If you are playing a 30 point crew, you should play your crew as if they are extremely effective at what they do, but who are pushed due to the nature of their mission to the outer limits of psychological stress and environmental deprivation that any human has ever experienced. 20 point crews are still highly effective and professional, whereas 15 point crews are more typical examples of role-playing groups although at the cohesive and competent end of the spectrum (Anti-social and incompetent crews are weeded out due to high numbers of simulator deaths).

Archetype Crew Quality The archetype ability levels are given for a high quality crew. If you belong to a medium quality crew you should choose one ability to reduce by 1 point. If you belong to a low quality crew you should choose two abilities, each of which is reduced by 1 point.
Alternately, you can generate your abilities using the Generating Abilities rules below.

Archetype Skill Points The archetype ability levels are given for a 30 point crew. A 15 point crew member gets the primary skills listed, but at 1 level lower than the listed levels. A 20 point crew gets the primary skills at the listed level. A 30 point crew gets the primary skills at the listed level, along with the secondary skills at the listed level. Note that the skill points for each archetype does not necessarily add up to the given point limit.
Alternately you can buy crew skills using the Buying Skills rules below.

Service History Roll 1D6 twice, once in front of all the other players and once privately, for the crew member's service history based on their archetype. The service history may modify your crew member in a number of different ways. You can choose to adopt additional items from your service history throughout play if desired, unless this would have prevented you being recruited by your MCSU. If both archetypes fail to fill a position, the position will be filled by either the Comeback Astronaut, Political Appointee or Security Troubleshooter (in that order).

Generating Abilities You can roll for crew abilities if you want to. Print out a copy of the appropriate high, medium or low quality character sheets on pages 170–116. Roll the number of dice listed on the character sheet for each ability. Choose the second highest dice rolled for the ability level. If the ability level rolled is below the minimum ability listed next to Conditioning, then you must spend skill points to condition the ability level up to the minimum listed.

Buying Skills You can choose to spend skill points where you want to instead of the archetype assigning them. The crew point value gives the number of points to spend on skills if the crew member is age 30 or younger. If they are older than 30, 30 point crew get skill points to spend equal to their age; 20 point crew get skill points to spend equal to their age minus 10; and 15 point crew get skill points to spend equal to their age minus 15. Crew must at least have the minimum skills listed for your position.

Buying Conditioning, Medical Specialities, Languages and Contacts If you choose to use the archetype's skills (and not buy crew skills), each crew member gets an additional 6 skill points to spend on your choice of skills, conditioning, medical specialities, languages and contacts. One of the crew must buy an Industry mission control contact to help ensure your first factory construction is successful. If the first mission is not on a science mission, one of the crew should also buy a Prospect mission control contact to assist with prospecting for your factory site. See the Contacts section on page 123 in the Skills chapter for details.

Comeback Astronaut

You trained as an astronaut and served as a crew member on the International Space Station (ISS) for several years. For a while you were the face of the international effort to stay in space, and then worked as a part of the first wave of renewed space exploration used the ISS as a launch pad to other worlds. When the mission control proposed a new mission with a destination beyond Low Earth Orbit, you used your considerable contacts and influence in space programs around the world to get onto the list of consultants initially employed by the mission control, and then onto the list of crew candidates once the program was ready for launch. As one of the few or only member of the crew to have travelled in space beyond suborbital flights, your experience and previous accomplishments outweigh the risks of sending an aging astronaut into a multi-year mission in space. Or so you have argued.

Abilities and Skills

Age	40 + 2D6
Physical	4
Mental	5
Social	5
Capital	4
Primary Skills	EVA (5), Activism (5), Recruit (6)
Secondary Skills	Pilot (4), Negotiate (4), Antitrust (4), Engineer (4)

Roll	Service History
1	Dentures
2	Glorious turncoat
3	Overview effect
4	Radiation exposure
5	Relaxed hygiene
6	Space blindness risk

Service History

Dentures You have replaced all your teeth with dentures. This means during a dental emergency you have merely broken your dentures instead of suffering from any pain or medical effects. You can readily 3D print a new set.

Glorious turncoat You served in a first wave crew that successfully reached Mars' surface or the Venus aerostat and returned to a ticker tape parade on Earth. Your support for a new mission control means there is no love lost between you and your former colleagues. Get 1 Glory and add one defect to the first wave faction of your choice. Glory increases the number of bumps you get each hour. Whichever glory you achieved no longer gives glory for subsequent crews.

Overview effect You suffer from the feeling of all mankind being united as one species on a fragile planet hanging in the darkness. The overview effect has been reported by a number of astronauts who have travelled to Low Earth Orbit or beyond. If joining a white MCSU, you fail the psychological testing and are replaced by the Test Pilot.

Radiation exposure Due to cosmic ray exposure or handling of radioactive materials, you are at the upper limits of recommended life time exposure risks to radiation. This manifests as a cancer risk.

Relaxed hygiene The International Space Station used to get a little…"funky" and it never hurt anyone. Your personal grooming and toileting habits aren't up to your fellow crew members' standards and it may become a source of irritation. Maybe you'll just decide to grow a beard.

Space blindness risk If male, you are in the half of all astronauts who suffer from deteriorating eyesight due to living in space. During your previous missions you were able to conceal this successfully, but this longer trip will mean you risk suffering the full effects.

Deep Sea Miner

You first started working on underwater oil drilling operations, piloting underwater autonomous vehicles used to monitor and maintain the drilling platform. From there you were recruited into early efforts to map the mineral distributions in Clarion-Clipperton Fracture Zone, where you could leverage your mining engineer degree and post-graduate studies to help build a statistical model to determine the most profitable mine sites. You were the project lead on the build of the first commercial continuous-line bucket system in a hydrothermal vent region before it was shut down. Your unique mix of practical and theoretical expertise on mineral extraction in hostile environments led to your involvement in remote management of one of the first wave space-based mining operations. This led to your recruitment by the current mission control, where you successfully argued that lowering the latency of mining operations by enabling the crew to direct control the mining process would significantly improve efficiency and reduce accident rates. Unfortunately you argued this too well and the mission control gave you an offer to be on the crew that you would have been foolish to refuse.

Abilities and Skills

Age	30+1D6
Physical	5
Mental	5
Social	4
Capital	4
Primary Skills	Teleops (5), Industry (5), Mining (5), Prospect (5)
Secondary Skills	Ecology (4), Engineer (4), Pilot (4), EVA (4)

Roll	Service History
1	Blemished safety record
2	Discharged bankrupt
3	Ecological vandal
4	First wave loyalty
5	Polymetallic nodule
6	Shoulder replacement surgery

Service History

Blemished safety record A serious accident resulted in the lose of a life as a part of the disaster that ended the hydrothermal vent region venture. The subsequent investigation absolved you of direct responsibility, but there is significant professional disagreement in your field as to whether this was a whitewash. Whenever you interact with another engineer, your blemished safety record acts as a safe favour penalty (does not contribute towards additional defects).

Discharged bankrupt You invested considerable personal capital into the hydrothermal vent region venture, which when it failed forced you to declare bankruptcy. However, subsequent work allowed you to discharge these obligations and rebuild some of your savings. Whenever your attempt to get credit for a purchase or incur further debt, discharged bankruptcy acts as a safe penalty (does not contribute towards additional defects). If joining a white MCSU, you fail the background checks and are replaced by the Political Appointee.

Ecological vandal Deep sea mining operations that you have been involved in have resulted in significant and lasting ecological damage to the marine environment which has worsened over time. Gain 1 Notoriety. If there is a marine biologist on the crew, they will not let you forget this fact.

First wave loyalty Your first mission control contact is with the first wave faction of your choice, not your current mission control. This will complicate your relationship with them.

Polymetallic nodule You carry a manganese nodule as an offering. It appears to be a dark grey, bumpy golf ball and would have started forming about 2 million years ago.

Shoulder replacement surgery You have received a reverse shoulder replacement due to severe rotator cuff damage from a serious diving injury. This increases the risk of you accidentally dislocating your shoulder in some positions which are safe for someone without this prosthetic. Shoulder replacement surgery acts as a safe arm injury penalty (does not contribute towards additional defects).

Deep Sea Mining While deep sea oil drilling has been feasible for some time, extraction of resources from hydrothermal vents or mineral nodules on the sea floor had yet to be commercially viable by 2015. For commercial space-based resource extraction to be considered within the next 25 years, deep sea mining would have to continue to fail to do so. This might be due to robust protection of undersea ecologies around the hydrothermal vents and benthic zones, because easily accessible minerals become quickly exhausted and further resources largely illusory, or because growing demand exceeded supply due to complexities and costs of ramping up undersea mining operations.

Drone Operator

After graduating in your national air force, you started out flying high altitude, long endurance surveillance vehicles over metropolitan areas in your home nation. You quickly graduated to piloting unmanned combat air systems in failed states such as Syria and Afghanistan, where you murdered enemy combatants using stand-off weapon systems they never knew were aimed at them. As these conflicts escalated you became an ace pilot many times over, although your confirmed air-to-air kills were almost always uncrewed autonomous or semi-autonomous drones deployed by the other side. Your reflexes began to slow and you retired out when you hit your 23s (23 years and 23 days) and, instead of taking up a teaching post or desk job, you joined an newly created teleoperator program responsible for doing wire pulls through 3D printed experimental military vehicles and emplacements. The defense contractor responsible for running this program has seconded you to the mission control crew to build even more complex systems in space.

Abilities and Skills

Age	24+1D6
Physical	5
Mental	6
Social	4
Capital	4
Primary Skills	Teleops (5), Pilot (5), Combat Ops (5)
Secondary Skills	Firearms (4), Trading Desk (4), Devops (4)

Roll	Service History
1	Battlefield souvenir
2	Depression
3	Former gamer
4	Heterodox beliefs
5	Limited social circle
6	PTSD

Service History

Battlefield souvenir Special forces on the ground have given you a battlefield souvenir from one of you successful strikes. Is there a specific story to this or was it just another kill?

Depression UAV combat pilots experience mental health issues such as depression, anxiety and PTSD at the same rate as pilots of crewed aircraft. You begin the game with a mental illness. If joining a white MCSU, you fail the psychological testing and are replaced by the Navy Diver.

Former gamer You previously identified as a gamer and may have played online professionally. You left the online communities you were a part of because of their poor treatment of someone you had become friends with.

Heterodox beliefs You have a set of unconventional beliefs, either outside the conventional teachings of your religion or as a result of self-guided study in your spare time. You can choose the time and a place to share these beliefs.

Limited social circle All your mission contacts must be Military.

PTSD You begin the game with a suppressed stress penalty (suppressed penalties only takes effect if another penalty applies). If joining a white MCSU, you fail the psychological testing and are replaced by the Navy Diver.

Experimental Ecologist

After graduating, you were recruited by the Biosphere 3 program for your work improving carbon dioxide regulation using genetically modified plant species. Shortly after starting you joined the biospherian crew as a doctor when a previous crew member was forced to drop out due to a medical emergency. During your time there, the crew successfully achieved both food production and atmosphere recycling independence over a three year period on Earth. You also took this opportunity to experiment with enhancing ecological feedback loops using CRISPR-based modification of plant and animal species to increase diversity using cultivars from a small number of base species. Using these techniques, ecologies could be made to respond to significant changes to atmosphere or soil fertility in time spans as short as days. A significant part of your subsequent work has been in getting legislative and political support for these innovative techniques. You have joined the crew because you see a place for the same techniques being applied successfully in space.

Biosphere III is a multi-year experiment to run an ecosystem in an environment sealed from the outside world, as a successor to Biosphere 2. The story of Biosphere 2 is remarkable and worth reading about.

Abilities and Skills

Age	30+1D6
Physical	4
Mental	5
Social	5
Capital	4
Primary Skills	Ecology (6), Medical (5), Antitrust (5)
Secondary Skills	Interview (4), Research (4), Devops (4)

Roll	Service History
1	Blood poisoning
2	Ethics complaints
3	Flavoured roach box
4	Political enemies
5	Veterinarian degree
6	Zero-g houseplant

Service History

Blood poisoning You had to leave Biosphere III as a result of blood poisoning from an experimental plant or fungal cultivar that you accidentally exposed yourself to while you were developing it. No one else was hurt but the resulting sepsis damaged your heart, causing you to have a Cardiac risk. There is absolutely no physical evidence that the toxin penetrated the blood brain barrier, permanently modifying your personality. If joining a white MCSU, you fail the physical and are replaced by the Marine Biologist.

Ethics complaints You have been cited a number of times for overstepping the mandate given by scientific ethics and oversight committees. These citations are only a result of the field you work in moving so rapidly and academic red tape not keeping up. Whenever you interact with another medic, your ethics complaints acts as a safe favour penalty (does not contribute towards additional defects).

Flavoured roach box A "roach box" is a cockroach farm in the crew module intended to act as a replenishing food supply using recycled waste to feed the roaches. Cockroaches are a clean and scent-free insect to farm compared to crickets and you have genetically modified these roaches to come in a variety of different sweet, sour and umami flavours.

Political enemies You have made a number of political enemies of people who would normally be on your side, because of your belief in the importance of your work. You begin the game with a suppressed penalty to your Antitrust skills (suppressed penalties only takes effect if another penalty applies).

Veterinarian degree While you have treated human patients while in Biosphere 3, your actual medical qualifications are for animals only. You may not begin with any medical specialities.

Zero-g houseplant A NASA study suggests peace lilies were the most effective plant at maintaining indoor air quality. You have modified this peace lily so that its roots need only a nutrient spray instead of soil, and it should grow happily in microgravity.

Full Stack Programmer

You built your first start up at 14 which paid for you to get part way through university before you dropped out and started your next. Market conditions and timing meant you weren't as successful with the second although your ideas were sound, and you left the company before the other founders recognised the problems inherent in the business model. And then you got a phone call from one of your colleagues from the space camp you'd help won as a kid, seeing if you wanted a job as a system administrator on working on spacecraft software. Software with both a power and complexity that has spiralled out of control so that the crew spends more of their time applying software updates than they do performing their intended job functions. Having a system administrator on the crew itself seems like an increasingly good idea.

Abilities and Skills

Age	24+1D6
Physical	5
Mental	5
Social	5
Capital	5
Primary Skills	Devops (6), Trading Desk (5)
Secondary Skills	Industry (4), Antitrust (4), Bypass (4)

Roll	Service History
1	Beta code
2	Exit strategy
3	Juvenile record
4	Martial interests
5	Musician
6	Petrol head

Service History

Beta code You're launching a spacecraft with tens of millions of lines of code attempting to duplicate what a first wave crew did with far more preparation and labour. While most of the intellectual property comes from proven third parties, the integration work is something you've had to develop far too quickly. Add a defect to the crew module.

Exit strategy Your premature departure from your second start-up left a lot of investors high and dry. Some of them seem to blame you personally: you've received credible death threats and at least one of them has been imprisoned for violating a restraining order that you've taken out against them. In your absence, these dissatisfied investors take to rumour mongering and smearing your name. The first time you return to Earth, add 1 Notoriety as a result of these actions.

Juvenile record You were good at everything you tried as a kid. Unfortunately some of the things you tried weren't so good. Your parents were able to afford good enough lawyers that you weren't tried as an adult but anyone who knew you from back then also knew what you were responsible for. This acts as a suppressed penalty that affects your emergency contact (suppressed penalties only takes effect if another penalty applies). If joining a white MCSU, you fail the background check and are replaced by the Robotics Specialist.

Martial interests You are an avid martial artist or gun collector. Spend 3 of your skill points (or 2 if on a Low quality crew) on your choice of Strong Arm or Firearms skill.

Musician You are an enthusiastic musician. Spend 3 of your skill points on Performance skill (or 2 if on a Low quality crew).

Petrol head You collect and refurbish classic cars or motorbikes. Spend 3 of your skill points on Engineer skill (or 2 if on a Low quality crew).

Marine Biologist

You were a nationally competitive swimmer or diver in high school and this led to your interest and study of marine biology at university. After graduating, despite your high grades, you were unable to find work in the field due to lack of funding for the study of collapsing marine ecosystems, in part to conceal how serious the issue has become. Instead you were forced to work two jobs, as a nurse and a computer programmer, to maintain an income while remaining an activist and organizer in what little spare time you had. It was here you met the founder of a robotics start up, who recruited you to initially work in and then to run an innovative drone program for undersea mining and research. The same hardware and software you've helped develop also runs the cubesat fleets and drones used by mission control, and no one can fly them like you do. **No additional skill points:** The Marine Biologist archetype does not receive additional skill points to spend beyond what is listed.

Abilities and Skills

Age	30+1D6
Physical	5
Mental	5
Social	5
Capital	3
Primary Skills	EVA (5), Ecology (5), Teleops (6)
Secondary Skills	Activism (4), Medical (4), Devops (4), Pilot (4)

Roll	Service History
1	Card tricks
2	Prior record
3	Recovering addict
4	Security clearance caveat
5	Virtual trophy room
6	Work history

Service History

Card tricks You needed something to keep your hands busy after you gave up smoking. So you picked up card tricks. Everyone in the crew knows how good you are.

Prior record You're not proud of it now, but you were involved in an activist group that got a little too radical in trying to stop the destruction of a reef system. You've been arrested for breaking and entering but more serious charges were dropped and your sentence was commuted, for reasons you're not willing to explain. This acts as a suppressed penalty that affects your interactions with anyone else with a criminal record (suppressed penalties only takes effect if another penalty applies). If joining a white MCSU, you fail the background check and are replaced by the Experimental Ecologist.

Recovering addict You've been clean almost a decade from an addiction to the stimulants you were taking while working two jobs. It makes you uncomfortable around other people when they use drugs or alcohol, a rare occasion in space except on special occasions. This acts as a safe social addiction/dysphoria penalty (does not contribute towards additional defects).

Security clearance caveat As a part of getting your security clearances for your crew position you have been warned to stop associating with a group you were friends with at school, who now have multiple criminal convictions ranging from disorderly conduct and resisting arrest to possession, supply and making of explosives. You have not seen these people since you were an adult however your emergency contact has kept in touch with them. Whenever you use your emergency contact, your security clearance caveat acts as a safe favour penalty (does not contribute towards additional defects).

Virtual trophy room You've won enough trophies when you were young that no single one is special enough to bring on board with you. So instead you've built your bedroom in virtual reality, with replicas of all of your awards inside it.

Work history You've been in the business long enough that you've worked with one of the other crew already and you've formed a definitive opinion about them, while they've just been impressed with your professionalism.

Navy Diver

You were a keen amateur body builder as a young adult and while you excelled academically, your grades were not good enough to qualify for a scholarship. Instead you enrolled in the national navy where you qualified to be a military diver, responsible for explosive ordnance placement and disposal, battlefield maritime repairs and amphibious reconnaissance. The navy paid for your medical degree and you were highly decorated in a number of covert operations in and adjacent to the South China Sea. After leaving the special forces, you moved from your initial speciality of undersea and hyperbaric medicine to begin working with a first wave faction on space medicine and microgravity surgical techniques. As a result of an incident on the International Space Station where you were stationed during a training exercise, you are one of the only doctors to have practical experience with operating in free fall. Your current mission control recruited your shortly afterwards.

Abilities and Skills

Age	30+1D6
Physical	6
Mental	5
Social	4
Capital	4
Primary Skills	EVA (5), Firearms (5), Bypass (5), Medical (6)
Secondary Skills	Engineer (5), Strong Arm (5)

Roll	Service History
1	Bomb fragments
2	Covert ops confidentiality
3	Fan correspondence
4	Human spaceflight skeptic
5	Prosthetic limb
6	Young parent

Service History

Bomb fragments You have small bomb fragments in your lower limbs and feet left by an explosion during ordnance disposal. Any fragments that were in danger of damaging joints have already been removed and microgravity completely relieves the pain that you suffered putting weight onto your feet. These bomb fragments act as a leg injury suppressed penalty (suppressed penalties only takes effect if another penalty applies). You have no memory of this injury and do not suffer post-traumatic stress disorder as a result. If joining a white MCSU, you fail the physical and are replaced by the Drone Operator.

Covert ops confidentiality You take the requirements of confidentiality about the covert operations you were involved in seriously and deflect any attempts to find out about where you were, who you were with or what you did during the years you operated in and around the South China Sea.

Fan correspondence You have a well worn and treasured letter from a famous body builder that you wrote to as a young person. For some reason, you've kept it in the original envelope rather than framing it.

Human spaceflight skeptic You have privately expressed extreme skepticism at the need for human space flight, based on your experience with microgravity medicine, and have confidentially written to your superiors requesting this mission be abandoned.

Prosthetic limb You have lost a hand as a result of an explosion during ordnance disposal: the detonator exploded after you had removed it from a much larger anti-ship mine. Following this, you were discharged from the navy with a medical retirement. The prosthetic is as functional as your original hand although it lacks the sensitivity needed for sophisticated surgical techniques. Your prosthetic limb acts as a safe arm injury penalty (does not contribute towards additional defects). You have no memory of this injury and do not suffer post-traumatic stress disorder as a result. If joining a white MCSU, you fail the physical and are replaced by the Drone Operator.

Young parent You had a child at 18 because of poor access to contraception and abortion options. Your parents adopted the child as their own and raised them as if they were your sibling. Add one additional sibling, 18 years younger than you.

Political Appointee

You joined the national army, graduating from officer training and rose in the ranks inside either the engineering or logistics part of the military, due to your professionalism and sound judge of the character of those around you, above you and under your command. This led to your appointment to the newly formed national missile defence forces which included a rocketry program, which you oversaw. The current mission control contracted the national missile defence for a number of flights responsible for the spacecraft component launch and assembly and you took advantage of this special relationship and the contacts you had cultivated in the military to push for you to be included in the crew.

Military rank The Political Appointee has a military rank of Major (or equivalent), which is recognised as a crew rank of 8 if the Mission control MCSU is Red.

Abilities and Skills

Age	35+1D6
Physical	5
Mental	4
Social	5
Capital	5
Primary Skills	Antitrust (5), Negotiate (5), Industry (5)
Secondary Skills	Recruit (4), Combat Ops (4), Engineer (4), Firearms (4)

Roll	Service History
1	Futurist mentor
2	Higher vision
3	Partnership
4	Reporting lies
5	Space enthusiast
6	Unstoppable

Service History

Futurist mentor One of your contacts is a mentor who will remain after you go AWOL. Roll 1D6 anytime you perform a bump. On a 1 they recommend you bump a dice down, on 6 they recommend you bump a dice up. You will follow their recommendation unless it is unsafe to do so.

Higher vision You belong to a semi-secretive society called Higher Vision which has its goals of getting humanity into space. Treat this as having 1 Glory until the source of Higher Visions funding is revealed to be a randomly chosen major faction.

Partnership You are married or in a domestic partnership and your partner or partners understand and support your decision to travel to space. Add them as a mission control contact with Activism 5 who will not leave if you go AWOL. If you are fertile and are unsure if you wish to have children, you can choose to have left behind frozen eggs or sperm to do so at a future date.

Reporting lies As a military appointment, you will have separate reporting lines to the rest of the crew, but you are also responsible for reporting to mission control. If these come into conflict, you must decide which side you continue to tell the truth to and when you will lie either directly or by omission.

Space enthusiast You are an amateur enthusiast about the current and former space programs and the potential for humanity to reach and colonize other planets around our own star as well as others. You have studied the history of the early space race as well as details on the first wave factions and their achievements. Add 1 to any skill level needed to understand the current social or political situation in space until the first time the Space Politics becomes War or Anarchy.

Unstoppable You will do whatever it takes for this mission to succeed. But at some point you will realise that your loyalty to the crew you serve with is more important than your loyalty to mission control or anyone else.

Robotics Specialist

As a child you were fascinated with bodies, especially you own, and how they could be shaped and changed to be more "perfect". You became a talented designer in your teenage years, using 3D printing, robotics and electronics to make innovative art, fashion and tools (you sometimes argue there is no difference). You began working directly with a number of technology companies to build better 3D printers and robots. You were initially funded by sponsorship and crowd sourcing and then as a start up where venture capitalists effectively paid for you as the brand and the product. Your involvement in the mission control program initially came from a solar-powered concept Canadarm3 that you developed which spun new International Space Station modules from lunar regolith supplied by proposed mass drivers on the moon. You have extensively redesigned the load-haul-dump and ship's drones included in the crew module and successfully argued for the inclusion of 3D printer workstations for in-flight repairs.

Abilities and Skills

Age	30+1D6
Physical	4
Mental	5
Social	5
Capital	4
Primary Skills	Teleops (5), Research (5), Engineer (5), Industry (5)
Secondary Skills	Bypass (4), Suffrage (4), Devops (4)

Roll	Service History
1	Assistive technology
2	Drunk
3	Pet robot
4	Plastic surgery
5	Sex toy
6	Synthesized voice

Service History

Assistive technology You're blind (1-2). Or deaf (3-4). Or both (5-6). You don't include it as a part of your brand, and it's covered by a non-disclosure agreement that you get everyone to sign before they meet you in person. Your blindness or deafness act as safe penalties (they do not contribute towards additional defects). You have implants that overcome some of the limitations of your blindness or deafness and you've designed a lot of robots that help in many situations. If you're blind you can read braille; if you're deaf, you know sign language (either tactile or visual field signing, depending on your visual perception). If joining a white MCSU, you fail the physical, lose in court and are replaced by the Full Stack Programmer.

Drunk Alcohol is straightforward to distill on spacecraft using available equipment and supplies, which is unfortunate because you're an alcoholic. This is a secret defect that applies one fatigue penalty when it occurs until you have two full night's sleep. You can recover from being an alcoholic in a shirt sleeves environment, when you get to one.

Pet robot You've had to leave your living pet or pets behind on Earth, but there's nothing stopping you from making a robotic equivalent for comfort and entertainment. If you need assistive technology, this also acts as a service animal for you.

Plastic surgery You've had extensive plastic surgery in a non-naturalistic style. This occasionally causes confusion or offence, although anyone who gets to know you quickly gets used to your appearance. If joining a white MCSU, you fail the physical, lose in court and are replaced by the Full Stack Programmer.

Sex toy It's discrete, gender flexible, designed and marketed by you, and each of the rest of the crew got one in a pre-launch care package you put together (unless they had mentioned they were ace). You deliberately haven't checked the wi-fi to see who brought theirs on board.

Synthesized voice The voice you speak with is a synthesized voice, not your real voice. It emerges from an implant in your mouth to avoid confusing people, but you use non-vocal communication to generate it. You can speak even if you don't have air to breath and your ability to speak is not affected by damage to your chest hit location. You made the decision at a very early age to use this voice and you've been refining it ever since. If joining a white MCSU, you fail the physical, lose in court and are replaced by the Full Stack Programmer.

Science Influencer

After graduating with your PhD, you began working at a research laboratory run by one of the first wave factions, where you were quickly promoted to head of department because of your results driven focus and your excellent communication skills. Because of both your research and the size of your streaming audience, boosted by renewed interest in space exploration, you were recruited by your current mission control to act first as the ambassador to the crewed space flight program and then as the public face of the final crew selection.

Abilities and Skills

Age	24+1D6
Physical	4
Mental	5
Social	5
Capital	5
Primary Skills	Research (5), Antitrust (6)
Secondary Skills	Interview (4), Devops (4), Bypass (4)

Roll	Service History
1	Athlete
2	Chronic fatigue syndrome
3	Criminal conviction
4	Grow box
5	Ordained
6	Rally driver

Service History

Athlete You studied on a sports scholarship and had a successful amateur sports career while at university. Spend 3 of your skill points on Strong Arm (or 2 if on a Low quality crew).

Chronic fatigue syndrome You have chronic fatigue syndrome which you manage using a combination of pacing your physical and mental exertion levels and use of pain killers including THC to ease your chronic pain. This acts as a suppressed penalty that affects your physical and mental actions, but not your ability to assist others (suppressed penalties only takes effect if another penalty applies). Roll 1-2 on 1D6 at the start of each new technology level for chronic fatigue syndrome to become treatable to allow you to recover from it. If joining a white MCSU, you fail the physical and are replaced by the Space Agency Scientist.

Criminal conviction You have a criminal conviction and have served a short custodial sentence, for either assault, possession with intent to sell or driving under the influence of drugs or alcohol. Your criminal conviction acts as a safe favour penalty (does not contribute towards additional defects). If joining a white MCSU, you fail the background check and are replaced by the Space Agency Scientist if the charge was drug-related. This is the case if you also rolled the Grow box service history.

Grow box A "grow box" is part of the crew's crop system dedicated to growing plants with pharmaceutical properties, primarily cannabis. This is prepared and consumed, rather than smoked, typically as bhang: either as a paste in foods or cannabis-infused drinks. Spend 3 of your skill points on Ecology (or 2 if on a Low quality crew). If joining a white MCSU, you do not attempt to bring a grow box on board.

Ordained You are ordained, which means you are authorized by the clergy to perform the rites and ceremonies of your religion. In religions without a formal clergy, such as Islam, you are instead recognised as a scholar or especially devote practitioner. Spend 3 of your skill points on Suffrage (or 2 if on a Low quality crew).

Rally driver You were a co-driver with a more successful sibling or your emergency contact in one of the few remaining amateur-friendly rally tour circuits. Spend 3 of your skill points on Engineer (or 2 if on a Low quality crew).

Security Troubleshooter

You joined the national armed services after leaving school where you become a military interrogator. Although highly commended, you were eventually discharged because you refused to comply with illegal orders to use enhanced techniques. You then worked in the intelligence unit of the national police where you led efforts to combat terrorist ethnonationalist organizations, including capturing the perpetrators of a significant civilian atrocity for which you gained 1 Glory. You ultimately became frustrated with the lack of success prosecuting politicians and business leaders who supported these groups, and moved to the private sector. You specialised first in financial audit and then cyber security, where you were able to pick up the technical skills needed for the role but were largely successful because of your people skills. You are a last minute addition to the crew, as a requirement by the new mission insurance underwriter.

Abilities and Skills

Age	35+1D6
Physical	5
Mental	4
Social	5
Capital	5
Primary Skills	Interview (6), Recruit (5), Negotiate (5)
Secondary Skills	Firearms (4), Devops (4), Strong Arm (4), Trading Desk (4)

Roll	Service History
1	Burned bridges
2	Cosplayer
3	DJ
4	Divorcee
5	Traumatic brain injury
6	Trekkie

Service History

Burned bridges You left your job in intelligence and went to the private sector after you became a whistle blower for a culture of malfeasance within your department. An extensive internal investigation was inconclusive and no formal charges were laid but your professional reputation was destroyed. Your contacts from this role still speak to you, but have to conceal their relationship with you from their colleagues. You have a suppressed favour penalty (suppressed penalties only takes effect if another penalty applies). If joining a white MCSU, you fail the background check and are replaced by the Wealthy Founder.

Cosplayer You have excellent crafting and sewing skills. You quickly become friends with the Pilot / Commander as they are also a cosplayer.

DJ You have excellent musical curation and beat mixing skills. You quickly become friends with the Mission specialist as they always wanted to be a rapper and are a surprisingly gifted singer.

Divorcee While it is a myth that law enforcement have higher divorce rates than the general population (studies suggest the inverse is true), you are an example that perpetuates the myth. Your divorce is amicable and you still speak with your former domestic partner, but losing something that you had thought you could make a lifelong commitment to still hurts. You have a safe stress penalty (does not contribute towards additional defects).

Traumatic brain injury One evening, instead of meeting a contact, you ended up on the train tracks underneath a train. It was a miracle that you survived but you suffered a traumatic brain injury from the incident that required extensive rehabilitation and from which you have never truly recovered. You have a safe brain injury penalty (does not contribute towards additional defects). You have no memory of the events leading up to the accident. If joining a white MCSU, you fail the physical and are replaced by the Wealthy Founder. If you are a late joiner, the traumatic brain injury is instead a result of the extended period of hibernation on the supply mission and it is not safe.

Trekkie You love Star Trek. You quickly become friends with the Engineer payload specialist as they are also in a science fiction fandom, although your likes and dislikes are a lot more vanilla than theirs.

Space Agency Scientist

You were employed initially by a contractor and then by a first wave mission control after graduating with your PhD. You literally wrote the book on the mission you'll be doing, with a detailed analysis of the process of exploring the site and industrializing it if necessary. When the first wave mission failed to fund this mission, instead choosing to begin commercial exploitation of space elsewhere in solar system, you left them to work for your current mission control. You are tied up in an extensive breach of contract and IP theft suit from your former employer and one of the main reasons you have been added to the crew is to complicate the discovery and deposition process by ensuring you remain out of the court's jurisdiction.

Abilities and Skills

Age	35+1D6
Physical	4
Mental	5
Social	5
Capital	4
Primary Skills	Research (6), Prospect (5), Industry (5)
Secondary Skills	Ecology (4), Engineer (4), Recruit (4)

Roll	Service History
1	Ambitious
2	Artist/model
3	Contempt of court
4	PNE seizures
5	Schizophrenia
6	Single parent

Service History

Ambitious You suppress the first penalty you acquire as a result of a service risk.

Artist/model You work professionally as a visual artist such as photographer or painter in your spare time. Your initial interest in this medium is a result of the modelling career you had while you were an undergraduate.

Contempt of court When you return to Earth, you will spend your first year back in jail serving time for contempt of court.

Psychogenic non-epileptic seizures You suffer convulsions, rendering you unconscious whenever you add a stress penalty. Once you have suffered this at least once, you can recover from suffering psychogenic non-epileptic seizures in a shirt sleeves environment as if it was a penalty.

Schizophrenia You began exhibiting symptoms suggesting you were developing schizophrenia in your mid to late twenties. Early intervention initially appeared to prevent the onset of the disease, however you experienced a significant psychotic break at the end of your previous role. You have been put on anti-psychotic medications which you have enough of a supply to last the planned mission duration and practise cognitive behaviour therapy. It is not clear at this stage whether you will suffer any further episodes. You begin the game with a mental illness however you will experience psychosis only half the time (1-3 on 1D6). If joining a white MCSU, you fail the background check and are replaced by the Science Influencer.

Single parent You have two children who don't have significant contact with their other parent and who you have been raising by yourself since you were in your early twenties. The youngest of these children is 15 and the oldest is your age minus 20 years. You have been forced to leave them in the care of your parents because of circumstances beyond your control. If joining a white MCSU, you fail the background check and are replaced by the Science Influencer.

Test Pilot

You first served as an aircraft mechanic and then enrolled in an enlisted pilot program run by your national air force. You were an exceptional pilot with an exemplary record although among the last cohort of human pilots to serve in crewed combat vehicles in a military conflict. You were recruited by a first wave faction to test fly a revolutionary air launch to orbit (1-2), new space plane (3-4) or stratospheric aerostat-launched zeppelin (5-6). The current mission control has recruited you because of your extensive exposure to first wave organizational processes and technologies.

Abilities and Skills

Age	37+1D6
Physical	5
Mental	5
Social	4
Capital	4
Primary Skills	Pilot (6), Devops (5), Engineer (5)
Secondary Skills	Teleops (4), Industry (4), Research (4)

Roll	Service History
1	ADHD
2	Gymnast
3	Post-concussion syndrome
4	Ripcord
5	Short
6	Wheelchair user

Service History

ADHD You were diagnosed with ADHD and have been taking medication for it since you were a child. You have enough medication to treat the ADHD for the mission and return trip. If you run out of medication, ADHD acts as suppressed penalty affecting any operation (suppressed penalties only takes effect if another penalty applies). If joining a white MCSU, you fail the psychological testing and are replaced by the Comeback Astronaut.

Gymnast You were a nationally competitive gymnast as a child. Spend 3 of your skill points on EVA (or 2 if on a Low quality crew).

Post-concussion syndrome As a result of injuries sustained during a crash you still suffering persistent headaches. You have enough medication to treat these head aches for the mission and return trip. If you run out of pain killers, these headaches act as a suppressed penalty affecting any action using the Mental ability or skills (suppressed penalties only takes effect if another penalty applies). If joining a white MCSU, you fail the psychological testing and are replaced by the Comeback Astronaut.

Ripcord What doesn't kill you makes you stronger. You wear a ripcord as a wristband from a parachute that failed to open. The backup chute luckily did.

Short You are 10% shorter and 20% less massive than average. This acts as an safe physical penalty (does not contribute towards additional defects).

Wheelchair user As a result of spinal or back injuries from a crash, you require a wheelchair or exoskeleton on size 6+ sites. This is equivalent to a safe leg injury penalty and permanently disabled legs. At Earthside technology levels and human scale, an unpowered wheelchair is 4 kilograms and a powered wheelchair is 60 kg. The powered wheelchair has a range of 60 kilometers (1 km/kg of mass), a top speed of 21 km/h (movement speed of 7) using an electric motor (charging in 2 hours) and can be controlled remotely using your smart device. The unpowered wheelchair is a 3D printed rigid frame with two gears and inflatable wheels for navigation over steep or soft terrain and uses your EVA skill for movement. ET produced wheelchairs are powered, 15 kg at human scale with a range of 120 km and top speed of 30 km/h and hold you in an upright position. You must aid climb when climbing with a wheelchair. If joining a white MCSU, you fail the physical and are replaced by the Comeback Astronaut.

Wealthy Founder

You have always expressed a deep interest in space exploration since you have been a young child. After graduating with both medical and engineering degrees, you became a serial entrepreneur, starting initiative after initiative designed to foster an interest in space and to enable businesses to develop space related technologies and to identify opportunities for commercial exploitation of space beyond low Earth orbit. These initiatives indirectly helped at least one first wave faction build an extraterrestrial factory which kicked off the second wave space rush. You were recruited for a board level position for the current mission control who agreed to your terms ensuring you were a crew member on their first crewed mission to another planet or asteroid.

Abilities and Skills

Age	35+1D6
Physical	4
Mental	4
Social	5
Capital	6
Primary Skills	Trading Desk (6), Industry (5), Negotiate (5)
Secondary Skills	Engineer (4), Prospect (4), Medical (4), Recruit (4)

Roll	Service History
1	Crew conditioning
2	Drug addiction
3	Hero complex
4	Learning disability
5	Smoker
6	Sports car

Service History

Crew conditioning You assist the crew with a specialized one-off conditioning program that one of your companies has developed. Choose one ability: each crew member including you gets two skill points of conditioning in the ability.

Drug addiction You have a drug addiction to treat stress instead of seeking treatment. Choose whether this is a physical, mental or social addiction penalty. This penalty only applies when you have access fulfill your addiction, which normally only occurs in a shirt-sleeves environment, however you believe you have ensured you have enough of a supply for mission and return trip. Instead, you use it much faster and run out when you first roll a Physical aging event. Accumulate two stress when you do: if you choose to suffer any Acute stress, it affects the Physical aging event results and your recovery.

Hero complex You suppress the first stress penalty you acquire.

Learning disability You suffer from dyslexia (1-2), dyscalculia (3-4) or dysgraphia (5-6). The learning disability acts as a safe mental penalty (does not contribute towards additional defects).

Smoker You smoke a drug. If you have a drug addiction, it is a highly addictive drug such as nicotine, otherwise you smoke a less addictive drug such as cannabis. You have a supply long enough to sustain you for the mission and return trip. You have a small cabin with a separate air supply and fire suppression system and filters capable of scrubbing the smoke out of the atmosphere.

Sports car The personal equipment you brought on board includes a 2004 Carterham Superlight R500 EVO with the original chassis but the Rover K-series engine replaced by an electric engine running in an emulation mode. It masses around half a tonne and can be driven in vacuum conditions, but not off road. You may choose a different car make and model if you know more about the cars than the author, which is any demonstrable knowledge about cars at all.

Abilities

Each crew is primarily rated using four abilities, each of which governs how well that crew member can develop a set of related skills: physical, mental, social and capital. These abilities have corresponding spaces that can be mapped and explored as part of the game: meat space (physical), cyber space (mental), social space (social) and market space (capital). The fifth space, outer space has no corresponding ability, and it is already mapped and can be explored using the High Frontier map.

Physical

Physical ability determines how much activity crew can do, as a function of explosive speed in the short term and endurance in the long term. Crew with high physical abilities can move further and carry more than those with low physical abilities. Crew physical ability also constrains how much they can condition your other abilities.
Physical abilities and skills are most useful in meat space: the physical world and the tools, structures and objects that inhabit it.

Body A related attribute to physical ability is body size, which is often shortened to Body. A crew member's Body determines how large they are, which impacts the size of the loads that they can carry along and how much damage they take. All starting crew start with a Body of 6, which means they mass between 60 kg and 249 kg.
Crew with a body higher than 6 get innate armour equal to their body size minus 6. Innate armour protects against all damage except CRASH damage but is not cumulative with rigid armour; use the higher of the two values. Crew with a body size lower than 6 suffer 1 extra point of damage for each body size lower than six whenever they are damaged.
Each step up or down of Body indicates a change of 4 times the mass upwards or division of mass by 4 downwards, with some rounding for convenience, between Body 0 and 10 inclusive. For instance 7 body ranges from 250 kg to 999 kg. Body 11 to 14 represents 1 to 4 water tanks, where each water tank masses 40 tonnes. Then each step up of Body from 15 onwards is double the previous mass.
Robot physical abilities correspond to human physical abilities. However robot skills are limited by their maximum skill level which applies to both physical and mental skills, and which is generated instead of their mental ability.
Robots roll their physical ability normally.

Mental

Mental ability determines crew ability to absorb and utilized information, and measures both general education and reasoning ability which are usually a product of their family's economic and social circumstances. The majority of skills are limited by crew mental ability.
Mental abilities and skills are useful across all the spaces, but particularly in cyberspace space: the stacks, systems and connections used for information processing and storage.

Intelligence A related attribute to mental ability is Intelligence which represents the raw processing power of a crew member's brain, as limited by its physical size, energy consumption and substrate. All humans have the same biological brains, which give them an Intelligence of 6 (General intelligence, or GI), comparable to a robot intelligence of 9. Human mental ability varies more widely than robot mental ability.

Robot Mental Ability

Robots do not naturally get Mental ability, and when generating robotic crew, use this ability roll to instead indicate the maximum skill level that a robot can learn for their skills. At a maximum skill of 3 or below, the robot is only able to learn Physical skills. At a maximum skill of 4, the robot can learn skills normally up to level 4 but is not able to improvise skill use at all. At a maximum skill of 5 or more, the robot begins to develop Mental abilities that allow for this improvisation. A robot with a consciousness capability of 8 or higher can directly condition their Mental ability. AGI = Artificial general intelligence. ASI = Artificial super intelligence.

Robot Mental Ability

Max Skill	Intelligence	Mental Ability
-3	Physical only	0
4	No improvising	0
5	Operational AI	2
6	Ahuman AGI	4
7	Turing-grade AGI	6
8	Specialized ASI	8
9	Ahuman ASI	9
10	Superturing ASI	10
11	Postsingularity ASI	11

Social

Social ability determines how much time crew spend on building and maintaining relationships with those both directly around them and in the professional and private networks they have developed. Named relationships are known as contacts and using them incurs favours.
Social abilities and skills are most useful in social spaces: the networks and relationships between individuals, factions and nations on Earth and in space.

Consciousness A related attribute to social ability is Consciousness which represents the capacity for introspection, self-awareness, empathy, reflection and recursive use of language to allow for complexity in communication. Humans all begin with a Consciousness of 12.

Robot Social Ability

Your roll for the robot's social ability instead determines its starting consciousness capability, from 1 to 6. Robots with a consciousness capability of 5 or higher experience pain and can recover from penalties as outlined in the Robot Recovery section on page 126 in the Skills chapter. Robots with a consciousness capability of 4 or less get a Social ability equal to their consciousness capability minus 2 (minimum 0); robots with a conscious capability of 4 or higher get a Social ability equal to their consciousness divided by 3, rounded up, plus one (4-6 gives a Social ability of 3). Remember that their maximum skill level controls their social skill limits, not their Social ability. Robots with a consciousness capability of 8 or higher can condition their abilities as outlined in the Ability Conditioning section on page 104, including both their intelligence and consciousness, noting the robot conditioning rules exceptions – Social ability cannot be conditioned until the robot's consciousness is at least 10.

Capital

Capital ability determines a crew member's socioeconomic position in society and the amount of wealth they have accumulated. A capital of 1 indicates a crew member is homeless. A capital of 2 indicates a crew member has a job, usually in the services sector, but no savings. A capital of 3 indicates a crew member is working class or newly affluent, with savings in the thousands of US dollars (2D6x$1000). A capital of 4 indicates a crew member is established middle class or with useful technical skills, with savings in the tens of thousands of US dollars (2D6x$30,000). A capital of 5 indicates a crew member is either managerial elite or have inherited wealth in the millions of dollars (2D6x$1,000,000). A capital of 6 indicates a crew member is a multi-millionaire, with accumulated wealth in the tens of millions of dollars (2D6x$30,000,000). A capital of 7 indicates the crew member is a billionaire (2D6x$1,000,000,000).
Capital ability can let a crew member buy their way into any space, but is most relevant to market spaces, where goods and services are bought and sold.

Robot Capital Ability

Robots can only accumulate capital once the robots are emancipated. As this is not the case at the start of the game, robots begin with a Capital ability of 0. The roll for the robot's Capital ability instead determines the robot's starting equipment load. See the Load Outs section on page 143 of the Assets chapter for details. In addition the robot will have one capability with a capability level equal to this roll and a capability gap of 1. If you do not have the A Facility with Words supplement, and if this roll was 6 or higher, the robot gets a capability from the Species capabilities section on page 206 in the upgrade chapter. Roll 1D6 for the capability type. 1: Biotech. 2: Computation. 3: Fleet Ops. 4: Logistics. 5: Pilot. 6: Mime (replaces Psyops).

Mime The robot adopts personality traits and behaviours from online media and those around it, which can be encouraged or suppressed. Increase its Social ability by one.

Robot Body Size The robot Body is based on the highest face value of the dice results used for each ability: that is the maximum of its Physical ability, maximum skill level, consciousness capability and half of it's equipment load. Use the following values once this is determined. 1: 8 kg (Body 4½). 2: 15 kg (Body 5). 3: 30 kg (Body 5½). 4: 60 kg (Body 6). 5: 125 kg (Body 6½) 6: 250 kg (Body 7).

Rank

A crew member's rank indicates how far they have progressed professionally in their career as well as their seniority in the organization and mission for the purpose of issuing and obeying orders.
Depending on the mission control BSU, crew may or may not have formal recognition of their rank by getting a title associated with the rank. Military BSUs and other stratified organizations typically have 11 ranks. In the military, ranks 6-11 indicating commissioned officers, ranks 3-5 indicating non-commissioned offices and ranks 1 and 2 indicating non-officer ranks. Most BSUs have fewer ranks, with ranks ranging from 1-6 being typical. Some of these ranks may not have distinct titles.

Pulling Rank A higher ranked crew member can always pull rank over their lower ranked colleagues. If a crew member says 'I pull rank.' any crew member with a lower rank than them must obey the instructions they issue, or mutiny. If the orders are illegal, then the mutiny must first establish this, and then determine the consequences for the crew member attempting to issue them.

Robots have rank 0 until they are emancipated.

Disabilities and Penalties

Disabled crew may be at an advantage in space because they are already experienced in working with assistive technologies and experiencing the world from a different physical or psychological perspective. If a crew member is disabled, pick one or more penalties to reflect the disability. The crew member starts the game with these penalty levels, and can choose to either make them safe or suppressed. Also determine if there are any resulting permanent disabilities – which typically depend on the disability.

Safe penalties A safe penalty never contributes towards additional defects when making an action check. This means you don't count any safe penalty levels when checking if there are 3 or more penalty levels for the action, and if there are 3 or more unsafe penalty levels, you do not count the safe penalty levels when determining how many defects to add (unsafe penalty levels divided by 3 and rounded down). See the Defects section in the Skills chapter on page 127 for details.

Suppressed penalties A suppressed penalty does not apply, unless it can apply cumulatively with an unsuppressed penalty. A number of archetypes start with suppressed penalties. It costs more to recover from a suppressed penalty: see the Recovery section in the Skills chapter on page 126 for details.

MCSU Ranks

For crew in White or Green MCSUs, starting rank is determined by the position: use Astronaut if the position is not listed. For red MCSUs roll 1D6+1, for purple MCSUs roll 1D6+3. For encounters, roll 2D6 for the rank each individual in crews or payloads, 3D6 for a colony and 4D6 for a Bernal, add together the lowest two dice rolled and subtract one. **Orange** Instead of rolling, Orange uses Capital ability as rank.

Roll	Red	White and Green	Purple	Orange
1	Private	Astronaut candidate	Probationary	Intern
2	Specialist	Astronaut	Trainee	Gig contractor
3	Corporal	Astronaut (1+ missions)	Assistant	Contractor
4	Sergeant	Mission Specialist	Administrator	Employee
5	Warrant Officer	Pilot	Supervisor	Stockholder
6	Lieutenant	Commander	Attache	Executive
7	Captain		Secretary	Owner
8	Major		Manager	Board member
9	Colonel		Ambassador	Investor
10	Brigadier		Counsellor	Bond holder
11	General		Minister	Sole proprietorship

Exclusive penalties Many penalty levels can only be applied once. For instance, a blind crew member cannot be blinded again. Crew members who have safe exclusive penalties are at an advantage acting in these situations because they do not have the increased risk of defects occurring.

Permanent Disability

Some disabilities will disable a body part or ability that a crew member would otherwise have. For instance being blind will prevent a crew member from ever seeing a target using their vision, and being unable to use their legs will mean a crew member will treat the legs location as being permanently disabled.

Assistive technologies For each permanent disability a crew member has, they can choose one assistive technology to allow the crew member to overcome the permanent disabilities when they use the technology. There are two types of assistive technologies: prosthetic and alternative. Prosthetic technologies allow the user to ignore the penalty level and effects of the permanent disability while using the prosthetic. Alternative technologies, such as a sensor suite or wheelchair, provide an alternate method of overcoming the disability, but means the user still suffers from the penalty level and effects of the permanent disability. For instance an alternate Van Eck detector sensor suite will allow the crew member to see anything that contains a powered electronic device or radio transmitter, but not anything else.

Conditioning Limits

Tech Level	Physical, Mental, Social Limit	Capital Limit
Baseline	4	6
Earthside	5	7
ET	6	8
Advanced	7	9
Promoted	8	10
Future	9	11
Breakthrough	10	12
Postsingular	11	13
Domain	12	14

Ability Conditioning

If you have a Physical or Social of less than 4 or a Mental of less than 5, you will need to spend skill points to increase your abilities. These skill points represent additional conditioning required to achieve the crew requirements. The skill point cost of 1 level of ability conditioning is equal to the value of the new ability score. Each level of conditioning increases the ability score by 1. e.g. To increase your Physical from 2 to 4 requires an expenditure of 7 skill points (3 + 4) to get the 2 levels of physical conditioning needed. You may elect to spend skill points to further condition your abilities even if you meet the minimum ability requirements.

Conditioning limits The current technology level determines the maximum you can condition an ability to, as shown on the Conditioning limits table on the current page. However you can condition your Capital ability 2 higher than the Physical, Mental or Social ability limit for a given technology level as shown in the Capital Limit column.

Low quality crews only need a Physical of 3 and a Mental of 4. Medium quality crews can have a Social of 3.

Background checks require that you have a Capital of at least 2 for any White BSU (including National Space Agency).

Species Rating If you condition an ability to 5 or more you can affect how human you are. See the Species Ratings section in the Upgrades chapter on page 200 for details.

Robot conditioning Robots can only condition their abilities once they achieve a consciousness capability of 8 or higher. Additionally, you cannot directly condition a robot's Mental or Social abilities until the robot has a consciousness capability of 10 or higher. Instead you can condition a robot's maximum skill level as if it was their Mental ability and a robot's consciousness capability as if it was their Social ability. Doing so will increase the robot's Mental or Social ability indirectly. Physical and Capital abilities can be conditioned directly, although the Capital ability requires that the robots are emancipated first.

Data exception Player controlled robots may condition their consciousness prior to achieving a conscious level of 8. For other robots this only occurs randomly.

Discounted Conditioning

Improving medical science reduces the cost of your ability conditioning improvements if your ability is less than the era number. This is 1 for Upported, 2 for Colonization, 3 for Exoglobalization, 4 for Futures, 5 for

Parents' Financial Status

Use the difference in Capital abilities of your parents.

Difference in Capital	Result
-0	Parents remain together financially despite different demographic backgrounds. Randomly pick one parent and roll for new nationality and ethnicity.
1 or 1-2 in a White BSU	Parents remain together financially. Both have the capital value of the higher rolled.
2+ or 3+ in a White BSU	Parents were separated financially while you were a child. Roll 1 on a 1D6 for one parent to have a different demographic background.

Breakthroughs and 6 for Postsingular. You may condition these abilities up to the level given by spending 1 skill point per level instead of skill points equal to the ability level.

Family

Parents, family and friends can form an important touch point as crew drift between the stars. The average age of the men landing on the moon was 39 years, and the crew members' ages are likely to be similar, which means that their parents are likely still alive but aging as they travel around the solar system. Unless they are estranged, crew will make the time to talk to their friends and family back home throughout the mission, or remember them if they are no longer alive.

Parents

You should determine each parent's Capital ability. Roll 2D6 and use the crew member's Capital ability as a 3rd dice roll. Pick the middle of the 3 values to determine the parent's capital. The difference in Capital between the two parents determines their relationship status.

Missing parents If either parent's Capital roll is 1, the crew member is missing that parent; either because of permanent estrangement or death during early childhood (5 years or earlier). Roll 1D6 and generate a grandparent (1), uncle or aunt (2), older sibling (3), teacher (4), mentor (5) or friend (6) to act as a parental figure in that crew member's life. Use the same Capital rolling rules for this parental figure as for your parents.

Economic migrants If either parent's Capital is a roll of 2, they are both economic migrants: their demographics determines the crew member's ethnicity and ancestral languages, but not their native language or nationality. In this instance, the adjusted capital if the crew member's parents remain together financially reflects the life they have made for themselves after migrating. Roll for the crew member's nationality again using the Colonist Nationalities table on page 70, rerolling if you get the same result as either parent.

Siblings

Roll 1D6-1 four times and choose the second lowest number for how many siblings a crew member has. If the crew member does not know their parents, use the lowest number rolled to determine how many siblings they know of.
A crew member has any siblings, the lowest number you rolled +1 determines where in the position of siblings they fell. Roll 1D6-1 three times for the number of years age difference between each child and choose the middle result, with an age gap of 0 indicating multiple births.

One Child Policy China's relaxation of the one child policy falls within the Sixty Years In RPG time line, but it's abolition does not. Crew who are Chinese citizens should will not have siblings except due to a multiple birth. The current Space Politics determines the 2040 Chinese views on population.

Disposition

Disposition is how the crew's subconscious inclinations express themselves. It is as much about a crew member's childhood as it is about their rational mind - were they raised in a social environment (Green) or a close knit family (White), were their parents distant and disciplined (Red), or left them to do their own thing (Purple) or did they have problems with authority figures (Orange)? A crew member's disposition helps determine their starting outlook but everyone can grow beyond their disposition.
Roll 1D6 for a crew member's disposition 1: Red. 2: White. 3: Green. 4: Purple. 5: Orange. 6: Matching the starting Space Politics.

Names

Names are complex and cultural specific referents to an individual and an exploration of how the collision of cultures and ethnicities results in an individual's name would considerably increase the size of these rules. Even just a simple frequency table for given and family names would be a gross generalization and miss the subtle and important complexities involved in giving someone a name.

Call Signs

Sixty Years In instead chooses to side-step this complexity by having all the player-controlled crew refer to each other by their call sign. Call signs are generated by combining two words from concepts relating to the positive values and concepts expressed in this game: aspirations, computing and mathematics, engineering, physics, planetology, and rocketry. You can also use these tables to generate single word nicknames: the author has included one of his nicknames given to him by his friends herein.

> **The use of names** You cannot refer to your crew by name within the game, or even give them a name in the game. You must only give them a call-sign and refer to them by that call sign, their public pronoun in public settings and their preferred pronoun in private settings. The only place the crew can be given a name is in fan fiction written about the game, and only by authors not involved in playing the game.

To generate a call-sign, roll 1D6 twice to determine the row for the first name and 1D6 twice to determine the row for the second name (duplicates allowed). Then generate three possible call-signs by rolling 1D6 for the columns for first name and second name for each call-sign, rerolling doubles. Choose which of the three call signs you prefer to use.

Family Nicknames

Crew should refer to their family members by creating a nickname for each family member. For each family member, roll 1D6 twice to determine the row for their first name and use the Aspirations (first) column. Leave their real name unsaid.

Nominative Determinism

Creating call signs for contacts, colonists and crew you encounter would take too long if you did so each time. In these instances, and for entities which don't suit call signs for names, you are strongly encouraged

to use nominative determinism for naming: that is use a name that most accurately describes the thing. In other words, if you encounter a cardiologist, call them Doctor Heart; a plumber should be called Fix Pipes; a famous game designer Video Gamer (pronounced Vid-AY-O); and so on. If this means you end up with one too many Willy Wontes, Self Loners or Evil Bads, then don't worry and just embrace it.

Outlook

Crew outlook controls how they behave in one or more areas of their life, called perspectives. The five perspectives are coloured to match the five BSU colours: White controls crew attitudes towards their friends including their fellow crew members, Red for their superiors and subordinates, Green for how they treat strangers, Orange for their attitude towards themselves and Purple for the natural world, and especially their place and fate in it. Crew can acquire up to five outlooks throughout the game - one of each colour, but will tend to have two or three notable outlooks, with the remainder being moderate.
Each outlook is also associated with an emotion: anger for Red, fear for White, happiness for Green, jealousy for Orange and curiosity for Purple. Use the emotion any high value Outlooks are associated with to guide how crew should behave when under stress, and choose to either give into or resist the influence of this emotion.

Determining Outlooks

A crew member's first outlook is initially determined by your MCSU: crew will start with a High outlook in the colour matching the BSU – except Purple BSUs start with a Low Purple outlook instead. Each crew member's disposition can then be used to modify an outlook one level; with the exception it cannot be used to reduce the starting High outlook from the MCSU (this exception doesn't apply for Purple MCSUs). Any outlooks crew don't have, begin as Moderate (level 3).
The disposition can be used in one of two ways: it can either increase the outlook matching the disposition by one level, or it can decrease the outlook that opposes the disposition by one level. Red opposes Orange, Green opposes White and Purple both matches and opposes itself.

Contact and Encounter Outlooks Other individuals outlooks will be determined by two cards, one drawn from a deck and one matching their BSU. The face value of the BSU card is determined by a 1D6 roll instead of a card, modified by +7 unless the BSU is Purple; and treating 1 as Ace, 11 as Jack, 12 as Queen and 13 as King. The card drawn will determine a second outlook – if the suit is the same as the BSU, the outlook will be Purple instead.
For anyone not aligned to a faction (including crew family and friends and non-mission control contacts), draw two cards to determine the two outlooks. If the second card drawn matches the first, the perspective for the second card will be Purple instead of the perspective determined by the card suit. The Outlooks table on page 118 should be used to convert the cards and dice rolled into more concrete outlooks or you can just use the face values to determine the strength of the perspective.

Robot Outlooks Robots have significantly different outlooks until their consciousness increases. At consciousness 10, robots get one random human outlook matching the BSU of their robot outlook, with a face card value of a roll of 1D6, which means that they have a minimal outlook on a result of 1, low outlook on a 2-5 and a moderate outlook on a result of 6. At consciousness 11, this single outlook is created as the first Contact or Encounter outlook. At consciousness 12 or higher, robot outlooks are created as contact and encounter outlooks.

Balanced You have a balanced approach to the perspective this outlook relates to. There is no need to note any Balanced outlooks on the crew sheet - these are assumed if not listed.

Chaotic It's not that you don't like to make plans: you make lots of plans, and are happy to wait to see which ones come to fruition, and which ones you have to discard without regret. You'll take any op-

Call Signs

Roll 1D6 twice to determine the row for the first name and 1D6 twice to determine the row for the second name (duplicates allowed). Then generate three possible call-signs by rolling 1D6 for the columns for first name and second name for each call-sign, rerolling doubles. Choose which of the three call signs you prefer to use.

Roll	Call-sign Words					
1, 2	Aspirations	Computing	Engineering	Physics	Planetology	Rocketry
11	Beauty	Axiom	Ablation	Ambient	Albedo	Abort
12	Beginning	Binary	Actuator	Black	Atmosphere	Annular
13	Birth	Curve	Aileron	Blue	Canyon	Anomaly
14	Charity	Cycle	Booster	Chill	Ceres	Aphelion
15	Comfort	Cypher	Caliber	Delta	Chaos	Apogee
16	Dignity	Drive	Canopy	Density	Chasma	Attitude
21	Diligent	Error	Composite	Doppler	Cloud	Axis
22	Dream	Firewall	Coupling	Drag	Collis	Azimuth
23	Eager	Graph	Drogue	Energy	Core	Ballistic
24	Every	Hash	Dynamo	Epoch	Corona	Brake
25	Excellence	Infinity	Fairing	Feedback	Crater	Burn
26	Fidelity	Input	Filler	Fission	Debris	Concentric
31	Giving	Key	Fin	Force	Eruption	Conjunction
32	Goodness	Lock	Gantry	Fusion	Geology	Dive
33	Grace	Look-up	Gimbal	Green	Geyser	Eclipse
34	Humble	Map	Grain	Grey	Jupiter	Eject
35	Inspired	Maximum	Hatch	Heat	Lacuna	Exhaust
36	Journey	Memory	Hybrid	Impulse	Luna	Flight
41	Justice	Node	Jet	Indigo	Mare	Flyby
42	Kindness	One	Mandrel	Lift	Mars	Freefall
43	Loving	Operator	Module	Mach	Mensa	Glide
44	Original	Point	Motor	Neutral	Mercury	Launch
45	Passionate	Processor	Nozzle	Orange	Mons	Orbit
46	Patient	Proxy	Outboard	Phase	Neptune	Parsec
51	Perfect	Screen	Pipe	Quantum	Plume	Payload
52	Quiet	Secret	Primer	Red	Regolith	Perigee
53	Running	Sector	Printer	Scale	Ring	Pitch
54	Safety	Sequence	Rail	Shell	Rupes	Stage
55	Separation	Sort	Rocket	State	Satellite	Telemetry
56	Silent	Space	Rotor	Symmetry	Saturn	Terminal
61	True	Switch	Servo	Time	Sunspot	Trimming
62	Trusted	Trend	Shroud	Tone	Terra	Turnover
63	Unity	Trinary	Turbo	Transition	Tholus	Vacuum
64	Vast	Warning	Uplink	Violet	Uranus	Vector
65	Virtue	Zero	Vent	White	Venus	Yaw
66	Wealth	Number (2D6)	Wing	Yellow	Weather	Zenith
Roll 3	1	2	3	4	5	6

portunity that presents itself in the moment and are happy to ride the currents of fortune down the river of fate.

Close-minded You are unwilling to let anyone or anything else influence you, and when you change your mind you will come up with arbitrary reasons as to why your actions are consistent with your previous point of view.

Compassionate You are extremely sympathetic to the plights of others, and will prioritize the well being of those in need ahead of yourself, even if you have never met them before.

Competitive You have a strong desire to compete with others and to succeed at the tasks you undertake. You are drawn to activities which challenge you and allow you to demonstrate mastery of a skill.

Contrarian If someone asks you to do something, you will go out of your way to do the opposite unless the task interests you or is framed in an unusual way. Contrarian Outlooks are highly resistant to virtual torture and will suffer PTSD - eventually leading to a psychotic break - instead of succumbing.

Cynical You've seen and see the worst of people which leaves with you an inherent distrust of others and a cynical view of humanity as a whole.

Dogmatic You have committed to the belief there is only one right way of doing things, and one set of principles which are undeniably true. Everyone around you is either with you or against you, based on their demonstration of their belief in these principles.

Duty bound You have a strong sense of right and wrong, and are dependable and tenacious in performing the tasks you are assigned by your superiors, and a quick decision maker when allocating tasks to your subordinates.

Easy going You focus on enjoying life rather than success or failures, and working steadily towards your goals instead of making sacrifices to achieve what you want.

Eccentric You are an outspoken nonconformist, happily obsessed with your hobbies, of which you usually have five or six. You are not particularly interested in the opinions or company of other people, except when you can try to convince them that you are right and the rest of the world is out of step with your ideas.

Faithful You have an overwhelming feeling of responsibility to those close to you, and will ignore their faults and highlight their strengths when interacting with them. This feeling of responsibility prevents you from committing suicide.

Flexible You'll happily discard process in favour of the context and your understanding of the situation. You'll also happy change your mind if given facts that contradict your current beliefs, and will go out of your way to test your beliefs to strengthen or discard them.

Jack-of-all-trades You are drawn to a wide variety of different and disparate fields of study, which means you end up with a broad range of knowledge and an analytic, "from first principles" approach to problem solving.

Machiavellian You are constantly working on furthering your own social position and worsening the social positions of those around you while maintaining that you are not.

Nihilistic You reject all religious and moral principles and believe life is random and meaningless.

Open-minded Systems, people and nature are too complex to neatly abstract and a deep understanding of them requires discarding some if not all of your preconceptions in favour of observations. You'll happily hold two sets of contradictory positions because any abstraction of reality will inevitably bring different ideas into conflict.

Prescriptive Rules are put in place for good reasons, and a consistent application of well-stated rules is the fairest and safest way for everyone to achieve the best possible outcomes.

Self-destructive You constantly undermine your own successes and make choices which may provide short term satisfaction but ultimately cause you long term harm.

Self-made You have built your life purely from your own efforts without acknowledging any outside help. Your friends are a reflection of who you are, and you will abandon anyone who does not support you unconditionally.

Selfless You are obsessed with the people or things you love and will put them ahead of your own happiness and well being, even as you criticise their failings.

Social You are an outgoing, socially confident person with a large network of peers, mentors and experts to draw upon. Your approach to solving issues is often knowing exactly who the right person to talk to is.

Systematic You are incredibly methodical in your approach to problem solving but you risk suffering from "engineer's disease": the belief that your technical understanding of one complex system gives you expertise in solving other complex problems. You may make unskilled attempts when using chrome with +1 effective ability level.

Team Player You work well in a high performance team environment, bringing out the best in your peers while identifying what skills you can bring to the group and constructively contributing towards the team's goals.

Type A You have a classic type A personality - ambitious, rigidly organized, highly status-conscious, sensitive, impatient, anxious, proactive, and concerned with time management.

Uncompromising You will never compromise your principles or performance to achieve a goal - you will do things the right way or not at all, even if inaction leads to a greater threat than compromising your principles would have.

Philosophy

Each crew member starts with a Philosophy which can either match the colour of your MCSU or the Space Politics - your choice. The philosophy determines what political beliefs the crew member holds. A crew member has a mismatched philosophy when their philosophy does not match the Space Politics. This is a social skill penalty which crew can only recover from if the Space Politics is not War or Anarchy. Recovering from a mismatched philosophy changes the crew philosophy to match the Space Politics.

Conservative (White) Conservatives tend to favor economic freedom, but frequently support laws to restrict personal behavior that violates "traditional values." They oppose excessive government control of business, while endorsing government action to defend morality and the traditional family structure. Conservatives usually support a strong military, oppose bureaucracy and high taxes, favor a free-market economy, and endorse strong law enforcement.

Statist (Red) Statists want government to have a great deal of power over the economy and individual behavior. They frequently doubt whether economic liberty and individual freedom are practical options in today's world. Statists tend to distrust the free market, support high taxes and centralized planning of the economy, oppose diverse lifestyles, and question the importance of civil liberties.

Liberals (Green) Liberals usually embrace freedom of choice in personal matters, but tend to support significant government control of the economy. They generally support a government-funded "safety net" to help the disadvantaged, and advocate strict regulation of business. Liberals tend to favor environmental regulations, defend civil liberties and free expression, support government action to promote equality, and tolerate diverse lifestyles.

Centrist (Purple) Centrist prefer a "middle ground" regarding government control of the economy and personal behavior. Depending on the issue, they sometimes favor government intervention and sometimes support individual freedom of choice. Centrists pride themselves on keeping an open mind, tend to oppose "political extremes," and emphasize what they describe as "practical" solutions to problems.

Libertarian (Orange) Libertarians support maximum liberty in both personal and economic matters. They advocate a much smaller government; one that is limited to protecting individuals from coercion and violence. Libertarians tend to embrace individual responsibility, oppose government bureaucracy and taxes, promote private charity, tolerate diverse lifestyles, support the free market, and defend civil liberties.

Sleeping Arrangements

It is human nature to desire friendship and companionship and the multi-year or multi-decade nature of High Frontier missions means that some of the time these relationships will be between members of the crew. Sleeping arrangements may or may not be a euphemism for sexual relationships, depending on cultural expectations and norms. For instance, in a culture accepting of intimate platonic relationships and asexuality, sleeping arrangements may not be predominantly sexual.

Important: This section is strictly optional. Before proceeding, ensure you have read and discussed the Important Note on Difficult Topics section at the start of the book.

Roll 1D6-1 twice and choose the lowest number. You will attempt to have this many sleeping arrangements. Roll 1D6 for whom the arrangements are intended to be with: 1: Pilot/Commander, 2: Mission Specialist, 3: 1st Payload Specialist, 4: 2nd Payload Specialist, 5+: Relationship back on Earth. Intra-crew sleeping arrangements will exist if the other crew member also has the reciprocal arrangement and consents to it. If you roll yourself, you may choose to reciprocate any sleeping arrangements that are offered. If there are multiple people occupying the same position, then roll 1D6 to determine which person to choose. This may mean that, for instance, in a 5 person crew that each of the pilot and captain has only half the likelihood of another crew member desiring a sleeping relationship with them.

BSU Specific Sleeping Arrangements

Practical sleeping arrangements Purple BSUs will start the first mission with 1D6 sleeping relationships in place (but no more than the number determined by the above generation process): the crew will have been selected with consideration of the interpersonal relationship dynamics in addition to other selection criteria.

Monogamous sleeping arrangements Crews on white BSUs must have exactly one relationship and will be censured for other relationships or the absence of any relationships. Relationships are not permitted (although can occur illicitly) between crew members because of the extreme risk of radiation damage to gametes, ova, fetus and babies in space. As a result all crew members must have a relationship back on Earth. Homosexual relationships are permitted provided these are monogamous, but risk later censure if the BSU moves to a heteronormative sexuality. These relationships are in place at the start of the first mission.

Hot bunking sleeping arrangements On a Red BSU space craft, sleeping arrangements denote hot bunking, where crew shifts are organised so that multiple crew can use shared berths. The captain will never hot bunk: any sleeping arrangements between the captain and other crew are tolerated because of the captain's seniority and no other sleeping arrangements other than hot bunking are allowed between other crew members, who all hot bunk. In a hot bunking crew, you cannot remove Stress penalties while in space unless you are the captain.

Flexible sleeping arrangements Green and orange BSUs will have sleeping arrangements back on Earth in place at the start of the mission if the sleeping arrangements roll was a 6. Other sleeping arrangements including all inter-crew arrangements will develop during the first mission.

Ethnicity		Gender	Disposition		Outlooks		Philosophy	
Physical	4D6 choose 2nd		Mental	5D6 choose 2nd	Social	4D6 choose 2nd	Capital	3D6 choose 2nd
Conditioning	Minimum 4		Conditioning	Minimum 5	Conditioning	Minimum 4	Conditioning	Min 2 if White
Body	kg 6		Intelligence	6	Consciousness	<10 stops destress 15	Parent 1 Capital	
Bypass			Combat Ops		Interview		Parent 2 Capital	
EVA			Devops		Negotiate		Activism	
Firearms			Ecology		Performance		Antitrust	
Strong Arm			Engineer		Streetwise		Recruit	
Addiction	Physical		Industry		Mission Control Contacts		Trading Desk	
Aging	Cancer		Medical		Name	Skill 5	Space suit	kg
Bends	2 hrs 20 m to avoid		Mining		Name	Skill 5	Stack	Usability:
Blood loss	3 6 9 Dead		Pilot		Mission Contacts			
Cancers	Risk Y/N		Prospect		Name	Mission	Smart Device	
Deaf Blind	Risk Y/N		Research		Name	Mission	Offerings	Jewelry
Drop sickness	No EVA		Suffrage		Name	Mission		Desk accessories
Dysphoria			Teleops		Glory	0 at start		Luxiury good
Fatigue			*Medical*	Risk	Notoriety	0 at start		Treasured item
Gastro	Kidney stones		*Speciality*	Risk	Addiction	Social	Personal Effects	
Heart attack	Risk Y/N		Addiction	Mental	Aging	Mental illness		
Injuries	Location		Aging	Alzheimer's	Dysphoria			
Malnutrition			Alzheimer's		Favours			
Osteoporosis	Physical aging injury		Blood loss	4 8 Unconscious	Mental illness	Suicide risk		kg
Oxygen	17%, 12%, Hypoxia 8%		Brain injury		Psychological risk		Addiction	
Permitted load exceeded			Dysphoria		Stress Acute (≤1 month)	All	Aging	Asset seizure
Space Suit penalty			Oxygen	14%, 10%, 6% Suffocate	PTSD (>1 month)	abilities	Debt	

Water ○○○○○
1 kg (O2 if nighttime, active cooling or Ceres zone+)

Fuel _____ centiburns
25 m/s ΔV

Small items ○○○○○○○○○
2 kg (1 tally +1 per larger item)

Sixty Years in Space Skill points

High quality crew

	Roll	Rigid	△ Disabled	◯ Damaged
Head	0/6	△◯◯	Remain prone	Unconscious
Chest	1	△◯◯*	Unable to talk	Unable to talk
Arms	2	△◯◯	No weapons	Only sidearms
Guts	3	△◯◯	No cover	Slow blood loss
Legs	4	△◯◯	Falls down	Fast blood loss
Back	5	△◯◯	Cannot move	Halve perm. load

Physical damage is applied to the location rolled on the above table.

▼	Resistance	if Rigid		Resistance	if Rigid
Bomb			Stab		
Crash		N/A	Beam		
Gun			Bolt		
Melee		+1	Fire		
Missile			Rad		+2

Energy damage is applied to the same location on both tables.

Complicated successes use the table below first.

	Roll		△ Disabled	◯ Damaged
Sensors	0/6	△ ◯	Cannot see or use sensors	
Comms	1	△ ◯	No spotting	No spotting
Weapon	2	△ ◯	Jammed	Cannot be used
PLSS	3	△ ◯	Power loss	Cooling loss
MU	4	△ ◯	No maneuver	Halve fuel
Load out	5	△ ◯	Hits largest item in your load out	

Launch day

30 years in space

Retirement day

Fold here - back cover

Fold here - front cover

Call sign _____ Year of Birth _____

Nationality _____ Pronouns _____

Languages _____

Emergency Contact Nickname Skill 5

Parent 1 Nickname Nationality _____

Parent 2 Nickname Nationality _____

Siblings Nickname Nickname

Nickname Nickname

Nickname Nickname

Crew Position Position Archetype

Service Record Service history

Year Service history (continued)

Service risks and/or upgrades

Ethnicity		Gender	Disposition		Outlooks		Philosophy	
Physical	3D6 choose 2nd		Mental	5D6 choose 2nd	Social	4D6 choose 2nd	Capital	3D6 choose 2nd
Conditioning	Minimum 4		Conditioning	Minimum 5	Conditioning	Minimum 3	Conditioning	Min 2 if White
Body	kg 6		Intelligence	6	Consciousness	<10 stops destress 15	Parent 1 Capital	
Bypass			Combat Ops		Interview		Parent 2 Capital	
EVA			Devops		Negotiate		Activism	
Firearms			Ecology		Performance		Antitrust	
Strong Arm			Engineer		Streetwise		Recruit	
Addiction	Physical		Industry		Mission Control Contacts		Trading Desk	
Aging	Cancer		Medical		Name	Skill 5	Space suit	kg
Bends	2 hrs 20 m to avoid		Mining		Name	Skill 5	Stack	Usability:
Blood loss	3 6 9 Dead		Pilot		Mission Contacts			
Cancers	Risk Y/N		Prospect		Name	Mission	Smart Device	
Deaf Blind	Risk Y/N		Research		Name	Mission	Offerings	Jewelry
Drop sickness	No EVA		Suffrage		Name	Mission		Desk accessories
Dysphoria			Teleops		Glory	0 at start		Luxiury good
Fatigue			*Medical*	Risk	Notoriety	0 at start		Treasured item
Gastro	Kidney stones		*Speciality*	Risk	Addiction	Social	Personal Effects	
Heart attack	Risk Y/N		Addiction	Mental	Aging	Mental illness		
Injuries	Location		Aging	Alzheimer's	Dysphoria			
Malnutrition			Alzheimer's		Favours			
Osteoporosis	Physical aging injury		Blood loss	4 8 Unconscious	Mental illness	Suicide risk		kg
Oxygen	17%, 12%, Hypoxia 8%		Brain injury		Psychological risk		Addiction	
Permitted load exceeded			Dysphoria		Stress Acute (≤1 month)	All	Aging	Asset seizure
Space Suit penalty			Oxygen	14%, 10%, 6% Suffocate	PTSD (>1 month)	abilities	Debt	

Water ○○○○○
1 kg (O2 if nighttime, active cooling or Ceres zone+)

Fuel _____ centiburns
25 m/s ΔV

Small items ○○○○○○○○○
2 kg (1 tally +1 per larger item)

Sixty Years in Space Skill points

Medium quality crew

	Roll	Rigid	△ Disabled	◯ Damaged
Head	0/6	△◯◯	Remain prone	Unconscious
Chest	1	△◯◯*	Unable to talk	Unable to talk
Arms	2	△◯◯	No weapons	Only sidearms
Guts	3	△◯◯	No cover	Slow blood loss
Legs	4	△◯◯	Falls down	Fast blood loss
Back	5	△◯◯	Cannot move	Halve perm. load

Physical damage is applied to the location rolled on the above table.

▼	Resistance	if Rigid		Resistance	if Rigid
Bomb			Stab		
Crash		N/A	Beam		
Gun			Bolt		
Melee		+1	Fire		
Missile			Rad		+2

Energy damage is applied to the same location on both tables.

Complicated successes use the table below first.

	Roll		△ Disabled	◯ Damaged
Sensors	0/6	△ ◯	Cannot see or use sensors	
Comms	1	△ ◯	No spotting	No spotting
Weapon	2	△ ◯	Jammed	Cannot be used
PLSS	3	△ ◯	Power loss	Cooling loss
MU	4	△ ◯	No maneuver	Halve fuel
Load out	5	△ ◯	Hits largest item in your load out	

Launch day

30 years in space

Retirement day

Fold here - back cover

Fold here - front cover

Call sign _____ Year of Birth _____

Nationality _____ Pronouns _____

Languages _____

Emergency Contact Nickname Skill 5

Parent 1 Nickname Nationality _____

Parent 2 Nickname Nationality _____

Siblings Nickname Nickname

Nickname Nickname

Nickname Nickname

Crew Position Position Archetype

Service Record Service history

Year Service history (continued)

Service risks and/or upgrades

Ethnicity		Gender	Disposition			Outlooks			Philosophy	
Physical	3D6 choose 2nd		Mental	4D6 choose 2nd		Social	3D6 choose 2nd		Capital	1D6
Conditioning	Minimum 3		Conditioning	Minimum 4		Conditioning	Minimum 4		Conditioning	Min 2 if White
Body	kg 6		Intelligence		6	Consciousness	<10 stops destress	15	Parent 1 Capital	
Bypass			Combat Ops			Interview			Parent 2 Capital	
EVA			Devops			Negotiate			Activism	
Firearms			Ecology			Performance			Antitrust	
Strong Arm			Engineer			Streetwise			Recruit	
Addiction	Physical		Industry			Mission Control Contacts			Trading Desk	
Aging	Cancer		Medical			Name	Skill 5		Space suit	kg
Bends	2 hrs 20 m to avoid		Mining			Name	Skill 5		Stack	Usability:
Blood loss	3 6 9 Dead		Pilot			Mission Contacts				
Cancers	Risk Y/N		Prospect			Name	Mission		Smart Device	
Deaf Blind	Risk Y/N		Research			Name	Mission		Offerings	Jewelry
Drop sickness	No EVA		Suffrage			Name	Mission			Desk accessories
Dysphoria			Teleops			Glory	0 at start			Luxiury good
Fatigue			*Medical*	Risk		Notoriety	0 at start			Treasured item
Gastro	Kidney stones		*Speciality*	Risk		Addiction	Social		Personal Effects	
Heart attack	Risk Y/N		Addiction	Mental		Aging	Mental illness			
Injuries	Location		Aging	Alzheimer's		Dysphoria				
Malnutrition			Alzheimer's			Favours				
Osteoporosis	Physical aging injury		Blood loss	4 8 Unconscious		Mental illness	Suicide risk			kg
Oxygen	17%, 12%, Hypoxia 8%		Brain injury			Psychological risk			Addiction	
Permitted load exceeded			Dysphoria			Stress Acute (≤1 month)	All		Aging	Asset seizure
Space Suit penalty			Oxygen	14%, 10%, 6% Suffocate		PTSD (>1 month)	abilities		Debt	

Water ○○○○○
1 kg (O2 if nighttime, active cooling or Ceres zone+)

Fuel _____ centiburns
25 m/s ΔV

Small items ○○○○○○○○○
2 kg (1 tally +1 per larger item)

Sixty Years in Space Skill points

Low quality crew