

# JUMP POINT

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## GREETINGS, CITIZENS!

Following up within a week after Citizen Con, it's hard to get much visibility until the hubbub settles a bit. So thank you for taking a few minutes with **Jump Point**. We'll try to make it worth your while.

First off, thanks to Strober and KuruptU4Fun68 for reminding me that we hadn't yet featured the Frankfurt office. They were interesting to talk to.

And then thanks to all the folks who gave me interview questions and suggestions for our Behind the Scenes discussion with them, including Algared, Astaryne, BaconofWar, Benemen, Booker\_Sheplin, Celade-Wallace, DocAndy, elbro\_dark, F-A-N-K, Far-seeker, Freakl, GeraldEvans, Krel, Imac, Luftwolf, M3neillos, Nalecondra, Oberscht, Orsk, Perry\_Hope, Schrike, SDTX, sigah, Skavenjer, SloanWarrior, Solis\_Obscuri, Speedbeat, StarLord-1, steve-2001, thanatos1973, TheronShan, Tony\_Knightcrawler, Topsock, Wiborg1978, Xedis and Xris. (As always, let me know if I overlooked anyone else.)

I wasn't able to use every question or suggestion you gave me, especially the questions that turned out to not be applicable to the Frankfurt office, but I appreciate all of them. For those who didn't get your question answered, hold on to it (and keep reminding me that it something you want to hear about), and we'll try to get to it. In particular, it sounds like you'd like to hear about VR ... I'll try to track down a willing staffer. :)

And bonus karma points to Speedbeat (I keep wanting to type "Speedboat") and Booker\_Sheplin, who offered Ger-



man translations of their questions. But it turned out that the primary language even around the Frankfurt office is English – who knew? – so we stuck with English.

Meanwhile, the rest of **JP** is filled with the usual servings of juicy goodness – the development of the Endeavor, in all its various manifestations and variations, the inside story on BiotiCorp and their Autodocs, a tour of Rhetor and its many universities, and another chapter in the tale of Jonah's one last job. It seems like the guy just can't catch a break – I'm hoping your adventures in the 'verse (and mine!) turn out to be a bit more rewarding.

Well, Ben just knocked politely on my computer to ask if this is ready yet, so I'd probably better wrap it up and get it posted. As always, thanks for reading and let me know what you want to read about in future issues. I can't give you everything, at least not just yet, but what I can, I will.

*Hold on, it's gonna be a wild ride!*

*David*

David.Ladyman@cloudimperiumgames.com

## SPOTLIGHT!

**Page 47: Hannes Appell, Director of Cinematics**

**Page 50: Sean Tracy, Content Technical Director**

**EDITOR: DAVID LADYMAN, INGAN MONKEY GOD STUDIOS**

**ROVING CORRESPONDENT: BEN LESNICK**

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**COVER: RYAN ARCHER**

**PAGE 33: RYAN ARCHER**

**PAGES 52, 55: KEN FAIRCLOUGH**

**PAGE 56: KEN FAIRCLOUGH & MEGAN CHEEVER**



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FROM THE HUBBUB!





# Endeavor

## INITIAL DESIGN DOC

The MISC Endeavor is the company's most prestigious ship: a dedicated research platform capable of carrying a dozen different space science packages, running the gamut from advanced long-range scanners for jump point identification to additional shielding for near-stellar corona research. Externally, the Endeavor is dotted with sensor hardpoints; internally, the main compartment is centered on a large research laboratory which can be configured for use by a wide range of scientific disciplines. The Endeavor's main compartment is modular, allowing an alternate configuration as a Hope-class floating hospital. This variant is employed by the UEE and other organizations as battlefield support, capable of getting Marines and pilots back to the battle as quickly as possible! When outfitted as a hospital, the Endeavor's docking bay is capable of maintaining a single Cutlass Red ambulance. The Endeavor has also found its way into the service of less reputable organizations, where it has been modified for everything from narcotics production to black market surgery.

## 10-16 Crew

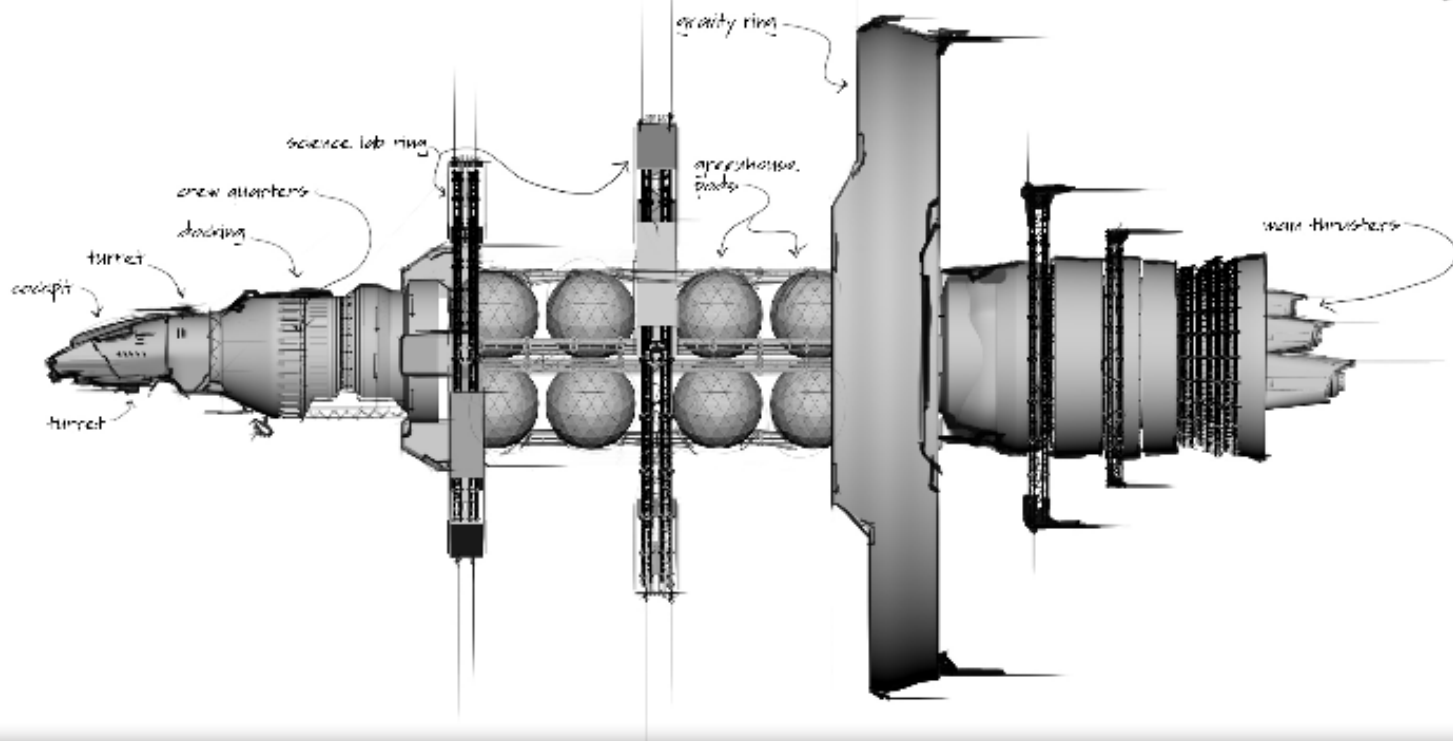
- Pilot
- Co-pilot
- 1-2 radar/scanner technicians
- 5-8 research/healing/augmentation seats
- 2-4 remote turret pilots

**Variants:** (Research Platform (Base), Mobile Hospital, Component Augmentation Station)

- Endeavor Class Research Platform (Base). Take data and turn it into more valuable data.
- Hope Class Mobile Hospital
- Virtue Class Component Augmentation Station. The ship of choice for gearheads to squeeze every drop of performance out of their equipment. Often run as a service-for-hire.

(Merit Class? Precision Class? Criterion Class? Paradigm Class?)

## MISC Endeavor 01



WORK IN PROGRESS

The first versions were designed by **Lance Powell, Supervising Art Director, CIG-LA.**

**Chris R:** I think you are on to something here - I quite like it - It has a bit of the Reliant vibe.

I would think we may want to have a few more MISC signatures - maybe the engines?

I think there needs to be work for the probes (docking, storage, launching, recovery), places for sample storage, sample taking (in nebula, tails of comets). Ship definitely needs a small hangar for shuttle craft / supply ship docking. Be cool to have modular pods that can attach for various things - living quarters - zero G manufacture, laboratory, etc.

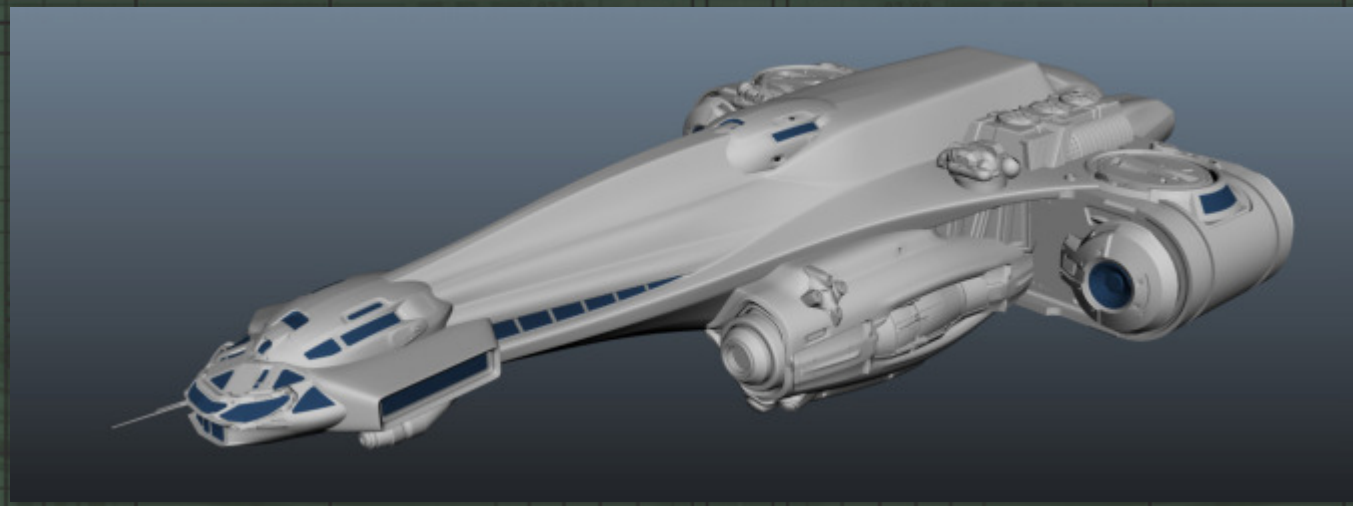
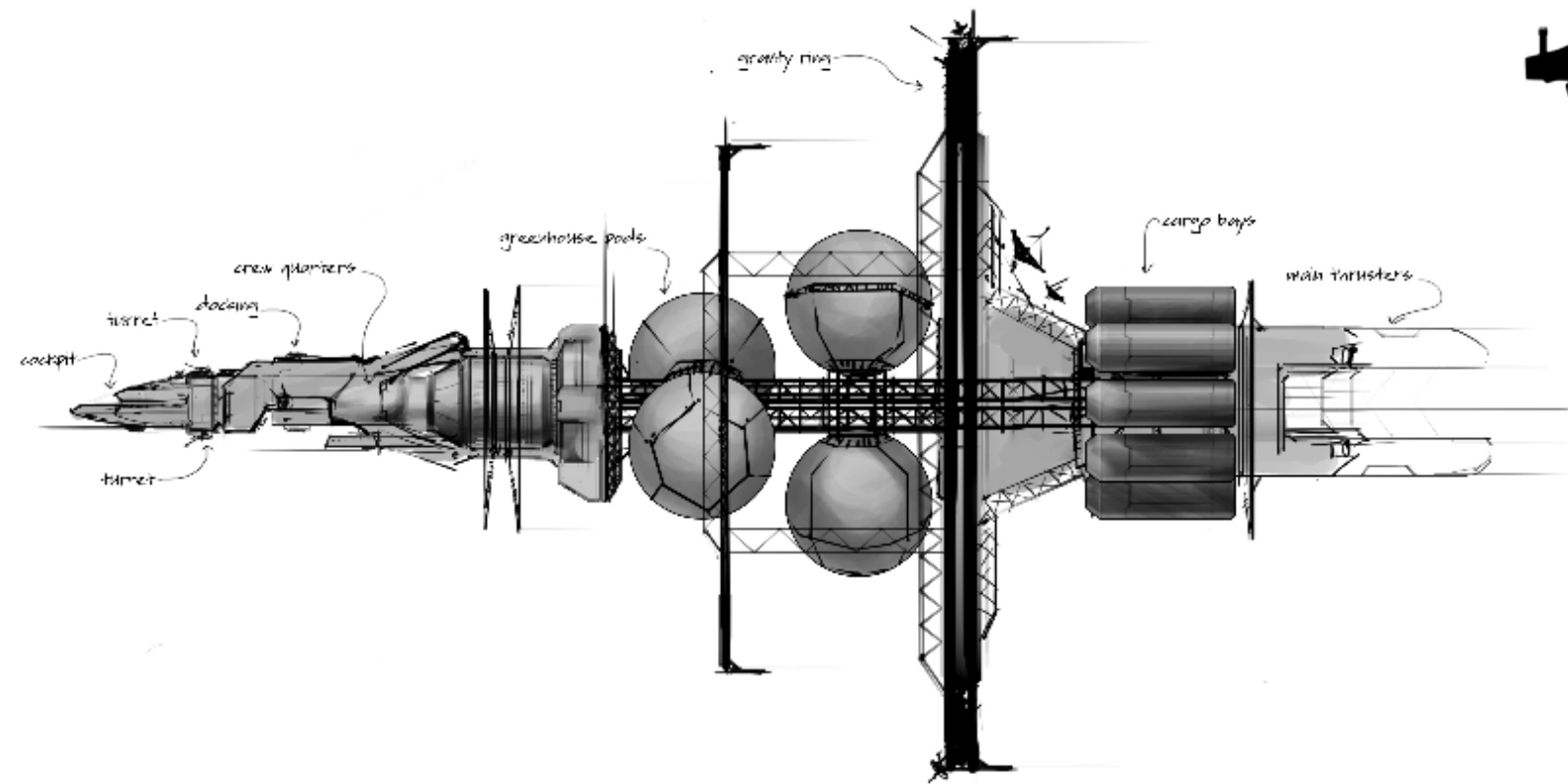
I'm assuming all this stuff would attach to the middle section?

**Ben Lesnick, Director of Community Engagement, Online Strategy and Ship Development:** I like this approach! I certainly see the Discovery in there, but it also reminds me a great deal of the human transport in *Wing Commander III* and *IV* ... which had modules that function in a way similar to what I think Chris is thinking here. (Heck, it even has the same position for the stinger turret!)

If we could launch this ship alongside a set of potential science/health modules, we'd really have something!

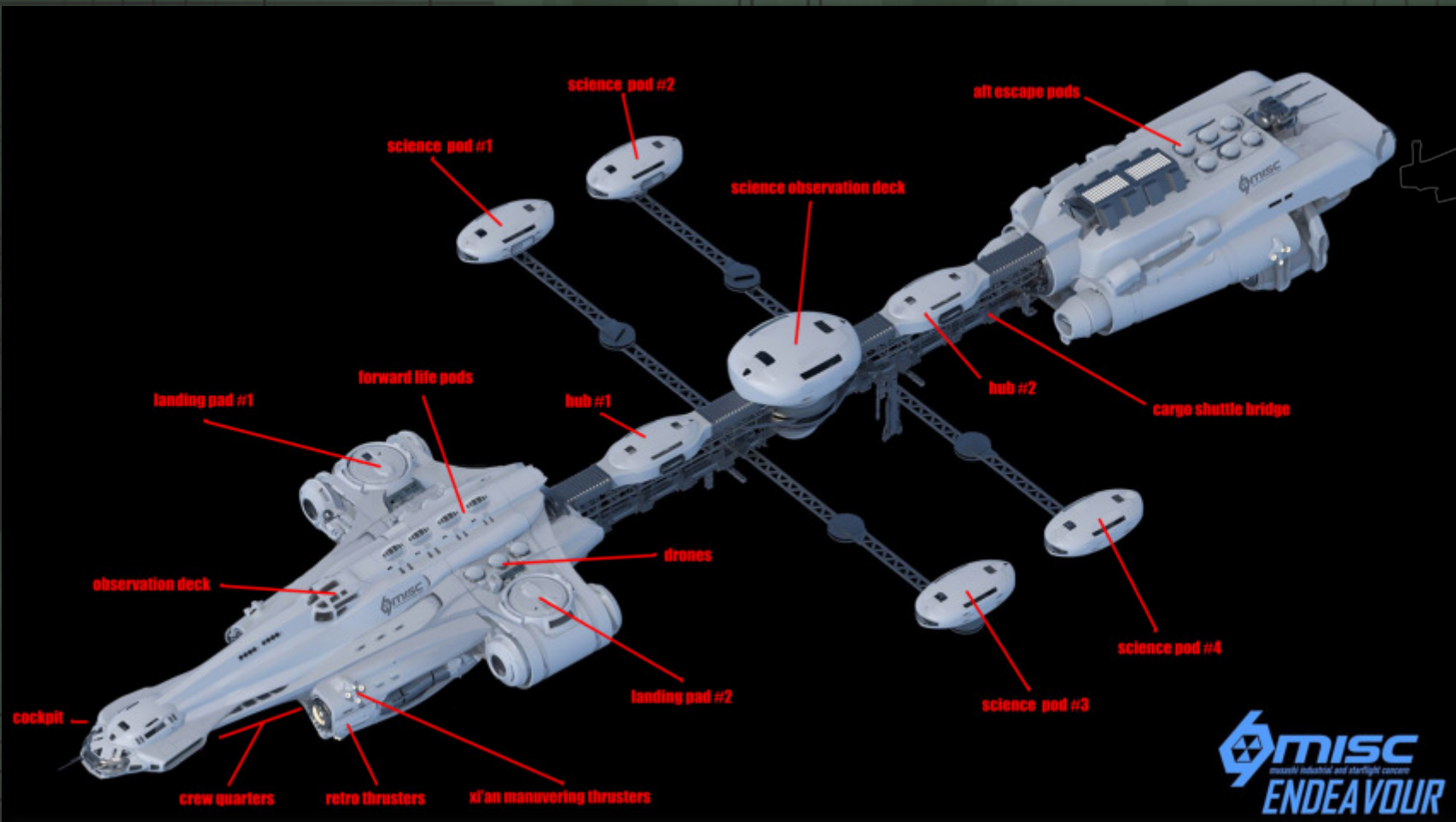


# MISC Endeavor 02



WORK IN PROGRESS





WORK IN PROGRESS

At about this point, the design shifted from Lance to Jim Martin, the freelance artist who has already done several ships for us, including the Cutlass, Freelancer and Scythe.

**Jim M:** Attached, you'll find the latest version of the ship. (The engine section hasn't been touched – that's next, plus next round of feedback.) I'm looking for critical feedback!

### Forward Section

- Cockpit
  - Conference Bays
- Crew Quarters
- Forward Life Pods
- Ship Docking Rings
  - Decompression Bays
- Drones 1-6

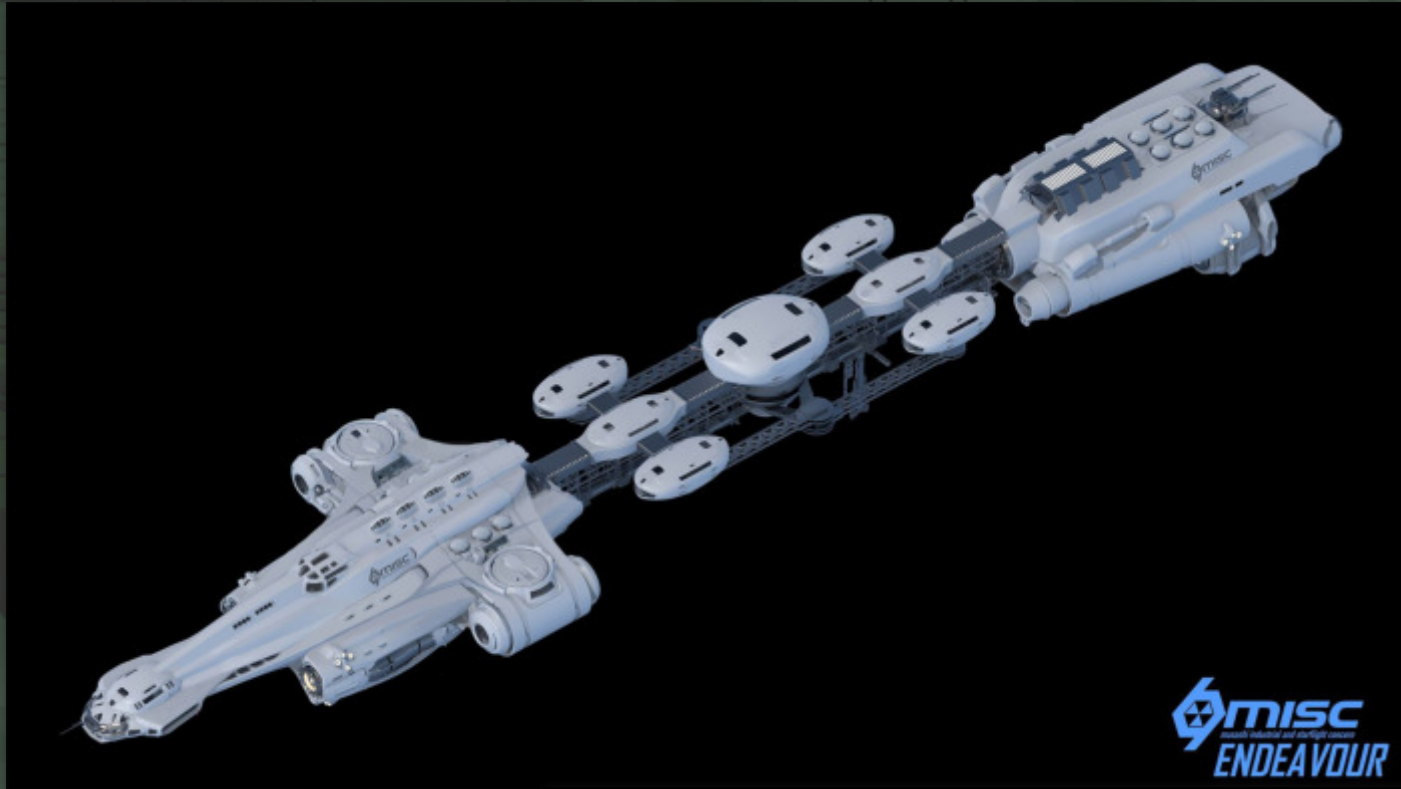
### Mid Section

- Sky Walk
- Hubs
  - Sealable
- Science Pods (configurable; this is where you'd mount technologies for specific missions)

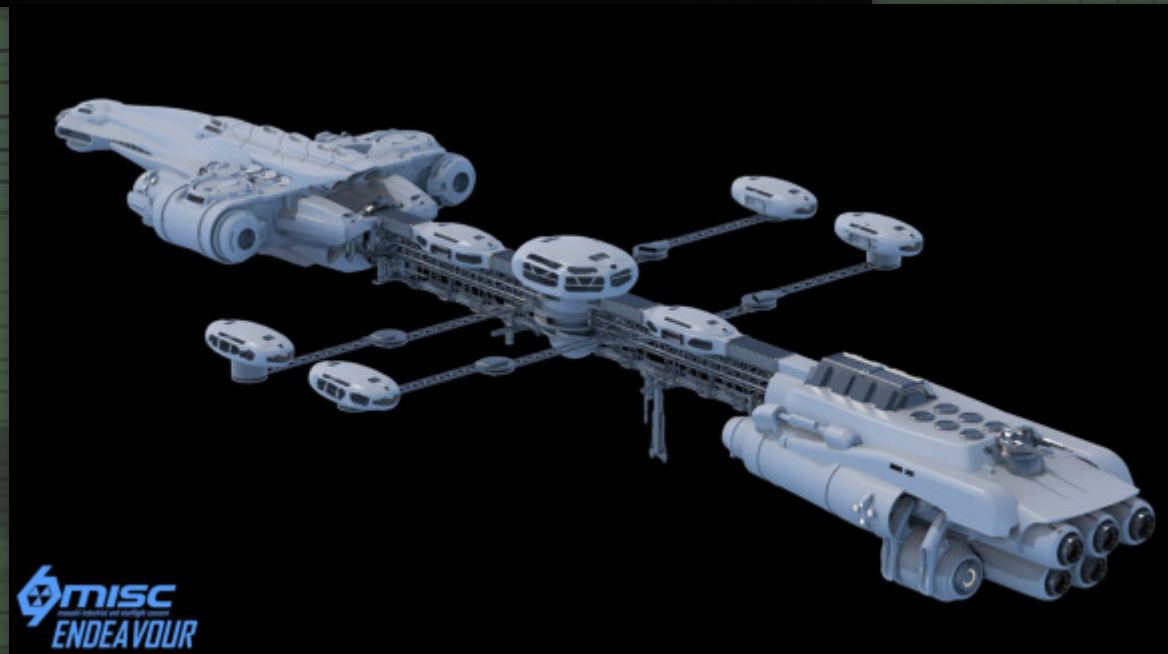
Sealable, isolated chambers that operate as part of a hub, or can extend from ship (to perform studies without ship interference)

- Science Observation Deck
- Cargo Bridge (shuttle cargo between forward and rear of the ship)





**MISC**  
MUSIC IN SCIENCE CLASS  
**ENDEAVOUR**



**MISC**  
MUSIC IN SCIENCE CLASS  
**ENDEAVOUR**



WORKING IN PROGRESS



**Ben L:** I think this is coming along nicely! It definitely has a distinct science feel to it, and the MISC styling is spot on.

A few questions ...

1. What's the difference between the observation deck and the science observation deck? Maybe one of them could have more of a glass dome look with some type of space telescope mount?
2. Is there a reason why the science pods extend? How do you get into them? Can you attach other types than what we see here? (When we sell, it'd be good to show a variety of possible pods with slight visual differences. Astronomy pod versus biology pod, etc. Hydroponic greenhouse pod with plants in it and so on.)
3. Any thought to something more vertical for the pod attachments? It seems like a very flat pane of a ship, making you wonder why there aren't pod arms above and below. Maybe some kind of cool deep space antennae sets that retract up while it's in science-doin' mode?
4. In the screenshot where the pods are pulled in, it looks like it's making a smiley face on each one because of the windows. Once you see it, it's hard to unsee! (Probably just at that particular angle, though.)
5. How 'bout a very distinct EVA point? I'm thinking of the shuttle bay doors on the Discovery or the shuttle dock points on the sides of the movie Enterprise. The sort of thing you'd expect to open and see a room full of cool space suits.
6. What size is the stinger turret? It fits well with the design but looks HUGE for a research ship.

**Jim M:** Good Q's.

1. I was thinking the observation deck (in the center of the ship body – really needs another name) was the area where the ship team would gather, hold meetings, or eat. One of those places where, when the shit hits the fan, that's where they meet (ala Alien, 2010, etc.);

The science observation deck (also needs a new name!) is the main hub that either controls the science experiments, or monitors the pods (or whatever is in the pods' place). This could be a great spot for a telescope.

2. The pods are a catch-all for a modular system that can be swapped out. For example: Tony asked for a telescope (like the Webb scope) that could be moved away from the ship so it didn't pick up engine signatures for precision reading. You're spot on: the pods could be swapped out for various configurations. Tony has specific needs for PU, Calix has other needs – I think you're spot on, being able to show various systems would really boost interest in the ship.
3. I was thinking about vertical pods; no reason we couldn't have them. The center design needs a lot of attention – right now, it feels like a disconnected system; it needs additional structures to give it volume. There is a folded-up antenna on the bottom of the structure not seen in that last image, but it's glued there for now.

4. Agreed. Working on removing those smiley faces. :)
5. Will definitely add EVA locations – two forward, two rear?
6. The gun is way too big. Thinking a few size 1 turrets?

There are also two tractor beams missing either side of the drones – that'll be in the next version.



1.



WORKING PAPER

2.

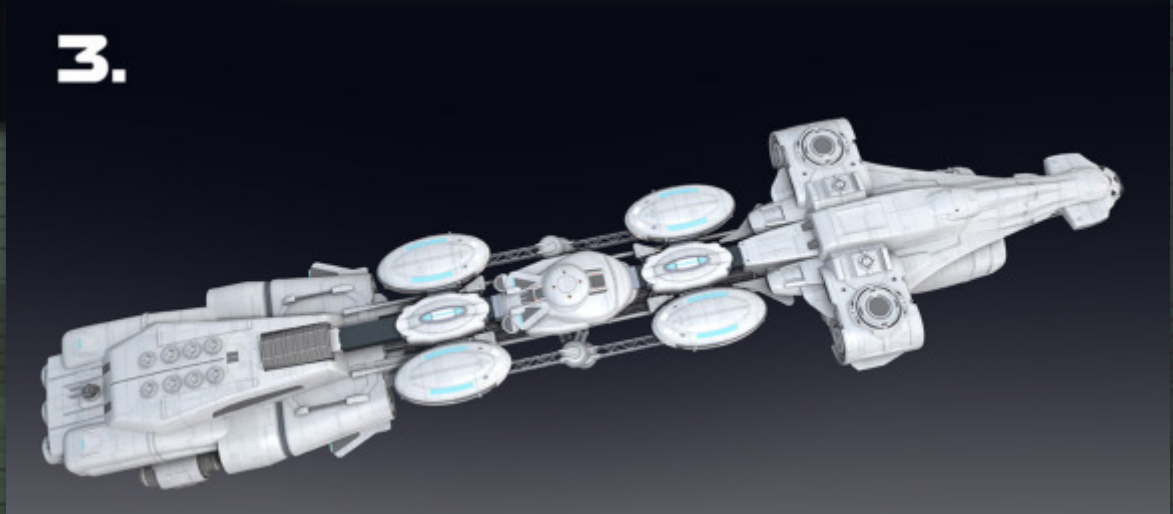


**Mark Skelton, Art Director, CIG-ATX:** Kick ass! Love the front section!

For me, I feel that the ovals in the center are throwing off the balance since my eye goes straight to them. Maybe if we put some ovals elsewhere also, they wouldn't draw your attention so much.

**Jim M:** I was keeping to the original concept of having science "pods" that crane out sideways from the ship. I agree with your note that they should integrate well with the overall design. Yes, maybe we repeat the oval motif elsewhere or maybe make the pods less oval and more modular. I'll explore.

3.





4.



**Chris Smith, Lead Vehicle Artist:** A couple of questions: It looks like the front part could detach and be its own ship. Is that the case here? Also, do the pods attached to the middle section detach as escape pods?

It's looking cool so far! I think the front end design is really strong. The rear is ok; I think it could use some more tweaks to bring it up the feeling of the front. I dig the middle section on #5. I think the boxy design in the center complements all the round shapes around it well, and ties it in nicely with the shape language of the rest of the ship.

**Jim M:** I'm working out the center section like in #5 so that it is more "ship-like" and boxy through the center "spine." I totally agree on the engine section, it needs some love. I'm working on styling up that portion of the design so that it matches up with the flow of the front, but still keeps that "utility" feel that the engine chunk should have. As for the front section detaching, it wasn't in the original design idea but it makes a cool ship shape on its own – so it can if you want it to. I'll keep going on it.



5.



WORKING IN PROGRESS

6.



**Jim M:** I've included the Freelancer as reference since this is an MISC ship.



## DESIGN REVIEW MEETING

*Attendees: Lisa Ohanian, Eric Davis, Chris Robert, Tony Zurovec, Dan Tracy, Ben Lesnick, Chris Smith, Forrest Stephan, Elwin Bachiller, Mark Skelton.*

Summary of comments:

**Chris R:** I have no issues with how it looks generally.

**Tony Zurovec, Persistent Universe Game Director:** It's not a good match visually for the ship's purpose – it looks like a transporter, not a research ship. It should be more sprightly and more heavily shielded.

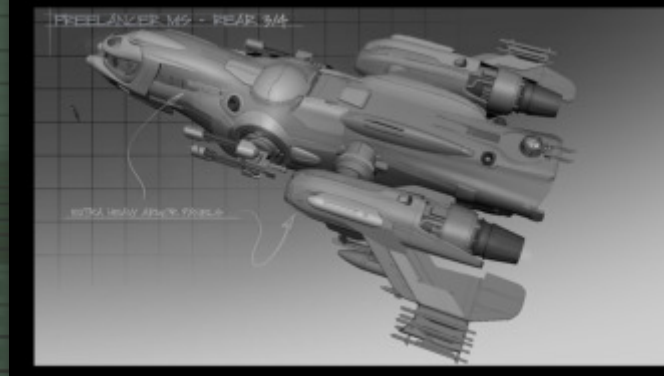
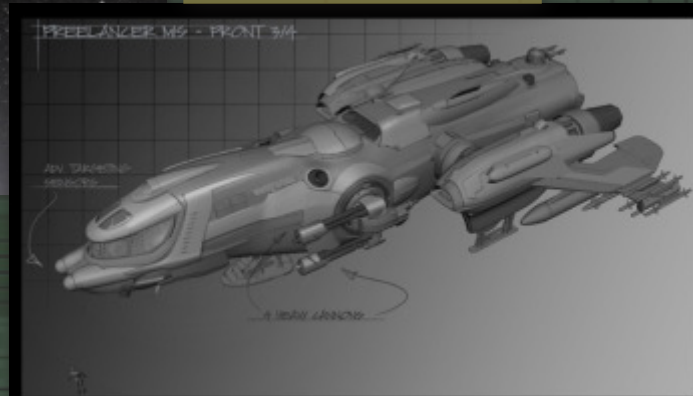
**Lisa Ohanian, Production Coordinator, CIG-LA:** We need to clarify the purpose of this specific ship – observatory or explorer.

Next steps:

**Chris R:** Have Jim Martin create a basic whitebox so Design can evaluate functionality.

Meanwhile, determine modular pod options – see attached for a writeup by Ben Lesnick [on next two pages].

**Elwin Bachiller, Senior Spacecraft Modeler:** We need to work on sizing for this ship and the pods/engines.



WORKING PROGRESS



## SCIENCE PODS (ENDEAVOR-CLASS)

### Zero Gravity Laboratory

**Gameplay:** Ties into the overclocking system that we've discussed in the past; players who perform their overclocking in this 'clean room' environment might have a better chance of success, or some other appropriate buff to the process. The idea is that this is the best possible place to overclock components, and it either increases the ease of the process or it adds something extra to the end result.

**Reference:** *A microprocessor factory, like the egg lab from Jurassic Park.*

### Deep Space Observatory

**Gameplay:** The Deep Space Observatory ties the science ship in with the exploration mechanic. It could have two missions:

Generating science data that can be sold to the UEE (fly out to L5, take X number of photos of these coordinates, travel to the corona of this star and take three samples, etc.). This would earn Credits for the players, and also contribute to an overall 'knowledge level' of the world. (So you'd have lots of players working together to try to increase the completion level of individual locations. Think the Mass Effect 2 probe game that everyone kept playing even after earning more than enough resources, just because it was satisfying to see all the planets turn over to depleted.)

Performing longer-term tasks that can result in the discovery of potential jump points. The possible jump point coordinate is the reward, which can then be sold for big Credits OR investigated with a player's own explorer ship (Carrack, Aquila, etc.).

Players would likely pair the DSO module with Shield Array pods (see below) for protection in many environments.

**Reference:** *James Webb Space Telescope; I'm imagining a larger, centralized module that expands outward while in use (antennae deploying and the like).*

### Pod/Drone Bay

**Gameplay:** A launch deck for between one and three small utility pods. These would be hardened mobile pods that can be flown by an individual player to investigate more dangerous phenomena. Need a core sample from a comet but don't want to fly your expensive research ship into the tail? Into the pod! (I picture players adapting these for their own uses; quietly planting an explosive on an enemy ship, pod racing, emergent gameplay!)

**Reference:** *The personal pods in 2001 and 2010*

### Botany Lab

**Gameplay:** Worlds undergoing the terraforming process need carefully curated plant life to establish their ecosystems! Using science data generated by other modules, players could be challenged to find similar worlds (star type, orbit, etc.) as the one being terraformed, collect plant life (via store interface) and then 'grow' it exposed to the sunlight of the new system. Boils down to a variation of cargo, with a baking mechanic: you have to go to a particular place to grow your plants and contend with random encounters (pirates, solar flares, etc.) until you can sell the load of plants for Credits.

**Reference:** *The hydroponics domes in Silent Running*

### Zoology Lab

**Gameplay:** Purely for collectors. We know we have players who are eager to collect fish (and presumably other items) from our various worlds ... the zoology lab is the place to display them! It's the maxed out, mobile version of our existing fishtank (to which we'd add terrariums and other environments for disparate critters).

**Reference:** *Behind the scenes at an aquarium or zoo; the museum in Animal Crossing.*



WORK IN PROGRESS



## MEDICINE PODS (HOPE-CLASS)

### Ambulance Bay

**Gameplay:** Small flight deck capable of supporting a Cutlass Red space ambulance and similarly sized ships. The medical ship will launch these ambulances on search and recovery missions, either in a known battlefield or responding to player/NPC requests. Their job will be to locate and stabilize wounded people for transport back to the mothership. Players will presumably also use this to create their own brittle mini-carriers.

**Reference:** *The helicopter deck on an Arleigh Burke-class destroyer (with the associated decontamination room)*

### Operating Theater

**Gameplay:** The operating theater module of the ship is the highest-level personal repair facility available without shipping the patient back to a planet. This is where any of the highest-level FPS body repair stuff can happen – replace lost limbs, fix damaged organs, etc. The operating theater could also be used for darker purposes – pirates might adapt the ship for body reconstruction to hide identities, or for performing illegal body modifications.

**Reference:** *Any actual hospital, or any of the relevant work we've already done for Squadron 42.*

### Rest and Recovery

**Gameplay:** This is a lesser tier of medical facility. The operating theater focuses on treating a single patient; the rest and recovery module has a lineup of beds intended to stabilize multiple patients at a slower pace. Part of your job as an S&R crewman is to triage cases and determine who needs to be treated in the Operating Theater immediately.

**Reference:** *Same as ambulance bay.*

### Storage

**Gameplay:** Additional refrigerated storage for medical equipment. For gameplay purposes, it's a closet used to store extra material that you'd use in the Operating Theater and Rest and Recovery modules. It would also be a cool set piece for random encounters and boarding actions: idle medical equipment, fresh limbs growing in bacta tanks and so on.

**Reference:** *Same (with a mad science spin)*

## GENERIC PODS

### Living Quarters

**Gameplay:** Additional standardized living quarters for passengers. Non-intuitive: beds, windows, tables, bathrooms.

**Reference:** *n/a.*

### Cargo - Bulk

**Gameplay:** Standard empty cargo space in which to store any freight.

**Reference:** *n/a (could be the same crates used on the Hull series).*

### Cargo - Tank

**Gameplay:** Standard cargo space in which to store any liquids. I only break this out because I think it will be a cool visual to have a tank full of liquids on the ship ... especially when they blow up (ref the shield towers going down on the Star Destroyer in Return of the Jedi).

**Reference:** *Any water tower.*

### Shield Array

**Gameplay:** No special gameplay, beyond dispatching players here to repair damage to the shields. These are support modules that limit the overall space available for the player in the ship and add a buff to the ship's overall stats (idea being that it includes an extra shield generator that can provide more protection during research missions).

**Reference:** *n/a.*

### Defensive Platform

**Gameplay:** A set of turret mounts that can be used in place of a 'functional' ship module. For example, a hospital ship that wants additional protection can essentially decide to trade bed space for guns.

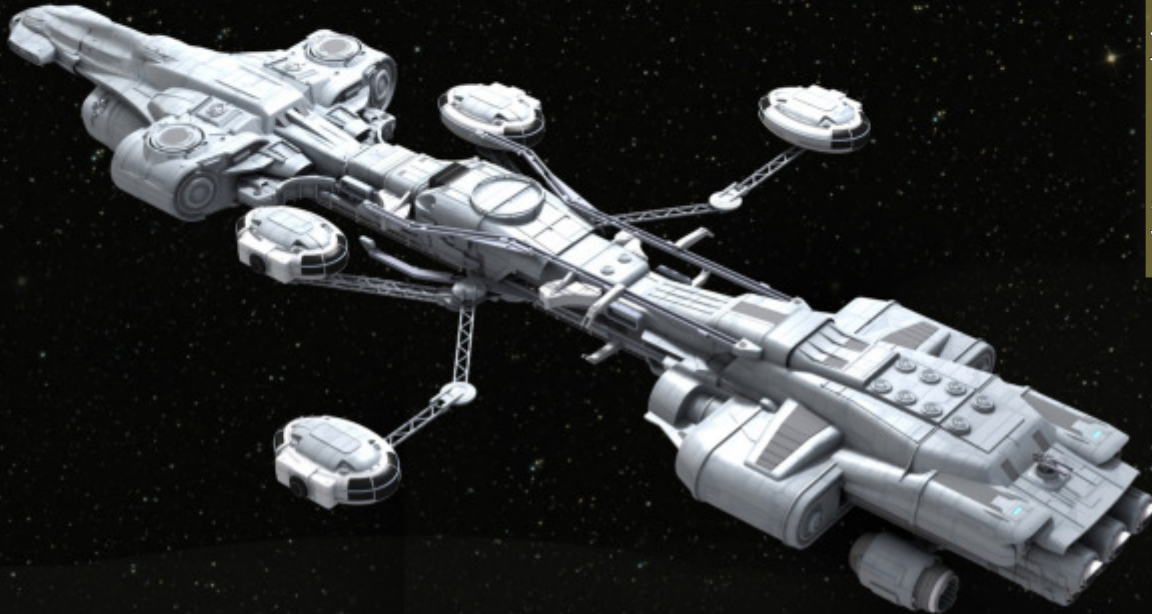
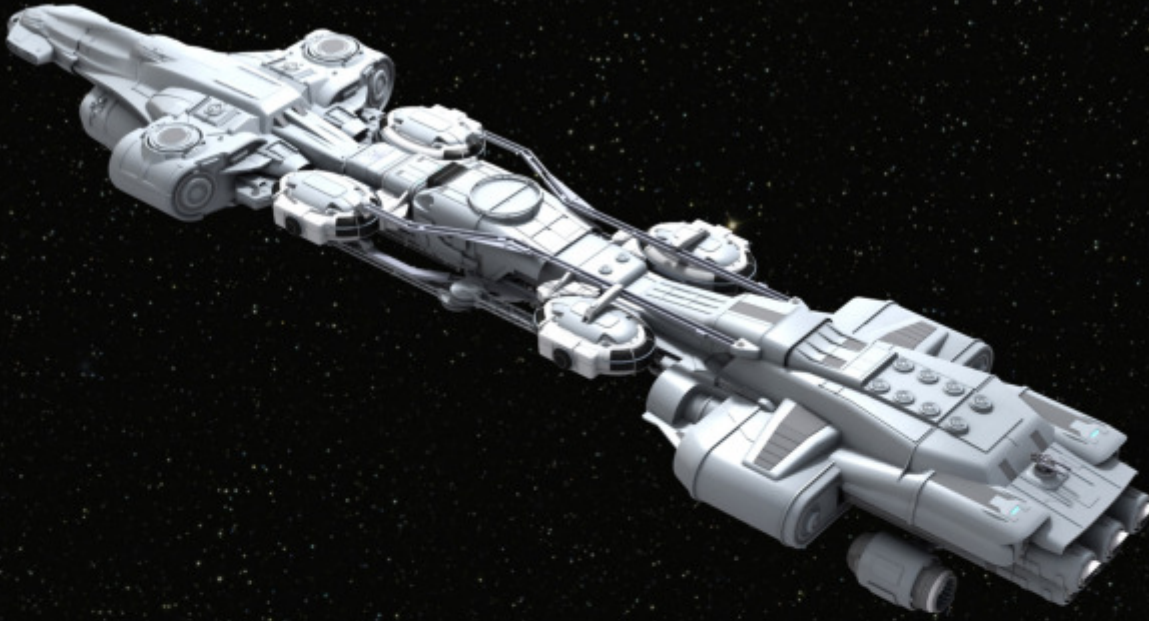
**Reference:** *n/a (the turret mines in Wing Commander IV are a good example of distinct turret modules, though).*



WORKING PROGRESS



# ENDEAVOR

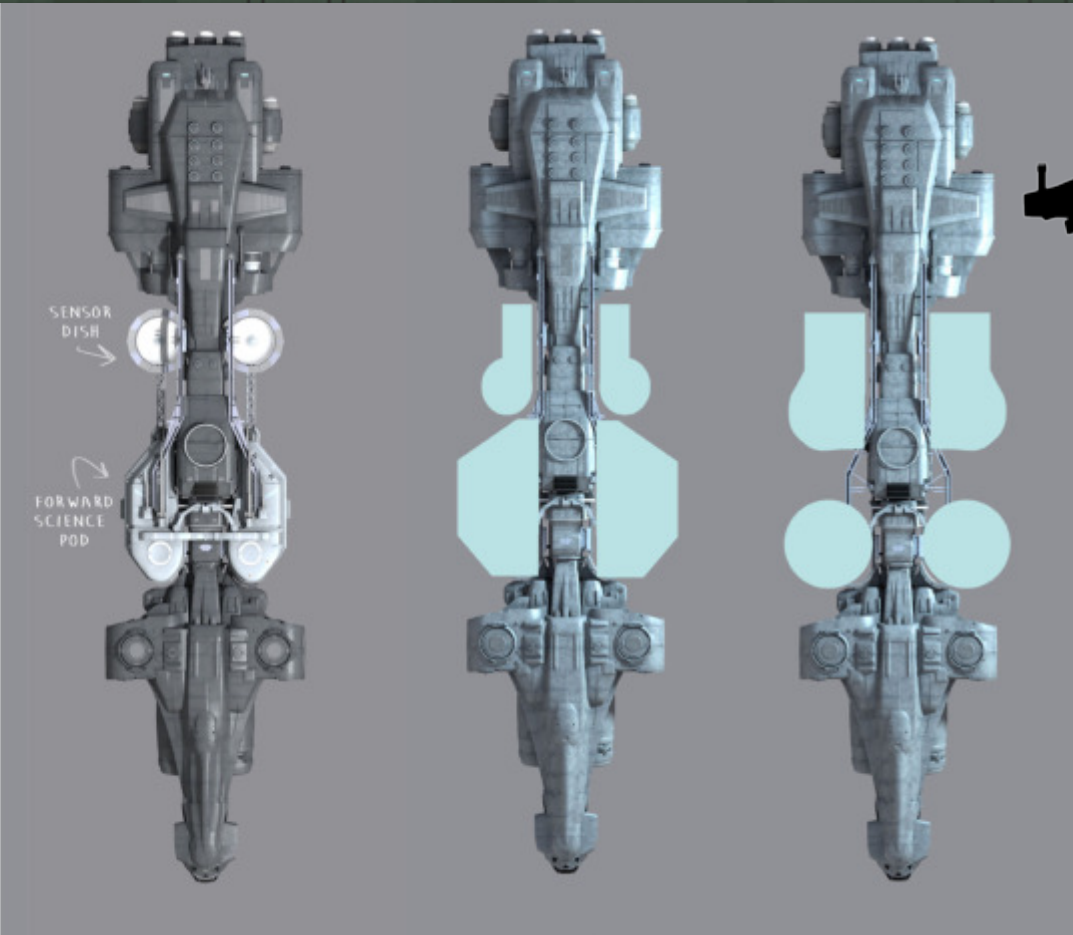
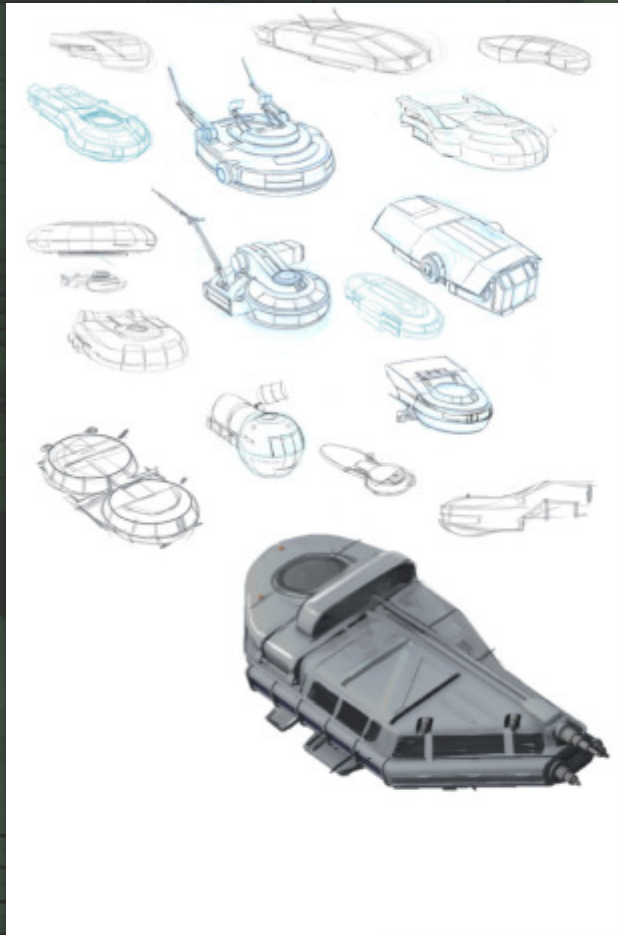


**Jim M:** Here's a reconfigure of the Endeavor science pods and back engine with a restyle of the center spine. A work in progress, looking for some feedback. It's a science ship, cool but technical with a little "nerdy" thrown in.



WORK IN PROGRESS





WORK IN PROGRESS



**Jim M:** Endeavor version with a basic science bay that includes a sensor rig and sensor dish. This is only a base idea of doing something other than a bubble pod. Other designs on the way, just wanted to get some stuff in front of you.





## DESIGN REVIEW MEETING

Attendees: Lisa Ohanian, Ben Lesnick, Calix Reneau, Tony Zurovec

**Tony Z:** Let's remove the extension arms.

**Ben L:** I'd prefer a more traditional-looking telescope that rotates instead of moves.

**Calix Reneau, Technical Designer:** Radars also look too medical.

**Tony Z:** Remove the vertical spindles as well (from pods on the extenders).

**Ben L:** Overall shape is otherwise good.

Would like to see more focus on the modules, specifically more distinct modules. Please design the specific science modules, instead of just providing interchangeable shape options, and please call out which pods are which.

We would also like to see more creatively shaped pods, such as pods that go (or even attach) under or above the bridge, not just symmetrically on either side.

**Tony Z:** Perhaps the "head" of the ship can break off, before the bridge. The head would be able to fly solo and go into more dangerous areas, but the main body of the ship would not be able to move without the head attached.

**Calix R:** We need more info from Jim on what the probes are in the space images. Perhaps the "horns" at center [in image above] store the probes when not in use?

**Tony Z:** Position ejection on the same side of the ship as the remote viewing.



**Jim M:** Science configurations



WORKING PROGRESS



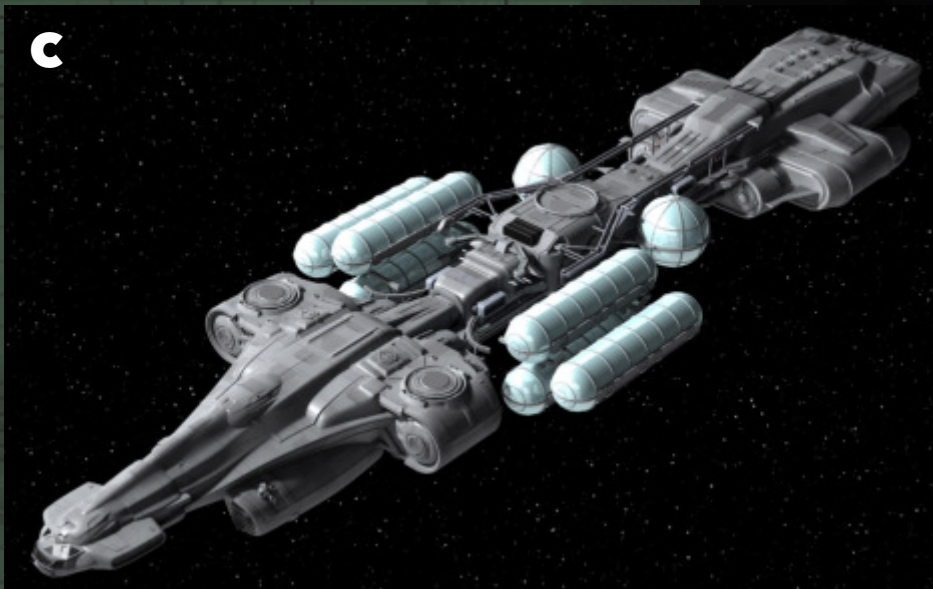
**A**

**Jim M:** Endeavor with attached bio-domes / hydro-domes for vegetation in space / biosphere experimentation. Some shape ideas and configs.

## DESIGN REVIEW MEETING

*Attendees: Lisa Ohanian, Elwin Bachiller, Calix Reneau, Chris Roberts, Eric Davis, Ben Lesnick, James Pugh, Dan Tracy, Todd Papy*

**Ben L:** We need Jim to provide specific pods, not just shapes. For example, the pod on the right of image B is good, but what is it?

**B****C**

## Design Review Meeting (cont.)

**Chris R:** I'd like to see something similar to Micro-tech concept art. I don't like image C.

**Ben L:** I would still like to see a view of the front head disconnected from the beam.

**Chris R:** We need more detailed harvesting mechanics.



WORKING IN PROGRESS



**Jim M:** Here are some added components that push away from the more standard modules. An idea for a pod launch bay, a break-up with solar panels, a circular element that can be a gravity science pod or a scanning array. Getting more options on the table.



POD LAUNCH BAY



SOLAR PANELS

**Chris R:** I like this look – it really makes the silhouette feel different.

I think the big thing we are missing is some feel of the interior. What is the cockpit view? How do you traverse back to the engine? To the attached pods? What do the attached pods look like inside? The Bio / Botany Dome is obvious, but what about the Deep Space Observatory? The Zero G Laboratory (on the inside)? The Zoology Lab? The Ambulance Bay? The Operating Theater? Rest and Recovery?

And how about a living quarters bay? A drone bay? A shield array? A defensive platform?

**Chris S:** This is the most striking design so far; I like it! The ring is providing a nice break-up to the long shape of the ship. I do think the top area of the front module of the ship seems a little flat and could use some more silhouette definition and breakup [marked on inset]. And yes, we really need interior shots, as any changes to interior could potentially affect the exterior design as well.

It also would be nice to see where all the items (radar, shield, powerplant, etc.) will be going as well.



GRAVITY SCIENCE POD OR SCANNING ARRAY



WORK IN PROGRESS



## DESIGN REVIEW MEETING

Attendees: Lisa Ohanian, Chris Roberts, Ben Lesnick, Elwin Bachiller, Mark Skelton, Chris Smith, Jim Martin

Lisa O: Science pods currently being worked on:

- Zero-G Laboratory
- Drone Bay
- Deep Space Observatory
- Botany Lab
- Zoology Lab

**Chris R:** I would prefer 2-3 'pod slots' that are symmetrical, rather than twice the numbers of pods.

ZERO-G LABORATORY (closest image: A)

**Chris R:** Love the ring; we need this for it.

- Define how it attaches to the ship.
- Establish how players enter the ring.
- Define what this looks like both from exterior and interior.

**Chris S:** Add some more shape to the non-ring part of this pod, to avoid looking too flat.

DRONE BAY (closest image: B)

**Ben L:** Would like to see variations on this image.

**Jim M:** Perhaps add another attachment for pod storage.

DEEP SPACE OBSERVATORY (closest image: C)

**Jim M:** Will add some elements of D.

I want to focus on the larger screens rather than the spindles.

**Ben L:** This is the right direction, but more modern looking like 'Endeavor-Grav-Unit01'.

BOTANY LAB & ZOOLOGY LAB (closest image: E)

**Ben L:** I prefer the look of the image on the right of E for Botany Lab.

**Chris R:** Use Microtech as a visual reference.

**Ben L:** For Zoology Lab, let's see some iterations on the chosen Botany Lab. It should be focused on collections, more industrial looking.

A futuristic spacecraft with a large circular ring structure attached to its side, flying in space. The ring has a complex internal structure and is surrounded by a blue and white nebula.

A futuristic spacecraft with a large circular ring structure attached to its side, flying in space. The ring has a complex internal structure and is surrounded by a blue and white nebula.

A futuristic spacecraft with a large circular ring structure attached to its side, flying in space. The ring has a complex internal structure and is surrounded by a blue and white nebula.

A futuristic spacecraft with a large circular ring structure attached to its side, flying in space. The ring has a complex internal structure and is surrounded by a blue and white nebula.

Two futuristic spacecraft designs, one with a large circular ring structure attached to its side, flying in space. The ring has a complex internal structure and is surrounded by a blue and white nebula.

A silhouette of a character wearing a helmet with the number 19 on the back.

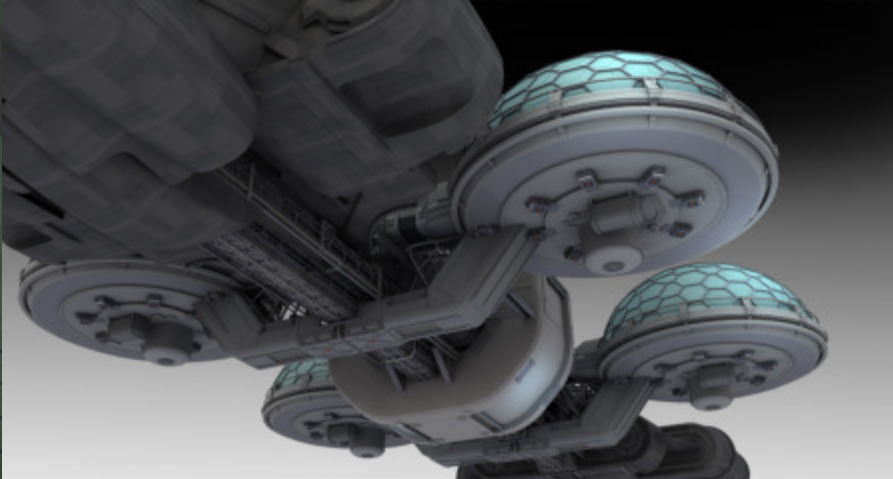
WORKING IN PROGRESS



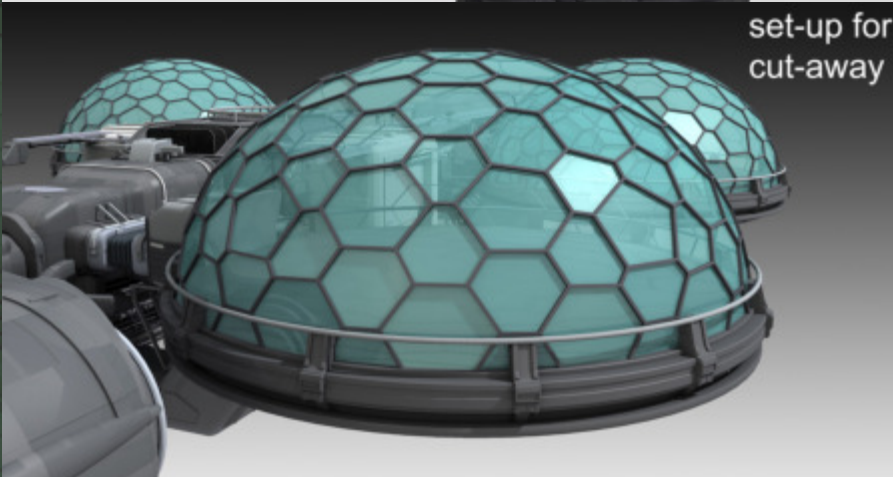
preliminary bio-pods



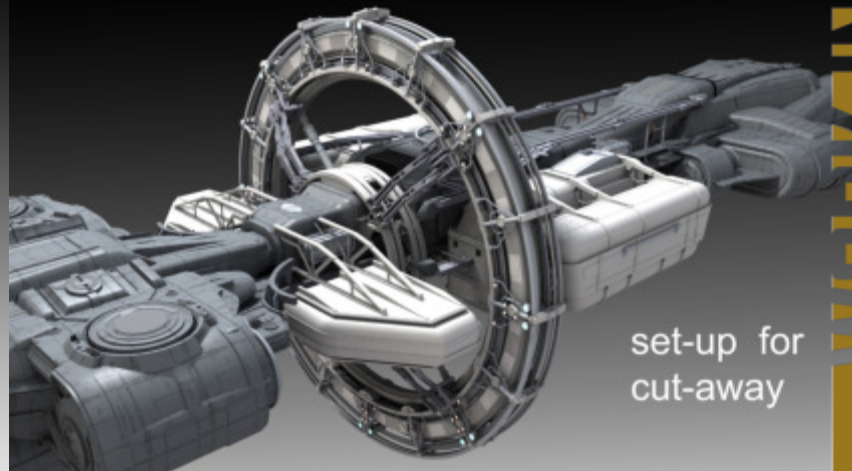
**Jim M:** Here are five base layouts for pods. I will go after these and detail and embellish until they are tight. Also a prelim cockpit. Still working on the separating front ship and a landed pod.



Preliminary gravity lab

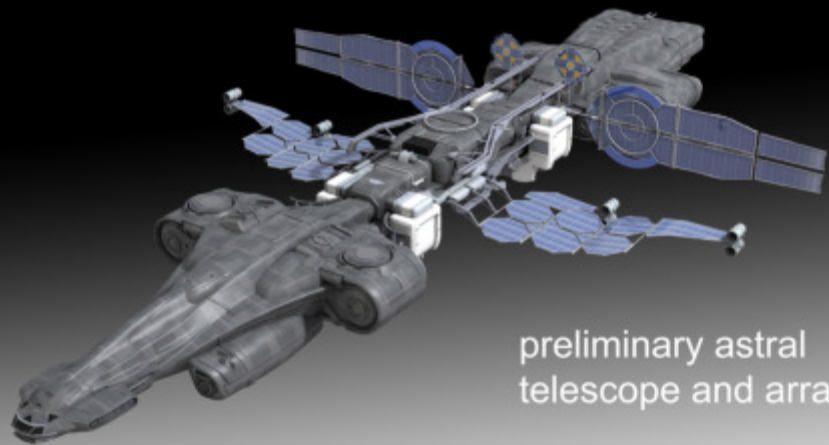


set-up for cut-away



set-up for cut-away

WORKING ON THIS



preliminary astral  
telescope and array



set-up for  
cut-away

underslung launch bay  
w/ general purpose pod



in progress  
medical layout  
landing bays not added yet

all-purpose pods  
pod 5, 6



WORKING IN PROGRESS

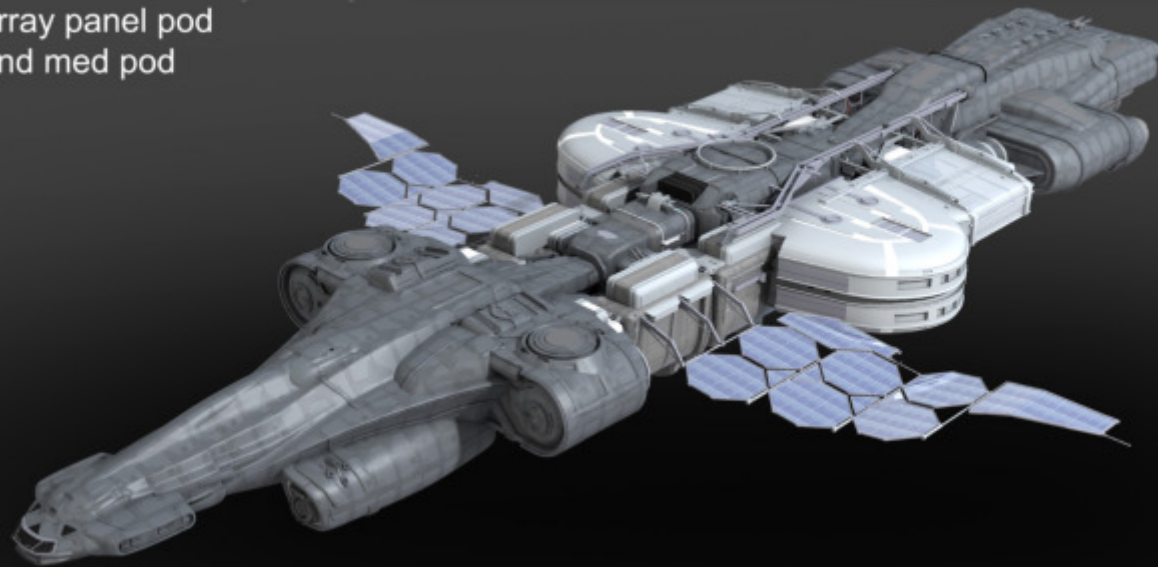




rough in cockpit

## hybrid version

array panel pod  
and med pod

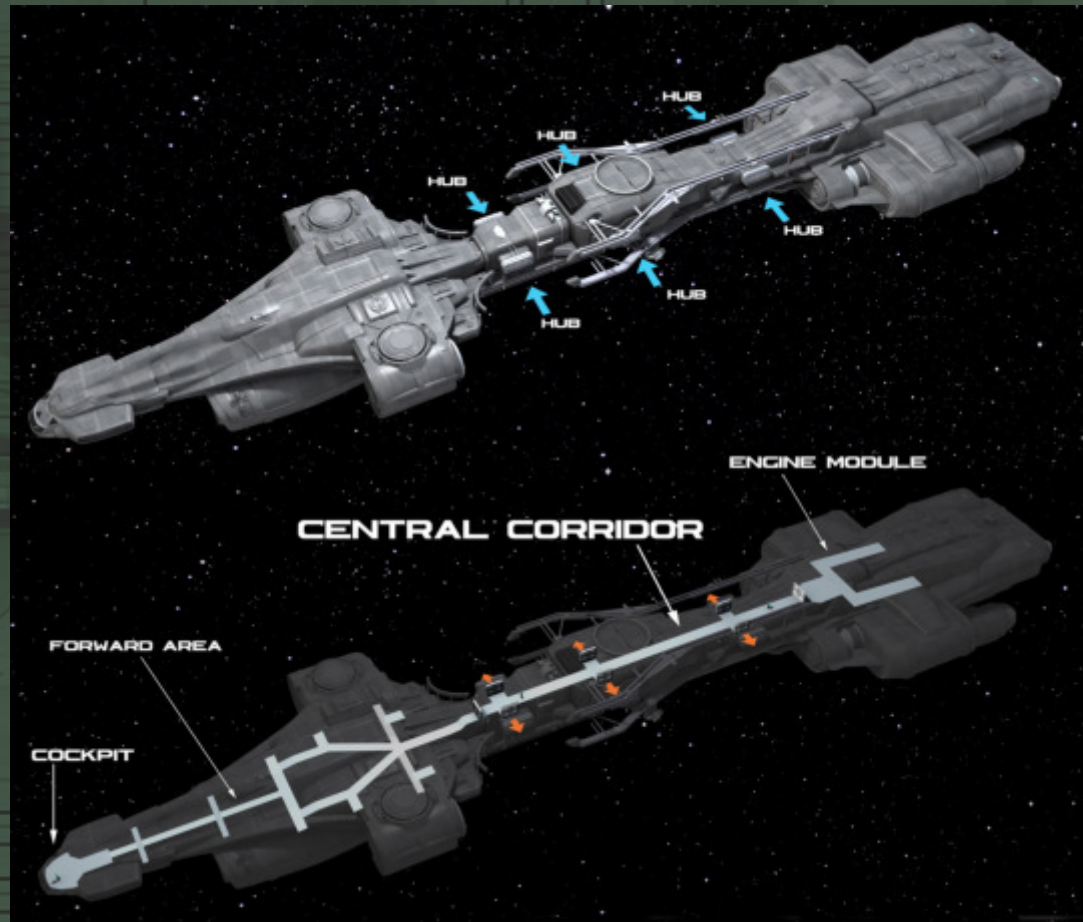


**Jim M:** Here's a hybrid of the array module pod and the large science or med pod put together. I like the spacing of this one, though it isn't in our immediate 5 versions.



WORK IN PROGRESS

Jim M: Here's a batch, in progress. Not final text.



WORKING IN PROGRESS



BIO PODS



SERVICING POD

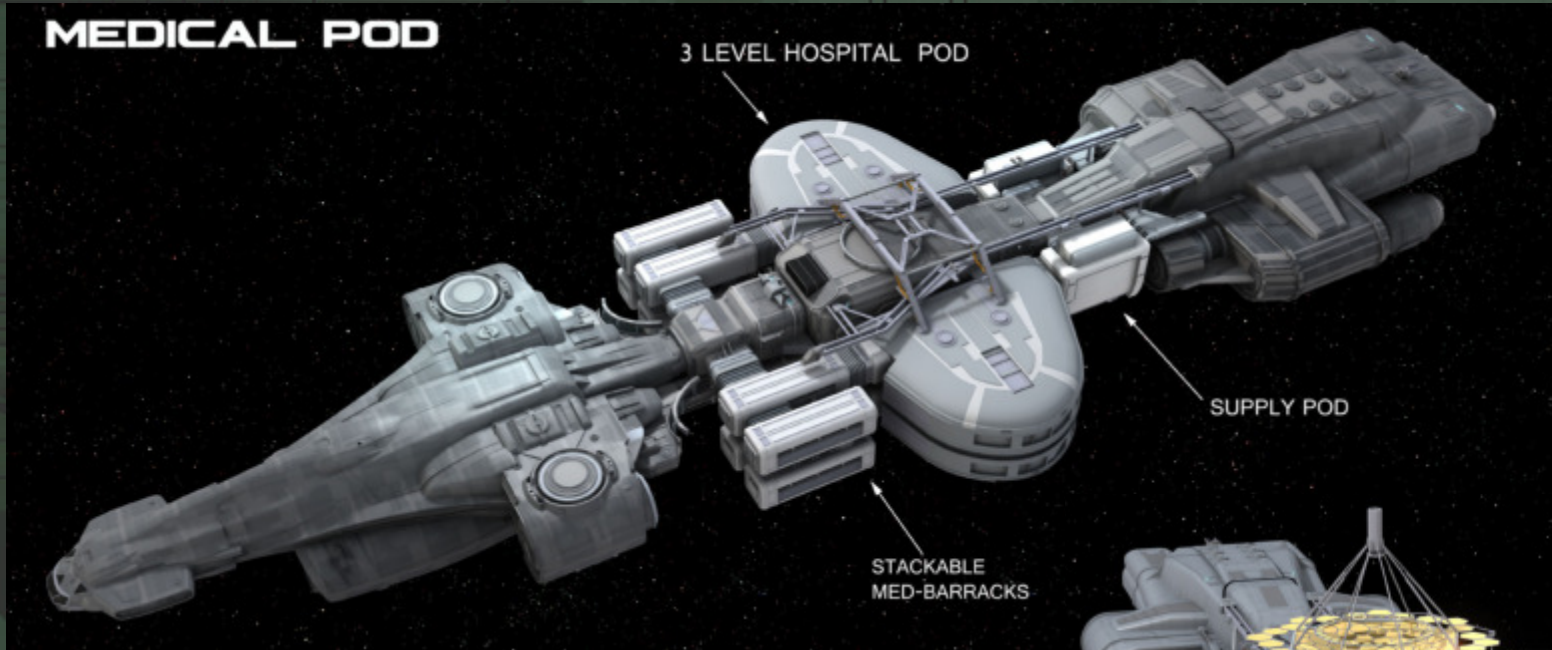
**Dave Haddock, Lead Writer:** Just to throw the idea out there: are these pods meant to be a way to transport living plants between systems? We might want to make it feel more utilitarian.



WORKING PRIORITIES



# MEDICAL POD



TELESCOPE ARRAY



MEDICAL POD CUTAWAY

WORK IN PROGRESS

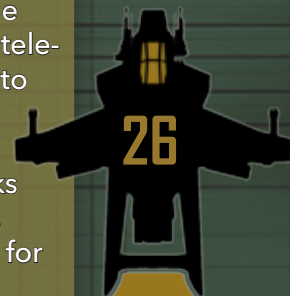
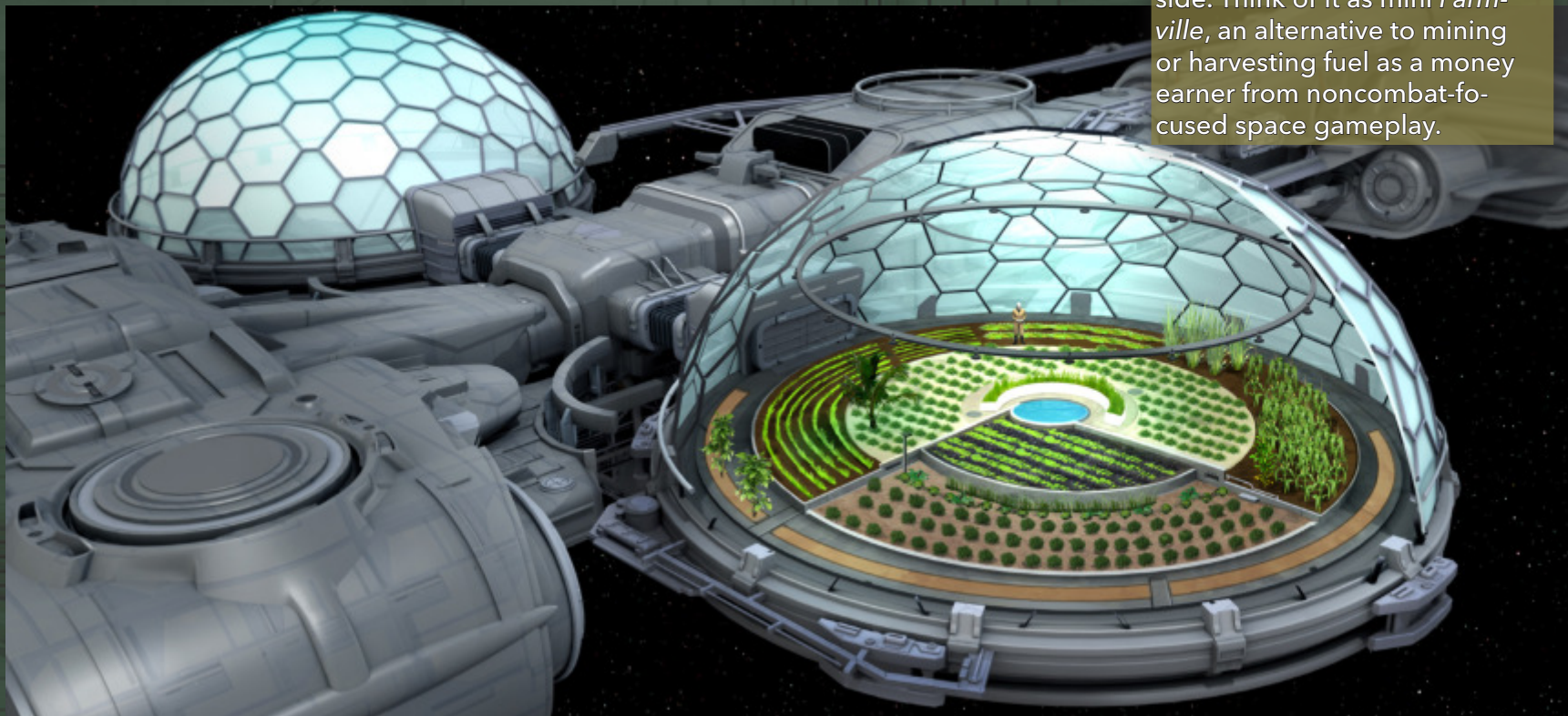




**Jim M:** Here are some revisions. Crops in the bio dome (circle motif), a three-seat cockpit, telescope array with a dish feel to the plates, and a possible config of medical pod and launch bay. I left the barracks boxes on for visual balance, but they could be re-tasked for maintenance or cargo.

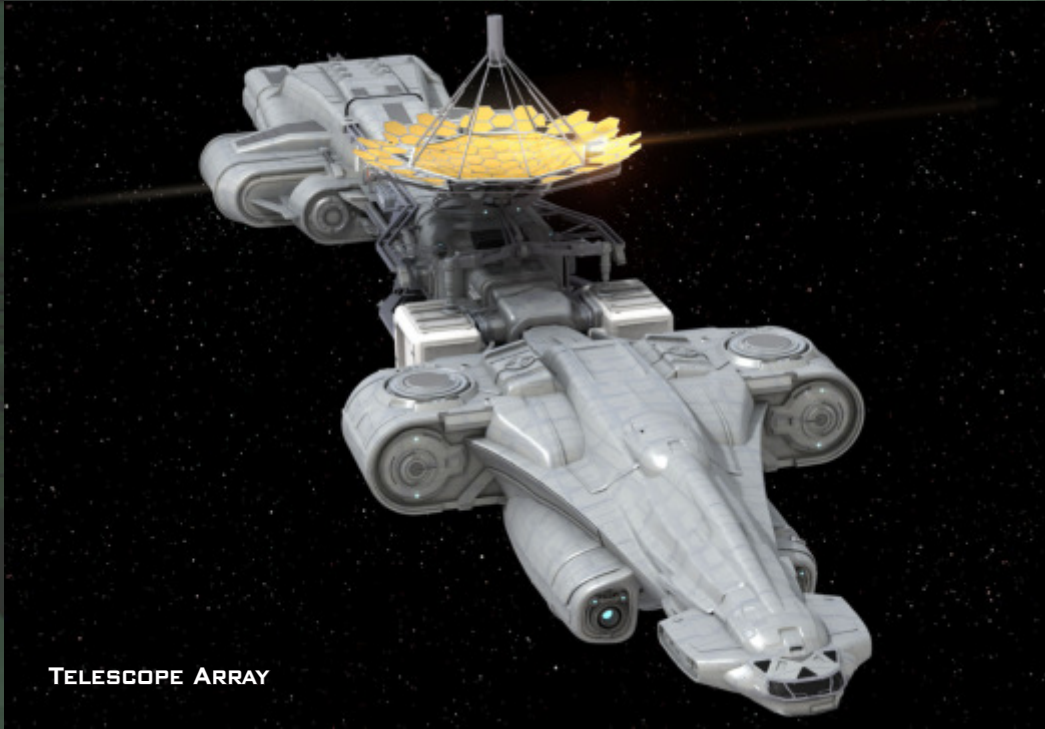
**Michael Barclay, Senior Level Designer, F42:** Out of interest, what do you do with this pod? Is it to generate money? Is it just a minigame with no reward?

**Chris R:** No, it's to grow space crops that can be sold planet-side. Think of it as mini *Farmville*, an alternative to mining or harvesting fuel as a money earner from noncombat-focused space gameplay.

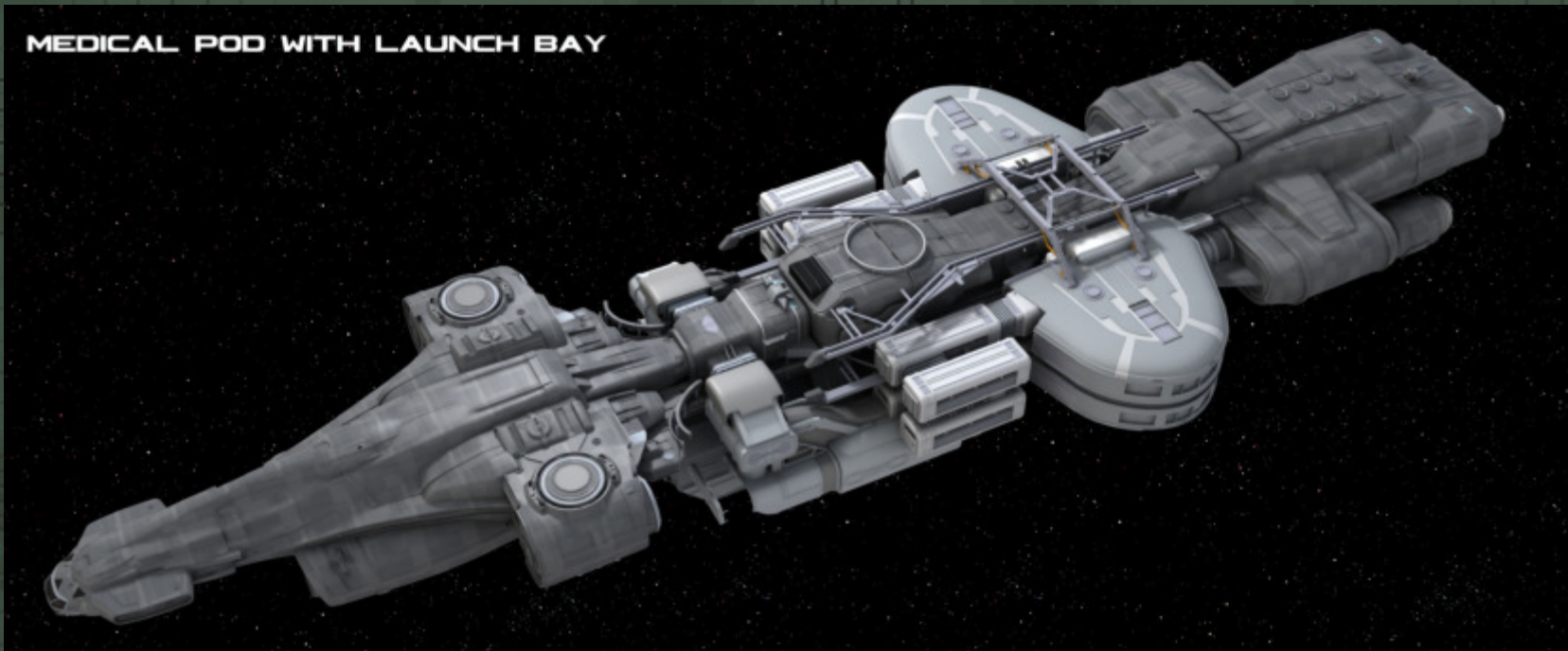


WORK IN PROGRESS





TELESCOPE ARRAY



MEDICAL POD WITH LAUNCH BAY



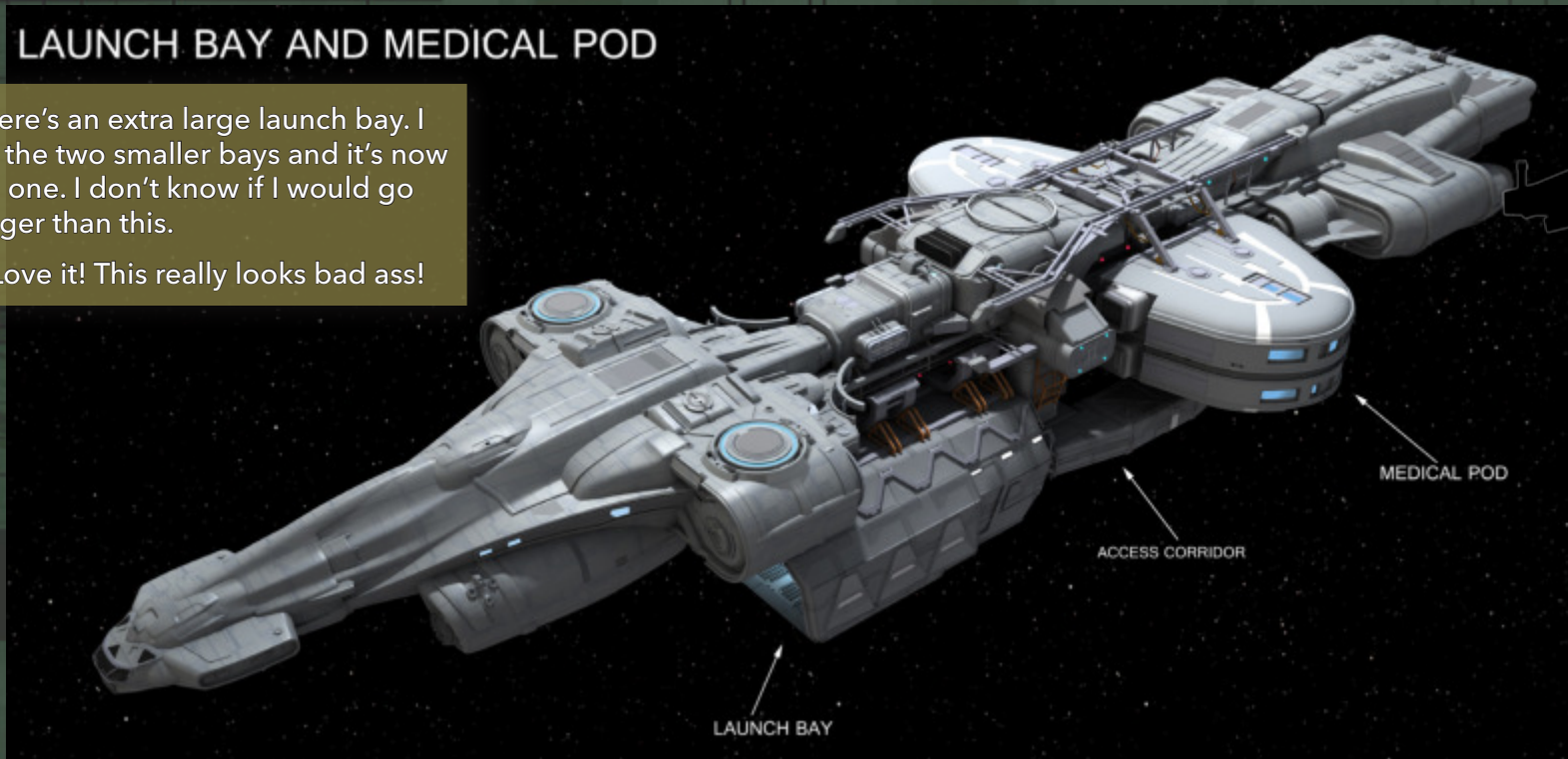
WORKING IN PROGRESS



## LAUNCH BAY AND MEDICAL POD

**Jim M:** Here's an extra large launch bay. I got rid of the two smaller bays and it's now one large one. I don't know if I would go much bigger than this.

**Chris R:** Love it! This really looks bad ass!



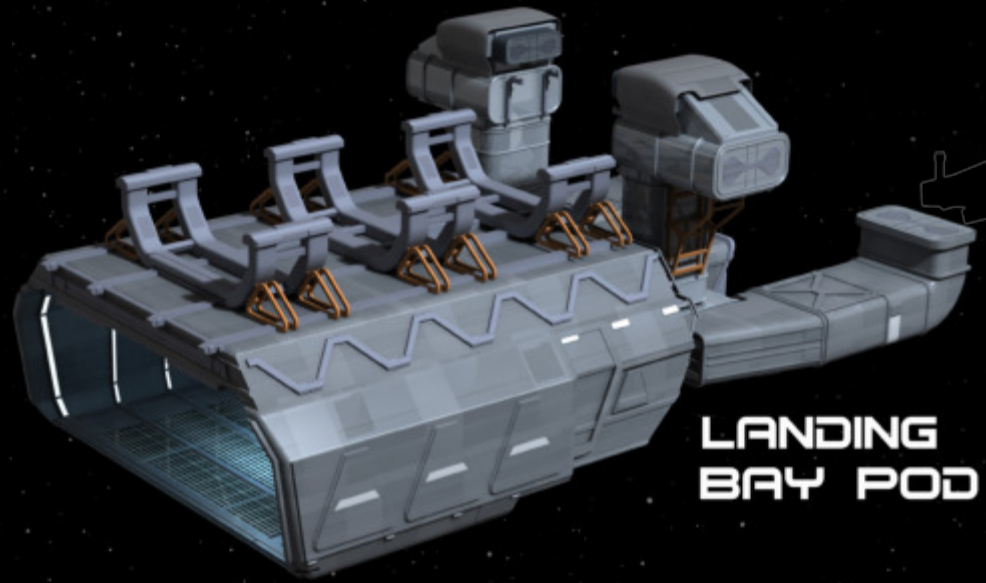
LAUNCH BAY AND  
MEDICAL POD  
UNDERSIDE VIEW

28

WORKING IN PROGRESS

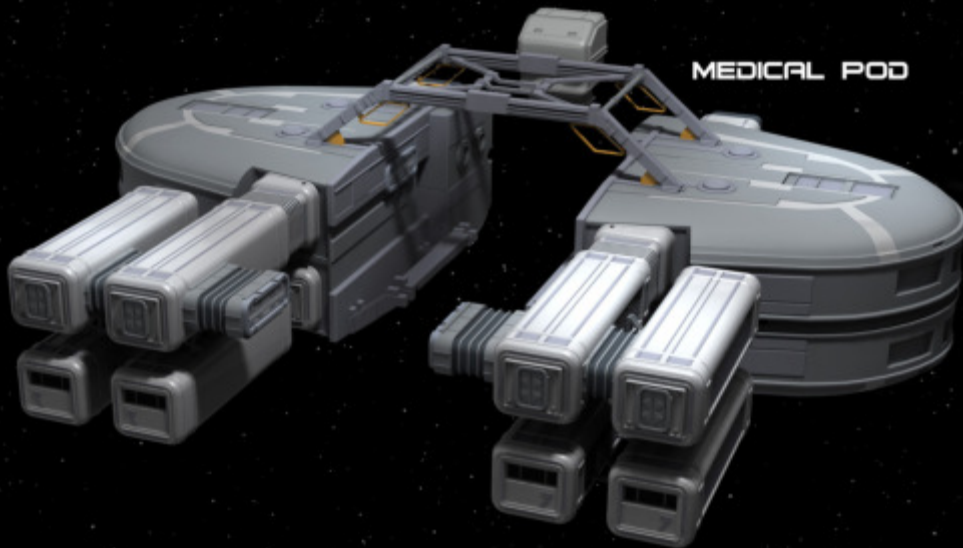


TELESCOPE  
ARRAY POD

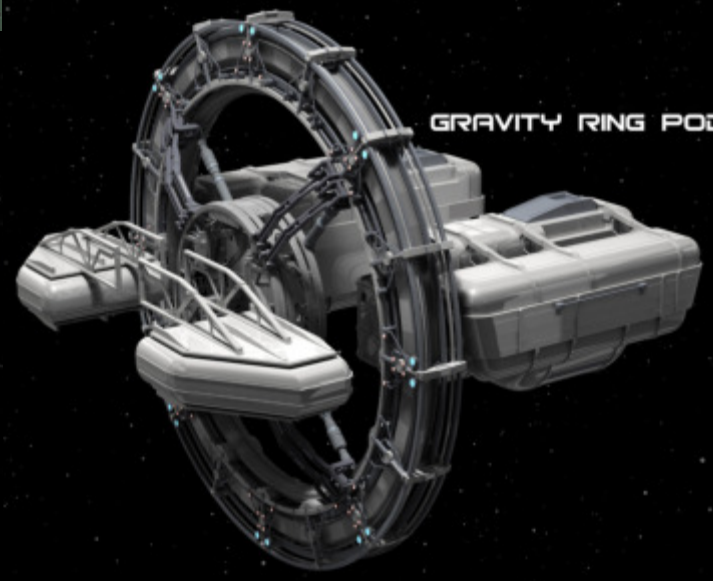


LANDING  
BAY POD

**Jim M:** Here are individual pods, an orthographic sheet and [as a finishing touch, for now] a couple of beauty shots of front separation.



MEDICAL POD



GRAVITY RING POD



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WORKING DRAFTS





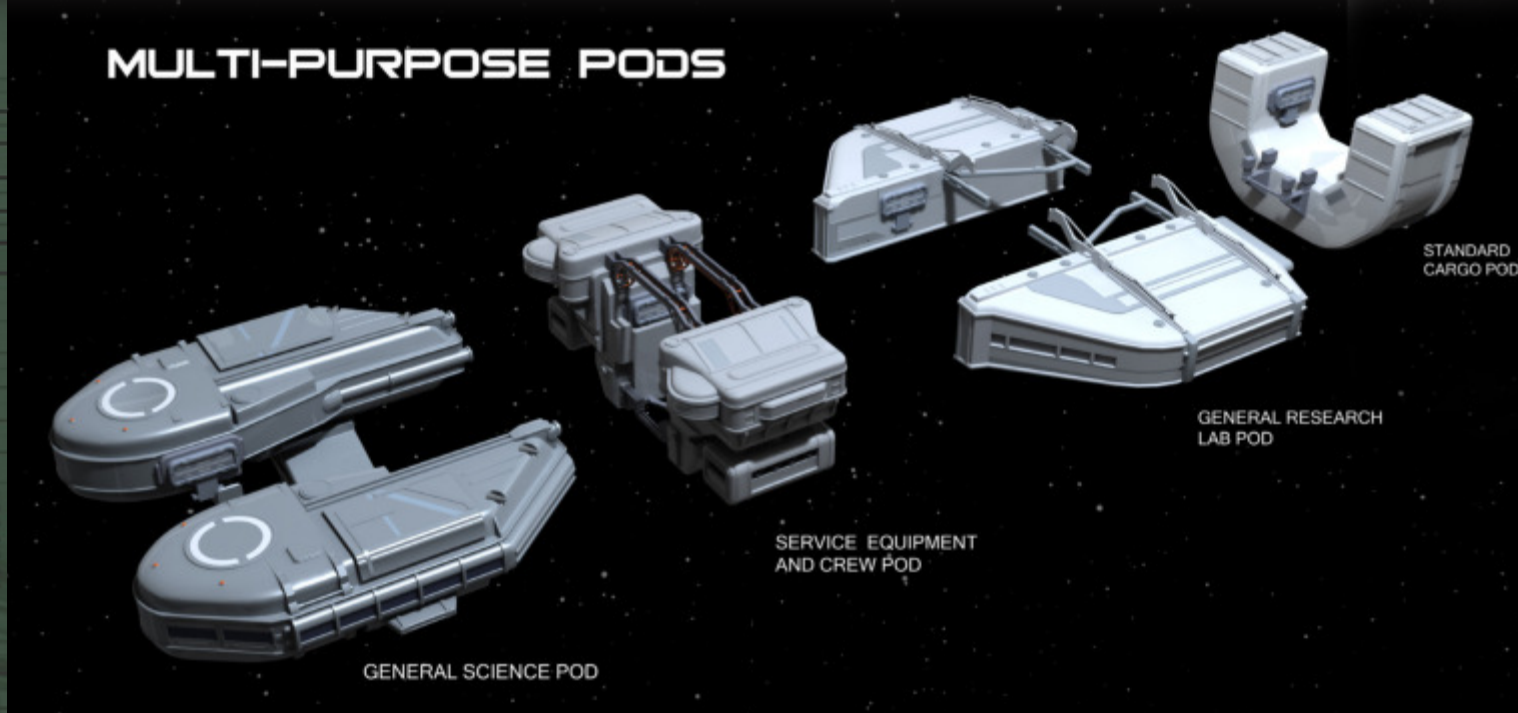
BIO DOME POD

**Chris R:** The cargo pod looks a little impractical to me. How do you load and unload cargo? Also what would really happen with the access points? Right now the doors basically open up to a vertical shaft – it seems like a cargo pod would focus on volume for cargo and easy loading and unloading.

**Jim M:** Yes, I agree. It was a left-over module from earlier

that I was using to fill empty spots. Maybe we drop that one from the “extras” lineup, or rename it something else. Sort of the most generic of the B team of pods.

**Ben L:** You refer to it as the fueling pod in an earlier image, and I think that’s a good way to go! We can think of it as a sort of drop tank for the Endeavor.



MULTI-PURPOSE PODS

GENERAL SCIENCE POD

SERVICE EQUIPMENT AND CREW POD

GENERAL RESEARCH LAB POD

STANDARD CARGO POD

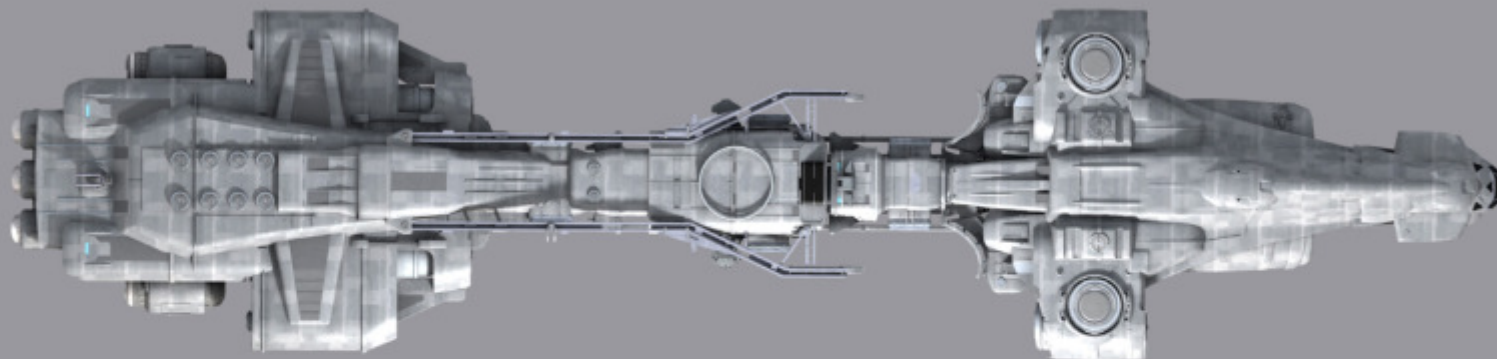


WORKING IN PROGRESS



WORKING PRIORITIES

# ENDEAVOR



TOP VIEW



SIDE VIEW



FRONT VIEW



BACK VIEW







WORK IN PROGRESS



# BIOTICORP



## An Experiment Gone Right

Today, a cutting-edge manufacturer of a wide range of medical and surgical devices, BiotiCorp can trace its roots back to the famed 'Decon' lab at Scaliger School of Medicine in Rhetor. The lab, so named due to the notorious sensitivity of its hazard detection system and the frequency with which students researching there would be trapped overnight for decontamination, has produced an overwhelming number of scientific advances in the last century, and was, in 2912, where doctoral students

and future founders of BiotiCorp, Ted Santos and Diyo Nikolas, first met.

Nikolas was studying the effects of quantum travel upon the precision of surgical assist robots when she found herself once again locked in the lab by the triggering of a decontamination alarm. Santo, who had only recently transferred to the school, was also in the lab at the time, and panicked when the alarms sealing the lab sounded.



Trying to calm the obviously agitated researcher, Nikolas asked Santo to explain his project to her. Having received a grant from the Navy to look into Targion disease, a neurological disorder that had been appearing in starmen with long service records, Santo was studying genetic gravitational compression with the hopes of finding a cause. By the end of the lockdown, the two had realized that their research was connected.

Three years later, Doctors Nikolas and Santo released a paper in the Rhetor Journal of Medicine proving the connection between genetic gravitational compression that occurs in quantum travel and the increased fatality rates for transporting emergency patients while in surgery. The

work was groundbreaking and immediately had an effect on Search and Rescue protocols. Seeking to capitalize on the valuable discovery, Scaliger School of Medicine eagerly invested in the foundation of a private research center that would be run by the pair, and BiotiCorp was born.

The company's first commercial product was a software suite for surgical robots that allowed them to better compensate for the effects of quantum travel and greatly reduced transitory deaths of patients. The suite was almost universally adapted, and BiotiCorp reinvested all profits in additional research, solidifying what would become the company's reputation for consistently pushing medicine forward.

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## The Cutting Edge

Having recently moved into a massive, brand-new facility outside Candalor on Raisse, BiotiCorp continues to take innovative strides with each new product release. For over three decades, they've been partnering with the top researchers and doctors from multiple disciplines to pioneer unique and advanced medical technologies to improve the quality of care for everyone in the Empire.

Expanding from software into manufacturing, BiotiCorp created their own line of surgical assist robots, branded the Autodoc. While they may not be as feature-rich as some their competitors, the robots are known for their continuously reliable performance under less than ideal conditions. This robustness makes them a favorite for Navy corpsmen and doctors serving aboard mobile hospital platforms like the Endeavor.

The Autodoc series found itself briefly in the spotlight after the recent attempted assassination of the Governors Council in New Castle. With most of the major Borea hospitals inaccessible in the aftermath of the attack, the

injured members were rushed to a Cutlass Red that they were fortunate enough to find parked on a nearby landing pad. Equipped with BiotiCorp's Autodocs, the council members were stabilized on board as they were rushed to emergency care facilities. In a later speech, Governor Jesper Donovin specifically credited the Autodoc with saving his life and tried, unsuccessfully, to pass a bill that would require one to be installed in every government-operated building.

It was in trying to further improve their surgical assist robots that BiotiCorp first approached their next major product line, medical scanners. Addressing the 2935 Scaliger School of Medicine graduating class, Dr. Nikolas proclaimed that the most important tool that any medical practitioner can have is knowledge. By improving scan techniques, BiotiCorp hoped to increase the ability of both assist robots and Humans to accurately determine what is happening inside a patient, giving treatments an even higher likelihood of success. Upon its release, the Vitalus Pro MediScan was received by the medical com-





munity with much acclaim. Featuring advanced clinical parameters for rapid patient analysis and hosting an extensive feature set, the Vitalus Pro line of scanners provides monitoring solutions capable of meeting a wide range of acuity demands.

There has been some concern that because they are so highly portable, that Vitalus scanners might be considered an invasion of privacy, since anyone equipped with one could learn a vast amount of personal information from an unsuspecting person. Lobbyists at the Empire Civil Rights Association are pushing for the Senate to make it illegal to scan someone without their permission, but some counter that such a law would make it harder to provide people with emergency care. Though the debate is ongoing, use of the Vitalus continues to spread.

Not all of BiotiCorp's innovations have been as successful as the Autodoc and Vitalus. In 2924, the company introduced a new anti-contamination chamber intended for use at landing zones to prevent off-world diseases and microbes from infecting local populations. The PurLyfe system was in use at customs centers for less than a month when the news broke that people being processed through the system were getting ill. It was revealed that the system had been too zealous and was removing helpful microbes along with the bad. BiotiCorp implemented a massive recall and terminated all sales and manufacture of PurLyfe devices. Despite the negative press, public favor remained with BiotiCorp for their swift handling of the problem and for the way the company rushed to help those affected.

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## Reconstruction

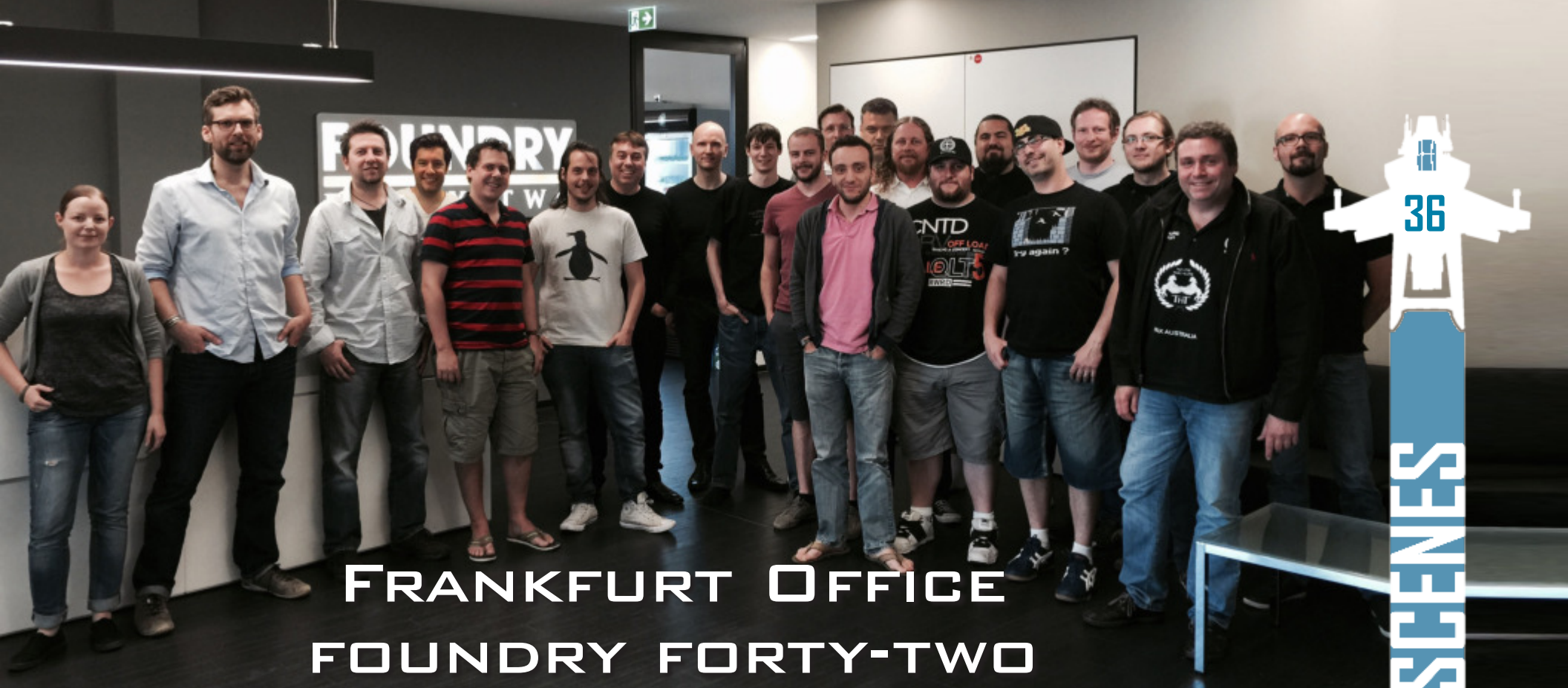
Never ones to rest on their laurels, Nikolas and Santos have been investing large amounts of their company's time and resources into what they believe will be their next big breakthrough. Project Calliope, headed by BiotiCorp's chief medical engineer Livia Haskel, is a full-body diagnostic and surgical system that has a variety of applications in reconstructive and cosmetic surgery. Inspired by her own personal trials after she was burned in a ship accident, Ms. Haskel and her team seek to improve upon the available physical alteration systems currently on the market. While people have been able to adjust their eye color or the shape of their nose relatively easily for years, Calliope is intended to allow people for the first time to safely and quickly undergo massive structural bone and tissue changes that would have previously taken a team of surgeons multiple operations to perform.

After a successful presentation to the Senate and High Command by Dr. Santos and Ms. Haskel, Calliope was adopted for early trials by the military with supposedly impressive results. Starman who a short while ago would have had to face life with debilitating scars, can now be repaired back to normal, or if the starman prefers, even better than before. With such positive feedback, Calliope is now beginning to make its way to civilian medical centers for the first time. Patients who have experienced the device first-hand have described it as 'life changing.' The full social and cultural effect of having the ability to completely alter one's appearance so easily remains to be seen, but it seems certain that BiotiCorp has once again transformed the universe we live in.



THE  
STAR  
MAN





# FRANKFURT OFFICE FOUNDRY FORTY-TWO

*It's time (in fact, way past time) that we took a trip to the Frankfurt office of Foundry Forty-Two, to talk to the folks in that rapidly growing site. As before, we asked you (our subscribers) what you wanted to know, and you responded with more questions than ever before. As it turns out, most of what you were asking about were programming questions, so the lion's share of our answers this month are from the programmers (CryEngine and otherwise) who form the largest group in Frankfurt.*

*We didn't get to all your questions; please hold on to those and we'll try to get to them in a later issue.*

#### NOT PICTURED

ANDREAS JOHANSSON, LEAD LEVEL DESIGNER  
TOBIAS WANKE, LEAD WEAPONS ARTIST  
PASCAL MÜLLER, ENVIRONMENT ARTIST  
ROBERT STEPHENS, SENIOR ENVIRONMENT ARTIST  
CHRIS SPEAK, SENIOR QA  
ATRI DAVE, SENIOR TECHNICAL ARTIST

#### FROM LEFT TO RIGHT

INEZ MATHERN, ADMIN/HR MANAGER  
HANNES APPELL, DIRECTOR OF CINEMATICS  
MARCO CORBETTA, SENIOR TECHNICAL DIRECTOR  
JASON COLE, LEAD CINEMATICS ANIMATOR  
CHRIS BOLTE, SENIOR ENGINE PROGRAMMER  
FRANCESCO DI MIZIO, SENIOR BUILD ENGINEER  
CHRIS ROBERTS  
CARSTEN WENZEL, TECHNICAL DIRECTOR  
CALEB ESSEX, SENIOR VFX ARTIST  
ALEX MARSCHAL, SENIOR PROJECT MANAGER  
SASCHA HOBA, SENIOR ENGINE PROGRAMMER (BACK)  
CLEMENT MELENDEZ, LEVEL DESIGNER (FRONT)  
TODD PAPY, DESIGN DIRECTOR (BACK)  
BRIAN CHAMBERS, DEVELOPMENT DIRECTOR  
CHRIS NOLAN, SENIOR TECHNICAL DESIGNER  
DAN TRUFIN, SENIOR SYSTEMS DESIGNER  
FRANCESCO ROCCUCCI, LEAD AI PROGRAMMER  
MIKHAIL KOROTYAEV, SENIOR AUDIO ENGINEER  
FRANK MEINL, SENIOR ENVIRONMENT ARTIST  
ERIN ROBERTS  
CHRISTOPHER RAINE, SENIOR PHYSICS PROGRAMMER





**JP:** *Let's start by introducing everyone. What is your title, and what do you do for CIG?*

**Dan Trufin:** Hi, I am Senior System Designer for the Foundry 42 Frankfurt office. I take various ideas that I and my colleagues have, pass it through a direction filter based on what Chris Roberts want to see in *Star Citizen*, try to think of how we technically can achieve it in-game, then draft it all together into one cohesive and easy to understand system. Then throughout the lifetime of the project I take care of it – from concept to final product – making sure it works together seamlessly with all the other systems in the game to create a fun and rewarding experience. :)

TL;DR – I make stuff fun. :)

**Mikhail Korotyaev:** I am a Senior Audio Engineer; my job is to make sure the audio effects created by the Sound Design team get properly played in the game.

**Todd Papy:** Hi, I'm Design Director for CIG and Foundry 42. I'm overseeing the design of the FPS and making sure we have high-level design planning for the Persistent Universe and *S42* with the leads.

**Christopher Bolte:** I am Senior Software Engineer. I work on all kinds of optimization and features to make the game run fast, even with our scale. This includes low level systems like multi-threading, but also higher level systems like the Zone System and (soon) rewriting the engine for DX12.

**Clément Melendez:** Hey, I'm Level Designer at Foundry 42. I design and build levels and missions, previously for *Squadron 42*, nowadays for the persistent universe.

**Pascal Muller:** I'm Environment Artist at Foundry 42 Frankfurt. I'm working on the environments for the FPS Module and PU.

**Brian Chambers:** Development Director for the Foundry 42 Frankfurt office. I keep the office running and help people stay focused on what they need to do. I keep an eye on the short-, mid- and long-term goals. A good amount of my time over the past few months has been focused on finding the right people we need to staff up the office.

**Francesco Rocucci:** I'm the Lead AI Programmer for the Foundry 42 Frankfurt office. I oversee the whole development for Artificial Intelligence in *Star Citizen*, I make sure the architecture of our AI system correctly embeds all the functionalities. In addition to that, I take care of programming a lot of those elements.

**Atri Dave:** Senior Technical Artist; character setup (rigging) in Maya as well as for the game engine, and other tech art things like ragdolls, body distraction and cinematic simulations.

**Francesco:** (Read my text with an Italian accent.)

**Andreas Johansson:** Hi, I'm the Lead Level Designer at Foundry 42 Frankfurt. We are currently working on content for the PU and *Squadron 42*, as well as Multiplayer FPS.

**Tobias Wanke:** I'm Lead Weapon Artist. I do gun stuff.

**JP:** *Francesco's comment prompts this question: which different nationalities are represented in the Frankfurt office?*

**Andreas:** I'm from Sweden. :)

**Clément:** I'm French.

**Atri:** I am Indian.

**Francesco:** I'm Italian! :)

**Todd:** American.

**Pascal:** Switzerlaaaaand.

**Dan:** Romanian here!



BEHIND THE SCENES



**Christopher:** Many nationalities are represented here :,) but I think mostly Germans and Italians? But I could be wrong (btw, I am German).

**JP:** *You have far more nationalities there than I would have guessed. I'm an ignorant American, and I'm used to everyone speaking American around me. What is/are the predominant language(s) that you use to work with each other in the studio?*

**Andreas:** English is the working language here; however if two of the same nationality are having a conversation they usually revert to their native language.

**Dan:** English ftw! :P

**Francesco:** We mostly speak English, but between people the funny part is to hear your colleagues using different words from the other languages in completely different contexts!

Like Sasha randomly saying "Scusi" in the engine room.

**JP:** *A couple of subscribers were kind enough to ask their questions in German, but it sounds like we should stick to English for this interview.*

*Let's take another overview: What are the departments in the Frankfurt office, and how many people are in each department?*

**Andreas:** Level Design: 2

**Dan:** System Design: 2

**Francesco:** AI Programming: 2

**Christopher:** Core engine: 6, including animation, physics, etc. Nearly everything except shading, which we only do a little of.

**Pascal:** Art: 2

**Tobias:** Weapon Art: 1

**Atri:** Technical Art: 1

**JP:** *Back to our regularly scheduled questions: What is the most interesting part of your job?*

**Todd:** Being able to solve complex problems with the team.

**Atri:** Building and playing games.

**Christopher:** The challenge. Not many projects require such a scale and provide a technological challenge like this one, and we're being allowed (and even asked) to push the boundaries while working on a very unrestricted platform.

**Dan:** Being at the center of everything; working with basically every other department; the awesome challenge and potential of the project and seeing people enjoying the game I am working on.

**Francesco:** The most interesting part of my job is designing the AI system in a way that can scale to handle (in a smart way) what the player does. I love the fact that the AI features are actually what the player really plays with and that if done properly they can generate a lot of fun and interesting situations that will create great memories for the players!

The other thing I love is that the AI is really in the middle of a lot of the disciplines that make a game, so I have to work a lot with designers, 3d artists, animators, UI designers and of course the other programmers!

**Andreas:** It enables me to use my creativity to build new worlds, entertaining scenarios and awesome events and stories, giving the players something fun and immersive to enjoy. As a lead, it also gives me the opportunity to oversee the development of worlds and locations on a larger scale.



BEHIND THE SCENES  
ENGINEER



**Clément:** Since a level designer is so central to developing level-based games, our job is not always so easily summarized into high/low points. I like both the brainstorming/early-days-designing part and the problem-solving part. Coming up with the design of a level can be an amazing creative process, but then you have to make this a reality and this usually involves a lot of balancing different resources and time, course-correction and problem-solving a lot of unforeseen issues. Both parts are crucial, and fun in their own way. But I think in terms of being the most interesting, I'd go for the player's involvement in your level: how you have to anticipate players' intentions and reactions, guide them subtly, communicate with them without words, etc. It's what makes it fun; if no one was ever to play a level I built, I wouldn't find it an interesting task.

**JP:** *We've got lots of questions from our subscribers. Let's start with some CryEngine questions. (From **Solis\_Obscuri**) It sounds like some impressive work has been done regarding expanding CryEngine maps to double-precision, introducing the new GIM for Star Citizen and so forth, in order to facilitate things like large ship battles with both many ships and many players in the ships, in sort of a "nesting doll" of instances. What major backend work remains in order to begin introducing larger battles and multicrew play?*

**Christopher:** From a tech perspective I can answer this. Basically the tech is ready, but not "final," so I would expect players to be able to start using large world multi-crew battles soon. However, we will also continue for a long time to optimize those situations and try to find solutions for corner cases. This is sort of the general engineer approach for games: by definition, there is always more to do than we can do. So it works, but it still needs a lot more work.

But Todd and the rest of Design have input as well – having something possible on the tech side doesn't mean

that it makes sense game-play wise, especially with such large features.

**JP:** *(From **Imac**) It was stated in the past that Star Citizen's version of CryEngine would only be updated to a certain point (I think it was version 3.7), but I heard that it will get updated to version 3.8.1 after 3.7 is integrated. Will Star Citizen continue to get updated with applicable parts of newer CryEngine updates indefinitely?*

**Christopher:** 3.8.1 SDK and any other CryEngine releases are cherry picked – we only select very specific fixes/features that we want to include in *Star Citizen*, since we have been modifying the very core of CryEngine. At this point, the codebases diverge significantly in certain areas that we have substantially improved to deal with Large World and many other *Star Citizen* features developed so far, as well as upcoming features that we are currently planning or that we have under development.

**JP:** *(From **Far-seeker**) Can you give us a gameplay example of something Star Citizen's zone system can do that would be impossible, or at least impractical, with Crytek's built-in octree system?*

**Christopher:** What the zone system is in the end, is an optimization (as well as is octree), called a spatial query structure that allows us to more quickly find which objects the player can see. What the zone system has done on top of this is to incorporate moving reference frames.

Normally, all objects have a world space position. With the zone system, they have a relative position, which allows us to very efficiently move objects in groups. This relative reference frame is also built into the whole culling system; for example, we make heavy use of portals, which allow us efficient culling of the insides of ships (and so far I am not aware of an engine supporting moving portals).



BEHIND THE SCENES



But as for the original question, the zone system doesn't allow new gameplay in itself; it more extends the scale where we can have traditional gameplay.

But if you include the local physics grid (which is tightly connected to the zone system, but isn't the same thing), gameplay on multi-crew ships is enabled. Normally physics systems tend to simulate things based on a fixed world, but with the local grid we now have a moving world, meaning that you (and all physics objects) can move around like you want, while the ship itself does its own movement.

**JP:** (From **GeraldEvans**) *What are the biggest challenges you face when dealing with CryEngine? Since you have some of the early / original team working on it, are you finding that you're trying to add options to the code or are you bound by pre-baked limitations?*

**Dan:** Limitations are not necessarily a problem. Most of us have learned how to work around those limitations long ago. The main problem, from the design side at least, is the fact that once you start jamming more and more features into it, stuff starts to break down and become unstable. So far, the amount of issues caused by this is outstripping our ability to fix them, so at some point developers will have to take dedicated time to bring stability back on track.

**Francesco:** I don't see many issues dealing with CryEngine; personally I'm very familiar with the AI system code and I know how to extend it. The biggest challenges come from what we want to achieve in general! :)

**Christopher:** On the code side, I don't see any actual issue (since most of the stuff we change, we already know, which is a nice advantage). In game development, it is rarely the case that you can use pre-existing technology to do exactly what you want (at least when pushing technology).

**JP:** (From **SloanWarrior**) *What new features are you most looking forward to adding to CryEngine? Do you submit any changes upstream to CryTek to make future merges of CryEngine versions easier?*

**Francesco:** Personally, at the moment I look forward to finishing my integration of the navigation mesh into the zone system. That in conjunction with the usage of the local grids will allow us to have navigation meshes local to the capital ships, allowing AI to navigate around a moving environment.

**Christopher:** Perhaps we need to extend Far-seeker's question about the zone system somewhat – I was more answering from the rendering (as this was the focus of the zone system so far), but seeing Francesco's answer, yes, the zone system will be the foundation for all gameplay involving larger groups of objects (like the navigation Francesco mentions).

**JP:** (From **Schrike**) *What does it take to remove the "USE" command from the engine and replace it with something of your own choosing? What do you want to replace it with?*

(And from **Orsk**) *I've always thought that any "USE" type of display should only ever show up when using mobiGlas in close range of "usable" locations ... with a far distance transparent small circle indicating that an object is usable, etc. What do you think?*

**Todd:** We are adjusting it to be more contextually based off of the items you are interacting with.

**Francesco:** You don't want to make it too frustrating for players to use objects in the world. You can even eliminate all contextual prompts in the world, except when using mobiGlas, but that raises the question of whether any objects should still allow interaction without showing the prompt first.





This may lead to unintentional uses of objects, or hard-to-discover elements that you would want to interact with. Probably Todd can also give a global point of view on this from Design. From the code perspective, the prompt is only a communication to the player and could be easily hidden/unhidden depending on what the Design department wants.

**Todd:** We have talked about doing highlighting/focusing depending on the object that you are looking at, and then it will bring up contextual options based off of what the player can do with the object. For example, you can look at a machine and turn on the power, then look at other knobs and use them.

**JP:** (From **Oberscht**) What would you say are the biggest features or “quirks” the engine is going to have that will be unique among engines once done?

**Christopher:** The supported scale, and most likely how we store positions.

Regular engines have ObjectsInWorldSpace -> Renderer -> Transformed into ScreenSpace on GPU.

We have: Positions in ZonePartitionSpace, which is sort of a regular grid inside each zone (to allow using 32-bit SIMD even at universe scale). those are transformed into ZoneSpace, which is dependent on all the parent zones of this zone, which is then converted into camera space (to allow the renderer to use 32-bit operations), which then goes into the GPU for the final ScreenSpace transformation.

**Christopher:** Not sure if this makes sense without a picture, as it is a lil’ bit math-heavy and abstract to understand based on text.

**JP:** Does a picture exist?

**Christopher:** I would need to draw one. :)

**Todd:** PLEASE DO!!!!

**JP:** If it’s a quick task, that’d be great.

**Todd:** Even if we don’t use it. ;)

**Christopher:** I can try to put one together tomorrow.

**JP:** This is the nuts-and-bolts section of the magazine, so it doesn’t need to be pretty. Tomorrow would be great. [Diagrams are on next page.]

**Francesco:** AI-wise, the biggest feature is definitely the scope of the game we have to deal with. Our goal in the final game is to have NPCs using the environment and interacting with the player, using tools and vehicles and moving from one planet to another. And also we will have some of these characters as persistent entities that can become your enemies and that will have personal beefs with you!

The creation of a whole universe that needs to feel alive is definitely one of the reasons why I love working here!

**JP:** (From **Oberscht**) What sort of modifications, if at all, were (or are going to be) necessary for planets to work and look good – or are they just extremely huge 3D objects floating in space?

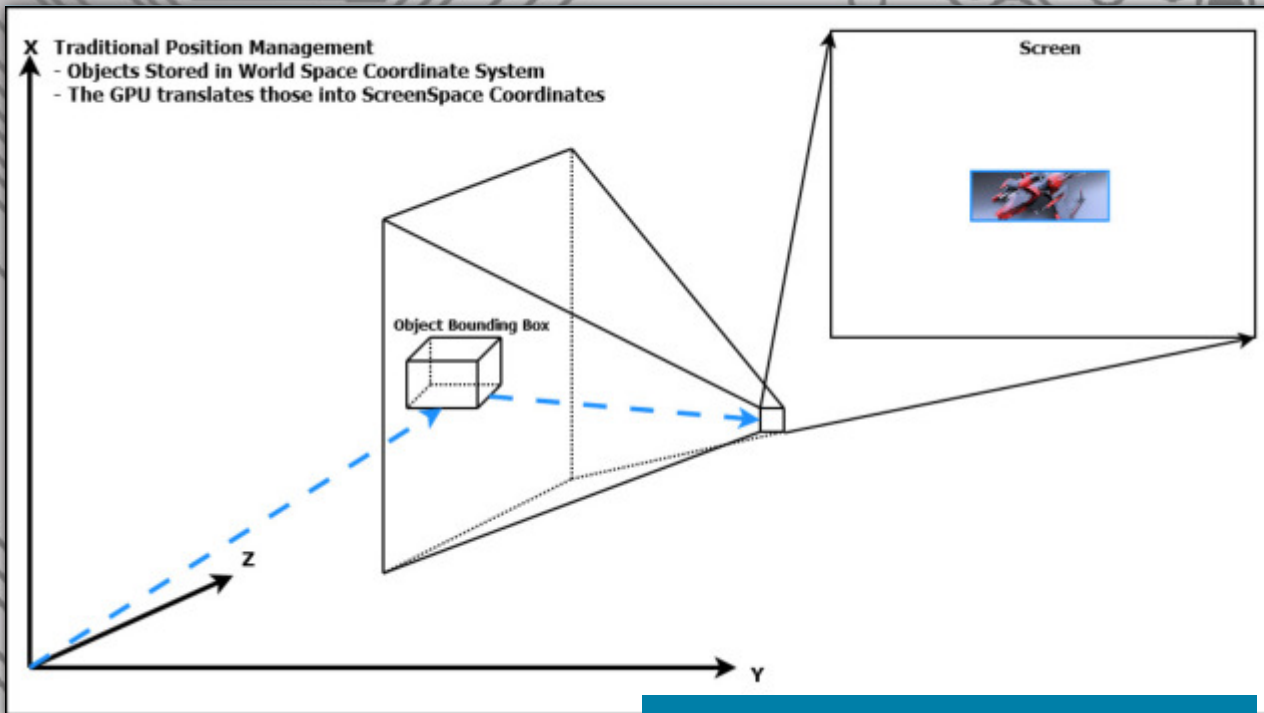
(Also, from **steve-2001**) Could you describe, in broad strokes, what work had to be done to the engine to support the Large World conversion?

**Christopher:** The planets in the Crusader dogfighting module are just large objects, but we want to change this, I’m just not sure when. Marco Corbetta is the one actively working on planets, but he’s not available right now.

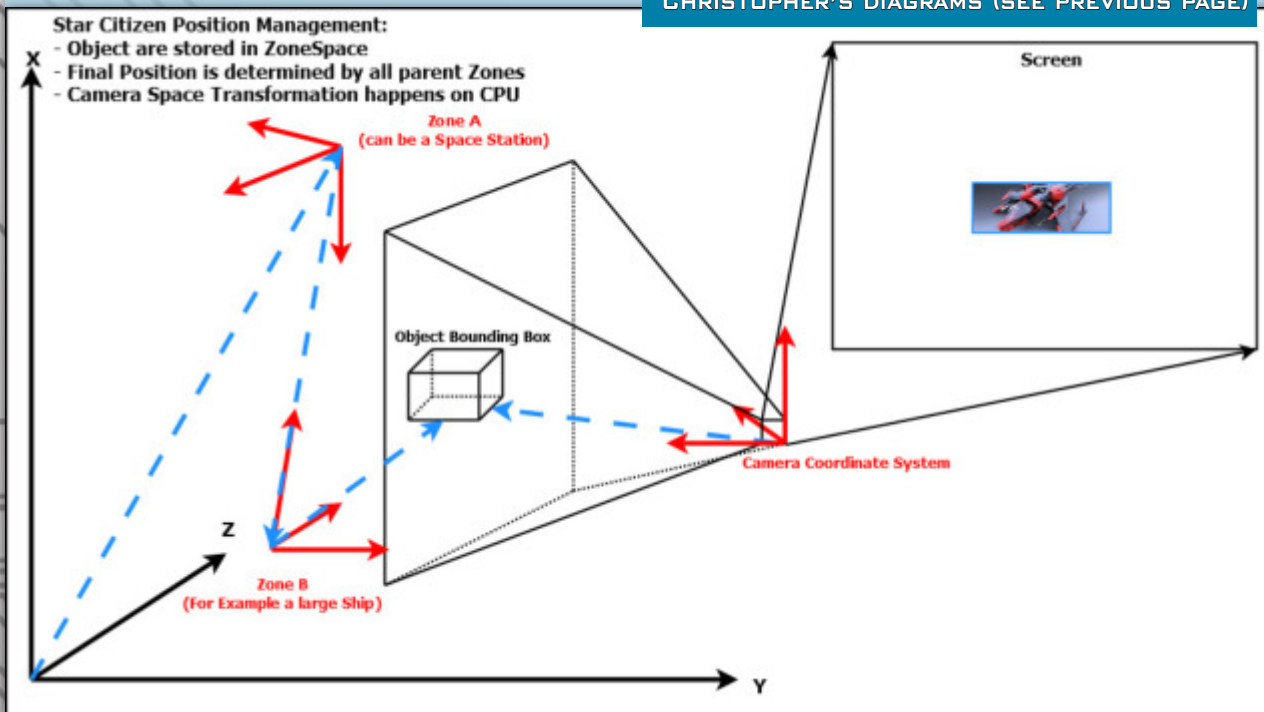
The major tasks were changing nearly all position fields to 64-bit, which was followed by at least two months of debugging to find all the places we missed (and we surely still have some). Also the camera-relative rendering part.







CHRISTOPHER'S DIAGRAMS (SEE PREVIOUS PAGE)



**Mikhail:** Camera-relative video and audio rendering. :)

**Francesco:** For the AI on a planet we will need to modify the navigation mesh, not only to be local to the planet itself but to be able to correctly handle the up direction of the Z-axis that will change in relation to the position on the planet's surface.

Physics will also need to handle a gravity vector that will always point towards the center of the planet.

**JP:** (From **thanatos1973**) Has there been any progress towards a Linux client?

**Christopher:** Not much, as we have been focusing on rewriting large parts of the engine, and Crytek's OpenGL implementation doesn't have the performance yet. Personally I would like to work on getting the Linux client running, but



only after DX12 (which will need a rewrite of the OpenGL backend anyhow).

**JP:** (From **Orsk**) With the die-shrunked next gen GPUs, along with their HBM memory, will SC be able to fully utilize these GPUs and their 12GB+ of VRAM?

**Christopher:** The general plan for streaming systems is to try to utilize as much memory as is available (we will still need a minimum of memory to work correctly), but afterwards we want to try to fill up as much as we can. No promise that we will actually use 12GB, or how much practical difference it will make, but we will try.

**JP:** (From **Orsk**) It's been noted multiple times that streaming is a hurdle that has yet to be completely jumped. Is there any chance that options will become available to store game files unpacked or that those of us with large chunks of system RAM (64GB) may have it used as a staging area to assist in faster streaming?

**Christopher:** We are looking into more CPU-friendly decompression systems. Then as with utilizing next gen GPUs, we want to try to utilize all the memory as well as possible (but no promise to use the full 64GB in this case, as that would be a lot of data).

**JP:** (From **Benemen**) With each iteration increasing the number of ships/players, is the work load a linear or exponential increase? If it's linear, can you project, yet, the "maximum" number of players/ships in a local "instance" or are we too far out yet to estimate?

**Christopher:** It's not really linear, and hard to predict. As with optimization, we mostly focus on the largest gains, so by definition there are less and less of those "low hanging fruits," which makes further optimizations harder ...

but then FPS is not linear as well, so smaller optimization, resulting in fewer ms, can still give us the same fps difference on higher frame-rates.

**JP:** (From **Topsock**) Considering the size of the 'verse, when I explore deep space I would not expect to see many, if any, PCs or even NPCs. My question is how will the number of NPCs and PCs be controlled (slider, server switching ...) and how will that impact random encounters with both NPCs and PCs? How will random encounters be controlled so as not to get the same ones over and over and make the play session feel real computer-generated?

**Francesco:** Currently, the idea is to keep the NPC amount of the 'verse determined by the economy of planets, the events that occur, etc. We want to generate the encounter based on what you are doing, so if you are exploring a hostile solar system and you have to cross dangerous paths, you have the servers controlling the chance for you to randomly encounter pirates or other hostile NPCs.

Due to the world dynamically changing, these encounters are not just random; they reflect the state of the 'verse.

**Dan:** What we are aiming for now with mission generation is to have handcrafted pieces that fit together like a puzzle, to create the final mission. This will go a long way towards making sure the encounters meet the quality standard we want, while mixing and matching them will hopefully make it very hard for players to feel like they are repeating content. Having a lot of handcrafted puzzle pieces, each with a theme, flavour, scripting, props variations and so forth, will make it very hard to get the exact same combination twice.



BEHIND THE SCENES



**JP:** (From **Celade-Wallace**) Anything you want to share about AI, especially AI goal/expectation analysis and how it can create emergent/dynamic behavior would be interesting.

**Francesco:** Our focus for *Star Citizen* is to create a believable universe, AI is our tool to do that. Personally I consider that all the details connected with how players will interact with NPCs are related to the AI.

The AI systems should always support the goal of telling a story to the player, making the AI act in a believable and understandable way. The complex part is not to make the NPCs make a good decision, but to make the player understand they made a good decision.

For the FPS enemies, one of our ideas is to have NPCs able to use the environment around them, being able to coordinate their actions and approach the player using varying techniques, based on the situation they are in.

Speaking of the ships AIs, our next focus in the close future will be on the multi-crew ships. Crew members will have to perform coordinated behavior – for example, pilots will have to control their ships to allow the shooters in the turret to correctly attack the enemies. Also, multi-crew AIs should be able to support the you, taking control of any seat at any given time, understanding what you want to do and helping you in your mission.

Looking at the non-combat scenarios of the game, both for *Squadron 42* and *PU*, we want to create NPC characters that can live realistic lives. This is one of the most challenging parts because we want to let the players interact with the people around them, talking with them and listening to them.

And consider that all of this needs to be able to combine

together to make a seamless experience, from a peaceful meeting to a combat scenario!

**JP:** (From **Krel**) What do you expect procedural generation to be used for at first, and where would you like it to go in the future?

**Dan:** It is very hard to estimate which one will be the first one to be ready. Most probably the first time it will make it to the live version will be in the form of procedurally generated NPCs and missions, and then move to a larger scale to generate our solar systems, planets and some of the planetary content. I think NPCs and missions are the most important ones right now, as we need to populate the universe and handcrafting the entire population or creating enough non-repeating encounters without procedural means is really impossible. That is not to say that where we really want to jump in and handcraft story characters or storyline missions we will not do so. Each method has its own benefits/drawbacks.

**JP:** (From **BaconofWar**) What scope of procedural generation are you looking at? Adding random planet landing areas or just augmenting existing landing zones?

**Dan:** Still TBD.

**JP:** (From **Perry\_Hope**) When someone flies to a point in space never seen before, and this space is procedural generated, will you guys be able to pick some of the areas and “fine tune” them to look better or have a bigger asteroid field, etc.?

**Dan:** Still TBD.

**JP:** (Several questions from **Tony\_Knightcrawler**) Are there plans to procedurally generate weather and perhaps even air or water currents?

**Dan:** Not sure about air/water currents, but definitely



BEHIND THE SCENES

weather will be one of the things we can play with when procedurally generating environments. We would like to have weather that procedurally changes while you are playing rather than it being static, but it's too early to make a call.

**JP:** *Are there any plans for procedurally generating gas giants?*

**Dan:** Solutions for this are being considered, but it's still too early to release anything on it.

**JP:** *Is there a way to lock a procedurally generated planet so it generates the same general terrain, even as the process is updated and improved?*

**Dan:** Procedurally generated planets/environment will always generate the same way, as the generation is based on a unique seed. Regarding the upgrading of the system, we'll have to see, but yes we are definitely aiming to keep consistency.

**JP:** *And lastly, even if the technology won't be ready to use in the PU for a year or more (in terms of populating the planet with cities, foliage, AI markers, traffic, etc.), will it be possible for us to get Arena Commander maps over procedurally generated planets sooner than that?*

**Dan:** Yes it is possible to get this – it might be that once the tech is in a decent state we will release this as part of the "Baby PU" directly. The detailed part of the planet might come at a later date, but at least you will be able to see that procedurally generated planet from space as a first release. Whether that will get placed into an AC map I don't know, but technically there should be nothing stopping us from doing that.

**JP:** *(From DocAndy) How will AI connect with dynamic, procedural mission creation? And can you explain how AI*

*behaviour will affect the flow of a mission, but still let you keep the overall sense/storyline of the mission?*

**Dan:** We aim for our AI to be smart enough that when dropped in any environment, be it handcrafted or generated, it will know how to deal with any situation that might arise (take cover, defend objectives, attack objectives, escort designated targets, etc.). Regarding pacing and flow, it is still too early to tell, but don't worry – we're not gonna just randomly sprinkle AI in missions hoping they give you a fun experience. Regarding story missions: these will be mostly handcrafted, as the amount of highly specific events, cinematics and encounters that happen as you go through them will be too much for any procedural system to achieve without sacrificing the quality of the experience.

**Andreas:** Our goal is to have AI that is intelligent enough to analyse the environment and extrapolate tasks. We will of course have scripted modules inside the missions that will control the finer details, but all in all we will be able to designate areas for AI to spawn, and the game will then decide what type of AI it should use depending on various parameters (e.g., faction, location, etc.).

**Francesco:** Let's imagine we have a mission where the player needs to retrieve an item from a Vanduul station. Without going too much in detail on how the mission itself will be created, the AI will receive a request to either create a specific set of Vanduul for the mission or to assign some of the Vanduul already in the 'verse to defend the selected item. The NPCs will then be assigned to a specific "Defend item" behavior that will notify the agent that the item is something precious to defend. The Vanduul will then decide how to patrol the area, what to do if an enemy is detected, how to split into groups to coordinate their attacks, and so on.





The agents will use all the knowledge they have (data coming from the mission system, from the universe simulation, from the previous missions of the player, and so on) to communicate the decisions they are making to the player, to taunt the player and to comment on the mission itself.

We call something like "Defend Item" an assignment. Assignments are our way of transferring context into the systemic behaviors so that the NPCs can still execute all the actions they normally do, but they can branch using, for example, tactics or dialogs crafted for the story the player is in.

**JP:** (From **Wiborg1978**) *Is the AI different between the NPCs in the 'verse and the Custom NPCs from the game packages?*

**Francesco:** We use all the AI systems for both *Squadron 42* and the PU, so the AI is the same for all the NPCs in the 'verse. My goal is to try to have those two aspects of the game as close as possible, so that the mechanics you learn playing the game can be used in the 'verse and vice versa.

**JP:** (From **SDTX**) *What has been one of your biggest challenges and how have you overcome it?*

**Christopher:** That's a very broad question! The best answer might be that the biggest challenge is *Star Citizen* itself, as a constant source of large challenges. :)

**Dan:** The main challenge, for me at least, is working in a game of this size and complexity with a team that is split all over the world. It requires a lot of hours spent on Skype trying to chase who owns what. The time zone difference is not helping either. I don't think we will ever overcome this challenge; we will just have to improve on how we

handle stuff and how we split tasks between the studios to ensure that people that work on one feature are at least in a similar time zone.

**JP:** (From **Algared**) *Given Squadron 42 is the single-player campaign and the PU is the MMO sandbox (for want of a better description of both), how will levels work?*

**Andreas:** The S42 campaign will take elements of how the world looks in the MMO Sandbox and incorporate that into its design.

**JP:** (From **Luftwolf**) *Do you offer guided tours through the Frankfurt office? ;)*

**Brian:** We absolutely offer tours of the office to backers, and have already had a few visit us. Any backer who wants to tour the Frankfurt office (or any other office) should write to Customer Service (support@cloudimperiumgames.com) and they'll pass Frankfurt requests on to Inez, our admin. As with the other CIG offices, we can't guarantee a tour, but we do our best to accommodate.

**JP:** (From **FreakI**) *Beer. Which one and why? ;)*

**Christopher:** German Beer :) With Becks being my favorite

**Andreas:** German Beer - With Schlappeseppel being the favourite ;)

**Francesco:** I almost like all the brands of hefeweizen or pilsner beers. I love also the Hoogarden or Italian beers like "Birra Moretti" and "Peroni." :)

**Dan:** Hmm, hard one ... If we're talking a German pils then Faust, Rothaus Tannen Zäpfle. For a nice stronger winter beer Andechs Doppelbock Dunkel. Belgians beers are always welcome with Leffe 9 & Kastel Bruin leading the way. On my trip to Scotland this year I really enjoyed Innes & Gunn and some Punk stuff too.



BEHIND THE SCENES

## Spotlight: Hannes Appell, Director of Cinematics: The Senate

Work on the UEE Senate started when we got the final shooting script for *S42* in March 2015.

In a scene from the intro sequence of the game, Bishop is addressing a packed emergency session after the Battle of Vega II has left New Corvo devastated.

In the final game, only a couple of shots of Bishop in front of the Senate will be used (it will be intercut with other scenes), but we decided early on that we wanted to capture the full speech and not just bits and pieces.

This was done so we would have a good test case for our facial animation pipeline based on a relatively static scene, with the actor not moving too much.

Doing the Senate speech in full also allowed Gary Oldman to embrace the role of the admiral heeding the call for a radical change in policy.

When he took the podium and did his first rehearsal of the speech without missing a beat and a perfect delivery, the crew on set, still busy with preparations, all fell silent and listened.

Before the shoot I started modelling a rough whitebox model of what the Senate could look and feel like. Our initial inspiration for the overall shape was actually the circular *Star Citizen* logo itself. Look and feel of that early

Senate chamber prototype was also heavily inspired by the United Nations great assembly hall building and other senate chambers around the world, such as the French hemicycle senate and the US senate chambers.

The UN assembly hall was also a fitting example for a slightly outdated look that we wanted to go for in our universe. The Senate hall should feel like it was built in a different era than the current year of 2945. For this we went to Art Deco and futurism from the 1930s and 40s for inspiration, as well as the aforementioned symbolic and Imperial architecture.

After this first whitebox was built, I took that model with us to the set so that we could show Gary what the chamber he was about to speak in would look like.



BEHIND THE SCENES



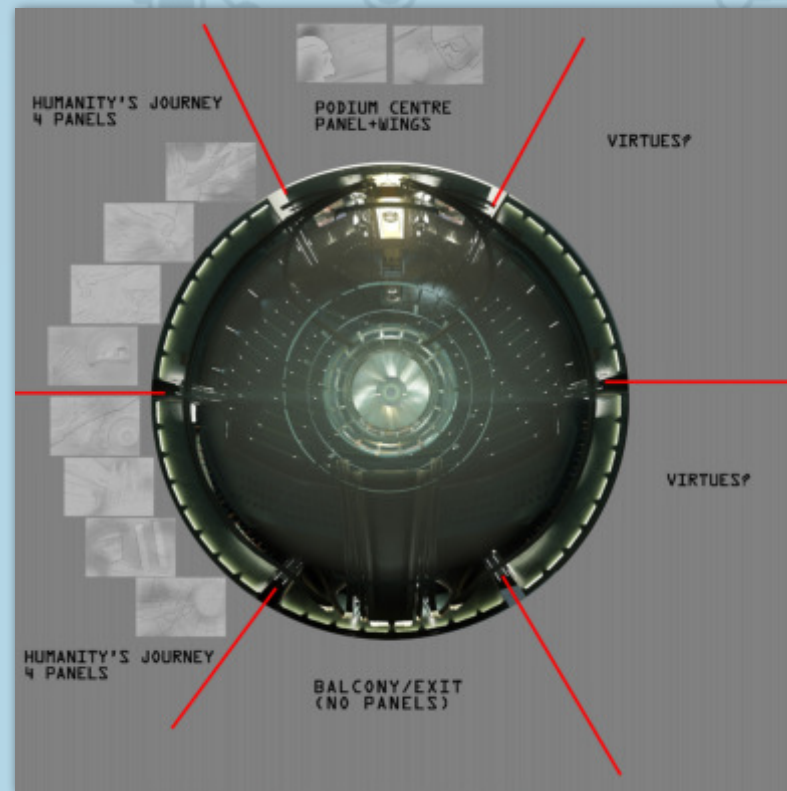
It was also helpful to have set geometry already built to give the set designers at Imaginarium so they could build a nice speaker podium approximation for Bishop and also for our real-time motion capture feedback in the engine.

After the shoot was done and the animation data was solved, the real work on the Senate chamber and speech began.

Frank Meinl, our Senior Environment Artist for Cinematics took over my rough whitebox and gradually turned it into the full UEE Senate chamber you can see in the final trailer. For the final chamber we wanted to have the whole rotunda surrounded by murals depicting "Humanity's Journey."

Concept artist Stuart Jennett developed these murals surrounding the Senate rotunda based on initial descriptions by Dave Haddock. There are eight images depicting "Humanity's Journey," as well as the "Virtues" and the "Evolution of Man."

Two androgynous giant statues flank the UEE logo, one holding a shield, the other holding a sword, foreshadowing Bishop's move to shift the UEE from a defensive stance



to one of active war against the ongoing Vanduul aggressions.



All in all, the Senate chamber can fit approx. 380 audience members (6 blocks, with approximately 64 seats each) all facing the centralized speaker podium, with aisles streaking out from that central focal point like light rays from a star.



BEHIND THE SCENES

## TWO OF THE MURAL PANELS



There is also a visitor balcony overlooking the Senate floor. During development we joked about including the Senate balcony as a space the players could visit in the Persistent Universe, and those who would sit through a full 24-hour filibuster speech by one of the AI senators below would get an achievement unlocked.

When it came to Bishop's animation, that was pretty straight forward. We took Gary's body and facial motions (only slightly tweaked for contact points and some eye darting, otherwise pretty much unedited) and put them on our custom Gary Oldman skeleton and Tier0 Bishop head and costume. The head itself has 40k polygons and several hundred corrective blend-shapes in addition to playing the bone animation.

The costume seen in the trailer is an admiral's dress uniform. (Scenes with

Bishop in his bridge outfit will show him in a less ornamental costume.)

For lighting, the whole chamber is depicted in a rather moody night-time setting, with the emergency session taking place at about 9 PM. The chamber itself has giant mirrors at the ceiling dome that would, during daytime, reflect sunlight into the vast chamber.

However for Admiral Bishop making the case for war, the setting after sundown was a more appropriate choice.

A fun fact about the cast name reveal at the end of the Bishop Senate speech trailer: When the camera pulls up towards the S42 coin logo (significance of this will be apparent when the full game is out) and then into and past it to reveal the cast names, this was all done in the Senate chamber set without a cut to a different scene.



STATUES WITH SHIELD (L) AND SWORD (R) FLANKING THE PODIUM



BEHIND THE SCENES



## Spotlight: Sean Tracy, Content Technical Director: Bishop's Face

We've been working on our characters – more specifically character facial aspects – for some time, so we're excited to finally reveal this to you.

Here you can see Gary Oldman as Admiral Bishop, making his speech to the Senate.



In terms of technology, we've built on the already robust systems provided by the CryEngine and have taken it a step further to really push the boundaries of what's possible in real-time on PC.

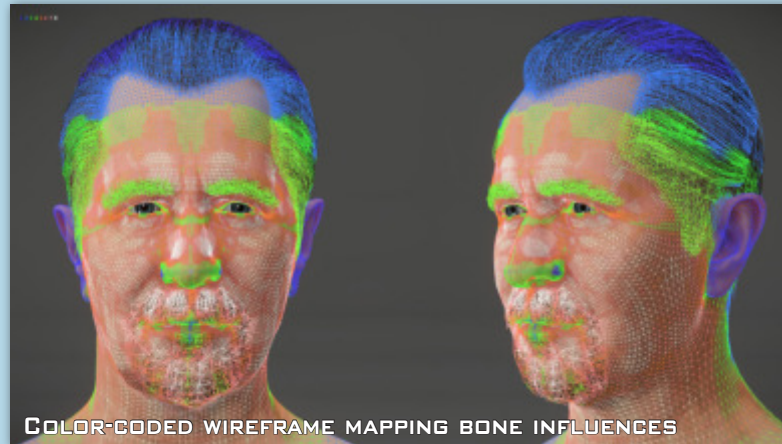
The high-fidelity work that you're seeing on the facial skeleton, rig and asset was done by 3-Lateral and really makes all of this possible! The animations from which these frames are pulled are made with an incredible attention to detail by Cubic Motion.

The faces in *Star Citizen* utilize a combination of both blend-shapes and bones to combine all the techniques available to us for real-time rendering.

If I enable a debug overlay, you'll see a color-coded wireframe that indicates how many bone influences there are per vert. This is important, as it gives smoother and more realistic deformation.



Recent updates to our technology allow us to compute this on the GPU, which means better performance and even more characters using it.



At the same time blendshapes are driven by the animation. Bishop uses over 400 of these blendshapes to accurately convey the actor's performance. We also use these shapes to apply the tangents to the mesh, meaning the shading is updated accurately as these shapes are blended in-between.



BEHIND THE SCENES



BLEND SHADES

One more obvious addition is comprehensive support for animated diffuse, also called bloodflow maps, as well as animated wrinkles.

When used together, this yields a whole new level of facial performance. Enabling these features, the change is dramatic.

There are even more subtle uses, such as making the lips lighter when they stretch, or darker when they purse, etc.

Where previous games on the CryEngine used a single wrinkle map texture, we have extended this to use either one, two or three wrinkle and bloodflow maps.

This ends up giving us 44 different areas on the face to blend in diffuse and normals, making unique wrinkles and expressions as accurate as possible.

We've made other subtle improvements to add a bit more life to the eyes. One such improvement is Dynamic Pupil Adaption, which causes the pupils to actually react to changes in lighting.

The animation for an asset of such quality can be heavy; animating 200+ bones and over 400 blend shapes creates an enormous amount of data.



WRINKLES

We compress this on the way into engine down from 100's of megabytes to just a few.

We do this compression very carefully, as Cubic Motion has provided highly accurate and specific animation data of the actor's performance. This performance must be retained when coming into the engine.

The facial pipeline within *Star Citizen* is well on its way and as you can see the characters push beyond where other projects and technologies have gone before.

We are committed to delivering the most life-like characters possible to enhance your immersion in the 'verse.



EYE ADAPTATION



BEHIND THE SCENES



# RHETOR SYSTEM REISSE



The Rhetor System is both one of the oldest and one of the youngest in the UEE. Considered old because of its place in the history of Human expansion, Rhetor was first visited in 2387, making it one of the earliest systems that Humanity discovered. Still, most consider Rhetor youthful because it is the heart of the UEE's public and private university system. Regardless of how it is perceived, Rhetor is an important part of Humanity's past and a key contributor to its future.

Rhetor was discovered by Leona Sono and Neil Nyemeto, two ambitious PhD students from the Martian Institute of Space and Technology (MIST). Sono, an engineering student and an accomplished pilot, wanted to test the accuracy of her ship's atomic navigational clock while tra-

versing the Sol-Croshaw jump point. Nyemeto, a student in astrophysics, accompanied Sono so he could collect data on Croshaw's plasma. While preparing to make the trip back home, one of Nyemeto's research drones returned a strange string of data. The pair investigated the location where the data was recorded, never expecting that the coordinates would led them directly to the Croshaw-Rhetor jump point.

**TRAVEL WARNING** Even though Persei has public universities, there are still extensive landing restrictions that the UEE military strictly enforces. To avoid incident, make sure that you have appropriate clearance before approaching any landing zone.

EDITH RHECTOR



Upon Sono and Nyemeto's arrival at MIST, they shared their discovery with the school's president, Adrienne Zemlock, a former politician who had been highly critical of how Humanity had expanded into the Croshaw System. Zemlock worried that if private companies were given too much involvement in planetary development, then worlds would be built with corporate profits in mind first and Humanity's needs second. As Zemlock famously said, "Humanity has realized that reaching the stars was easy. The hard part is figuring out what to do with them. So I ask you this – what kind of universe should we build?"

With that question in mind, Zemlock, Sono and Nyemeto approached the recently formed UNE with news of the jump point. However, they refused to disclose its coordinates without assurances that a quarter of the land on all habitable and terraformed planets in the system would be preserved for educational purposes. Pushback from corporate interests was severe, but the education community rallied to the cause. Zemlock became a fixture on the Spectrum where she passionately defended the need for "responsible expansion." Public pressure to balance private and public interests grew, and the UNE eventually agreed to their terms. They even decided to name the system Rhetor, the word for a master and teacher of oratory and Zemlock's popular nickname, as a reminder that "words have the power to shape worlds."

Once the UNE surveyed the system they discovered five planets, three of which were terrestrial worlds located in the star's wide habitable zone and worthy of terraforming. Vast deposits of neodymium, erbium, samarium and other rare elements were discovered on Rhetor II (Persei). The UNE auctioned off mining rights to the entire planet, then used the profits to pay for the terraforming of Reisse (Rhetor III) and Mentor (Rhetor IV). To stay true to their initial agreement, the UNE set aside land on Persei to es-

tablish a state-run university, while offering incentives for corporations to consider the planet for their research institutes and think tanks. Though not quite the educational oasis Zemlock envisioned, Persei has become an incubator for influential ideas and technological advancements.

Rhetor's other two habitable planets have grown into bastions of higher education for the UEE. Students and related staff make up the majority of the population on both Reisse and Mentor. As a degree from one of its universities is considered a fast track to a job on Earth or Terra, the application process to attend any school in the system is fiercely competitive.

Many historians have wondered what fate would have befallen Rhetor if Zemlock, Sono and Nyemeto had not insisted on placing education at the forefront. Persei's rare minerals brought prosperity to the system for only a few hundred years, but Rhetor's education infrastructure continues to infuse Humanity with new perspectives, ideas and technologies. For this reason, many consider Rhetor one of the most vital systems in the Empire.

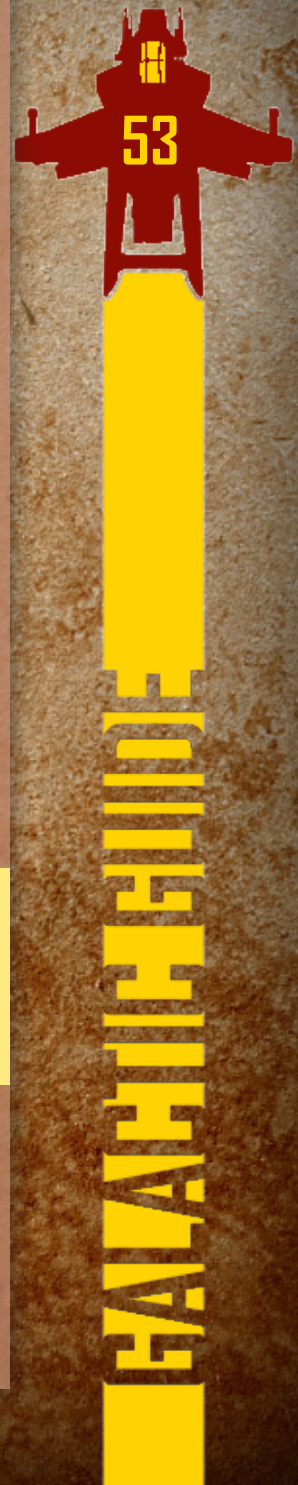
## HEARD IN THE WIND

"After exiting the jump, I looked at Neil and asked what happened. He smiled and replied, 'History.'"

- Leona Sono, The Accidental Explorer, 2464

## RHETOR I

A small, rocky dwarf planet with no terraforming prospects and an inhospitable climate.





## RHETOR II (PERSEI)

According to Werner Fricke, a former member of the UNE planetary expansion committee, "The promise of Persei is what makes Rhetor possible." The planet's vast deposits of rare elements were the economic engine that drove development in the system. At first they brought in mining consortiums and technology companies, then top-tier scientists followed because of the expedited access to rare elements in their research.

As the planet's resources were mined away, Persei gained renown in intellectual and scientific communities. Numerous corporate research institutions and privately funded think tanks are headquartered here. Yet, it was the work done at the state-sponsored University of Persei Analytical Research and Quantification (UPARQ) that became known for pushing scientific boundaries. Though the work done at UPARQ is mostly classified, energy-efficient quantum drives and improved thermal-resistant spacesuit fabric are just some of the advances believed to have originated there. Due to the sensitive nature of UPARQ's work, access to the planet has become highly restricted.

## RHETOR III (REISSE)

Reisse is home to a great number of prestigious institutions of higher learning that offer a variety of education options to people of all walks of life. Despite its growing reputation as a party planet, experts in a wide range of fields, from universal economic theory to the history of Banu oral tradition and everything in between, can be found in Reisse. With many of these experts appearing on

Spectrum shows, and the high volume of comms traffic from students, Reisse is believed to have more comms relays near it than any other planet in the 'verse.

The planet's youthful population has kept it on the cusp of cultural and political movements for centuries. It has also made it a constant thorn in the side of the UEE. Even the Messer regime struggled to stifle dissent on the planet. Recently unclassified documents show that the Messers secretly encouraged state-run universities on Reisse to embed operatives into the administration and student population to act as radical and outspoken opponents to their regime, believing that by making these more extreme views front and center, it would help discredit all dissenters on the planet.

Initially the plan worked and Rhetor was considered out of step with the rest of the UEE. Yet, the resistance to Rhetor's radical ideas only taught Messer's opponents how to soften their message for public consumption. Some historians credit the system's outspoken opposition as having a significant influence in helping the public accept Terran Senator Akari's justifications for negotiating a peace treaty with the Xi'An independent of the Messers, as well as laying the foundation for what would come to be considered Transitionalist ideals.

Regardless of the era, Reisse has always been and will continue to be a haven for youthful exuberance and the free exchange of ideas.

### HEARD IN THE WIND

"Education. Honor. Empathy. Those are the core values Reisse's universities claim to instill in their students. Yet, after four years attending URL, these three words best describe my experience: politics, protests and parties. What can I say? It was the best time of my life."

- Alex Boboltz, Diary of a Reisse Revolutionary, 2731





## RHETOR IV (MENTOR)

Located on the far edge of the habitable zone, Mentor has a harsh boreal climate that keeps most people indoors. Its highly rated universities have a reputation for being more studious than those on Reisse. Some students say the challenging climate helps them focus on their studies, while others struggle with the constant cold both physically and psychologically. For this reason, Mentor's institutions have a higher dropout rate than those on Reisse.

Mentor is also home to one of the UEE's universal seed vaults. This secure location reportedly contains seeds for every plant in the UEE. The vault's specific location is a closely guarded secret. There is a heightened military presence on the planet, but they usually keep their distance from the universities.

## RHETOR V

The atmosphere of this beautiful chromatic gas giant constantly swirls with storms. It is a hypnotic view adored by tourists, passing pilots, and students with a predilection for hallucinogenic substances.



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# One Last Job

by Amanda McCarter



CHRONICLES

## Part 2

Jonah, for the second time that day, broke into a cold sweat. They were already at the jump point, on their way to drop off supplies to a known criminal with a ship full of passengers that weren't supposed to be there, and one of them was an Advocacy Agent. Added to that, the Agent was the criminal's former partner.

Things were not going well.

"Char, I need you to check the cargo," said Jonah.

She raised a thin black eyebrow. He knew how odd it must've sounded. They'd just taken off.

"Just make sure nothing shifted and no one's been messing

with it," he said.

She pursed her lips and nodded. He could tell by the look in her eyes she didn't buy it, but she would do as he asked. She gave him a final glance before she left the cockpit. The door clanged shut and Jonah punched the comms.

He'd only used this code a handful of times. It was only for emergencies and this was an emergency.

"This better be important," a voice growled.

"I need to talk to Mickey," said Jonah.

Silence.

"If you're backing out," the voice said. It must've been Mickey's second, a man known only as The Second. No one knew his name except Mickey.



“No,” said Jonah. “I have a problem and I need to talk to Mickey.”

Truth was, he wanted to back out, more now than ever. Before, it was the fear of Mickey that kept him going. He owed him money and he was behind on payment. Now, there was an Agent. He was an old fella, but Pietro used to talk about him with awe in his voice, like the man was part god. He’d caught or ghosted so many bad guys, Jonah was surprised he hadn’t known what Pietro was up to.

Silence crackled over the comms and sweat poured down Jonah’s face. His scalp itched and his mouth was dry.

Finally, Mickey came on.

“How big a problem we talkin’, Jonah my boy?” There was an edge to his voice. He wasn’t happy.

“Oh, about six feet tall, goes by the name of Ardoss.”

Mickey sniffed. “Name sounds familiar.”

“It’s Pietro’s partner,” said Jonah.

“Ah, yes, that’d be it,” said Mickey. “Why do you have a passenger, Jonah? I checked your schedule. You had no passengers. It was cargo only.”

He didn’t yell. He never did. He was always calm and even toned. He liked to make you feel like everything was fine. Jonah couldn’t help but remember the bartender’s ruined face.

“Passengers, plural,” said Jonah, trying to keep his voice from shaking. “I have a full flight. Haru changed it on me, last minute. I thought some politician pulled some strings, but now I think it was this Ardoss guy.”

“You think he’s after his partner?” said Mickey.

“I can’t think of anything else,” said Jonah.

Mickey took a slow breath. “I need the job done and Pietro taken care of. We can’t have this Ardoss fella causing trouble.”

“That’s why I called,” said Jonah. “Can we postpone?”

Jonah could practically hear Mickey’s teeth grind.

“Postpone?” he said, his voice still even, but a pitch higher.

“Kick Ardoss off at the next station,” said Jonah. “He’s got to be here for Pietro. He blew up a shopping mall to get him. I don’t want that kind of trouble. When he’s off, I’ll go back and give Pietro his cargo.”

“That’s not what we agreed to, Jonah,” said Mickey. “You deliver your cargo when I say you deliver it. You show up late, Pietro will bolt. He knows things about my organization. I need to make sure he’s happy. Stick to the schedule. Do you understand?”

Jonah’s heart sank. “Yes, I understand. What do you want me to do about Ardoss?”

“Kill him,” said Mickey.

The sweat on Jonah’s face and back went cold and he thought he’d be sick.

“I’ve never killed anyone,” said Jonah.

“The first one’s tough, sure,” said Mickey, his voice softer. “But if he lives, you put the entire job at risk. If you drop him off somewhere, he’ll be back and you’ll go to jail. And if you think sitting in an Advocacy prison will keep you safe from me, I have people everywhere, Jonah. I will get what’s owed me, one way or another.”

“The Advocacy will be after me if I kill him,” said Jonah. “I’ll be a wanted man.”

“You let me worry about that,” said Mickey. “You just think about your family, my boy. They need their father. They need the money.”



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Jonah swallowed. Talking to Mickey didn't make it any better. He was still caught between two impossible choices.

"And how do you propose I go about killing an Advocacy Agent?" said Jonah. "It's not like I can shove him out an airlock."

"You could," said Mickey. Jonah could hear the smile on his lips.

"But I've got a much simpler solution for you," said Mickey. "There's a gun in the crate for Pietro. It's in a hidden compartment, no code, just a special latch. It's loaded, so be careful. Have you ever fired a gun?"

"No," said Jonah, shaking his head. He'd seen them fired, and heard the awful sound they made. His ears hurt just to think about it.

"It's real simple," said Mickey. "Just point it at the fella you want dead and squeeze the trigger. It's like magic. Hit 'em in the right spot and they're just gone."

Jonah's stomach twisted.

"Anything else?" asked Mickey after a moment.

"No," said Jonah, "that's it, I guess."

"Good," said Mickey. "I know you'll do the right thing. Call me when it's done."

The comm disconnected.

Jonah stared at his console. Ten years of working for Mickey and he'd never been asked to kill anyone.

But then, he'd never had an Agent on board before.

A knock came at the door and Jonah jerked his head up. Char was back from the cargo hold.

He let her in.

"Jesus, Jo, you look pale as a sheet," she said. "Are you all right?"

"Yeah," he said, pushing away from his station. "I need to go check the cargo."

"What's going on?" she said.

"Nothing," he said as he waved her off. "I forgot something. I won't be long."

He could feel her eyes on him as he exited the cockpit. She knew something was up. He just hoped he could keep her away from it. This wasn't her burden to bear.

He spotted the Agent in the passenger area and gritted his teeth. Time to get it over with.

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Ardoss shifted in his seat. He'd never had any dealings with Jonah Ruskella; they'd never once crossed paths. The pilot would not have recognized him. The last thing Ardoss needed was some pompous blowhard blowing his cover. He hadn't wanted to spook Ruskella, but it was too late now.

The co-pilot came back from the cargo hold. Something was going on. He ignored most of what the politician was saying and watched the cockpit.

The door was open and he could hear urgent whispers filter through to the passengers. A moment later, Ruskella appeared at the doorway and looked directly at Ardoss.

Ruskella was pale, much paler than when everyone boarded, and his hands shook. He looked at the deck as he passed Ardoss.

He was up to something.

Ardoss unhooked from his seat and followed Ruskella to the cargo hold. He crept along the corridor and found a gun in his face as soon as he rounded the corner.

"Let's not do anything we're going to regret, Ruskella," said Ardoss.



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"I regret too much already," Ruskella said. "This was supposed to be an easy drop-off. That's it, but you had to go and make it harder. You should have stayed out of it and let Pietro get away."

"So you are meeting with Marquez," said Ardoss.

"Like you didn't know?" said Ruskella. "You pushed to get booking on my ship. You took a fake name. You know who Pietro and I work for." The pilot was near hysterics. This man wasn't a killer, Ardoss could see that. He didn't even hold the gun right.

"You don't have to shoot me," said Ardoss, raising his hands, slowly. The gun made Ruskella off-balanced. He was nervous and the slightest move could cause him to fire. The bullet would pierce the hull or ricochet. Either way, it would end badly.

"I do," said Ruskella.

Ardoss shook his head and took a step forward. Ruskella put both hands on the gun. It still shook, but not as badly. He might actually hit Ardoss if he pulled the trigger.

"You don't have it in you," said Ardoss. "You're a smuggler, a courier. That's it. You're not a murderer. You never will be. This isn't you."

"You think I want to kill you? I just want to get through this job and see my family again," said Ruskella.

"My concern is Pietro," Ardoss soothed. "He's the only one I'm after. Help me and you won't see the inside of a jail cell. You'll go home to your family, you have my word."

"If I give you Pietro, I'm a dead man," said Ruskella.

"It doesn't have to go down that way. I protect my informants, but if you kill me, you're done," said Ardoss. "Maybe not immediately, but it will happen."

Ruskella's nostrils flared. Ardoss' arms were getting tired. Something needed to happen, and soon.

"Get in the locker," said Ruskella.

"What?" said Ardoss.

"There's a tool locker right behind you," said Ruskella. It locks from the outside and it's just big enough for you. Now get in."

Ardoss creased his brow. "I'm not getting in a locker."

"Get in or I'll shoot you," said Ruskella.

"You're not shooting me, either," said Ardoss.

Ruskella raised the gun and took a step forward. Ruskella's hands must have been sweating because the gun slipped and he struggled to get a grip on it. Ardoss took the momentary distraction to rush the pilot. He collided with Ruskella's midsection and the two men plowed into the shipping crates.

The gun flew out of Ruskella's hand and skittered across the floor. Ruskella reared back and punched Ardoss in the shoulder. No doubt, he was aiming for the face, but it was still a hard blow. The man might not know his way around a gun, but he knew how to swing.

Ardoss stumbled back and Ruskella rushed him. Ardoss braced and grabbed him under the arms. He shoved the man backwards. Ruskella stumbled a bit and then charged again.

Ardoss had spent some time on a farm as a child, a cattle ranch to be exact. The farmer had a bull with a legendary temper. He charged any person who came near him. That's what Ruskella was. A bull. He had no focus in his fight. Just a deep-down desperation to win. Ardoss couldn't blame him.

All the same, he had a job to do.

Ardoss side-stepped Ruskella and clasped both his fists together. He brought them down on Ruskella's back and the man crumpled like a stack of cards.





"I don't have time for this," said Ardoss. "Tell me where you're meeting Pietro Marquez."

"No," said Ruskella, panting, "not a chance." He pushed up on wobbly arms.

"If you give me his location, we can protect you," said Ardoss.

Ruskella rolled over, laughing. Tears rolled down his face. "Don't you get it? Pietro knows too much. He knows way more than I do. I turn him over, there's nothing that can protect me. Mickey Black has people everywhere. Everywhere. Do you understand? There's no safe place for me if I help you. And there's no safe place for Pietro. Just let him go."

"I can't," said Ardoss.

"Then kill me," said Ruskella. "I'm dead either way."

Ardoss shook his head. "Not what I'm here to do. I'm going to arrest Pietro Marquez, then I'll take you both into an Advocacy station and you'll stand trial for your crimes. Now you get in the locker."

"My co-pilot won't stand for this," said Ruskella.

"I can handle her."

A smile spread across Ruskella's face. "I very much doubt that."

Pain blossomed across the back of Ardoss' head and he fell to his knees.

"You okay, Jo?"

"Yeah, Char," said Ruskella. "Thanks for that."

"So this was the cargo you wanted to check?" she said.

"Why didn't you just tell me that in the first place?"

Ardoss' vision blurred and their conversation was somewhat muted. She'd hit him hard. Not hard enough to knock

him unconscious, obviously, but hard enough to make him think really good and long about standing up.

"Yeah, sorry about that," said Ruskella. "I didn't want to involve you."

She gave an exasperated sigh. "This ship is my home, too. Whatever happens here involves me."

"I'll remember that," said Ruskella.

"What do you want to do with him?" said the co-pilot. She tapped him with her boot.

"I won't kill him," said Ruskella.

"I wouldn't even suggest such a thing, Jo," she said. "But he's interfering with your job for Mickey, isn't he?"

"Yeah," said Ruskella. "Wait, how did you know about Mickey?"

She laughed. "Jo, I've known you for sixteen years. Be worried if I *don't* know what's going on in your life."

Ardoss' vision started to clear and he managed to turn just enough to look over his shoulder.

The co-pilot had the gun pointed at his face.

"Please," she said. "Unlike my friend, I know how to shoot a gun."

He blinked. She wasn't kidding. The way she held her gun, the crispness of her flight suit, they were dead giveaways. Former military by the look of it. He should have noticed earlier. Would have if he wasn't so focused on catching his partner.

Ardoss let out a sigh. "What will you do with me, then?"

The co-pilot didn't take her eyes off him. Ardoss turned his head back to Ruskella who thinned his lips.

"I . . ." he started, but the ship shuddered.



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Ardoss almost lost his balance. "What the hell?"

Anger flashed across Ruskella's face.

"Someone's flying my ship."

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Things were not going at all as planned. Ardoss wanted to slip on the ship, the *Open Sky*, undetected, get to the rendezvous with Pietro Marquez, and arrest the lot of them.

Now, some stuffy politician too big for his very expensive suit had ruined Ardoss' cover, leading to a showdown in the cargo bay. And now it looked like the situation was about to go from bad to even worse.

"Someone's hijacked your ship?" asked Ardoss.

"No idea," said Ruskella, "but I have a schedule to keep. Mickey will have my head if I'm late."

"What do you want to do about him?" asked the co-pilot, jerking her head in Ardoss' direction.

"I can't let him loose on the ship," said Ruskella. "We'll have to put him in the locker."

"I can help," said Ardoss.

"Not a chance," said Ruskella.

"You forget," said Ardoss, "if you miss your meeting with Pietro, so do I. We both have a vested interest in what happens on this ship and where it goes."

"And when we get there," said Ruskella, "you're going to arrest Pietro Marquez and I'm going to die. I see it as a conflict of interest rather than a mutual goal."

"I could arrest him after you drop off your package," said Ardoss.

Ruskella creased his brow.

"Go on," said the co-pilot.

"You're only supposed to drop it off, right?" said Ardoss.

"Mickey never said anything about seeing him off safely?"

"He didn't," said Ruskella, "but he also told me to kill you."

"And you didn't," said Ardoss. "Either way, you're defying your boss. Drop off your package, then let me have Pietro. That way, we both get what we want."

"He's got a point, Jo," the co-pilot said.

"And if I don't?" said Ruskella.

"You'll be arrested for aiding and abetting," said Ardoss. "What do you think Mickey will do with you then? Help me and I can protect you."

Ruskella's nostril flared and his jaws clenched.

"I'll think about it," he said. "You help us and you don't stab me in the back and I just might do as you ask. First, we get the ship back."

"That's fair," said Ardoss. "So how do you want to handle it?"

"We kick them out of the cockpit," said Ruskella.

Ardoss raised an eyebrow. "Really? You don't strike me as the violent type."

Ruskella's face reddened. "It's my ship. I want it back."

"Okay," said Ardoss. "Let's say you storm up there and pull whoever it is from your seat. Or try to. Then what?"

Ruskella looked at the floor. "I don't know. Lock them up?"

"And if they put up a fight?"

"I fought you."

"And lost."

Ruskella glared at him, but the co-pilot stepped forward.

"I'll handle it," she said.



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Ardoss shook his head. "Let me handle it."

Both pilot and co looked at him, eyebrows raised.

"I'm an Agent," said Ardoss. "I'm trained for this."

Ruskella shot the co-pilot a look.

She shrugged, "He's got a point."

"You're not getting the gun," warned Ruskella.

"I don't need it," Ardoss returned.

"Fine," the pilot conceded, "what's the plan?"

"First, we see what the hell is going on out there."

"After you," said the co-pilot, gesturing to the door.

Ardoss nodded. His plan, he'd go first.

He reached for the door and turned the wheel.

It didn't budge.

He put his weight on it, but still it wouldn't move. "It's stuck."

The co-pilot pushed him out of the way, and she shoved her own weight against the door, her face turning red from the exertion. "No way in hell it's stuck," she said and pushed again. "We keep this ship in tip-top condition." The door's inability to move was a personal affront to her.

She tried the door one last time before finally accepting the reality of their situation. She peered through the window.

"I see the woman and the kid," said Ardoss, "but no sign of the politician. I guess we know who's behind this."

"He didn't seem like the hijacking type," said Ruskella.

She shrugged. "We're assuming this is a hijacking."

"The door's locked," said Ardoss.

"Point," she said. She knocked on the door and peered through the glass. She pounded on the door. Nothing.

"It's too thick," she said. "I would try the comms, but it would alert Thrumm or whoever took over."

"The emergency hatch," said Ruskella.

The co-pilot looked at him and narrowed her eyes.

"If we go that way, one of us has to operate the airlock and one of us has to go out there," she said. "Someone will have to be alone with the Agent."

"I can retake the cockpit," Ardoss said.

Ruskella shook his head. "I can't risk you taking over the ship and leaving us back here. One of us needs to go too."

"I'll go," said the co-pilot. "I have more zero-g training and you'd be in the locker as soon as I leave."

"Fine," said Ruskella. "We're getting farther off course the longer we stand here arguing. Char, take the Agent and get me my ship back."

Ardoss could see in the man's face he'd rather be the one going. He must have had a lot of trust in this woman. Ardoss knew what that was like, to trust someone to do what needed to be done.

But that was gone now, ripped away when he found out about Pietro's dealings. Twenty years they were together and never a word, not a hint.

The three of them made quick work to strap down the cargo hold. Ruskella helped Ardoss and the co-pilot into the evac suits.

"Wait. What about you?" asked Ardoss, "There's no airshield on this ship's hold."

"I'll be fine," said Ruskella.

Ardoss raised an eyebrow.





"I've got it rigged," said Ruskella. He pointed to a small seat with straps and an O2 tank right by the control panel. It had a small enclosure with a door around it, barely big enough for a person.

"You two have done this before," said Ardoss. "Must be interesting working for Mickey."

The co-pilot stole a hard look at Ruskella. "Couldn't say."

Ruskella turned bright red, something unspoken passing between the two. Changing the subject the pilot said, "We need to hurry."

Ardoss nodded and, with help, donned his helmet. It snapped into place. His breath warmed the dome and the visor fogged a little. The familiar hissing started, followed by the clinical, yet somewhat musty odor of oxygen filtered into the suit. He coughed once as it filled his lungs.

"Can you hear me?" the co-pilot asked over the suit comms.

"Loud and clear," replied Ardoss. "It's Char, right?"

She took a moment to respond.

"Yeah," she said. "Now grab the railing. We've only got one really good chance at doing this."

He nodded, aware as soon as he did it that the suit swallowed simple gestures.

Char grabbed the rail and gave a thumbs up to Ruskella. Ardoss followed her example. Ruskella had an O2 mask strapped to his face and returned the gesture, punching a button on the console.

Vacuum yanked at Ardoss. He lost his footing, but kept his hand tight on the rail. Just as his fingers started to slip, the pressure equalized and the pull lessened.

"Ready?" asked Char.

"Yes."

She reached outside the ship and grabbed a hold on the hull. Ardoss followed.

Once they were outside, the door closed. He could only imagine what kind of discomfort Ruskella must be in. It was gutsy for sure. And downright dangerous.

He suddenly thought better of the man.

"You guys are pretty close," said Ardoss.

Char didn't say anything.

"You get that way, I suppose," he continued, "out here alone, just the two of you."

Silence.

"That's how Pietro and I were," he said. "Or I thought we were. Twenty years together and I never had a clue he was working for Mickey. Betrayal like that makes you question everything."

"I wouldn't do that to Jonah," she said.

"What about him screwing you over?" he said. "It's clear that he ran with Mickey and didn't tell you about it."

"He didn't have to," she said. "I wouldn't be a good partner if I didn't notice the little things. He didn't bring it up, so I didn't mention it. We've known each other sixteen years, he's worked for Mickey for ten. I knew the day Mickey approached him."

"Are you two . . .?" said Ardoss.

She laughed. "Of course not. Jonah is married with three children. I introduced him to his wife."

"That doesn't keep people from enjoying the company of each other," he said.



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He could almost feel the scowl she must have given him.

"I owe him more than you could understand," she said. "Jonah's a good man. He wouldn't work for Mickey if he had a choice."

"Are you saying he was coerced?" he said.

"Of course he was," she said. "That's the way Mickey Black works. He finds something on you, a way to squeeze you. He manipulates you into doing what he needs done."

Ardoss wanted to ask more, but they had reached the cockpit.

"This will be just like the cargo hold," she said. "When I open the door, the cabin will decompress. Grab onto something or you may be blasted out into space."

"Understood," said Ardoss.

She reached for the latch and Ardoss looked around for a hook or a bar or something to hold onto. There was a small ledge and he dug his fingers in.

"Ready," he said.

Without another word, she twisted the handle and the door popped open. Air whooshed past them, knocking Ardoss' hands loose from his hold. He tried to grab back onto something, anything, but he'd already drifted away from the ship. Food wrappers expelled from the cockpit whirled around him.

He stared for a moment as the ship grew smaller. The hiss of air pumping into his suit was the only sound. Gradually, the panic built as he realized the ship wasn't coming back. The pounding of his own heart and his rapid breathing smothered the sound of the oxygen.

A red light blinked on his display. His O2 was low. These suits weren't meant for long excursions. He had minutes. Ardoss steadied his breathing. He needed to conserve. If he was going to survive, he needed to be calm.

The ship dwindled smaller and Ardoss couldn't help but feeling he was about to die.

*To be continued*



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