

# JUMP POINT

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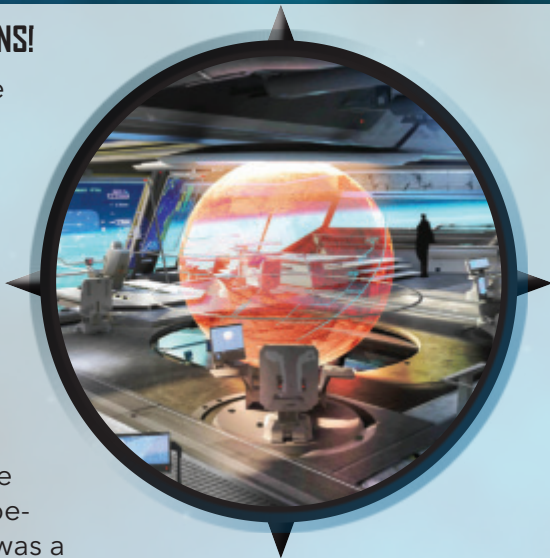
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## GREETINGS, CITIZENS!

**Teamwork** is the title of this issue, and it is demonstrated in multiple ways. When I asked Nathan whom I should credit for the Freelancer cargo hold on our cover, he told me there wasn't a specific person – it was a team effort. (You could even say the pic itself has a team working in the hold.)



And as usual, our Behind the Scenes interview describes a great deal of teamwork, as they work to create a really intricate part of the game we've promised. But on top of that, what they're designing will enable you to engage in teamwork yourself to a degree never before possible.

Behind the Scenes this month is a discussion with the people working on the functionality of multicrew ships – particularly the stations and seats that will control our larger ships, from a two-seater Super Hornet to the Bengal-class carriers with its hundreds of stations. (No, this isn't a promise that you'll be able to captain a Bengal anytime soon.) We weren't able to answer nearly all the questions that Subscribers posed, but I thank all of you who submitted questions, and in particular **BaconofWar**, **Waytrekker**, **Guntram**, **Lock\_Os**, **DragoFire**, **Zorwan**, **rucdoc** and **reddot24**.

Meanwhile, Zane is still busy, and will continue to be so for the foreseeable future, but he managed to answer three more questions, from **Sao Saoldian** and **Trent Hawkins**. He plans to continue working his way through the stack,

but (at least for the time being), I've untagged the request-for-questions post until he has a chance to catch up.

**Terms of the Issue.** We have two this month, from the captions that Paul Reindell gave us for the Multicrew article.

**Proxy** stands for "proximity model," a rough representation of the exact shape of an object (for example, a ship). Some of the programming doesn't need precision to the millimeter, and so the proxy model allows that part of the programming to more quickly calculate effects and results.

A **voxel** is like a pixel, only in 3D (a "volume element" rather than a "picture element"). You voxelize an object (again, a ship is a common example in SC), so that you can apply programming that requires rapid calculations that are more easily made on this sort of bitmap version of the object.

There's a longer (and better) description for both of these (Proxy Pattern, Voxel) in Wikipedia, among other places.

One place they are used is with the LocalPhysicsGrid (described in this issue's article), especially when one grid is meeting or intersecting another grid.

That's it for this month! As always, if you have any suggestions for what you want to see in **JP**, drop me a note or a post in the forums and we'll see what we can do.

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

*David*

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<b>COVER:</b>	<b>UK SHIP DESIGN TEAM</b>
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FROM THE HICKET

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# Constellation Upgrade



As our vision grows clearer of exactly what each ship and each ship manufacturer are creating, we are able to more clearly refine the ships you'll be flying. With the emphasis on getting multi-crew ships ready to fly, the Constellation and Freelancer have been getting

an upgrade, which we'll be showing you today. **Chris Smith, Lead Vehicle/Weapon Artist**, and **Josh Coons, 3D Modeler**, have taken the lead on re-vamping the Constellation, as illustrated by these before and after shots.



WORKING IN PROGRESS



**Chris S:** One of the biggest changes to the interior is the addition of the new bulkhead that separates the cockpit area from the living quarters. This change had two main purposes:

- Limit the amount of potential exposure to the outside, due to the main entrance in the floor.
- Give the cockpit and the living quarters its own distinct feel and atmosphere.

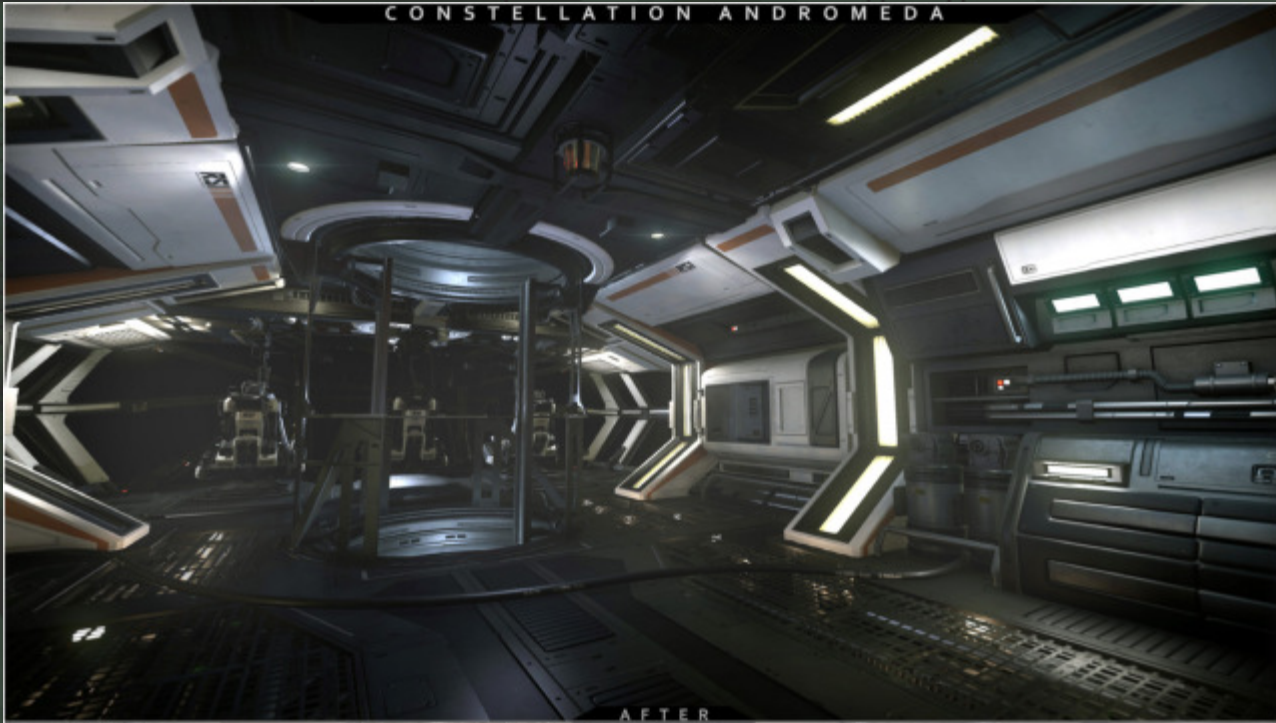
I gave the cockpit room a darker/moody look, whereas the living quarters has a contrasting bright/white look. I colored the mechanical wall components white and kept that style/theme throughout the ship for a cohesive look as you go from room to room. The detailed wall pieces are not just for show – these also function as housings for the various serviceable components (shield gen, radar, etc.) the Constellation has installed throughout the ship.



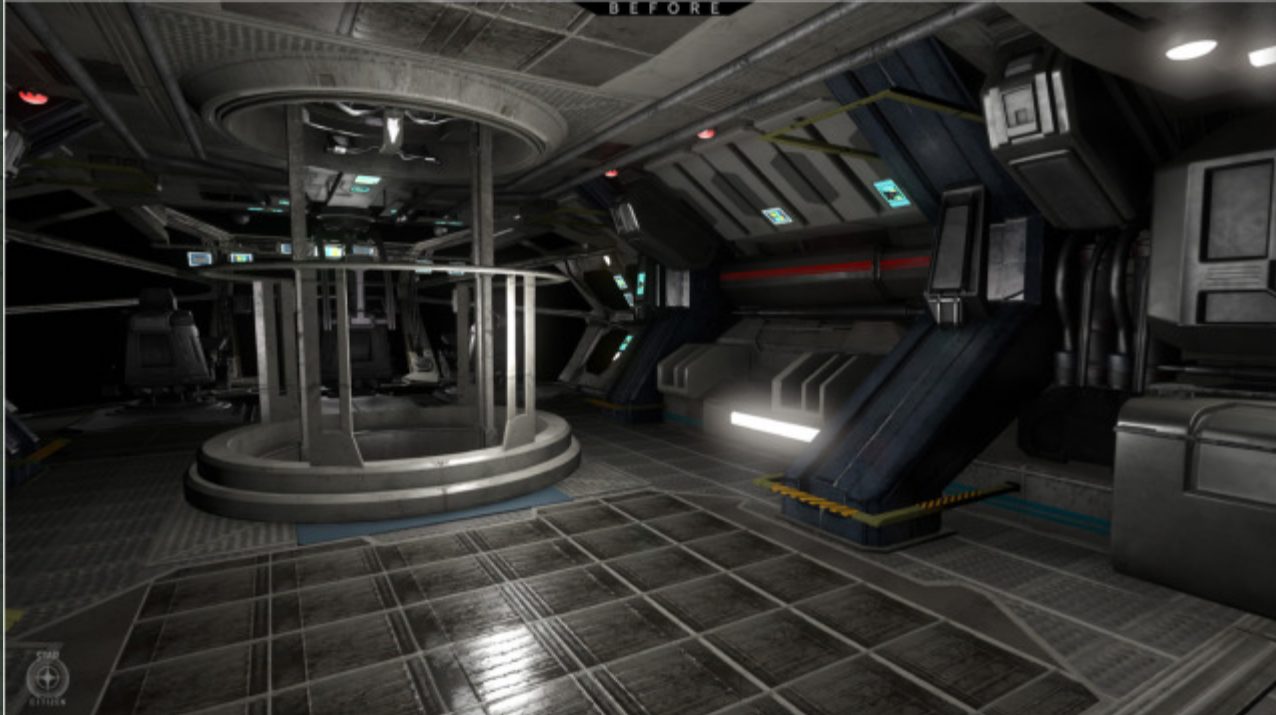
WORKING IN THE DARK



CONSTELLATION ANDROMEDA



AFTER  
BEFORE



**Chris S:** Another distinctive and obvious difference is the addition of multi-layered and fine detail throughout the ship. With our newest modeling techniques we were able to add much more detail whilst at the same time saving on poly and texture memory! In this picture you can see the changed entrance to the turrets. The new rear-facing entrance provides a much quicker and easier way of getting in and out of the turret seats compared to the old version. Also, the new floor has accessible hatches where serviceable components will be located.

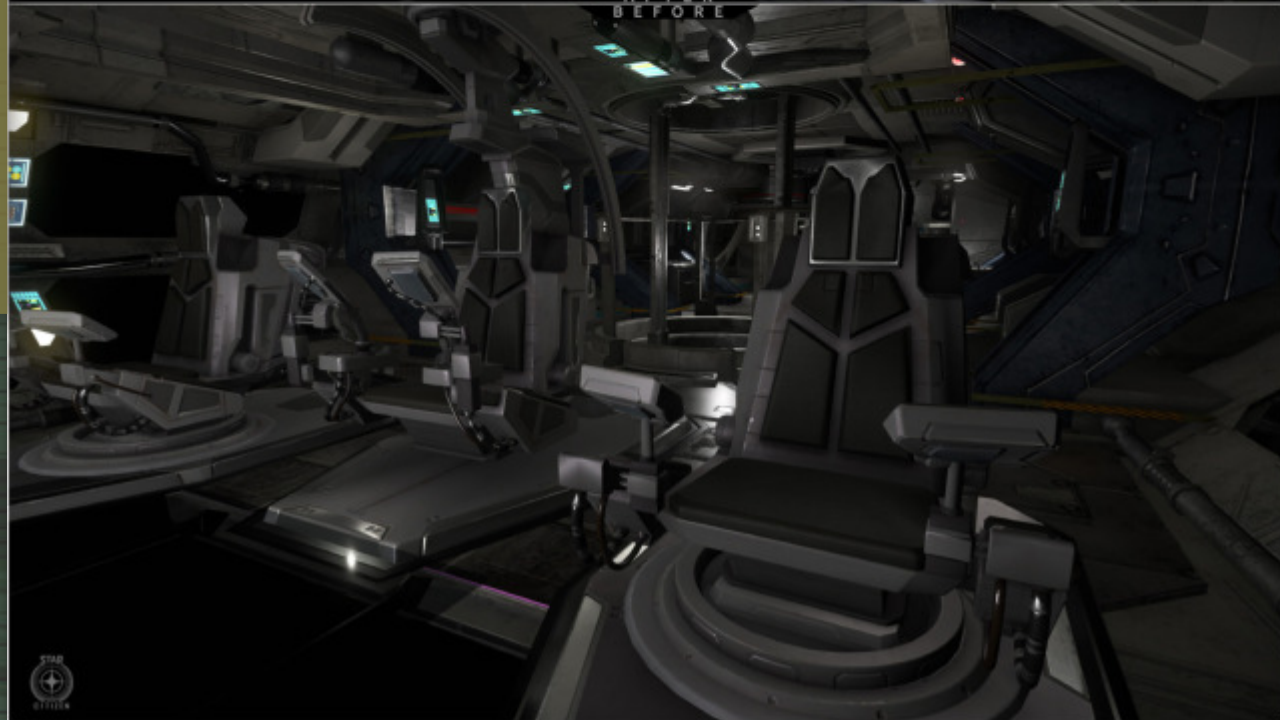
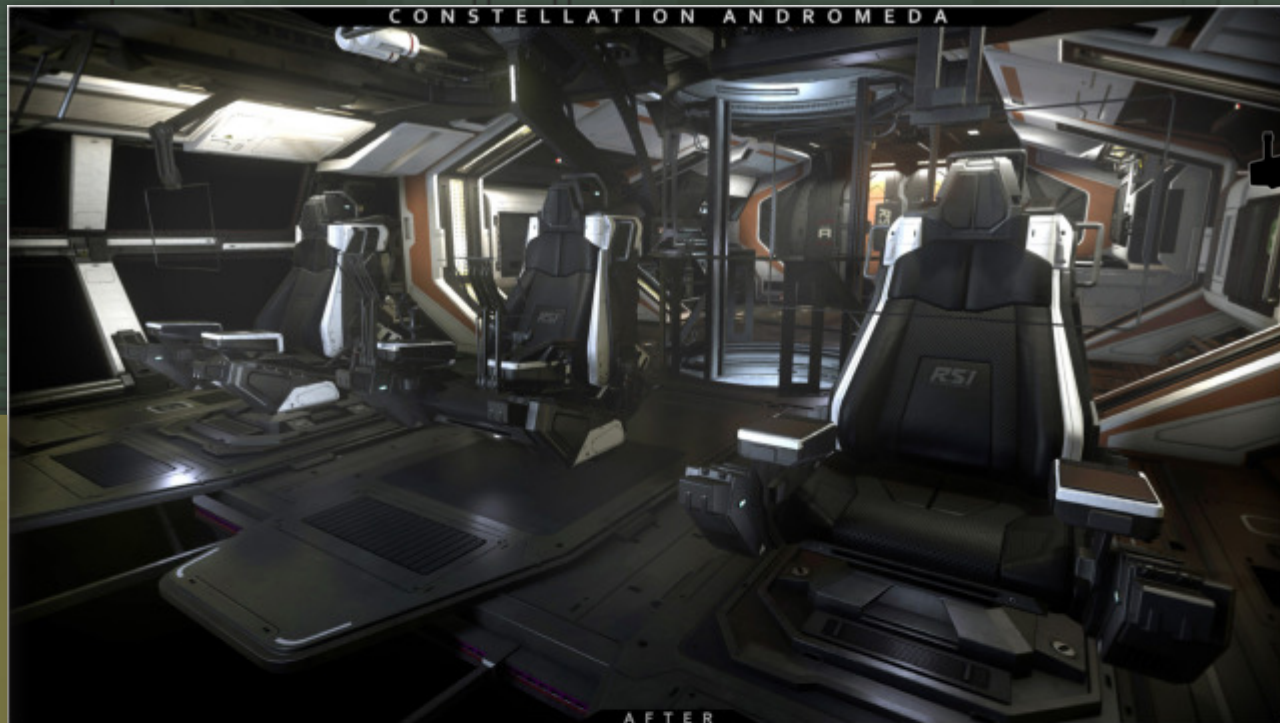


WORK IN PROGRESS





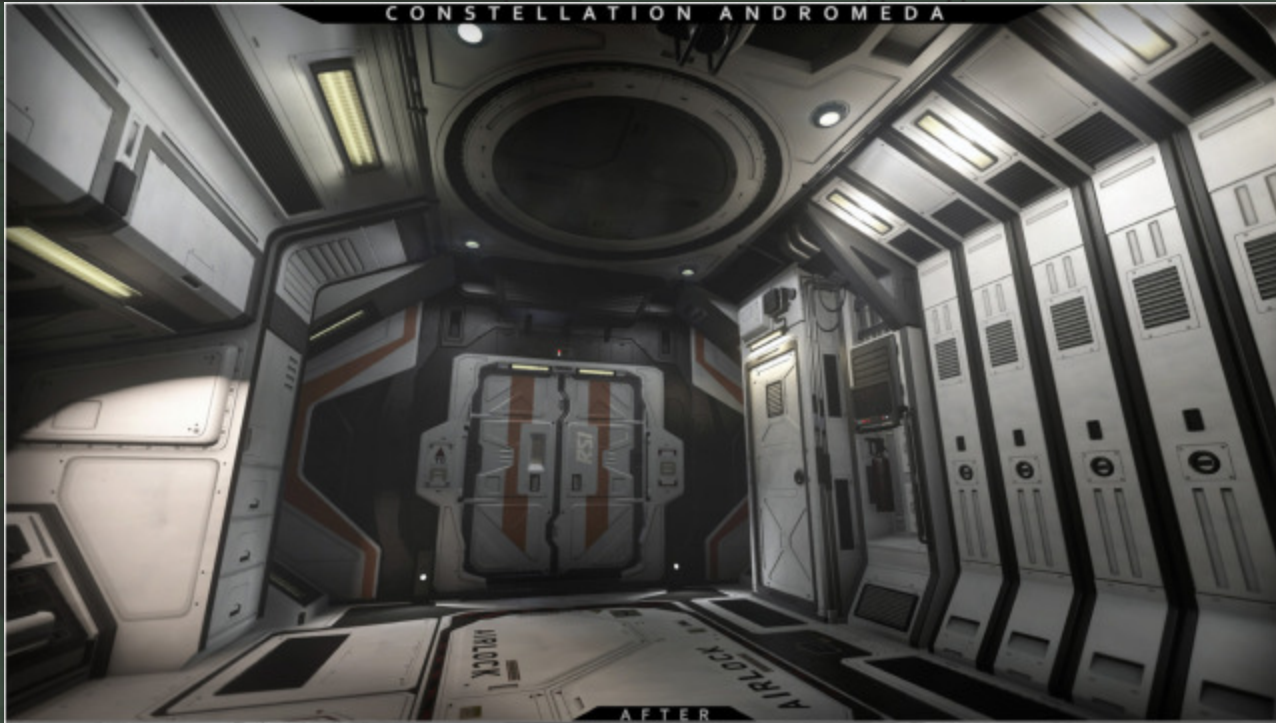
**Chris S:** The seats, while kept mostly in the original configuration, have received the same enhanced level of detail. I wanted them to look like they could be comfortable for extended trips, so I made sure the leather texture and upholstery came across as real as possible, right down to the embroidered RSI logo! The interaction screens have also been updated with new and smoother animations and better reach for player characters.



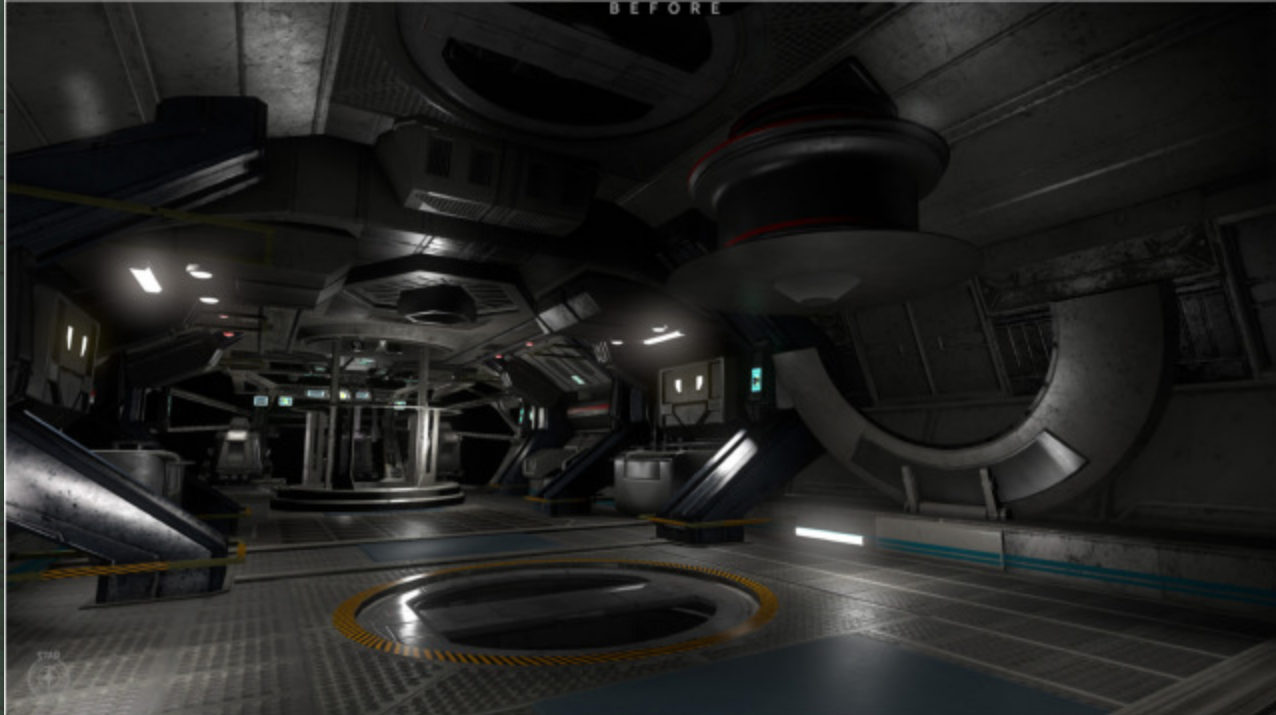
WORKING IN PROGRESS



CONSTELLATION ANDROMEDA



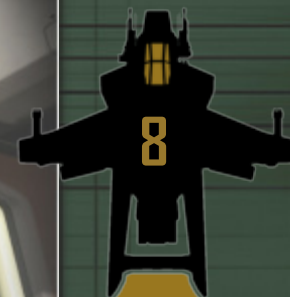
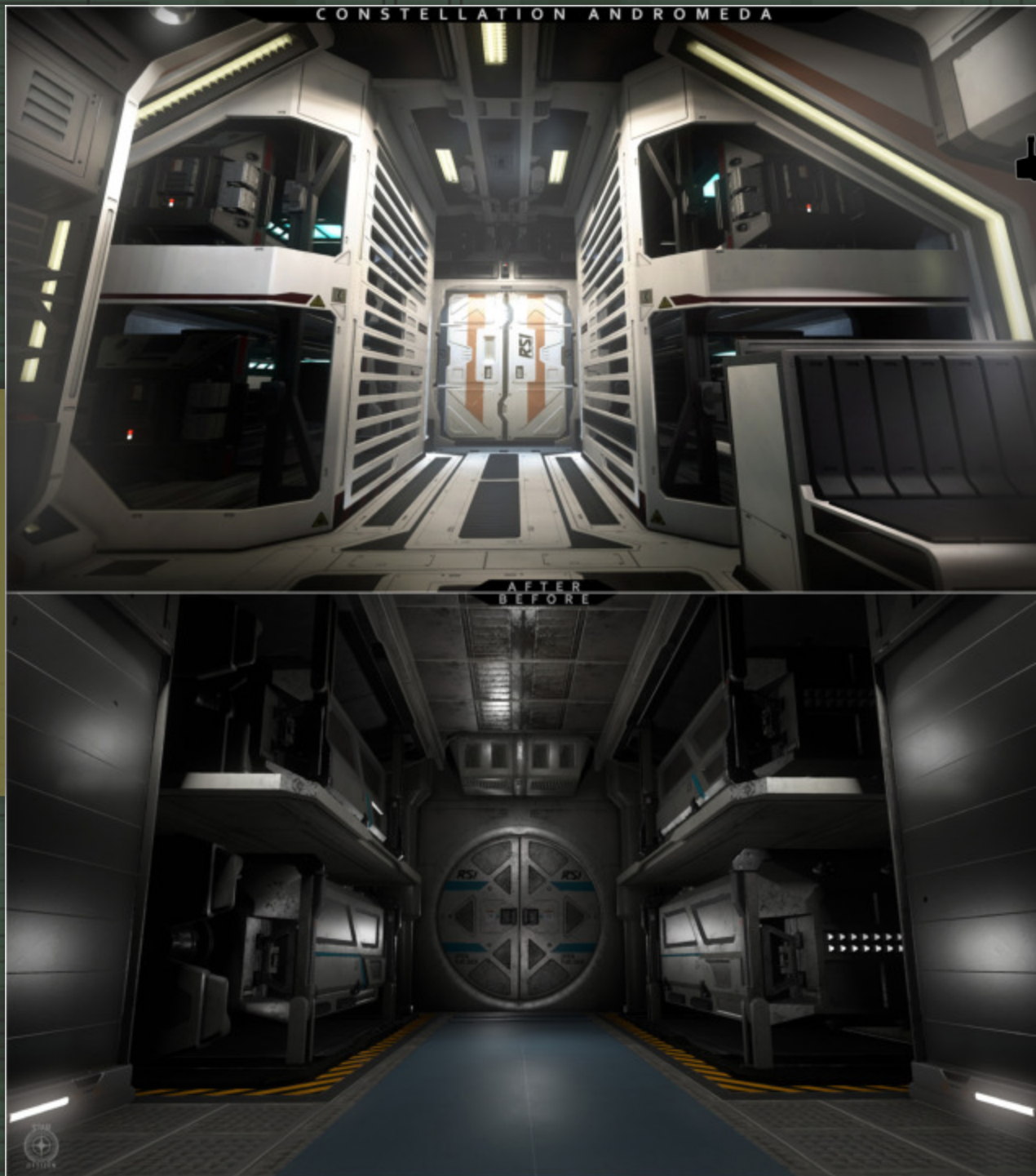
**Chris S:** I wanted to give the living quarters a very distinctive and contrasted look compared to the other rooms in the Constellation. It should feel more livable and comfortable for recreational time in the ship, hence the brighter colors and lighting. Also, the airlock was redesigned to more easily accommodate the whole crew if they choose to all board or disembark at the same time. It still retains an integrated decompression chamber. The updated shower/toilet combo room, as well as a floor-retractable dining table saves on interior space, allowing more room for the whole crew to move around in that area.



WORKING IN PROGRESS



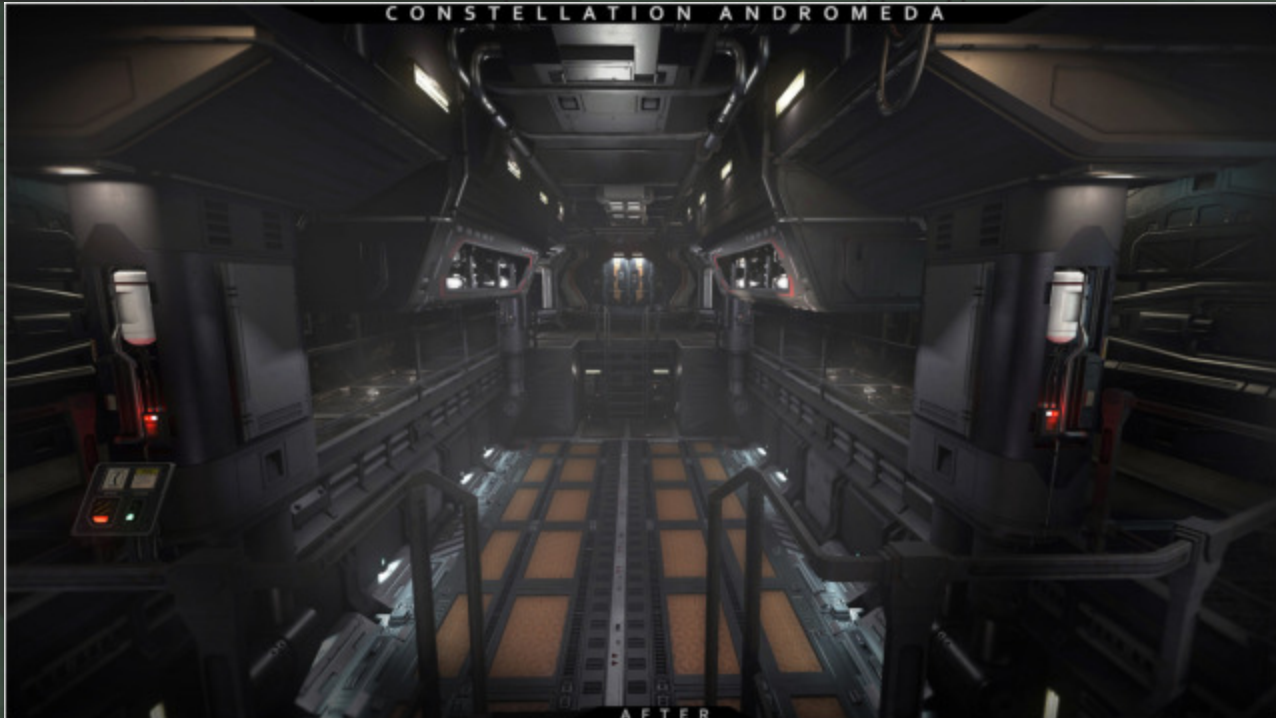
**Chris S:** The escape pods in the new Constellation received an updated pod 'room' that seals the pods off from the main room to prevent unwanted exposure to the outside. I added windows as a way to see the pods and their detail. A weapons rack was added in the living quarters to enhance the armament capabilities of the crew.



WORKING ON THE SYSTEMS



CONSTELLATION ANDROMEDA



AFTER  
BEFORE



**Chris S:** The main cargo room mostly stayed functionally the same. The most notable addition is the inclusion of an integrated weapons rack for the top-loaded missiles on either side of the room. While the missile rack box opens on the cargo sides for reloading, I included a viewing window to allow the crew to catch any potential problems with the reload system during operation. The main floor also now includes the new magnetic cargo floor system that will be used throughout the game. I wanted this room to have a lot of contrast with the living quarters, so that as you walk from the quarters full of light, you go into this large, dark and cold cargo area, where it's all business.

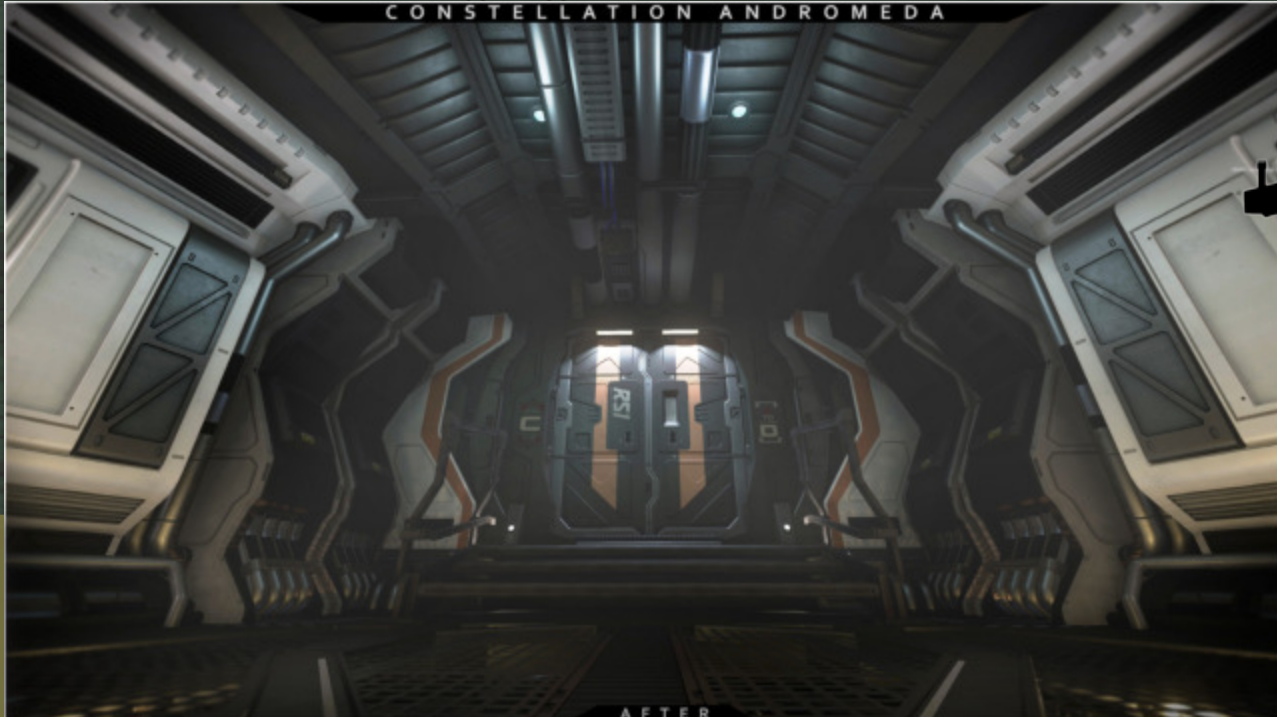


WORK IN PROGRESS

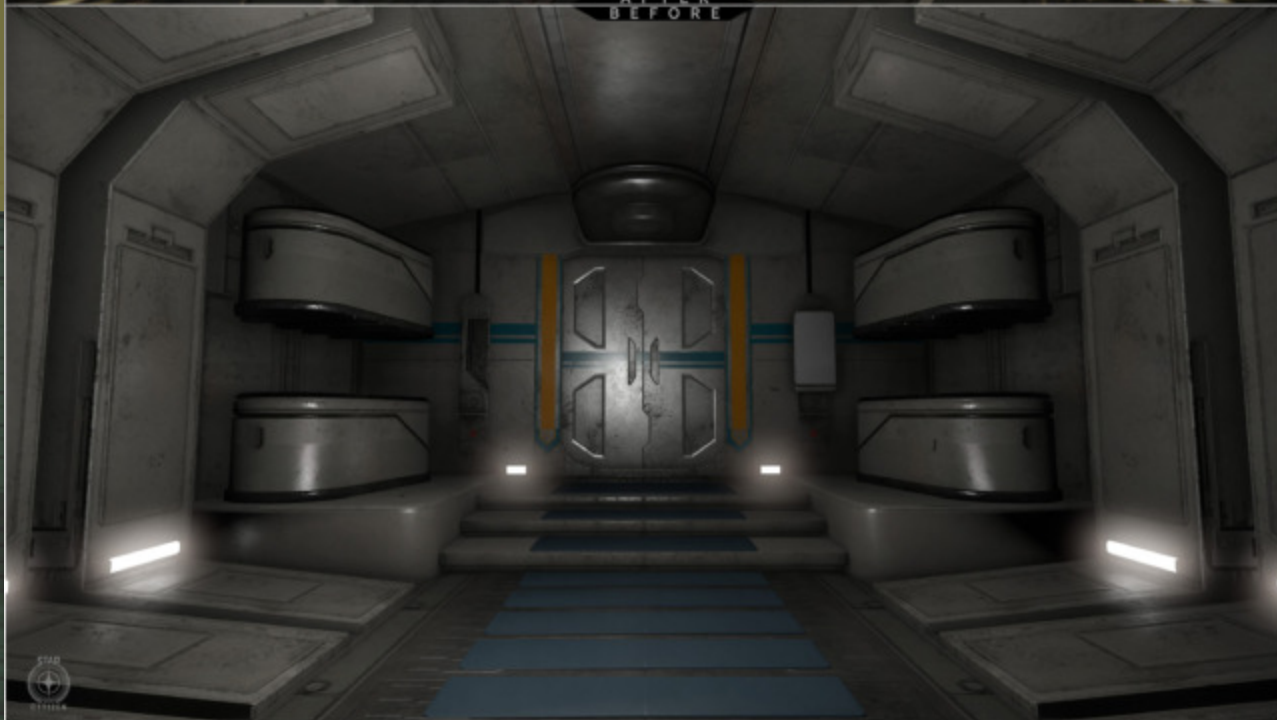




CONSTELLATION ANDROMEDA



AFTER  
BEFORE



**Chris S:** The previous version of the ship had the lockers in this back area, which didn't make sense, so those were moved to the living quarters in the new version. Replacing the old lockers are highly detailed mechanical wall pieces that will serve as housings for the ship components.



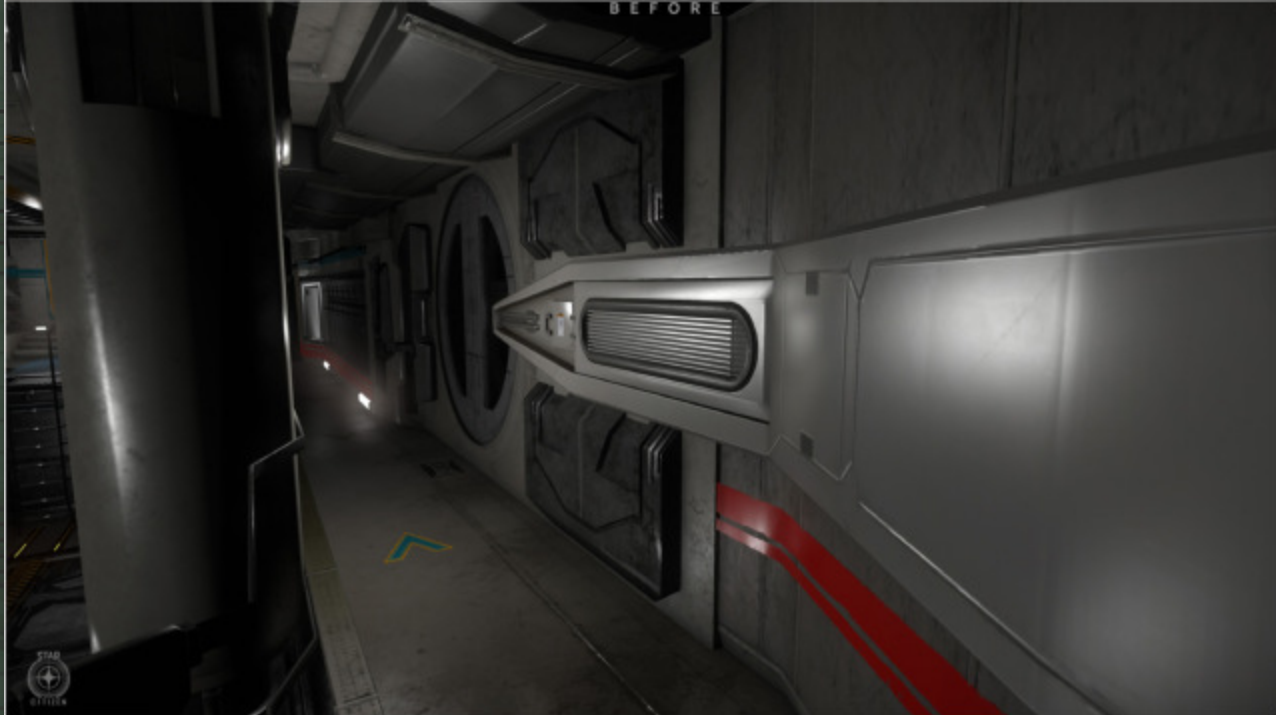
WORKING IN PROGRESS



CONSTELLATION ANDROMEDA



AFTER  
BEFORE



**Chris S:** Since the cargo walkways are very tight, it reminded me of one of those tight submarine-like spaces, so I added a lot of piping and mechanical detail to get a bit more of that claustrophobic sub-feel when you walk down this hallway. At the same time, I actually widened the walkway towards the back to give characters a bit more wiggle room. The use of multi-layered detail enhances this area considerably.

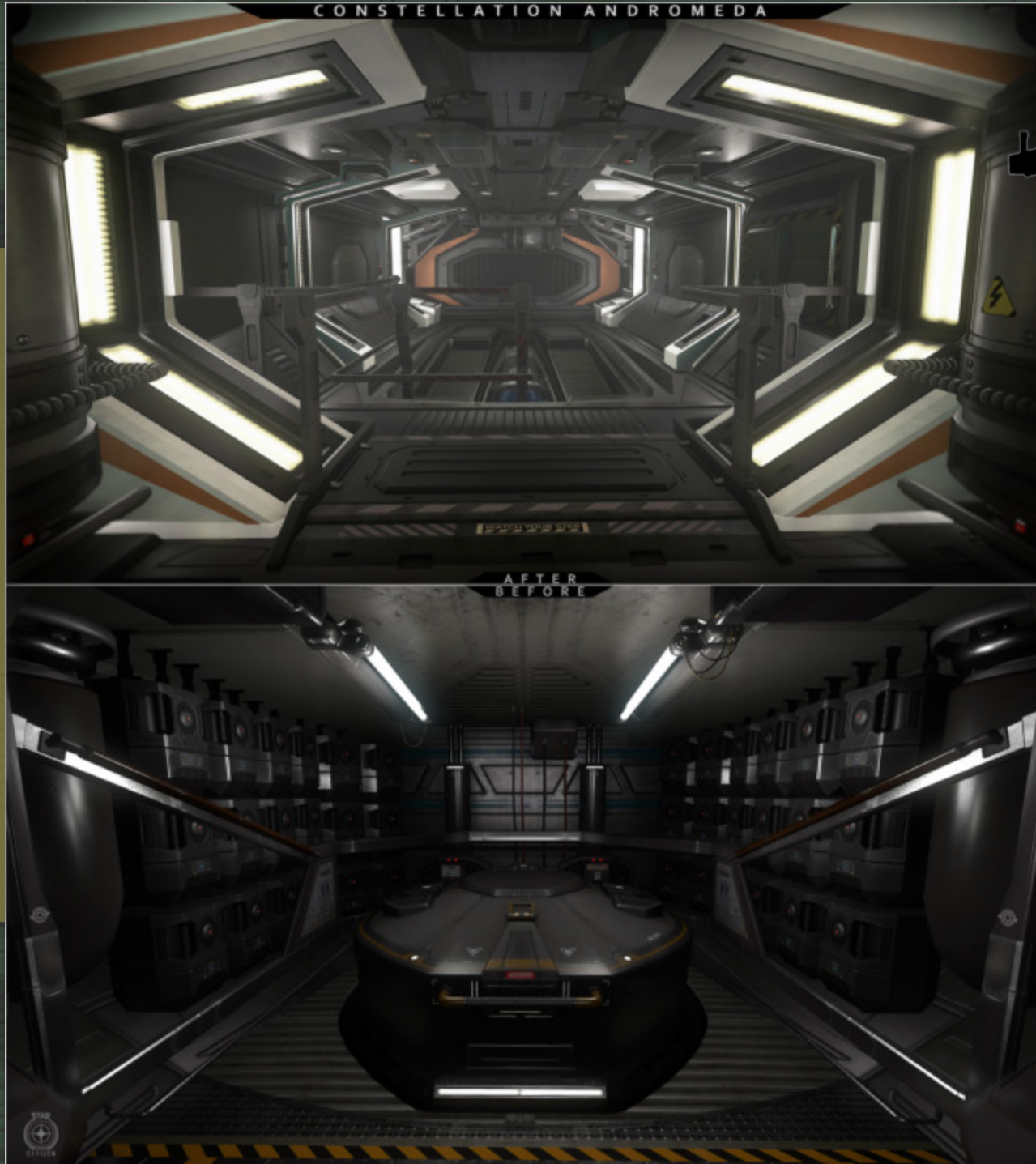


WORKING IN PROGRESS





**Chris S:** The engine room/ Merlin pod berth was redesigned quite a bit. We weren't too happy with the old design solution, which included a complicated hatch/tube section the pilot had to climb through to get to the Merlin ship. We cut most of that clutter out and created a more direct connection between the Merlin and Constellation where the pilot simply enters the Merlin's cockpit directly from the room. This not only enhanced it visually from the inside, but also from the exterior. Stylistically, the room includes a lot of visual similarities to the front of the ship to provide a more cohesive feel overall.



WORKING ON THE MERLIN





**Chris S:** Most of the ship's components, including the power plant, are now housed within the detailed wall sections of the engine room, with the player's ability to open and service these components if the need to do so arises. I used a lot of decals and micro detail to try to make this area feel somewhat 'dangerous' and purpose driven.



WORKING ON THE





**Josh C:** *Turbine Covers*

I wanted to put a lot of detail into this area. These turbines will be proprietary to RSI so I wanted to really nail down the look of both the turbine and the housing. At the same time, I wanted the actual art to be reusable across all ships no matter the orientation. In this shot you will notice a lot more love was given to the maneuvering thrusters as well. I believe the end result is a much more recognizable component and more pleasing aesthetic. The MK4 decal I added for fun to symbolize the new Constellation.





CONSTELLATION ANDROMEDA



AFTER  
BEFORE



**Josh C:** *Escape Hatch*

These needed a bunch of love to get them up to the quality bar. I added actual explosive charges at the base of the escape pod hatch cover that detonate when the escape pod deploys. The numbering on the hatch indicates the individual pod – this one is 201, indicates it's the top bunk, right side.



WORKING IN PROGRESS





CONSTELLATION ANDROMEDA



AFTER  
BEFORE



**Josh C:** *Bottom Shot*

Here I mostly focused on getting the hull to feel right in scale and look good. In this shot you can see the re-shaped bottom hatch which can now easily fit more than one crew member. Lots of micro detail was added to enforce the scale of the ship and bring it to size.



WORKING IN PROGRESS





CONSTELLATION ANDROMEDA



AFTER  
BEFORE



**Josh C:** *Lower Nacelle*

The lower nacelle in the beginning felt really disconnected and needed a redesign. Front running "DRL" lights were added to each retro thruster, noise from excessive geo was reduced, and a new chunky landing gear set added – the sled landing gear is now replaced with a new heavier set. These needed to be super heavy, as the Constellation rests all of its forward weight on just this set of landing gear.



WORKING PROGRESS





CONSTELLATION ANDROMEDA



AFTER  
BEFORE



**Josh C:** *Under Shot*

Out of all the feedback from backers, the Merlin docking was brought up the most. Gone is the telescoping tube and the "sport jock strap" shaped connector. I added a slight angle to the lower nacelle connections for a more aggressive stance. The rearmost turbines have been removed to make way for components and the Merlin entry/exit. (We felt the remaining 16 turbines would still easily do the job.)



WORKING IN PROGRESS





**Josh C:** *Upper Nacelle*

The first thing to go was the oval-shaped bits. They didn't follow the style guide for RSI and removing them gave us more polies to play with and drastically enhanced the overall silhouette of the ship. I removed a huge amount of unseen detail (and more polies), which allowed me to give more detail to other areas of the ship that will actually be viewable. The Constellation letter logo was added to the side, as well as a full set of directional flight lighting.



WORK IN PROGRESS



CONSTELLATION ANDROMEDA



AFTER  
BEFORE



**Josh C:** *Front Shot*

The old front nose frame felt disconnected. I used more connection points and gave it a more frame-built appearance. You will notice the nose side wings are no longer floating, but instead are now supported by a rail system. Front running lights were added to the side wings, as well as landing lights toward the bottom.



WORK IN PROGRESS







WORKING IN PROGRESS



CONSTELLATION ANDROMEDA



# Freelancer Upgrade



WORKING IN THE DARK

Meanwhile, across the pond, the F42 ship team has been working on – well, they’ve been working on a lot of stuff, but today we’re showing you their current results on the Freelancer.

**Nathan Dearsley**, the new **Art Director – Vehicles**, **Neil McKnight**, **Senior Vehicle Artist**, and others combined to give us the lowdown on how the Freelancer has been upgraded.



**Neil M:** Gunner entrance position changed to reflect the new seating template. It also allows you to use the chair with full cargo.



WORK IN PROGRESS





AFTER  
BEFORE

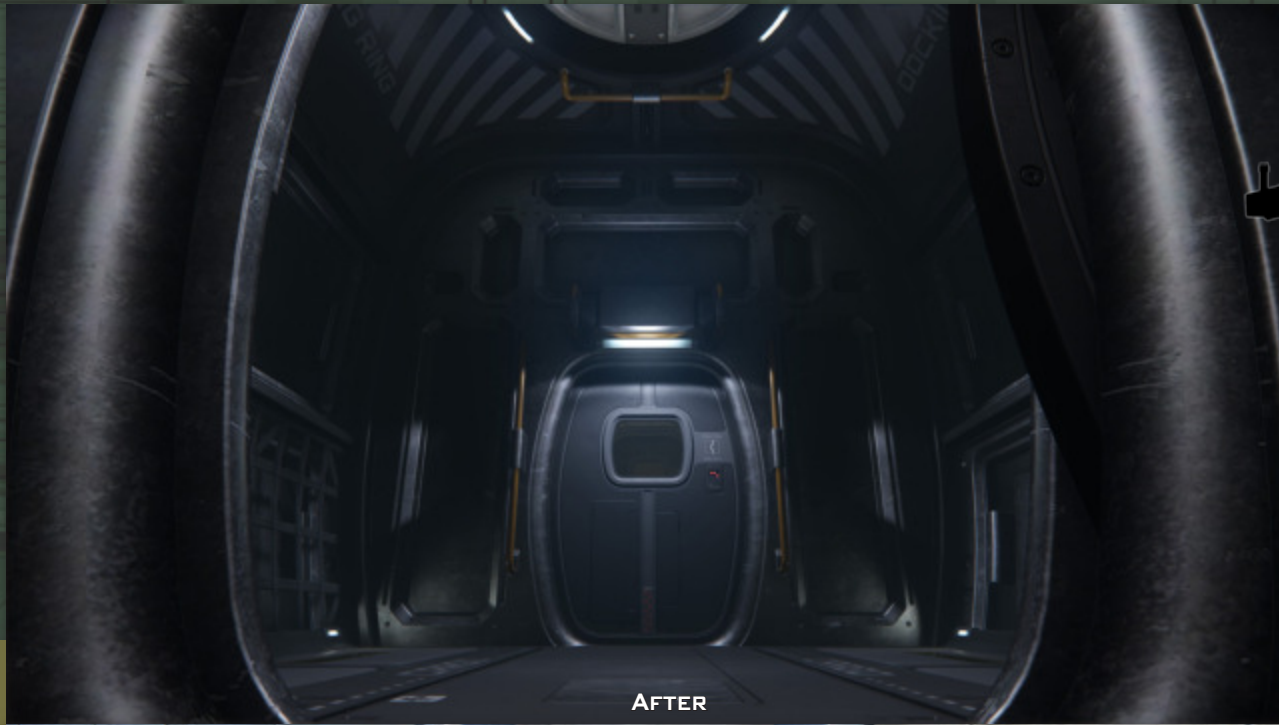
**Neil M:** Cargo area extended and widened to fit new cargo dimensions. This also allows enough room to walk beside it.



WORK IN PROGRESS



**Neil M:** Airlock room widened to allow extra cargo and the other room variants.



AFTER  
BEFORE



WORKING IN PROGRESS





AFTER  
BEFORE



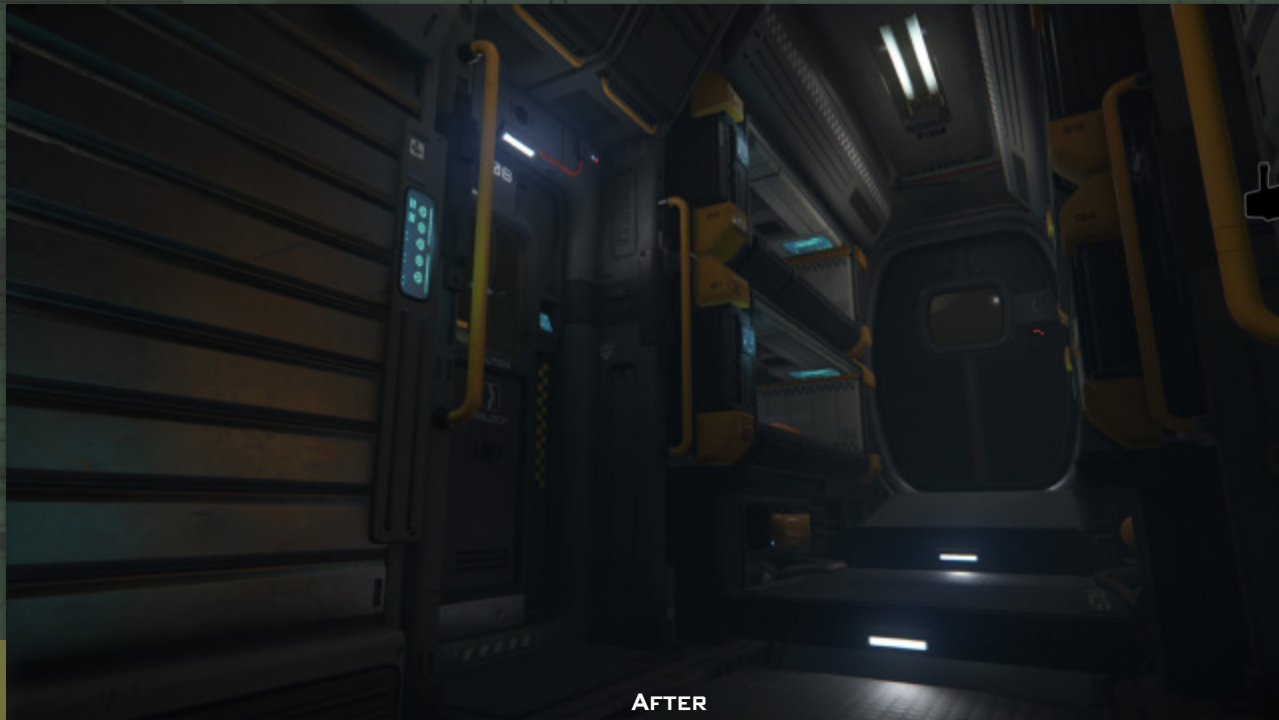
**Neil M:** Removed floor entrance to avoid navigation issues when there are multiple players in the area.



WORK IN PROGRESS



**Neil M:** Entrance now relocated to the side of the living quarters. Bunk beds double up as escape pods.



AFTER  
BEFORE

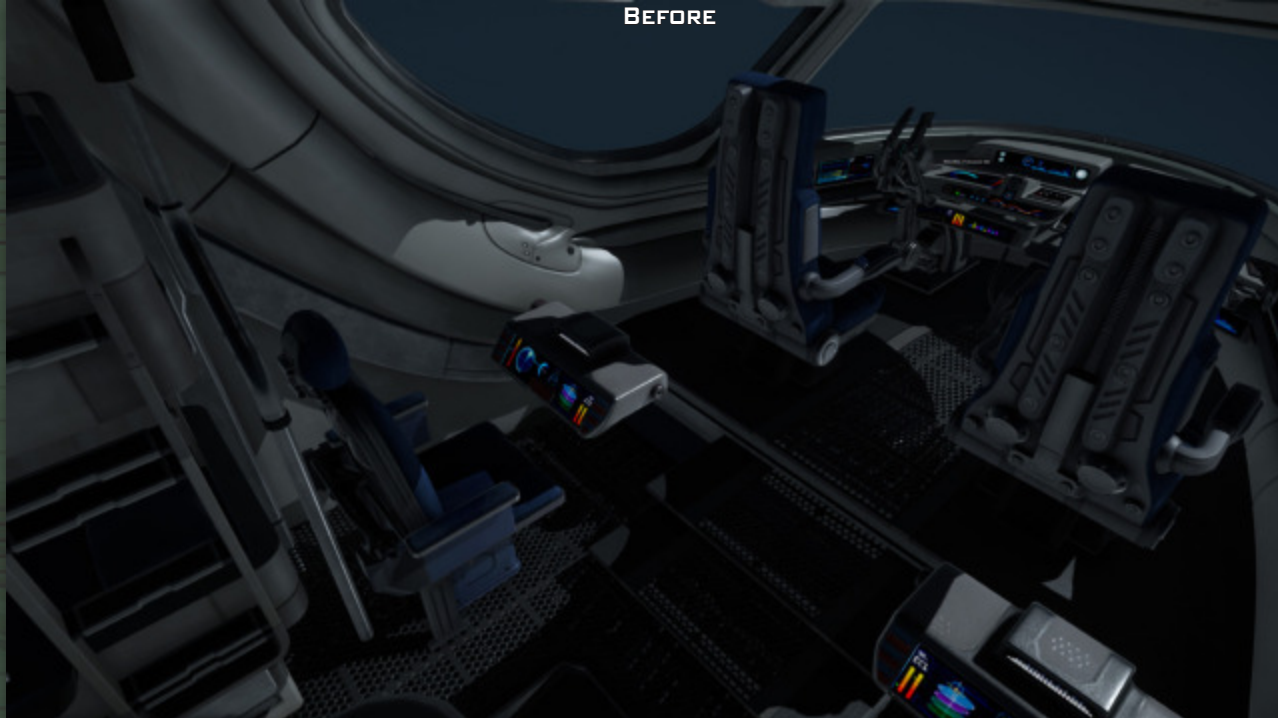


WORKING IN PROGRESS





AFTER  
BEFORE



**Neil M:** New cockpit layout with bulkhead/airlock added to separate cockpit from living quarters.  
*[this page and next page]*



WORK IN PROGRESS





AFTER  
BEFORE



WORK IN PROGRESS





AFTER  
BEFORE



**Neil M:** As the underside entrance has been relocated to the side, we could now lower the ship to allow the ramp at the rear to be more accessible.



WORKING IN PROGRESS



**Neil M:** Changes in the cargo area of the ship had a knock on effect to the exterior of the ship. After these adjustments were made we also lengthened the wings and engine mounts to make the ship more balanced.



WORKING IN PROGRESS





WORK IN PROGRESS





# Terra Mills



## A Business Takes Root

Millions of people consume their wide range of products everyday, but to the surprise of many who enjoy these drinks, snacks and meals, Terra Mills did not get its start in Terra at all. In fact, for the first century of its existence, Terra Mills was exclusively located in Bremen.

Though settlement began in the 25th century, it wasn't until the outbreak of the Second Tevarin War in 2603 that Bremen, and more specifically Rytif, began to really take off. The Navy turned to the small agrarian planet to help feed their largest ever fighting force of starmen to date. As demand skyrocketed, farmers were eager for the influx of government credits but lacked the infrastructure needed to take full advantage of the subsidies, so they began to pool their resources. Under the leadership of

de facto Governor Arcturus Koerner, the major landholders on Rytif banded together to form the Bremen Milling, Processing & Farming Association, more commonly and simply known as Bremen Mills. This collective of farms, processing centers and mills allowed its members to cut costs by sharing the overhead of expensive large-scale production, as well as providing them a united front through which they could set higher prices through collective bargaining.

In just a few short years, Bremen Mills became an economic powerhouse, and for the next several decades saw its shareholders becoming extremely wealthy. However, due to a lack of diversification, when the grain market crashed in 2640, Rytif, and with it Bremen Mills, fell on hard times.



## Ashes

Though profits were down, Bremen Mills managed to hang on. The Empire still needed grain, and though margins were slim, the established network of transport, milling and processing allowed Bremen Mills to succeed where other farmers were forced to close shop. During this period, many of the farms consolidated ownership and by the turn of the 28th century, Bremen Mills boasted the largest agricultural holding on Rytif and changed from an association into a corporate entity in its own right. Through further standardization and streamlining, it began to look like things could finally be turning around for the once-struggling group. Then disaster struck.

In 2716, the main Bremen Mills grain facilities just outside of Stalford exploded, killing hundreds, injuring hundreds more and sending a plume of fire into the sky that could be seen from orbit. Known today as the Great Stalford Disaster, official reports state that a broken filtration unit in a mixing area allowed airborne flour dust particles to accumulate to dangerous concentration levels. A single spark was all it took to ignite the air. The fire that raged afterwards burned tens of thousands of cultivated acres surrounding the facilities. It was days before it could be fully contained. As the people of Rytif sorted through the wreckage, very little hope remained that the struggling collective would be able to recover from such a crippling catastrophe.

## Growing an Empire

Meanwhile, a few jumps away, another agricultural conglomerate was experiencing its own, if less grisly, difficulties.

Terragra, Inc., founded in 2665 on Terra, had made its mark on the system with its range of salty and sweet

snacks. The most popular of these, Prallies (a wheat snack stick covered in a spicy caramel coating), was starting to gain notice across the Empire. As orders from stores and stations wishing to stock the snack grew, Terragra could not find an affordable source of wheat that they could use to reliably expand their production.

The solution to the company's supply problems presented itself after the catastrophe at Stalford. Seeing an opportunity to guarantee their own secure source, Terragra offered to provide Bremen Mills with the capital needed to rebuild their destroyed facilities in exchange for controlling interest. The two companies were able to resolve terms for a mutually agreeable merger and, in the summer of 2717, they revealed their new corporate identity as Terra Mills, headquartering production on the more affordable Rytif.

Thanks to the combined resources of the two companies, Terra Mills was able to meet demand and launched Prallies across the Empire to soaring popularity. Within a decade the processing facilities on Rytif had surpassed their previous capacity and soon Terra Mills was making an ever expanding product line, from cereals like Dappers to the perennial holiday cookie favorite Maybelles, and even eventually expanding into the drink market.

## Ready to Pop

Whereas the snacks Terra Mills introduced over the last two centuries usually met with positive reaction from the public (or at the very worst indifference), this was not the case with their initial beverage offerings. Today, everybody is familiar with Terra Mills' assorted beverages – from Pips, to Fieldsbury, to Clash – but their first attempt, Braga Malt, a malted fruit drink created as a way to find a use for surplus barley, was universally despised. Terra Mills actually received hate comms after the launch of Braga. The





complaints described a drink that tasted stale and bitter. The flavor scientists were stumped; everything they had tasted off the factory floor was delicious. It took a marketing director bringing back a case from Horus for them to get to the bottom of the issue.

Cracking open the can and tasting the drink that had been shipped out for themselves, they immediately saw what the complaining was about: it tasted terrible. Something was happening to the Braga from the time it left the factory to the time it arrived on store shelves. Careful research revealed that their bottling plant was using a grade of aluminum composite that wasn't up to the rigors of space travel. At first, it seemed that the only solutions available were switching to more expensive containers, which would severely hamper their profit margin, or changing the drink formula to overcompensate for the effects of shipping. Unsatisfied with choosing between two lackluster options, the scientists in the Terra Mills lab managed to formulate a completely different solution. They devised a method to store carbonation inside nanobeads which would remain intact until the surrounding pressure was fully released. This process insured that a drink would never go flat and could survive decades in space without any adverse effects. Braga Malt was redesigned with this revised formula and repackaged under the new name Snazzle. The drink was a huge hit and continues to be so, with a dozen popular flavors to be found on store shelves throughout the Empire.

## Big Benny's

The most recent addition to the Terra Mills family may be their most audacious yet. After conquering snacks and drinks, they have decided to pursue a position in the fast meals sector. In 2943, they purchased a small restaurant franchise from Lo that, since its opening three years prior, had gone from a single location to over a hundred.

Benicio Lewis, Jr. had grown up on a fringe transfer station in Corel eating his father's homemade kacho, a ramen-like combination of noodles and broth that was heavily spiced to combat the taste bud numbing that occurs with long exposure to pressurized environments. As Lewis quoted his father, "If I have to live in a tin can, I'm sure as hell not going to eat food that tastes like it came from one." Years later when living on Lo, Little Benny himself made kacho for his friends, who began to rave to their friends. Their encouragement convinced him to open up a small stall at a commercial spaceport. He named his foodstall Big Benny's in honor of his father. With its cheap and satisfying fare, the stand was crowded all the time.

From that humble beginning, Lewis quickly opened new franchises as the "kacho kraze" spread like wildfire. It wasn't long before he was approached by Terra Mills with an offer to introduce his kacho from Lo to the rest of the universe. Despite protests from the franchise's loyal fans, Lewis was happy to sell, explaining, "My dad would have loved to know that people across the 'verse can have something good to eat when they need it. Plus, he loved making money." Today, Big Benny's stalls and vending units can be found everywhere people are looking to stretch their credits and eat a warm meal.

To the surprise of no one, Terra Mills is not stopping there. With one successful ready meal launch under their belt, they recently revealed their newest brand, TipTop, at the 2946 Vendor Association Conference. Offering a variety of bite-sized tapioca-wrapped dumplings, TipTop is anticipated to soon be as ubiquitous as the Mills' other creations.

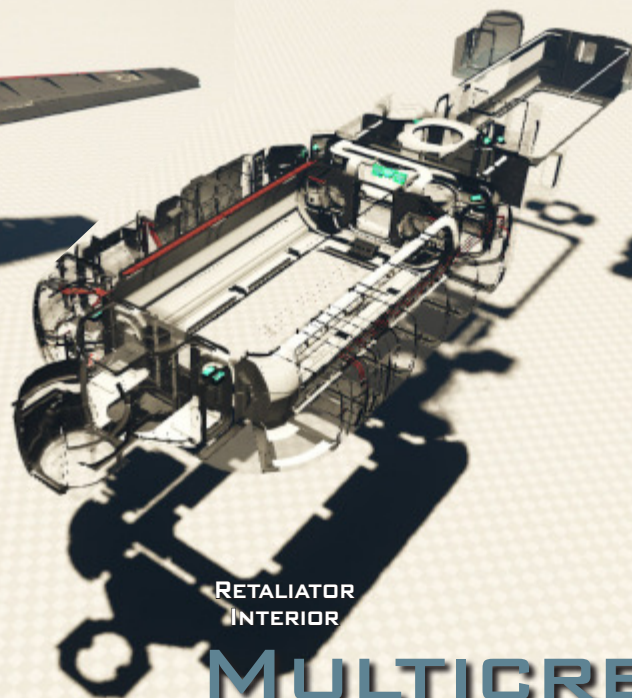
As a result of these successes, Terra Mills continues to be the largest employer in the Bremen system and it shows no sign of slowing down. What started out as a collection of farms has grown into one of the biggest food manufacturers in the Empire, with products that can be found in every system where Humans live.







RETALIATOR (ACTUAL MODEL)



RETALIATOR  
INTERIOR

## MULTICREW & PHYSICS GRIDS

Star Citizen devs across the globe are working diligently to create this magnum opus, not least of which are those designing the methods for you to pilot a large ship with several of your closest friends or AIs. We were able to track down a couple of those devs for this month's interview Behind the Scenes.

We also collected several dozen questions from Subscribers, far more than could be covered in a single interview. We set aside all the questions about specific ships and specific functions, because we're not to that point yet. We're getting all the building blocks into place, but aside from a few trial runs that no one should expect to represent finished products, we haven't started actually placing the final multicrew stations (etc.) onto finished ships.

What that left was about a dozen questions regarding core theory and design. John and Karl graciously donated a couple of hours each to answer those questions, with assists from Paul and Francesco. (The screenshots were supplied by Paul.) Here's what they had to say.

**JP:** Let's start with the usual first question: What is your title, and what are you doing for Star Citizen? In particular, what are you doing for SC multicrew game development?

**John Crewe, Lead Technical Designer at Foundry 42, UK:**

My responsibilities for multicrew work involved setup on the Retaliator, as well as overseeing the other members of the UK Tech Design team working on other multicrew ships





– such as the Freelancer, Starfarer and (to a small extent) the Avenger and Cutlass as they implement the technology in them too.

**Karl Jones, Lead Systems Designer at Foundry 42:** In regards to multicrew gameplay, I spec the functionality (not the aesthetic) on the various layers of UI in the game, including the diegetic screens found in all of our multicrew ships.

**JP:** *Here's our first Subscriber question (from BaconofWar). As soon as a ship hits concept, threads pop up everywhere discussing everything from the model to how the ship will function and its capabilities. How much does player feedback weigh in the initial ship functionality setup?*

**John C:** Usually by the time the backers see a concept, it's already been in development for quite some time and gone through multiple rounds of feedback between various departments, so a lot of the suggestions people give us have already been considered, and they've been implemented or rejected by the time you see it.

Although sometimes the backers come up with something we've totally missed, and we try and feed that in where it makes sense.

**Karl J:** The good thing in regards to this is that a lot of the time, the threads from the community are in sync with the thoughts of the dev team anyway, so for the most part those suggestions and the actual design are one and the same.

**JP (from Waytrekker):** *Thanks for making Star Citizen awesome and for taking the time to answer our questions. Multicrew ships have introduced many new gameplay opportunities for players, centered around crew stations that are designed to manage a particular function or role (engineering, navigation, etc.). Could you explain how you hope*

*to have the multicrew experience feel unique from ship to ship while maintaining the same basic set of crew roles?*

**Karl J:** There will be a base layer of functionality that's used throughout all of our multicrew ships, but on top of that, different ships will have different crew counts, UI, seat/station layouts, seat/station types, functions and so forth. Some will even have really specific functionality that is only accessible on that ship.

A 'lite' example would be something along these lines: the Engineering functionality in Ship A might be accessible from the captain's chair, due to limited space/no room for more seats. Ship B might have a specific Engineering station on the bridge, whereas Ship C might have its Engineering functionality in the actual engine room. Even though that's just the location of the functionality, that already makes these three ships feel different from each other.

Then we will have layered functionality – smaller, more basic ships will have the basics of any given function, whereas the bigger, more complex ships will require more in-depth functionality, greater visibility on things and more granular control over the various systems. This goes hand in hand with the sizes of the actual displays themselves. Our smaller ships will have smaller screens, while bigger ships will have bigger screens, which accommodates the scaling functionality.

On top of all that, the actual look and feel of the UI will have a huge impact on how players feel. At one end of the spectrum we have the more old-skool, cash machine-style UI (I'm looking at you, AEGIS) and at the other end, you'll have the hi-tech, holographic UI, and then everything in between. And when we layer a ship's specific functions on top of all that (for example, like mining functions for a mining ship), the amount of variables gets crazy, in a good way.



BEHIND THE SCENES



**John C:** Just as Karl said, the same underlying system is always present; differences will come more from how it's presented to the player.

You'll be executing the same actions, but the dressing and location of where you're doing it will change. It might be on one ship you have all of Engineering on one station, but on a larger ship that might be split over separate consoles in the same room or even across several rooms, but the underlying mechanic remains the same.

**Karl J:** Yeah, and eventually, the captain of a ship will be able to delegate functionality across the various stations. So if you're operating with a skeleton crew, each crew member will have more to do, but if there are more of you, the responsibility can be spread out a little more.

**JP (from Guntram):** *From a development standpoint, multicrew sounds somewhat daunting, with separate physics grids, exposing one grid to another upon ship destruction, etc. When faced with a requirement that you don't actually fully comprehend how it will be implemented, how do you estimate how long it will take to deliver? Where do you start? Do you have small prototypes that you eventually stitch together like a microcosm of the game itself, or something else?*

**John C:** A lot of the individual systems are worked on piece by piece, layering on the functionality. For example the LocalPhysicsGrid work was started for Gamescom 2014 and used in the demo for that, and a lot of quirks were found back then. When we came back to do it across the board, we had a lot more understanding of the systems and could plan better.

We often "tier" up the implementations of the systems, with classifications something like:

- Tier 1: must be done for initial release,
- Tier 2: what can be added to make a solid first release, and
- Tier 3 (and onwards): add polish or expanded features.

For 2.0, Tier 1 was getting the LocalPhysicsGrids in ships, plus working on both the Connie and Tali, along with all the usability, such as entering/exiting cleanly and visibility in and out of the grids. Tier 2 was being able to destroy the ships and split them in half and keep the grid working to some extent.

**JP (from Lock\_Os):** *What multicrew stations are you planning to release next?*

**Karl J:** Rather than churn out lots of stations on top of an untested foundation, we're making sure we get the base layer right. We're designing the system to be flexible and future-proofed and we're doing that by building a number of functions first, and then building a station out of a set of functions.

Our first functions include Power, Weapon and Shield management, which means we could put each of those on its own station and effectively create an Engineer, Weapons Officer and Shield ... guy. We could combine some of the functionality and create a new station type – for example we could put Weapons and Shields together and create a station that looks after both the offence and defense of a ship.

Once this system is fully established, we'll create more functions which in turn will create more station types, and we'll be adding to this list for a long time. Other functions we're looking at are Cargo Management, Scanning, some new Radar functionality and some ship/component specific things, like an EMP Manager.





## TRANSPARENT RETALIATOR



**John C:** We're also doing another pass on the readability and input methods with the existing screens we released for 2.0.0 after receiving feedback from the backers that they were quite hard and complicated to use during gameplay. As Karl said, we want to iterate on the base set and get them working as well as we can, before we move on to the next set of functions, such as Cargo and Fuel Management.

**Karl J:** Yeah, we pushed out the first iteration, which looked great but wasn't particularly user-friendly. This is being iterated on, simplified and made more intuitive. The next drop will look simpler but be much more usable, and we'll build up functionality from there, adding depth and granularity.

**JP (from *DragoFire*):** Will ships like the Retaliator have more than basic pilot and gunner stations? Will these larger ships have co-pilot stations, navigation, sensor/comm, flight engineer, load master, etc. ... stations, not just pure combat-only crew stations?

**John C:** It all depends on the ship, really. The Retaliator was originally designed and made as a pure combat ship,

which is why it only has the minimal set of stations (Pilot, Gunner, Engineer), whereas more specialised and multi-role ships have additional stations.

**Karl J:** The Retaliator has up to seven stations, but five of those are turrets, leaving the Pilot station up front and an Engineering station toward the rear. The actual number of stations is unlikely to change much, simply due to how much space is available, but the functionality found at the stations can be added to. For example, the Engineering station may start off with access to just the shield and power management, but as more functions are created, they could slot right in alongside the existing functions. Think of functions as tabbed pages – just click through the tabs to change the functionality on the screen.

One thing to bear in mind is that some functionality may be tied to components aboard a ship. So in order to gain access to different functionality, it may be necessary to swap out a part of your ship for another. One quick example might be something like equipping a mining laser automatically adds mining laser functionality to at least one station on the ship.

**JP (from *Zorwan*):** What are you planning to do to make crew roles interesting and challenging?

**John C:** We can't give you specific examples until we have fleshed stuff out more in terms of the actual gameplay associated with those stations. We need to implement Cargo, Refueling, Mining, etc. first, and get those actions feeling good whilst thinking about the UI side.

**JP:** So basically, the current focus is making them functional (making sure they work), and then we will focus on how to use that functionality for interesting gameplay?



BEHIND THE SCENES



**Karl J:** As we layer deeper functionality on top of the base system, we'll be adding bespoke gameplay experiences to each station type. One example is the Overshield gameplay that is being considered for the Shield Manager [this is not yet definite]. Choosing to manually operate the Overshield would switch out the player's MFD for a hologram (or perhaps some wireframe elevations) of the player's ship and some visibility of the ship's surroundings, and have this player physically move around a smaller, more concentrated shield on top of the regular shields. The tactical purpose is to better defend against incoming enemy fire.

Of course, using the Overshield would drain power from the Power Plant more quickly, so it can't be used frivolously. These types of experiences will be added to stations only where they makes sense – we won't be making 'mini-games' just for the sake of it.

The communication between stations will have a huge impact on how interesting a given station is. The interaction of players requesting assistance, providing assistance, assigning more power or more coolant, painting targets for each other, and so forth, is going to make for some awesome co-operative gameplay moments.

**JP:** (from **Guntram**): *Hindsight being 20/20, what aspect of multicrew would you have done differently had you known then what you know now? What effect would that have had?*

**John C:** I would've started on a smaller, simpler set of ships than the Constellation and Retaliator. :)

We were fighting a lot of technical issues with the larger ships, on top of breaking new ground with the technology.

**Karl J:** I would've started simpler with the MFD functionality. We got a bit of tunnel vision with the specs and layouts, and basically overcomplicated them. That said,

the iterative way we develop *Star Citizen* means that the solution is never more than just a version or two away.

**JP** (from **rucdoc**): *Manning a multicrew ship looks to be one of the most fun and most challenging parts of the game. What have you found to be the most challenging part of building the systems for multicrew?*

**John C:** The most challenging aspect for me was the actual setup of the ships. Up until now the setup has been relatively easy (but time consuming), but for the multicrew setup we iterated on a variety of implementation methods for things like the LocalPhysicsGrid.

It resulted in spending a fair bit of time getting something in and working, itself a challenge as it's new tech and when something goes wrong you're not sure if it's your fault or a code issue ... only to find out a few days later the method wasn't giving the results we need and we have to totally change it.

**JP:** *First, for those who don't know, what is the brief description/definition of LocalPhysicsGrid? And then, how does it affect a multicrew ship differently than it affects a single-seater?*

**John C:** The LocalPhysicsGrid allows us to define a volume where physics is calculated separately from the rest of the world. In most games there's just one direction which is "up" and a fixed amount of gravity. In *Star Citizen*, we have zero gravity in outer space locations, but inside a ship that's in that outer space, there's gravity, which could be rotating and moving at any speed. In other games you'd have the physics from the outside calculated and applied inside and would end up essentially ping ponged around inside the ship as you stay in one place and the ship moves around you. Here, we calculate the physics for the interior of that volume separately, and transplant it into that part of the world, allowing players to walk normally around the ship despite what the ship is doing.



BEHIND THE SCENES





**Karl J:** From a systems design standpoint, ensuring we accommodate different crew sizes has been quite tricky. This isn't much of an issue for the very small or very large ships, but the medium ships are less black-and-white when it comes to how many crew/players need accommodating. You can tailor your small ships to one or two players, and you can assume that the large ships require a large crew, but that grey area between "large" and "small" ships requires a lot of thought.

We need to make sure that players who are out on their own have enough functionality at their disposal to go out and do some basic things (they may not be able to quickly access everything that the ship is capable of, but they need to be able to get around and have fun), and at the same time we need to ensure that everyone on board is having fun when the ship has a full crew. This is where the delegation system came from. Players on their own can take on the bulk of the functionality at their station, and it can be delegated out to various stations when there are more crew members around.

This also works really well with the scaling functionality. If there is one player with all the functionality, he's probably in the pilot seat – which has the smaller MFDs/lighter functionality – which is great because he's flying the ship and juggling a bunch of other functions. But if he has a crewmate come on board and he delegates some functionality to their larger, 16:9 display, they will have access to deeper functionality, which in turn is fine because they're not worrying about also flying the ship.

**JP:** *I've been thinking of "multicrew" as just the various ways crew interact with each other through their workstation consoles. If it includes things like LocalPhysicsGrid, it means more than the consoles. What all do you mean when you talk about working on multicrew?*

**Karl J:** I guess different development team members mean different things when they talk about working on multicrew, but for me, it's largely the roles at the stations, how the player interfaces with the ship and its systems and how players work together to keep their ship alive and get their jobs done.

**John C:** I think of multicrew as all the systems that work together, such as the stations but it extends to all the technology behind the scenes that makes it possible.

**John C:** Ships have to be made differently, set up differently.

**JP:** *Let's end with this: what is the most fun, most enjoyable part of creating multicrew functionality?*

**John C:** Just seeing and thinking of all the possibilities that it brings to the table, such as having multiple people able to freely walk around and interact with your ship, rather than just locking you into seats and blocking you from movement. All those cool little moments we see where players can go rescue each other from situations and work together, stuff that simply wasn't possible before.

**Karl J:** The most fun thing for me is also the thing that causes me the most headaches: working on a multicrew experience with this level of complexity is completely new ground for me, and most (if not all?) other people in the industry. The amount of scenarios we have to accommodate and be prepared for is incredible, which means our systems have to be rock solid at their foundations, and I really enjoy creating a strong base system which can be built upon.

**JP:** *Thank you very much! I hadn't planned on just two of you dealing with all the questions, but I can understand that crunching can pull folks out of something like this. I appreciate all the time you were able to give.*



**JP:** We brought in Francesco Rocucci, in the Frankfurt office, to answer a question about AI. But first, Francesco, what is your title, and what are you doing for SC multicrew?

**Francesco Rocucci, AI Lead Programmer:** I'm basically involved in all discussions related to the AI architecture, and in all the details of the implementation of the different functionalities.

Specifically for multicrew ships, in the past months I've worked with the designers to clarify and design some of the requirements for the behaviors of NPCs working as a crew.

The idea is to have different NPCs able to occupy different seats in a multicrew ship and perform different coordinated operations: we will have one pilot mostly focused on controlling the ship movement and perhaps the main weapons of the ship, gunners controlling independent turret seats, and engineers controlling shields or power stations.

While I'm mostly trying to organize the work of my team regarding the implementation of the behaviors requested by design, I'm personally involved in the implementation of the local navigation mesh [aka LocalPhysicsGrid]. Having the local navigation mesh attached allows all the different crew members of a ship to navigate the environment of a bigger ship while it flies through space.

**JP (from [reddot24](#)):** The AI in most current games seems to not have changed in the last 10 years or so. What are the main differences planned for the AI in SC that will separate it from the capability we've had up to now?

**Francesco R:** We have set two main pillars for our AI experience: it must be stable and it must have rich content.

Our effort is basically moving towards having the AI characters being believable in the way they move and the way they interact with players, so that the visual feedback for the users will not break the experience. Having a great visual quality is not only a matter of having good animation technology; the AI is responsible for providing

the right context for their actions, the correct flow of the decision-making process.

But we don't want to have NPC characters that just move well, we want them to perform meaningful operations and actions and make the right decisions: this is why our approach to the development of behaviors is very "context-centric."

When we talk about the context, we refer to the whole scenario the character is in – why he acted in a certain way before, why a specific action can or cannot be performed in a specific environment or in a specific moment – are elements that allow us to create contextual decisions that will improve the experience.

To achieve that, we are implementing the NPCs so that they will use the environment in different ways, they will utilize different tools and weapons, and they will have multiple reactions to the several actions a player can perform.

In *Star Citizen* we have an environment close to the classic FPS games, but we also have transitions from those scenarios to zero-g environment, spaceship combat, and (in addition to that) all the peaceful scenarios.

Each planet's population will have to be dynamically allocated to reflect the state of that planet. (A rich planet will have lots of jobs and a large population, while poor planets will probably have a lot of smugglers and thefts and they might be more dangerous for the players.) The universe will dynamically change with time and that will influence every AI element you can encounter.

We are very excited by the overall scale of the game because it will result in a world where the emergent experience is something no other game has done before!

So to go back to [reddot24](#)'s question, what makes our AI unique is the amount of content you will be able to experience and the overall complexity of the environment our NPCs will evaluate to make the most appropriate decisions.





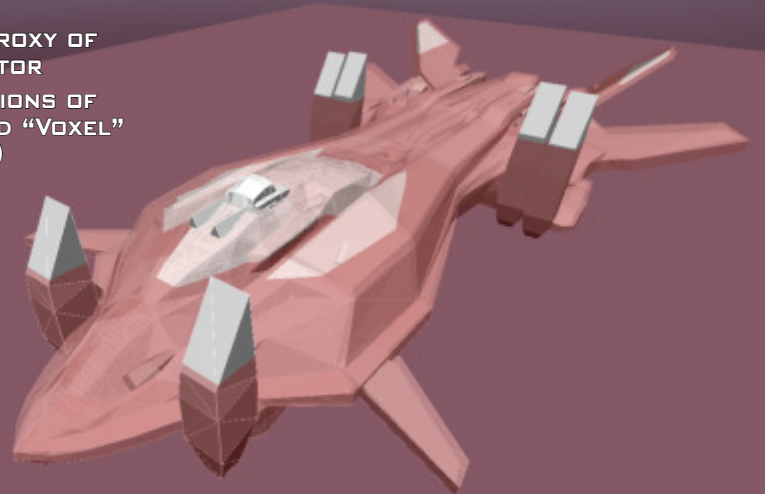
JP: Meanwhile, Paul Reindell, in the LA studio, contributed his perspective on the multicrew task. Paul, what are you doing for Star Citizen, and in particular for multicrew?

**Paul Reindell, Lead Engineer at CIG-LA:** For multicrew work, I am planning/overseeing all of its (gameplay) code systems. This is mainly the vehicle tech (creation of the physical grid, transitions between interior and exterior grids, multiplayer support, ship damage, etc.), plus how multiple seats will work together to control the entire ship (engineering, gunner, pilot and so forth).

**JP:** Let's start with the first question from **Guntram:** When faced with a requirement that you don't actually fully comprehend how it will be implemented, how do you estimate how long it will take to deliver? Where do you start?

**Paul R:** Since a lot of the features in *Star Citizen* have

EXTERNAL PROXY OF THE RETALIATOR (FOR DEFINITIONS OF "PROXY" AND "VOXEL" SEE PAGE 2.)

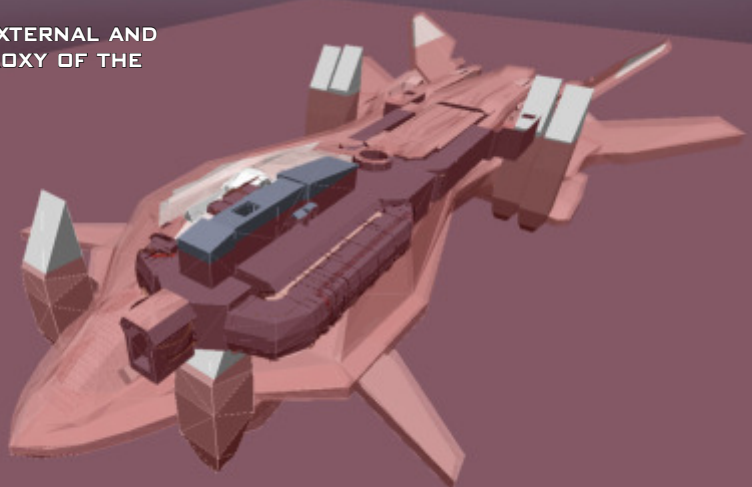


never been done before, a lot of R&D work is required, the timing of which is always very hard to predict. We constantly prototype new features during development, even before the actual feature is on a release schedule. This gives us at least a vague idea of how long a feature will take us to implement fully. A good example of this is the Gamescom 2014 multicrew demo, which was basically the first prototype of what we have now released with 2.0, almost a year and a half later.

**JP:** What is your perspective on LocalPhysicsGrid?

**Paul R:** From a coding standpoint, 'LocalPhysicsGrid' basically means to run multiple physics simulations for different 'physical worlds' at the same time. Traditional games usually have one global physics simulation and all objects are affected by this one simulation. In *Star Citizen* we can now have multiple LocalPhys-

COMBINED EXTERNAL AND INTERNAL PROXY OF THE RETALIATOR

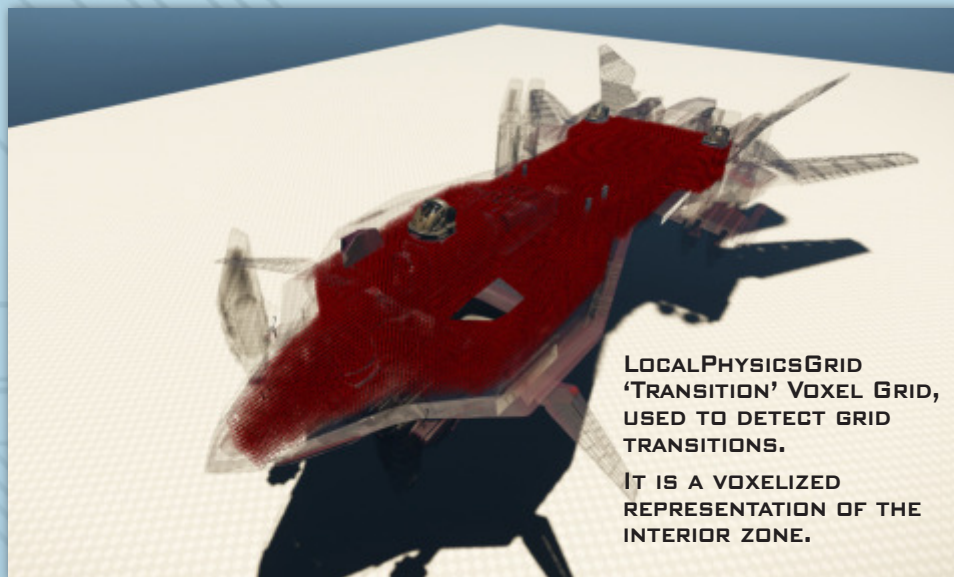




icsGrids, with each having its own little simulated world. Each of those 'worlds' has its own parameters (e.g., gravity) and these various simulations are completely independent.

For example, space has planets, asteroids and spaceships. All those objects are simulated in the 'global' physical world and they can collide/interact with each other. But a Retaliator in this 'global' simulation has its own LocalPhysicsGrid inside the ship. Characters and other objects that are inside the Retaliator are simulated within the LocalPhysicsGrid of the Retaliator and not by the 'global' world. This way we can have gravity inside the Retaliator while the global world has zero gravity. It also allows for optimizations, as the grid for players in one ship doesn't have to take into account what's happening inside any other ship.

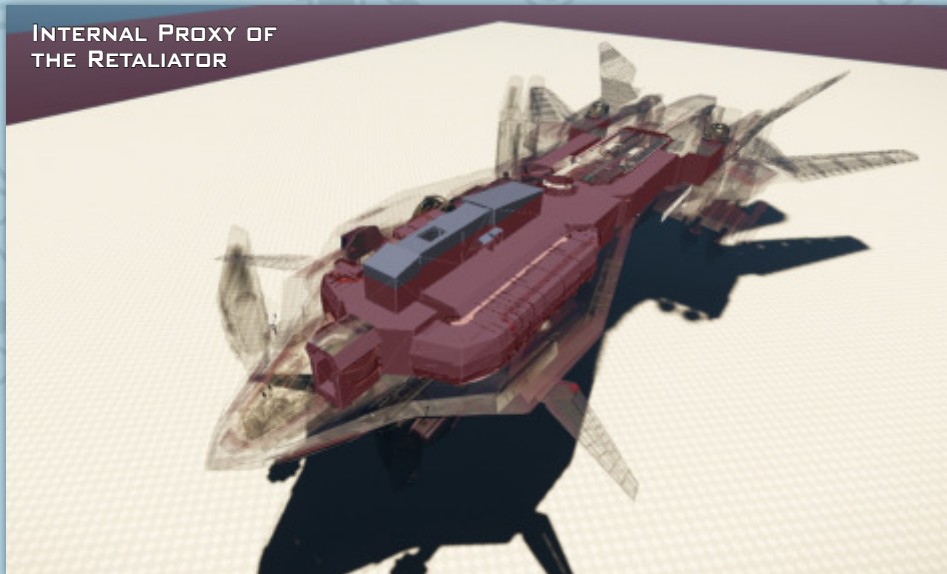
**JP:** *Having multiple physical simulations at the same time*



**LOCALPHYSICSGRID  
'TRANSITION' VOXEL GRID,  
USED TO DETECT GRID  
TRANSITIONS.**

**IT IS A VOXELIZED  
REPRESENTATION OF THE  
INTERIOR ZONE.**

**INTERNAL PROXY OF  
THE RETALIATOR**



*sounds pretty complicated. Are there any problems you run into while working on this tech?*

**Paul R:** We had to modify CryPhysics (the physics engine that comes with CryEngine) heavily to work with multiple simulations at the same time. It took us almost half a year to get the first version running. But getting multiple simulations running at the same times is just the first step. We have to make sure transitions from one 'world' to another work seamless – even though each world is simulated individually, they need to interact with each other. Imagine a Constellation getting hit by a big rocket. The ship will shake in the outside world, but we also want to feel that impact while you're inside the ship. Or we want to be able to sniper a player who is inside a multi-crew ship from the outside (e.g., through an open hatch). All those 'cross-world' interactions are among the most challenging problems we have to solve.





## Zane & the User Interface

**Sao Saoldian asks:** *Will the new UI elements still be able to be assigned macros for using Voice Attack profiles or will mouse be the only input method as shown in the UI video?*

We still want to support key-based navigation in the UI. Key-based navigation may be broken in-game at the moment, as we are in the process of refactoring the way the screens are set up on the front-end to be much more modular and dynamic in terms of the content they can display. With the introduction of diegetic displays, each display now needs to be recognized as having its own focus group of UI components.

One thing that's on our radar to develop is preset management and the notion of assigned actions. The idea is that you would be able to configure presets, each containing a number of configurations, and assign them as an "action" that can be activated by a specific hotkey. The preset system is something we still need to formally spec out a design for, but it's certainly going to offer a great deal of flexibility in terms of defining complex configurations that can be made available at the stroke of a key (or voice command).

*Aside from look, color and aesthetics, will the UI's basic functionality be standardized for the entire game (as they are now) or will they be unique to each manufacturer?*

*Looking beautiful btw Zane and co.!*

The UI across all ships and manufacturers will not have the same exact functionality available. That will depend and be driven primarily by the specific components you have installed on your ship. For instance, if you've outfitted one of your ships with an EMP module, the system will recognize that and push the associated EMP management function to be available in the MFD. Similarly, a lower-tiered

targeting computer may only be able to track a limited number of targets simultaneously, while a higher-tiered one may track more, which dictates the number of targeting slots available in the UI.

However, all ships will have a certain base level of functionality available, and regardless of how the elements are laid out or what the aesthetic looks like, it all interacts with the underlying system in the same way.

**Trent Hawkins:** *What about the holotable? Will it be redesigned or will we be using the mobiGlas to outfit our ships?*

Ship and component customization will still happen primarily through the holotable, and will not be completely replaced by mobiGlas. We are actually in the process of doing a full-fledged redesign of the holotable, which takes into account the new components system being led by our Lead Systems Designer, Karl Jones. The holotable UI is now going through what could be considered the most important step in the UI pipeline, the wireframing stage. In this stage of the pipeline, we are working to map out all of the user flows for accomplishing tasks and are really focused on making sure the end result feels fluid and easy to use.

I don't want to reveal too much about our planned improvements at this point, but let's just say that certain tasks such as transferring a component from one ship to another should be doable in one fell swoop. The actual interaction of selecting items on a ship will be much more user-friendly and unambiguous in nature. Not to mention a whole host of filtering options, sorting, contextual awareness, and stat readouts, as well as the ability to compare components against each other.



BEHIND THE SCENES



# HORUS SYSTEM SERLING



EDITH MITHVA

The Horus System is best known for two things: its two jumps into the Xi'An Empire and Serling, a tidally locked planet with one of the most unique human habitations in the universe. For years, Horus' connection to the Xi'An Empire made it a part of the Perry Line, a string of no-man's-land systems that provided a buffer between the species, a status that cut off any public access or private development to the system. Now those connections are its biggest asset, making the system an intriguing prospect for those interested in doing business with the Xi'An. Horus was officially discovered in 2528 by a then-un-

known navjumper named Marie Sante. Legend claims that the system was actually discovered several years earlier by the fourteen-year-old Sante after she stole a ship to flee her family in Gonn. If true, she must have spent the majority of the intervening years in the unclaimed system, alone on her ship, as extensive checks of UPE records and landing registries have failed to uncover her name anywhere during that period of time.

The UPE's first official record of Sante was her application to register the discovery of the Horus System, which she, maybe tellingly, requested be named after her ship.



Included in her initial application were meticulous documents describing the system's three planets and two asteroid belts. Apparently, Sante had spent years alone in the system exploring before she finally decided to share her find. This resulted in Horus being the only system to have been discovered and have all of its celestial bodies charted by the same person.

Sante's single-minded interest in uncovering all Horus had to offer was both her greatest strength and her ultimate downfall. In 2530, only two years after Horus' registration, Humanity first encountered the Xi'An, and tensions only escalated from there. Meanwhile, as public and private interests established operations in Horus, Sante stuck to its outer reaches, singularly focused on the areas she had yet to explore. In 2542, Sante discovered the jump from Horus to the Rihlah System. To this day, historians debate whether Sante understood how reporting Horus' connection to Xi'An territory would drastically alter the system's future.

At that time, the jump to Rihlah made Horus a security risk for the UPE. The government closed the system to non-military personnel, receiving little resistance from the small group of civilians that had begun to settle on the fledgling planet of Serling. Only Marie Sante defied the order. She hid in the system's outer reaches and managed to remain undetected until a Navy pilot reported an unauthorized ship in his sector. A battle group was mobilized only to realize that the ship had been Sante's. With the false alarm wasting many hours and credits, the military prioritized pushing Sante out of the system.

To this day, no one is certain of what fate befell Marie Sante. The last record of her comes from a recovered info-beacon containing her journals. The final entry was dated 10.1.2545. In it she expresses her belief that Horus had more secrets to uncover, which proved true with the discovery of a jump into the Xi'An controlled Kayfa System in 2617. Her final entry ended with "Horus is the only

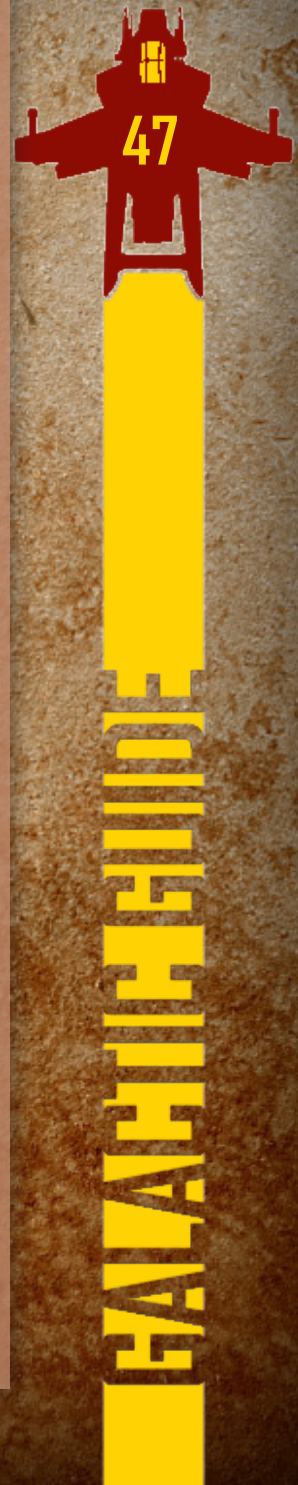
home I've ever had. I shared the world and they took it from me. Let's just say I'll never make that mistake again." With those final words, Sante was never heard from or seen again.

To this day some believe Sante spent her remaining years hiding in the system. Everyone from novices to expert explorers, and even Spectrum show hosts, have tried to piece together clues from her journals to uncover her ultimate fate. A portion of Horus', albeit small, tourism sector focuses on this mystery, with 'history hunters' eager to locate the remains of Sante's lost ship.

Meanwhile, as the UPE was transitioning into the UEE, the military maintained control over the Horus System throughout the cold war. Assignments monitoring the system's two jumps into Xi'An territory were both strategically essential and extremely dull. A lack of hospitable planetside locations meant military personnel spent their deployment in either their cockpit or a capital ship, which did not endear the system to starmen.

Once the cold war ended and the Perry Line was dissolved, the UEE decided to use the system for more than just military patrols and exercises. The public finally had another chance to put its stamp on the system. Unfortunately, inhospitable planetary conditions have kept the population down, and minimal natural resources have made heavy industry slow to develop in the system.

Yet, its connection to the Xi'An Empire, which once doomed it to isolation, may now be Horus' strongest selling point. Businesses looking to capitalize on improved relations and increased trade pay ever-rising real estate prices on Serling to have an office only one jump away from the business-friendly Rihlah System. While the future may be bright, many within the UEE still considered Horus an afterthought, a system that has yet to exert enough political or economic force to earn recognition in the UEE Senate.





# HORUS I (SERLING)

Maintaining the nickname Sante gave it in her original reports, this tidally locked planet contains one of Humanity's most interesting habitats. With one side of the planet perpetually facing the system's main sequence M-type star and the other shrouded in darkness, the majority of the planet is unfit for habitation. Yet Humans discovered that life was possible along the terminator line, the narrow strip dividing the light and dark side of the planet, running from pole to pole.

Visiting Serling is a must for anyone interested in truly unique vistas, but living under such conditions is not for the faint of heart. Serling is plagued by constant storms, a meteorological side effect of one side of the planet receiving all of the star's heat. Photographers flock to Serling to snap a pictures of the system's red star sitting upon the horizon amidst a severe storm. This majestic and surreal image has become emblematic of the entire system.

It has taken some ingenuity to make a manageable living in a place either constantly light or constantly dark (depending on which side of the terminator line one is on). In general, workplaces are zoned closer to the light side of the planet while residences are built near the dark side. This allows people the semblance of a normal day/night cycle. A system of high-speed trains and transport ships constantly moves workers from one side to the other.

Since businesses on the light side, technically, never close, there is work aplenty for those who want it. Yet, some residents suffer psychological strain from the lack of a natural circadian rhythm similar to what many tour-

**TRAVEL WARNING** Visitors are encouraged to track their time spent on either hemisphere of Serling, as the effects of too much or too little light have been linked with exhaustion, depression and other symptoms.

ists feel upon arriving on a new world. Currently, the University of Aten, Serling's most prominent educational institution, is conducting a lengthy study in an attempt to isolate the differences between people who flourish under these conditions (often those in families who have lived on the planet for generations) versus those who have trouble adjusting.

As in most places around the Empire, those with unlimited means make the most out of even these unusual conditions. The planet's most expensive real estate lies in the middle of the terminator line, which provides a breathtaking permanent sunset view when facing the star. Stunning architectural homes, apartments and high-end hotels are programmed to rotate on a "daily" schedule, providing their residences with the semblance of a more normal day/night cycle.

## HEARD IN THE WIND

"While we will never know for sure what drove her there, Sante's journals make it clear that she truly loved two things in life: her ship and the system she discovered."

- Kwame Jones, *The Heart of Horus*, 2678



EMERGENCY



## HORUS II

A massive desert world located within the green band. Even though the planet lacks any natural bodies of water, UEE surveyors and scientists are seriously assessing the cost-benefits of a terraforming attempt. As xeno-economic relations continue to strengthen and improve, there has been considerable support from the business community to pursue settlement on this planet, simply because companies without a foothold on Serling would love to establish operations on a more traditional planet and enjoy easy access to the Xi'An Empire.

## HORUS III

Horus III is one of the few Super Jupiters in UEE space. Its high-density atmosphere makes the planet many times more massive than most other gas giants. Separated from Horus' inner two planets by two asteroid belts, Horus III sits in a long, lonely orbit far from anything else in the system.

### HEARD IN THE WIND

"Before we sing the chorus,  
let us speak of Horus,  
a system sure to kill us,  
from boredom, not from war!"

- Guardians of the Jump, *traditional Navy shanty, 27th Century*



EDITH HAWK





# Second Run

## A SORRI LYRAX STORY

by Thomas K. Carpenter



### Part 1: Never Travel Empty-Handed

I stumbled into the airlock, wiping the last bits of a pecan nut bar from my jumper as the mechanism clicked into place behind me. The whoosh of air being recycled was muted by the blue-green steel walls of the synch-orbit waystation above Jata.

The ride up from planetside had been a bumpy mess. I should've known better than to eat after the fresh-faced pilot with far too much acne on his forehead had told me upon my arrival: *"You're my first real passenger, y'know, besides the training runs."*

But I'd been new once too, and he did bring me in alive, despite hitting every air pocket in the atmosphere, and then

somehow, despite the physical impossibility, hitting a few more while we were in space on the final leg to the station.

I unhooked my backpack and stretched my neck while staring at the grey biodome I'd just left back on the rocky surface of the planet. I could still make out the sprawling facility that housed the Aegis production center, just as daunting from above as it had been when I was making my drop. I can't say I wasn't happy to be finished with that delivery for FTL. While the corporation claimed they were no longer focused on the military market, I saw far too many crew cuts to believe that bit of branding nonsense. Plus, seeing the Avenger-class ships in the showroom only reminded me of when I'd almost been killed during my first real delivery.

HERONICLES



My gurgling stomach reminded me that most of my peccan bar had ended up on the floor, so I set out to find the falafel vendor I'd eaten at on the way down. The creamy hot sauce provided the perfect match to the crunchy fried chickpea mash in the wrapped sage-infused flatbread. I had an afternoon to kill while I waited for my next FTL delivery.

The waystation was a confusing maze. The original structure had been built with military security in mind, which meant the different sections were segregated by tubes, so each area could be safely cordoned off in case of an attack. Then later, when it started going civilian, and regular commerce started passing through, they added roomier areas with crimson carpet over the plasticrete, and places to eat and stay the night between journeys.

The walls had been painted with murals — actual hand-painted murals rather than the normal holo-crap — with happy families walking through hand-in-hand, or smiling businessmen pulling trade cases behind them. There were even a few paintings of the ridge-headed Banu on the walls, harkening back to when a significant amount of alien trade came through Jata.

I rounded the corner to the delicious smells of my falafel vendor when I heard a familiar shrill voice.

“What is *taking* so long? I'm gettin' freezer burnt here. I put my order in three *years* ago,” declaimed Betrix LaGrange, rubbing her pale arms and stomping her feet for warmth in front of the falafel vendor.

*Maybe if you actually dressed for the job, you pasty-headed twit. No space station manager or ship captain ever wants to spend their hard-earned credits on keeping people warm,* I thought as I backed into the tunnel so Betrix couldn't see me.

I couldn't think of a worse FTL courier to run into. If a hyena had been transformed into a person and given perfect

blonde hair, then that would be Betrix. She was sleeping with the dispatcher at headquarters, so she got all the premium deliveries and her routes actually made sense.

Rather than deal with that human scavenger, I headed towards the other vendor area. The food wasn't as good, but at least I'd avoid Betrix. The falafel vendor probably had spit in the cream sauce after her nasty outburst, anyway.

As I chowed down on a questionable curry, I pulled out my mobiGlas and thumbed to life my dream ship: the Aurora LX. I had bookmarked the custom package I had spec'd out. Bare bones, but it was the perfect vehicle to branch out on my own as an independent courier. Eight-tons of space-faring goodness, and I was only five more years of courier work away.

I blew a kiss at my dream ship, and switched to the local networks, bringing up the independent courier display. My display name was SILVERKHAN, a reference to my father's bar, the Golden Horde. I lingered on my name before toggling my availability for hire into the 'on' position, then I quickly marked the locations I was willing to deliver.

Sorri's first rule of the efficient courier: *Never travel empty handed.*

I smiled to myself as I repeated the rule in my head. Most of the other couriers I'd met during my first year with the company seemed to treat the job like a prison sentence, drudging through their deliveries with their eyes closed. There was so much more to do if you were paying attention.

A soft *ding!* in my ear alerted me to a job offer on the independent courier channel.

My jaw hit my chest when I saw the credits offered for completing the delivery. It was a colossal sum. At least fifty times my normal fees and it would take a year off my quest for the Aurora.



CHRONICLES



I had to convince my shaking hand not to just jam the 'accept' button and review the terms first. That was my second rule, a hard lesson from my first delivery: *Nothing illegal.*

The request entailed a traveling case that needed to be transported to Tyrol IV. The job was bonded, so I knew it wasn't illegal.

Then I checked the delivery date, and realized why the fee was so high. They needed it delivered in less than sixty standard Earth hours. From here, Tyrol was five systems away, involving multiple jump points and a significant amount of in-system travel time, not even counting layovers or delays – which were frequent – so there was no way to deliver the case on time using the normal routes. The high fee was to entice independents who had their own ship to make the journey. It was a helluva-lot of fuel to make that trip, especially when there wouldn't be time for taking other business, which again, made the fee astronomical.

As I stared at the red 'accept' button, I knew there were multiple couriers considering the same thing: can I make the delivery on time? Because if the delivery wasn't completed on time, the payment fee minus the late delivery penalty minus all the out-of-pocket expenses would drain my savings. No Aurora, no falafel, no nothing. So the only couriers who would be seriously considering the job had their own ships. Plus, given the time frame, only couriers less than a system away could take the job and still make the delivery date.

The Davien system, where I was currently located, was connected to Ferron, Cano, Sol and Cathcart. The competition couldn't be worse for this job – a job that I didn't even have a ship to use for transport.

But cutting a year off my plan for the Aurora would be worth it. I loved being a courier for FTL, but I really wanted

to be my own master, see the galaxy on my terms.

So I jammed my thumb down on the screen, sending my bio-signature to the broker to signify my acceptance of the job. As I did, an ephemeral shiver went down my back, a potent mixture of dread and excitement.

Then I actually looked at the job blinking on my mobiGlas, a countdown timer signifying the time remaining.

[60:25:05]

*What the hell did I just do?*

\* \* \*

After a modicum of overwhelming panic subsided – I mean, it's not every day you bet your savings on a delivery job that you technically don't have the resources to make – I actually started having rational thoughts. Ones like: how the hell am I going to make the delivery?

While I didn't have my own ship, there was one advantage I had over the others in taking the job: the case that needed to be delivered was here on the waystation.

But that didn't explain why I would take a job that I knew I couldn't deliver in time using the normal commercial routes.

Ring in Sorri's Rule Number Three: *Official routes are for suckers.*

Using my mobiGlas, I quickly found a junker, the *Nomenclature*, headed through the Cathcart system to the Nexus system. Going through Cathcart, a system known for pirates and an extensive black market economy would be risky, but if this junker was heading that way rather than other routes, they probably had some shady business, or were just looking to shave some time. Technically, this didn't violate my second rule, nothing illegal, since I was just a passenger, but it left an uneasiness in my gut worse than when I rode up the gravity well with that wet-behind-the-ears transport pilot.



CHRONICLES



I sent the *Nomenclature* a message, along with my credentials. Surprisingly, I got a reply back a few minutes later with a reasonable price. He gave me an hour to get to his ship, which gave me enough time to get the case before we left. I sent him a reply, transferred his fee, then pulled up the station map to find the pickup location.

\* \* \*

After showing my courier credentials, and having my biometrics verified, I was the proud owner of one silvery metallic case.

I whistled as I examined it. The exterior was made of nano-mesh, and the lock was something exotic involving a smooth granite ball surrounded by alien symbols.

A shrug later, I was strolling back the way I'd come, headed for the *Nomenclature*, when I heard my doom in a high-pitched greeting.

"Sorri? Sorri!"

I tried to ignore Betrix, but heard her soft leather boots scuffing up the carpet behind me as she shuffle-ran.

"Sorri!" said Betrix, digging her nails into my arm and stopping me. "It's been soooo long. Let's have a little sprinkle and catch up."

Her mouth was set in a wide grin, but her eyes were the black soulless gaze of a shark. She danced her fingertips when she said the word, "sprinkle," as if she were spreading fairy dust. It was her annoying way of saying, "let's get a drink."

I tried to dislodge my arm from her pincers, but she was surprisingly strong. "I have to go, Betrix."

Her forehead wrinkled in faux-confusion. "But where are you going? My dearest David mentioned in passing that you haven't any jobs booked right now."

"Sightseeing," I said, drolly.

Betrix made a show of noticing the silvery case hanging from my left hand.

"Well, what do you have there? If I didn't know better, I'd say that was a freelance job. But I know you're smarter than that, I mean, you know it's against company rules to freelance . . . like, in an immediate termination kinda way," said Betrix, tilting her head so her blonde locks fell attractively against her shoulder.

Besides general mischief, I couldn't figure out what angle she was pursuing. "It's a portable EVA. Just trying to be safe."

For a moment, Betrix looked like she actually believed me, before she shook her head and said, "Portable EVA? How forward thinking. But you know, I thought it might be the delivery that was just posted up on the ICN."

If I hadn't already been so annoyed that I was being delayed by this bucket of pond scum, I might have been surprised that she worked as an independent courier, too. I figured with her dispatcher boyfriend, she had enough work to make a living.

But now I understood her angle. She'd probably been about to accept the job when I snatched it out from under her, and Betrix wasn't the type to let things just drift.

"Nope. A portable EVA," I said, strategically stepping on the toes of her soft leather boot and wrenching my arm from her vice-like grip. "Sorry. The stars need seeing."

Stirred to anger like a hornet's nest, Betrix said, "I know what that case is for. FTL will fire you when they find out what you're doing."

"Then why were you on ICN?" I yelled over my shoulder, a final barb that I couldn't help.

One last glance caught the murderous glare in her eyes. She'd wanted this job badly. Probably hadn't even realized that I was in station until she saw that the job was taken, and went to find out who it was.



CHRONICLES



What a spot of bad luck. Hopefully that was the end of it. I checked my mobiGlas to find I had plenty of time. I could even stop and get a bite to eat if I wanted. Though I wouldn't feel safe until I was off the station and away from Betrix LaGrange.

\* \* \*

Working with my father at his bar, the Golden Horde, taught me a lot about people. One of his favorite theories involved karma. Not the mystical, vacant-eyed stare kind karma, but the statistical proof-worthy karma that could be charted on a graph.

His theory went that karma was really all your little good and bad acts that created a sort of karma-web around you. If you kept doing good things – giving a customer a little extra rum when they're looking a little bleary-eyed, paying for a taxi to make sure the wealthy businessman made it back to his hotel, introducing two lonely customers sitting at opposite ends of the bar to each other, or making sure the antique jukebox plays the couple's favorite song when they come in for an anniversary – then the world would pay you back with interest at a later date when you didn't expect it.

I mean, I'm not blind to what my father was doing. The extra rum – which didn't cost him much since he watered it down – encouraged a larger tip at the end of the night. The taxi made sure a high-value customer made it back on future nights. The two lonely customers would feel obliged to the bar for introducing them and the anniversary couple would keep coming back year after year to relive their first memories. He wasn't doing it out of the kindness of his heart, it was a calculated, monetary thing, but I thought his theory was sound, even if he were doing it for the wrong reasons.

Karma worked in reverse, too. Or at least I hoped so, when it came to Betrix and her shenanigans. Which was why I wasn't going to do anything about her. Karma would take care of her eventually. That was the theory, anyway.

I was glancing over my shoulder, checking to see if Betrix was following me, when I heard the awful sound of a child wailing. I didn't even have to look to know tears and snot were streaming down the girl's face.

But what I didn't expect was that the young girl, maybe seven years old, was being dragged across the carpet by a burly man in a suit while a woman, who I assumed was his wife by the way she was screaming and hitting his arm, tried to stop him.

A lump formed in my throat.

A quick glance around the sitting area told me what I already knew. The other passengers in the area were busy burying themselves in their mobiGlas, or getting up to go to the bathroom. No one, and I mean no one, was even looking at them. There were at least thirty people in the area and not a soul looked like they cared.

Even the security guard at the connecting tube was picking at his thumbnail as if it were the most interesting thing in the world.

*Karma.*

*Shit.*

A quick check of the time told me I could still make my departure ship. Though I have to admit, part of me actually was hoping there wasn't enough time to interfere.

The dark-skinned woman, wearing shoddy clothing, was pleading with her husband not to take their daughter.



CHRONICLES



By her screaming, it didn't take me long to figure out that this was the fallout from a separation and the husband was overriding court orders by taking the girl away from her mother. It was a far too common experience that kids were ripped away from one of their parents and moved across the galaxy. With the overlapping jurisdictions and high cost of travel, it made it too easy for court orders to be ignored.

Once he went out the airlock with their daughter, the mother would most likely never see her again.

My hands turned to fists despite the impossibility of me stopping the burly husband physically. He looked like he spent a fair amount of time using the latest gene-therapies and working out until he had veins growing on his veins.

But I had no intention of physically confronting him.

As casually as I could muster, I moved behind the row of seats with connected holovids, and slipped the silvery case beneath a chair. Then I popped the lid off the nearest trash receptacle and started digging through the nasty food containers, unwanted papers, and discarded junk.

I didn't have time to be choosy; the husband nearly had the girl to the airlock that led to a comfortable commercial vessel headed to Sol. The attendant was making the announcement about final boarding as I slipped behind the husband with a stack of folded papers in one hand and a plastic cup half-filled with some pale sugary drink.

"Abel?" I asked in my deepest authoritative voice. I'd pieced together his name from the wife's screams.

The husband paused. He held his screaming daughter with one arm, and with the other fended his wife off from taking the child.

I saw the incredulous look on his face. He'd looked over expecting someone taller, and then had to look down to find me.

Holding out the papers in an official manner, I announced, "You are being served for violating the UEE Treaty Against Toxic Allowances in Demonstrable Air Emissions for Use of Transport and Endangerment of Local Species, surface code number six-point-five-five-one-point-eight-nine."

He looked like I'd slapped him in the face with a bag of slugs.

"What?" he said, visibly trying to process the words.

So I repeated myself, going faster this time, "You are being served for violating the UEE Treaty Against Toxic Allowances in Demonstrable Air Emissions for Use of Transport and Endangerment of Local Species, surface code number six-point-five-five-one-point-eight-nine."

I could tell he was trying to figure out what was going on. My spacer jumpsuit wasn't giving him any clues, since I purposely wore clothing that looked semi-official, to keep people guessing about my real profession.

"That means that you have to report to our planetside branch to pay your fine before leaving system," I said, shaking the papers emphatically at him.

He pulled his hand away from his wife, and started reaching out for the papers.

"As coming from an authority of the UEE, if you accept these papers you are legally bonded to pay all fines and fees," I said.

An announcement came over the speakers: "Mr. Gorane, party of two, please enter the airlock. Your ship is departing."

Abel's head snapped toward the waiting transport where the engines had begun to spin up.



CHRONICLES



His focus was so split between the papers in my hand and the open airlock, that he momentarily forgot about his wife and child. In that instant, she kneed him in the groin, and snatched away the girl before running the other way.

“Alara, no!” he grunted, but realized he had no way of stopping her.

Then he turned on me, reaching out murderously in a half-crouch. That’s when I put the half-filled plastic cup in the way, and when his hand touched me, I flung myself backwards, tossing the sugary drink across the passengers waiting with faces buried in their mobiGlas.

While people may be willing to listen to a husband abduct his daughter over the clear legal objections of the wife, they weren’t willing to have a drink tossed on them. Even the security guard at the tube entrance came running over.

Mr. Gorane, sensing he had to cut his losses, fled into the airlock amid the shouting. An older gentleman in glasses helped me up.

Before anyone could question me about my role in the incident, I dumped the papers back into the trash receptacle and went to grab the silvery case. My heart nearly exploded out of my chest when I found the space beneath the chair empty.

In that brief moment when I couldn’t find the case, I had the horrible thought that Betrix had snuck in and stolen it. Part of that feeling came because I’d sworn out of the corner of my eye that she’d passed through the waiting area, but I was too focused on the husband to actually confirm her existence.

Then I realized I was looking at the wrong row. I grabbed the case and headed off towards the waiting junker, content that I’d done the right thing in helping that woman and her daughter.

I reached the airlock that was supposed to be connected to the *Nomenclature* to find two very disturbing things.

One, Betrix LaGrange was standing at the airlock with a smug, holier-than-thou look on her face, and two, the *Nomenclature* was no longer connected to the station. Through the thick window, I could see the thruster flares as the departing junker moving away from the station.

\* \* \*

Which brings me to my fourth rule: *Never get distracted.*

A rule I had just stupidly broken for that woman and her daughter. I knew exactly what Betrix had done; she’d hurried past the scene and paid the captain of the *Nomenclature* to leave without me. Even as I pulled up my mobiGlas to contact the ship, I could tell by Betrix’s radiating glow of superiority that it wouldn’t matter.

“Whatever you offer, I told the captain I would pay him more to leave without you,” she said, when she neared.

I quickly calculated that there was nothing I could do about it. The captain was headed to Cathcart, which meant he was a man of dubious morals. No doubt he was enjoying this turn of events, being paid twice for a job entailing nothing.

“Why would you do that?” I stupidly asked. I was shaking my head, even as the words came out my lips.

“I want that job,” she said, nodding towards the case. “I have a route lined up, and I can make the delivery. I’ll offer you ten percent of the fee to transfer it to me.”

“Route lined up? You mean your boyfriend’s set up FTL deliveries that gets you there without a credit paid out of your pocket,” I said, clenching my fists.

Betrix flared her nostrils, but kept an otherwise stoic expression. “I’m doing what I can, just like you are. I’ll give you fifteen percent, paid right now. Just hand me the case.”





The offer was tempting. Fifteen percent to do absolutely nothing except make a few swipes on my mobiGlas and hand over a heavy shoulder-straining case seemed like a good deal. Especially when I didn't have a reasonable way to make the delivery since the *Nomenclature* had left the station. Which was exactly why Betrix had made the offer.

Despite my overwhelming hatred for Betrix LaGrange, handing over the case for fifteen percent was the sensible thing. It was a sure-fire way to earn more credits towards the Aurora LX.

But I could have the whole fee if I made it to Tyrol IV without her and I wouldn't have to let her win.

"No," I said, simply and emphatically.

"No?" she repeated. "Twenty percent, but that's as high as I'm willing to go. I have to give a cut to David, too."

So that's how she was doing it. He wasn't just her boyfriend, he was taking a cut of her profits.

"No," I repeated.

I couldn't bring myself to work with Betrix after what she'd done to me. If I allowed it, she'd do it again later, using me like a sub-contractor.

"Take the twenty or I let FTL know what you're doing," she smirked.

I knew right away that it was a bluff. No way she rats on me. With what I know about her, it'd be mutually assured destruction.

"Fine." I said. Betrix swelled with satisfaction. "You want to comm them or should I?"

Betrix eyes narrowed and she shook her head lightly. "You're a stubborn fool."

I turned my back to her as she stormed off, and brought up my mobiGlas, scanning through the other ships at the station, studying their destinations. Nothing, and I mean nothing, was headed to Kilian system for another three days. In fact, the only ship leaving today was the *Vita Perry*, a Reclaimer, but it was headed towards Ferron.

A quick check of Ferron departures confirmed that going in that direction would put me further behind the delivery timetable.

There was always a way if you were creative enough. I just hadn't figured out the angle yet.

I leaned my face against the cool window while aches made strafing maneuvers through my stomach. I didn't have a spacer's chance to make the delivery in time. Hell, I hadn't even gotten off the first station and there were five more systems along the route. I was better off tucking tail and running back to Betrix, though I doubted she'd offer the same twenty percent after I told her to shove off.

What was I going to do?

[59:49:35]

*To be continued*



CHRONICLES