JUMP POINT

IN THIS ISSUE

GREETINGS, CITIZENS!

In the last two weeks: two brochures, plus **JUMP POINT**. Today you're getting just the facts. Well, that, and an apology. And a thank you. The facts, an apology and a thank you.

As an even casual reviewer of the cover can tell, this issue we've got the Freelancer — a big, hefty multi-purpose craft. After reading about it as we got it all laid out, I'm leaning toward making this my craft of choice (but there are still plenty of other ships to consider). In concert with that, we cover MISC (its manufacturer) and Centauri system (MISC's home base).

CitizenCon was the biggest deal of the last month, but I'm figuring you can get all you need of that from the video and other coverage. Instead, we take you Behind the Scenes to an event that is potentially more significant than CItizenCon. See if you agree with me.

And our fiction begins the second three parts of Doug Niles' *The Void Rats*. By the time we're through, you'll know what the Silver Spider is, and how it came to be.

Okay — apology. I asked for writers and I got them. But I haven't had any time to review what you sent me (see: schedule above). Please be patient, and I'll reply to everyone this next month. But — please send things to my CIG email (just below my sign-off, below), not through the forums and not to my own company address. That's the only way I'll be able to keep track of everything.

And a thank you to everyone who responded to my feedback query in the Subscribers' Den, along with a couple of shoutouts: thanks particularly to Sigma957, Tony and Faiunus Ke'Dar for most precisely giving me what I asked for (specific comments on September's articles) and to Gemini for loads of suggestions. Perhaps the most useful input I got was the suggestions for future Behind the Scenes articles — y'all put together some good ideas.

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

David

David.Ladyman@cloudimperiumgames.com

FREELANCER STATS

Manufacturer: MISC

Length/Beam/Height: 32/15/8 meters

Crew (max): 2

Mass (empty): 55,000 Kg

Focus: Transport & Exploration

STRUCTURE STATS

Cargo Capacity: 20 tonnes

Power Plant: Groupe Nouveau Paradigme Etoile-00

Factory Engine: ArcCorp Arc Duo 400 (2x TR4)

Maneuvering Thrusters: 8 x TR2

Shield: Beijing GH-146m

Jump Engine: Tarsus Leaper

HARDPOINTS

4 x Class 2 (waist): 2x Behring Mk VI laser cannon (2 empty)
2 x Class 3 (under wings): 2x Behring Executioner Twin
1 x Class 5 (turret): 1x Behring M5A twin turret

Freelancer

This month, our Work In Progress contributors include:

Chris Roberts (CR)

Jim Martin (JM) Concept Artist (Freelancer)

Chris Olivia (CO) Chief Visual Officer

Chris Smith (CS) Lead Vehicle Modeler

Martin Gamez (MG) Lead Artist, CGBot

Adam Poole (AP) Associate Producer

Bryan Brewer (BB) Animation Director

Chuy Alanis (CA) Senior Artist, CGBot

Harry Jarvis (HJ) Art Producer

It began, as it often does, with an email:

CR: I'm about ready to jump into more ships – you up for it? Here's the quick rundown of the Freelancer:

MUSASHI INDUSTRIAL & STARFLIGHT COCERN (MISC) Mass produces very efficient, modular middle-of-the-road ships, mostly transports of different sizes that make them the preferred brand for traders and larger corporations. Has a deal with Banu or Xi'An designers to incorporate alien tech into their ship.

JM: Sounds good to me. MISC line sounds cool. Utility, efficient, modular. I love it.

JM: Here are some rough starts for a direction. Just circle what you like and I'll go from there, or send me in another direction.

CR: For me it's the top two on A and the one on the far right on B.

JM: OK, now the "fleshing it out" pass. Thanks for sending the Church stuff [the Constellation concept art]. I will be steering well clear of that aesthetic yet keep it in the same universe.

CR: Perfect! I think it's going to be cool – just as different manufacturers have different designers, so will the *SC* universe … I think it will really help to sell the living, breathing universe!

A

B

C
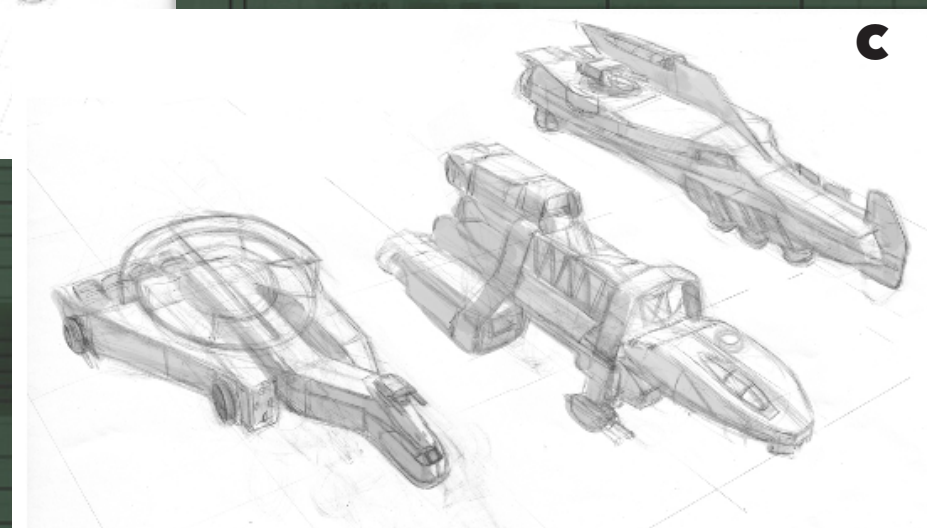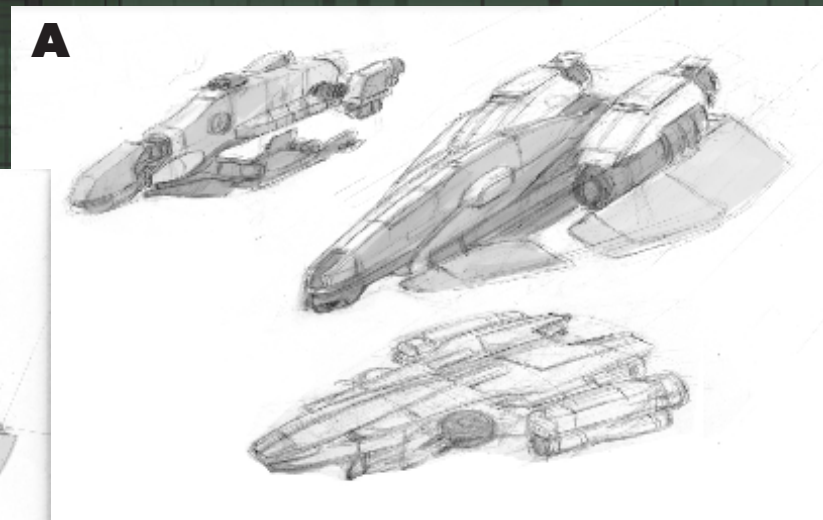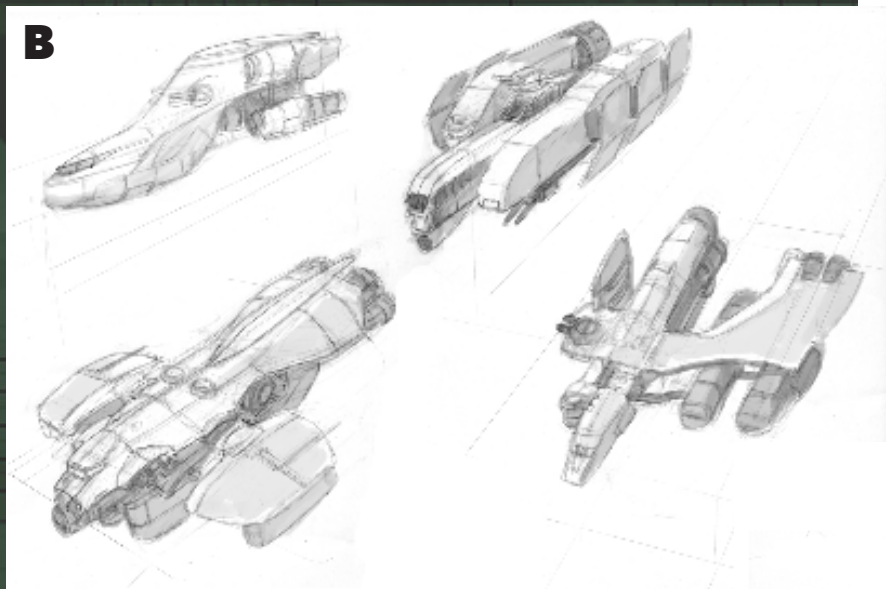
JM: Here's a pass on the first of the three designs that I'm working on. This is for the ship idea with the underslung cargo.

CR: Nice — I'm looking forward to the other passes, but I quite like the top right design — something pretty iconic about it (it also matches up with the ships stats, as there are two main engines per the ship specs).
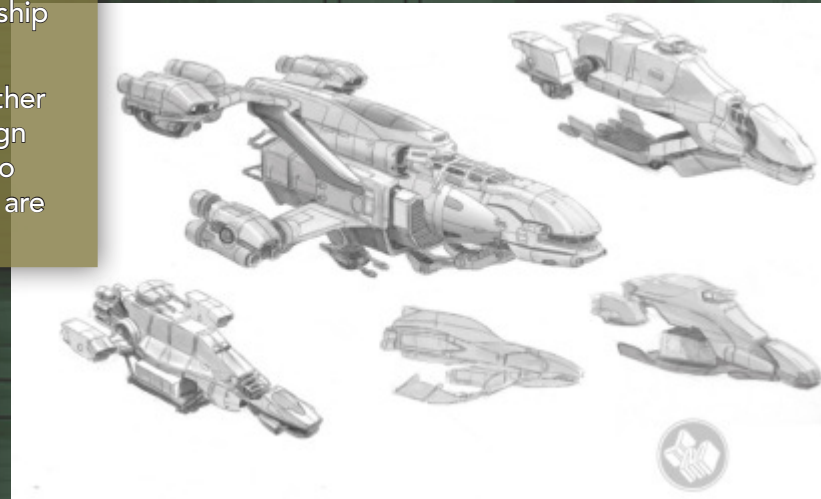
JM: Here's the pass on the second design, it's the more "wing"-like ship. I like a couple of these, they could really be worked into cool designs.
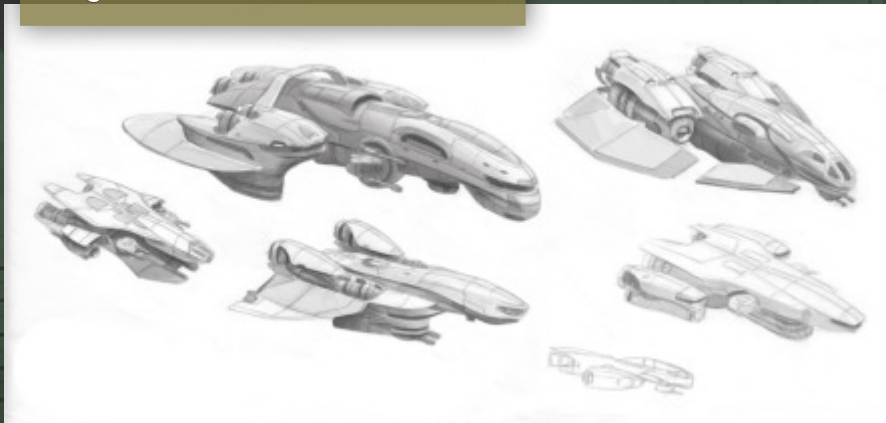
JM: This is the pass on the third MISC ship idea that you liked from the first round. It's old school. I like it because it's for the gamer who likes the "Serenity" vibe.

What I'm doing now is taking the four picks you liked [from the first two sets] and taking them further. And if you like something here I will add it to the others. My goal is to have some tight designs that you feel like you want me to take to model.
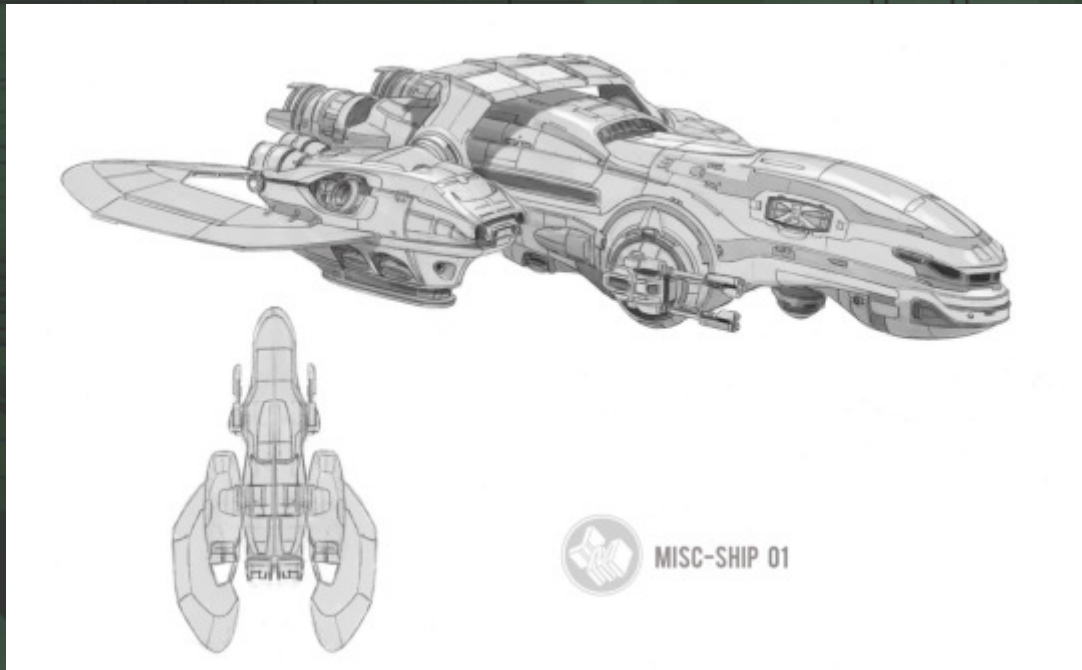
CR: This is my least favorite of the three sets, I think because of the asymmetric aspect. I think we should keep that for the Vanduul ships (which is the one you designed), and the Human ships should be more traditional / symmetrical.

Let's get the other ones knocked out and onto 3D!

MISC-SHIP 01

JM: Here are some more finished designs for the versions 1 and 2. I can revise these based on notes from you or we can go to model on these and do revisions in 3d.

CR: Dig them! In fact both are pretty cool!

One critique is the lack of visibility from both of the ships' cockpit — maybe make some of the top of cockpit glass for greater visibility?

I'm attaching Ryan Church's most recent work so you can gauge the relative sizes of the Lancers vs. the Constellation. Lancer should feel a little smaller than the Constellation (but not by much: 55 tonnes empty vs. 75 tonnes).

MISC-SHIP 02

JM: Here's a rough model for the Freelancer. This is my interpretation of what the three-quarter sketch would look like in 3D. Things need to be worked out (engines refined, proportions adjusted, details added, etc.) but I like this starting point. Let me know what you think and we'll go fro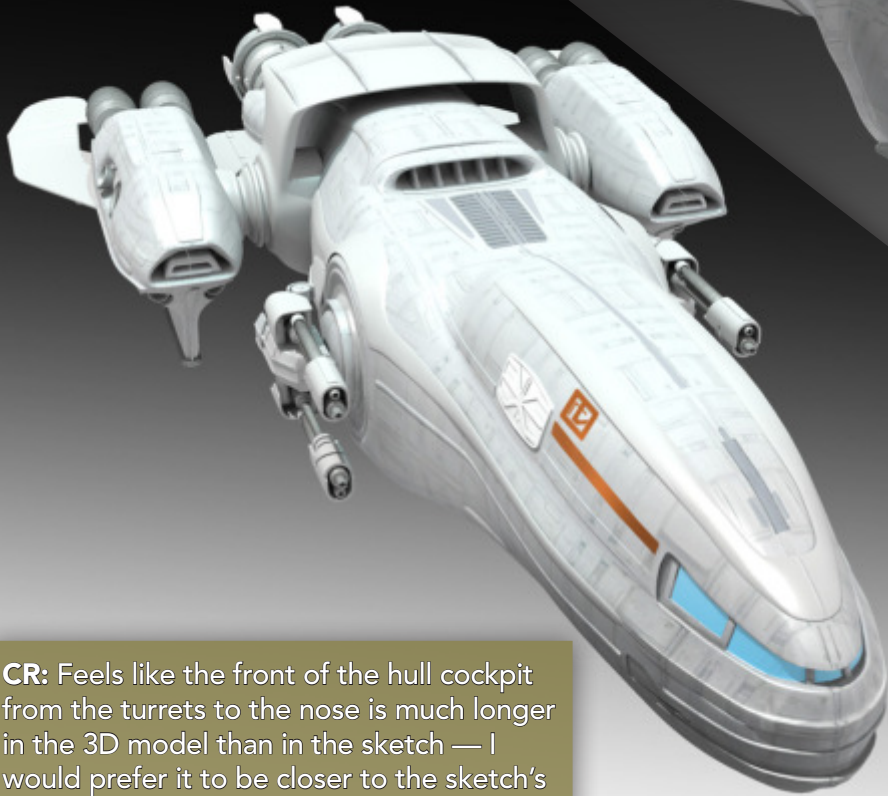m there. I can also send you the model if you want to spin it around. Textures are added only to help skin it, not final textures which would be a displacement map.

CR: Feels like the front of the hull cockpit from the turrets to the nose is much longer in the 3D model than in the sketch — I would prefer it to be closer to the sketch's proportions. In addition, I think we need to have increased vertical (upwards) visibility from the cockpit and the ship should seem smaller – the current cockpit gives the ship the feel of a 737, whereas the *SC* Freelancer is meant to be a 2-man ship — so think an 18-wheeler with a big cab.
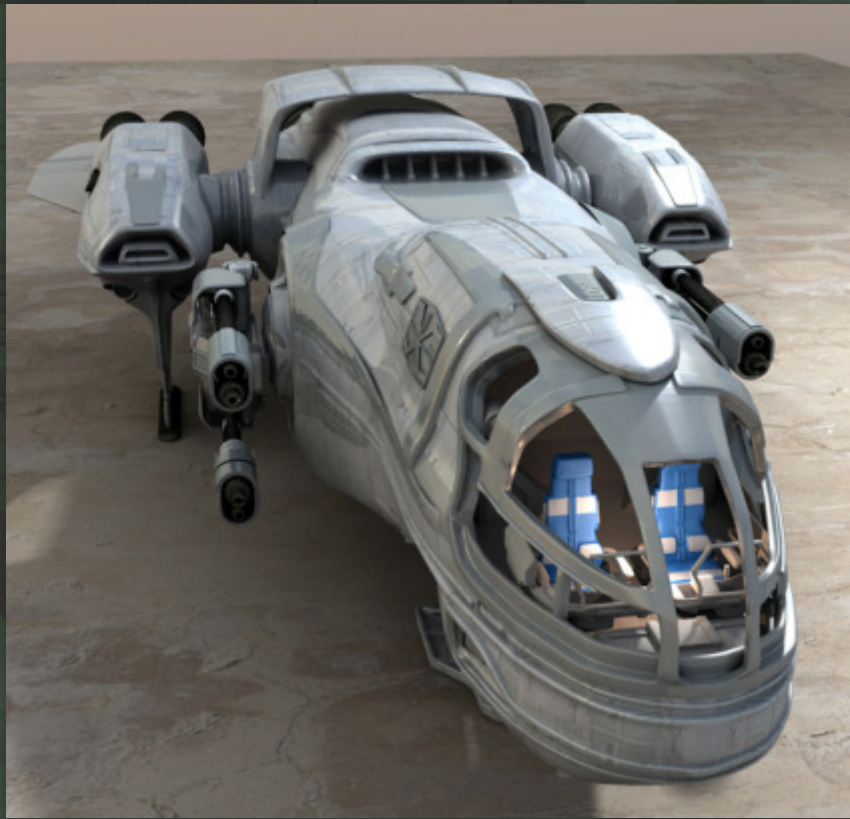
JM: Here are some Freelancer renders. I have:

1) shortened the overall front end

2) increased canopy glass with a different design config that I think looks better

3) added some more details, particularly around the nose and neck.

This design would look good with some really cool graphic paint treatments, like white with a blue head and markings (like a "District 9" styling) or striping and number markings. You enter from the hatch located at the base of the front landing gear.

CR: Looking good!

The exterior color treatment adds a lot. I like the new front cockpit, much better all-around visibility.

I would say the back could be bulked up — I would like to feel more volume for cargo and the engine.

CR: People are going to love this!

On the thruster / engine side you should definitely have more detail / piping etc. Also, the vectored thrust flaps on the two rear engines need to be able to pivot down as well as up to help vector the thrust, so their pivot point needs to be the rim of the nozzle.

I assume the landing struts retract into the side engine nacelles and the front.

How is cargo loaded? How do you board? We'll also need at least one airlock that can be used for docking / entry / exit in space.

JM: Here's a color pass on the Freelancer, with something graphic to further break up the shapes.

CR: The other issues on the model vs. the specs are the engines / thrusters. There should be two main engines. Currently it looks like there are six (two on each nacelle and two on the main body). I can't see any maneuvering jets / thrusters. There should be eight of these — four on the top (all equidistant from the center of mass — front right & left, rear right & left) and four on the bottom. These should be articulated so that top ones can point up, forward and out. Same for the bottom, but obviously flipped.

We'll also need to find places for the two missile pylon hardpoints (BTW, a pylon hardpoint can have a rack of missiles) and the turret (maybe rear facing or in the underside). The turret could be manned by a friend (co-pilot) or controlled remotely by the pilot. I'm assuming the two double laser cannon on either side are the 4 x Class 2, with all four slots taken (the default loadout is only with 2 Behring M3A Laser Cannon).

JM: Good notes. On my end I'm going to …

1. Beef up the back end, add some more engine details and piping, & rework thrust flaps.

2. Engine logic. 2 main engines, then eight maneuvering engines, 4 up / 4 down.

3. Cargo doors, docking entry & landed entry.

4. Missile hardpoint booms, a manned turret. (lose a barrel each off the side guns?)

CR: I would have a version of the side gun that just has one barrel and also the current two barrel version (which is super cool). It's ok to show the weapon options — the idea is that these ships can be upgraded, adding guns, turrets, missiles to the appropriate hardpoints. The same also applies to the upgrade slots for engines / thrusters — in game you will be able to upgrade these items: get a bigger engine, expand the cargo hold, add drop tanks or a bigger radar package, etc.
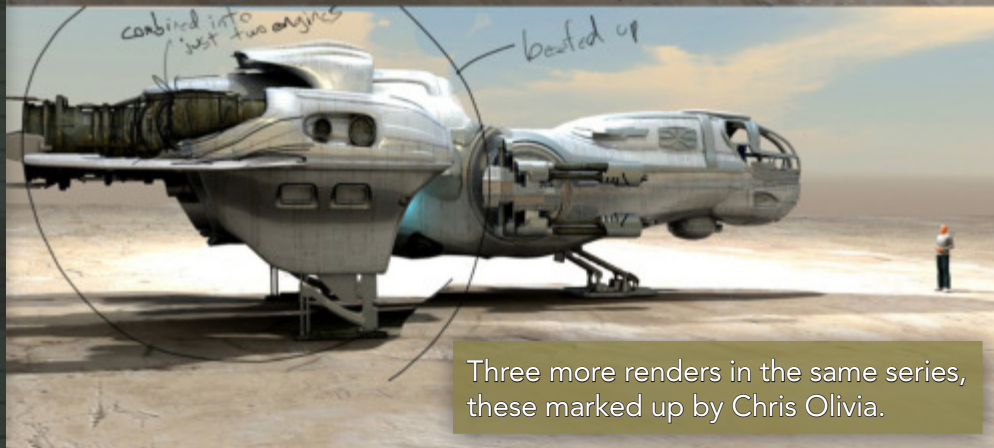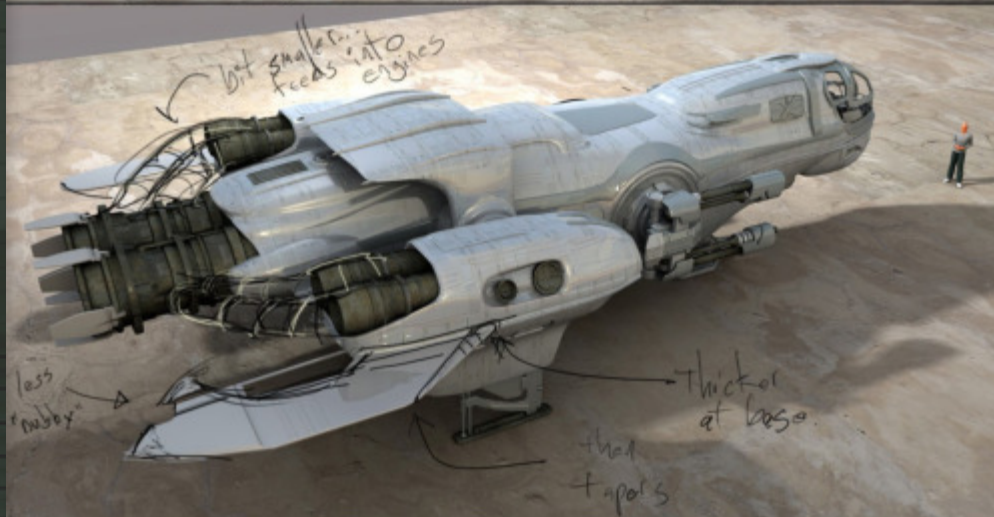
Three more renders in the same series, these marked up by Chris Olivia.

A couple of action renders.

JM: This pass addresses the cockpit; I'm serving up a version closer to the sketch for you to look at. I also increased the cargo bay, adding a ramp door. I've added some missile booms and a turret (in progress), and moved the engines to the outer engine pods. I also included a heavier version with a chubby cargo bay. It's starting to lose some of the flow but it does add a utility look. As you intended, you can upgrade to larger cargo modules to increase capacity.

CR: Better! Still needs some tweaks.

I prefer the slimmer version over the heaver one.

I would beef up the left and right engine nacelles — they feel kind of small to me relative to the main hull. If I look at the 2D concept sketch they feel a bit heavier and chunkier, which I think is good. I'm also not so keen on the engine's sticking out so much from the nacelle — it feels unbalanced. The nacelles should enclose more of the engines, but when you're looking at the ship from the rear you can look in to see the engine details.

Rear landing struts need to be bigger to feel like they can support the weight of the cargo. Maybe there's a two-step deployment animation — legs extend and then the skid telescopes out — maybe with both lengthwise and cross skids for better weight distribution?

Rear wings: I prefer the shape of the concept sketch; I would just not have them extend so far back. So shape from the concept art, but keep the length of the current model.

Love the missile loadouts!

I kind of feel the rear cargo hold needs to be both increased in the beam and height on the normal version. The heavier version is better, but still feels like the rear cargo section needs more height (upwards). If you look at the concept art everyone loved so much it feels like it raises /

slopes up after the side turrets. In general I prefer the slimmer version's form, so maybe just do some adjustments on that? Perhaps the "heavier" version is a hull modification. if so, perhaps it should be done in such a way that the old cargo hold is switched out for a new one? Think of the cargo part being a lock-on container that comes in sizes?

LARGER CARGO BAY

EXTENDED ENGINES

HEAVIER VERSION

COCKPIT

BERTHS

KITCHEN

SYSTEMS CORE

SECONDARY HOLD

PRIMARY HOLD

90 ft
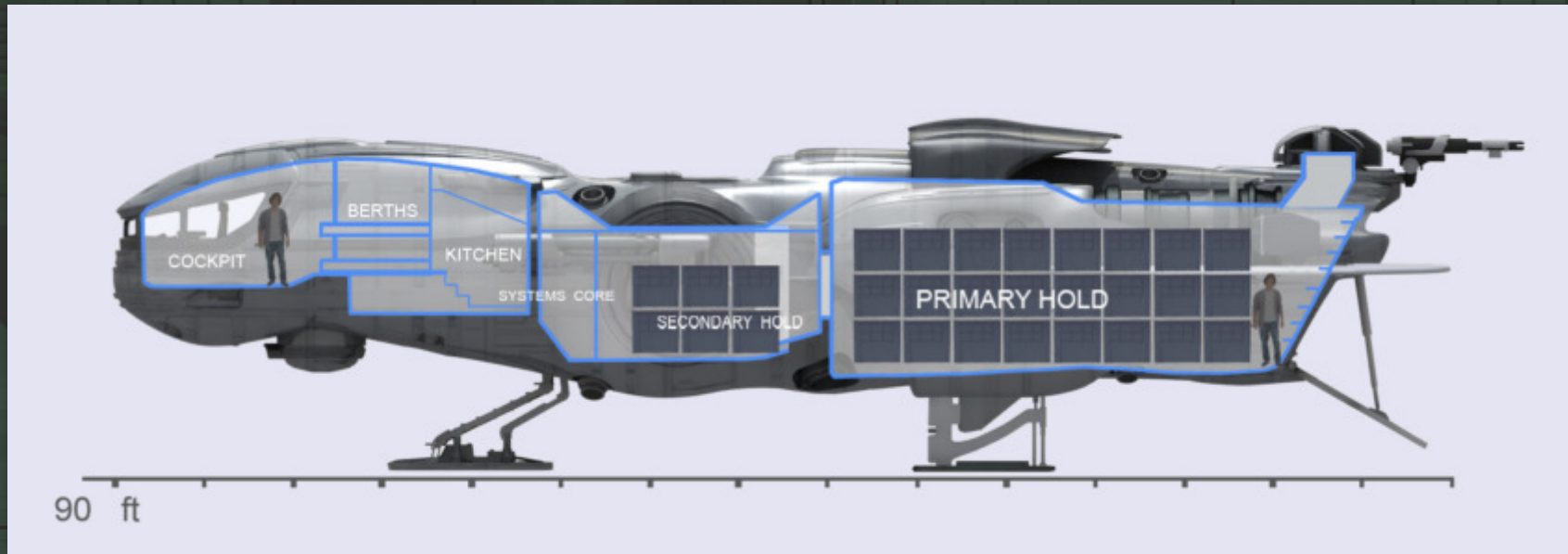
CR: I don't like the rear turret design with the two guns hanging from far on the front; it feels unbalanced. I think it should be closer to a B17 glass turret and maybe have the guns terminate inside the turret — essentially on either side of the gunner. So think of the glass being an enclosure over the dual guns that rotate and elevate around the center ... It also should sit further forward (it feels like it's hanging over the lip of the rear right now).

Cockpit. I like the sun roof in the heavier version — maybe there's a blast shield that retracts to reveal this? I think you're going to have to open the front windows up some, or reduce the width of the struts; currently, if you sit inside, they block a lot of your forward vision. I feel like you can extend the front nose beyond the underside dome and highlight the "chin" of the nose so it's closer to MISC_SHIP 01 (and the one in Misc02 copy that this was based on). One of my favorite parts of the original design was this sense of nose / chin and how it curved down. When I was talking about shortening the neck of the ship when you did the first rough 3D renders I was talking about the distance between the underside dome and the class 2 side hard points not he very front part!

We also need a couple of "in flight" sleeker renders as I think people are getting too hung up on the form when landed.

JM: Good notes, here's my summary:

1. Beef up engines, reduce exposed back end piping so we glimpse into it from back end.

2. Thicken rear landing struts, maybe a two-step deploy so that we can really get some beef in there.

3. Wings redesign more like the sketch, but keep the length.

4. Cargo hold, taller and wider as possible.

5. Rear turret, go for a more straightforward B17 look, framed glass, full visibility.

6. Front end rework, open up front windows more, extend nose to highlight the "chin" element from the sketch. We like a sunroof for visibilty.

7. Need some in-flight renders of this thing hauling ass!

I'll get on these changes.
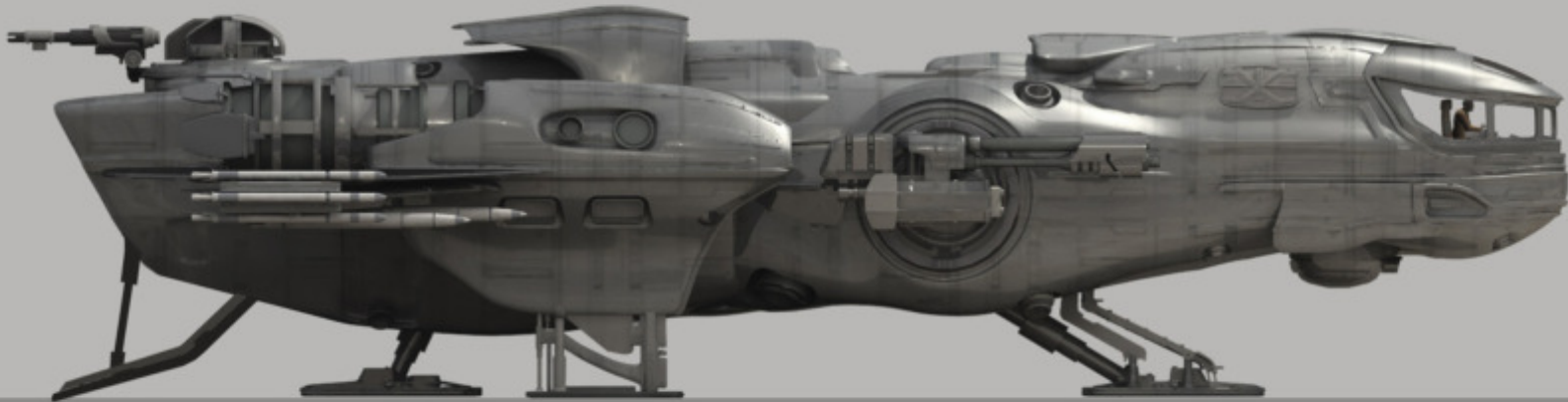
VERSION 2 HEAVY CARGO

WORK IN PROGRESS

13

PRIMARY CARGO HOLD

BERTHS (4)

CREW STORAGE

FLIGHT DECK

SECONDARY CARGO HOLD

GALLEY
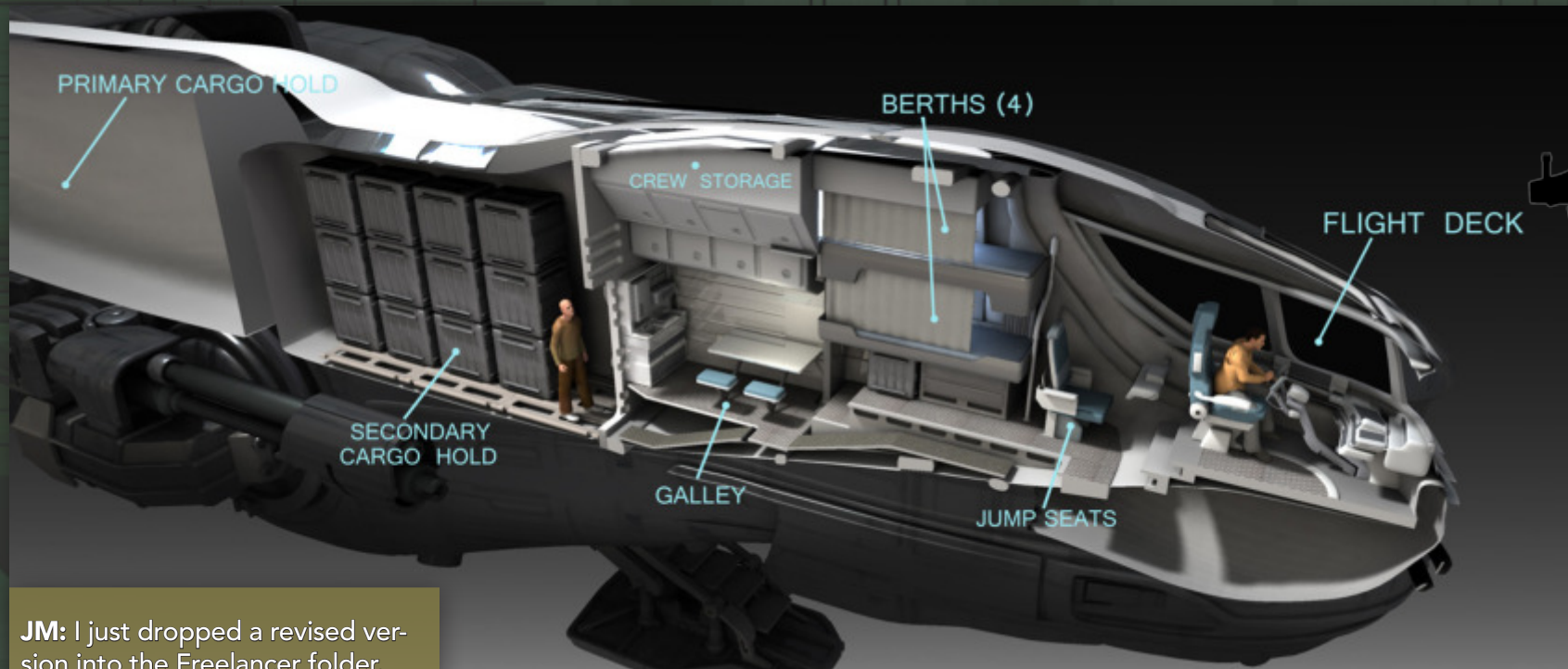
JUMP SEATS

JM: I just dropped a revised version into the Freelancer folder.

CR: Just saw them — cool. They look good; the only issues for me are tweaking the rear turret (I want the guns to extend into the turret, old-school WW2 style), and we need to think about the power plant. I think on the stats we have just one for the ship, but the way it's set up right now it feels like it has two, one in each engine nacelle. Perhaps we should do a cross-section there too?

JM: Ok, I'll change up the turret, maybe shrink the guns a little bit so they can originate from within the glass bubble. Yes, cross-section of the engines to show how they are being driven by a single stardrive.
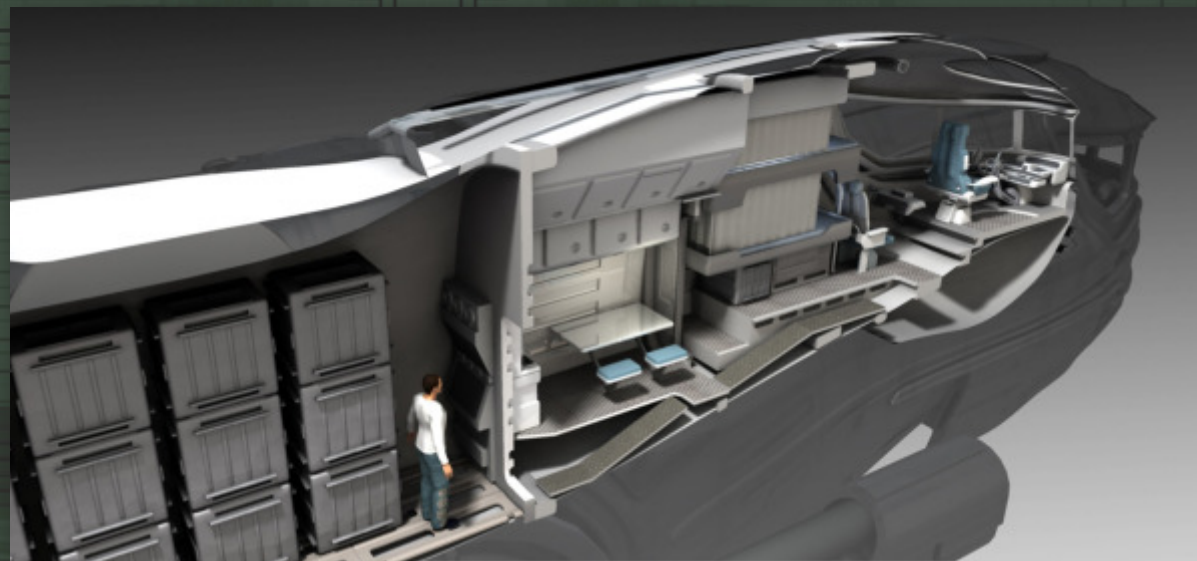
JM: I uploaded a layout for the Freelancer interior. This is a general model of how I think things might fit. The third render (above) is a 'look and feel' of how the space is from inside. It's a corridor config like a submarine. Not addressed are toilets, showers, a lift elevator for the center hold and the hatch-up config for the under entrance from the model. I'm currently working up the new turret and a refined exterior.

CR: These are great! Love them ...

Perhaps a few nods to the exploring capabilities in the interior? A nav chart device, a scanner array?

Also maybe one or two touches of personality inside? People could be flying one of these for a week or so, so it feels like there should be a few personal touches ...
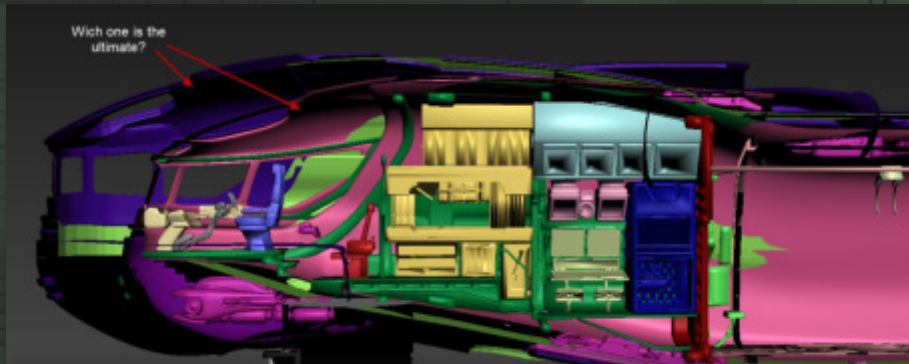
Also please highlight the jump drive / power plant side when you get to that part of the ship.

And now, over to CGBot for
in-game modelling.

Wich one is the ultimate?

MG: In the reference mesh we received there seem to be two different hulls, one that seems to fit the interior props but doesn't fit the exteriors, and one that fit exteriors but ther rear and the whole canopy don't match each other, being too large in the exterior.

Two different doors
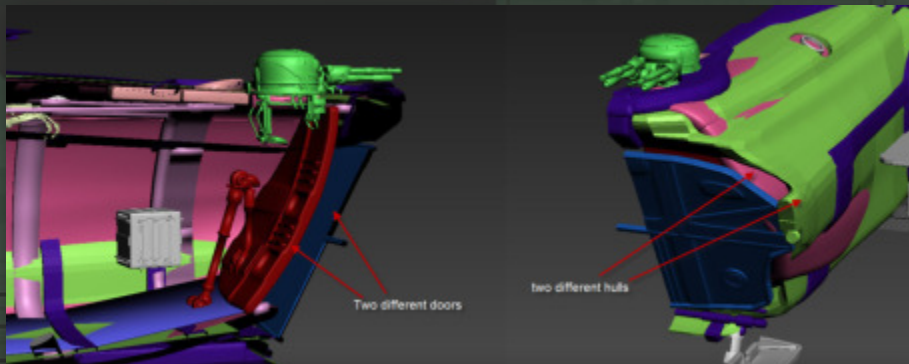
two different hulls

MG: This may due to the same issue, but we found two different rear doors — which one is the right one?

Is this machinery inbetween going to be visible some time?

MG: There is machinery and other items in between walls, but most of it doesn't seem to be reachable or visible from any side. Should we work on this anyway?

MG: As we started working on props for the Freelancer, some important questions came out. I've attached screenshots showing this.
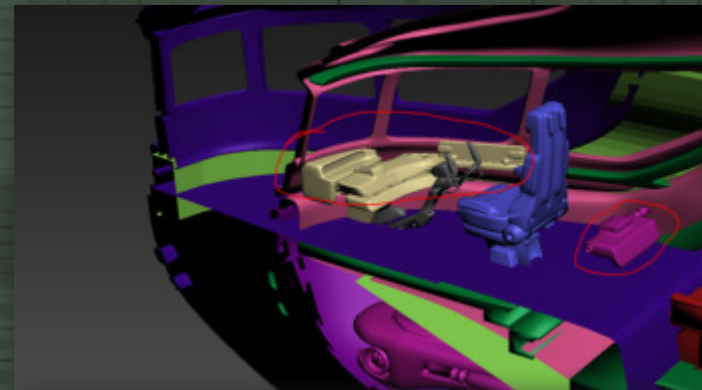
MG: I read in the Information file that the cockpit uses Xi'An technology. What does Xi'An tech look like? We need some reference/concept here to figure out how to work on this part.

CR: I would generally go for the better / more detailed geometry and the paint-over / final renders trump the model you have. Difference in size could be due to scaling the ship correctly for our pilot (you should check that it's scaled per our stats).

I don't think you need to model completely hidden geometry, but I do like the idea of some of it being modeled and then becoming pieces of debris if the ship breaks apart is destroyed.

Xi'An tech and look is completely undefined. Chris O may have some ideas, but nothing has been designed yet outside the look of a Xi'An itself.

MG: The light gray on the interior are mostly low-poly cleaned-up versions ready to be UV mapped, and some high-poly models, such as the chair. The dark gray parts are the ones that haven't been worked yet.

On the exterior, we have most of the Hull Base (all the overlaid panels and details are still to be worked), geometry cleaned up and UV mapped. Also the geometry on the engine nacelle has been cleaned up, but UV map is still WIP here.

I included three tiled textures we will use for the tiled areas on the exterior; there is also a WIP HP for the side cannon that would be handled as a unique mapped object.

WORK IN PROGRESS

time some one gets into the ship to the first cargo area, then close the doors then go to the cockpit.

One possible solution is to add hinges to the little pad in in the floor just above the door, to be opened each time someone gets in/out of the ship, and then be closed every time someone wants to go to the cockpit.

CR: On entry stairs, it seems like there needs to be some re-factoring, as stairs shouldn't be welded to the front landing gear — you don't want to expose the interior to the outside / potentially hostile atmosphere just by the act of landing / deploying the landing gear. So stairs need to be separate and are deployed after landing.

MG: For the main entrance (the one with the stairs on the front landing gear) it seems we need to make some adaptations to make the landing gear/stairs functional. But we noticed that when the door is open there is no room for the player to go to the cockpit. so doors should be closed every
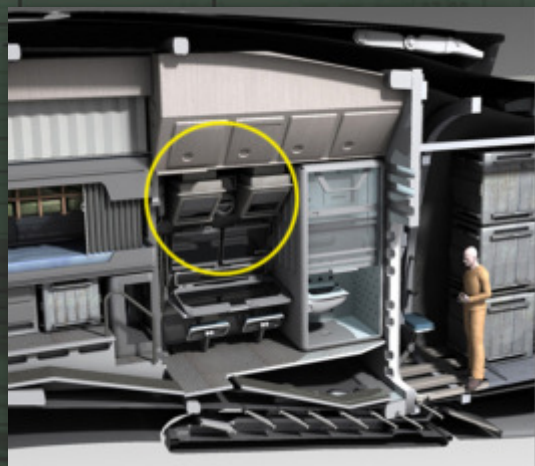
MG: On the kitchen area section, we are wondering what these assets are meant to be. The ones below seem to be screens, but we aren't sure about the higher ones, as that area is labelled a kitchen but we don't see any other kitchen props.

CS: Those look like small storage cabinets/medicine cabinets to me. The doors could open like this maybe? [reference picture of overhead storage on an airplane]

MG: Also, here are some references we got together to give the artists an art direction guide. These references are meant to be used only as mood guides for the different areas on the ship and not at the detail level. Please let us know your thoughts on this or if you have any references that better fit the direction you have in mind, so we can ensure we are going on the right direction.

CS: Looks good to me.

CR: Yeah, references look good to me.

Cargo Area Floor

Missile

Turbine

Cockpit

MISC FREELANCER TYPE 1

Cargo Area Floor
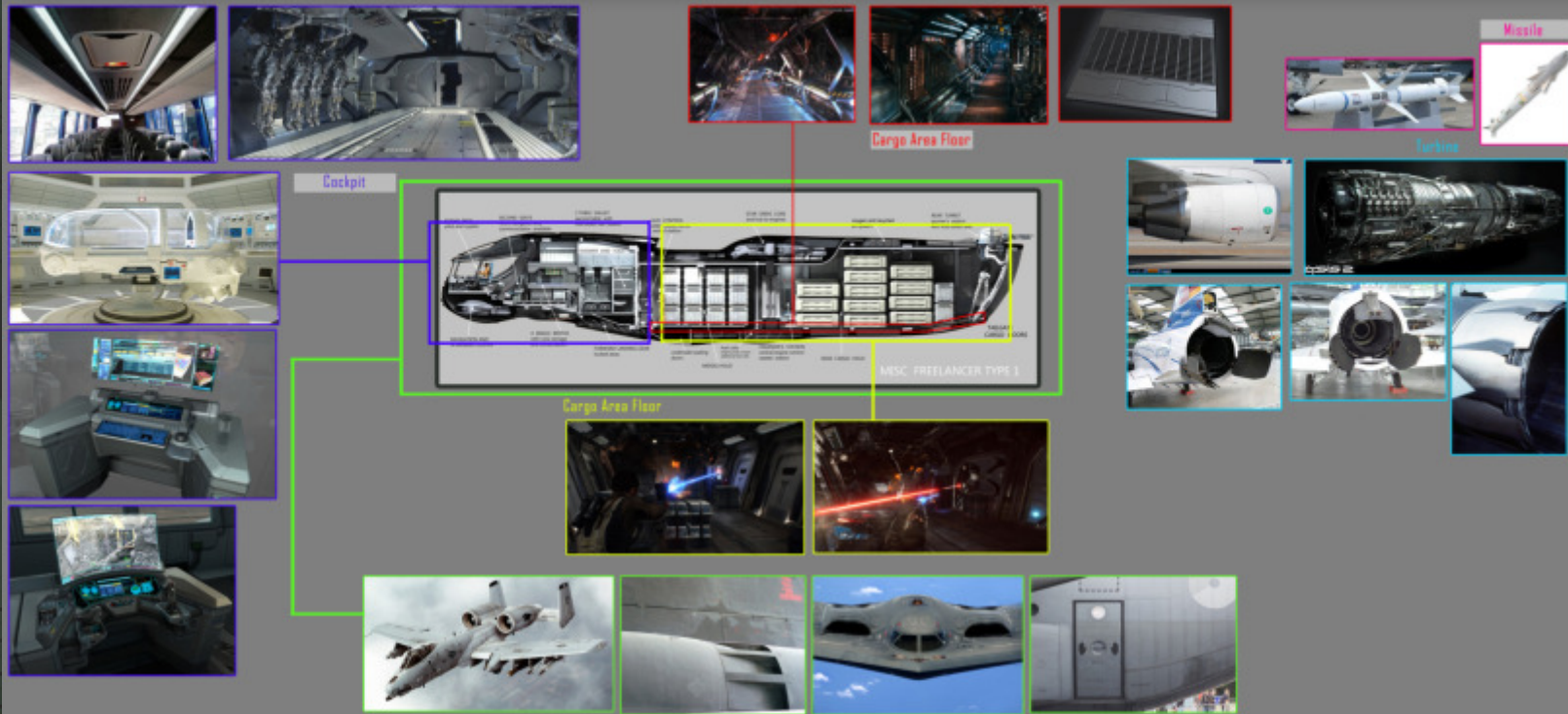
CLIENT REFERENCES
EXTERIOR

INTERIOR

Previous versions got from Shotgun

19
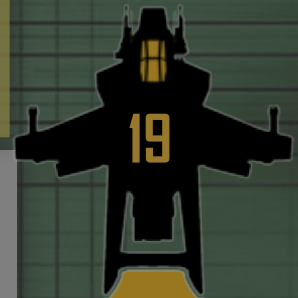
WORKINPROGRESS

AP: Using Jim Martin's concepts for reference (attached), here's a very high level list of what we will be looking to animate on the Freelancer.

- Flight deck controls / panels
- Forward landing gear extend and retract anims.
- Rear landing gear extend and retract anims.
- Underside loading doors
- Doors from cabin to middle hold
- Door / passageway from middle hold to rear cargo hold
- Tailgate cargo doors
- Rear turret

CR: Also:

- Gun recoil
- Thruster range of motion
- Main engine nozzle flare. Also I believe that Jim intended for the main engines to rotate 180 degrees for strong braking.

FLIGHT DECK
pilot and copilot

SECOND SEATS
helm, navigation and
communication available

2 TABLE GALLEY
second table with
fold-down nav. station

SHOWER AND TOILET

AUX CONTROL
AND CARGO BOSS
seated station

STAR DRIVE CORE
and hub to engines

oxygen and recycled
air system

REAR TURRET
gunner's station
with fold-down seat

NAVIGATION AND
SCANNING CLUSTER

4 SINGLE BERTHS
with crew storage
and consumables

FORWARD LANDING GEAR
tucked away

underside loading
doors

fuel cells
engine pods contain
additional fuel cells

ENGINEER'S STATION
central engine control
seated station

REAR CARGO HOLD

MIDDLE HOLD

TAILGATE
CARGO DOORS

MISC FREELANCER TYPE 1

CS: I took a look at the Freelancer landing gear/ entry situation. There is pretty much no way of making that entry work without having some limitations on crew movement inside the ship once landing gear is down.

Once the LG is down, the bridge/ramp has to be out of the way, which creates a hole with no space to walk around it.

IF the only concern with this design is exposure to outside elements while landing, we can fix that issue by adding a secondary door that fits in between the LG area and the inside. This door would only open once crew is ready to head out.

As an alternative, I've included some pics of an idea where a hatch could possibly go. It would be a more traditional opening on the side which would deploy a ladder as it opens. (In my kit-bash example I think the door is actually too wide; I would make it narrower, so it's just wide enough for one person). I've provided two opening possibilities. The inside would have to be modified a bit for this and obviously we'd have to model in the door cavity and a new ladder.

Let me know what you think Chris.

CR: I prefer to keep the stairs on the front landing gear — I think that's cool. Could we move the door that opens to allow you to step down onto these stairs either slightly more forward, or into the hold so we can have some room to walk around the opening in the floor to access the hold?

Could still be closed hatch for landings which only open once crew is ready to head out

The only problem is the inside walkway bridge has to move out of the way so the crew can walk into making it problematic for crewmembers inside to maneuver to the back of the cargo while landing gear is down.

MG: On the sketch mesh and concept art there's a door, but it has a frame that we thought might be a secondary door. So we are leaving this just as frame, but is that a secondary door?

CS: I would say go with just one door. Doesn't seem to make much sense to have two there.

CR: One door makes more sense unless you have separation for airlock reasons (which doesn't make sense internally).

MG: One of the missiles seems really close to one of the thusters, making it look like it is going to explode with the thuster heat. Should we take this missile out?

CR: Yes. There are more missiles on Jim's work than there should be.

HJ: More Freelancer cockpit paintovers and reference. Some tweaks from before, some new. Perhaps a little more detailed than necessary, but should be enough to work with. Let me know if you need more.

MG: Thanks a lot for all these references and paintovers, they definitely show us what direction we need to go in. It also helps for the amount of detail that everything needs. As an example, we were planning to have the ceiling on the cockpit made of metal tiles before we got these references.

As another example, the chairs (those models where already done before this reference) were planned with a low level of detail, but after Chris's feedback on the amount of detail on the Constellation's cockpit, we decided to put more detail on the Freelancer chairs. Now chairs are really close to the level of detail on these paintovers.

[Pictured are a couple of more than ten reference sheets.]

The plastic molding should be fitted together neatly -w- crisp cutlines.

Shapes, lines, geometry should be fitted together and transition into each other as if manufactured and not look tacked on.

BEFORE

AFTER

Pull window trim details from reference.

MISC VERSION

Material/Ceiling/Bulkhead reference! Not color reference, ignore the green, this version is not a military vehicle ... Ignore the Olive Drab.

MISC VERSION

MG: As for the chairs, this is what we had in the previous paintovers. At this point we Have HP and LP for both, and UVs for the rear chair. Should we go back to HP and rebuild the chairs in the concept direction, or should we continue with what we already have?

CR: No, your current work is great!

HP+Proxy

WORKINPROGRESS

BB: I wanted to touch base real quick on prepping the ship for animation.

I want to make sure that you have the HumanProxy-Cockpit.max file I gave you for the Aurora, so that our Human fits in the seat and can properly reach all the controls.

Any parts that should be cylindrical or round, but which are made oblong, wobble when animated. I would like to get the Freelancer rock solid when it come to any mechanical part that moves.

All moving parts need to be broken out, pivots properly centered and pointing down the correct axis.

Animations for the cockpit will need to match the character's animations. I will do those when I create animation for the character. Just have any moving part in the cockpit broken out and with the proper pivots set.

Also it helps when files get large to add a prefix to naming parts. For example for any part in the cockpit, I add a "CP_" (like CP_LeftControl, CP_Yoke, etc.) For landing gear I add "LG_". Really, it can be anything to help quickly group parts of the ship together.

Also creating specific layers helps in the organizing of complex files. Like all the thruster parts go in a "thruster" layer, front landing gear goes in a "FrontLandingGear" layer, any exterior parts not already part of another layer go in an "Exterior" layer, and so forth.

One last thing. We have a new process for exporting animations of CGAs. We now export .CAF files. The exporter now treats the geometry like bones. This means you don't have to animate TCB curves or convert to TCB before exporting. This also means you can add rigging like AIM constraints to help out with animation.

BB: Here is a starter list of animations for the ship. I also have a few suggestions on how various parts can articulate:

landing gear up

landing gear down

cargo door up

cargo door down

turrets rotate on the heading

turrets rotate on the pitch

engine articulating

seats and tables fold up to the walls

curtains open to the beds (skinned with joints)
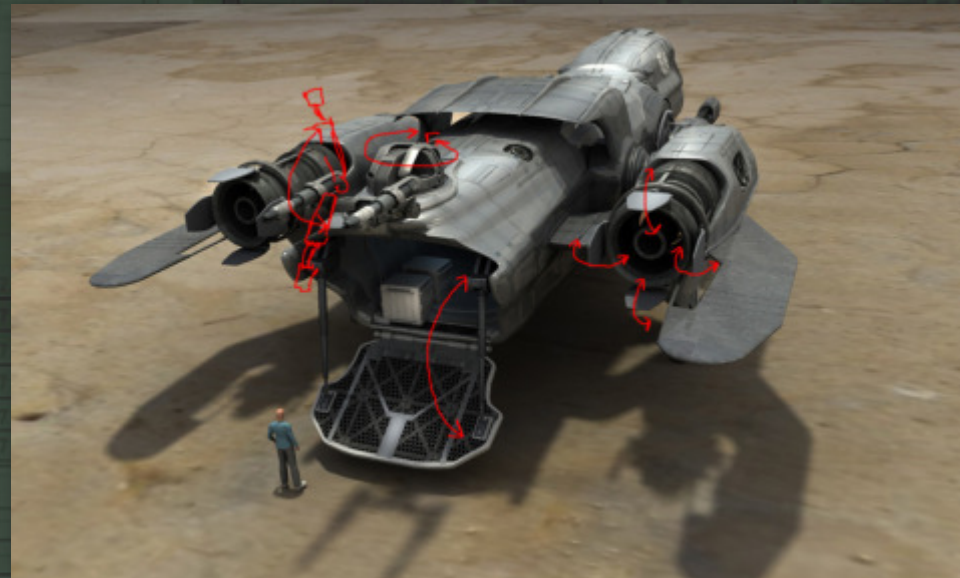
BB: The flaps on the afterburner nozzle should move. The cargo door opens; when the door opens (on upper hinges) the pistons attached to it may need to push back to allow the door to close so the geometry doesn't clip. The turret should spin at the base and the guns rotate up and down from their pivot.

BB: The pilot's seat arms rotate up. Yoke rotates up. Berth curtains open and close.

I also cut out the wall and added steps to open up the walkway a bit, so if the floor door is open you can walk around. Also take note on the yoke: the grips need to be angled to match the 300i. This will eliminate a pop in animation when we turn IK on in the sitdown animation.

BB: The table folds up to the wall. The seats rotate down and push back to the wall.

The floor over the landing gear exit slides open to show the airlock.

BERTHS (4)

CREW STORAGE

GALLEY

JUMP SEATS

LARGER CARGO BAY

EXTENDED ENGINES

HEAVIER VERSION
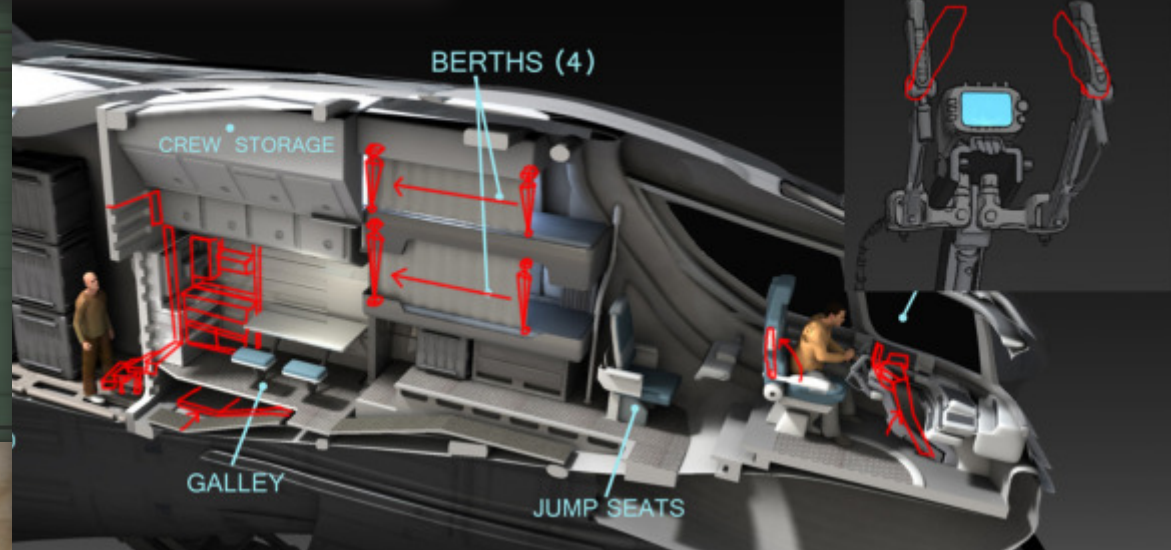
BB: I would like the outer wings to push forward and the afterburner to push in. Then the whole engine can rotate 180° from pointing up to pointing down.

HJ: One of the designers is asking about docking rings and the Freelancer model. Could I get a screenshot or two of 3/4 top and 3/4 bottom views of the model in its current state?

MG: Here are the screenshots, Harry. Also, Chuy is about to post WIP screenshots with most of what we're working at now.

WIP

REF

WIP

WIP

WIP
Render reference

Constellation / Hangar references

Other references
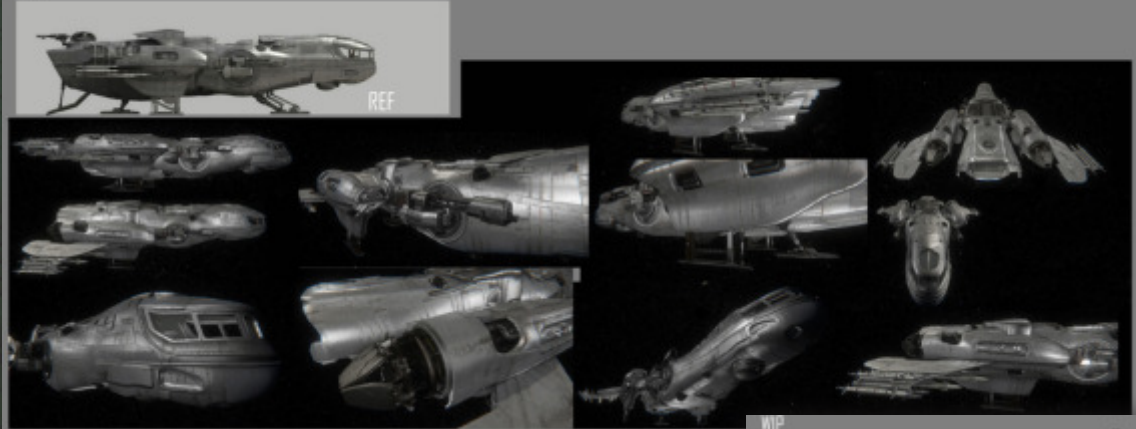
CA: Here's what we're working on right now.

WIP

WIP

Concept

Metal gray

Rubber

Toothy Grating

WIP

WIP
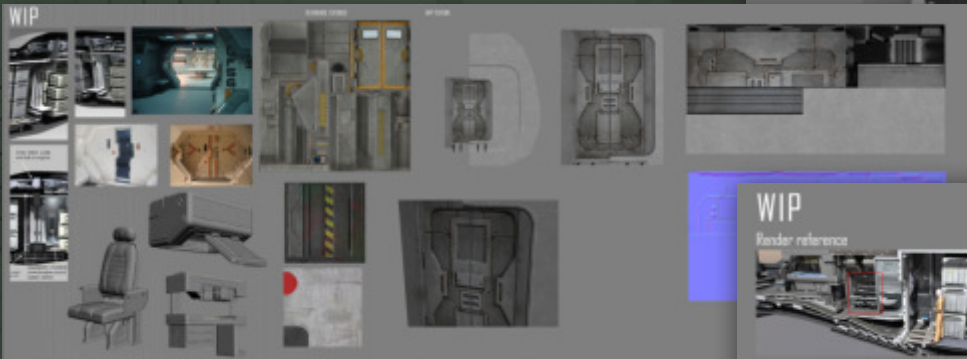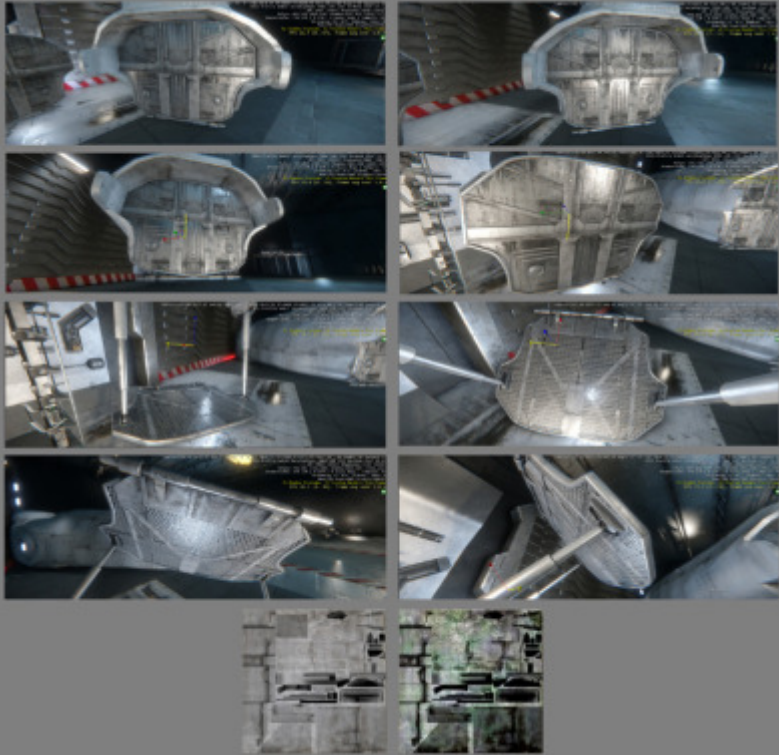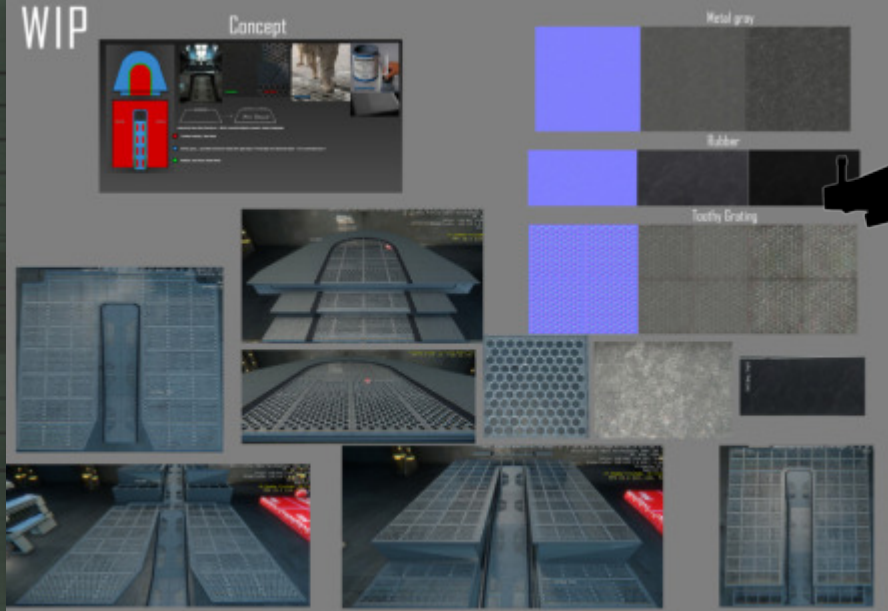
CR: Looking pretty good to me so far! Just make sure we have some decals / burn marks on the exterior — we don't want to be too Airstream trailer-ish!

WORKINPROGRESS

29
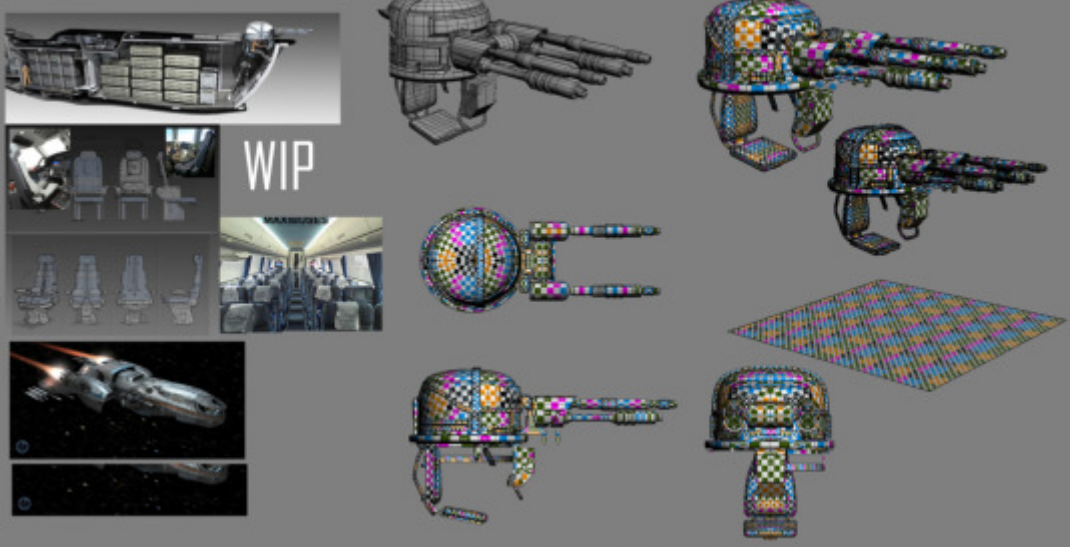
HJ: May I get a couple of screenshots that show the passage / door between the front (secondary) cargo hold and the rear (main) cargo hold, from both directions?

Design is trying to figure some stuff out that might affect the model.

MG: Here are some screenshots for the cargo transition areas. Textures on the secondary cargo hold are just a quick tile we made to get the screenshots, the same for the boxes, but the spaces and volumes of everything are the final volume/space they are going to use in the ship.

HJ: Thanks, Martin! Very helpful.

CR: Looking promising! I guess we need to figure out the cargo container system (and build some nice ones).

Not as a direction for right now, but I kind of like the idea of being able to walk back to your hold and see what cargo you're carrying — so maybe a piece of machinery on a pallet, a drum full of liquid, a rack of missiles, a container of food stuff ... We probably should figure out a tile-able footprint to make layout / storage / cargo hold design simple (so everything tiled into 1x1 or 2x2 m so you could have a pallet that is 2x6 next to one that is 4x4, etc.).
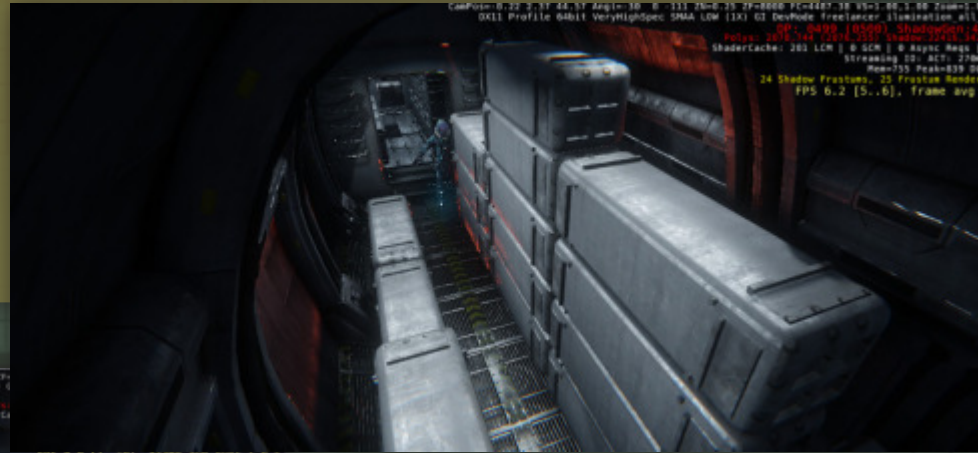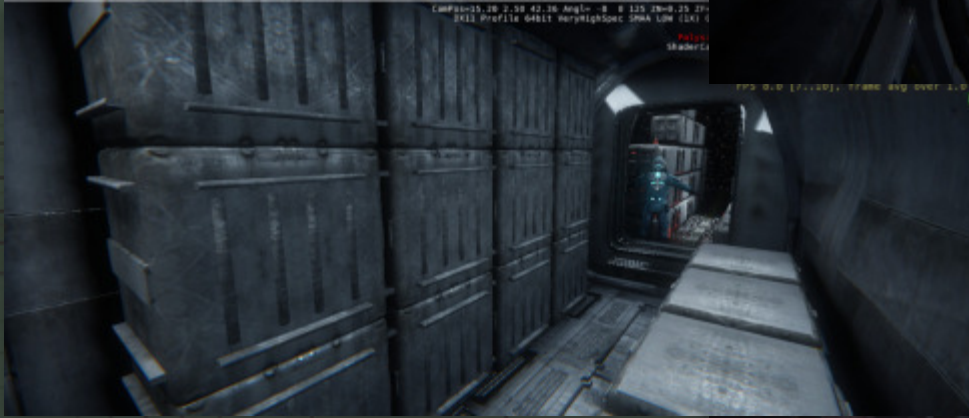
WIP
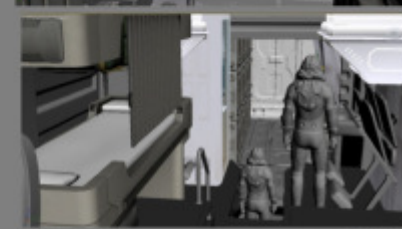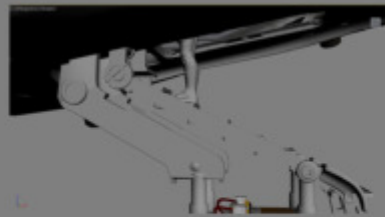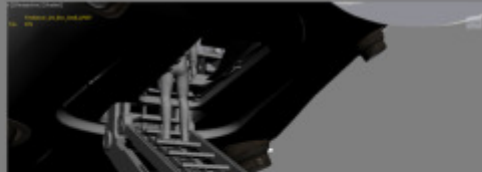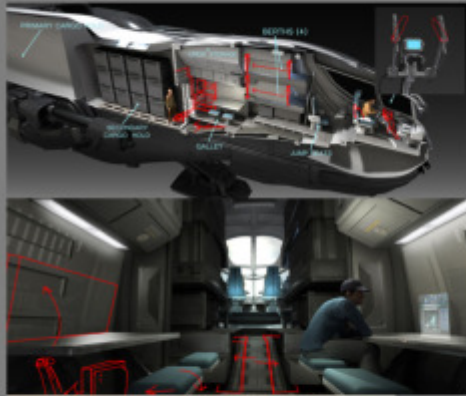
CA: Here's another WIP update for the Freelancer.

CR: Looking good! I like a lot of the internal details — turret, yoke, etc.

On the exterior, we need to be careful to not make the ship feel from a different game / style. Right now it feels fairly David Lynch "Dune" or Steam Punk — we need to keep a more "Star Wars" feel to the exterior. I think it's in the level of grime / dirt and also the metalic base texture (the concept was a little sleeker and shinier) and lack of decals.
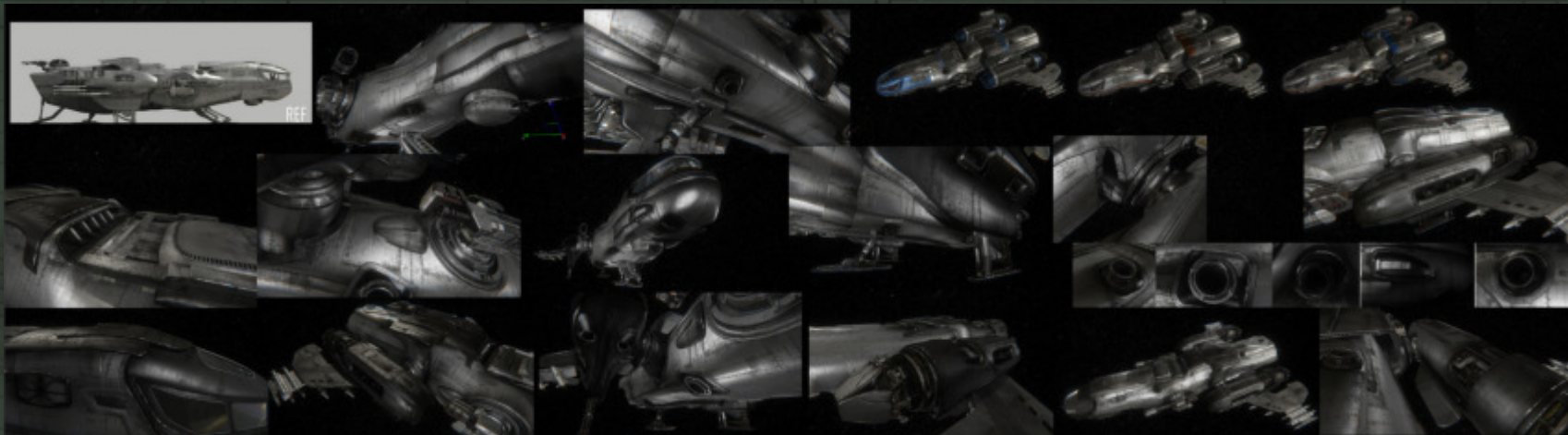
MG: We are currently working on the decals; the texture changes may not be present in the next update, but certainly we will also address that before it is finished.

For Bryan and Chris Smith, here are the screenshots about the rear turret current allocation that address the guns pointing down in a wider angle.

The screenshots show what would need to change on the ship to move the turret. And I think the easiest solution would be as Chris Smith said in the meeting, to just make the turret higher. But we can also make the guns higher (just raise the place where the guns pivot) so we woudn't impact any interior/exterior matching.

CR: I think we are fine with the current setup. I want various ships to have some flaws / blind spots. I don't think the proposed changes would make enough a difference anyway.

Current Turret allocation — Limited Angle

Posible new turret allocation — Move closer to the edge — Larger Angle
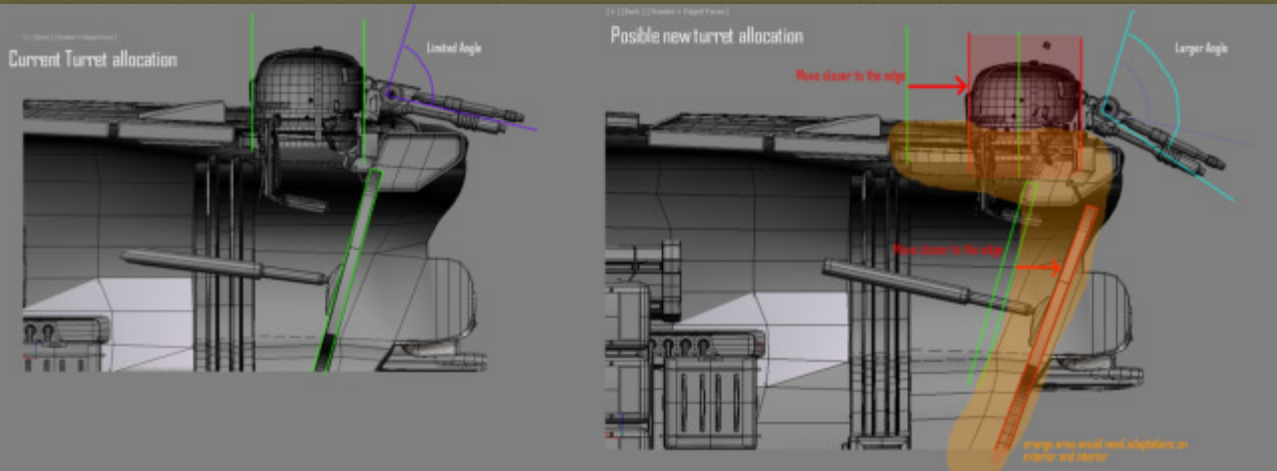
MG: A new issue/question came up when we were testing the landing gear stair. On the attached image you can see the top row of screenshots that show the stair adjusted to fit the standard measures you guys defined for stairs in the game (SC-Stairsdimensions-050713-1534-14.pdf), so the each step is 0.1865 height and 0.4 width having a slope of 25°.

The bottom row of screenshots shows the original Freelancer stairs — steps are 0.1865 height and about 0.3 width, but this makes a very different slope angle from the 25° standard angle.

The bad thing with the standard slope is the character will hit the hull of the ship when going in/out of the ship. So it would need to have some adaptations.

Having the stairs as they were made originally in the concept won't have the contact issue, but would need a custom animation when getting in/out this ship.

Which way should we go here?

CR: Entering and leaving spaceships is different than standard stairs and ladders for the hangar. Each would have a custom enter / exit animation (which could include a "duck" and hold of the fuselage for the Freelancer for instance as you enter the opening on the fuselage). So I would stick to the original Freelancer set-up.

WORK IN PROGRESS

Feet go through Floor

Too close

Too close (note markings on image)

The text content is within images. The body text box:
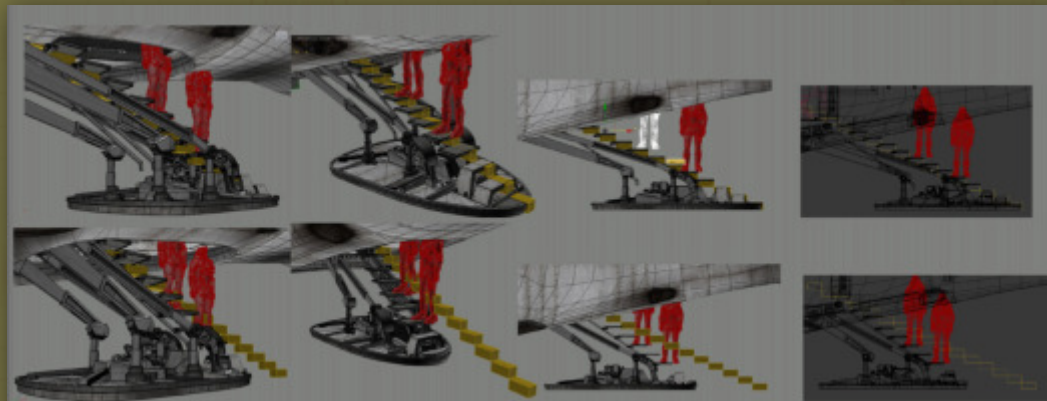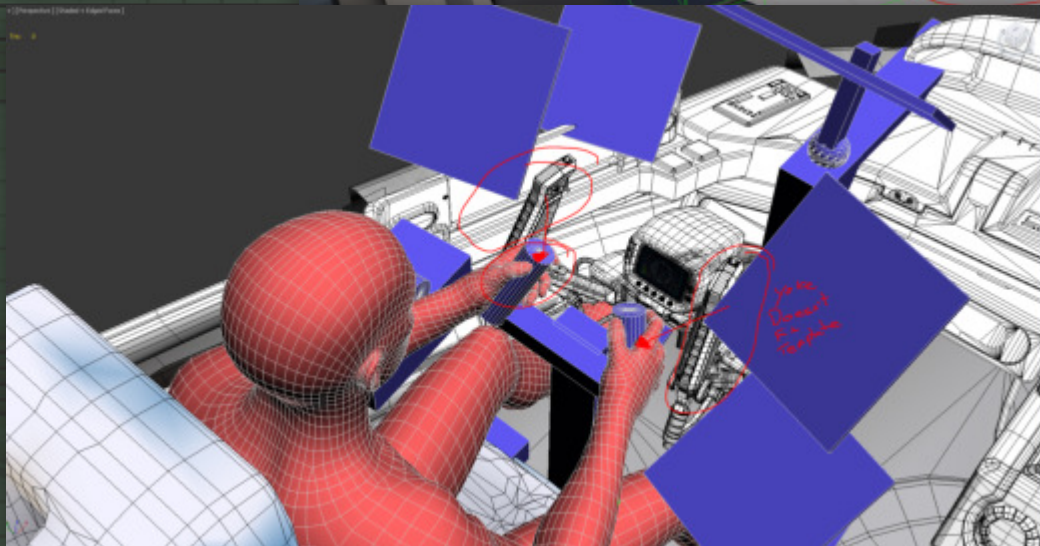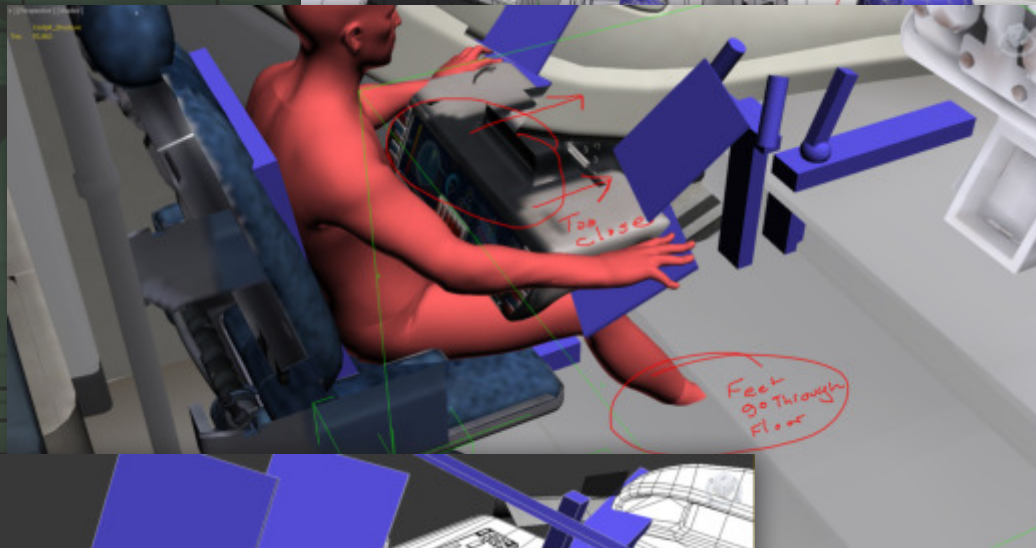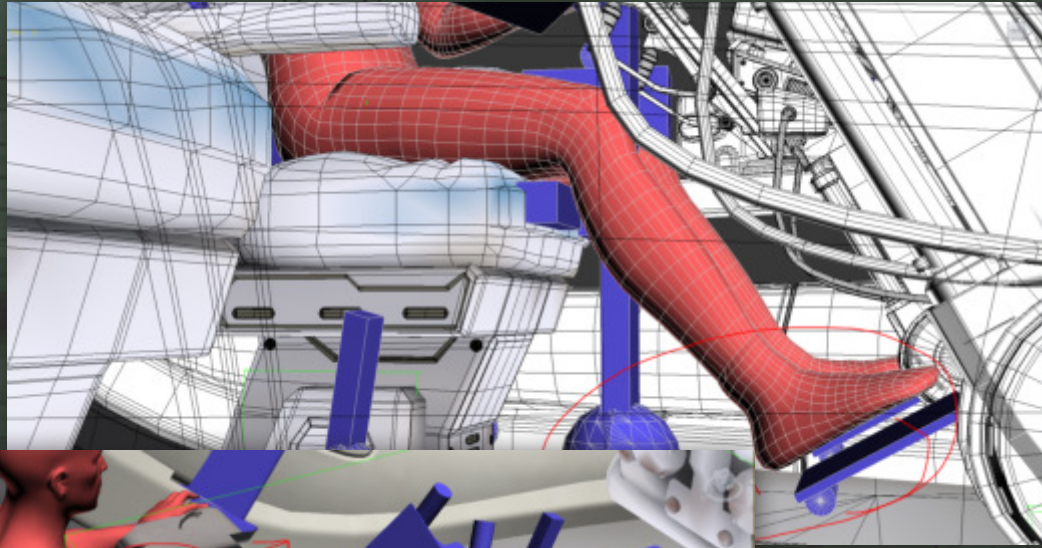
HJ: Hey guys, found some issues with ergonomics in Freelancer. Images attached.

MG: Sorry on those issues, we did checked that out but it must have been altered in the latest phases on the process. We will double check and fix those.

Right side vertical text:

WORK IN PROGRESS

33
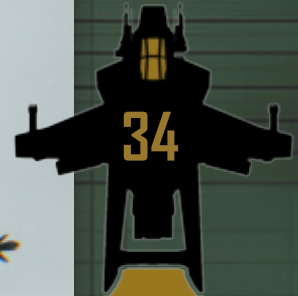
MG: Freelancer modeling/texturing is done.

Right now only rear and side landing gears are animated with TCB controllers, the remaining animations will be done without those controller as you mentioned before, we jus need to do some tests because is a method we haven't tested yet.

Also the containers and collisions set-up is not properly done yet, but those will be done within the the next couple of days.

CR: Looking good, guys! Environment mapping is a bit weird, but other than that pretty beautiful and detailed. Looking forward to the animations!

CS: Great job, guys! That thing looks pretty sick.

![MISC – musashi industrial and starflight concern]

The Musashi Industrial & Starflight Concern (MISC) was formed in 2805 in an arranged business merger between the failing Hato Electronics Corporation and the Musashi Lifestyle Design Unit spinoff of Acorn Limited. The merger made smart use of Hato's extensive network of large-scale production facilities and Musashi's reputation for design genius. MISC is based on Saisei in the Centauri System. Corporate offices are located there, as well as an impressive central dealership facility that is fully open to the public. MISC is also known for their especially ergonomic factories, with every spacecraft piece assembled robotically with expert precision. Fully modular, identical production lines have been established on dozens of worlds.

For most of the concern's history, the majority of business has come from the production output of their heavy industrial division. MISC-HI is responsible for a range of configurable bulk transport spacecraft which are ubiquitous in UEE space. These sturdy, modular hulls are the basis for the majority of human corporate shipping. Their unexpected popularity among the Xi'An has spawned an unlikely business relationship (and a string of imitators on the other side of the border). Four standard hulls are mass produced, ranging in size from the efficient MISC-A to the gargantuan MISC-D.

MISC is the only Human spacecraft corporation to sign a lend-lease agreement with the Xi'An, agreed to in a closed-door conference in 2910. Although the actual specifics of the deal have remained a tightly-held trade secret, insiders suggest that Xi'An technology has played heavily into Freelancer

development, while seemingly Xi'An-produced MISC-D hulls are becoming an increasingly common site at border outposts. Wilder rumors claim that MISC's next line of spacecraft will begin to incorporate Xi'An thruster technologies adapted for use in their Human craft.

In recent years, MISC has funneled profits from their corporate line into the development of two spacecraft that are nominally marked for personal use, the Freelancer and Starfarer. These spacecraft are aimed to compete in a crowded marketplace against heavyweights like Roberts Space Industries and Drake Interplanetary. Nevertheless, a carefully managed business plan and the one-two punch of a generalized private craft (the Freelancer) and a role-specific niche ship (the Starfarer) have found overwhelming success for the company in this arena.

Freelancer

The Freelancer follows the MiSC-HI concept of extreme modularity on a smaller, more distinctive hull. Initially marketed as an efficient long-haul merchant ship for private en-terprises, the Freelancer quickly became the ship of choice for dedicated explorers. With the range of a transport plus room to install advanced scanning and jump technology, Freelancers have enabled their captains to chart a number of new jump points in recent years. With a noted engine upgrade capacity and the ability to maneuver better than any other dedicated transport ship, it is no wonder the Freelancer's roles continue to expand.

It can also be said of the Freelancer that it has inspired more debate than any other spacecraft on the market. Detractors claim the hull is unattractive, that the cockpit's field of view is unnecessarily limiting and that on paper it is not suited to the roles it has expanded to fill. Freelancer's supporters, however, are equally dedicated to the ship. They argue vehemently that the ship is the secret of their business success: that rare cost-effective ship that fulfills many of the same roles as the RSI Constellation, but requiring far fewer crew.

In some sense, the Freelancer image has begun to appear at odds with that of MISC itself: dashing space captains charting new frontiers on a wing and a prayer versus heavily organized corporate governance. The truth is, the Freelancer

MISC Freelancer

MISC Freelancer

spacecraft lineup, a MISC analysis board conducted an 18-month survey of space travel which resulted in a 15,000-page study on ship roles and the current shortcomings faced by space pilots. The end result: a decision to focus development efforts on a dual-role fueling craft, capable of both collecting spaceborne fuel and refueling other spacecraft in-flight. Before the first Starfarer launch, both of these roles were performed by wildly different spacecraft, none of which were intent-designed. Refueling was conducted by bulk transports equipped with massive aftermarket tanks and the process itself had become notoriously dangerous. No ship is more vulnerable than when it is engaging in a refueling operation. (A rule of thumb for pirates states that a ship caught refueling could be captured intact, as no captain would ever risk a firefight breaking out.)

Starfarers carry massive internal fuel tanks that are welded directly to the ship's core superstructure, making them significantly safer than a modified transport. A system of external probes and dual-pressure access nozzles allows these tanks to be accessed at any time, meaning that a Starfarer can scoop hydrogen from a gas giant as easily as it can offload fuel to a nearby ship. Starfarers can even be upgraded to carry basic refining mechanisms, allowing them to process sufficiently pure fuel themselves without need for a refinery visit. Another common Starfarer upgrade involves modifying the hydrogen tanking system to carry liquid foodstuff. Yet another MISC-designed upgrade package allows for the replacement of the tanking machinery entirely with an alternate cargo chassis that supports bulk goods transport. This has proven fairly unpopular, with bulk shippers preferring a standard hull or a Freelancer.

project would not exist without that governance. Every aspect that makes the design popular for independent pilots was carefully researched, analyzed, tested and produced. From the optimal radar package placement to the vacuum-form cupholders, the components of the Freelancer went through hundreds of thousands of man hours in an effort to produce a design that comes together seamlessly.

Starfarer

Where the Freelancer was designed to appeal to a wide variety of small scale roles, the Starfarer is a niche spacecraft through and through. As such, it has become the galaxy's standard fuel transport. Seeking to expand their private

The Starfarer has also seen unexpected success as a military support ship. MISC has licensed the design to Aegis Dynamics, which produces the Starfarer Gemini ("Star-G"), a heavily-armored tactical variant, under contract for the UEE military.

Modular Environment Summit

Modular Discussions

CItizenCon was earlier this month, and on the Tuesday and Wednesday before CitizenCon we held a Modular Environment Summit. CIG staff from LA and Austin were there, of course, as were key contributors from BVHR and VoidAlpha, in Montreal, Canada, and CGBot, in Monterrey, Mexico. What's a Modular Environment Summit, you ask? We're glad you did — we had the same question, and several of the participants were kind enough to fill us in. They include Cole Ellis, Stuart Lee (BVHR), David Opreska (CIG), Sergio Rosas (CGBot), Nathan Dearsley (CIG), Harry Jarvis (CIG) and Forrest Stephan (CIG).

JP: *What's a Modular Environment?*

CE: To state it the obvious way, this is an environment built using modules. Generally, these modules fall on a grid, and the rules governing a module differ based on its intended usage.

SL: It's made up of many smaller components, usually re-peated multiple times. This way we can build up large and complex locations with a small number of individual pieces, and then create other, different locations with different layouts but using the same basic architectural blocks.

DO: Think of a Modular Environment like a set of lego blocks. Each piece of the environment needs to be able to "snap" together with other pieces.

SR: These pieces can be any level of granularity from single bricks to entire rooms or even larger, to collections of rooms. They can be swapped out for other similar ones to change an area from one look to another.

ND: The pieces can be used in several different ways to create the illusion that everything is unique, not exposing the player to obvious repetition. The key feature and reasoning behind this is to allow design and art to prototype environments fast, getting playable spaces up and running in little time while of good visual quality. Due to the re-use

BEHIND THE SCENES

At the Summit: BHVR, Void Alpha, Illfonic & Crytek

From left to right:
Mathieu Beaulieu (BHVR; out of view)
Christian Lavoie (BHVR)
Stuart Lee (BHVR)
Dave Richard (BHVR)
Gabrial Galaz (Void Alpha; mostly hidden)
Denis Renshaw (Void Alpha)
Miranda Martinez (Void Alpha)
Mark Day (Void Alpha)
Cole Eggen (Illfonic)
Kedhrin Gonzalez (Illfonic)
Sean Tracy (Crytek)
Andrew Stifter (Crytek)
Dan Tracy (CIG LA)

nature of this construction, good planning is crucial, but time saved in the long run allows the artists to focus on the quality of pieces used.

JP: *What's a Modular Environment Summit? Why did you need to get together?*

HJ: Because we have multiple studios working on environments, and we have a LOT of environments to build, we got everyone together to discuss and agree on how we were going to build these and make sure we all did them the same way, so that kits are interchangeable and shareable.

ND: We have several talented individuals working on this project across the globe; it was a good opportunity to put faces to names and share different techniques and opinions of how we're going to push the envelope of dev time vs visual quality. Some fantastic ideas were brought to the table on how we are to get over certain hurdles in dev. Basically, the summit was a way to reach key communication moving forward, ironing out problems before dev time is wasted on them.

CE: A modular summit is a gathering of environment artists with the intent of everyone getting on the same page, both aesthetically and technically.

SR: We needed to get together to get all the brains from around the world to meet and be on the same page about knowledge sharing.

DO: We have a lot of different studios working on this project. We all needed to get a set of rules, methods, pipelines setup so we could all get on the same page.

SL: It was a bit like that scene in *Lord of the Rings* where

From left to right:
Dan Tracy (CIG LA)
Dave Opreska (CIG LA)
Forrest Stephan
    (CIG ATX)
Pete Mackay
    (CIG ATX)
Brendan Jackson
    (CIG ATX)
Nathan Dearsley
    (UK contractor)
Nate Blaisdell
    (CIG ATX)
Rob Irving (CIG ATX)
Sergio Rosas (CGBot)
Chris Roberts (CIG LA)
Mark Skelton
    (CIG ATX)
Harry Jarvis (CIG ATX)

At the Summit: Everyone else

all the representatives from all the different races come together to discuss what the best course of action will be for our mighty quest to create the Best Damn Space Sim Ever. But we have fewer dwarfs, so there was less arguing.

JP: *Why were* **you** *at the summit?*

HJ: I organized the summit, and I'm responsible for making sure we get the environments working and built.

DO: First, we were all there to get everybody on the same page. Second, getting to meet the other studios' employees face-to-face was invaluable.

ND: I've been working on the project for a little while now, making and designing anything from buggies to ships. I have a background of over four years as a lead and principle environment artist for Crytek and other studios. I could talk about what the engine does and doesn't do well, so we

could come up with a plan to make it do the things we want it to in creating this huge universe.

FS: I was there to help establish a pipeline that is clearly communicated across the development studios and to meet the teams.

CE: I was at the summit to support my studio in absorbing knowledge with regard to established conventions, as well as sharing knowledge to help establish conventions.

SL: It was in Austin! YAY! But seriously, it was a good chance to meet all the various people that we have only had contact with via email before. The kind of work we are doing is very technical and complex, so it's a lot easier and more productive to have discussions face to face. Also, knowing people on a one-to-one basis when you are working together on any creative project is very important.

SR: I was there because I run CGbot and we will probably be creating assets for these systems — and if we're lucky, maybe even playing with them.

JP: *What did you hope the summit would accomplish?*

SL: I hoped the summit would help us to arrange all our ducks into neat rows.

HJ: Exactly — get everyone on the same page and come out with a roadmap for moving forward in sync.

ND: Consistency is key — everyone should be on the same page moving forward, from naming conventions and scale of objects, to far bigger key elements like lighting pipelines, material definitions and so on. Game dev in the last five years has evolved tremendously, it's no longer about just making an asset and getting it in-game, there are so many dependencies that rely on each other. It was a good opportunity to discuss these and come up with a plan moving forward … which we are already putting into action!

CE: I hoped I would come out of the summit being more in touch with the project and its needs, so I would be able to make good decisions regarding future environment development.

SR: I wanted to meet and greet. Put faces to names, bond, and make sharing and communicating easier and more natural.

JP: *What **did** the summit accomplish?*

ND: Working on a project with teams spread across the globe is difficult. Meeting the team and seeing the talented bunch of guys and girls working on this made the whole thing seem just that bit smaller and more approachable. It got everyone talking, communicating, and hyped!

HJ: We got the different studios to meet and get to know one another, which got everyone understanding we were all in this together, and not just a bunch of separate vendors. We also got a better feel for what Illfonic brought to the

table — a lot of experience in CryEngine.

CE: The summit helped me understand the current state of things. This was the first I had heard anything about pipelines and scope. Understanding these things in the context of the project helps our studio to know how to work more intelligently going forward.

SL: It allowed us to share all the ideas and processes we have been working on so far, distill them down, and come up with a more unified approach to how we will tackle the mammoth task of creating an entire universe.

SR: Meet and greet? Faces to names? Check … I also got a very positive feel for how good the other teams are. There are a bunch of bad asses working on this game, and that makes me even more excited about it.

JP: *You're all talking about the value of getting to meet each other face to face. Describe something you learned about someone else at the summit.*

FS: Illfonic having such a foundation on the exact modular techniques we are trying to incorporate. I also learned that I know Austin about as well as Nathan, who has never been to Texas. And I learned David Opreska is Irish.

ND: Yes — it turns out that Forrest doesn't know Austin hotels very well at all …

CE: I learned that Christian from BHVR is a sculptor is his down time.

SL: I hadn't realized that Chris Roberts is originally from Manchester. I'm English too, but I hadn't been able to place his accent before.

SR: The guys working at the other studios are GOOD.

JP: *Other than learning each others' secrets, what surprised you most at the summit?*

SR: I was surprised by how many different teams all over the world are working on it.

ND: And what a versatile team we have working on this, and how vocal everyone was. I'm not used to that; it was refreshing to see. You could sense that everyone wants this to be a success, which it will be!

FS: Seeing four teams so quickly become one team. It was pretty amazing to see everyone's different experiences, from so many different backgrounds, collaborate with each other.

CE: I was surprised to find out that we were planning on implementing mod tools for players to use. Before the meeting I thought that *Star Citizen* would be a contained project.

DO: Illfonic's modular tier system was what surprised me. It was a pretty ingenious way of approaching modular design, allowing artists and level designers to crank out levels at a rapid pace, while still making each environment unique.

HJ: I agree: how much experience in exactly what we were discussing Ilfonic had and how much they could do to help get us all on the same plan.

JP: *What are you looking forward to in* Star Citizen's *next year of development?*

HJ: Seeing these first steps at environment creation and process pre-production turn into full scale planetary location production.

ND: I'm totally hyped about seeing the environments grow. It's hard to explain how when you start an environment you essentially have nothing, then over weeks it develops into its own living and breathing identity. It gains its own personality, you live it, breathe it, then hand it over to the crowds. In my profession, nothing comes close to this, it's so satisfying.

CE: I look forward to talking in more detail about the larger, more ambitious modules, such as the capital ships, and how we intend to create them.

FS: Taking what we have learned from the summit, implementing it and applying it in the development cycles.

SL: I'm most looking forward to creating lots of amazing planets to visit and explore. And driving my buggy. Maybe I'll be able to combine the two?

SR: Solving the environment challenge. I would love to be able to spend all of my time solving that one. It's a once-in-a-career kind of challenge.

JP: *What did you think of the Citizen Con festivities after the summit?*

HJ: I thought they were a good expression of where we are, what we are doing, and a good way to thank the fans and supporters. Nothing was perfect, but it went pretty well.

ND: For our first year its was a huge success. It was great to see all the dev interviews of the team; it's so different from the usual process where you may sink three years into a project before anything is shown. I love the transparency of dev for this game — our citizens are a hard crowd to please, but having their input definitely makes things better!

FS: I thought it was great to be able to provide an event and an inside look at the development process, for all the fans who believe in this project so much.

CE: It was awesome. Best thing I've been to in a really long time.

SL: It was great to see a lot of the work that's been done so far up on the big screen and get an immediate reaction from the fans.

SR: I had a great time, it was way more inspiring than I realized it would be. It really got me excited to be working on such a cool project!

CENTAURI SYSTEM

SAISEI

The Centauri System consists of five planets and three known jump points surrounding a large Type A main sequence star. Centauri was one of the first systems settled during Humanity's initial period of interstellar expansion. It was discovered in 2365 by a dedicated survey ship that immediately recognized the tremendous colonization potential of the third planet. The flag was quickly planted on Centauri III and land there was immediately offered at a premium to colonial outfitting groups. The result was Saisei, one of the most beautiful and well-constructed Human worlds in the UEE. In the development process, the other worlds in the system went largely ignored. In the ensuing centuries, scattered resources have been discovered on these other worlds and more scattershot development has taken place.

Inner Planets

Centauri's innermost world is a tiny protoplanet that orbits very close to the star. **Centauri I** has no atmosphere and no mineable resources. The close-up view of Centauri's star from orbit, however, is overwhelming. A well-known photograph (commonly available as a post card) taken by the initial system survey ship shows the blue-white star with a prominence reaching out to seemingly grab the tiny planet.

Centauri II, called **Yar**, was initially a Venusian world that has since been terraformed by the UEE. Its proximity to the sun makes for an arid environment, and the planet is largely covered by the Red Desert, decidedly its identifying feature from orbit. Yar is dotted with research stations, commercial layover points and abandoned settlements, many of which are coated in the planet's fine red sand (and a significant number of which are being reclaimed entirely by the Red Desert). Although it's not quite a ghost planet, many visitors report being left with a sense of unease among its abandoned facilities.

Why is there development in the first place? Yar underwent an unexpected land grab roughly a century ago after valuable precious minerals were located in a mountain range. These claims petered out quickly, and Human civilization on the planet has been in a clear decline since. The world's largest landing pad is Archibald Station, a scientific outpost that grew into a small town and then shrank back to an outpost as interest in the planet waned. Other landing zones on the planet continue to remain functional, although unmaintained. Enough infrastructure remains on the planet to support passing spacecraft, although the small population needs only essentials from traders.

Market Deals — Yar

BUY:	SILICON (UNREFINED)	+4
SELL:	BASIC FOODSTUFFS	+1
SELL:	WATER	+1

Saisei

Saisei, the third planet, is the reason to visit Centauri. A beautifully terraformed world, Saisei has been planned and cultivated for Human habitation since the initial survey. Saisei is one of the only worlds in explored space where the Governor's Council has imposed a population cap, limiting the number of inhabitants to preserve the environment. Despite their similarly limited populations, Saisei stands in sharp contrast to Yar as a jewel of Human development.

Centauri was first surveyed in 2365 and bids for Centauri IV went on the market almost immediately. The winning group, ADJUST Colonial, consisted largely of Earthen Japanese expatriates who carried over design foundations and other cultural memes from their homeland to the landfall location at Fujin City. Saisei's own culture has

TRAVEL WARNING Visitors to Saisei should be aware that on-planet accommodations are extremely expensive, food and lodging on the planet selling for roughly 300% of the galactic standard. Deep pockets are highly recommended.
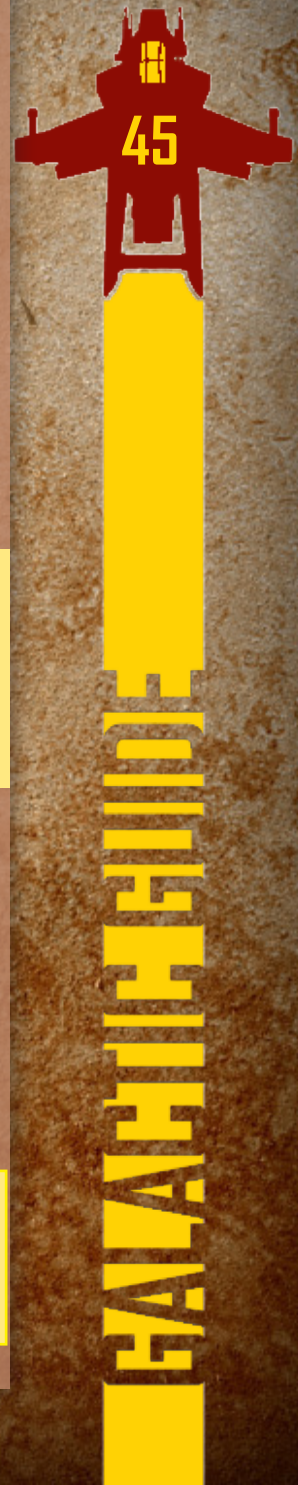
veered in unique directions since this time, influenced by earthly tradition but having become something completely unique. In addition to natural beauty, organic construction and a limited population, Centauri is also known as the headquarters of MISC, the ship concern responsible for much of the UEE's heavy vehicle traffic.

Fujin City is the landing point for most visitors to Saisei. It boasts a fully automated high volume landing zone, Saisei Landing Consortium. Personal hangars here are few and far between, with real estate everywhere on the world going for high UEC values. The city features all the comforts of home, from an Astro-Armada ship dealer to an Advocacy Field office. Downtown Fujin is home to the MISC corporate showroom, where visitors can see the latest Freelancer, Starfarer and bulk transport hulls on display. At the heart of the city is Nessa Park, a beautifully cultivated park designed as an oasis for city workers involved in high tech industries all day.

The central MISC factory is located in the city's outer environs, a carefully crafted automated setup that has

Market Deals — Saisei

BUY:	LUXURY TECH	+2
BUY:	DRIVE COMPONENTS	+2
BUY:	ELECTRONICS	+2
SELL:	LUXURY FOOD	+1

been duplicated on many other worlds. The majority of MISC Starfarers are currently constructed in this facility and then shipped off-world on massive enclosed ship transports (though the fully modular factory can change ship output types overnight). A great deal of other heavy industry takes place on Saisei, but always planned in an environmentally respectful manner. The result is a massive export of ship components, luxury items and other heavy industry that would seem to be completely at odds with Saisei's well-deserved reputation as the cleanest planet in the known galaxy. The message to other Human worlds is clear: planning pays off!

Outer Planets

Centauri IV is a rocky world with one interesting feature: it completely lacks a molten core. As a coreless world, the planet never developed an electromagnetic field and was never able to retain a serious atmosphere (archaeological studies have revealed that it had a limited atmosphere for some time, but that solar wind impacts ultimately fully eliminated it roughly three thousand years ago). Due to its proximity to the system's asteroid belt, Centauri IV has been heavily impacted by asteroidal strikes. The world is considered a potential candidate for terraforming, albeit a very poor one: the need for special technology and resources to construct a core would be an incredibly expensive and technically difficult proposition.

Beyond Centauri IV lies a dense asteroid belt, the only one in the system. Although the Centauri Belt contains enough mass to form a planet, for whatever reason it has never come together. The region is rich in standard heavy metals, and pop-up mining bases frequently appear to support Saisei's heavy industry. The system's outermost planet, **Centauri V**, is a massive Super Jupiter, a red and yellow gas giant several times the size of those normally encountered. The world's atmosphere makes an excellent stop-over for long-haul transports seeking fuel, but it has not been otherwise developed.

The Void Rats

by Doug Niles

PART Four

Having commandeered the cutter Plumetail *and her reluctant captain, Sharona Sirene, the surviving Void Rats have driven off the enemy fighter squadron that menaced their small carrier,* Africanus, *but they were frustrated by the escape of the enemy's lead fighter, a small but powerful ship of unprecedented lethality they call the Silver Spider . . .*

Plumetail *came to rest in the reserve hangar of* Africanus's vast hold. Located in the stern, the compartment was usu-ally tasked with loading cargo and storing the ship's shuttle. That shuttle was now a smoldering hulk on the hangar deck of the nearby commerce station in the Centauri system. Though the battered old carrier had taken hits in the recent fracas, the hatch on her stern surface — a mechanical door, as opposed to the see-through force-field airlocks on the more sophisticated orbital station — was still intact, and before Lieutenant Commander Naya Antoinette popped the cutter's hatches she was able to confirm that the pressure between the two vessels had equalized.

That didn't mean that the air within *Africanus* was pleasant to breathe, however — a fact Antoinette realized as soon as she stepped down *Plumetail*'s ramp. The lingering stink of battle filled the compartments and companionways of the old battle cruiser that had been reconfigured as a carrier a half century ago. The skipper tried not to gag as sulfurous smoke, stinging ozone, and even the stench of organic residue clogged her nostrils. She could have stopped to grab a breathing mask, but she was in too much of a hurry to reach the bridge and speak to Captain Marker.

"Stay here — I'll see what's going on," she ordered the other three people who had followed her off the shuttle. Chief Petty Officer MacClean was already looking around the cargo hold, no doubt scouring the area for resources and supplies that would be needed to make repairs. Lieutenant Jackson, his normally handsome face distorted by the swollen mess of his broken nose, and Sharona Sirene, the pirate captain who had broken that nose, glared at each other in hostility as Naya quickly made her way through the central companionway of the ship's long hull.

She found Captain Marker on the bridge, with the great dome of Plexi open to a view of space above and before the ship. Right now that space of the Centauri system was deceptively peaceful; the star itself was out of sight below the hull, and the glowing image of the orbital station was just a spot of light some hundred kilometers away. A few burn marks, a hole and other assorted dents marked the parts of the hull Naya could see, proof of the savage attack *Africanus* had just survived.

At her approach the captain lifted his gray head, which he had been supporting with his hands. His expression of dismay brightened a bit as she came through the hatch.

"Naya! Thank heaven you're alive! After I saw your fighter wing get hit in that first attack —"

"I know," she said, more brusquely than she had intended. Marker had been a colleague of her father's through decades in the UEEN, and usually she welcomed his avuncular affection and appreciated his sincere concern for her well-being — not to mention his skillful and friendly mentoring that had meant so much to the success of her career. Now, however, her squadron was shattered, her career probably a shambles, and she wouldn't give a cup of warm spit for concern of her own well-being.

"How many casualties?" she asked, remembering the smells of blood and roasted flesh that lingered throughout *Africanus*.

"Four dead, a dozen wounded," Marker replied briskly. "Aboard my ship, in any event. We have two of your Hornets in our number one hangar bay, both intact, with the pilots also aboard and unwounded." He left several questions unspoken, and Naya filled the gap.

"Jackson and MacClean came back with me. Your shuttle was destroyed reaching the station, but Mac did a hell of a job bringing it in for a crash landing on the hangar deck. I think all of the passengers made it out — one starman was burned, but Mac pulled him out and saved his life." She paused. "What about the attackers, sir?"

"You messed them up pretty good. Bastards lost at least half, maybe more, of their fighters. Of course, that silver one with all the wings made it out of here, back to that mining ship. Once the little ones were aboard, the big one made for the jump point. I'm afraid it's long gone."

"It's the same son of a bitch who ambushed my squadron in the Nexus system," Antoinette declared bitterly.

Marker nodded and opened his mouth to speak, but his words were forestalled by the swift opening of the bridge hatchway. A young petty officer stood there uncertainly.

"Begging your pardon, sirs," she said to the captain and lieutenant commander. "But we request orders regarding your . . . passenger? Or is she a prisoner?" She directed the question at Naya, and Marker raised a questioning eyebrow.

"She's a —" Naya's anger flared, but she bit back her harsh retort before vocalizing it. She made an effort to remember the flight of *Plumetail* and the vicious dogfight objectively, and then she explained.

"Actually, she pulled our fat out of the fire. That cutter is her ship, and it's a damned capable fighter. Very fast and maneuverable for its size. I commandeered it on the station to get us back to the fight. At first I had her locked up, but Mac released her after we took a few hits. We wouldn't have driven off the Silver Spider without her help."

She remembered something else, a conversation she'd had with the pirate captain at the end of the fight. "She also claims to know why that bastard has it in for my squadron," she admitted.

"Then maybe we'd better have a talk with her," suggested Marker. He seemed to have shaken off his despair, and his firm tone indicated the "suggestion" was more along the lines of an order.

"Yes, sir. Of course." She addressed the petty officer. "Have Lieutenant Jackson escort the pris — er, our guest — up to the bridge."

* * *

"The jump engine is disabled, Chief," a gloomy engineer's mate explained to CPO MacClean. "We won't be leaving this system until we can get some big parts delivered. From a very long ways away."

"And from a previous century, too," Mac growled. He was the senior NCO on *Africanus*, transferring here with the rest of the Void Rats. Though his first priority had concerned the maintenance and battle-worthiness of Antoinette's Hornets, he had taken an interest in the old ship, and had been impressed by the number of effective — and relatively inexpensive — modifications her crew had made to keep the big vessel spaceworthy and reasonably comfortable.

Now he'd learned that the chief engineering officer, a lieutenant commander, lay in the hospital with a serious concussion. His assistant, a second lieutenant, had been reduced to a shivering bundle of nerves by his first exposure to combat and was currently sedated in sick bay, so it would be up to the petty officers and starmen to get the ship back into some semblance of working order.

"How's the atmo through the ship?"asked the chief.

"All sections are intact again," the starman explained. "We had a few leaks to patch, though."

"Get the air scrubbers online, all of them. Even the reserves."

Mac knew the order was redundant. The ship's ventilation systems already strained to filter the air throughout the long hull, while her propulsion was limited to the maneuvering thrusters that would carry her, slowly, around the Centauri system and nowhere else.

"What about the hangar deck?" he asked.

"The hatch took a few hits, but I made that repair a priority. She's airtight again, and the two Hornets there are refitted and replenished, ready for launch."

"Good man," Mac stated, pleased to see that the young mate had his priorities in order. "Now, let's go see about those engines . . . ."

* * *

"My father made his name as a captain in the UEEN," Naya explained for Sirene and Jackson's benefit, since Captain Marker was well acquainted with her family history. The four of them had retired to the privacy of Marker's cabin. "He went after pirates and took part in a few fleet engagements, including some of the larger battles against the Vanduul. His accomplishments were enough to get some headlines, earn some promotions."

"But that wasn't his most important work, was it?" Sirene suggested, with a sly look that, to Jackson, made her thin, dark face and pointy nose resemble a fox's. Even as he admired that look, he was surprised by the content of her words, and turned expectantly to his tall, blonde skipper. Antoinette's usual haughty demeanor — he tended to think of her as an ice-queen — was surprisingly shaken, leaving her looking uncharacteristically troubled. It was the first time the subordinate pilot had seen her anything less than completely self-assured.

"No," Naya acknowledged with a slight shake of her head. "His reputation was really established behind the scenes, in Unit 0811."

Jackson blinked, surprised by that admission. Like all officers in the UEEN,

and many civilians, he had heard rumors about the mysterious wing of the navy that specialized in new technologies and advanced system designs. Very few people were cleared with a "need to know" on Unit 0811; to most the black ops section was simply a matter of speculation and gossip. It was the latter, in fact, that had attracted notoriety to the secretive unit — stories were rife about cost overruns, scandals and extra-legal operations of questionable tactical worth and even shakier moral justification. Every once in awhile a story about the unit would make it to a news broadcast, but those stories tended to quickly disappear. Some few 0811 officers had risen to positions of fame and flag rank; more often, the branch was known for

destroying careers, with many projects ending in courts martial, and even a few whispered cases of people being "disappeared" because of what they knew.

Now, Naya surprised them by talking about the section with unprecedented frankness. "My father was a rear admiral, a department head in Unit 0811, for the last decade of his career. He was working on a unique operating system for small ships, something that allowed the pilot to link his intentions and commands to his ship's drives, shields and weapons with an organic connection. The system had advanced beyond the test stage, far enough that several prototypes were built, and good pilots were being trained to fly them."

"Wait a minute. By 'organic,' you mean the ship's controls had a connection right into a pilot's nervous system?" Jackson asked in surprise. "It tapped into his brain?"

"More or less, yes. I gather it was sort of a wireless plug that could pick up the impulses of a trained pilot's central nervous system, and convert those impulses into commands to the ship. He or she could instantaneously activate screens, weapons and maneuver drives, that sort of thing."

"That would revolutionize space combat!" the young fighter pilot immediately perceived. Every second mattered in a dogfight, and any system that could speed up the transfer of a pilot's intentions to the performance of his ship could be a life saver.

"Well, yes. It would have if it had worked. And to an extent it did — the ships performed amazingly well, during the early trials. But it soon turned out that there was a terrible cost," Naya continued. Now it seemed like she was having to work hard to force out the words. "Some two dozen pilots were trained and . . . prepared to use the technology. You see, there had to be some surgical modifications to the pilot before he or she could connect to the ship."

"Brain surgery, you mean?" Captain Marker asked. His face wore a disturbed frown.

"Yes, neurosurgery to establish the connectors to broadcast the brain's commands. There were some initial successes. But also a high rate of pilot casualties. Most of them seemed to fall sick after one or two flights. I don't think any of them were cleared to return to duty. Then the project was abruptly disbanded."

"Did the pilots die?" Marker followed up.

"I'm not entirely sure. Dad talked about it a little, when he knew he was near the end. He told me that the pilots, they . . . well, they lost a great deal of their own intellect, very quickly. In some cases, most of them, it proved fatal. Even before death the pilot was essentially disabled by the stress on the brain. And I mean disabled to the point where they couldn't feed themselves, didn't recognize their own parents, spouses, children. Like that," she concluded forlornly. Her father's despair had seemed a cruel burden for him to bear at the end of his life. Now she wondered if that despair had reached beyond his grave, a curse on the next generation of Antoinettes.

"I'm pretty sure one of those test pilots is still alive," Sirene declared bluntly, as if reading her thoughts. The comment startled the three navy officers who had virtually forgotten her presence. "And I had enough of the bastard's paw prints on me to assure you he is not in any way disabled. At least, not physically."

"You know this how?" challenged Naya, visibly shaken by the allegation.

"I've met him. His name is Zather Dane, and he's now a crime lord. Powerful, but not terribly well-known — he's very secretive. He operates out of a base in the Nul system. That fighter — the one you call the Silver Spider — is his ship. I first saw it a few years back, when Dane had me in for a . . . visit."

"And you think he's using this brain connection technology in it?" Jackson asked pointedly.

"I assume so," the pirate captain replied with a shrug. "He was trying to recruit me, and gave me a tour of his base. I got a look at the ship, but the cockpit was off limits. He was a weird-looking guy: half his skull was a chrome plate with wires and connectors built right in."

"And that's what lets him control his ship?" queried the pilot.

"Not just the ship. That bastard could move . . . *things* . . . just by waving his hands. I saw him dump a personal hovercraft from across a room. A fellow was flying in to make a report, and Dane thought he wasn't showing enough humility or something. So he waved his hand, and the hoverbike flipped upside down. The guy is a complete and unapologetic bully. And he's king of his own little hill, so no one I saw dared to stand up to him."

"Okay, wait a minute," Jackson interrupted, trying to comprehend her descriptions. "First, what kind of things could he move?"

Sharona shrugged. "Machines, I guess. He had a motorized chair he liked to ride in. He could wave his hand and bring it to him from across the room. He also had a hovercar that he drove all over the place — never once touched the controls when I was with him. It's not too far of a jump from there to imagining he could mentally control his fighter."

"And what about people? You said he controlled them. Did he hypnotize them or something?" Antoinette pressed.

"I got more of a hint about that. His minions, servants, soldiers, whatever, they have to wear collars. They were silver rings — the ones he had on his female attendants were studded with diamonds and other precious stones. I think that's how he influences their actions. At least, everyone

he jerked around — and he liked doing it, I could tell — was wearing one of those. He tried to slip one on me, which is when I decided it was time to give him the slip."

"How did you get away?" Jackson wondered.

"That joker couldn't get up off the floor fast enough to chase me," she replied smugly. "And from the amount of blood, I think he was dealing with a broken nose." She chuckled grimly and Jackson winced, involuntarily touching a hand to his own still-sore face.

"What kind of visit did you make? Why didn't you report this?" snapped Naya, drawing a look of scorn from Sirene.

"Report to whom? And what should I have told them? You know as well as I do that I'd have been in a world of trouble, just for visiting that base." Her expression grew dark, even bitter. "Truth is, he was trying to recruit me to pilot for him, and he offered me more money than I've ever seen before. But he moves slaves through there. Hundreds of them, all sentient races. He's made a cargo-load of money doing that, and even worse, he seems to like it.

"But I don't," Sirene continued vehemently. "Once I learned what was going on with him, I pretended to consider his pitch, but I got out of there as soon as I could. I don't think he was happy that I got away."

"You weren't tempted by the money?" Naya probed.

"I *hate* slavers," Sirene snapped angrily, glaring around the compartment, challenging anyone to argue. "And he's a real bad one. At least half crazy, it seemed to me. He has all his, I don't know, minions or whatever you want to call them, wearing these silver collars. He wanted them to call him Caesar, if you can believe that! I admit, I didn't connect him to the UEEN, at least not at the time. I told you, we didn't part on exactly friendly terms. I just barely made it back to *Plumetail*, and I wasted no time blasting out of there."

"If he's got such a comfortable and profitable empire to run, why would this Dane guy rock his boat by going after the Void Rats?" Jackson wondered aloud. "I mean, with a stronghold and unlimited funds—"

"I think he wants revenge," Sirene said, turning again to Naya. "Against your father. And since he's dead, you presented the next best target."

"And what makes you think he was one of my father's test pilots?" Naya asked again, but she was afraid she already knew the answer.

"I didn't make the connection till I heard your story, but now I'm sure of it. He's ex-military, to the core. But he also referred to an old unit. His fellow pilots, he referred to them . . . they all died. Because of some admiral who Dane claims had his hand out, taking bribes to overlook safety considerations. He was agitated when he talked about it. Of course, he got agitated a lot; he's not the most stable fellow I've ever been acquainted with. He was a braggart, too. Told me he had busted out of a hospital by manipulating the machines the doctors were using to control him."

"It might be that the procedure, the neurosurgery, encountered some kind of mutation within him, that allowed him not only to survive, but to apply his mental powers to other kinds of machines, as well," Captain Marker suggested.

"Makes as much sense as anything," Sirene admitted. "Like I said, he had that kind of a remote control ability with his personal transport. He was an arrogant son of a bitch, too. I'm sure his vanity is relishing the notoriety he can gain by taking on a whole squadron of Hornets with just one ship."

"More to the point," Jackson interjected. "Do you know where this scum-bucket can be found?"

"I've got a general idea," Sirene acknowledged. "At least, I can narrow it down to the fifth planet in the Nul system. It's a waste world, uninhabited by anyone except the rankest kind of criminal, but Dane has created one hell of an installation there to be his headquarters. He even has a personal arena — and it's huge — where he parades his slaves before potential customers. You probably know that Nul is one of the busiest illicit trading hubs in the known universe. They hold a very secret slave market there on an irregular basis. By invitation only," she added dryly. "And Zather Dane is king of the hill when it comes to that circus."

"You were invited?" Naya challenged.

Sharona shook her head. "Not to *that* party. But I'm sure it would have come to that if I'd joined his team."

"Sir," Antoinette said, turning to Captain Marker. "I request permission to take my squadron to the Nul system and hunt down this Zather Dane in his lair."

"Aren't you forgetting something?" Sirene asked, a hint of nastiness in her voice.

Antoinette looked irritated for a moment, then stricken as the reality hit. Jackson suspected she was remembering that the Void Rats were down to two intact Hornets — hardly enough for an interstellar strike force, especially when taking those two fighters would leave *Africanus* essentially defenseless. The squadron commander looked almost defeated, though she clenched her jaw in defiance and glared at the pirate captain.

"I have an idea," Jackson proposed, addressing Sirene. "You sound like you have a bone to pick with this Zather Dane. Why don't we go in your ship? You've shown us that *Plumetail* can really hold her own in a fight. And from your own words, it sounds like this may well prove to be a profitable excursion."

"An *excursion*?" Sirene's tone was contemptuous. "Oh, you mean like a vacation, or a sight-seeing trip?"

"No. He means a chance to get revenge. For you, for me, for all of us. And to remove one useless rat-bastard from the universe, and make sure that no one else gets his hands on that screwed-up technology." Antoinette spoke harshly and then faced the pirate captain directly.

"At least, I want revenge, for my Void Rats, for my father, for the navy. If you come along, I'd suggest you be authorized to carry away as much of that treasure hoard as you think you could carry."

Surprisingly enough, Sharona Sirene appeared to be seriously considering the lieutenant commander's proposal.

* * *

"Everyone strapped in for the jump?" Antoinette asked, before casting a sideways glance at Sirene.

The pirate captain smiled slightly, then shrugged. "You can see that I am," she replied.

The two women occupied the flight deck of *Plumetail*, while Jackson sat above in the dorsal turret and MacClean stretched out in the tail, ready to use the newly-repaired particle cannon. The chief had personally supervised the restoration of the powerful gun, and in a matter of a few hours had confirmed that it was ready for action. Less than six hours after bringing the cutter aboard *Africanus*, the crew of four had taken their seats and gotten under way. Since they didn't want to jump directly from Centauri to Nul, suspecting they might be anticipated, they had taken the extra step to make the jump from the Croshaw system, and were now poised for their final transit.

The two men acknowledged their readiness over the comm, but Naya hesitated. "You take the helm for the jump," she finally said, shaking off her reluctance.

"Don't mind if I do," Sirene answered.

Her supple, thin fingers stretched across the controls as she applied power to the jump drive. The ship shuddered slightly as the computer program took over, steering them through the maze of interspace. Finally, with barely a shiver, they emerged from the shimmering aura of the jump point into the Nul system.

"Bogey — dead ahead!" barked Jackson, even as the alarms blinked and sounded through the ship. A long, metallic ship lay sideways across their path. The vessel was huge, battered-looking, and terribly familiar.

"It's that carrier!" snapped Antoinette, recognizing the huge ship that had originally appeared to be an ore hauler — until its hatches burst open to disgorge a whole squadron of lethal fighters, led by the Silver Spider. "How the hell did they know we'd be coming in from Croshaw?"

"This is the same way I came last time I visited; bastard must have anticipated me. So much for the element of surprise," Sirene muttered as she instinctively pushed *Plumetail* into an emergency dive. The maneuver carried the cutter beneath the ventral surface of the big carrier, even before the enemy ship had opened up with a single shot.

"Or it may have just been the luck of the draw — I bet all the JPs are guarded, and it might simply be her turn for sentry duty. Either way," Mac observed laconically, "I think she fell asleep at the gate."

Finally a laser battery blinked from the carrier's bow, lashing a few hastily-aimed bolts of energy past *Plumetail*'s stern.

"Permission to return fire —" Jackson's voice came over the comm, but Naya was already barking her orders.

"Give that bastard everything you can! D-Jack, try to take out that laser battery, any other guns you can see as well. Mac, shoot for the engines."

Immediately the two men opened up. The twin Mark V lasers in the turret swiveled, locking onto the bow gun of the carrier. Jackson fired a blast that stitched a line of fire through the faux-miner's hull, neatly excising the laser battery that had opened the festivities.

Meanwhile MacClean lined up his particle cannon on the control surface of the enemy's starboard engine nacelle. The big weapon packed a powerful punch; the lack of a full turret limited Mac's tracking ability and field of fire, but the Sirene had the ship perfectly aligned for a killing sting out the stern. His first bolt was negated by the suddenly activated screen, but the second shot tore through the barrier and ignited a cascade of sparks on the engine surface. He grunted in appreciation as he watched large pieces of metal break from the drive mechanism and spin away into space.

"Any small ships on the scanner?" Sirene snapped, flipping switches and then pulling *Plumetail* into a hard, banking turn. She took care to keep the particle cannon aligned on Mac's target.

"Nothing in the vicinity. I'll expand the view," Naya replied. In the stress of battle, she didn't have time to consider the irony of taking orders from this ragged pirate captain. Besides, there was a certain competency in Sharona Sirene that the tightly-wound naval officer found herself respecting, almost in spite of herself.

"I've gone system-wide," she continued, leaning in and frowning. "There's a lot of traffic out there."

The star called Nul was a pulsating yellow supergiant, currently in the midst of an uptick in size and brilliance — it was too bright to look at directly, even at this distance and through the shaded Plexi of the cockpit screens. Quickly Antoinette located and marked the images of the system's planets, all but one apparently lifeless and uninhabited. Because of the pulsating star, Nul had long been abandoned

by legal Human interests, and though it was a known haven for smugglers and slavers, such clandestine activities would not be revealed in the harsh glow of a system-wide scan.

"Most of the traffic is in stable orbits," Antoinette noted, still examining the scanner. "But we've got someone making speed, coming our way from the fifth planet. Coming *fast*."

"That will be your Spider, I'm thinking," Sirene replied with remarkable calm. "We'd best get ourselves out of the line of fire."

"I took out a belly turret!" whooped Jackson, his voice shrill in the comm. "And Mac has that engine dribbling parts like a broken gearbanger!"

"Cease fire!" Sirene barked. "We're going dark."

She pulsed the engines once, a full blast of power that accelerated the cutter away from the jump point. Naya checked the rear scans. She could make out the big guard ship; her starboard engine glowed dangerously and the spot where Jackson had taken out the belly turret spewed smoke and debris into the vacuum of space. Another glance at the wide-scan showed the hot-spot of the other ship, the vessel Sirene had confidently labeled as the Spider, still closing fast.

But now *Plumetail* had soared far from the jump point, on an arcing course that would take them very near Nul's first, heat-scorched planet, a heavy-metal roundel orbiting terribly close to the fully expanded volume of the pulsating star. Radiation and cosmic particles bombarded them as they swept in to Nul I, but Sirene didn't activate her maneuver thrusters until they were almost even with the steaming, virtually molten rock. "If he followed us on his own scanner," she explained grimly, "he might think we're disabled, crashing into the star."

Only then, when the interference was thick enough to cancel out almost any search program, did she curl in and slow down, barely a thousand klicks above the sunward side of the world. The scorched ball of rock lay between them and the rest of the system.

Naya glanced nervously at the temp regulators, seeing that the outer skin of the cutter was already growing dangerously hot. "What now?" she finally asked, startled by the dryness of her own mouth.

"Now we wait," Sharona Sirene replied. "And hope we don't burn to a crisp before that bastard gives up the hunt."

To be continued . . .

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