JUMP POINT

A ROBERTS SPACE INDUSTRIES PUBLICATION   ISSUE 05.03

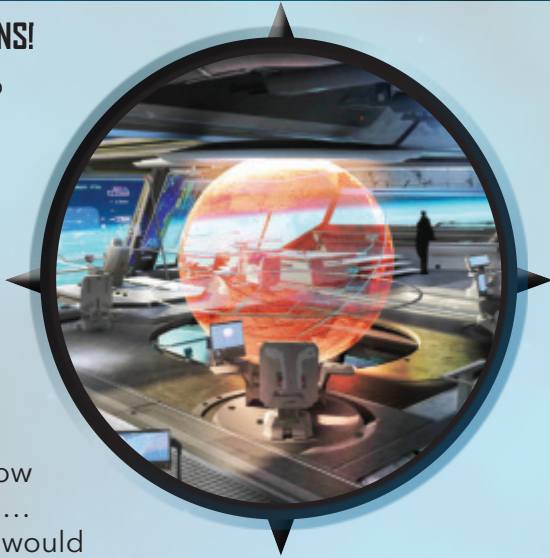## IN THIS ISSUE

GREETINGS, CITIZENS!

I don't get out to many of the *SC* events, but I was able to make the Bar Citizen in midtown Austin last month, at the appropriately named *The Flying Saucer*. (Flying saucers … now that's a thought. … I wonder what it would take to get those into the game.) Thank you to the folks who organized it, and thanks for the fancy etched Reliant glass – a good time was had by all. :)

And thanks also to all the various photographers who have lent their talents and equipment to help **JP** document and illustrate nearly every issue so far. This issue, that includes **Kristian Kullmann** in Frankfurt (page 36) and **Sian Crewe** in the UK office (page 37) – thank you both very much!

This month's title is "Storm Season," and that is reflected in most of the articles. The Hurricane, of course, creates its own tempest wherever it goes, while Casse Aerospace, our Portfolio feature, and Charon, the Galactic Guide entry, have been equally storm-tossed. Meanwhile, there's all sorts of stormy weather in the tale of "Drifters," at the end of the issue. No, I didn't find a storm hook for the AI team who went Behind the Scenes with us this month – they are steadily bringing all the NPC behaviors and activities to realistic life.

I sometimes ask pretty naïve questions in the Behind the Scenes interviews, to get people started talking, but generally, I really do have some idea what we're talking about. This month, I asked a few naïve questions because I had only a slight grasp on what we were discussing when we began. That brings us to our term of the issue: **Subsumption**, which means *an act of subsuming*. Got that?

Going further (because you know I will always take that extra step for my devoted readers), "to subsume" means *to consider or include (an idea, term, proposition, etc.) as part of a more comprehensive one*, all according to Dictionary.com. As far as I can tell, a primary part of the Subsumption process in AI is grouping similar activities so that you can assign the same behavior to a group, rather than having to program each individual separately. Of course, I could be very much wrong, in which case I'm sure several of you will make sure to straighten me out before next issue.

Meanwhile, as Alexis announced just a few days ago, there will be a printed **Jump Point** *Volume 3*. I know when I'm supposed to have my part done on it, but I'm not sure how long it'll take to get it scheduled, printed and shipped, which means I don't know how soon we'll actually start taking orders. From recent direct experience, I know that each one of those steps can take longer than you'd expect, but (to borrow a phrase from a well-known editor), it will all happen soonish!

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

David
David.Ladyman@cloudimperiumgames.com

Anvil A4A Hurricane

Design Brief

AIMS

- Heavy hitting support role – very vulnerable alone, very dangerous in groups.

AESTHETIC

- A taller, thinner Hornet – the Hurricane is a bullet delivery service
- Barely armored

ESTIMATED STATISTICS

Length ~ 22 Meters

Width ~14.5 Meters

Height ~ 6 Meters (In Flight)

~ 7.5 Meters (Landed)

Mass ~15,500kg (no cargo)

No room for any cargo.

Point the business end where you want more broken things. More durable than you'd expect for a glass cannon – it can take a hit, but it's not quite nimble enough to do anything about it, so bring a friend or find yourself easily cornered.

Crew 1-2 (Pilot, Manned Turret)

Engines 1 x Medium (the engine is actually pretty powerful for its size)

Thrusters 8 x Flex; 2 x Fixed (2 main, 8 maneuvering)

Power Plant 1 x Small (enough power to fly and little else. This ship will have difficulty running laser weapons.)

Pilot view

Weapon Hardpoints

1 x S7 Manned Turrets (comes with quad link S3 ballistic repeaters)

2 x S4 Fixed Gun (pilot weapons, comes with S3 ballistic cannon)

4 x S2 Missiles (on two racks)

Shield 2 x Small (Front-Back shield emitter. The Hurricane comes with a pretty weak complement of shield options.)

Armour Small (probably the nicest thing you can say about the Hurricane armor is that it does, in fact, exist)

METRICS & TEMPLATES

Animation Templates

- Main seat enter/exit
- Standard turret enter/exit

Components

- Small Power Plant (0.5m x 0.75m x 0.5m)
- Small Shield Generator x2 (0.25m x 0.75m x 0.25m)
- Small Avionics (0.5m x 0.75m x 0.25m)
- Medium Coolers (1.0m x 1.5m x 0.5m)
- Small Jump Drive (0.5m x 0.75m x 0.5m)
- Small Life Support (0.5m x 0.5m x 0.25m)
- Small Radar (0.5m x 0.5m x 0.5m)
- Medium Fuel Tanks (1.0m x 2.0m x 1.0m)
- Small Battery (0.5m x 1.0m x 0.5m)
- Medium Ammo x2 (1m x 2m x 1m)

Gunner view
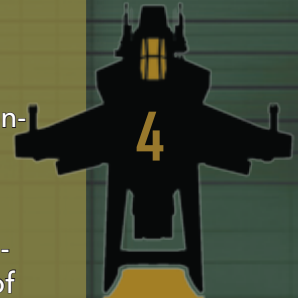
*Justin Wentz, Concept Artist, was given the task of developing the Hurricane, with **Paul Jones, Art Director**.*

Justin W: So I ended up throwing out the sketches I did on Monday and just started over. I went back and created a kit from Hornet and Gladiator parts and bashed a bunch of mockups together, then scribbled over them in Photoshop.

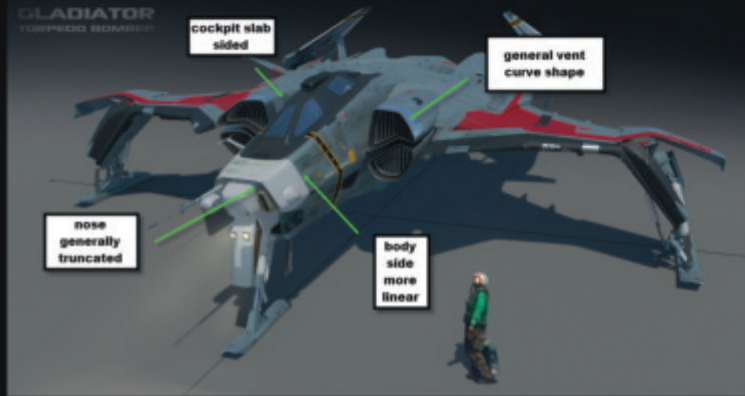I think I like 1 and 2 the most in this set.

Two vents, generally flowing through to the rear
Snub nose
Circular section
Two engines for this ship preferred

V3
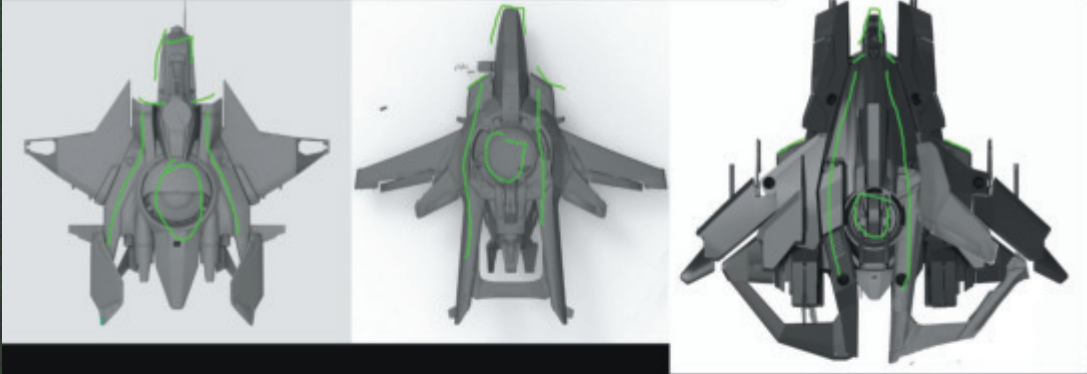
Calix crazyiness but like this section and would like to see an option with this negative space - also harks back to the Gladiator dipped wing tips shape

General notes

GLADIATOR
TORPEDO BOMBER

cockpit slab sided

general vent curve shape

nose generally truncated

body side more linear

Paul J: Hey, Justin, interesting start! Think we are still a bit off base, so I've given some more direction to help it along — excuse the scrappy notes, it's been a busy day!

Avoid large vents as a general note, and keep a more angular style like the Hornet v1 and Gladi-ator. This is an older ship.

Justin W: It would be helpful to see what you think works and doesn't work on the mockups I sent, so I can revise my per-spective. It seems like some of my mockups conform with your instructions. Just need some addi-tional help to look at them the way you're looking at them.

Paul J: They do, but they are all a little whacky looking — go a little more conventional.

6

Justin W: Here are a few more versions. These are still kit bashes, so the details are pretty messy – if the main idea is on track, I will go back in and redesign/integrate everything.

Paul J: Yeah, cool, seems more in line with Anvil.

Nathan would like to see some options with the dropped wing tips, if you can. You could also create some variations if you mirror that setup to create some negative space – a bit like no. 1's, but not. :D

With the current batch, some interesting ideas, some thoughts for you:

1. Cuts a good shape from the rear, though the engines / central area needs balancing – 4 is similar and achieves a better weighting to me.

2. Interesting, though having four fins will make for a fairly large area that you have to rotate your guns over. Engines feel too stuck out in their current form.

3. Large fins that are parallel to the body; it's a cool idea, but wonder if they could work better in other areas.

4. Same.

I'd also be interested in seeing some ideas where we have more of the separation between body, vent and wings and some negative space (akin to Gladiator front).
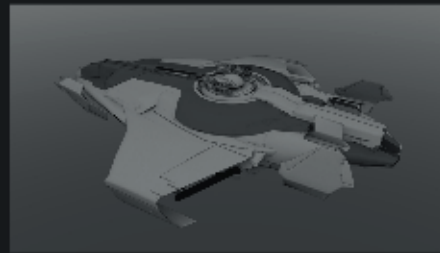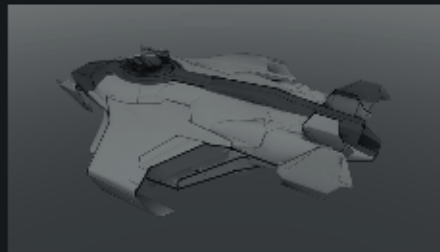
Justin W: Here's the latest.

Nathan Dearsley, Vehicle Art Director: I'm personally really liking version 2 of these atm. This feels nicely balanced, not too front heavy, if you get me?

We could potentially have the front mounted side fins (either side of cockpit) slide back when grounded to allow space for entry / exit using an existing template. Be intrigued to see those downswept sections of the wing take more along the lines of the Gladiator. This way we could have the landing skids fold out from here and not worry about integrating them into the main body, although I do like the secondary sweep under the wing too.

What are your thoughts with the turret on these – remote or a different entry point?

Paul J: Yeah, looking good, Justin – at this point I'm going to get CR feedback so we don't go too far down the line.

It would be 2 or 3 for me, but let's see what CR wants.

Justin W: Ok cool, thanks for the feedback.

I think the front mounted fins sliding back would look cool, though I don't think it would be necessary for entry if we use the Gladiator template (entry from underneath).

And the turret entry could also use the Gladiator template – which would be separate entry from underneath as well.

Paul J: Anvil Hurricane – 2-person fighter with manned turret. CR, any preference?

Chris Roberts: 3 by far. Would like to see a turntable – canard wings seem a bit busy.

Justin W: Here are a turntable *[screenshots on this page]* and some renders *[next page]*.

Paul J: This version has adjusted turret guns that we'll need to look at next for viable options.
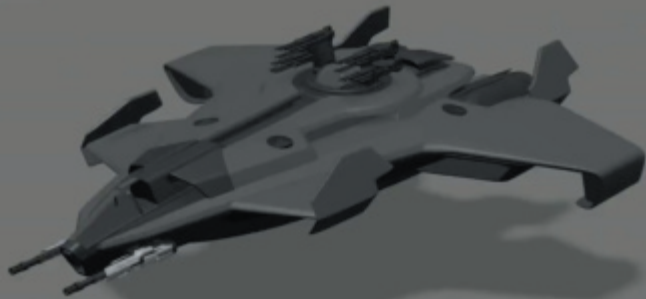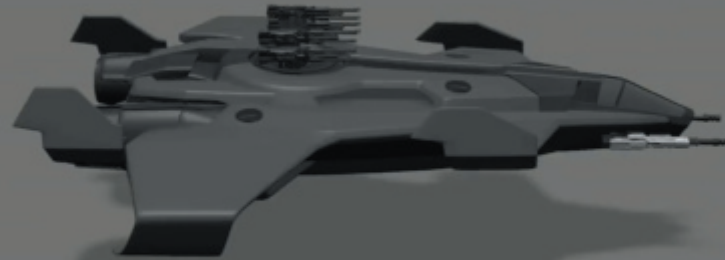
ANVIL - HURRICANE - CONCEPT MOCKUP

Justin W: Had a half day today, so just worked this up before heading out.

Paul J: Looks cool – we'll see what CR says, too.

Paul J: Meanwhile, I think we'll need to look at some turret options to get it sitting better.

We could double stack the guns; that would help too.

Also it looks a pretty beefy ship – it's meant to be a glass hammer, so we should look to shed some weight.

Front profile
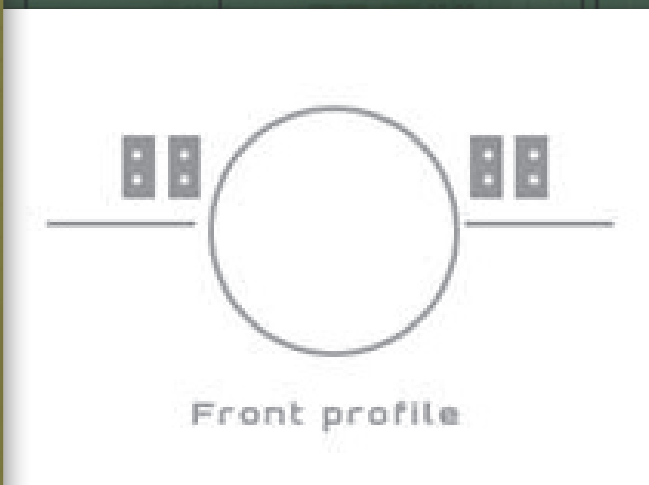
Paul J: Chris, what sort of lines should I be pushing Justin towards for the Hurricane? By that I mean, it's meant to be an old fighter that's been reintroduced – so is it the sharper lines of the old Hornet/Gladiator or the softer lines of the new Hornet/F8?

…

Paul J: Justin, he's loving the vibe! Definitely prefer the side-by-side guns on the turret.

Paul J: The decision is that we'd still like to see some options for a bit more shape definition (a la Gladiator). I know this is a heavy fighter, but we still want to sell an edge of vulnerability/delicateness in places.

Paul J: Some ideas to get the ball rolling.

Paul J: Further on, would like to see options for these areas, something with a bit more shape.

Also, what dimensions are the craft? And can you include a person for scale reference too in the next shots?
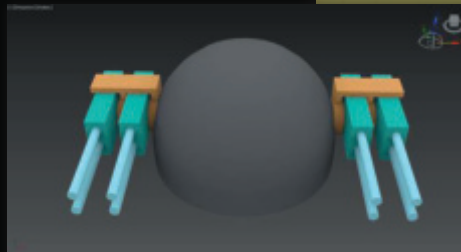
Justin W: Here's the latest.

Currently, the guns and chair rotate around different axes – this allows us to place the guns in a cool looking position from first-person view. Is this doable from a technical/game design point of view? (I think it looks pretty cool.)

Ship dimensions are about 21m long and 18m wide.

Paul J: John [Crewe], we're hoping to do this for the turret – any reason it won't work? Just need a sanity check …

Paul J: Looks cool. I've upload it for feed-back.

John said we can't actually do the chair rotate back yet, but they have done something similar in the Retaliator where the arms and screens move up with the character's arms and the head just looks up (someone correct me if I'm wrong).

The guns would be better placed like this *[see diagram below]* – each gun will have a mount so it daisy chains and can take into account the max dimensions of a weapon (they don't all fill the max bounds).

Also, AFAIK, we don't have a repeating gun with 4 barrels, I'd go with 2.

Unless CR has some counter-advice, I'd go ahead and keep working it up.

(Uploaded for review: Anvil Hurricane update, reduced a bit of bulk, turret size increased, vents worked on, some styling updates.)

Justin W: The guns used on the turret are actually the S2 Ballistic Repeaters pulled straight from the library. Is it an issue that they have four barrels?

I'll definitely implement a gun mount idea like that. I was thinking of something similar but hadn't gotten around to it yet.

John Crewe, Lead Technical Designer: What's the asset path? This is the only S2 Ballistic Repeater we have ingame currently:

Justin W: Oh, ok. I see that I should use the first version with three barrels, instead.

Paul J: That mount is pretty much what we are intending to implement, so anything you make should replicate that.

For the gun barrels, we should use what's currently available. Eventually we'll have more.

Justin W: I've made progress on various interior parts and the bottom, but don't quite have illustrations of those ready for feedback.

Here's an update of the top of the ship.
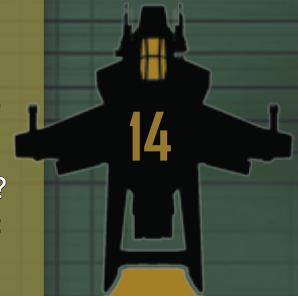
Paul J: Looking cool, Justin. Can we shed a bit more weight though? The marked areas feel like places that could be a tighter radius and the wings could be a bit thinner. It feels a bit inflated to me at the moment.

I like the paint job, it's shaping up quick!

Justin W: Steve, Paul Jones and I are wondering if a slight customization is possible on the Gladiator entry animation. Currently, the guy sits in the pilot chair, then the chair slides vertically on rails up into the cockpit. We're specifically wondering if the length of the vertical slide portion of the animation is possible to customize. This would allow us to vary the height of the cockpit for other ships using this same entry. Thanks.

Steve Bender, Animation Director: As the Gladiator seat could function like a turret in item 2.0, the same could be done here. ATM, it requires custom assets, but according to Paul R and Mark A, they expect this functionality to be in for 3.0.

So … yes, assuming such ships don't need to go out before 3.0.

Jay Brushwood, Lead Animator: If this ship is a few months out (specifically, after 3.0.0) then we should be able to accommodate that.

Paul J: Sounds good, thanks, Jay/Steve!

WIP

Justin W: The view from underneath is very WIP.

Paul J: Some feedback for you. :)

Yes, I'm still banging this drum. Can you try an option like this – it communicates a little more delicacy (fragility) and also reduces the overall wedge shape.

WIP

1. Like this

2. Feeling too bloated and soft (WIP, I know :))

3. Having a hard time reading this area and seeing how it works/functions – are the missiles located here?

Justin W: Ok, got it. I see what you were reacting to now.

Justin W: I wanted to try something a little different with the back *[this page and next page]*.

I actually like both the top and back view shapes more with this variation.
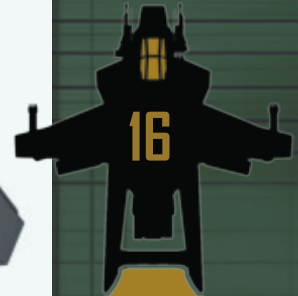
Justin W: Here are current exterior concepts.
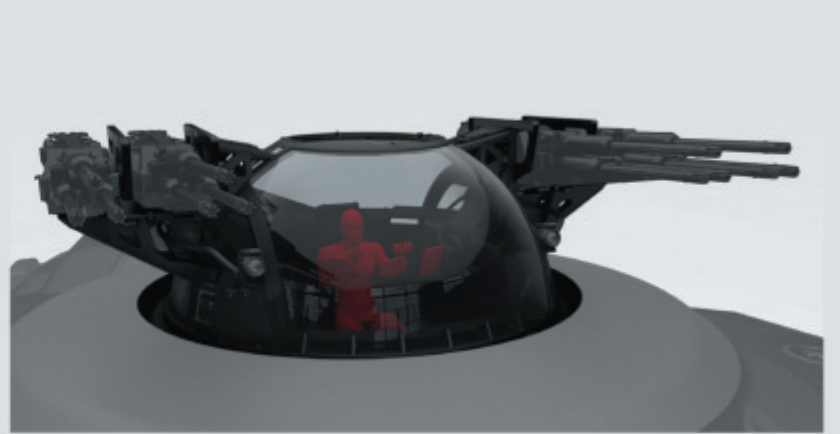
Current concept- I'm really not liking this. design has gotten jumbled by adding and changing elements gradually.

I do like the back view though

original concept. I think there are ways in which this is stronger than the current design.

New variation I just tried. I think this makes the design a little more cohesive but it's super boring.
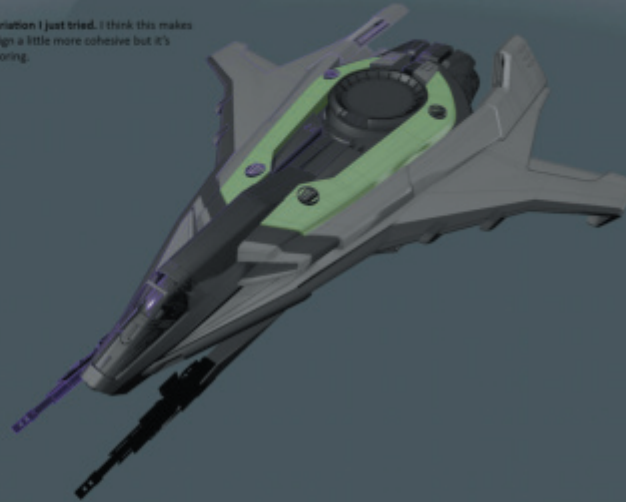
Scribble paintover idea. kinda cool. Could be fixed up. too reminiscent of Gladius though?

Justin W: So I've been really unhappy lately with where my current design is. I've been scrambling to try to fix it, but I'm having trouble. Everything I've done is either messy or just boring/super conventional. I've attached a few versions I've been looking at with comments. Would love to talk about this and get on the right track.

A

B

C

original concept. I think there are ways in which this is stronger than the current design.
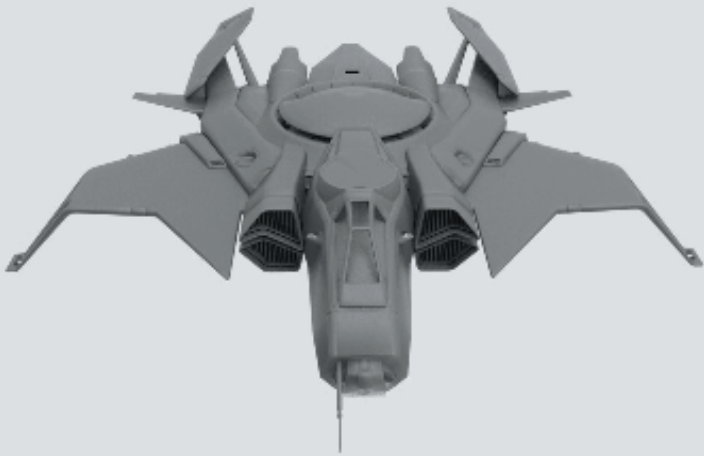
original concept. I think there are ways in which this is stronger than the current design.

Paul J: Tomorrow is my last day here for about three weeks. In my absence, Nate has kindly agreed to continue with Art Direction.

A. All the designs have merit, but we really need to start locking things down. Talking to Nate, this direction could certainly work, but we still have to solve the thickness of areas that really should be thinner.

B. The Gladiator wings (in comparison) look like they could cut you, and I think your version needs the slimmer wings to reduce the inflated feeling.

The turret is quite overpowering at the moment on the latest versions; can you look at some options:

1. Reduce scale as much as possible.

2. Look at a variety of turret shapes. There is no reason it has to be a bubble if the glass rotates with the chair …

C. Also, some of your shapes could have a stronger cross section. I've made a comparison to the new Hornet. On this version I also added back in the front vertical wing tips.

At this point I'll let Nate take over.

Justin W: Ok, thanks. I'll keep moving forward. I know I'm ditching a good bit of work I've been doing, so I'll most likely be making that up over the next few days to make sure I stay on schedule. I'm hoping to have something I'm happier with very soon that I can bounce off Nate.

Justin W: Here's my recent re-work of the basic design.

VERY WIP

WORKINPROGRESS

Justin W: Hope to catch up Monday.
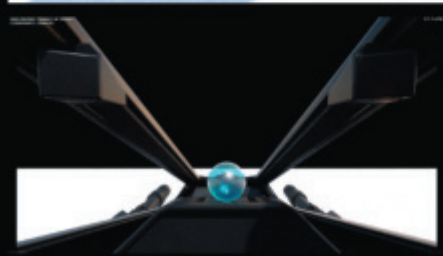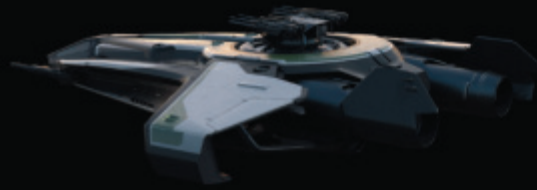
Justin W: Here's the latest for CR's review. If my 3D gets signed off, I'll actually finish the ship in Photoshop.

Justin W: Here's an additional concept I was just working on this morning. From this point, I'm hoping to choose angles to finish up in Photoshop. The one attached is just meant to show nose detail.

Justin W: Here's a quick viewport shot of ship item placement. They can all fit easily around the turret entrance area for bottom accessibility. Fuel tank access will be at the back, in the large compartment between the thrusters.

Paul J: Update of the Anvil Hurricane for various peeps.

This ship is using anims from the Anvil Gladiator. The only difference (which Steve thought would be ok) is the height difference the seat's travel (Justin cleared this with Steve at an early point, as the travel distance is greater.)

The UI layout is taken from the Gladiator and we'll be following that turret layout too.

We are moving on to final definition of this ship, so if anyone has any issues, now is the time to chime in.

Justin W: We decided quite a while ago that we'd try to fit landing skids out on the wing tips in order to match the Gladiator. I'm now thinking that it'd make more sense to move the side landing gear into the main body. We'd just have three skids in this configuration: one front and two back. There's readily available space for the skids this way and I can thin the bent wing-tips (which I think looks cooler). Overall, this feels more natural to me. (Also, the ship could potentially be landed without the wings should they be destroyed) Let me know what you think.

Paul J: Makes sense to me – Nate?

The only thing would be that at this angle the ship feels a little under-developed. Does it need a bit of belly weight, or is it the landing gear feeling a bit anorexic?

Justin W: This is a general update for visibility.

In the attached image are rough Modo renders of my current 3D (the background is just a quick temporary scene). The ship 3D is representative of what I'd be Photoshopping on top of tweaking for the promo illustrations.

Justin W: There are also a few shots of the ship with the current Hornet landing gear, which may need to be beefed up.

I threw a couple of concepts in there as well.

PROMO MOCKUPS
All images are rough Modo renders with no photoshopping over the ship

Needs BG idea

Justin W: I'm sending these along because they represent some of my ideas for the promo images — pretty straightforward stuff.

All renders are rough with no Photoshopping. However, the backgrounds are hi-res. I'll just need to replace the ship render before finishing.

WORK IN PROGRESS

CASSE AEROSPACE

While Casse Aerospace bears the name of an engineering legend, the company itself has faded from memory for all but the most dedicated ship enthusiasts. Or at least that was the case for over a century until Anvil Aerospace resurrected one of Casse's designs and alongside it, interest in the man himself and the ships he built.

An Edleson Design Institute Hall of Fame inductee in 2902, Leonard Casse has earned a place in the annals of history as one of the top spacecraft visionaries of the Messer Era. While the general populace may wind up considering his creation of the Hurricane fighter the most enduring part of his legacy, his effect on the industry overall is not limited to that one design. Cited by ship design luminaries such as J. Harris Arnold, Silas Koerner and Jules Parliegh as a prime source of inspiration, Casse's influence can be seen in many spacecraft being flown today. From the humble RSI Aurora to the mighty Anvil Hornet, several of the Empire's most popular vehicles can trace their lineage to Casse's unique vision.

Taking Off

Hired fresh out of university, Casse began his career as a junior aerospace engineer for RSI in 2587, securing himself a position on the Starbright transport team. This simple and functional ship, often referred to as the Aurora's spiritual predecessor, had been redesigned for the 2590 model year release and was about to go into full production. Assigned to review the machining specs for the ventral hull piece before the manufacturing run began, Casse noticed that the updated nozzle placement, while adding fuel efficiency, was going to cause potentially dangerous additional stresses to the ship's frame. He promptly reported his findings to the Starbright's lead designer, only to be told that the effect was negligible and that he should trust the more experienced members of the team.

Unsatisfied with that result, Casse took his report directly to the head of the company, CEO Thessaly Vanowen. Impressed with the young engineer, Vanowen ordered a separate independent team to audit the Starbright's testing results. Two weeks later, the project was completely halted for a total rework of the internal struts. The 2590 Starbright would now be released as the 2591, with Casse promoted to a full engineer on the team.

His rise after that was rapid. In 2595 Casse was named lead designer for the 2600 Starbright. RSI saw the new century as the perfect time to relaunch the Starbright and was hoping that Casse would be the ideal candidate to revitalize the aging ship line. He did not disappoint. Rebuilt from the ground up, the 2600 Starbright was praised for its innovative entry system and all-new custom IFCS that integrated flawlessly with the ship's thrusters for unmatched responsiveness. What was previously thought of as "just another transport" became elevated to "a flying experience that everyone should have the pleasure of enjoying." Even today, centuries later, collectors still covet the 2600 Starbright for their personal fleets. Perhaps what makes it so valued though, even beyond its quality, is that it would be the only ship Casse designed for RSI.

A New Way to Fly

As soon as the assembly line began rolling out the ship he had labored on for close to four years, Casse announced at the beginning of 2599 that he would be leaving to start his own company. According to later biographers, Casse described his time at RSI as a constant struggle. From that first instance when his suggestions were passed over due to his junior status, he felt that good design was too often sacrificed in order to placate a hierarchical organization trying to justify its own worth. "As soon as you have a ship manufacturing company where almost half the people who work there have nothing to do with manufacturing ships, you're going to have problems," he would state in a later interview.

He swore that the company he was building, Casse Aerospace, would be different. He would only hire a small team of people whom he could trust to do quality work at the standards he demanded, and then he would leave them to do it. Everyone's opinion would have equal weight, with all final decisions left to himself. It was unorthodox for ship manufacturing, but under the strong vision and guidance of Casse, the flat organization style worked.

It was 2604 when Casse Aerospace released its first ship, the limited-run Cosmo Sloop. A leisure craft with a focus on ease of use, the hull premiered the open circle signet

and curved wings that Casse would use on all his future designs. The reviews of this cutting-edge craft were universally positive, but unfortunately the timing of the ship's release would prove to be its undoing.

The Second Tevarin War had begun the year prior and with enemy forces pushing their way through Humanity's defenses, the personal leisure craft market bottomed out. With all their fortunes riding on sales of the Cosmo, Casse Aerospace found themselves struggling to keep their fledgling company afloat and decided that the best course of action was to join the war effort.

Calm Before the Storm

The Tevarin fleet had undergone significant tech upgrades during their exodus, and the UEE Naval forces were having a difficult time overcoming the new phalanx shields. In 2605, Navy officials called upon the Empire's ship manufacturers for a solution. Though he had never worked on a combat ship before, Casse knew that the credits such a lucrative contract would bring could save his company, and so he set about designing the solution to Humanity's current problems.

Analyzing battle footage of Naval forces engaging the Tevarin led Casse to the conclusion that trying to overwhelm the Phalanx shields was a losing proposition. The bulk of damage that the Navy was able to inflict occurred when a Tevarin was caught off guard. The goal of his design would be to increase the frequency with which those opportunities would occur and maximize the damage inflicted during them. To help his ship achieve this goal, he borrowed a page from the enemy's playbook. If the Tevarin were operating in teams of two, one pilot and one shield operator, his ship could also be manned by a team, a pilot and a turret gunner. The design he submitted to the Navy stood in sharp contrast to those submitted by industry leaders like Aegis, and it surprised many when the Navy granted a contract to the unusual contender. Casse Aerospace immediately began work on what would become the Hurricane.

Launched late in 2607, the Casse Hurricane suffered some setbacks during the testing phase. Though pilots liked the power-to-weight ratio and the extra punch its quad-turret offered, the high degree of coordination needed between the pilot and gunner had a very steep learning curve. Because of this, the Hurricane didn't enter active combat until 2609. While they were used to devastating effect in a few instrumental actions, the war ended shortly after their deployment in 2610.

Trying to capitalize on the success of the Hurricane, Casse Aerospace used the goodwill they had garnered to win a contract designing a long-range patrol ship suited to guard the growing Xi'an front. However, before that ship could be finished, Leonard Casse tragically passed away in 2615 after being involved in a deadly in-atmosphere collision. Reeling from the loss of their founder and leader, Casse Aerospace attempted to finish the project, but without Casse's personal involvement, military officials lost confidence and pulled the plug.

Surviving off continuing Hurricane sales, Casse Aerospace attempted to return to their roots and release an updated Cosmo but again, without Casse behind the project, it was not a commercial success. Things were looking dire for the company, and when the Navy announced the Hurricane would be retired from active duty, it signaled the end. The market was soon flush with

surplus Hurricanes and any remaining new sales dried up. With little options remaining, the board sold the company to an investment firm. From there it passed hands several times before falling into receivership and becoming nothing more than a footnote of history for the next century.

The Next Generation

When J. Harris Arnold was in school, he was obsessed with the works of Leonard Casse. To him, the mostly forgotten engineer represented everything he loved about ship design. When he eventually started his own ship manufacturing company, Arnold drew heavy inspiration from Casse's business model and ships for his own designs, utilizing such signature elements as the curved wings and open circle signet. The similarities were such that Arnold and his fledgling company, Anvil Aerospace, was sued by the holding firm who had bought the rights to Casse's designs. Arnold decided to settle the case by purchasing all of Casse Aerospace's portfolio himself. Now the owner of Casse's legacy, Arnold sought an opportunity to put the company's original designs to use, but one didn't present itself for close to seventy years.

The UEE was suffering as Vanduul attacks in Caliban grew in frequency in a manner similar to the ones that led to the fall of Virgil and Tiber. Eager to turn their efforts around, the Navy brass were looking for a new ship that would enable their pilots to cut engagement times down. Their theory was that the faster a Vanduul fighter could be taken out, the less opportunity it would have to cause Human casualties. Anvil provided the solution in the form of a resurrected Hurricane. The updated design still bore all the hallmarks of Casse's original, but with the addition of Anvil's proven conflict expertise. The result was a game changer for the war effort, and in 2878 a new generation of Navy pilots began to use the Hurricane to devastating effect.

Today, Casse and the company he built have finally taken their proper place in history books, thanks to the efforts of Arnold and others who sought to keep their memory alive. While he may have only designed three ships in his lifetime, Leonard Casse's contributions extend well beyond what he left behind in the shipyard, as he has inspired countless numbers to see the universe a little bit differently. The plaque honoring him in the Edleson Design Institute Hall of Fame cites a fitting Casse quotation, **"Good design solves a problem, bad design creates new ones."**

Combat Subsumption Activity
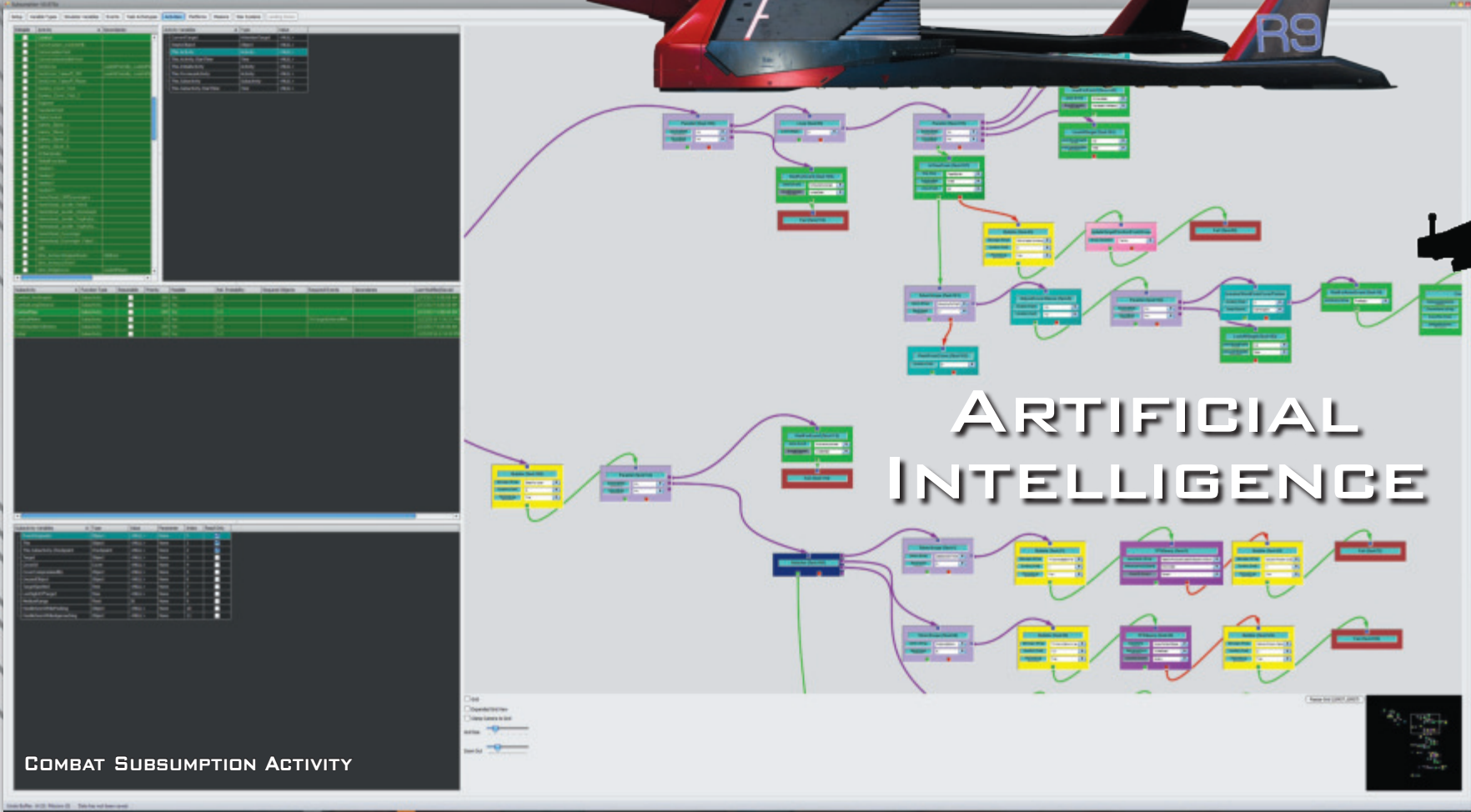
Artificial Intelligence

*One of the most visible aspects of any game, especially a persistent universe game, is the behavior of its NPCs — its guards, its store clerks, its rivals, its janitors and gardeners and pilots. How do they acknowledge that a player character is engaging them? How do they treat a friend, a hero, a villain? What can we see them doing when they're **not** interacting with PCs?*

Today we're talking with the team that, along with Tony Zurovec, is creating the framework for all of this activity.

JP: *Let's start with an introduction — each of you please give me your title, and what you're currently working on.*

Francesco Roccucci: I'm the Lead AI Programmer. I'm working on Subsumption core functionalities and navigation.

Andrea Carbone: I'm an AI programmer, working on Ship AI and AI perception.

Rich Welsh: I'm a senior AI programmer, currently working on the mission and spawning systems.

Marius Airinei: I'm an AI programmer. I'm working on NPC daily schedules.

Dave Pollard: I'm a Senior Gameplay Programmer currently on loan to the AI team, working on the new Subsumption Mission System.

Francesco R: Dave, you need to accept you are not going back to your old team. :D You belong to us now.

JP: *What have you worked on before coming to CIG?*

Rich W: Before CIG I was working on *The Division* at Ubisoft. Before that I worked as an AI programmer at the UK Crytek studio for 4 years, which is where I met Francesco. I started in the games industry back in 2008.

Marius A: Before getting here, I worked on *FIFA* and *Need for Speed* for the Electronic Arts Romania studio.

Andrea C: I come from academic research; CIG is my first experience in the game industry. I don't have AAA games in my background. However, my research topics have all been centered around AI and autonomous robotics.

JP: *How did you get from academics to CIG?*

Andrea C: CIG offered me the best environment where applied research in AI can really have an immediate impact. Most research normally remains on paper and I always felt the need to reach out a bigger audience. *Star Citizen* is ideal for this reason. Besides, I was always fascinated by game programming in general. Programming for me is a strongly creative process and under many aspects, I don't see much difference with respect to the efforts that a research oriented activity requires.

Francesco R: I started in 2008 working as intern for the EA Phenomic studio on the *Battleforge* game. I then moved to Crytek where I spent the next 5 years and a half working on CryEngine, on *Crysis 3*, and I supported the *Ryse* team. After that I came to CIG in February 2015.

Dave P: I've worked at a few places over the years, mostly on console games (*Malice*, *Crash Twinsanity*, *Super Monkey Ball Adventures*, *The Simpsons Game*). Before joining CIG, I'd spent about several years running an independent development studio called Eiconic Games, releasing both our own console games and ones for clients.

JP: *Rich, you're "working on the mission and spawning systems." Does that mean that you're designing individual missions, or that you're creating the framework in which missions can be designed? Or both?*

Rich W: At the moment I'm mostly just helping with the mission framework. We're using a tool called Subsumption Editor, which is being created by Tony Zurovec. Since it's a new tool for setting up missions, a lot of the work that we're focusing on at the moment is to make sure that any functionality that the designers need to build missions is available to them.

As part of that, we also help set up a few example missions, but these are mostly for testing and demonstrating how the system works to the designers. Then they're able to take it and start creating content for both *Squadron 42* and the Persistent Universe side of *Star Citizen*.

JP: *What is "Subsumption," and why does it need to be edited?*

Rich W: Subsumption is the name for the logic system that the designers can use to create behaviours for the characters in the game, and for the mission flow. It's the name of the tool that they use to edit these, rather than something that would be edited itself.

Andrea C: The Subsumption architecture in *SC* is reminiscent of AI robotics (in the eighties), where a robot's autonomous navigation behaviours were implemented by Rodney Brooks in what was then call Subsumption.

Francesco R: Subsumption is a design for a global architecture of a system that focuses on simulating and represent a complex living world. Tony called this architecture Subsumption in honor of Brooks.

Currently Subsumption contains the functionalities to create behaviors for entities in the world (NPCs, robots, computers and so on) and Missions logic. It also allows us to reference and keep track of the multiple variables that make the world complex (economic simulation, world structure and so on).

Rich W: en.wikipedia.org/wiki/Subsumption_architecture

Francesco R: Yep, that's the original Rodney Brooks architecture design.

Tony Zurovec is basically the mind behind the current idea of Subsumption. He designed and implemented a tool that designers can use to create the content used by the AI systems for all the systems mentioned before (behaviors, missions, definitions of available platforms, definitions of the NPC schedules, and so on). This tool outputs all the data inside xml files.

We then read those files and we implement the run-time code that actually executes the logic in game.

Subsumption logic is a graph where each node represents some operations executed by the C++ code: each node can have input and outputs.

Mission logic or behavior are made internally in the same way. They basically result in the execution of the logic described in the designed graph.

JP: *So basically, Subsumption is a master framework to deal with all the AI-based mechanics in the game?*

Francesco R: Yes, that's correct.

JP: *Dave, you're working on the Subsumption Mission*

(L–R) Francesco Roccucci, Andrea Carbone, Marius Airinei

System also — how is what you're doing different from what Rich is doing?

Dave P: A lot of Rich's focus in the mission system has been on spawning AI characters and ships (an important part of missions), whereas I'm responsible for the overall mission flow and providing tools for the designers to create that flow.

I also do a lot of work hooking up the Subsumption mission logic to various gameplay mechanics to add to the designers' toolbox.

JP: *So you started designing missions, and now have been drafted/stolen to create the framework for others to design missions?*

Dave P: Well, I didn't design missions before, I was working on gameplay systems, some of which I'm now hooking up to Subsumption. :)

(L–R) Rich Welsh, Dave Pollard

Francesco R: Dave, maybe you can give some examples to make it more understandable.

Dave P: Ok, for example, I wrote the old system for tracking missions and mission objectives in the player's mobiGlas. I also worked on the scanning and radar mechanics, and the criminality system (wanted levels in the PU), amongst various other things.

JP: *Will all missions (moving forward) be created using the Subsumption Editor, or will that be just one of several methods? What happens to missions created before this?*

Dave P: The plan is to move all the mission logic into Subsumption, so old missions will be converted over to the new system. We need to do this, as the old way of creating missions isn't scalable with the new Solar System and object container streaming technology that is being worked on.

Andrea C: Part of the work that I am doing for the space-ships is to govern the flying behaviour of a pilot in Subsumption.

JP: *What are spaceship behaviors? What are examples of AI that ships need?*

Andrea C: It's tricky. Right now, ships have a behaviour; in Subsumption it's the pilot that has a behaviour.

JP: *I'm guessing that either way, the results would be similar. In what way are the results different? As a player, why do I care whether it's the ship or the pilot that has the behavior?*

Andrea C: Well, the advantage is twofold in my opinion. First, each character might have its own specific behaviour and, for example, get on board a Vanduul ship and fly as a UEE pilot (rather than all Vanduul ships having the same behaviour).

Second, we can use Subsumption as the only tool for behaviour modelling, focusing on what and how a character can perform actions and react to events.

JP: *Does that mean that Subsumption is more a "person-based" system than a mechanics system? That it's more intended to determine the behavior of an NPC worker than the machine the worker is operating?*

Andrea C: It's not just about the flying skills, there is the target selection, turrets aiming, engineering. There are potentially many roles on a ship.

But yes, I'd say that that's the spirit.

JP: *How about AI perception? Does that include things like determining whether an AI pilot has detected a player's ship? Or whether a guard has detected a player thief?*

NPC	▲	Num. Schedule Nodes
Advocacy.Advocacy_Agent01_nw-1		5
Cast.Aaron_Seetow.Seetow_FlightOps_t2_nw		5
Cast.Cara_Web_Webster.Web_Deck_t1_nw		6
Cast.Cedric_Cochran.Cochran_ClassAUniform_t0_nw		5
Cast.Dr_Spenser_Gallo.Gallo		4
Cast.Graham_Yury.Yury_Deck_t1_nw		5

This tells us what schedule an NPC is on during the day ...

Schedule - Time	▲	Activity	Action Area
8:00:00 AM		Electrician	middle_deck_rear.MidDeck_Rear_Engineering_EngineRoom
12:00:00 PM		Eat Lunch	middle_deck_centre.MidDeck_Center_Messhall_Room
1:00:00 PM		Electrician	bridge.Bridge_MainBridge_Room
7:00:00 PM		Rest and Recreation	right_stairwells.RightStairwells_Armory_FiringRange_Room
10:00:00 PM		Sleep	middle_deck_centre.MidDeck_Center_Bunk_Room

Andrea C: AI perception subsumes all senses that are available to a character. As of now those are vision, audio and radar (but can be extended at will). An NPC can be configured to use any or all of them. The senses relay the detected events to the NPC perception that keeps track of what he sees, hears and reacts accordingly. This certainly includes the Player detection and tracking.

Currently the main role of NPC perception is for combat, where it is central in determining the state of the enemy and planning the most appropriate attack or defend behaviour.

JP: *Marius, what types of things are included in an NPC's daily schedule?*

Marius A: So for NPC schedule, we are working on the basis of the framework that designers will use from the Subsumption Editor – like

being able to assign activities for a specific frame time and assigning action zones for those activities. For example, when an NPC wants to sleep, he will know the action zone is a specific dormitory and is going to look for a free bed in that area.

Another part that I'm working on for NPC schedule is to have a smooth transition when AI actors interacts with usables.

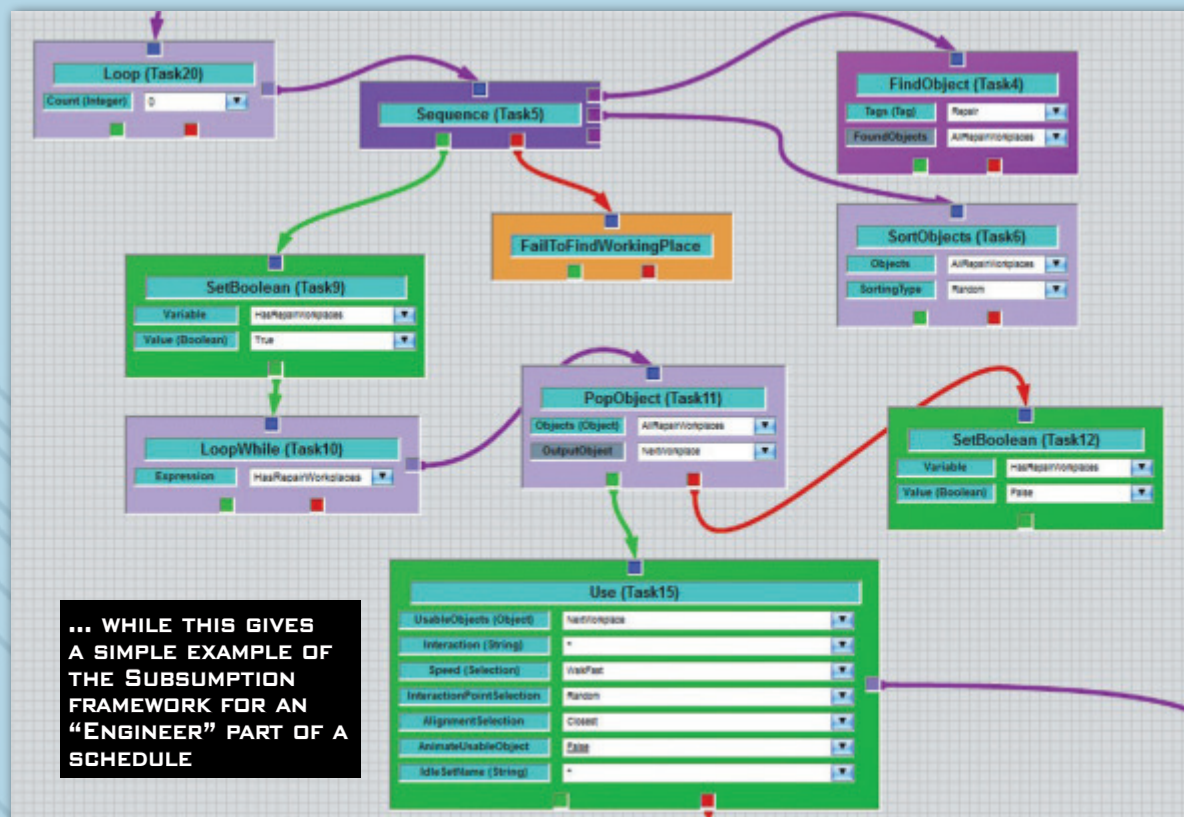**JP:** *What's an example of a smooth transition, compared to a rough (not-smooth) transition? As a player, what's the difference in what I'm seeing?*

... while this gives a simple example of the Subsumption framework for an "Engineer" part of a schedule

Marius A: Smooth transitions are related to transitions from movement animations to specific animations while interacting with usables. For example, it's not a problem for a player character to stop in front of an item for a short period and then to interact with it, but for an AI, it will look bad to initiate some sort of idle animation before it starts interacting with an item.

Also, the AI needs to get to a specific place to be able to play the animation for interaction correctly.

JP: *Dave, you mentioned the new Solar System and object container streaming technology ... what's that, and how does it relate to the game's AI?*

Dave P: Object containers are something Steve Humphreys has been working on in LA, and are a way of packaging up hierarchies of objects (such as ships, space stations, buildings, planets and asteroid fields), which in turn are able to contain other object containers, so they can be streamed in and out of memory as you travel across the system.

There's also a new Solar System tool being developed to allow designers to populate each system with these object containers (including setting up planetary and moon orbits).

Subsumption will be able to directly reference any object within the full Solar System and object container hierarchy so we can do things like start a mission on a space station with an objective to fly down to a specific crashed ship on a planet on the other side of the solar system and download the data on its black box recorder. We can directly reference the black box recorder and set up a callback in Subsumption that is triggered when the player interacts with it.

JP: *How do object containers make streaming easier?*

Dave P: That's really a question for Steve! They are entirely self-contained and have no direct references to other entities, which means they can be safely streamed out when there are no players nearby.

JP: *These next questions are for everyone, starting with: what specifically are you working on today?*

Andrea C: I just finished implementing the connection between a ship's radar and its pilot perception. So that as soon as the NPC gets on board a spaceship, his perception will be updated automatically with the information originating from the radar.

Dave P: I'm working on how we spawn the player at the start of a mission for one of the chapters of *Squadron 42*. It's surprisingly complicated, as we need to spawn the player sitting in the cockpit of a Gladius, which we also need to spawn landed inside the hangar of an Idris, which itself needs to be spawned (with a full crew all running their own individual behaviours) at a specific location in the solar system ...

Marius A: At this moment I'm working on what I said earlier, improving the transitions between normal movement and animations on a usable (this goes both ways).

JP: *Marius, by "movement" you mean walking around?*

Marius A: Yes – maybe it's better to give an example: an AI actor sitting on a chair. Basically, the AI needs to plan its movement close to the chair so that it gets to the position where it's going to play the animation for sitting. Also, when it gets up from the chair, you need to know where the animation will leave the AI actor and plan the subsequent movement from that point.
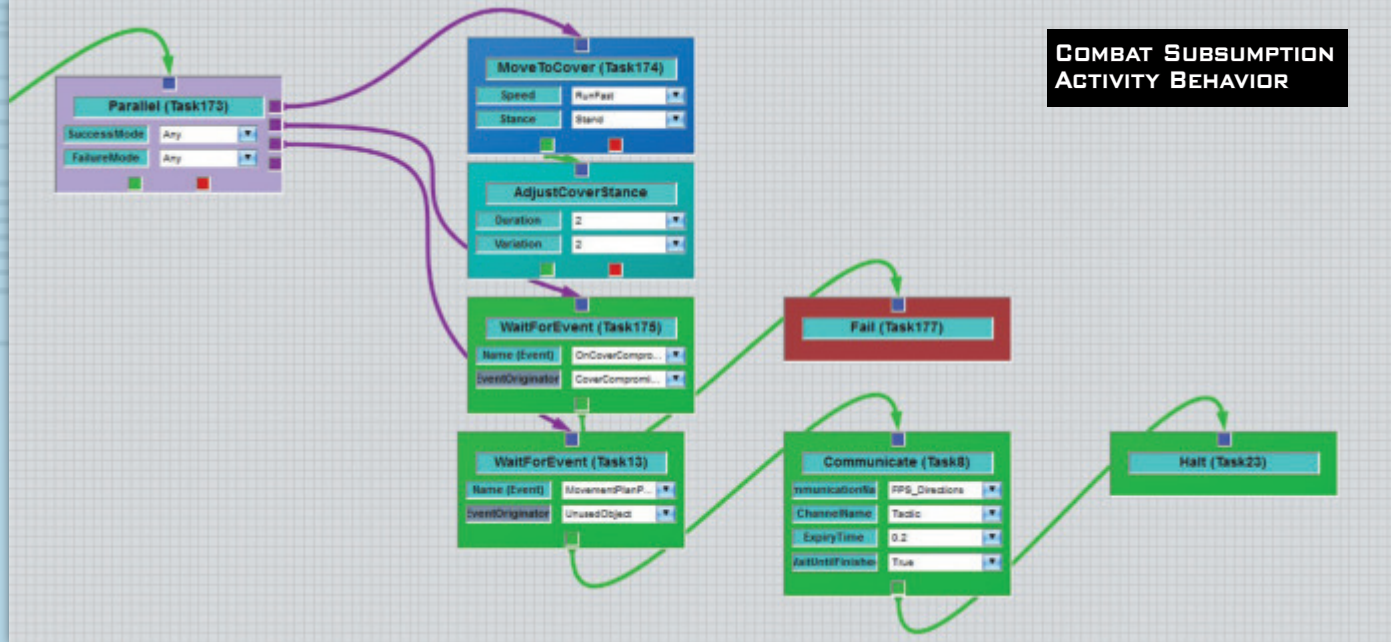
Francesco R: Today I finished implementing some low-level code that allows us to access variables that should be serialized and those that are only local in the same way.

COMBAT SUBSUMPTION ACTIVITY BEHAVIOR

As a result, a Subsumption task (the basic piece of logic of a Subsumption graph) can read input variables and write output variables without caring where those variables are stored.

I then moved to investigate a bug in the navigation mesh generation process. I found a problem with the way the triangulation algorithm is creating the walkable triangles and I'm trying to find a solution. :)

Rich W: Today, I am working on something that will fill a ship with characters. Designers should be able to drop a ship into a mission and then select how many and what kind of characters they would like it to start with, and where they would like those characters to start. This means that rather than hand placing tens of characters around every ship, they will be able to instead request "10 crewmen to start in the messhall, 5 engineers to start in the engine room, 1 pilot in the bridge," and so on.

JP: *What is the most important thing you've worked on for SC's AI? (We're looking for something more specific than "the Subsumption Editor." :))*

Andrea C: Well working on AI perception has been quite rewarding in the past year. But I believe that the major contribution to the *Star Citizen* AI will be the current work in progress that is the refactoring of the whole ships-related AI.

Dave P: If you measure importance by potential time saved across the company, setting up the debug visualizer for the mission system, while not very exciting on the face of it, was hugely important for helping designers (and programmers) debug their mission logic in real time inside the game. Being able to see at a glance exactly which task has failed in a Subsumption graph, and why, will save everyone a huge amount of time when creating or tweaking missions.

BEHIND THE SCENES

Francesco R: It really depends on what "important" means.

JP: *The thing that affects* SC *the most. For example, Dave's example isn't exciting, but it looks like it will significantly affect ease of programming missions.*

Marius A: Well, I liked working on the cover system and improving it to support non-z-up maps and movement transitions into cover.

JP: *"cover system"?*

Marius A: Yes, we have in place a "cover system" used by AI actors in combat, when they take cover behind walls / props.

Rich W: I think my most significant contribution to the AI has been the changes that I've made to spawning. In order to make the game scalable to the size that we're aiming for, we couldn't continue to use the old system of hand placing every ship and character. Similarly, we weren't easily able to adjust the number and type of spawns based on the number of players. A lot of the changes that I've made have given the designers the ability to request spawns more dynamically, and set up this data in a much more scalable, reusable way than before. By decoupling the spawning data from the mission setups, it has also meant that designers are able to quickly make adjustments to game modes such as Vanduul Swarm, without needing to wade through lots of flowgraph or Subsumption logic. Generally, the more that I can help automate and the more that I can simplify the workflow for the design team, the faster they can make more content for the game. Everyone's a winner!

Francesco R: For me, it was implementing from scratch all the basic functionalities of Subsumption, keeping in memory all the data we have for multiple NPC activities, the mission logic data and the graph, while making sure we use as little memory as possible and we still run fast.

Also, creating the system in a way in which it was easily extensible from the other AI team members and possibly multiple game programmers in the future. For example, it was very rewarding seeing all the people of my team being able to write very quickly new Subsumption tasks or extend the basics of the Subsumption Visualizer I started.

The other bits I think that are important for *SC* are the improvements I made to allow the navigation system to connect properly with the zone system and the physics local grids.

JP: *What's the most frustrating or difficult thing you've worked on in the AI?*

Rich W: I think the most difficult thing for me has been wrapping my head around the rotational maths that can be involved in making a game in space. Previously, when I've worked on FPS games, characters have all been in the same gravitational field. Up is the same up for everyone, down is the same down. In this game, you could have two AI standing on two different ships. Locally to each character, "down" is the direction of their feet relative to their head, but that's not necessarily the same direction from character to character.

Andrea C: I can say that it's been challenging to achieve the current ships' behaviours, in response to the requests for a richer variety of the desired dogfighting behaviour that Arena Commander designers want to achieve.

That wasn't frustrating, just a lot of difficult work. I had to dive into a pretty complex existing code base and get acquainted with it, as the requests for new features were expressed.

A MISSION CHART

I'd also say that even the most frustrating situation becomes immediately rewarding when it's been solved.

Marius A: Can I say the work for Citizencon? We worked so much and so intensely and in the end … we couldn't present the Idris level.

Dave P: I would say the early work on the Mission System was frustrating for me because I had to be patient while some of the core technology was written before I could get really stuck into linking it up to the rest of the game. I could see the potential early on and was itching to get

it in to the designers' hands to let them run with it. We're finally beginning to see the fruits of all that work, so despite it being frustrating at times, it was worth spending time 'doing it right' so we now have strong foundations to build on.

Francesco R: Probably for me the most frustrating part is the fact that the AI, more than any other discipline, is hard to see until the point at which it's almost ready to ship. We rely on all other disciplines (game code, animation, art) and until everything comes together, it's very hard to find a way to showcase the work we are doing.

JP: *A combined question, for everyone. You can answer either one or both. :)*

- *What's the most interesting thing you've worked on for SC?*

- *What's the most unexpected/surprising AI behavior that you've seen in SC? (I'm asking here about any time that the AI gave you a really unintended result.)*

Andrea C: Well … maybe unexpected was the sandworm.

JP: *How was the sandworm unexpected?*

Andrea C: I just didn't know that it was in the demo until the very day before it was released.

Dave P: The most interesting thing for me is the Mission System, as there's just such a huge amount to think about. But second place would be the Criminal/Hostility system for the PU — working out how to determine if a particular player action should count as hostile when you take into account multicrew ships through all sorts of interesting scenarios. Say if you're piloting a ship and another player in one of your turrets decides to fire on a friendly ship — is the pilot responsible? The friendly ship should see the attacker as hostile and perhaps the turret gunner should be given a wanted level, but should the pilot be marked as criminal as well? What if a criminal boards an otherwise friendly ship? Should that make the whole ship appear as hostile to others? Lots to consider …

Francesco R: To be honest I'm a bit of a nerd and I find all the things I work on interesting. I love that the AI is not just about programming, it's about making everything fit together, and despite the fact that is sometimes frustrating because you rely on lot of people, it is also very rewarding when you reach the goals.

Maybe so far the navigation improvements have been a very interesting task for me; I've loved working on navigation since the Crytek days.

I think you're always seeing something unexpected when dealing with the behaviors made by designers … sometimes you are pleasantly surprised, sometimes you are shocked! :D

"I've seen some subactivity logic you people wouldn't believe."

Rich W: I think that as a programmer, I find problem solving interesting generally. With the AI, the problems tend to be a little more tangible to the players, since they can see the characters on screen, but there's a lot of problems like "How do we make this code as fast as possible?" or "How can we make life easier for the designers?"

In terms of unexpected, I think Francesco is right. You make a set of tools and release them to the design team, and they will squeeze everything they can from them. Things that you never thought would be possible, they will manage to make happen.

JP: *Any last words?*

Francesco R: Well I definitely want to thank all our community that allows us to develop this amazing project. Without them this won't be possible.

Dave P: Yeah, I second that — the passion of our backers and community is really inspiring, and something I'd never experienced to this extent anywhere I've worked before!

Marius A: Indeed we have a great community that give us a good impulse to realize great things, so many thanks :) and I'd also like to say my thanks to the CIG team, it's a great team to work with.

JP: *Thank you all very much, especially those of you in Germany who have stayed so late.*

CHARON SYSTEM

An ongoing civil war, centuries of strife and the fact that they are the only system to have ever renounced their recognition in the UEE Senate are all reason enough to give most travelers pause before visiting Charon. Situated on the frontier, Charon may be connected to four other systems, but it still harbors a deep sense of isolation from the rest of the Empire. This mentality, fueled by the UEE's regrettable actions in the system during the Messer era, has birthed a fiery and fiercely independent spirit that defines Charon to this day, a spirit that might have made the system all but impossible to govern.

Most accounts claim the discovery of this five-planet system swirling around a K-type main sequence star was an accident. In 2538, Max Keaton was a novice merchant marine pilot on his first supply run in Helios when the system's intense solar winds disabled his ship's sensors. Nervous about falling behind schedule, Keaton flew on, only to realize when the sensors rebooted that his bearing was wrong and he was well off course. Determined not to make another mistake, Keaton quickly tested all his systems. That's when he noticed an anomalous reading on his scanners. In a surprising show of self-restraint, Keaton saved the coordinates, completed his run and then returned the first chance he could. What he eventually discovered was the jump that would lead to the Charon System.

GALACTIC GUIDE

The UPE claimed the system and deployed a scan team from the Government Cartography Agency (the era's ICC). Terraformation of Charon III began almost immediately, but once complete, the system's remoteness never allowed it to develop as a hub for traffic and trade. Those who would eventually seek to settle the system were typically interested in living a simple life and saw Charon's isolation as a benefit. The Messers, however, had another use for the system's isolation.

Throughout the generations, the Messers and their policies created a vast number of enemies, dissidents, activists and revolutionaries. They found that mixing these political prisoners into the usual criminal penal systems only radicalized the criminals and gave the dissidents access to criminal training. So, the Messers decided to build a vast prison network across Charon III, with many of them in the state of Dellin, and hired loyal government employees to staff it. Horror stories about the prisons swirled among residents, though they quickly learned not to press the issue publicly. Local officials that investigated the matter were silenced or suddenly charged with crimes that landed them in those very prisons.

When the Messers fell from power in 2792, people across the planet celebrated, and the local population forced their way into the prisons. What they found and documented horrified everyone and became an integral argument of 2806's Truth and Reconciliation Commission report that exposed the horrors of the Messer regime. Local officials also discovered during their investigations that their Senators not only knew about the atrocities, but had been profiting off them. The Messer regime had funneled extra resources to Dellin, where most of the prisons were located, and even influenced elections involving corrupt Senate candidates they favored.

Senator Constance Winterfield was indicted on corruption charges and removed from power. The Governor's Coun-

cil was supposed to name a temporary replacement, but vicious in-fighting and political maneuvering stalled any decision. Charon III's Senate seat stayed vacant for years until Constance Winterfield's term expired. By that point, many residents had concluded that Charon III was better off than it had been with a Senator and the UEE imposing their will on the planet. In 2795, Charon III voted to renounce their recognition in the Senate, making them the only planet to ever do so.

Without an advocate on Earth, government credits to the system slowed to a trickle as the UEE political elite were intent to show that renouncing Senate recognition would come at a cost. As government funds evaporated at high cost to local economies, particularly in Dellin, the fierce independent spirit that inspired people to stand up to the UEE now turned them on each other. Constant strife between political factions only hardened over time, and governance of the planet became practically impossible. Any attempts at reforming the Governor's Council and resubmitting for recognition have thus far failed.

Today, the system is primarily defined by the bloody and devastating civil war raging on Charon III between the states of Dellin and its neighbor Acheron. Regular commercial traffic in the system is minimal and may come under fire if entering Charon III's atmosphere. Due to this unfortunate situation, and a lack of other habitable locations within the system, the Galactic Guide advises travelers to avoid the Charon System unless absolutely necessary.
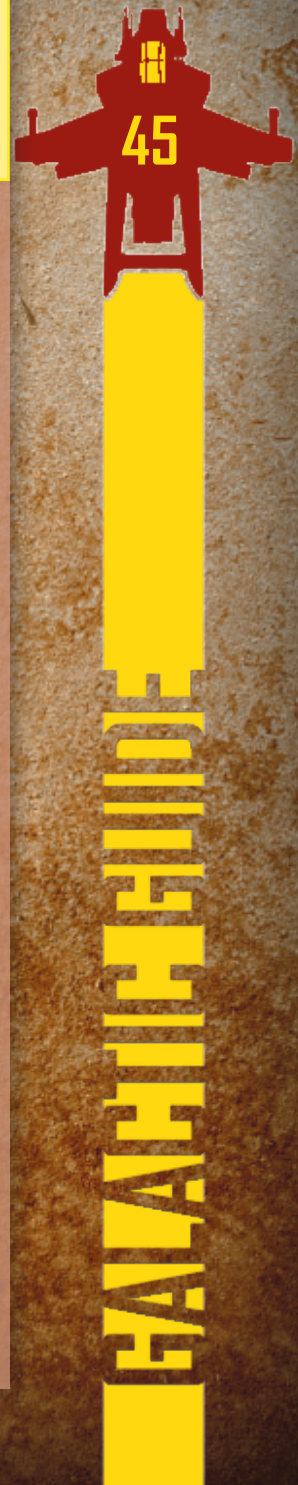
Charon I

This is a small terrestrial planet being sublimed into the system's sun due to its decaying orbit. Analysis of the surface has led scientists to believe that a massive collision pushed it out of its original orbit and towards its eventual doom. The large trail that is forming in its wake as it spirals ever closer to the sun gives the appearance of a staggeringly large comet.

Charon II

Charon II is a smog planet with a dense layer of carbon dioxide that traps heat within its atmosphere. The greenhouse effect makes the planet's surface inhospitably warm. The difficulties in terraforming such a hostile world, along with the difficult political climate throughout the system, have made any attempt to initiate the complicated process a non-starter.

Charon III

The UPE claimed this system because of Charon III. The planet was quickly terraformed, but few colonists were eager to settle in such a distant corner of the Empire. It lacked significant deposits of rare minerals to attract miners, and even though the real estate was inexpensive, few factories were built since the additional shipping costs more than offset any local savings for most manufacturers. Homesteaders that were attracted by the isolation did steadily stream in over the decades, though they often had to rely on soil enrichment products, like moly-nitronese, to reliably grow food.

Things changed in 2635 during Livia Messer III's reign. She proposed a restructuring of the UEE's legal system that involved building a massive, maximum security penitentiary in Dellin's vast desert. The project kickstarted the economy and brought in new people and credits. When her brother Corsen Messer V rose to power, he built several more facilities. In 2670, the planet received recognition in the Senate via a decree from Corsen. Many of today's historians now assume the move was a quid pro quo between Corsen Messer and Gwen Czukay, who was Dellin's Governor's Council representative and shortly thereafter the planet's first Senator. When Senator Czukay was sworn in, she personally decided that the planet should be recognized under the name Haros.

In 2795, when the planet voted to renounce their recognition in the Senate, Haros was scrapped as the planet's official name, as many of the locals continued to associate it with the Messer era. For a few years, the planet dealt with political turmoil but lived in peace. Then a terrible drought destabilized Dellin in 2811 and sparked violent uprisings. The neighboring state of Acheron, struggling with the drought itself, couldn't provide much aid and was overwhelmed by desperate refugees from Dellin. The first civil war erupted between the two states in 2813 and lasted until 2819. The war never officially ended, as the adversaries simply agreed to what turned out to be a prolonged ceasefire.

Although tensions have flared up since then, not all hope is lost. Most recently, a 2934 earthquake that devastated Acheron brought much of the planet together in relief of Acheron's ravaged population. During the rebuilding, the Phiyl Tower was constructed in Acheron's capital. Considered a masterwork of Supermodernist architecture, it was meant to symbolize a new, more hopeful era for Charon III. Unfortunately, the peace did not last long, as residents of Dellin openly speculated on why Acheron needed their help yet had the funds to construct such a tower.

In 2944, the most recent war between the states of Ache-

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ron and Dellin broke out after the election of Tarquin Klast as governor of Dellin. Acheron had supported his political rival and claimed Klast used intimidation tactics to swing the vote in his favor. When Klast instituted sweeping changes to the government and removed the checks and balances designed to limit his power, Acheron intervened to stop what they claimed was a growing tyrant. Following several skirmishes, the UEE set up armistice talks between the two states, but no accord could be reached.

Today the civil war still rages. UEE Navy ships observe from above atmosphere only to ensure no gross violations of the Common Laws. While experts debate exactly how involved the UEE should get, much of the Empire's population appears to be ambivalent to the conflict.

Charon IV

Upon discovering the system, Max Keaton first saw and became enthralled by the ice giant Charon IV. The beautiful blue, dead world inspired Keaton to call the system Charon, a nod to both the mythological character and Keaton's grandfather, who was a beloved classics professor in Rhetor.

Charon V

Every few decades another upstart mining concern scans and surveys this distant dwarf planet in the hope of finding precious minerals others have missed. So far none have been found.

Heard in the Wind

"It is with a heavy heart that I stand here today to renounce Haros' recognition in the UEE Senate. From here forth, the planet will relinquish its Senate seat along with all responsibilities and benefits associated with it. Though I strongly disagree with this decision, it is the will of the people and I will respect it. I fear not everyone on Haros will be as gracious in defeat."

– Bernard Ma, Dellin's Governor's Council representative, in a speech before the Senate, 2795

"Turmoil and trouble, give us double
'Cause this unending struggle is what defines us."

– Gasper Khan, lyrics from Halcyon Home, *2912*
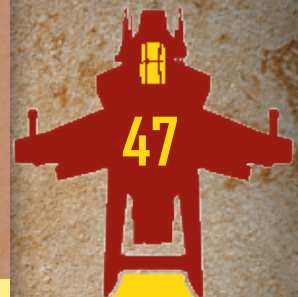
GALACTIC GUIDE

DRIFTERS

BY DAVE HADDOCK

Episode 3

"Sorry, table's taken," Mags said to the two people that were now looming over them. There was something immediately off-putting about the pair. They were far too calm, too self-assured, to be random people. Her other hand quietly drifted under the table and closed the lockbox with the fortune's worth of eriesium.

"Hey, you two deaf or just stupid? Drift. Unless you wanna find out what it feels like to get spine-punched from the front." Trin certainly wasted no time.

The man sighed while the woman watched Trin like a hawk. Trin just stared right back.

"That belongs to us," he nodded to the lockbox.

"Hell it does," Trin snapped back.

Mags' mind raced. She didn't see any visible weapons on these two, but their heavy layered clothes were perfect for stashing guns.

"I understand that you're confused," the man said. His voice was pleasant and calming. Mags got the distinct

impression that he was the talker of the two. "You pulled this . . . item . . . from the wreckage of *Echo Calling* which had been working for our employer. Nearest we can tell, you weren't the aggressors in the fight that caused its destruction, so by all accounts, you wandered your way into this mess, which is why we're giving you this chance to turn our property over and walk away. You do that? We'll call it square. You don't? There'll be problems."

"I don't know. We're problem kind of people." Mags looked past the two to where Ozzy had posted up at the bar. He was gone.

"Four Points kind?" he replied.

That froze everyone at the table. All of them had heard about the Four Points syndicate in some form or another. Mags knew three people who disappeared after botching a heist in Prime. Even Trin seemed fazed by the mention.

"Thief Magdalena," Soahm finally spoke up. The former Xi'an policeman now security consultant stood from the table. The woman broke her stare on Trin to keep an eye on him. The Xi'an simply looking back to Mags. "I will leave you to your business."

"How about this." Trin slammed her hand on the table, attracting everyone's attention (except Soahm, who kept walking). She'd used the momentary distraction to pull a grenade. "How about I prime this puppy and waste the lot of us?"

"Uh, Trin?" Mags slowly edged away from the device. No one else in Cafe Musain seemed to be paying them any attention. She did clock about eight visible weapons on patrons.

"Well now," the man said, sounding truly engaged for the first time. He stepped closer to Trin. "That is interesting. You really ready to blow us all up?"

"Sure, figure then nobody gets the eriesium. Think I can die happy knowing that."

The man looked like he was enjoying this. "Osane here's fast. Real fast. Could probably put rounds in you before you armed the device."

"Yeah, you might be right," Trin said, glancing past the man towards Osane. She turned her hand to show more of the grenade. It was already beeping. "If I waited to arm it."

Mags pulled a snub pistol from her pocket and put two shots into Osane's chest. The woman dropped heavily to the floor. The man dashed to grab the grenade in Trin's hand. Everybody in the bar turned as drinks crashed to the floor. Mags grabbed the lockbox with the eriesium and vaulted out of the booth.

Her feet hit the floor and she was off, pushing her way through the confused onlookers. An energy round zipped past her from behind and caught a guy just ahead of her in the face. His head snapped with a sizzle. Mags risked a look back.

Osane pushed to her feet, her subcompact assault rifle struggling to aim for another shot. Smoke rose from the two holes in her clothes, exposing the armor vest below.

Mags shoved as hard as she could. She thundered up the stairs and burst outside as gunfire erupted behind her.

*   *   *

"Yes, yes. Very nice. And this?" Kel pointed to a small children's action figure at the bottom of the box. He'd spent the past hour meticulously asking about each item he didn't recognize. The stall owner, a dirty kid in his early twenties, had his feet up on the counter. He'd clearly lost his patience with the Banu fifty-five minutes ago.

"It's a Captain Levo action figure," the stall owner said without even looking up from his mobi.

"Oooh. Captain Levo." Kel looked over the figure closely, rotating the various joints and studying the chipped paint. "Explain."

"I don't know, man," the stall owner said with a defeated sigh. "He was a cartoon character from like five years ago. He, like, saved people, went on adventures and shit."

"I see. I see. So good man. Hero."

"Yeah, I guess."

Kel nodded and studied the figure for another moment.

"Yes. I buy."

The stall owner dragged his feet off the counter and brought up the sales program. Kel paid out three credits.

Suddenly alarms went off. Kel looked around, momentarily convinced this was how this stall celebrated sales. He smiled.

Then he saw the people fleeing out of a doorway marked "Cafe Musain." There were the unmistakable sounds of gunfire.

He saw Captain Mag among those running. She was carrying the eriesium.

"Captain Mag!" Kel waved to try and get her attention. He pointed at the Captain Levo figure, hoping she would look.

Unfortunately, some Humans in uniform appeared around her, aiming some kind of weapon. Mags immediately skidded to a stop. She looked around for a moment, locked eyes with Kel.

He pointed to Captain Levo again. She smiled and winked, then dropped the lockbox and raised her hands.

Kel watched the uniformed Humans take her into custody. He should find out where they were taking her . . .

Then he saw a different stall, surrounded by dirty Human children eating some kind of frozen consumable.

Kel went to investigate.

*   *   *

Cafe Musain was a war zone. Some of the locals were trading shots with Osane, who'd dug in behind a flipped table.

Trin got slammed against the wall. Arno (Osane dropped his name as she opened fire at some of the Musain patrons) didn't loosen his grip on her hand and subsequently the grenade while they tussled. She could tell he'd had training, been in more than his fair share of scraps, but he was technical, rigid.

"Your friend left you here to die," he hissed as he leaned in close.

Trin laughed in his face. He headbutted her. Her vision reset with a flash to white. Blood gushed out of her nose.

There we go, she thought. She spit blood in his eyes and punched him in the armpit with her free hand. His grip faltered, at least enough for her to slip free. Trin spun around behind him and drove her elbow into the base of his skull. Then again. He sank to one knee. She clubbed him one more time for good measure.

She saw Osane glance back and raise her rifle, snapping off a couple shots. Trin pulled Arno up as a shield. The shots caught him flush in the chest.

He muttered from the impacts, but didn't die. Wasn't even wounded. *This was some kind of armor they got*. She stuffed the live grenade in Arno's vest and kicked him towards Osane.

Then she made a break for the door, taking a moment to memorize the exact geography of the place and its current patrons.

Arno quickly dug into his armor to try and fish the grenade out. Each second, a whine from the grenade reached a higher and higher pitch. He was about to throw it when the thing went off.

The lights cut out. Everyone's electronics went dead.

Trin figured she had maybe twenty seconds before whatever backups this shithole had kicked on. She traced the mental image of Musain's layout as she ran through the dark. She hit the stairs a little quicker than she expected, but grabbed the rail and pulled herself up without falling.

Her feet thudded up the steps. One more turn and she could hear the acoustics change. She was back in the main bazaar when the backup lights surged back. Shop owners grabbed people who had been ripping off their stalls in the darkness. Trin did her best to blend into the crowd. Some old woman stepped up to her, shocked at the blood that was undoubtedly pouring down Trin's face.

"Oh my god," she gasped, full of concern. "You need a doctor —"

Trin shoved past her. All she'd need to do is keep a low profile until she got back to the *Harlequin.*

A hand grabbed her wrist. She whirled back, fist ready.

It was Ozzy.

"Come on. We aren't safe."

* * *

Dr. Honan Yao was tucked away somewhere in the tunnels of Levski when the lights cut out. He sat in darkness for a few moments before he realized that they'd actually gone out. The dose of WiDoW in the hypo hadn't been injected yet. Even though his nerves ached for the shot, for the cool calm to swim through his system, he hadn't done it. That moment of realization, when the lights cut out and he'd casually accepted that it was probably just another side effect of his new normal, made him catch a glimpse of himself. This time, he cared what he saw.

He'd been on edge ever since they left Kallis. He thought it was just the pangs that came with needing another hit, but seeing his old friend Lev after all this time . . . that hit him harder than he would've guessed. Running rampant in those pre-med days . . . hell, university in general felt like a lifetime ago. Certainly before . . .

There it was.

It was always a matter of time before his mind drifted to that place. After all this time . . . he slammed his head back against the wall in frustration and tried to tamp down the memories. They kept flooding back. Images, formerly dulled by booze and drugs, resurfaced with crystal clarity. All those broken faces . . .

No. He couldn't. Not yet.

Yao put the loaded hypo against his vein. His thumb hovered over the button. He hesitated.

Then he saw a beautiful sun. The rings of Vega II barely visible in the morning sky. And the field of bodies. Torn apart. Scraps of people strewn among the grass. So many pieces you couldn't tell what belonged to whom. A child screaming.

His thumb hit the button.

The memory went away.

* * *

It'd been two hours since Mags had been dumped in this holding cell. At least, she thought it was a holding cell. The last time she was in Levski, this area had been some kind of sorting facility or something.

Guess it was now their police station. The burnouts of Levski had certainly come a long way.

She could still hear alarms echoing through the reinforced metal door. When the EMP went off, she'd tried to grab the lockbox and make a break for it, but the guard had a surprisingly firm grip on it. Fortunately, it was sitting on the table in front of her, so not a total loss.

It was those thugs who approached them in Cafe Musain. That's what worried her. How long had they been on her trail? Maybe it had been stupid to think that no one would come looking for something as valuable as the eriesium that was sitting in front of her, but this kind of money? It pays to be a little stupid.

The door unlatched from the other side and creaked open. A man entered the room. Older. Human. Short, close-cropped salt and pepper hair trimmed to mismatched lengths that implied he either cut his own hair or he frequented a second-rate barber. He had a heavy jacket and sweater on. All pretty standard fare for a station that was generally as cold as this one. Mags could see the top of a Los Imperators t-shirt peeking out from under the collar of the sweater.

A guard started to follow him in, but stopped after the man whispered a few words. The guard glanced at Mags then stepped back out. She waved.

"I'm Executive Devin," he said as he flipped open the lockbox to reveal the rock inside. After a quick once-over, he sat down in the seat across from her and looked at her. He cocked his head to the side. "Do I know you?"

"I don't think so." Mags wracked her brain. She'd definitely spent some time in Levski a few years ago, hooked up with some bad people like —

"You ran with Frank McGarr."

Shit.

"Maybe?" She really drew out the word, like she was desperately trying to make the connection. Truth was, she had run with Frank. Their crew was boosting freight ships that had parked up at transit stations. Levski was a great place to lay low. "I mean, I only stayed here a couple times over the past few years, but I met some interesting people here. Why I keep coming back, I guess. Did you know Frank?"

"Yeah, I had him exiled. He had been running crimes in UEE space and using us as cover."

"Ah. I didn't know. We bonded about music mostly. He wasn't a Los Imperators fan. I had to school him."

Devin didn't respond, just watched her. She decided to take a chance and keep going.

"Haven't seen him in a bit. I've been travelling a lot. You know, looking for work. I never really felt comfortable in UEE space, you know? Always feels like they're watching you."

"Well, they probably are." Devin replied with a shrug. His mobi pinged. He gave it a quick check and looked back at her. "I didn't catch your name."

"Kristin Breen," she fired back without hesitation. Kristin was a civilian she met once at a Sataball game. Some guy seated behind them said they looked like sisters. There was definitely a resemblance, so she became Mags' go-to 'clean ID' whenever she was in a pinch.

"So Cafe Musain . . ."

"Crazy, right?" She shook her head. "My mom always said, don't stick around when people start fighting in a public place. There's something not right in their head."

"Did you see who started it?"

Mags thought about it for a second to make it convincing.

"To be honest, I grabbed my stuff and hauled ass the second I heard the first shot."

"Pretty good reflexes."

"Sorry?"

"To react so quickly," Devin responded as he crossed his arms and settled back in the chair. "From the other statements I've gotten. There wasn't much of a buildup to it."

"Oh, no. I guess not."

"A witness that said one of the gunmen took a shot at you."

"Yeah, pretty nuts. I must've pissed her off somehow. Like I said, I didn't stick around to find out." Mags watched him make some notes on his mobi. "So, any chance I'll be getting out of here soon? Had a lead on a possible gig I don't want to miss."

"We've locked everything down. The People's Alliance has had to become more committed to washing out the harmful influences in our community, so no one's taking off until we sort this mess out." Devin stood up. "You might want to get comfortable."

"Great," Mags tried to make that sound as enthusiastic as she could.

*   *   *

"Where the hell were you? I was getting my ass kicked back there."

Ozzy didn't respond, just cut through the thinning crowds of people towards the old mining tunnels. The further they got away from the central Bazaar, the more the sound of shouts and confusion were replaced with the heavy hum of mining machines that were still trying to hack out profitable ore from the asteroid. The temperature dropped too. Squatters, huddled in dirty blankets, clustered around the few vents in the tunnels that pumped out heat.

Trin wiped the blood from her face with her sleeve while checking to make sure they weren't being followed. Heavy footsteps echoed down the hall.

"We're gonna have some company,"

Ozzy ducked towards a door, pulled it open and motioned her inside.

"Come on."

Trin went in. It was a small store room. All the equipment racks had been cleared out. There was an overturned, rusted chair on the floor. She pulled it up, slumped into it and checked her nose. It didn't feel broken.

"You see anybody else?" She looked up at him.

"No," Ozzy slammed another latch closed then turned and stared at her.

"So?"

"What."

"Where'd you go?"

"I ran into somebody," he replied. "Blind Jack Sticha."

Trin tensed up. Her hands naturally clenched into fists.

"He's here?"

"Yeah," Ozzy didn't move. Just watched her stew in rage for a few moments. "You remember when I got pinched?"

Trin looked back at him.

"What?"

"When I got snagged by the law. Do you remember it?"

"Yeah."

"Walk me through it." Ozzy folded his arms.

"Are you serious?" Trin forced a laugh and kicked back in her seat.

"Walk me through it," he said a little more emphatically.

Outside the heavy footsteps thudded up to the door. Someone pushed on it from the outside, but it didn't budge. There was a muffled conversation. Someone tried it again.

"We were knocking over a cargo ship. You clipped their quantum before they could spin up. I crossed over, breached the airlock, swept up the crew and was trying to bring the engines back online when a bunch of local law showed up. You were trying to get me to abandon the ship, but I stayed aboard and finally got her running. We made a break for it. You got nabbed."

"How?"

"How what?"

"How'd I get nabbed?"

The voices outside moved on. The heavy boots slowly disappeared into the distance. Ozzy watched Trin the whole time, expectantly waiting.

"I don't know."

"I got clipped by *your* ship. I got close so you could jump over. Instead, you got the engines online, swung that piece of shit freighter around, hit me, and lit out. You got away. I got years."

Trin didn't say anything.

"Why'd you run?" Ozzy stepped forward. His voice dropping lower, quieter, which made it even more ominous.

"You kidding? You remember how much firepower was headed our way."

"You've never been scared like that before."

"That ain't scared. That's just smart.

"Did you leave me behind?"

"What? No."

"Did you leave me?"

"Blind Jack got in your head, brother." She tried to laugh it off. He kept moving forward.

"Tell me the truth." Ozzy persisted. He was standing right over her. "Did you leave me?"

"I don't know."

"Bullshit. You picked the score over me."

"I don't know. All right?" Trin pushed out of the chair to get away from him. "Shit happened fast, man. We needed to get outta there. I didn't even know you weren't behind me until they'd already gotten you."

Ozzy watched his sister weave her way to the door and listen, desperate to do anything but have this conversation.

"We gotta get the hell out of here." She checked her nose again and winced.

"Yeah," Ozzy finally said. He walked over and listened at the door. It seemed quiet. He unlatched the bolts and opened it. Trin's mobiGlas hummed. She quickly checked it.

"Come on," she said as she hustled out into the halls, back to her old self. Ozzy followed.

The two made their way back through the tunnels. They stepped out on a platform overlooking the Grand Bazaar. Cafe Musain's entrance was surrounded by curious onlookers and People's Alliance enforcers.

Kel was waiting, clutching a Captain Levo figure and licking at what looked like ice cream stains around his mouth.

"Very bad. Human Legal People have Captain Mag."

"Does she have the eriesium?" Trin replied almost immediately. Ozzy glanced at her. It was obvious that the valuable mineral was her prime concern.

"Yes," Kel nodded more times than necessary.

"Guess we'll have to get her out then," Trin flashed a grin at Ozzy.

* * *

Arno shoved the body into the vent and adjusted his new, stolen outfit. He'd managed to kill the previous owner without spilling a drop on the clothes. There were times he impressed even himself. He transferred his weapons from his discarded clothes then dumped the clothes in the vent with the corpse.

He stepped out of the side room and made his way back to the public. Thanks to his new threads, he didn't draw any attention. He still reeked like ozone from the grenade, but with all the other smells lingering in the place he didn't think anyone would notice. Arno stopped to grab a drink and survey the crowd. He spotted Osane at one of the overlooks doing the same. She was wearing different clothes too.

He paid up and made his way to her.

"Anything?" He asked as he approached.

"No," she said while still scanning the faces. "This has turned into quite the shitshow."

"Yeah," he finished his drink and tossed the plastic bottle into a corner. "They didn't slip the launch freeze, did they?"

"No, the *Harlequin*'s still docked. Saw it myself."

"I hate to play the pessimist, but we should plant a tracker."

"Already done."

"See? Synchronicity." Arno looked at his mobi. "That's why we're so effective at what we do."

* * *

Mags rubbed her shoulders. She always hated how cold Levski could get. Well, all stations really. Sure, they could jack the temperature up, but it was always artificial heat. It was never really truly warm. That's why she always said she'd retire somewhere tropical. Somewhere she could get by with a thin blanket and even that would only be for worst case scenarios. Some place she'd never need to close the windows.

A flurry of muffled, agitated voices drew closer outside the door. Suddenly the door opened. Mags grabbed the lockbox and backed away. Kel came striding into the room, dressed completely differently than the last time she saw him. He had swapped out his "Human clothes" for the traditional Banu clothes he only wore when they drifted into the Protectorate. Executor Devin followed shortly after along with some confused People's Alliance guards.

Kel took one look at Mags, then whirled to face Devin.

"Unacceptable. Yes. Look. Look!" He waved his hand toward Mags. "She is in completely unacceptable condition. Shocked am I to see property treated in this way."

"She's a person. Not property," Devin tried to intervene, but Kel's eyes widened in shock and horror.

"Not property?! I buy her from Essosouli Prit direct," Kel got more and more agitated as he spoke. "She three job away from paying off debt when she took *my* property." Pointed to the lockbox. "You dare to say she not mine! Defy all tradition of the Banu. Shame!"

"Look," Devin started backpedaling. "I'm not trying to denigrate your culture."

"Yes! Yes, you do!"

"I'm not —"

"Then give her to me. Now. Now I say."

Devin, completely flustered, finally motioned to one of the guards to uncuff Mags, who was as baffled as the rest. Kel looked at her with disdain.

"Wait outside. Will discuss what this cost."

Mags looked down, playing into . . . whatever role Kel was trying to push . . . and quietly walked out of the cell. As she passed, Kel turned back to Devin and patted him on the forehead.

Mags followed him as he proceeded outside. She wasn't sure exactly how the slave dynamic worked in Banu culture, but figured it was a safe bet.

Kel ignored everybody as they walked, playing his role perfectly.

Once they got out of the makeshift station, Kel turned back to make sure they were alone, then looked at Mags. He reached into the folds of his clothes.

And pulled out the Captain Levo figure to show her.

"Captain Mag, look what I found," he said with unfettered excitement.

"Kel, that was amazing," Mags hugged him.

"Oh, no. Captain Mag, you needed to be free." He looked down at the figure and played with it a little bit.

"Holy shit," a voice said from around the corner. They looked over to see Trin and Ozzy step out. Trin was laughing. "I can't believe he pulled it off. And you got the box?"

"Glad to see you guys made it out of there," Mags nodded to both Trin and Ozzy. "Is Levski still on lockdown?"

"Yes, far as we know," Trin took the lockbox from Mags and draped it across her shoulder. "Do you think you can still make a deal with that Xi'an?"

"Maybe, I don't know. He might be long gone." She glanced around at the passing faces in the crowd. "Any sign of those syndicate hitters?"

"Nah, nothing." Trin started walking back towards the hangar lifts. "We should head back to the *'quin*, seal up and get the hell out of here as soon as they let us."

Mags looked around.

"Anyone seen the doc?" Mags asked as she look to Ozzy and Kel. They shook their heads.

"No, but he knows where we're parked," Trin said as she locked eyes with some local who had glanced at the lockbox. He quickly averted his gaze and ducked away.

"We can't leave until we find him," Mags said as she rushed to catch up with Trin.

"If he ain't there when we launch, that's on him. I'm not risking this score for his junkie ass."

Mags checked her mobi and quickly typed out a message. Kel followed along.

Ozzy stopped and stared after Trin. He typed a message on his mobi too.

*   *   *

The *Harlequin* waited on the expansive landing pad. A couple local mechanics sat on the far end of the pad by the refueling station, chain-huffing stims and blasting music. A small maze of crates, both new and old, encircled the edges of the landing pad. Tall platforms were positioned near the rock face that led into Levski. A People's Alliance banner hung from the wall while their Rules of Life, a list of aspirational mantras that the inhabitants lived by, was helpfully displayed by the airlock.

A warning light above the airlock door began to flash, precipitating the airlock doors hissing open. Mags, Kel, Trin and Ozzy stepped out and started walking towards the landing platform.

Mags seemed preoccupied with her mobi.

"Still no word from the Doc."

"What the hell, Mags, he's probably tripping the life fantastic somewhere. Leave him be." Trin responded as she adjusted the lockbox in her hand. "We got bigger fish to fry."

"I'll say." A voice emanated up ahead. The group slowed to a stop.

Blind Jack Sticha, leader of the Souther Titans, stepped out from behind one of the crates as he lit a stim. All around, the rest of the Souther Titans emerged from their hiding places and leveled guns at the group.

"Hey Jack," Trin said through gritted teeth. "Been a while."

"Hey Trin." Jack smiled that warm grandfatherly smile that cleverly obscured the thieving murderer inside. "Why don't you do us a favor and drop the box?"

"Why don't you kiss my ass?"

Jack laughed one of those belly laughs that echoed off the cavernous walls.

Trin's other hand started to reach for her gun when something clocked her hard in the back of the head. She dropped into a heap. The lockbox clattered to the floor. Ozzy stepped around her body and aimed his pistol at her head.

Mags and Kel stared at him in shock. He stared right back and shook his head. *Don't.*

Ozzy turned back to Trin and kicked her in the side. The impact slid her across the floor as the breath escaped her body.

"I knew you clipped me on purpose," he said calmly as he grabbed the lockbox. "You always were in this game for you, sis. I always had a feeling, but now I know."

"You goddamn traitor," she hissed between gasps of air.

Ozzy kicked her in the head then turned to join Blind Jack and the other Titans.

"You . . . you think you're just gonna walk away from this?" Trin wheezed.

Ozzy stopped. Trin slowly pushed herself to her feet. Her head rolled as she tried to maintain her balance.

"I'll find you," she muttered as blood drained out of her head into a pool on the floor. "I'll find all of you."

"No, Sis," Ozzy said quietly. "Not this time."

Ozzy snapped up his pistol and put five rounds through her chest. Her body jolted with each shot and slammed back into the ground. She didn't move after that.

To be continued