

THE HISTORY OF THE CANADIAN SPACE STATION

**By: Maxime Croussette
(Maxorbiter/LordCroussette)**

September 24th 2022

v.220924

THERE IS A BEGINNING TO EVERYTHING, AND IT TAKES PLACE TEN YEARS AGO:

Hello. You might wonder who I am. My name is *Maxime Croussette*, though I am known under various names in the Orbiter community. On Dansteph's forum, I am Maxorbiter. On Orbiter-Forum. I am LordCroussette and, on the subreddit r/Orbiter, I am u/Maksimme. And, finally, I am known as simply "Max" on the Discord Server for the French-speaking community.

If you are a French-speaking member of Dan's forum or follow the Orbiter subreddit, you possibly heard of the Canadian Space Station before you found this add-on in your favourite add-on repository. In fact, you might have come here because I announced the release of this add-on there.

If you are part of Dan's forum, the Orbiter subreddit or the Francophone Discord Server, then you probably know what the Canadian Space Station is. But, if you came from anywhere else – or if you are from years in the future – then you probably do not know the history behind this small station. Thus, I will dictate it for you.

Ever since I began playing Orbiter, it was always a wish of mine to assemble my own station from scratch, launching modules to orbit, docking them to previous modules and then return to Earth to ready the next mission. However, I struggled for years to be able to do more than launch a Deltaglider into orbit and dock it to the ISS. In fact, I didn't even know how to light up a ship's engine until a month after I first began playing this simulator. It took a few more weeks to figure out how to turn a spaceship around.

Suffice to say, but my early adventures on Orbiter were nothing complex. I remember being awed and feeling a bit jealous when I saw other members of Dan's Forum launching shuttles and docking them to space stations, or

travelling to the moon or doing interplanetary missions in Arrow Freighters when I could barely put myself into orbit after months of playing.

It was around that time that I first wished to assemble my own little space station. On Dan's Forum, users "orbitermat" and "SolarLiner" were working together to assemble the "Hadfield Space Station", a Canadian-European space station named in honour of Chris Hadfield, famous Canadian astronaut who was Commander of Expedition 35 at the time.

I remember following the forum thread with apt attention, checking the site every day for an update, to see a new flight to the station, a new module assembled up here. My thirteen-year-old self (because that's how old I was) dreamed of assembling a station of his own.

Unbeknownst to me at the time, it wouldn't be until nearly ten years later in 2022 that I would finally accomplish that dream. But, I'm getting ahead of myself.

While I watched as more experienced Orbinauts accomplished amazing feats of space flight, I tried very much to learn how to do basic orbital manoeuvres. Eventually, I learned how to put myself into orbit with practically any craft I piloted (as long as it had a relatively good margin of fuel for error) and how to travel to the Moon and dock with a space station like the ISS or Mir.

But, as the years progressed, my interest in Orbiter slowly dwindled as I focused more and more on simracing games like F1 Challenge '99-'02 and, later, rFactor. The release of Orbiter 2016 revitalized my interest in the simulator for a few months but, by 2017, I only played Orbiter a few rare times a years. I don't remember if I even touched the simulator in 2019 and/or 2020.

But, at the beginning of 2022, I slowly but surely began playing Orbiter again. While I kept on playing the 2010 version before, even after the release of 2016 as I loved my DGIV, I concentrated uniquely on 2016 in this small comeback. Early this year, I flew a Deltaglider from Cape Canaveral to Mir,

and then to the Moon were I landed. Then, I took off a few days later and returned to Earth to eventually land back home where everything began.

It was on this mission that I finally unlocked the key to reentry. Because, something I didn't mention before is that I was horrible at reentry. I might have been able to launch and dock but, when it was time to return home, I couldn't do it. I just couldn't figure out how others managed to reenter and land on a runway. Because, when I tried it, I always ended-up exiting my reentry over random patches of lands hundred of kilometres away from my target. Sometimes I was braking too fast and ran short, other times I didn't slow down enough and overshot the base by a wide margin. It baffled me and I could never hit the target straight.

And then, my adult self figured the key to everything:

Lift.

Wings generate lift...

Now, I can hear you right now. *"Of course they generate lift, duh! That's the whole bloody points of having wings!"* And for that I'll tell you to shut it and stop interrupting my Ted Talk!

Yes, wings generate lift. I always knew that. Otherwise, how else would one fly? But, I never understood how it worked.

I mean, an engineer who specialize in the subject would probably tell me that I still don't understand how it works, but I know enough for this simulator!

When I tried to reenter the atmosphere before, I always put the belly of my ship (usually a Deltaglider) facing forward with the nose pitched up by 40-50°. And it certainly helped slow down fast. But, I never really controlled it and, depending on the descent angle, would always end up losing it and the aerodynamic forces would force the nose back to 10-15°, allowing the Deltaglider to bounce off the atmosphere and crash a long distance away from the base. And it always annoyed me because, in my mind, spaceplanes **MUST** land with their bellies pointed forward! That's just how it was done!

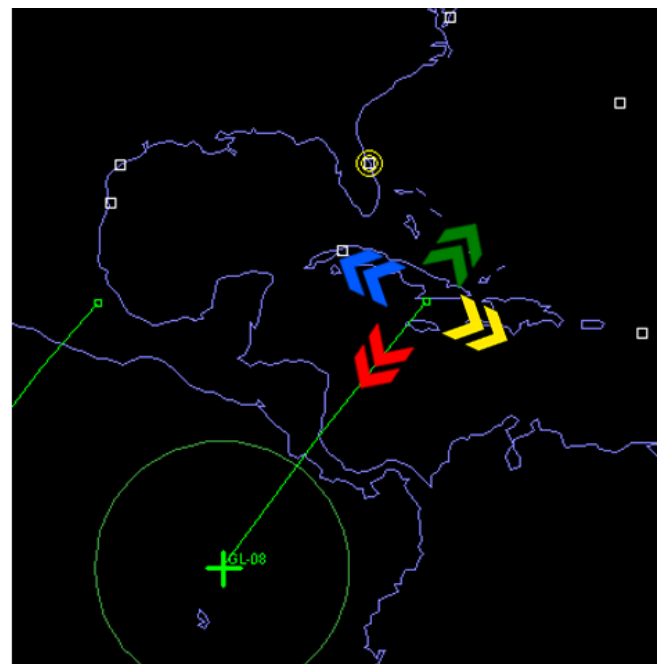
And then, in the beginning of the year, I suddenly hit me that no, I did not need to descend with a 40° angle! I could just point the nose forward and let it glide through until it reach the base!

But what if I start rebounding and overshoot? Turn the ship around so the wings generate downforce like a Formula One car instead of lift, bringing us deeper down the atmosphere!

But what if I'm going to land short because my current trajectory doesn't reach the base? Turn your wings so the lift generated raise your ship in the air, and even pitch up a few degrees if you need to!

And if you need to adjust the direction of your trajectory because you're going to land too south or north otherwise? Put your ship sideways and let the lift generate enough force to alter the trajectory of your ship to go in the direction you want to!

Because that's the answer, isn't it? Lift is the key to all of this. You need to go further? Generate lift upwards. Need to slow down faster? Generate lift downward. Need to go north? Turn 90° to the left and let the lift alter your trajectory. And turn right to go southern.

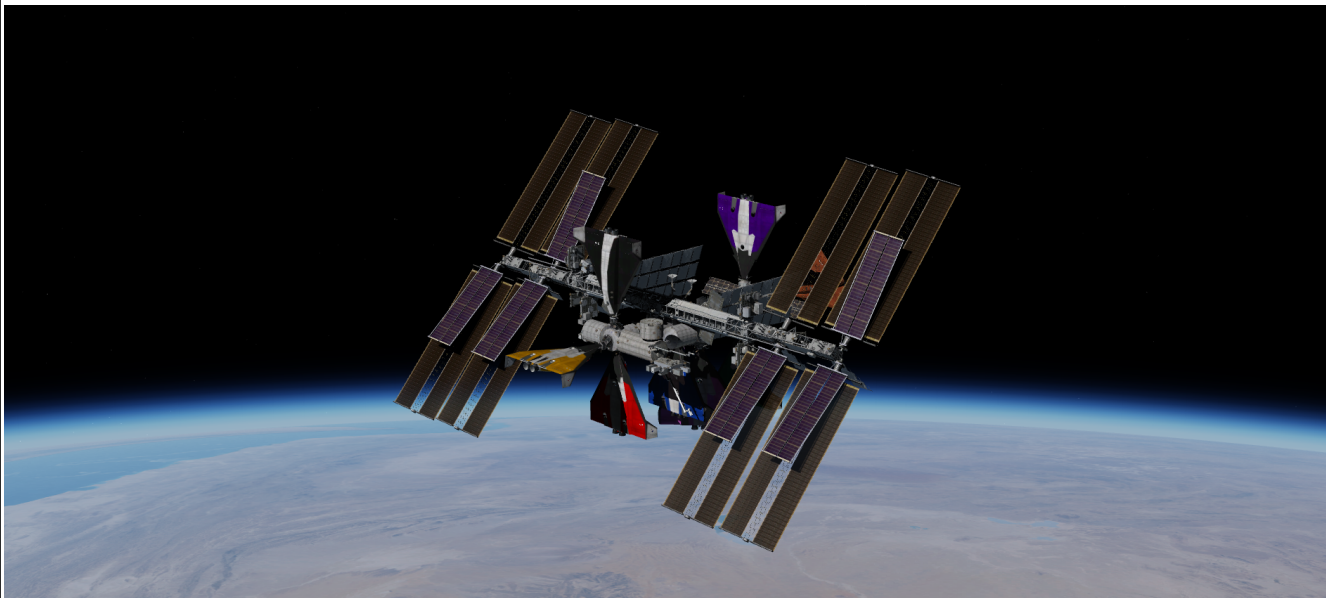


It's quite easy to alter one's trajectory when you know how to manoeuvre in the atmosphere...

And that was the final key I needed to find for my dream to assemble a space station to come true. However, the idea wouldn't come back to mind until the summer of 2022.

At the beginning of the summer, I took back Orbiter after not playing it since that flight to the Moon. This time, I started with a very simple mission to ensure I remembered the basics: take-off from Cape Canaveral and dock with the ISS.

This mission was accomplished easily – no surprise there. It had been ten years since I first played Orbiter and the basics had been mastered long ago. For fun, I decided to repeat the mission again, and again, and again until all the docking ports of the ISS were occupied at the same time. Since I downloaded the [Better ISS add-on](#), it meant the station had eight docking ports, not five like the vanilla ISS. And, I accomplished all eight flights. It made for a funny sight in orbit.



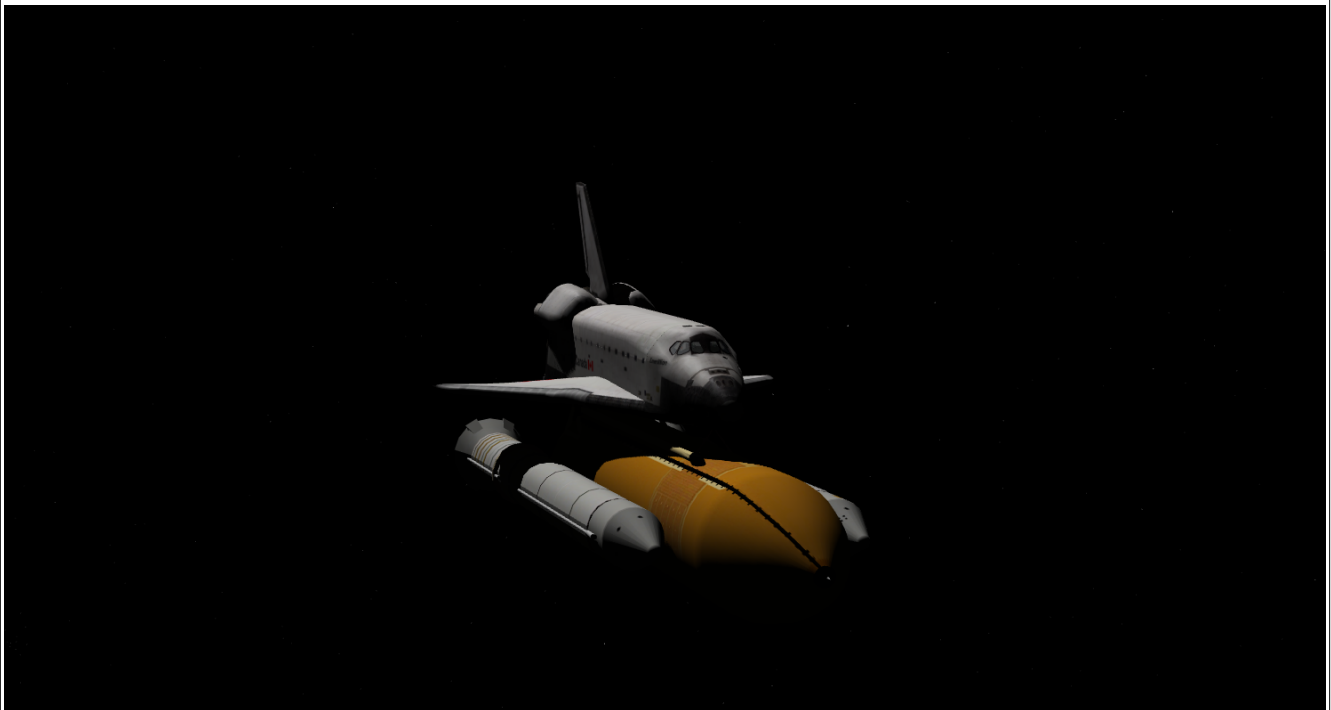
It was interesting to do, and I was almost ready to call it quit then. But... the mission felt incomplete without bringing all the Deltagliders home. At this point, reentry and landing at a base on Earth was not mastered. All I said about lift earlier? It was really a theory I had in mind which ended-up working when I made my voyage to the moon a year before.

But, I decided to do it. It had been ten years since I first played Orbiter. An entire decade of my two-decades long life. I needed to learn to reentry now, or I would never forgive myself.

Thus, I sent the first Deltaglider home. And... it worked! I was able to control my reentry trajectory easily thanks to the big wings of the Deltagliders. Repeating the same with the next seven ships was as easy as eating a pie!

It was after that mission that I decided to fly the Space Shuttle again. I mastered rendez-vous and reentry in a Deltaglider. But, could I repeat the same in a Space Shuttle, which has much less margin for error? That I did not know.

At first, I planned to use the vanilla Space Shuttle Atlantis to launch and rendez-vous with the ISS. It was something I never did and, just like assembling my own station, something I always wanted to do but never could because I wasn't good enough at the game. But, this time, I was confident! I would do it! I loaded a scenario and...



Yeah...

For some strange reason I still don't know to this day, the vanilla Space Shuttle simply does not work on my installation of Orbiter 2016. Whenever I loaded a scenario with Atlantis on the launchpad, it would summon the Kraken from the Kerbal universe and send it flying through space at faster-than-light speeds.

Now, you might say "Why not simply put it back on the ground with the Scenario Editor?" And that's an excellent idea! Let's try it!



It didn't work.

As you can see in this very useful picture, it doesn't work. I mean, would you launch a Space Shuttle that look like that? Me? No thanks.

So that left me with a problem on my hands. I want to launch a Space Shuttle and dock it to the ISS. But, the Space Shuttle doesn't work on my Orbiter 2016. So, what do I do?

The logical idea would be either find a replacement or fix the problem. I tried fixing the problem. Didn't work. So, that left me with finding a replacement. But... it's not like Shuttle Fleet by David-something exist on Orbiter 2016. Should I still try to install it and hope for the best? Or should I just changes versions and move back to Orbiter 2010? I kinda got used to my Orbiter 2016 and that didn't interest me very much. But it didn't look like I

had a choice. After all, a Shuttle Fleet replacement for 2016 doesn't exist... right?

WRONG!

Introducing Space Transportation System 2016 by gattispilot, an add-on that sought to bring the same functionalities Shuttle Fleet did to Orbiter 2016!



<https://www.orbiter-forum.com/resources/space-transportation-system-2016.134/>

Holy shit! There was my solution! I could fly a Space Shuttle on Orbiter 2016 easy peasy! This was excellent!

After installing the add-on and doing a bit of troubleshooting (that thing doesn't install itself easily, let me tell you), I managed to make it work and tested the add-on. To my delight, the launch system of the Space Shuttle is a Multistage rocket made to look like a Space Shuttle. As it just so happen, I know Multistage, having worked on an Ariane 6 rocket myself! It meant I could change things at will should I need to! It was perfect!

With a proper, working Space Shuttle in my hands, it was time to launch my first mission to the ISS!

At first, I considered using the original orbiters and continuing from where STS-135 left-off. But, after seeing my good friend Snax fly a SSU shuttle with the name “Massilia”, I decided to make my own Space Shuttle. And, unlike him, I also decided to change the American flags, logos and wordings to Canadians ones.

And, just like that, Space Shuttle Emerillion was born!



Space Shuttle Mission – 1, the first flight of the Canadian Space Shuttle program.

Since I was now flying my own Space Shuttle, I decided to use a new naming convention for my missions. I switched from “Space Transportation System (STS)” to “Space Shuttle Mission (SSM)”.

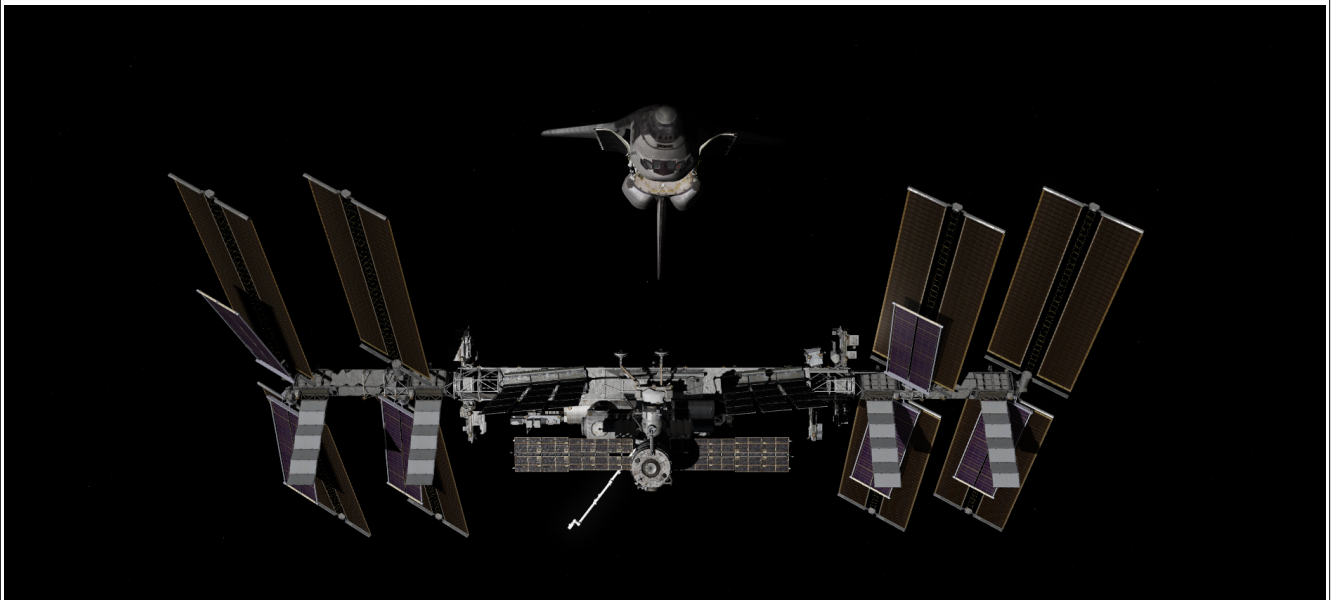
And SSM-1 took-off from Cape Canaveral on July 18th 2022 with the goal of reaching the International Space Station. Unfortunately, as I quickly learned, doing a rendez-vous with a Space Shuttle is not as easy as doing it with a Deltaglider. *Oh no, no, no, no, no!* The fuel and DeltaV is incredibly limited and leave little to no margin of error. Emerillion ended-up burning more fuel than she was allowed to spend and ended-up aborting the attempt to return home her tail between her legs.

Thankfully, Emerillion was able to complete the second objective of the SSM-1 mission, which was to confirm that the technique employed by the Deltagliders to manoeuvre during reentry also worked with the Space

Shuttle. And, it did! Emerillion landed safely at the Kennedy Space Center. Her flight to the ISS would have to wait. But, the ice was broken and the Shuttle Program had started.

Emerillion was not enough to carry an entire Shuttle program on her back, so she was given a younger sister. Space Shuttle Adventure was the second Canadian Space Shuttle to launch, which happened a few days later on the 21st of July.

To my delight, Space Shuttle Adventure did manage to rendez-vous and dock with the International Space Station before coming back home and landing in one piece. SSM-2 was a complete success and was able to prove that rendez-vous with a space station was in fact possible with a Space Shuttle.



Space Shuttle Adventure and the International Space Station on Space Shuttle Mission – 2.

And that's when the idea to build a space station from scratch came back in full swing. SSM-2 and Adventure proved I was good enough at the game to reach a space station with a mere Space Shuttle. Could I repeat the experience while carrying a space station module in the cargo bay?

And I thought... "Yes."

So I put Emerillion back on the launchpad and launched SSM-3 on July 26th, believing I would easily reach the ISS. And...



Space Shuttle Emerillion on Space Shuttle Mission - 3

I ran out of fuel and got stranded in space.



I couldn't believe it. What did I do wrong this time??? Why did I fail? What's wrong with me as a human being?

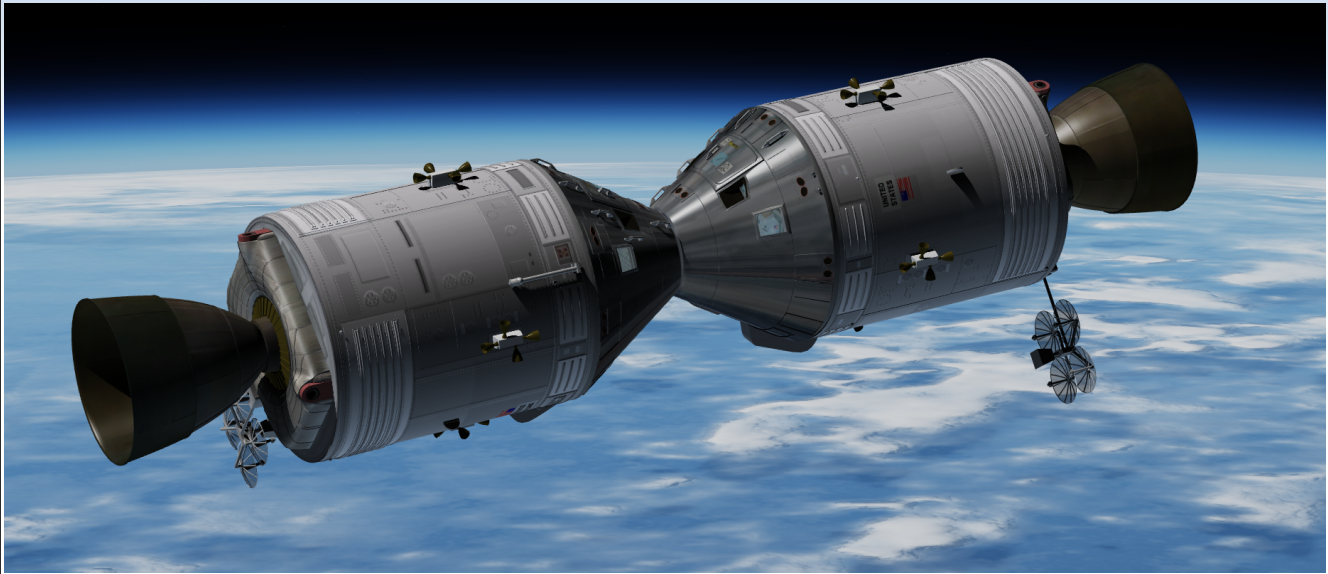
In the end, I needed to launch one of the Deltagliders I used for my eight-DGs ISS mission to refuel Emerillion. I contemplated using the new filled-up fuel tanks to reach the station but decided not to in the end. So, once again, Emerillion had to go back home with her tail between her legs.

The next docking attempt wouldn't take place on SSM-4 but SSM-5. Adventure flew on SSM-4 with a fuel tank in her cargo bay. GL-01 rendezvous-ed with Adventure, grabbed the tank and took-off for the planet Mercury. Adventure peacefully returned home after a second completed mission.

So far, it looked grim. Only Adventure was able to complete her missions. The younger sister was leaving her older sister in the dust. So, I went back to

the drawing board and decided to push the pause button on the Space Shuttle program in favour of doing other missions.

I sent a XR2 to the Moon (which also needed saving as its landing legs collapsed on landing) and then launched the Apollo-Apollo Test Project, which was a great success. These missions were enough to push the Shuttle on the back burner until I regained confidence.



The Apollo-Apollo Test Project, where Apollo CSMs Peppermint (Apollo 19) and Excalibur (Apollo 20) rendez-vous-ed in orbit and docked.

With the successful AATP mission, it was time to return to the Space Shuttles.

The next logical option would have been to launch Emerillion again and this time succeed in docking with the ISS to prove that the oldest Shuttle of the fleet was capable of accomplishing her own missions, that she wasn't cursed as I jokingly said she was.

But, instead, I built a third orbiter. Space Shuttle Brunswicker, third Shuttle of the fleet, took off from Cape Canaveral for her maiden flight on SSM-5. And, just like her older sister Adventure, she too managed to dock with the ISS on her first try.



Space Shuttle Brunswicker undocking after a successful stay at the International Space Station.

Now it was getting ridiculous! Not that I wasn't happy to have successfully docked again, but that this brand new shuttle did it on her first try as well while Emerillion failed on two different attempts was sad!

I could not let that stand. So, I launched Emerillion again on SSM-6. And, ladies and gentlemen, she did it! And not only did she successfully rendezvous and dock with the ISS, but she successfully brought a new module and PMA docking port to the ISS. In a single flight, Emerillion proved herself and accomplished what her younger sisters did not:



She proved that the idea of building my own Space Station was entirely feasible!

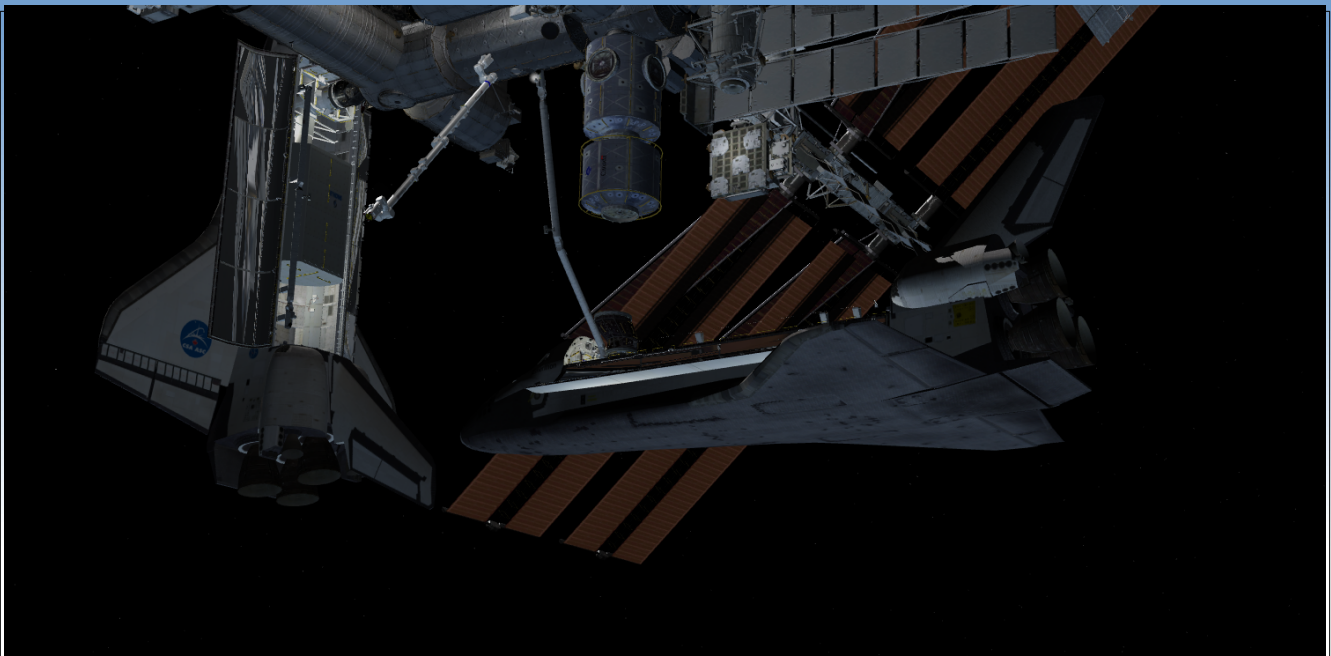
Now I was pretty confident I managed to master rendez-vous and docking with a Space Shuttle. But, to ensure my space station could indeed be assembled, I decided to organize one last mission to the ISS. Well, not one exactly but two. After all, I did in fact add a new shuttle docking adapter to the ISS. Why not use the two available at the same time?



Emerillion (SSM-10) and Adventure (SSM-9) ready for launch.

SSM-9 and SSM-10 were the next missions to take-off for the ISS after Adventure and Brunswicker spent the previous two missions putting satellites into space. Adventure on SSM-9 took off first, bringing cargo to the International Space Station while Emerillion went second, bringing in another module. Adventure was launched first, believing its remote manipulator arm might come handy while installing the module in Emerillion's cargo bay. But, it ended-up not becoming the case.

However, the two Shuttles did succeed in their main mission, which was to visit the ISS Together.



Adventure (left) docked as Emerillion finish installing the new module.

Adventure and Emerillion came back home in one piece. With the end of the double ISS mission, I knew for sure:

My own Space Station project was a go!

SSM-11 was soon put into work. For this mission, it was decided to launch the new member of the shuttle fleet: Olympic. The fourth sister would launch from Kennedy Space Center on her maiden flight with the important goal of putting the first module of the space station into orbit. It was an objective she accomplished easily.

The first module of the space station, which was given the unoriginal name of “Canadian Space Station” contained two orange solar panels which would be tasked with fuelling the electrical systems of the first two modules in electrical power. A PMA adapter was also included in the cargo bay. Olympic needed to dock with the CSS, after all!



Space Shuttle Olympic on her maiden flight docked to the Canadian Space Station.

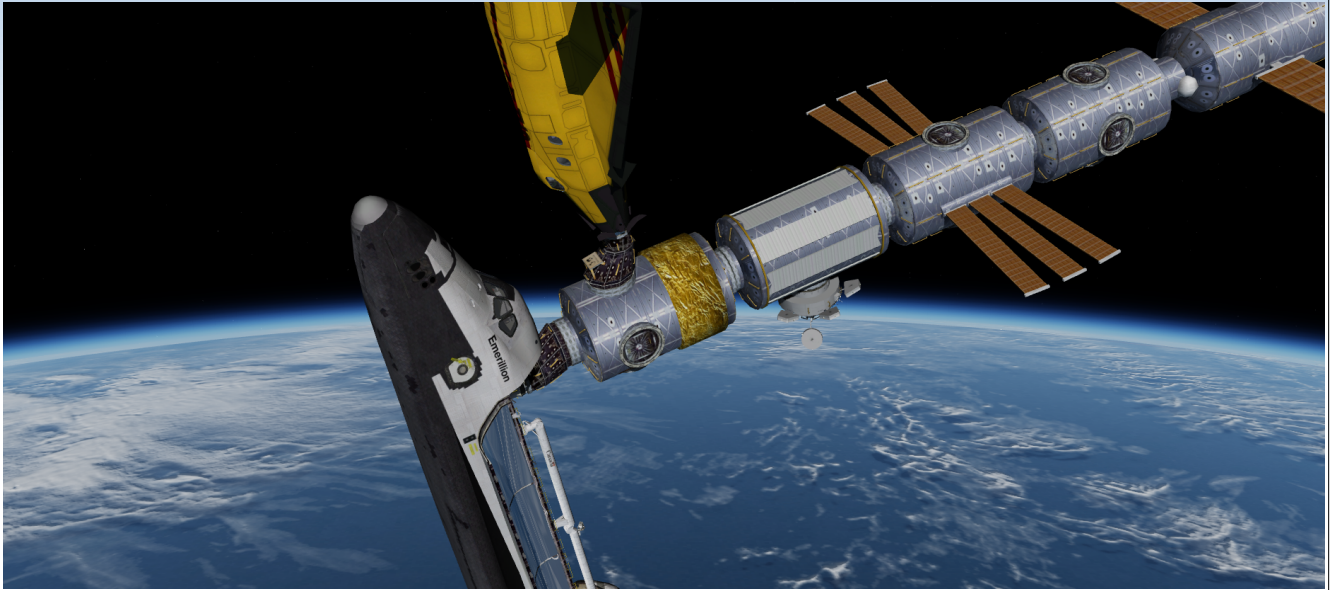
Space Shuttle Olympic returned from her maiden mission with acclaims. With the successful launch of the station, it was time to send the next modules to the CSS.

Brunswicker took off not long after on SSM-12 to bring Module-2 to the CSS.

Adventure flew next on SSM-13 and brought Module-3, which would later serve as the base for a pair of solar arrays. And, like the first station, it had solar panels of its own.

Olympic would fly again for SSM-14 and brought Module-5 to the CSS. Yes, Module-5, not Module-4. Module-4 was intended to be at the other end of the station where another PMA adaptor would be located, allowing for two shuttles to be docked at the same time. But, it was realized that the CSS would not be long enough to offer enough clearance for a ship to dock on its underbelly, which was intended in the future. So, Module-5 was built and launched by Olympic first. She also brought a cupola and a second PMA adapter, this time one designed to allow Deltagliders to dock.

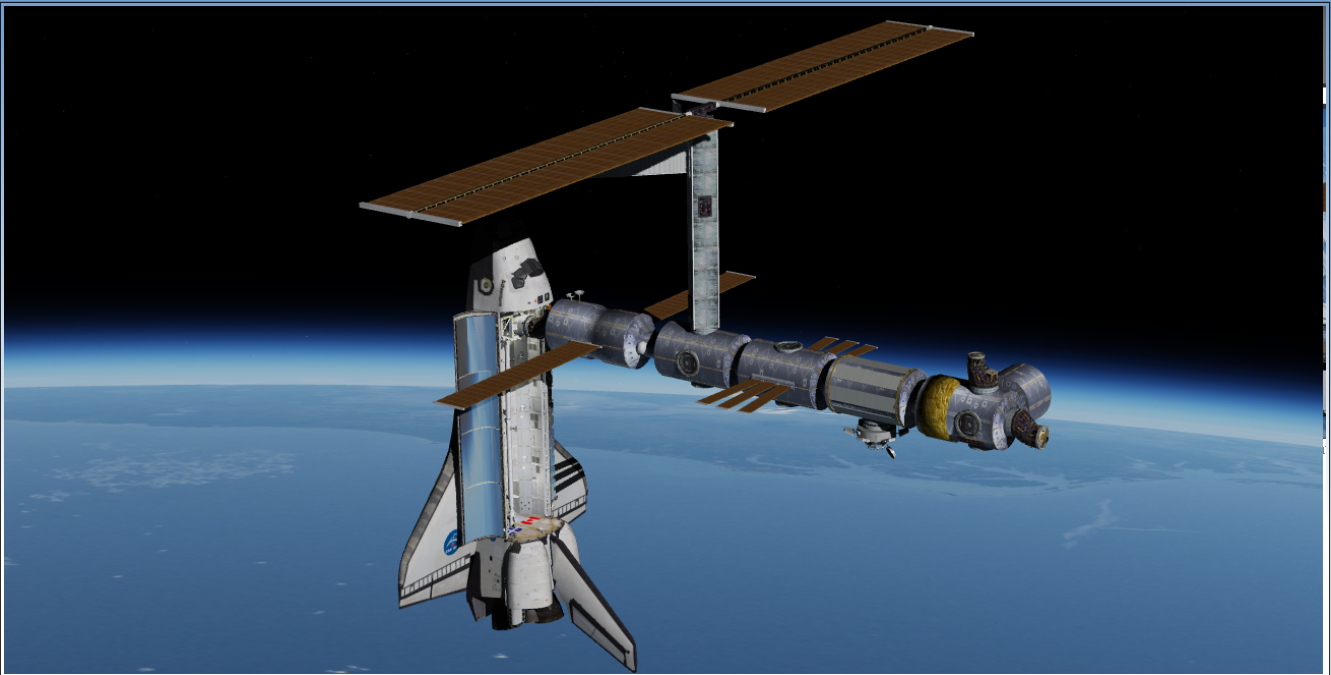
Emerillion would finally make her first flight to the CSS on SSM-15, which brought Module-4 and the third and final PMA adapter to the CSS. Emerillion would complete the main row of modules of the CSS, completing the first step of the assembly.



Space Shuttle Emerillion and GL-07 docked to the Canadian Space Station.

The next step was to install the main solar arrays of the station to fuel it in electricity. Brunswicker took part in SSM-16, which launched from Cape Canaveral on August 25th. The third sister carried in her cargo bay the small Module-6, which was installed on the side of Module-4, and the base of what was called the “Solar Tower”.

Then, SSM-17 took off. Adventure brought the rest of the solar tower and deployed the main solar arrays. For the first time, the Canadian Space Station looked like an actual space station.

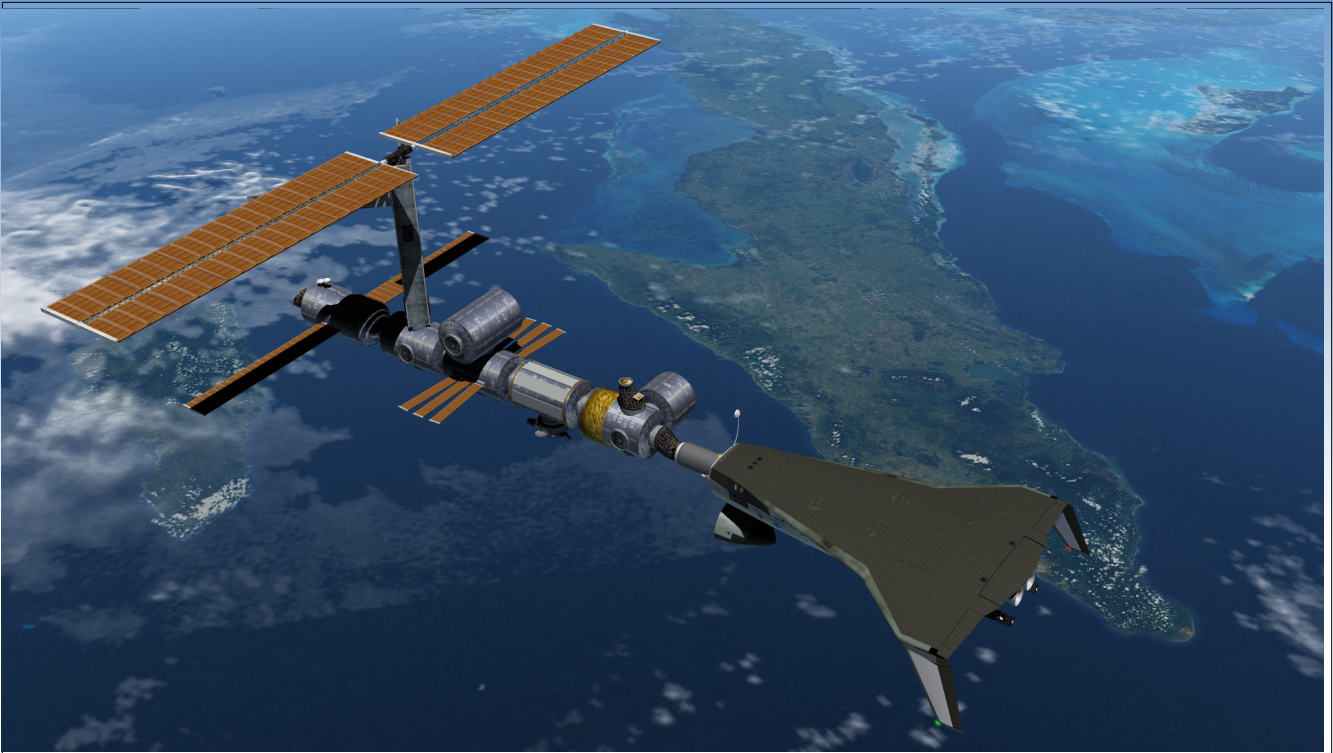


Space Shuttle Adventure docked to the CSS during Space Shuttle Mission – 17.

The station was now fully powered and the rest of the modules could be brought in. Olympic launched to space for SSM-18 and brought Module-7, which was originally docked to the top of Module-3 next to the solar tower. Later, it would be moved to the side of Module-2.

While the next mission was being prepared, the Canadian Space Station received its first International visitor. In cooperation with the European Space Agency (by Snax), the Albatross spaceplane Europa visited the CSS to bring cargo to the crew.

Europa would end-up staying for a day before travelling back down to Earth, where she landed at the Kennedy Space Center.



The European Space Agency's Europa spaceplane docked to the CSS.

SSM-19 took off next. It was the maiden flight of Space Shuttle Resolution, fifth and intended final shuttle of the Canadian fleet. She brought with her a special module. Unlike the previous ones, it contained neither habitation space nor a source of electrical power. Instead, Module-8 was a fuel tank.

I was beginning to think about the future of the station by that point. Not many flights were left before it would be fully completed. So, I decided to make the CSS into a refuelling depot and launch platform for future lunar missions.

The fuel tank was added to allow Deltagliders and other ships of the kind to make a pit-stop to the CSS before leaving low-Earth orbit. The orbit of the CSS was ideal for that goal as it was already at a low inclination.

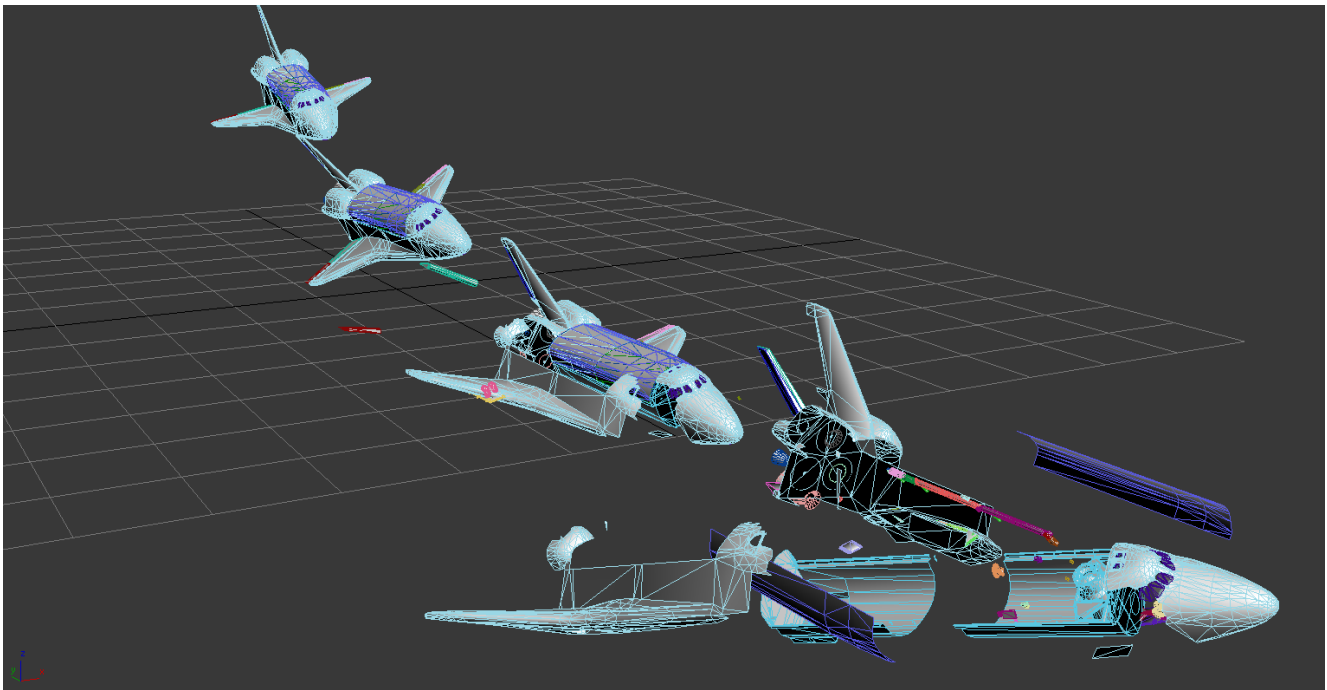
Everything was going perfectly well and no missions failures took place since SSM-3. It seemed like I had fully mastered the use of a Space Shuttle. The sky was no longer the limit.

And then came the Adventure Disaster.

The mission objective will be kept confidential as it was a military mission. But, on September 5th 2022, Space Shuttle Adventure took off from Vandenberg Air Force Base with a secret military payload in her cargo bay. She launched south and released the secret payload into polar orbit. She was set to land at Istres-Le Tubé, an Air Force base belonging to the French Military in southern France, only a few hours after launch.

However, while the French citizens living near the base were getting ready to see a Space Shuttle land for the first time in their backyard, Adventure was struggling. For reasons that are yet still unknown – the Military like to keep their secrets secret, after all -, Adventure's reentry was faster than expected and exited reentry quicker than intended. She was in sight of the base and the crew tried to glide all the way to the runway. They nearly did so as well.

But, disaster took place.



3D reconstruction of the Adventure Disaster.

Space Shuttle Adventure crashed less than a kilometer away from the runway. While footage of the event is unavailable, it was reported that Adventure landed on her right wing as she tried to stay afloat. The wing collapsed under the pressure and the rest of the orbiter broke up in pieces on the ground. The crew survived but only just.

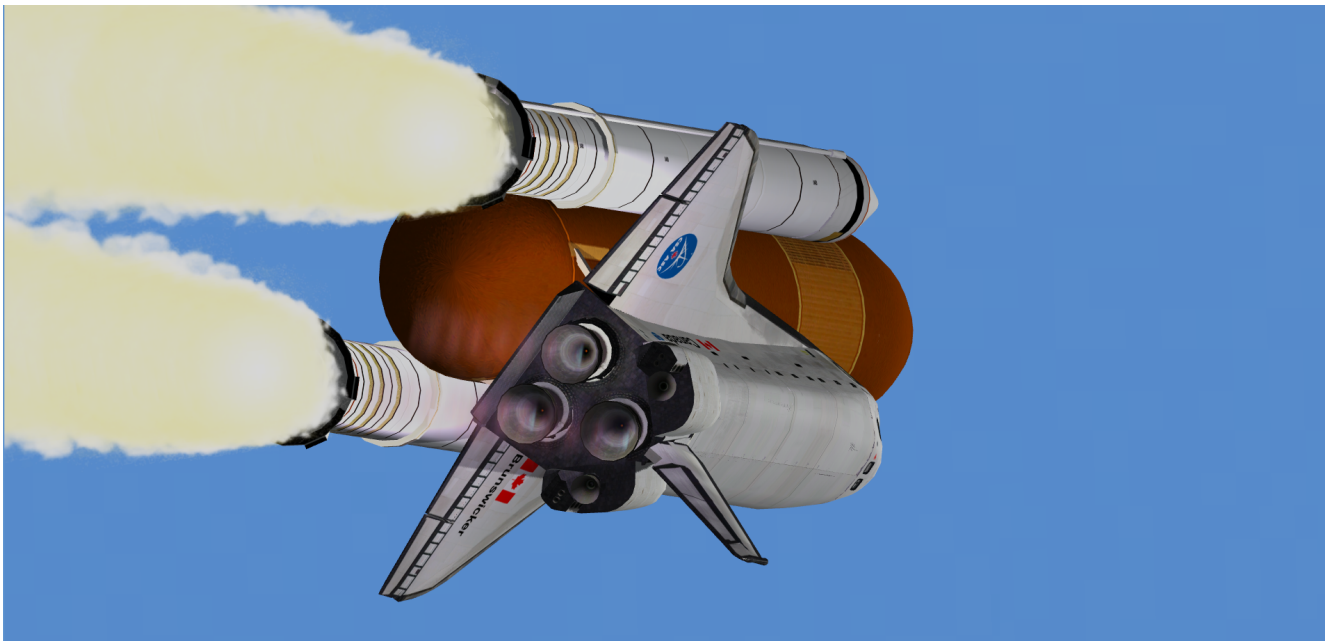
The Canadian Space Agency had just lost its first Space Shuttle. I lost my favourite Space Shuttle. The CSS assembly was going so well that I became arrogant and believed I could no longer do any wrong, that all of my problems were fixed and I would never fail a mission again.

And Space Shuttle Mission – 20 proved me wrong.

NASA lost their first shuttle (Space Shuttle Challenger) on their twenty-fifth mission. I lost my first shuttle on my twentieth mission. Despite having a huge advantage on them (using a simulator), I still lost an orbiter faster than them.

For a time, I wondered what to do. Should I pretend nothing happen? I am using a simulator after all. I could easily load an earlier scenario and try again – or just outright redo the flight. But, in the end, I decided not to. I crashed Space Shuttle Adventure and I had to own up to my mistake.

Thus, Adventure is now lost forever, leaving her four sisters to complete the assembly of the Canadian Space Station.



Space Shuttle Brunswicker launching on Space Shuttle Mission - 21, the first mission since the Adventure Disaster.

After a pause of a few days, Brunswicker launched on September 11th 2022 with the goal of bringing a new pair of solar arrays to the CSS. It was found that the main arrays produced less power than was expected, and thus could not power the entire station, even with the help of the solar panels on the Core and Module-3.

Also in the cargo bay was small Module-10, which made SSM-21 a near clone of SSM-16 objective-wise. Brunswicker succeeded in her mission and returned home safely, to a huge sigh of relief on my part.

Emerillion, only older sister of Adventure, took off next on SSM-22 and brought Module-9, which was docked on the side of Module-2 in the opposite direction of Module-7.

And, finally, the final assembly flight of the Canadian Space Station arrived. It was Space Shuttle Resolution who got the honour of installing the last module of the CSS. SSM-23 took off on September 13th 2022 and brought Module-11 to the station. With it's addition, the Canadian Space Station was completed.



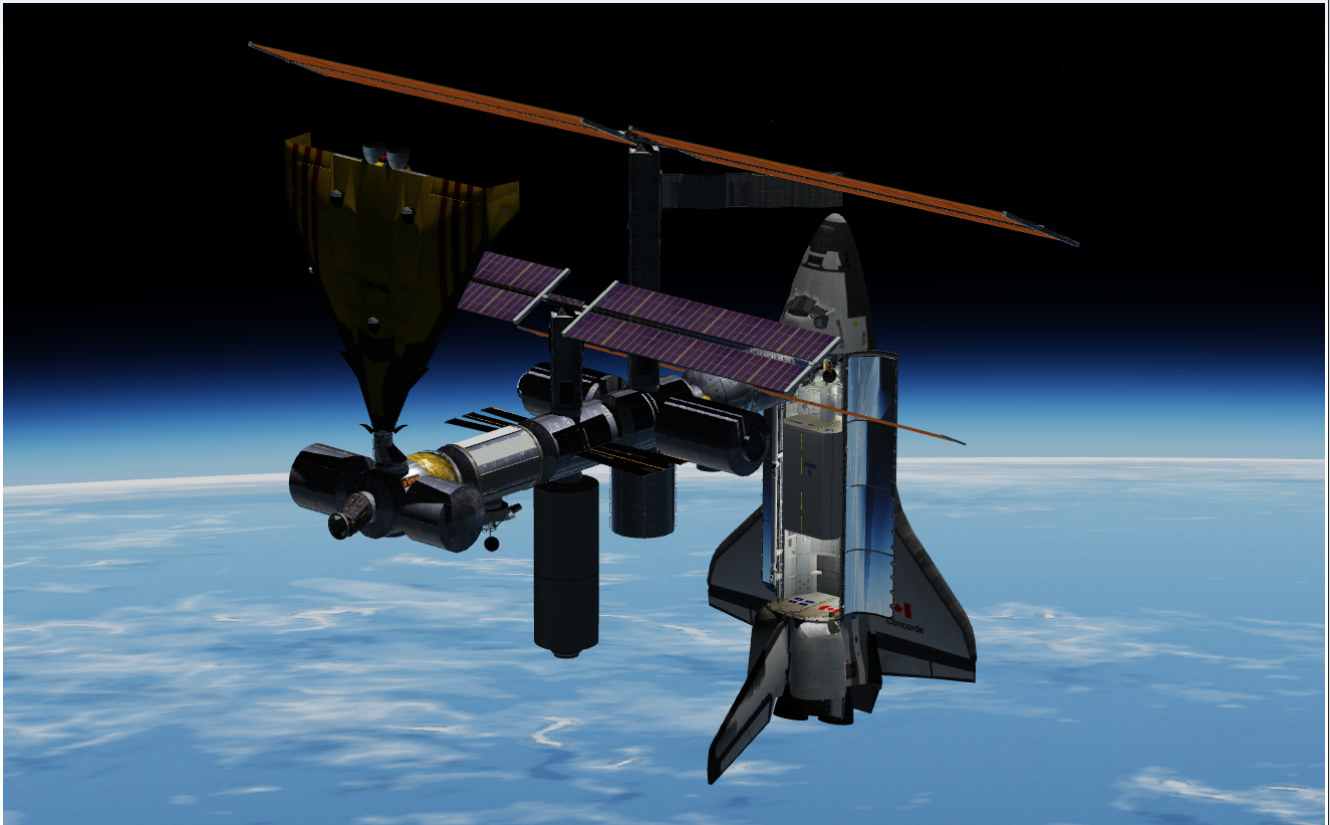
Space Shuttle Resolution docked to the completed Canadian Space Station during Space Shuttle Mission – 23.

Resolution returned home to receive accolades for the success of the final assembly mission. The Canadian Space Station was now open to service, and

a Deltaglider soon found itself docked to the station to bring the first crew that would occupy it.

A Canadian Space Shuttle would not visit the Canadian Space Station again until SSM-32, which took off on September 24th 2022.

As I am writing this document, Space Shuttle Concorde, sixth sister of the fleet and the shuttle built to replace Adventure, is currently orbiting Earth on her maiden flight while being docked to the Canadian Space Station.



Space Shuttle Concorde docked to the Canadian Space Station during Space Shuttle Mission – 32.

To keep the scenario clean and to facilitate use of the station, I put all the modules together to make the station into one single mesh/vessel. And, because I wanted to, I decided to put it online for all to play with.

It is now your turn to visit the Canadian Space Station. So, what are you going to do now?