

10th Anniversary GS Edition

Project Phoenix Flight:

Mission Time Zero-Zero-Zero



An Excerpt from **Challenging the Cold Silence**
by Professor Asami Sato, Ph.D., FRSEME



United Republic Space Agency Publications and Public Affairs Office



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An Excerpt from *Challenging the Cold Silence:
The Inside Story of Project Phoenix Flight*

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IN *NAGA'S* CARGO HOLD, all was quiet. The ballast tanks were loaded and sealed, their yellow tags giving positive indication that the ground crew had checked them. Not speaking much, we all climbed the ladder-stairs to the upper deck. In the after compartment, the hatch leading up to the *Agni V* stood open in the ceiling, waiting for Bumi and his crew to climb into history.

In the inevitable mover about the mission, someone—probably Korra or I—will no doubt make a very moving speech at this juncture, but the truth of the matter is, we said very little. Everything we had to say to each other, we had said at the final briefing or on the quayside, and besides, we were operating on a very tight schedule now. We wished each other luck, there were salutes and embraces and perhaps a kiss or two, but for the most part, we just got down to business.

Korra was the last to board the moonship. The last I saw of any member of the crew before she swung the upper boarding hatch down and sealed the ship was her face, grinning and throwing me a wink through the closing gap. While the rest of my crew went forward to the cockpit, I shut and locked the lower hatch, then stowed the ladder. That done, I followed the others and went up to my station, trying (and mostly failing) to stop myself thinking that might be the last time I ever saw her face-to-face. As I made my way forward, I made brief eye contact with each member of my crew and saw similar resolve in their faces. We all had at least one loved one on board that ship. It wasn't just a day at work for any of us.

As I took my seat, I checked my chronometer. Right on schedule. I strapped myself in, pulled on my helmet, and plugged in its built-in earphone and mic. "Comm check. *Naga* to Crescent Control, how read you?"

"Crescent receiving you five by five, *Naga*," Hikari's voice replied in my ear. Some people had raised eyebrows at my choice of my teenage daughter as Control Room flight director for the lift-and-launch phase of the mission, but I knew her familiar voice on the radio would steady everyone's nerves, and I knew that she was up to the challenge. The calm I heard in her now confirmed that belief and gave me a moment's pride before business intruded once more.

"OK, Crescent, I read you. *Agni V*, this is *Naga*, comm check."

"*Agni V*, reading you loud and clear," Bumi declared. "Let's get this show on the road."

Despite the gravity of the occasion, I couldn't help but chuckle. "Roger that, *Agni V*."

One by one *Naga's* twelve huge propellers started to turn, slowly at first and then faster, their contra-rotating blades blurring into near-invisibility as Rohan and Xian brought all six engines online. We glided away from the quay and out into Crescent Bay.

"Crescent, *Naga*, met check," said Senna, her eye on the mostly-slack windsock at the top of the pole at the end of the south breakwater.

"*Naga*, Crescent," Hikari replied. "Winds out of one-two-zero, less than two. Visibility unlimited, ceiling two-twenty, broken."¹

¹ In other words: A very light (less than two knots) breeze blowing from a compass heading of 120° (or almost directly into Crescent Bay), and clear skies with a broken cloud deck at 22,000 feet. A nearly perfect day to go flying.



"Traffic?" Senna inquired. We all knew the answer to that one—apart from the observation and photographic aircraft that would take off from Future City to intercept us over the launch zone, we were the only aircraft cleared to be flying anywhere in the northern hemisphere for the next two hours—but the question was part of the procedure, as was Hikari's immediate answer:

"No traffic. You're cleared for takeoff!"

Senna glanced at me and smiled. "Understand, Crescent, *Naga* cleared to depart at..." She glanced at the mission clock on her instrument panel, then added crisply, "Nine-thirty-two."

She and I made momentary eye contact across the center console; then, as we had on every test flight so far, we put our hands together on the throttle levers and pushed them smoothly to full power. *Naga's* six turbines screamed, her props roaring; despite her great weight, she surged forward with a will, pushing us back in our seats. Within seconds she was on the step of her boat hull, crashing through the light surf beyond the breakwater. Senna watched the airspeed indicator, her calculations simplified by the almost complete lack of wind, as we streaked out into the open sea, faster than any boat had any business going.



United Republic Space Agency Phoenix Flight Spacecraft Center - Crescent Island

URSA Photo: 198-44-294 Date: Jiuyue 14, 198 ASC Photo by: N/A

Spacecraft carrier *Naga* CV-1 with spacecraft *Agni V* aboard, taking off for release and glide test ("G" FLIGHT)



" V_L "² she reported, and then, a few seconds later, "Takeoff!"

We eased back together on our control yokes and felt *Naga* hesitate, the sea unwilling to give up its grip on her hull; then she broke away, springing into the air like an object pulled out of mud, and began to climb.

The climb itself was curiously anticlimactic, given the general intensity of the occasion. For more than an hour, we droned relentlessly upward, our mighty machine making slow, undramatic work of the task of carrying the *Agni V* most of the way to operational altitude. On *Naga's* flight deck, we strapped on our oxygen masks at 30,000 feet, not because we needed them, but because if something went wrong with the ship's cabin pressurization after this point and we *did* suddenly need them, we wouldn't have time to put them on. In this last phase—that area where we deliberately stepped outside the aircraft's margin of safety and into the unexplored far corner of the envelope—there would be *plenty* to do.

We passed *Naga's* service ceiling at 45,000 feet and kept going, feeling our way upward. The math told us that the ship's *absolute* ceiling, the height above which the wings simply wouldn't maintain lift in level flight, was 57,000 feet, but no one had ever actually *gone* there before. It was too risky to attempt during acceptance testing, given that we had only the one aircraft and flight crew. Like so much else on this mission, we were only going to have one chance to see if it worked.

By now, the engines were straining, their sounds weirdly attenuated (since they were really only reaching us through the airframe itself at this point), the propellers desperately clawing for any remaining atmosphere that could be used to pull us aloft. Through our control yokes, Senna and I could feel the ship trembling as the margin between maximum speed and stall speed grew smaller and smaller. At the outboard-facing station behind me, Rohan was all but in a trance, using airbending gestures to gather what little air was still outside together around us—trying to keep the local atmosphere thick enough for this whole mad scheme to work. Behind Senna, Xian was doing much the same thing, save she was metal-bending to reinforce the integrity of our launch vehicle.

At this phase, the mission plan called for Mako to take over comm duties aboard *Naga*, since we had assumed—rightly, as it turned out—that Senna and I and our flight engineers would be far too busy by this point. Now I could hear his voice in my ear, reading off our altitude and distance downrange for the benefit of the people patched into the circuit.

My own eyes were locked straight ahead, my hands gripping the control yoke tightly. At this altitude, there was no horizon as such, the curvature of Diquíú startlingly obvious in its shape and scope. Very few on our world had seen this sight firsthand, the blue-white curve of the atmosphere sheathing the ocean and landmasses below, the stark blackness threatening to overwhelm us from above. My breathing was controlled and regular, any remaining anxiety burned away just by the sheer effort it had taken to get us this far.

I double-checked my instruments against the flight plan clipped to the center of my yoke: 56,000 feet and still climbing, ever so slowly. Only exotic developments in jet engine technology that were still merely theoretical at that time would ever be able to take a manned aircraft higher. Flying due east at 525 knots,

²"Lift velocity", the speed at which an aircraft's wing is generating enough lift to counteract her weight. In a land-plane, this would also be the speed above which an aborted takeoff would probably lead to a runway overrun (V_1), but since our runway was 1,205 miles long (the sea distance from Crescent Island to Republic City), that wasn't an article of particular concern for us.

pulling 890 feet farther away from Crescent Island with every second, we would be somewhere over the old Western Empire by now; if anything went wrong at this point, the wreckage would come down in the uninhabited wastes of the Si Wong Desert. The only lives we risked were our own.

We were on target and on time. All we had left to do, as Dad sometimes used to say, was everything.

Senna gasped and pointed through the windscreen. "Asami, look!"

I looked up, and even though I had been expecting what I saw, my eyes widened.

The arc of the world before and below us was turning red. Not the pale pinks and warm oranges of a terrestrial sunrise or sunset, but a deep, lurid red that seemed to ignite the entire planet. Moments later, the source of the glow appeared in the black sky overhead, overtaking us far above with a terrible, majestic grace.

I sucked in a deep breath, tasting the rubber of my oxygen mask, and felt a brief twinge of dread. Despite everything that I had learned in school and discussed with scientists and spiritualists—despite what I *knew*—the sight of Sozin's Comet, round and balefully burning as it grazed the stratosphere high above us, still inspired an instinctive flicker of fear. I was certain I wasn't the only one who felt it, but I couldn't let it rule me. Not now.

"Comet in sight, Crescent," Mako reported, the tension in his own voice contained but evident. "*Naga* requests GO/NOGO for launch."

Even as busy as I was, I felt another surge of pride as I heard Hikari's voice, as cool and even as if she were participating in a spelling bee, respond, "Roger, *Naga*, stand by. *Agni V*, what's your status?"

"*Agni V*, OK," Bumi's voice replied, sounding as calm as I had ever heard him. Then, sounding much more like himself, he added, "You call this thing off now, kid, and I'm gonna paddle your butt."

"Understood, *Agni V*," Hikari said, sounding faintly amused. "*Naga*, you are GO for launch."

I reached for the timer mounted above the main instrument cluster, and hit the solitary button next to it, declaring, "Two minutes—*mark!*"

The display clicked down to 1:59, then 1:58, and I knew without looking that matching counters at the other stations onboard, aboard the *Agni V*, and back at mission control were doing the same thing. The seconds thundered by in my head, the Comet growing ever closer, the five of us performing final checks almost automatically thanks to the hundreds of hours of drills we'd endured to hone us into a single aeronautical unit.

Less than a minute... less than thirty seconds... less than fifteen...

Although I didn't need to, I tilted my head to look back over my shoulder. Through the lenses of my goggles and his, I caught Mako's eye; I held him there for a second, then gave him a fleeting wink and called out,

"Mako—*do the thing!*"

With a tight little smile, he nodded, turned back to his panel, took hold of the T-shaped separation handle, and waited for the moment. In my ear, I heard him mutter,

"Mom, Dad, please don't let me screw this up..."

And he gave the handle a firm, decisive clockwise quarter-turn.

It was eleven-ten o'clock and twenty seconds, Republic Summer Time, on Wednesday, June 25, 200 ASC.

Phoenix Flight mission elapsed time: zero hours, zero minutes, zero seconds.

Mission start.

"*Agni V...*" said Mako. A shudder passed through *Naga's* airframe as explosive bolts on the dorsal platform fired, severing the connections between us and the spacecraft. In the center of our main instrument panel up front, a little cluster of red indicator lights in the shape of those connections turned green, then went out, showing that all had separated successfully.

"... **away!**" Mako cried, his voice choked with such a conflicting tangle of emotions I doubted even he knew what they all were.

Down below, huge ballast valves opened automatically, dumping the tons of water we'd carried to counterbalance the moonship's weight. Between that and the *Agni V's* sudden release, our aircraft's flight dynamics immediately changed, and Senna and I had to wrestle the suddenly agitated beast with all four of our hands to keep her on the desired flight path.

But that was nothing compared to what came next. A tremendous roar was building above and behind us, loud enough to be carried even by the vestigial wisps of atmosphere up here, audible through the hull. That was the sound of the *Agni V's* Comet-boosted Fireflight engine at full power, propelled by two of the most capable firebenders any of us had ever seen. If we didn't get out of the way extremely quickly, we could be roasted by our lunar craft's exhaust (assuming we weren't shaken apart outright by the shock-wave).

The problem was, there was little for *Naga's* aerodynamic control surfaces to act on at this altitude. Having clawed our way all the way up here, we could now maneuver only very slowly and gingerly, everything happening in slow motion, if we weren't to stall outright and just *fall* out of the sky. Fortunately, we had our own firebender aboard.

No sooner had Mako turned the launch handle than he started throwing switches on his panel in rapid succession; then, with a speed and precision he'd trained long and hard to achieve, he unlocked his seat on its floor track, slid to the center of the aisle, and turned 90 degrees to his right. He now faced aft, toward a very specialized vent in the bulkhead behind us. Above us, a very similar (albeit rather larger) device was in use aboard the *Agni V*, enabling Korra and Kizaki to drive her upward.

Here, this system would be used to expedite our descent.

With a sharp firebending *kiai*, Mako punched forward into the vent, and the resulting flames, boosted by the power of the Comet, lit the entire control cabin from behind. The Fireflight port drew the flames in greedily, guiding them into a series of precisely curved platinum ducts and then directing them out of a series of ports up on the now-vacant launch deck and out at the tips of the wings.

We were thrown against our straps as *Naga's* firebending-assisted reaction thrusters shoved her downward, briefly pulling negative G. Xian uttered a quiet grunt, nearly lost in the roar of Mako's flames and the *Agni V's* powered ascent above us, as she felt the flexion in *Naga's* wings—so in the zone that, she said later, it felt like tension in her own arms. Behind me, Rohan muttered a sutra in Xiaerba, the ancient airbender language, calling on the Garuda and the Apsara³ to protect our colleagues and ourselves as the twelve of us challenged the very limits of what human beings could achieve.

As for Senna and me, we were too busy to pray just then. We had all we could do to keep *Naga's* descent from turning into an outright plummet. For a few seconds, we weren't entirely sure we were going to pull it off—between the launch, the jettisoning of the ballast, and Mako's kick toward the ground, the big

³Types of air spirits.

ship's flying characteristics had become viciously contrary, almost alien. She shuddered, on the brink of stalling, the altimeters winding down as the airspeed indicators trembled near the V_{NE}^4 pegs...

... and she flew out of it, her huge wings biting into the thicker air down below her service ceiling, coming back to familiar life in our hands. I couldn't keep the smile off my face, and I knew without looking at her that Senna couldn't either. We weren't out of the woods yet, but nothing was happening now that we hadn't trained for a hundred times. Feathering back a little on the throttles, we eased her into a controlled descent that was steep, but no longer brushing the edge of the envelope.

Before I could immediately register it, the light and sound of Mako's firebending cut out. I looked at the timer display—2 minutes, 30 seconds, precisely on schedule. We had descended nearly 25,000 feet in that span of time, more than enough distance to be clear of the thrust exhaust of the *Agni V*, and were now cruising at 32,000 feet—airliner territory, well within *Naga's* comfort zone.

Through the cockpit windows, Senna and I could see the thick grey smoke trail of the *Agni V's* exhaust, slowly curling upwards in the distance as it crossed into the cold silence surrounding our world. At its tip, the flame burned brightly, driving the ship yet farther upward, Korra and Kizaki still hard at work.

"Woooooo!" I heard Bumi cry on the *Agni V's* frequency. "It's working, boys and girls! *Oh boy is it working! Go, baby, GO!*"

"Rohan? Xian? Everyone OK?" I asked.

"Astonishingly enough, we have not broken the aircraft," Xian replied dryly. "Everything looks good on my side."

"Agreed, all systems go over here," Rohan concurred.

"Hooph," said Mako. "I think I'm glad that doesn't happen more than once every hundred years." He slid his seat back to the radioman's panel and locked it, then swiveled to give me a wry grin, wiping sweat from his forehead with his flightsuit sleeve. "I'm getting too old for this stuff."

I chuckled, but only for a moment, before I looked to my copilot and saw that her eyes, glinting with unshed tears, were locked on the *Agni V's* rising-star flame. Over the intercom, I could hear her murmuring in Tukisi under her breath. It took me a moment to translate it in my head, but when I did, I nodded in complete sympathy and reached across the center console to rest my right hand on her shoulder.

"*Yue, Spirit of the Moon, please watch over our daughter of the waters. See her and her companions safe on their journey, as they cross the cold silence to visit your home and as they return to their own.*"

That was a sentiment I could definitely get behind. The others were silent for a moment as well; they hadn't understood the words, but the solemn fervor in Korra's mother's voice was enough to convey the intensity of her feelings.

"*Naga, Crescent,*" came Hikari's voice on the high-band. "What's your status?"

Mako flipped a switch on his panel and nodded to me, so I replied, "Crescent, *Naga*. We're OK. Returning to base."

With a last long look at the Comet, now passing over the horizon to the east, and the dwindling star that was the *Agni V*, we slowly turned around and headed for home.

⁴"Velocity (Never Exceed)", the speed beyond which the airframe could be expected to suffer a catastrophic structural failure from the aerodynamic forces.



United Republic Space Agency Phoenix Flight Spacecraft Center - Crescent Island
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Spacecraft carrier *Naga CV-1* and spacecraft *Agni V* at MET 00:00:00:15



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Undocumented Features: The Legacy of Korra
Project Phoenix Flight: Mission Time Zero-Zero-Zero
(An Excerpt from *Challenging the Cold Silence* by Asami Sato, Ph.D., FRSEME)

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"Why don't we go to the moon?"

Yue: Dìqiú's only natural satellite. For all our recorded history, she has haunted us with her beauty and impressed us with her power. Waterbenders love her. Firebenders fear her. Young lovers pray for her intercession. And always, people have wondered: *Could we ever possibly reach high enough to touch her?*

And if we could... do we dare try?

In this thrilling excerpt from her definitive memoir of Project Phoenix Flight, *Challenging the Cold Silence*, Professor Asami Sato tells the story of the moment when—after years of testing and preparation—the flight to Yue finally and irrevocably began: launch day. In her own words, the Project Director herself describes the point at which she and her hand-picked team of experts, supported by the efforts of thousands and the hopes of all Dìqiú, sent the crew of the *Agni V* on their way to the moon.

In advance of the 10th Anniversary Galactic Standard Edition of *Challenging the Cold Silence*, the United Republic Space Agency is proud to present this special commemorative publication:

Mission Time Zero-Zero-Zero

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