JANUARY 2024

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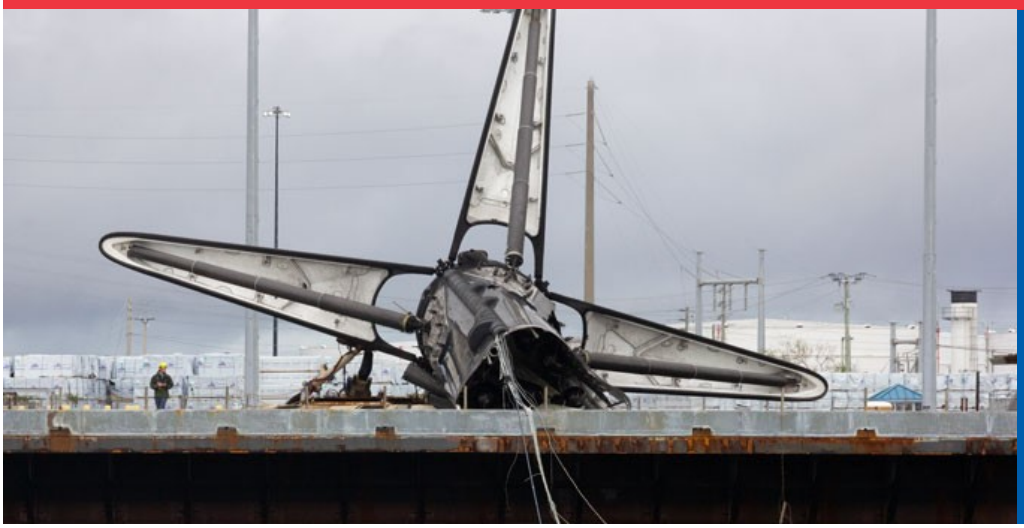

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Historic SpaceX Falcon 9 Booster Topples Over and Is Lost at Sea

A piece of America's space history is now on the ocean's floor. During its return voyage to Port Canaveral in Central Florida, a SpaceX Falcon 9 first stage booster toppled over and broke in half. This particular booster, tail number B1058, was coming back from its record-breaking 19th mission when it had its fatal fall. The rocket lifted off from Cape Canaveral Space Force Station on Dec. 23 carrying 23 Starlink satellites. The booster made a successful landing eight and a half minutes after launch on the drone ship 'Just Read the Instructions' which was stationed east of the Bahamas. SpaceX said in a statement on social media that it succumbed to "high winds and waves." The company stated that "Newer Falcon boosters have upgraded landing legs with the capability to self-level and mitigate this type of issue. In a separate post, Kiko Deontchev, the Vice President of Launch for SpaceX, elaborated by added that while they "mostly outfitted" the rest of the operational Falcon booster fleet, B1058 was left as it was, "given its age." The rocket "met its fate when it hit intense wind and waves resulting in failure of a partially secured [octo-grabber] less than 100 miles from home."

"We came up with self-leveling legs that immediately equalize leg loads on landing after experiencing a severe tippy booster two years ago on Christmas," Deontchev wrote, referring to the first flight of the B1069 booster. "One thing is for sure, we will make lemonade out of lemons and learn as much as possible from historic 1058 on our path to aircraft-like operations," he added.

Beyond its status as the flight leader in SpaceX's Falcon fleet with 19 completed missions, B1058 also held the distinction of launching astronauts from American soil for the first time since the end of the Space Shuttle program in 2011. Former NASA astronauts Bob Behnken and Doug Hurley were the first to climb aboard a SpaceX Crew Dragon spacecraft to fly to the International Space Station on May 30, 2020. That historic mission, dubbed Demo-2, began the illustrious mission career of B1058 that spanned more than three years. To mark its landmark flight, the booster was emblazoned with both the official NASA logos, nicknamed the "meatball" and the "worm." This became the first crewed flight in NASA's Commercial Crew Program, which began a new chapter of the agency purchasing commercial services to shepherd astronauts to and from the orbiting outpost. When the booster was being prepared for the Demo-2 mission, NASA and SpaceX determined the loss-of-crew (LOC) probability to be 1-in-276, beating the program-required threshold of 1-in-270.Crew Dragon Endeavor docked with the ISS 19 hours after launching from NASA's Kennedy Space Center in Florida. While the Demo-2 flight was the only crewed mission using B1058, the booster did support one additional mission to the Space Station when it launched a Cargo Dragon spacecraft, designated C208, on SpaceX's 21st Commercial Resupply Services (CRS-21) mission on Dec. 6, 2020. The other 17 flights of this booster included the first and third of SpaceX's Transporter missions, carrying an array of CubeSats and NanoSats to orbit, as well as 14 missions to send up satellites for SpaceX's Starlink internet constellation. Read the full article here.

Nickel/Cobalt & Stainless-Steel Flat Rolled Surcharges

--	Oct '23	Nov '23	Dec '23	Jan '24	Feb '24	Mar '24
15-5	0.9599	0.9103	0.8851	0.8828	*	*
17-4	0.9737	0.9238	0.8985	0.8957	*	*
17-7	1.0218	0.9603	0.9332	0.9085	*	*
201	0.6995	0.6713	0.6614	0.6608	*	*
301 7.0%	0.9980	0.9388	0.9133	0.8901	*	*
302/304/304L	1.0995	1.0315	1.0005	0.9701	*	*
304-8.5%	1.1438	1.0713	1.0378	1.0038	*	*
305	1.4605	1.3566	1.3046	1.2463	*	*
309	1.5050	1.4019	1.3495	1.2901	*	*
310	2.1511	1.9852	1.896	1.7875	*	*
316/316L	1.7667	1.6247	1.4761	1.4247	*	*
321	1.1750	1.0978	1.0616	1.0245	*	*
347	1.4846	1.4074	1.3711	1.3339	*	*
409/409 Mod	0.2975	0.3001	0.3118	0.3390	*	*
410/410S	0.3074	0.3101	0.3217	0.3487	*	*
430	0.3647	0.3686	0.3796	0.4052	*	*
439	0.3770	0.3811	0.3918	0.4170	*	*
263	8.4765	8.9779	9.0827	8.7045	7.9101	7.5289
276	10.5559	10.5271	10.7552	9.8207	9.0944	8.2179
A286	2.9677	2.9181	2.8866	2.7438	2.5129	2.3167
600	7.2431	7.1216	6.9579	6.6048	6.0518	5.5351
601	5.9930	5.8958	5.7653	5.4831	5.0475	4.6399
617	9.1029	9.3428	9.4716	9.0559	8.1737	7.6002
625	10.1864	10.1222	10.2172	9.8207	8.9962	8.3243
718	8.7390	8.6605	8.6247	8.3341	7.8114	7.3599
X-750	7.6070	7.4798	7.3173	6.9845	6.4649	5.9800
800	3.2999	3.2300	3.1618	3.0082	2.7867	2.5825
825	5.0231	4.9678	4.9676	4.7352	4.3011	3.9414
HX	7.2075	7.1806	7.3057	6.9550	6.2032	5.6145
188	8.6075	9.9286	9.7249	9.3558	8.8538	9.0730
L-605	8.4040	10.0520	9.8839	9.5253	9.0231	9.4004

*Surcharge currently not available

Thin Gauge Stainless Steel and Nickel Alloy Surcharges

--	Oct '23	Nov '23	Dec '23	Jan '24	Feb '24	Mar '24
301 7%	1.20	1.13	1.0959	1.0681	*	*
302/304/304L	1.32	1.24	1.2007	1.1642	*	*
304 8.5%	1.37	1.29	1.2453	1.2046	*	*
305	1.75	1.63	1.5655	1.4956	*	*
316L	2.12	1.95	1.7712	1.7096	*	*
321	1.41	1.32	1.2739	1.2294	*	*
347	1.48	1.41	1.6453	1.6006	*	*
201	10.98	10.79	10.53	9.96	9.0716	8.2428
600	8.69	8.55	8.35	7.93	7.2622	6.6421
625	12.22	12.15	12.26	11.78	10.7954	9.9892
625LCF	12.22	12.15	12.26	11.78	10.7954	9.9892
718	10.47	10.39	10.35	10.00	9.3736	8.8320
Alloy X	8.65	8.62	8.77	8.35	7.4439	6.7374
X750	9.13	8.98	8.78	8.38	7.7578	7.1760

*Surcharge currently not available

Nickel/Cobalt & Stainless-Steel Bar Surcharges

	Aug '23	Sep '23	Oct '23	Nov '23	Dec '23	Jan '24
316LS/316LVM	2.82	2.88	2.77	2.43	2.19	1.83
Custom 455	1.57	1.57	1.51	1.39	1.31	1.33
Custom 465	2.17	2.19	2.12	1.94	1.83	1.85
Custom 630	1.21	1.20	1.15	1.04	0.98	1.01
CCM	12.56	12.20	9.94	10.77	10.76	10.16
625	10.57	10.78	10.36	9.40	8.62	8.69
718	8.15	8.19	7.85	7.26	6.75	6.71
718CR	8.15	8.19	7.85	7.26	6.75	6.71
A286	3.98	3.99	3.84	3.52	3.28	3.27
A2861	3.98	3.99	3.84	3.52	3.28	3.27
A2862	3.98	3.99	3.84	3.52	3.28	3.27
A2867	3.98	3.99	3.84	3.52	3.28	3.27
A286R1	3.98	3.99	3.84	3.52	3.28	3.27
A286SH	3.98	3.99	3.84	3.52	3.28	3.27
Alloy X	8.65	8.86	8.50	7.66	7.00	7.11
Wasp6	10.20	10.16	9.37	8.89	8.33	8.16
L605	12.84	12.46	10.78	11.53	11.59	10.95
321	1.85	1.83	1.75	1.58	1.46	1.47
347	1.85	1.84	1.75	1.58	1.46	1.47
Greek Ascoloy	1.46	1.46	1.45	1.36	1.32	1.34

*Surcharge currently not available

Titanium Surcharges

Form	Grade	Q1 2024 Surcharge
TISH	6AL4V	12.72
TIPL	6AL4V	8.08
TIPL	6AL4VE	7.28
TICO	GR 2	8.70
TICO	GR 3	8.70
TICO	GR 4	8.70
TISH	GR 2	8.70
TISH	GR 3	8.70
TISH	GR 4	8.70
TIBR	6AL4V	5.45
TIBR	6AL4VE	5.45

ULA Stacks Vulcan Rocket for the First Time ahead of Jan. 8 Debut Launch

United Launch Alliance achieved a critical milestone towards the debut of its next launch vehicle. On Wednesday, the company integrated the payload fairing on top of its Vulcan rocket, marking the first time it has put together the full stack.

The operation comes less than three weeks ahead of the target launch date for the rocket, Monday, Jan. 8, 2024. Liftoff for the Certification-1 (Cert-1) mission is set for 2:18 a.m. EST (0718 UTC) from Space Launch Complex-41 (SLC-41) at Cape Canaveral Space Force Station.

Earlier this month, ULA was hoping to launch the rocket during a December window that ran from the 24th through the 26th. However, an incomplete wet dress rehearsal tanking test caused them to redo the test and therefore, pivot to the January launch window, which spans from Jan. 8-11.

Because of launch delays over at Launch Complex 39A at NASA's Kennedy Space Center, the launch of Intuitive Machines' Nova-C lander was pushed off into the February window. That means that Vulcan and its payload, Astrobotic's Peregrine lunar lander, is now set to be the first spacecraft to launch as part of NASA's Commercial Lunar Payload Services (CLPS) program.

The Cert-1 mission will be a Vulcan VC2S variant vehicle. The "2" represents the two GEM 63XL solid rocket boosters onboard and the "S" represents a short payload fairing length. The short version of the fairings are 51 feet (15.5 meters) in height and 17.7 feet (5.4 meters) in diameter.

As a fully integrated vehicle, this Vulcan, sporting a short fairing, stands at 202 feet (61.6 meters) tall.

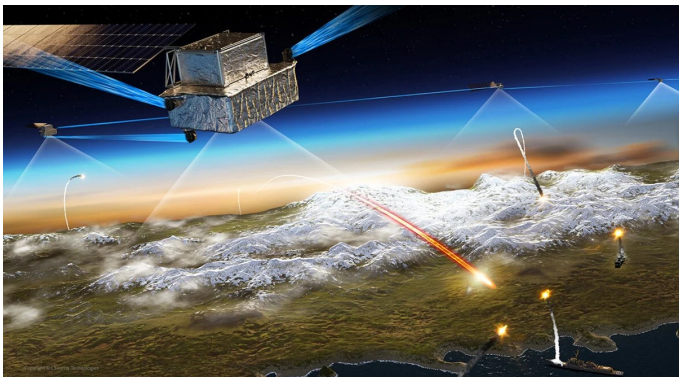
The primary mission is to send the Peregrine lander into a highly elliptical orbit on its way to the Moon. Secondarily, a memorial payload dubbed "Enterprise" affixed to the Centaur 5 upper stage, will continue on into a hyperbolic orbit around the Sun.

The mission being launched on behalf of Celestis Memorial Spaceflight contains 265 capsules with the cremated remains and DNA samples of many notable figures. The name "Enterprise" comes from the fact that "Star Trek" creator Gene Roddenberry and his wife, Mabel Barrett Roddenberry, are among those onboard. Key actors from the show, Nichelle Nichols and James Doohan, are also being flown along with DNA samples from three former U.S. presidents.

The Cert-1 mission notably marks the debut mission for Astrobotic as well. Peregrine Mission-1 (PM-1) is designed to demonstrate a suite of five NASA payloads under the CLPS program. Astrobotic was one of nine companies selected in 2018 to carry out these commercial missions to the Moon.

Regardless of when during the January window Vulcan launches, a spokesperson at Astrobotic said the lander will touch down on the Moon's surface on Feb. 23. The anticipated time of the landing has not been publicly released. Read the full article here.

L3Harris Gets Green Light to Produce 16 Space-Based Hypersonic Missile Trackers



Defense contractor L3Harris announced Dec. 20 it has received approval from the Space Development Agency to move into production on 16 satellites designed to detect and monitor hypersonic missiles aimed at the U.S. or its allies.

L3Harris said its satellites cleared a critical design review and a production readiness review.

The Space Development Agency (SDA) is a U.S. Space Force organization building a layered network of satellites known as the Proliferated Warfighter Space Architecture. It includes a Transport Layer of interconnected communications satellites that will transmit data collected by the Tracking Layer of sensor satellites.

L3Harris in 2022 won a $700 million contract to design and produce 16 Tracking Layer Tranche 1 satellites, and to provide ground systems and support services. The company selected Maxar Technologies as its satellite bus supplier.

"Hypersonic missiles are the most destabilizing kinetic weapons in our adversaries' arsenals due to their dim flight profiles, varied launch points and high maneuverability," said Bob De Cort, L3Harris's director of program management. "To deter their use and, when needed, to defeat them, the United States requires a resilient sensor platform to remove the veil from their flight paths." L3Harris produces satellites in Melbourne, Florida and Fort Wayne, Indiana. The company has already delivered four prototype tracking satellites under a previous $193 million contract for Tranche 0 of the program. Those satellites were slated to launch this year but have faced delays. The Tracking Layer Tranche 1 satellites are scheduled to launch in 2025. Northrop Grumman and Raytheon RTX also are producing Tracking Layer Tranche 1 satellites under separate contracts. Read the article here.

A New Type of Jet Engine Could Revive Supersonic Air Travel

Since the 1960s engineers around the world have been fiddling with a novel type of jet called a rotating detonation engine (RDE), but it has never got beyond the experimental stage. That could be about to change. GE Aerospace, one of the world's biggest producers of jet engines, recently announced it was developing a working version. Earlier this year America's Defence Advanced Research Projects Agency awarded a $29m contract to Raytheon, part of RTX, another big aerospace group, to develop an RDE called Gambit.

Both engines would be used to propel missiles, overcoming the range and speed limitations of current propulsion systems, including rockets and existing types of jet engines. However, if the companies are successful in getting them to work, RDEs might have a much broader role in aviation—including the possibility of helping revive supersonic air travel.

In a nutshell, an RDE "replaces fire with a controlled explosion", explains Kareem Ahmed, an expert in advanced aerospace engines at the University of Central Florida. In technical terms, this is because a jet engine relies on the combustion of oxygen and fuel, which is a subsonic reaction that scientists call deflagration. Detonation, by comparison, is a high-energy explosion that takes place at supersonic speeds. As a result it is a more powerful and potentially a more efficient way of producing thrust, the force that drives an aircraft forward.

A conventional jet engine uses lots of moving parts (see diagram). Rotating blades draw in air and compress it before igniting it with fuel in a combustion chamber, creating rapidly expanding hot gases that blast out of the rear. As the gases exit they drive a turbine, which keeps the whole process going. An RDE is simpler. Air entering the front is forced into a hollow space between two concentric cylinders. When fuel is pumped into this area, it mixes with the oxygen in the air and detonates, creating a rotating supersonic shock wave that spirals around the gap and out of the rear. Once it has started, the detonation is self-sustaining.

Some jet derivatives, such as ramjets and pulse jets, also work without compressors and turbines, but they operate differently and have limitations. Being simple and compact, an RDE would be cheap to make and fuel efficient, allowing missiles to fly farther and faster, at up to five times the speed of sound (Mach 5, or some 6,125kph). The GE version is designed to be used with a ramjet to accelerate hypersonic missiles, which fly faster than Mach 5. Read the article here.

UPM Focus: Clearance Items