MAY 2023

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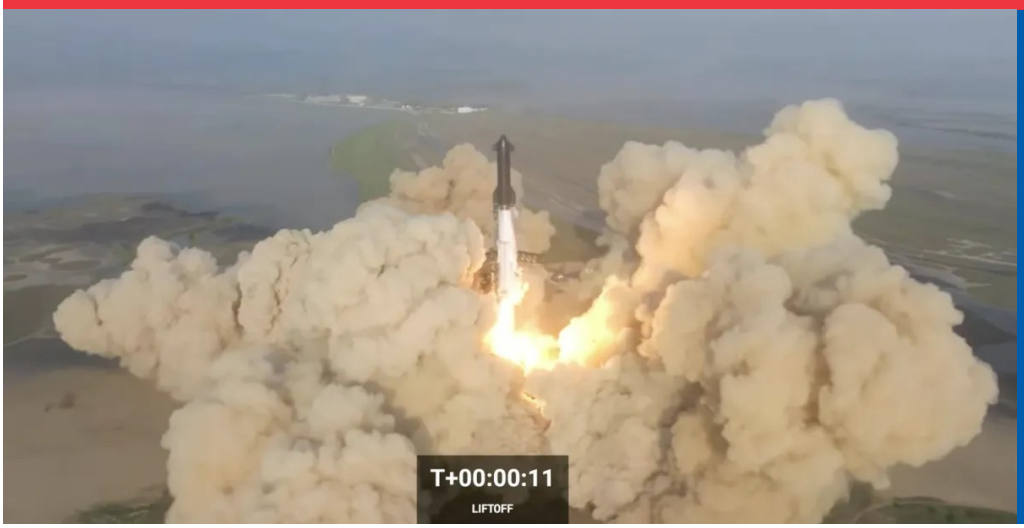

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Starship Lifts Off on First Integrated Test Flight, Breaks Apart Minutes Later

SpaceX's first integrated Starship vehicle lifted off on a long-anticipated test flight April 20, only to tumble and break apart minutes later.

The Starship vehicle lifted off from SpaceX's Starbase test site at Boca Chica, Texas, at 9:33 a.m. Eastern. The liftoff took place after a brief hold at T-40 seconds to clear final issues pressuring the rocket's propellant tanks. Starship slowly lifted off from the pad and ascended. Several of the 33 Raptor engines in the Super Heavy booster appeared not to be firing in video shown on SpaceX's webcast a little more than a minute after liftoff.

Stage separation took place 2 minutes and 45 seconds after liftoff, and the rocket's single Aeon Vacuum upper stage engine ignited. However, footage from a camera on the stage showed the plume flickering seconds after ignition, and telemetry on the company's webcast of the launch indicated the vehicle was slowing. Mission control declared an anomaly with the upper stage five minutes after liftoff, but didn't immediately disclose additional details about the failure.

Data displayed on the webcast showed that, at T+15 seconds, three Raptor engines, two in a fixed outer ring and one in a center section capable of gimballing, were not working. A third engine in the outer ring shut down at T+40 seconds, followed by another 20 seconds later. By T+100 seconds, six engines were not operating, although one was restored a few seconds later. According to the timeline provided by the company, the Raptor engines in Super Heavy were supposed to shut down at T+2:49, followed second later by the separation of the Starship upper stage and ignition of its six Raptor engines. Instead, the combined Starship/Super Heavy stack started to tumble as the engines in Super Heavy continued to fire. "This does not appear to be a nominal situation," said SpaceX's John Insprucker in the webcast.

At T+4:00, the vehicle broke apart when controllers activated the flight termination system on both the Super Heavy booster and Starship upper stage. Despite the failure, SpaceX employees watching the launch at the company's Hawthorne, California, headquarters cheered, celebrating the progress made on the flight.

In a later update, SpaceX said the vehicle reached an altitude of 39 kilometers before the engine failures caused the rocket to lose altitude and tumble. "With a test like this, success comes from what we learn, and we learned a tremendous amount about the vehicle and ground systems today that will help us improve on future flights of Starship," the company stated.

The company stressed both before and immediately after launch that this flight was a test designed to collect data to improve the design of the vehicle. "This was a development test. This was the first test flight of Starship," said Insprucker. "The goal was to gather the data and, as we said, clear the pad and get ready to go again."

This test flight was not designed to reach orbit but instead send Starship on a long suborbital trajectory, splashing down near Hawaii 90 minutes after liftoff. Neither Starship nor Super Heavy, which would splash down in the Gulf of Mexico offshore from Boca Chica, would be recovered.

SpaceX has several other Starship and Super Heavy vehicles in various stages of development. They have already incorporated some design changes from work on this vehicle. "Learned a lot for next test launch in a few months," SpaceX Chief Executive Elon Musk tweeted shortly after the flight. To read the rest of the article, click here.

Nickel/Cobalt & Stainless-Steel Flat Rolled Surcharges

	Feb	Mar	Apr	May	June	July
15-5	1.1856	1.2015	1.12194	1.1235	*	*
17-4	1.2011	1.2168	1.1359	1.1396	*	*
17-7	1.3454	1.3272	1.2054	1.2296	*	*
201	0.968	0.9618	.8985	0.9302	*	*
301 7.0%	1.3099	1.2923	1.1756	1.2011	*	*
302/304/304L	1.4562	1.4342	1.2970	1.3216	*	*
304-8.5%	1.5231	1.4991	1.3517	1.3746	*	*
305	1.9977	1.9593	1.7408	1.7525	*	*
309	2.0414	2.0026	1.7830	1.8042	*	*
310	3.0029	2.9352	2.5730	2.5748	*	*
316/316L	2.3468	2.4610	2.2319	1.9784	*	*
321	1.5841	1.5565	1.3997	1.4196	*	*
347	1.8868	1.8607	1.7033	1.7217	*	*
409/409 Mod	0.3007	0.3111	0.3387	0.3734	*	*
410/410S	0.3046	0.3162	0.3432	0.3789	*	*
430	0.3609	0.3719	0.3975	0.4453	*	*
439	0.3822	0.3908	0.4166	0.4691	*	*
263	10.8442	11.7846	13.2813	12.3785	11.6182	10.2646
276	10.0837	11.153	13.5698	14.5412	14.9952	12.6782
A286	3.0092	3.4243	4.0143	4.0365	3.8984	3.4292
600	7.4646	8.7808	10.2636	10.0981	9.4687	8.1466
601	6.1684	7.2046	8.3839	8.2504	7.7529	6.7394
617	10.2334	11.3131	13.1396	12.9453	12.5807	10.8897
625	10.0402	11.1493	13.0263	13.4647	13.444	11.7114
718	8.7834	9.713	11.0007	11.0906	10.8266	9.6864
X-750	7.8343	9.0694	10.4613	10.3044	9.706	8.4810
800	3.3695	3.8869	4.5042	4.4588	4.2056	3.7000
825	5.0087	5.6952	6.7372	6.8800	6.7479	5.8487
HX	7.0661	7.9429	9.6011	10.0649	10.1612	8.6280
188	14.287	14.5401	14.9566	12.1294	10.4308	10.1272
L-605	15.3483	15.396	15.5962	12.1584	10.2033	10.0991

*Surcharge currently not available

Nickel/Cobalt & Stainless-Steel Bar Surcharges

	Jan	Feb	Mar	Apr	May	June
316LS/316LVM	3.59	3.74	3.77	3.35	3.01	*
Custom 455	2.18	2.02	1.94	1.80	1.87	*
Custom 465	3.18	2.91	2.88	2.63	2.59	*
Custom 630	1.41	1.43	1.38	1.33	1.36	*
CCM	17.72	14.34	12.34	12.61	11.18	*
625	14.44	14.37	14.45	12.67	11.62	*
718	11.33	10.87	10.71	9.48	9.24	*
718CR	11.33	10.87	10.71	9.48	9.24	*
A286	5.83	5.45	5.30	4.73	4.71	*
A2861	5.83	5.45	5.30	4.73	4.71	*
A2862	5.83	5.45	5.30	4.73	4.71	*
A2867	5.83	5.45	5.30	4.73	4.71	*
A286R1	5.83	5.45	5.30	4.73	4.71	*
A286SH	5.83	5.45	5.30	4.73	4.71	*
Wasp6	14.58	13.56	12.82	11.53	11.04	*
L605	16.76	13.81	12.10	12.41	11.87	*
321	2.37	2.35	2.25	2.06	2.11	*
347	2.37	2.35	2.24	2.05	2.10	*
Greek Ascoloy	1.45	1.47	1.49	1.49	1.50	*

*Surcharge currently not available

Titanium Surcharges

Form	Grade	Surcharge
TISH	6AL4V	8.80
TIPL	6AL4V	5.87
TIPL	6AL4VE	6.45
TIBR	6AL4V	6.88
TIBR	6AL4VE	4.45
TICO	GR 2	8.69
TICO	GR 3	8.69
TICO	GR 4	8.69
TISH	GR 2	8.69
TISH	GR 3	8.69
TISH	GR 4	8.69

Lockheed Martin Demonstrates System for Servicing CubeSat Swarms

In an autonomous orbital ballet, Lockheed Martin's In-space Upgrade Satellite System (LM LINUSS) completed a demonstration of how highly automated CubeSats can upgrade and service increasingly common constellations of small satellites. One constant of commercial space operations is that launching satellites is always expensive and that it is often cost effective to simply abandon an otherwise perfectly good orbital asset because of a malfunction.

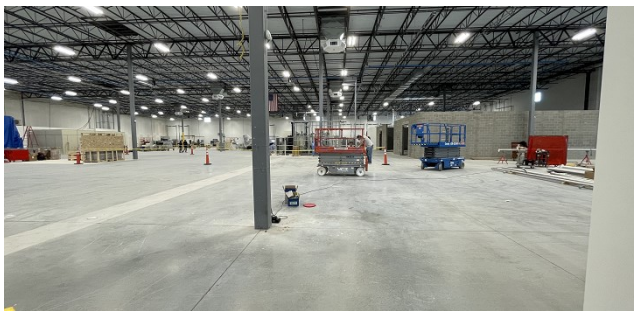
That attitude has been changed in recent years with companies like Northrop Grumman opting to develop repair satellites that can dock with ageing and ailing satellites, then act as service modules to help them keep station and continue function.

That's fine for large geosynchronous satellites that are used to maintain global communication networks, but what about constellations of small satellites that aren't much bigger than a loaf of bread? These swarms of CubeSats can also fail or become obsolete, so how to keep them working and up to date? Lockheed's LM LINUSS is one step in solving this problem. Consisting of toaster-sized LM 50 2U CubeSats, the system is designed to carry out highly-automated rendezvous and proximity operations (RPO) needed to maneuver in multi-satellite constellations in a prelude to one day being able to service them.

In the recent demonstration, one satellite acted as the passive target while another took the role of service vehicle. Using online navigation algorithms and artificial intelligence, the service vehicle successfully approached and rendezvoused with the target.

In addition, the satellites tested Lockheed Martin's Horizon 2.0 command and control (C2) software and SmartSat software; maintained connection for telemetry, tracking, and control; and demonstrated a low-toxicity propulsion system, machine vision, and validated the use of 3D-printed components. "The LM LINUSS pathfinder is an excellent example of how Lockheed Martin is investing in innovation in the real world, "said Johnathon Caldwell, Lockheed Martin, vice president and general manager, Military Space. "Agile development, cloud-based operations, and smallsat platforms came together at speed and in orbit, where the real test of technology occurs. Through the accomplishments of LM LINUSS, Lockheed Martin is pioneering how future small and medium class missions will be upgraded on-orbit… To read the full article, click here.

On the Ground at Zeda's New 3D Printing Facility with Shri Shetty and Greg Morris



Last month, Silicon Valley-based PrinterPrezz and its Cincinnati, Ohio subsidiary Vertex Manufacturing announced that they were rebranding as part of their growth strategy, and Zeda was born. The California company represents the strengths of both PrinterPrezz and Vertex Manufacturing, and uses 3D printing and nanotechnology to develop solutions for the medical industry, as well as the aerospace, space, defense, and energy sectors. Zeda then closed a $52 million Series B financing round to accelerate its footprint and medical product expansion in Asia and the U.S., including a new advanced manufacturing digital foundry in Cincinnati. ."Right now, we're packed in like sardines, and it's just because we've been growing pretty exponentially," Zeda's Chief Technology Officer and TCT Hall of Famer Greg Morris told me. "These are really good problems to have, but a little frustrating because we want the construction to get done. But we're close."

Morris said they expect to get occupancy within the next couple months, and will start moving equipment in June. This process will be "relaxed" to ensure that ongoing jobs and projects aren't disrupted, and because they'll already have plenty of equipment up and running, including the first of a planned eight FormUp 350 printers. He also confirmed that the first AddUp system, already in place at the facility, is for aerospace applications, while the second one will be for "non-aerospace." Zeda, originally PrinterPrezz, primarily works with medical implants and related instrumentation, and Morris explained that when PrinterPrezz acquired his Vertex Manufacturing company, they were "brought on board to continue to do what we do with aerospace and the DoD, and energy, and other industries, but also a significant medical focus and making the actual cervical spinal implants and instrumentation."

Morris explained that one side of the factory floor will be "predominantly" focused on medical, with the other focused on space, aerospace, and other industry, due to the different work processes. "Medical is a little bit different in how you want to process that workflow than some of the other industries," he told me. "For instance, the titanium room will house the titanium machines and will be very much focused on medical. You have to have a different setup for that, from an Environmental Health and Safety aspect. So keeping all the titanium in one place, keeping all the stainless steel in one place, makes more sense. Keeping the machines that would be on the back end working on those parts as they come out of the machine in one space, and keeping the people whose minds are kind of aimed toward medical is probably a better flow than just trying to mix people back and forth."

Shri Shetty, Co-Founder and CEO of Zeda, said that the main differences between the advanced manufacturing facility's two workflows are the materials used and the size of the parts being produced. Medical will the main focus of this "flex facility," and Morris explained that the second workflow would be focused on what he calls "other," including space and aviation, with gas turbine engine components and semiconductors. He also said the company does "quite a bit of work" with the Department of Defense, both directly and indirectly, and that energy would be the fourth main industry in the "other" category. So the facility will represent mainly high-end, regulated industries. We walked past a separate room being built on the floor, which Morris informed me would house titanium 3D printers, as they "have very big plans for quite a bit of titanium, especially a lot of implants." Zeda's Co-Founder and COO Kishore Karkera made another point here about why the different workflows in the facility will be separated. Read the full article here.

New UK Green Aircraft Business Formed to Accelerate Transition to Zero-Emissions Flight

A proposed merger between a pair of British firms—one a longtime aircraft manufacturer and the other a pioneer in alternative propulsion systems—could hold the key to an aviation first. The U.K.'s Britten-Norman and and Cranfield Aerospace Solutions (CAeS) last week signed a heads-of-terms agreement outlining a merger that is expected to be completed in mid-2023, clearing the way for the companies to launch a hydrogen-powered regional transport-category jet by 2026.

To achieve that, the combined entity's near-term focus will be achieving certification for hydrogen-powered models of Britten-Norman's nine-seat Islander, one of the best-selling commercial airliners in Europe. The current model is used primarily to complete short-range commercial passenger service.

Now, the new firm is looking to complete those same flights using CAeS's hydrogen-electric fuel cell propulsion technology to power Britten-Norman's airplanes. It will replace the Islander's piston and turboprop engines with fuel cells and electric motors that run on gaseous hydrogen, which CAeS says is easier and cheaper to manufacture despite having a lower range than its liquid alternative. The idea here is that Britten-Norman, the sole manufacturer of passenger-carrying airlines in the U.K., will create "a clear and unambiguous route to market" by becoming one of the world's first OEMs of hydrogen-powered aircraft.

"[It] will create a new market leader in green aircraft manufacturing, bringing together joint strengths in aerospace manufacturing, certification, and innovation," said Willian Hynett, CEO of Britten-Norman. "The investment will give a huge boost to U.K. aviation exports and will deliver the first OEM sub-regional aircraft powered by hydrogen." The proposed merger also calls for HydrogenOne Capital Growth Plc—a who's who of CAeS investors including Hydrogen One, Safran Corporate Ventures, and the UAE government-backed Strategic Development Fund—to put as much as $12.5 million into the new firm.

"This deal accelerates our roadmap for the introduction of new zero-emissions aircraft," explained Paul Hutton, CEO of CAeS. "As other sectors decarbonise quickly, it is imperative that the aviation industry accelerates its own transition to new, clean aircraft. Looking to the future we will use the combined experience of Cranfield Aerospace and Britten-Norman to produce an entirely new aircraft design, optimized around hydrogen fuel cell technology. According to Britten-Norman and CAeS, the deal comes as airlines and operators increasingly demand an OEM-backed, zero-emissions aircraft. To read the full article, click here.

UPM Focus: Roger Haire, Cincinnati Plant Manager

Throughout the years and countless changes that UPM has endured, there has been one constant: Roger Haire, our plant manager based in our Cincinnati, OH headquarters. Roger has been an integral part of keeping our Cincinnati location the cornerstone of UPM for over thirty years. We decided to catch up with him and hear what is going on out on the shop floor in Cincinnati.

Roger Haire attended Cincinnati State College in the late 1980s and started at UPM shortly after graduation in 1990. He is celebrating his 34th year this week and has been the plant foreman for the past 20+ years. When asked about his career journey at UPM and how the Cincinnati location has grown along with him, Haire said "At the beginning of my time, we were huge on safety, and we still are. We've made drastic improvements to our safety protocols and we've actually evolved so much so that we have achieved ISO certification. In addition to upgrading our safety policies, we've also upgraded the efficiencies of our machines. The new shearer here in Cincinnati allows for tighter tolerances, we have upgraded our re-coiler, added newer equipment to our slitters and edging machines, all while maintaining our CTL (cut-to-length) machinery".

Haire continued to say that "In order to continue UPM's journey in being a world-class organization, we need to continue to add automation to our equipment out on the floor. With the way technology is advancing in the world today, UPM has to align with the advancements that best fit our business and our customers' needs".

While UPM's Cincinnati-based operation has been a player in the metals industry for a long time, Haire shared some insights as to how the location can carry on making a difference for both the company and industry.

"Recent developments in Cincinnati have tasked us with adding a third shift, working closer with our customers, and finding talent. One of our biggest struggles right now is finding the right talent to fit our needs and our customer needs, however, we have a fantastic group of team members who give their all on the shop floor everyday. We want to change the culture of UPM Cincinnati for the better so we can keep helping world class customers and attract top-tier talent".

If you or someone you know would be a great fit for our Cincinnati operation, click here. If you'd like to learn more in general, click here.