SPACENEWS 30 YEARS

Safety last: Reckless behavior provides China with economic competitive advantages in space launch

by **Greg Autry** — May 21, 2019

Strap-on booster from April 20 launch of Long March 3 lies in stream near Chinese farm. Credit: Weibo

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Space launch is becoming a highly competitive market and the United States' leadership position in the new landscape has been based to a great extent on its successful regulatory model. The framework first established by the Commercial Space Launch Act of 1984 has provided startups and investors with defined processes and licensing regimes that are workable for business while ensuring public safety. The generally effective and forward thinking work of Federal Avia Administration's Office of Commercial Space Transportation (AST), the Federal

Communications Commission and more recently the Office of Space Commerce have actually attracted foreign founders and investors to set up shop in the United States. Space has been a rare case of American regulatory competitive advantage. Witness the success of Rocket Lab, Virgin Orbit and Firefly as U.S. entities. These firms might easily have taken their business elsewhere, but U.S. talent and the rule of law have made space launch America's business to lose. China has recently made it clear it intends to contend aggressively over this important industry and it is worth noting that extremely lax regulation has often played a critical role that nation's ability to undercut other U.S. industries.

On April 20, China launched the 100th mission of its highly successful Long March-3 rocket series. While the powerful 3B/G2 (CZ-3B) variant successfully lofted a navigation satellite, designated as Beidou-3I1Q, toward its geosynchronous orbit, it also littered the Chinese landscape with a collection of dangerous rocket boosters leaking toxic fuel. The safety standards used in Chinese space launch would leave American regulators apoplectic. As is the case in many global industries, this lax approach to environmental standards and human safety promises to provide China with a significant cost advantage over more responsible and highly regulated American firms.

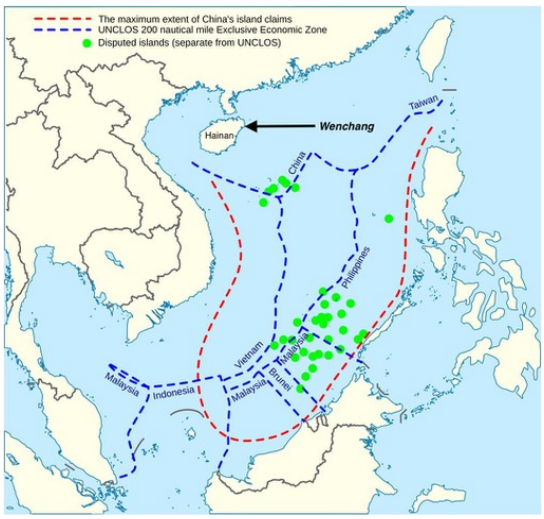
Xichang Satellite Launch Center, Sichuan China. Credit: Wikimed

This launch was conducted from the LC3 pad at the Xichang Satellite Launch Center in China's southwestern Sichuan Province. While the site is remote, it is entirely land locked and the Long March overflew a large swath of populated territory. As it did so, the rocket's four strap-on boosters were jettisoned to fall somewhere across the mountainous landscape of Sichuan and the core of the Long March 3B/G2 first stage followed somewhere to east. Unlike SpaceX's elegantly controlled first stages, the Chinese boosters just fall where they may. Photos on the Sina Weibo microblogging site show debris from the recent launch lying alongside a farm as well as in a river. The blog reports that the government had "the propaganda in place" and that villagers "were satisfied," presumably with not having been simply crushed by any of the plummeting space junk.

What these rural farms probably don't know is that the Long March 3B runs on a hypergolic mix of unsymmetrical dimethylhydrazine (UDMH) and nitrogen tetroxide (NTO). UDMH is a toxic fuel and a known carcinogen that mixes well in water. The rocket's N204 oxidizer is also extremely dangerous, causing liver damage. Three U.S. astronauts came very close to serious, injury after being briefly exposed to N204 during the splashdown phase of the 1975 Apollo-Soyuz space mission. Vance Brand lost consciousness and all three had to be hospitalized for two weeks. These boosters are not the sort of stuff that should be left around for curious kids to play Taikonaut on. A frightening video from last year shows a jettisoned Long March booster crashing to earth just outside a town. The resulting fireball and toxic mushroom cloud removes any doubt that these spent boosters contain significant quantities of propellants.

It's hard to know how many Chinese citizens have been killed by their nation's space program – because the propaganda is in place – but the count isn't zero. In February 1996, the launch of the Intelsat 708 commercial satellite went infamously wrong, turning night into day as it destroyed a town down range. In this case, there were enough foreigners onsite that Chinese censors were unable to sweep the incident under the proverbial table. A video smuggled out by an Israeli leaves little doubt as to the extent of the destruction and the Chinese government admitted to six killed and 57 injured. U.S. estimates of the deaths are above 100.

The point to be made here is that more than 20 years after the Intelsat disaster China continues to play a game of "space booster bingo" where the squares contain forests, rivers, farms and towns. It's an approach familiar to those who have followed Chinese domination of other industries. While the Communist Party leadership always has its greenwashing propaganda in place, it routinely exploits its authoritarian power to maximize national economic advantages without regard to environmental or human consequences. The Three Gorges Dam project famously killed off what was left of the Yangtze River's unique ecosystem and compelled the forced relocation of over a million residents. While Scientific American asked if China might have induced an "environmental catastrophe," the dam's cheap power, along with burning a lot of very dirty coal, helped Chinese state-owned firms establish global dominance in both the aluminum and steel industries over the last decade. A BBC report investigating a Chinese strip mining operation in Inner Mongolia described finding a "tr



China's "red line" claim in the South China Sea secures launch space to the west and south of its new launch site at Wengchang on the east coast of Hainan Island. Credit: Google Maps

environment, dystopian and horrifying." This "hell on Earth" supported a successful price dumping campaign that forced the closure of California's much more responsible Mountain Pass mine, which China then acquired in bankruptcy.

Many of the hazardous Long March 3 launches have been used in support of the Beidou Navigation Satellite System (BDS). Beidou is a mixed constellation of geostationary and medium-Earth-orbit satellites that provide Chinese military, state and commercial actors with space-based navigational capabilities independent of the U.S. Global Positioning System. BDS is also offered as a global service to underpin the digital portion of China's ambitious Belt and Road initiative (BRI), a 20-year plan to establish Chinese economic influence via infrastructure development and investments across Asia, Europe and Africa. Italy recently signed on to this Chinese pact, distancing itself from the U.S.

China's reckless behavior in space extends beyond launch. It's 2007 ASAT demonstration using a kinetic kill vehicle against a polar-orbit weather satellite created the largest space debris field in history. While I'm not excusing them, a U.S. response to that and a recent ASAT test by India were intentionally conducted at very low altitudes and structured to minimize long-term debris creation. That thought apparently never occurred to China, which made absolutely no attempt to protect anyone's safety. This irresponsible act has necessitated maneuvering the International Space Station and will continue to threaten human and commercial activity in orbit for decades to come. The following year, China's Shenzhou-7 spacecraft passed within 45 kilometers of the ISS. Uncomfortably close and uninvited, the Shenzhou-7 then deployed a maneuverable microsatellite, called BanXing-1, in an apparent demonstration of their ability to use co-orbital anti-satellite technology to threaten the space assets of other nations, again with no regard for the safety of the ISS occupants.

The Xichang launch complex was located deep in China's interior to keep it from prying foreign eyes. At the time, the communist nation lacked control of the sea beyond the 12-mile coastal limit that the U.S. and its once-indomitable 7th Fleet were willing to acknowledge. Today, however, China's large fleet of submarines and a growing array of high-tech anti-ship weaponry including ballistic and hypersonic missiles backup Beijing's audacious claim to the South China Sea. China has destroyed several ecologically sensitive shoals and reefs in the construction of artificial islands that support airfields and missile installations designed to control thousands of square miles of strategic seas. Beyond annexing fossil fuel reserves previously claimed by Vietnam, Malaysia and the Philippines, this territorial aggression provides China's new Wenchang Space Launch Center on Hainan Island with hundreds of miles of nationally

controlled water to the east and south. Long March boosters need no longer frighten Chinese villagers, as they can be dumped into formerly Taiwanese, Filipino and Vietnamese fishing grounds.

A still image from a video showing descent, explosion and close-up of Long March strap-on booster in 2018. Credit: YouTube

In addition to the newer Long March 5 heavy-lift rocket, Wenchang will host a number of nominally "commercial" launch firms that have seemingly sprung up overnight in China. Several of these firms are getting their start by launching multistage solid rocket systems off mobile launchers that appear to be coming out of China's state-owned ICBM factories.

History suggests that Chinese space startups will not be held to the rigorous safety standards demanded of U.S. launch firms by FAA AST. Under 14 CFR § 417.107, FAA has set the minimum standard of safety for the public at 1 × 10-6, or odds of one in a million that debris might injure an individual or impact an aircraft. The odds of a dangerous impact with a waterborne vessel are set at 1 × 10-5. 14 CFR § 417.227 details stringent rules for limiting the exposure of the public, seagoing vessels and aircraft to toxic fuels and oxidizers. To be clear, unlike the Long March 3, no U.S. launch system depends on highly toxic fuels to power their first stage boosters. UDMH and hydrazine are commonly used in upper stages and thrusters on satellites and commercial vehicles.

The cost in time and delay in complying with these stringent rules and demonstrating full compliance is very real for U.S. commercial operators. For instance, a SpaceX launch (SES-9) on Feb. 28, 2016 was held at less than two minutes before scheduled lift off by a tug boat entering the restricted offshore safety zone. The subsequent attempt to relaunch after the ship had cleared was scrubbed, likely caused by an increase in liquid oxygen temperatures induced by the hold. The direct cost of standing down, rescheduling and re-preparing the rocket for launch are in the hundreds of thousands if not a million dollars or more. The indirect costs of such delays to the satellite operators, launch attendees and other parties are also very real.

In response to the White House's Space Policy Directive-2, the Office of the Secretary of Transportation has released a draft notice of proposed rulemaking (NPRM) developed by FAA AST. These proposed rule changes are designed to streamline and expedite launch licens
While such measures will increase U.S. competitive advantage, no effort has been spared

keeping the American public safe. FAA Acting Administrator Dan Elwell and the new associate administrator for AST, Wayne R. Monteith, have made it absolutely clear that “safety first” remains the acting principle at the FAA. While that is the right approach, U.S. launch operators cannot expect to be competing on a level field with an international competitor willing to risk environmental damage and endure human casualties in pursuit of national competitive advantage. The Trump administration and Congress, which are already highly attuned to the growing competitive landscape in space, must address the issue of China’s lax safety regime and the cost advantages it supplies to their commercial space operations.

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publiusr ➚ se jones • a month ago

Poor Borat...

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Flechette ➚ se jones • a month ago

Interestingly, those booster sections look remarkably intact for slamming into the ground without parachutes.

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se jones ➚ Flechette • a month ago • edited

Yeah the terminal velocity or an empty stage isn't that fast.
Spend your $3 and watch "Space Tourists", it's a treat!

After a free fall into the Atlantic, this Titan booster was recovered off Florida in the '60s

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Brains and Looks • a month ago

When you're the most populous nation on Earth, a few villages dying of cancer or getting hit with a discarded rocket booster is just a rounding error, I guess.

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Beckerjr ➚ Brains and Looks • a month ago

China is the human equivalent of an army ant colony. The average worker is insignificant in comparison to moving the greater nation forward. The cost be dammed.

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publiusr ➚ Brains and Looks • a month ago

That's what Rand Simberg wanted, right? Safe not an option. Here you go Rand.

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Rand Simberg ➚ publiusr • a month ago

I see you that either didn't read my book, or didn't comprehend it.

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Flechette • a month ago

This has China's modus operandi for decades. It is how they muscle into an industry and destroy Western competition.

China

A: Heavily subsidizes industries to make their products cheaper to the consumer.

B: Uses slave or really-reduced cost labor. Things that would be flat-out illegal in Western nations.

C: Dump industrial waste rather than processing it.

D: They steal IP so they do not have to bear the cost of developing it themselves.

All of this lowers costs to force Western competition out of the market. We simply cannot compete with such practices (and we shouldn't do them in order to compete).

So we really must implement sanctions (tariffs) to save our industry and force China to stop their human rights and environmental abuses. However, we see how the political elites have resisted this. We know why; they are making a lot of money under the current system.

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And you believe that why? • a month ago

Well yes, but the Chinese people are the ones who need to decide dropping rocket stages on Chinese people isn't acceptable.

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Greg Autry ➚ And you believe that why? • a month ago

Yeah, they could like hold an election and vote agains that. Or they could organize a protes public square. Or maybe discuss it in the free press.

2 • Reply • Share ›

nakedChimp ➚ Greg Autry • a month ago

Well, they will do that if enough Chinese are affected.
This 'political market reaction' is called revolution and the only way out for systems that have been monopolized.
The 35% standing behind Trump are a similar reaction as for them corpocracy isn't working.

^ | v • Reply • Share ›

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Quattro Bajeena • a month ago • edited

Who cares? It is *their* country. Plus with the move to Hainan island there is less chance of stage impacts overland. With the Long March 5/7 series of rockets they are getting rid of hypergolics. Even at least one of their private launch companies is going to use LOX/Methane.

It is funny to chastise them for using hypergolics when the US still used the Titan a couple decades back. Or for using solids when a lot of US launchers still use solids from the SLS, to the Atlas V, and others. You joke about their private companies using military derived solids and yet the US had rockets like the Conestoga, the Pegasus, and the Taurus/Minotaur series. Honestly...

1 ^ | v • Reply • Share ›

envy ➚ Quattro Bajeena • a month ago

Blowing up villages full of people with hypergolic rocket explosions is generally frowned upon no matter who does it...

2 ^ | v • Reply • Share ›

envy ➚ Quattro Bajeena • a month ago

US companies were and are prohibited by law from using military solids for commercial launches. Pegasus and Minotaur-C use solid motors that were specifically developed for those vehicles and are not related to ICBM motors. The Minotaur variants using ICBM motors are not legally allowed to launch commercial payloads and can only be sold for US government launches.

1 ^ | v • Reply • Share ›

Greg Autry ➚ envy • a month ago

And to be clear the US rockets and some Russian ones using retired ICBM motors are party of a program to reduce ICBMs. The Chinese on the other hand are building NEW ICBM motors and launcher, enabling them to keep their ICBM factory going. This is not good.

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billsimpson • a month ago • edited

Forgot to mention the imprisonment of thousands of Uyghurs for the crime of being Muslims, but that's okay. And it might be a greater national security threat than Canadian aluminum of German cars.

^ | v • Reply • Share ›

Greg Autry ➚ billsimpson • a month ago

re: Metal tariffs, they were designed to block both transshipments of Chinese aluminum via Canada or elsewhere (very real) and "price transfer." It's like oil. US doesn't actually buy much or any from Middle East, but we care a lot about what the production rates are there because it sets the global prices including the ones in our domestic market. The Chinese have weaponized that mechanism. If China intentionally crushes global prices in a fungible commodity with massive state generated overproduction - as they did with Rare Earths and Solar modules/cells - they can kill US industry regardless of where we buy goods.

Therefore, if we conclude aluminum production is strategic - I think it is for aerospace nation - we have to keep our operators selling a price that is profitable enough to allow them to continually reinvest in their production and maintain US standards. It doesn't matter a wit if our steel and aluminum firms die because US companies buy metal from China at China's state subsidized price or if US companies by from Canada at China's price, they die all the same and we are no longer a superpower. It's takes more than a few minutes to understand and is easily misinterpreted by those who don't get that or don't want to. Canada needs to put in place assurances that they won't be the dumping ground for cheap metal price and pass that into our market. They seem to have done so.

5 ^ | v • Reply • Share ›

billsimpson ➚ Greg Autry • a month ago

Good points. I remember when Kissinger & Nixon started talking to the Chinese communists. I knew that was a bad idea from day one, since it is a totalitarian regime. I laughed when businessmen and politicians said that trade and development would change them. Which group has ever given up power and the wealth it can bring in a country as large as China? Like that will ever happen.

I would gladly pay more for things made outside China, not because I dislike Chinese, but because I dislike their political system which could become expansionary once they have built the largest military. Thankfully, they can't fill in the Pacific.

^ | v • Reply • Share ›

Greg Autry ➚ billsimpson • a month ago

Thanks for pointing that out Bill, the imprisonment of Uyghurs, in fact the occupation of their former country of East Turkestan - after Mao had their government killed a likely arrange plane accident - is one of the great human rights disasters of our age, along with the ethnic cleansing in Tibet and Mongolia. Media won't give it its due but I've not forgotten. It's just not salient to the scope of this topic. (I wrote a book for that).

2 ^ | v • Reply • Share ›