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CREATING A SAFE SPACE



Federal Aviation Administration

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U.S. Department of Transportation

Federal Aviation Administration

ISSN: 1057-9648 FAA Safety Briefing May/June 2023 Volume 62/Number 3

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The Office of Management and Budget has approved the use of public funds for printing FAA Safety Briefing.

ABOUT THIS ISSUE ...



The May/June 2023 issue of *FAA Safety Briefing* explores the FAA's role in the exciting and rapidly growing world of commercial space. Feature articles take us behind the scenes with the FAA's Office of Commercial Space Transportation and its critical safety oversight responsibilities. We also take a close look at spaceports and review how the FAA handles both safety and efficiency when it comes to protecting NAS users during launch and reentry operations.

Cover Photo: A SpaceX Falcon 9 rocket lifts off on a resupply mission to the International Space Station on Nov. 26, 2022. This marked the FAA's 500th licensed commercial launch. Photo courtesy of SpaceX.

Contact Information The magazine is available on the internet at: www.faa.gov/safety_briefing

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The Superintendent of Documents, U.S. Government Publishing Office sells FAA Safety Briefing on subscription and mails up to four renewal notices.

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The FAA Safety Policy Voice of Non-commercial General Aviation



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A NEW AGE FOR SPACE



Blue Origin's New Shepard rocket lifts off during the NS-22 sub-orbital space flight mission. Blue Origin photo.

With the warmer spring months now in full swing, we know many pilots are eager to get back in the air. As you consider new and exciting aeronautical adventures this year, I'd like to encourage you to become familiar with a national airspace system (NAS) neighbor that's not necessarily new but one whose operations are growing at warp speed — the world of commercial space transportation.

Space is our future and it's exciting to see the level of innovation and advancement now underway. It is also exciting to see how the U.S. continues to take the reins as the global leader in this industry.

You may not know that the FAA plays a leading role in advancing commercial space transportation. We do extensive licensing and regulatory work and participate in programs and initiatives to facilitate industry growth.

As you will see in this issue, we've gone from a single FAA-licensed commercial space operation in 2011 to 84 licensed operations in 2022. Those numbers will only increase as the industry grows and additional operators come online.

record requires a great deal of hard work and coordination. That's where you can help.

Thanks to a

ing that safety

In this issue, we will introduce several new terms and ideas that could be important when planning your next flight. For example, an "aircraft hazard area" (AHA) defines airspace that ATC cordons off to protect other NAS users during a commercial launch or reentry activity. Here's how the Pilot/ Controller Glossary defines it:

AHA — Used by ATC to segregate air traffic from a launch *vehicle, reentry vehicle, amateur* rocket, jettisoned stages, hardware, or falling debris generated by failures associated with any of these activities. An AHA is designated via NOTAM as either a TFR or stationary ALTRV. Unless otherwise specified, the vertical limits of an AHA are from the surface to unlimited.

There have been instances where GA aircraft flying near a launch area have resulted in a fouled range when an aircraft enters the launch range during a live launch attempt. It's a big deal because regulations

stipulate scrubbing the launch if communications cannot be established to reroute the aircraft. In addition to putting the errant aircraft's occupants in harm's way, such incursions also create significant costs and potential delays for other NAS users.

If you are chafing at the idea of more airspace restrictions, please remember that the FAA has made tremendous strides toward improving efficiency around AHAs. We have been able to cut airspace closures from four hours to around two hours and, in some cases, as little as 30 minutes.

To learn more about the importance of AHAs to the aviation community, please read and share the article "Let's Give 'em Some Space" in this issue. Our Checklist department also offers a refresher on the differ-

SPACE IS OUR FUTURE AND IT'S EXCITING TO SEE THE LEVEL OF **INNOVATION AND ADVANCEMENT NOW UNDERWAY**

ent types of special-use airspace, including those near space launches or reentry sites. You'll also learn more about the growth and

utility of spaceports, as well as how the FAA's Office of Commercial Space Transportation helps assure safety before, during, and after launch and reentry operations.

Knowing and better understanding commercial space operations can help us maintain a proactive approach to safety and promote a healthy safety culture in the NAS.

Let's reach for the stars. Happy reading!

AVIATION NEWS ROUNDUP

FAA Urges for Warning Labels on Lasers

High-powered laser pointers can incapacitate pilots flying airplanes with hundreds of passengers. To combat the threat, Acting FAA Administrator Billy Nolen requested, in February, that laser manufacturers add a warning label to their packaging to make consumers aware of the safety risks and federal laws when using lasers.

Lasers may seem like just a toy, office tool, or game for most, but they can incapacitate pilots putting thousands of passengers at risk every year. People need to be aware pointing a laser at an airplane is a federal crime. Pilots reported over 9,000



laser strikes to the FAA in 2022. Two hundred and seventy-eight pilots have reported an injury from a laser strike to the FAA since 2010. People who shine lasers at aircraft face FAA fines of up to \$11,000 per violation and up to \$30,800 for multiple laser incidents. The FAA issued \$120,000 in fines for laser strikes in 2021. For more information on laser safety and how to report an event, see the article "Blinded by the Light" in our Mar/ Apr 2023 issue bit.ly/3Tjckf9.

Aircraft Registration Now 7 Years

Congress required the FAA to initiate rulemaking to extend the duration of

aircraft registration certificates for all noncommercial general aviation aircraft from three years to seven years. The FAA cannot distinguish between commercial and noncommercial general aviation aircraft therefore, the FAA is extending the registration duration for all aircraft to seven years.

If a registration certificate expires after Jan. 23, 2023, the expiration date is extended by four years. The FAA's Civil Aviation Registry will send registered owners new aircraft registration certificates before their 3-year expiration date printed on the certificate. For aircraft owners who are operating with pink copy authority that expires after Jan. 23, 2023, that operating authority is extended to 12 months from the receipt of the first application following the transfer of ownership from the last registered owner.

For additional details, download Information for Operators 23002 at bit.ly/3Ki3LhH.

New Arrival Alert Notice Added for VGT

The FAA has added a new arrival alert notice (AAN) for North Las Vegas Airport (VGT). AANs help create situational awareness for pilots by providing a visual graphic of a wrong-surface landing hot spot at airports with a misalignment history. There are now 12 AANs published in the Chart Supplement (bit.ly/ USChartSup).

In addition to AANs, the FAA also established a set of standardized shapes for airport hot spots. The agency recommends that pilots familiarize themselves with Information for Operator (InFO) bulletin 22001, *Arrival Alert Notice* (AAN) and Airport Diagram Symbols



New Arrival Alert Notice for VGT.

for Wrong-Surface Hot Spots to ensure they know the new symbols. There are three standardized shapes for both surface-based and wrong-surface hot spots. Cylinders represent wrong-surface hot spots (landing surface) and circles or ellipses represent surface-based hot spots, depending on the size of the hot spot.

For additional details, download Information for Operators 22001 at bit.ly/3nqkWVj and be sure to visit the FAA's Runway Safety page at faa.gov/airports/runway_safety. You can also view the From the Flight Deck video on AANs at youtu.be/ wgA2RXUwaxo.

NAFI to Host Inaugural Flight Instruction Safety Summit

The National Association of Flight Instructors (NAFI) will convene its inaugural flight instruction safety and business summit on Oct. 24-26, 2023, in Lakeland, Fla. The organization will conduct the summit on the Sun 'n Fun campus at Lakeland Linder International Airport for current and prospective flight instructors, aviation leaders, industry advocates, government representatives, and the news media. The summit will feature keynote speakers addressing the vital role of flight instructors, with an emphasis on continuous improvement in safety and customer service. You can register for the event at nafisummit2023.org.

In addition to the keynote speakers, the summit agenda will have a schedule of 30-minute presentations related to flight instruction. NAFI is accepting presentation abstracts and the deadline for submission is June 1. Send an email to summit@nafinet.org for details.

FAA Urges Airlines, Pilots, and Others to Take Safety Actions

Following the FAA's Safety Summit on March 15, the agency issued a Safety Alert for Operators (SAFO 23002) with specific steps it wants airlines, pilots, and others to take. Among these action items include understanding the importance of sterile cockpit procedures, emphasizing the importance of awareness of the aircraft in relation to taxiways, runways, and other aircraft, and encouraging personnel to identify and report existing and emerging safety issues through voluntary reporting programs.

Pilots and operators should review the listed items and consider taking



additional steps to ensure operations are conducted at the highest level of safety, including changes to procedures or training. Download the SAFO at bit.ly/ 40Iq6KE.



Airports Now Required to

Develop and Implement SMS A new rule from the FAA helps

airports detect and mitigate safety problems before they result in accidents or incidents. The final rule requires certain airports to develop and implement a safety management system (SMS).

The use of SMS programs by commercial airlines and many manufacturers helped foster the safest era in commercial aviation history. Fundamental to the program is identifying risks and then taking steps to correct potential safety issues before they result in accidents or incidents.

The final rule applies to more than 200 of America's busiest commercial airports. The timeline to fully implement SMS ranges from four to five and a half years depending on the airports' classification and operations.

Learn more about SMS for 14 CFR part 139 airports at bit.ly/3lXd2SP.

NTSB Releases Data Visualization Tool for GA Accidents

The National Transportation Safety Board (NTSB) introduced a new tool to visualize information about recent general aviation accident investigations. The dashboard provides summary statistics, investigative findings, and safety recommendations for general aviation (GA) accidents from 2012 through 2021.

The dashboard allows users to more intuitively display accident

information, reports, and statistics by selecting one or more filters for year, location, phase of flight, and defining event. Accident findings are displayed in a tree-like menu that's based on the four-level hierarchy NTSB uses to break down its investigative findings. The tool also includes preset filters for commonly sought-after findings such as those on aircraft control, powerplant, and weather. Safety recommendations relating to the GA accidents in the 10-year data set can be filtered by year or addressee. Go to bit.ly/40My9Ge to view the dashboard.

LAANC Now Accepts Night Authorizations for Recreational Drones

Recreational flyers may apply for near real-time airspace authorizations to operate at night through the Low Altitude Authorization and Notification Capability (LAANC). LAANC is a collaboration between FAA and industry, which directly supports UAS integration into the airspace and provides drone pilots with access to controlled airspace at or below 400 feet.

Recreational flyers must meet the requirements of the Exception for Limited Operations of Unmanned Aircraft and follow the safety guidelines of FAA-recognized community-based organizations. Learn more at bit.ly/3lTqvey.

THE HUMAN BODY IN SPACE

On April 12, 1961, Yuri Gagarin became the first person to journey into space and orbit the Earth. Remarkably, this was less than 60 years after the first powered flight by the Wright Brothers on Dec. 17, 1903. Even more remarkably, it has been over 60 years since Gagarin's space flight.

During that time, space flight has become almost routine. Space flight is no longer limited to a select few individuals rigorously screened, medically, and extensively trained for specific missions. Instead, the FAA requires the pilot or remote operator of a human spacecraft to have a FAA pilot certificate with an instrument rating (14 CFR part 460). After all, the spacecraft will transit through the national airspace system to get to space. In addition, each crew member with a safety-critical role must possess a FAA second-class medical certificate.

Space tourism began on April 30, 2001, when Dennis Tito spent eight days aboard the international space station. Over the past few years, the space tourism industry has expanded with multiple private companies providing transportation. Unlike the crew, there are no medical requirements for the passengers.

Congress passed the 2004 Commercial Space Launch Amendments Act to safely open space to private commercial, scientific, and cultural enterprises. Any medical requirements are put in place by the operators themselves. However, Congress can always direct requirements at some future point; this was the case for the airline industry in which Congress mandated that the airlines accommodate passengers with medical conditions. As you probably suspect, ongoing discussions are already addressing the path ahead. Even though this is a work in progress, you might be interested in some of the medical issues of space flight.

Space is a harsh, unfriendly environment for humans. Aside from the obvious fact that there is essentially a vacuum outside the vehicle, humans face several medical concerns in space flight.

Space motion sickness affects up to 70% of astronauts and can last several days. This high frequency is seen in a group selected for good health and experienced in flight.

Calcium is mobilized from the bones in a microgravity environment and can lead to both kidney stones as well as weakening of the bones themselves. There is also muscle loss in a microgravity environment. Countermeasures for muscle and bone loss exist but only partially mitigate the effects of microgravity.

Radiation exists everywhere on the Earth, but it increases in low Earth orbit outside most of the atmosphere and increases again when outside the protection of the Earth's magnetic fields.

The latter was a concern for the lunar missions and will be again for future missions to the moon and Mars. The acceleration forces on launch and re-entry are not insignificant and easily exceed 3 Gs, sustained for seconds or even minutes.

Post-flight effects include orthostatic intolerance (feeling faint) and neuro vestibular dysfunction (such as vertigo and instability). These issues affect everyone regardless of underlying health, but there is concern that those with compromised health might face more significant challenges. It is reassuring that centrifuge-based research studies have shown that most people do very well during simulated



Photo of astronauts and cosmonauts conducting a medical emergency exercise on the International Space Station. NASA photo.

space flight profiles, even those with stable chronic diseases.

Many concerns are similar to those that impact passengers now, albeit more extremely: emergency egress for those with physical or mental limitations; exacerbations of underlying medical problems; medical emergencies without the ability to obtain treatment immediately (similar to transoceanic flights); loss of or decreased cabin pressure. My staff is looking at these issues, as are other governmental and industry organizations in the U.S. and worldwide. To help address these and other issues, FAA's Office of Commercial Space Transportation hopes to publish updated guidance based on the 2014 initial release of "Recommended Practices for Human Space Flight Occupant Safety" by the end of this year.

Not that long ago, air travel was limited to the wealthy or adventurous. It might take longer for space travel to become as egalitarian as air travel, but we are preparing for it now.

SPACE RACE 2.0 Why the FAA is Aiming for the Stars

By James Williams

Photo courtesy of SpaceX.

e think of rockets as a descendant of aircraft, but in reality, rockets have existed in functional roles since the late eighteenth century. Look no further than the "Star Spangled Banner" and the rocket's red glare. Fast forward to today and rockets are now an integral part of a thriving commercial space industry. It has been a long and winding road, but the FAA and many other partners, both in government and the private sector, have worked diligently to enable a glorious liftoff.

A Brief History

Rockets stayed in the domain of battlefield artillery for all practical purposes until the 1920s. While aircraft came of age during World War I, it wasn't until the World War II that rockets would begin to play a more significant role. Rockets were bolted to trucks, half-tracks, and tanks on all sides to provide mobile artillery. They would be widely issued to infantry as anti-tank weapons. They would be added to airplanes to increase firepower from traditional armaments. They would even go on to power a few aircraft and provide takeoff assistance to others.

The space race would officially be kicked off in Germany on June 20, 1944. That was when an A-4 rocket (popularly

known as the V-2) would be launched vertically to a height of more than 100 miles, becoming the first manmade object in space. The war in Europe would be over within a year, and that technology, among others, along with many scientists working on it, would be transferred to the United

States. In a twist of irony, it would be the German program and not the work of Robert Goddard (the pioneering American rocket engineer) that would, a little more than 25 years after the A-4's trip to space, form the basis of landing men on the moon.

Rockets were extremely expensive and dangerous (both intentionally



Photo of the lift off of a Saturn V rocket on Apollo 11. NASA photo.

and unintentionally). This meant governments had a critical role in both funding and managing the technology. With the successful completion of the Apollo program in 1972 and the retirement of the Saturn V rocket in 1973, change was coming to the space arena. The follow-up Space Shuttle program would focus on making access to space more affordable and perhaps even practical as a business. As the Space Transportation System (the formal name of the Space Shuttle program and why missions would be labeled STS-XX) ramped up in the mid-1980s, the regulatory environment began to shift. At first, with an executive order followed rapidly by legislation, 1984 would be the year when commercial space was born. The Department of Transportation was initially designated as the federal agency in charge of enabling commercial space operations. This would be shifted to the FAA and eventually come to rest in the FAA's Office of Commercial Space Transportation (AST). But why the FAA?

A Guide to the Stars

At first, the FAA might seem like an odd fit. While we think of the space arena as one unit, there are actually three sectors: civil (NASA), military (DOD), and commercial (FAA). NASA and the Department of Defense (DOD)/Space Force (SF) run their own operations and coordinate with the FAA only to secure airspace around their space launches and recoveries. This situation is very



The Space Shuttle Discovery prepares for launch. NASA Photo.

similar to how our classic aviation system works. The FAA does not technically regulate government aircraft and operations (whether military or civil).

Government aircraft operators may often be under orders to comply with FAA regulations or procedures. In fact, the FAA's own fleet of aircraft operates under Part 135 by the agency's decision (see bit.ly/FAAFleet). The same situation holds for space operations. The DOD may contract with air carriers to provide transportation and stipulate that the carrier must operate under FAA regulations. DOD, or NASA, may also employ commercial space operators to conduct missions for them where they may require FAA regulations to be employed. In general, though, DOD and NASA operate and oversee their own space operations.

Another key difference is that the FAA is a regulatory agency, while NASA is a research agency. NASA grew



An FAA licensed commercial resupply mission to the International Space Station lifts off. NASA photo by Tony Gray.

out of the National Advisory Committee on Aeronautics (NACA), which conducted significant aeronautical research that eventually included rockets before and after World War II. Long after the agency was folded into NASA's creation, NACA's groundbreaking research lives on in airfoil profiles and NACA ducts that are still employed today. From even before it existed until today, research remains the core focus of NASA.

In contrast, the FAA exists as a regulator. The FAA's primary concern is safety. Regarding commercial space operations, the FAA explicitly targets the safety of the uninvolved public. Space operations are very risky when compared to traditional aviation. While everyone involved wants the operation to be as safe as possible for the participants, there is a significant amount of risk involved in all space operations. Even well-funded and well-run government programs, like NASA's Space Shuttle or the Soviet/Russian Soyuz, experienced losses well after they matured.

The FAA focuses on a few key areas to regulate and support the nascent commercial space industry. "We license launch/reentry operations and site operators or spaceports, issue experimental permits, conduct safety



AST Associate Administrator Kelvin Coleman (2nd from right) with FAA employees (I-r) Dr. Paul Wilde, Diane Doran, Sherman Council, and Jeff Holmes at Vandenberg Space Force Base.

inspections of launch and operation sites, and review payloads in coordination with our government partners," explains Brian Verna, an engineer and senior advisor in AST. "The commercial space industry is in a very different phase than aviation," Verna continued. "Commercial space is still emerging, so we work much more hands-on with applicants to help them get to a place where they are ready for licensing."

"Since 2011, we've seen a dramatic increase in the cadence of operations from three operations to 84 in 2022 and 92 projected in 2023," Verna said. "Those numbers don't include NASA or DOD who handle their own operations although both are increasingly turning toward commercial space launch services to augment their own capacity. With such a packed schedule and a growing list of applicants, we stay quite busy," he continued.

"Licensing is key to what we do," Verna explains. "We license the launch or reentry of vehicles produced by U.S. companies and launched domestically or internationally. So we even have some launches licensed in New Zealand and this year licensed the first commercial space launch in the United Kingdom." He continued, "We don't license or certificate the launch or reentry vehicles themselves. We license the operation because each operator has their own systems and vehicles." The current state of commercial space operations would resemble air carrier operations if United or American Airlines would not only operate and maintain their fleet, but also design and build it. This means there is little commonality amongst the designs, but quite a bit between the operations. Plus, this focuses on the FAA's primary concern, ensuring the safety of the uninvolved public.

Space Map

"In 1997, AST had about 40 employees that covered 17 commercial launches," Kelvin Coleman, the Associate Administrator of AST, explains. "That grew to 26 FAA-licensed operations in 2017. But in the last six years the industry has taken off, we had a record-breaking 84 total

operations last year [2022]. That's a 223% increase!" He continued, "We're proud of our perfect public safety record throughout such a fantastic period of innovation and expansion, and fortunately this year Congress recognized our needs and approved an increase in funding that will allow us to grow our staff to address the needs of the industry." Coleman attributes their overall success to the exceptional contributions of dedicated FAA employees and industry partners.

AST is comprised of two directorates, the Office of Operational Safety and the Office of Strategic Management. The Office of Operational Safety tends to most of the day-to-day operations of AST (See the article "All Systems Nose to Tail" on page 15). Their role would be akin to our Fight Standards District Offices (FSDO) in that they work directly with the operators. The Office of Strategic Management is similar to the headquarters division role that provides policy, guidance, and support to the inspectors and analysts in the field doing the direct work with operators. This also includes functions like rulemaking and administrative support. Additionally, AST's Office of Spaceports supports commercial spaceports across the country. Find out more about spaceports on page 18.

In some ways, AST is a space-based miniature version of the FAA's regulatory structure in whole. Given the expected growth in the commercial space industry, AST adopted this structure to realign for greater efficiency. This more robust structure allowed for more manageable spans of control.

What Goes Up?

One of the keys to AST's operation is partnership. AST works with other offices within the FAA, particularly the Air Traffic Organization, as well as other government agencies. While no government agency has control of space, AST is charged with reviewing the payload of each commercial operation. This is a collaborative process with other government agencies to ensure that a payload doesn't present a problem once it arrives in space. This can be a complicated process even when there is entirely noble intent. At least one applicant is working on launching a nuclear power source for use in spacecraft. This technology allows long-range missions with a more reliable and powerful energy source than solar alone. This can be critical for operations moving away from solar energy. But as you can imagine, it requires working with other agencies to ensure the safety of the launch and failsafe procedures in the event of an anomaly. Innovative technology requires a certain amount of risk, but AST's job is to ensure the public does not bear the risk.

Human space flight is the next big field that looms large over the future of AST. "AST was specifically given additional resources to address human space flight safety," Coleman



Northrop Grumman Antares rocket launches from Mid-Atlantic Regional Spaceport with Cygnus resupply spacecraft onboard. NASA photo by Bill Ingalls.

said. "Currently we are in, what we refer to as the 'regulatory preparation period,' so that in the event the learning period is allowed to expire in October, we have several ongoing efforts to engage with our industry partners."

"Right now, we're operating under an informed consent model for human space flight participants," Verna said. "That's based on a moratorium from a congressional mandate that limits the FAA from issuing regulations on human space flight until October 2023."

Verna mentioned that the FAA will be providing an update to its Recommended Practices for Human Space Flight Occupant Safety later this year for the first time since 2014. "This is part of our effort to modernize our guidance should the moratorium end later this year," he continued. "We wouldn't be in a place to issue new regulations in October, but we are working with industry and our government partners to chart a path forward."

"In addition to updating the recommended practices, we are also preparing for an aerospace rulemaking committee, called a SpARC, which is an opportunity for industry to share their input," Coleman explains. "We will continue to engage with industry to establish best practices and look for consensus on voluntary standards to improve safety for everyone."

One of the critical adversities AST has faced is how to do something that hasn't been done before. "Given the emerging nature of the commercial space market and the need to accommodate unforeseen approaches, we've been moving from a prescriptive to a performance-based licensing model," said Verna. AST is in the process of changing its licensing of launch and reentry vehicle operations from those existing in 14 CFR parts 415, 417, 431, and 435 to the new, streamlined licensing of part 450. Part 450 combines the concepts from the previous parts into the new performance-based framework. "This change allows us to focus on safety goals without relying on sets of prescriptive requirements to achieve the same safety outcomes." This dovetails with the FAA's broader approach to regulation, which has been shifting to performance-based rules for over a decade. "Part 450 allows us to issue a single license for multiple launches from multiple locations instead of licensing every launch from every location and every trajectory separately," he continued. "We aim to allow innovation while protecting the public, and part 450 helps accomplish that."

Ultimately FAA's role with commercial space transportation is to protect the public while allowing this nascent industry to mature and innovate. AST has a perfect safety record in protecting the public, and the FAA aims to keep it that way even with the massive future growth.

James Williams is FAA Safety Briefing's associate editor and photo editor. He is also a pilot and ground instructor.

LEARN MORE

FAA's Commercial Space homepage faa.gov/space

LET'S GIVE 'EM Some "Space"

How to Safely Steer Clear of Aircraft Hazard Areas During Spacecraft Launch and Reentry

By Tom Hoffmann

n case you hadn't noticed, the commercial space race is on. Today's headlines regularly tout the commercial space industry's blistering pace of advancement and innovation — everything from reusable rockets to space tourism to nanosatellites the size of a shoebox. Launch frequency has recently picked up too. In just the last 12 years, we've seen the cadence of U.S. commercial space launch and reentry operations grow from about three licensed operations a year to approximately two per week!

As this industry has grown, the FAA has developed a safe operating infrastructure that ensures the safety of the public, and all National Airspace System (NAS) users, including general aviation. However, the complexities of space operations require some innovative ideas to balance industry growth, operational efficiency, and more importantly, safety for all.

Celestial Changes

GA pilots know all too well that change in aviation is a constant, but it's also something this group is keenly adept at handling well. Depending on where in the country you regularly fly, it's possible you've encountered some changes spurred by commercial space activity. And if you haven't, well, it's probably just a matter of time.

FAA licensed launch and reentry sites, a.k.a. "spaceports," are expanding geographically and are no longer limited to the coastlines. Becoming familiar with this growing sector of the NAS is just as important to your safety as it is to any humans strapped in and waiting to blast off into space (more on that later).

The FAA collaborates with federal and industry partners to determine the safest path for space launch and reentry operations and how to safely integrate them into the airspace with the least disruption to other users. Let's take a closer look at this process and see what this might mean for you.

Launching Some New Terms

For starters, no one will ask GA pilots to solve trajectory optimization calculations or measure their altitude in astronomical units. Still, there are some key terms and concepts that can be helpful to know when operating near areas with launch activity. A good starting point is a

A SpaceX rocket successfully launches a communications satellite. Photo courtesy of SpaceX. familiarity with 14 CFR section 91.143, Flight limitation in the proximity of space flight operations. It states:

When a Notice to Air Mission (NOTAM) is issued in accordance with this section, no person may operate any aircraft of U.S. registry, or pilot any aircraft under the authority of an airman certificate issued by the FAA, within areas designated in a NOTAM for space flight operation except when authorized by [air traffic control (ATC)].

14 CFR part 450, which covers space launch and reentry licensing requirements, describes the safety criteria for a launch in Section 450.101, stating that:

A launch operator must establish any aircraft hazard areas necessary to ensure the probability of impact with debris capable of causing a casualty for aircraft does not exceed $1 \times 10-6$ [one in a million].

So the regulations require the FAA to protect the airspace near a launch or reentry but also require pilots, when indicated, to avoid that same airspace. The launch operators often utilize the expertise of DOD or NASA Range personnel to develop these protective aircraft hazard areas (AHAs) noted in Part 450. They perform complex calculations to determine the risk to aircraft at areas above and around the launch point and under the path of the launch vehicle as it makes its way to space.

Consideration factors for AHAs include the type of operation, the launch vehicle's flight history, as well as its configuration, including how many stages there are, and whether any fairings, skirt rings, batteries, or other spent components will jettison during launch.

"The AHA is essentially a box that encompasses the airspace where the risk to an aircraft exceeds the acceptable limits," explains Duane Freer, manager of the FAA's Space Operations Group at the Air Traffic Control System

Command Center in Virginia. "Air Traffic Operations then takes that box and determines how to best protect the airspace."

Air traffic control (ATC) uses a variety of special-use airspace to create an AHA, including a temporary flight restriction (TFR), restricted or warning area, ATC-Assigned Airspace (ATCAA), and a stationary altitude reservation (ALTRV). In some cases, it's a combination of all five.

"It's often a mosaic of these airspaces that's needed to protect the launch area," says Freer. "We're limited once we go 12 miles offshore, where we can't use TFRs or restricted areas." That's when warning areas, ATCAAs, and ALTRVs round out the needed protection.

The information in these space launch and reentry hazard areas is relayed to pilots via Notices to Air Missions (NOTAMs), usually 48 to 72 hours in advance. The NOTAM provides details in terms of timing, size, and scope of the restriction and can include terms such as "rocket

AIRCRAFT HAZARD AREA (AHA):

Used by air traffic control to segregate air traffic from a launch vehicle, reentry vehicle, amateur rocket, jettisoned stages, hardware, or falling debris generated by failures associated with any of these activities. An AHA is designated via NOTAM as either a TFR or stationary altitude reservation (ALTRV). Unless otherwise specified, the vertical limits of an AHA are from the surface to unlimited. — Aeronautical Information Manual

launch activity," "space launch," or "space reentry," depending upon the type of operation.

For GA pilots, the accompanying TFRs and restricted areas are what you'll most likely see graphically depicted on a flight planning chart before a launch. But you may also see the ALTRV areas depicted in certain flight planning apps (e.g., ForeFlight) or the term included in the NOTAM associated with the launch. The ALTRV protects the airspace under the projected launch area and debris fields, often further away from the launch sites.

For example, in figure 2, you'll see an initial AHA — "AHA A" — east of the launch site and another much larger one — "AHA B" — hundreds of miles further east of the launch. Although ALTRVs typically impact the air carrier and business aviation operators more than GA, it's good



Figure 1 - Space launch and reentry cadence graph.

to have situational awareness of these zones, particularly when a launch may involve an AHA closer to or over land.

Made in Space

Unlike the familiar axiom in civil aviation, where your landings should always equal your takeoffs, it's a bit different in the commercial space arena. As shown in the space launch and reentry cadence graph (figure 1), launches far outnumber the reentries. Thankfully that's by design. For suborbital launches, both the ascent and descent are counted as a launch as they do not achieve orbit and reenter. Additionally, many orbiting vehicles are not expected to reenter to a landing. By design many reenter the atmosphere and burn up high in the earth's atmosphere.

However, that calculus might soon change due to the expected growth of certain markets, like suborbital space tourism and microgravity manufacturing.

So while current space reentry operations from orbit generally occur in remote areas over water with a minimal impact on GA, future reentry operations may involve more inland reentry operations and require a more watchful eye.

Space Invaders

As we've detailed here, a lot of planning and preparation goes into having a safe commercial space launch or reentry operation. But just as we hear about presidential or special event TFR violations, airspace violations have also occurred during launch operations. These incursions may not result in scrambling F-35s to intercept the errant aircraft, but they can have some serious and unexpected consequences. In space parlance, these airspace violations are known as range-fouling and can easily result in a scrubbed launch. "To date, we've only had a few cases of range fouling in the U.S., but with the expected increase in operations, there is greater potential for more," says Glenn Rizner, a senior technical advisor in the FAA's Office of Commercial Space.

One of these incursions happened at Virginia's Wallops Flight Facility, the Mid-Atlantic Regional Spaceport, in 2018. As a commercial resupply flight to the International Space Station was approaching launch (T-0), a small GA aircraft flew near the launch area likely with the intent of getting a good view or picture. The aircraft's radar track showed it orbiting just off the coast to be in the best position at T-0. Unfortunately its flight path violated the AHA airspace causing the operator to scrub the launch. There were numerous implications from this act, the immediate being the pilot violating 14 CFR section 91.143 and possibly other regulations.

However the implications go far beyond that. The launch operator had to again coordinate with the spaceport and the Range personnel for a new launch opportunity. DOD airspace needs had to be considered. New NOTAMS had to be prepared and disseminated. Air carriers, domestic and international, as well as GA flights again had to reroute around the new designated AHA airspace. One aircraft's errant action impacted countless NAS operations.

Beyond the NAS implications, a fouled range also presents an obvious danger to anyone onboard the aircraft that commits the incursion due to the risk of falling debris. But did you know it also endangers the lives of any human occupants on the spacecraft and accompanying support personnel? These men and women are in close to proximity to millions of pounds of highly pressurized and volatile propellant. If a launch attempt is scrubbed, the astronauts must be removed from the capsule, and the vehicle

de-tanked with meticulous care.

The cost of a scrubbed launch is also significant, ranging upwards of \$1 million. Cost considerations include recalled security personnel, road closures, fresh propellants, and impacts to neighboring launch facilities. Launch windows are often tight and dependent on several variables, so it could be hours, days, or weeks before operators can reschedule the launch.

Then there's the cost and inconvenience factor to the airlines and other NAS operators who have to once again navigate around these areas and possibly incur delays. On the plus side, assuring safety and improving the efficiency around airspace closures for launch and reentry activities is an area in which the FAA has made tremendous strides.



Figure 2 – The aircraft hazard areas depicted in red following the launch of a spacecraft, from Kennedy Space Center in Florida.



In the Challenger Room at the FAA's Command Center, the Space Operations Group works directly with the launch/reentry operators to provide mission planning assistance and realtime support with tools like the Space Data Integrator (SDI).

A Stellar Effort

In just the last few years, the FAA has been able to cut airspace closures from four hours to around two hours and, in some cases, as little as 30 minutes. To do this, the FAA leverages a multi-faceted approach that, in addition to improving efficiency, has allowed the agency to maintain an exceptional safety record.

The FAA Air Traffic Organization's Space Operations Team, led by Duane Freer, is of key importance. Stationed in the "Challenger Room" at the FAA's Command Center, this team works directly with the launch and reentry operators to provide mission planning assistance and real-time support during launch and reentry activities.

"If there is any kind of problem, the Space Ops Team uses a special hotline with the operator to call out the anomaly or malfunction and employs a contingency plan as needed," says Freer. He adds that this hotline has been instrumental in gaining real-time situational awareness and dynamically opening and closing airspace.

Another tool, the Space Data Integrator (SDI), adds even more fidelity to operational awareness by providing realtime telemetry data on the vehicle's location, speed, and altitude. Freer likens the SDI to a radar system that helps his team see whether a space vehicle is progressing on a nominal path. SpaceX is currently the only operator using SDI, but the FAA is in the process of onboarding several others to the system soon.

"Future add-ons to SDI will provide greater efficiencies and push real-time info to controller's scopes," adds Freer. "SDI is the foundation of the house we're building."

The Culmination of Collaboration

Safely integrating space launch and reentry operations into the NAS may be a complex mission for the FAA, but it's not a task they shoulder alone. Instead, the agency regularly relies on a host of industry and government partners to execute these safety protocols and help develop and tweak them going forward. As part of a collaborative decision-making (CDM) process, the FAA meets quarterly with all active launch operators, participating government agencies (e.g., NASA, DOD, Space Force), and various aviation community members, to collectively solve and manage issues.

"Just about all of the tools we have today to promote airspace safety and efficiency have been involved with the CDM process in one form or another," says Freer.

An important result of this collaboration and improved monitoring capabilities is the industry's stellar safety record

and the FAA's ability to lessen the impact of AHAs on airspace users and immediately release that airspace once it's safe. That's good news for everyone, including the GA community.

Maintaining this upward trajectory of safety and efficiency is a collective effort. So how can you be a part of the safety equation when it comes to commercial space activity?

"Start by familiarizing yourself with the local area you're flying in to see if there is a potential for space operations," says Freer.

"If you are near a launch or reentry site, you'll want to conduct additional preflight planning," adds Rizner. That



Depiction of commercial space launch TFR on a flight planning app.

includes checking NOTAMs and your flight planning tool of choice to verify any future launch or reentry activity. Another safe option is to request Flight Following from ATC.

So the next time you're ready to "blast off" to your next destination, be mindful of your fellow NAS users, who might be ready to more literally do the same. By working together, we'll all achieve greater heights.

Tom Hoffmann is the editor of FAA Aviation News. He is a commercial pilot and holds an Airframe and Powerplant certificate.

LEARN MORE

Space Data Integrator faa.gov/newsroom/space-data-integrator-sdi-0

FAA's Commercial Space Data page faa.gov/data_research/commercial_space_data

FAA's Commercial Space Airspace Integration page faa.gov/space/airspace_integration

Watch 57 Seconds to Safer Flying on YouTube





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ALL SYSTEMS NOSE TO TAIL

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How the FAA Ensures Public Safety at Commercial Space Launches

Rolling out a SpaceX Falcon 9 launch vehicle. Photo courtesy of FAA.

By Jennifer Caron

almost missed it. My fingers fumbled to click the live stream link to watch the SpaceX Falcon 9 rocket blast into space. I made it just in time as the countdown clock read T-00:01:25 minutes to go.

I anxiously awaited liftoff of the tall, white cylindrical capsule piercing the backdrop of the Florida night sky. As plumes of white clouds blanketed the spacecraft, the launch director called, "Go for Launch."

It's now T-minus 30 seconds ... 15 seconds ... T-minus 5, 4, 3 — the hold-down bolts explode, bright beams of gold illuminate the launch pad, and like a phoenix rising from the ashes, the rocket is unbound and free for liftoff — T-minus 2, 1 — "Engines Full Power! Lift Off!" "Go,



What a rush! Every time I watch a launch, I get chills. But consider this — that launch was just another routine FAA-licensed NASA/SpaceX operational success, marking its 27th commercial resupply mission to the International Space Station. Not long ago, who would have believed that commercial space missions would increase in frequency and complexity and become commonplace? Just another day at the commercial space transportation office.

One Giant Leap

For a long time, the commercial space industry was mostly static. What once was an exclusive government-led activity

is now open to commercial space operators and private individuals. Now, the industry is very dynamic, and it's growing and changing day by day. There are new operators in the system, new launch vehicles, and new launch sites and spaceports, with more on the way.

We also see the frequency of launches increasing thanks to innovative commercial technologies. The price of commercial launches is decreasing as companies reuse rockets to save costs and improve accessibility



Licensed launches since 1989 as of 3/30/2023. To see more, visit faa.gov/data_research/commercial_space_data.

to space. Human space flight is also changing. Although, for now, most of us Earth dwellers still have to "win the lottery" to boldly go and hitch a ride on a space flight.

It's Not Just NASA

U.S. space transportation has three sectors. The National Aeronautics and Space Administration (NASA) runs the civil sector. The U.S. Space Force, under the Department of the Air Force, oversees the military sector.

The third sector is commercial. The FAA regulates com-

mercial space transportation with jurisdiction over all commercial launches. Yes, the FAA. The FAA has authority over any commercial launch in the U.S. and any conducted by U.S. operators outside of the U.S.

In 1984, Congress passed the Commercial Space Launch Act designating the Department of Transportation as the lead federal agency enabling private-sector launch capability. In 1995, the agency transferred regulatory oversight of com-

mercial space transportation to the FAA. You'll find the regulations in Title 14, Code of Federal Regulations, parts 400 to 460 (bit.ly/3JH1A5C).

Sharing the Final Frontier

To avoid conflicting requirements and multiple sets of standards between the civil, military, and commercial space launch sectors, the FAA has partnership agreements in place with the following:

- NASA to "achieve safe, reliable, and cost-effective access to space" for passengers, cargo, and payloads for orbital and suborbital missions,
- The Department of the Air Force for licensed launch and reentry activity on Air Force ranges and installations, and
- The National Transportation Safety Board (NTSB) on commercial space mishap investigations.

In addition, NASA and the U.S. Space Force are using commercial operators' launch services for many of their operations. Both agencies work closely with the FAA to ensure safety without duplication.

To learn more about U.S. launch and reentry sites, also known as spaceports, take a look at the article "Spaceports are Where the Spaceships Go" in this issue.

These are the Voyages to Exceptional Safety

To enable the world's safest commercial space transportation system, the FAA plays a vital role in integrating launches and reentries into the National Airspace System (NAS) to balance the needs of all NAS users, including commercial space operators.

The FAA also has safety oversight responsibilities in commercial space to protect the public on the ground, in the air, and on the seas. The agency's Office of Commercial Space Transportation (AST) works to encourage, facilitate,

> and promote safe commercial space launches and reentries by the private sector while ensuring the public's health and safety, the safety of property, as well as the national security and foreign policy interests of the U.S.

Public safety is AST's top priority. Public safety is at the core of AST's commercial space responsibilities, from the licensing and permitting process to the safety inspections conducted before, during,

and after a launch or reentry, and to the investigation and corrective actions following a mishap event.

License to Launch

You can't legally drive a car without a driver's license. It verifies that you have the required training to drive safely. Similarly, you can't blast into space without a license to launch.

AST licenses and regulates commercial space launch and reentry operations. While public safety is the driving force and ultimate determinant in launch and reentry licensing, AST strives to provide commercial space transportation operators with maximum flexibility to innovate by regulating their operations only to the extent necessary.

The goal of the initial application review is to determine whether or not what the operator is proposing to do is in line with FAA requirements. To help applicants develop a comprehensive, compliant, and complete application for review and approval, AST provides checklists for a launch or reentry license, experimental permit, launch site operator license, or safety approval.

Safety Authorization

The process begins with conversations about the operator's concept of operations, focusing on the effects of that operation from a public safety standpoint.

Commercial space covers any type of mission that is

Drop launch of Virgin Space Ship Unity. Copyright Virgin Galactic/Reuters.

suborbital, orbital or beyond when launching on a commercial provider. Key differences determine how a launch is licensed or permitted. For example, some flights are orbital, such as SpaceX flights that orbit the Earth, and others, such as the Stratolaunch, that don't reach orbit, are designed to return to Earth.

Although a majority of FAA licensed launches do not involve human space flight activities, there are several considerations to be made with those that do. Take, for example, the differences between Richard Branson's Virgin Galactic flights and Jeff Bezos' rocket company, Blue Origin, which is famous for launching Captain Kirk into space "for real."

Blue Origin flies without a pilot on board. Their flights are suborbital, software-driven, and they launch from a relatively remote area in West Texas.

In contrast, Virgin Galactic (VG) flights have two pilots. Their suborbital space flight system involves two



Ray Jenkins, an aerospace engineer and licensing evaluation team lead.

vehicles, a carrier aircraft, or mothership, and smaller spacecraft attached below. Both vehicles are licensed for the launch of a reusable launch vehicle, where the spacecraft separates from the mothership and air-launches under rocket power. VG flights launch from New Mexico, which brings additional considerations to protect the public and surrounding property.

"It's different when you're launching nearly straight up in the middle of Texas in a remote location as you do with Blue Origin, but when you're climbing out and away from Spaceport America in New Mexico, there are people and property around that have to be protected," says Ray Jenkins.

Jenkins is an aerospace engineer and licensing

evaluation team lead in AST's Safety Authorization Division. He trained astronauts during NASA's Space Shuttle program and currently leads the FAA licensing teams for human space flight operators Virgin Galactic, the Boeing CST-100, Space Florida, and reviews safety approvals for commercial ground and flight training from his office at the Cape Canaveral Space Force station near the Kennedy Space Center in Florida. "You have a mothership that's carrying a rocket with nitrous oxide and other very explosive commodities, and you have to make sure that these are not going to fly over populated areas in the event of an anomaly," Jenkins explains.

The FAA also requires human space flight commercial operators to provide life support, smoke detection, and fire suppression systems on the launch or reentry vehicle. Operators are also required to take the precautions necessary to account for human factors that can affect a crew's ability to perform safety-critical roles in such things as the

design of the vehicle and mission planning. "We look at what kind of ground equipment they'll use, how they'll pressurize the vehicles before they fly, what kind of fuels they'll be using, and how the space flight participants will be informed of the risks and trained to fly aboard. We're looking at it from beginning to end, whether pre-launch or post-landing," says Jenkins.

SpaceShipTwo, another VG vehicle, is a rocket going up, but a glider coming down. "We need to understand which way the rocket's pointing, which means when it's coming down, we need to make sure it's not going over-populated areas," Jenkins explains.

For crewed flights, AST also reviews the commercial space operator's pilot qualifications and training. Jenkins reviews the operator's pilot operating handbooks in great detail to ensure that these handbooks address all the operations necessary to function safely.

FAA commercial space safety regulations also contain requirements for flight crew qualifications and training so that the vehicle's operation will not harm the public. This includes training for routine, emergency, and abort situations and demonstrating the ability to withstand the stresses of space flight.

Safety Analysis

Next, AST conducts deep dives into flight and system safety analysis by performing more specialized studies and reviews. With a risk-based approach, they focus specifically on the effects a commercial space operation could have on public safety. AST uses flight safety and system safety



Katie Cranor, Safety Analysis Division Manager.

analysis to determine license application compliance and develop a quantitative assessment of public risk.

To calculate risk and determine probability, AST's technical staff evaluates several critical factors of the proposed operation. For example, they look at what would cause the spacecraft to break up and how it would do so. They evaluate the location of property and persons, performing complex calculations such as the potential trajectory of the debris and whether or not these pieces are explosive or could cause harm.

"Essentially, we apply a risk-based approach to commer-

the guidance system were to fail or the probability that the vehicle would fly off in the wrong direction.

Flight safety analysis and system safety analysis are concurrent processes. System safety is the umbrella that identifies the hazards. System safety analysis evaluates particular hazard control strategies to mitigate the risk to acceptable levels. AST requires commercial operators to follow a system safety process and designate an independent safety official within their organization that is separate from the launch vehicle team. System safety analysts take an overarching approach to evaluate the operator's system safety processes from the top down. They identify top-level hazards and ensure that the verifications of mitigation measures put in place by the operator are sufficient.

AST's system safety analysts evaluate every safety-critical system on the vehicle, particularly the systems that implement the operator's hazard control strategy, design, and all components of the operator's flight safety system.

Flight safety systems, for example, are specific to the operator's mission. In VG operations, the flight crew is essentially part of the flight safety system; therefore, they play a critical safety role in the event of an anomaly. They're on the controls and have direct input into where the vehicle is going.

Operators such as SpaceX use an autonomous flight safety system (AFSS). Suppose the vehicle starts violating a flight rule. In that case, the flight computer will take action to control the flight of the vehicle. Some AFSSs set off linear-shaped, on-board ordnance designed to blow open fuel tanks to disperse the engine's propellant and break up the vehicle.

Other operators use a thrust termination system that cuts all power to the pumps feeding the engine.

"Our analysts assess the flight safety system's ability to end the flight of the rocket in a controlled manner if it were



The flight safety analysts on Cranor's team aim to achieve a probabilistic expectation of the likely outcomes. They review the launch vehicle and the potential hazards, such as what would happen if The FAA's Commercial Space Licensing Process.



to go off course," Cranor explains.

Working closely with the commercial operator's independent safety official, AST also develops mitigation measures that serve as flight commit (go/no-go) criteria on the day of the launch to protect flight and launch personnel and the public in the surrounding area.

To conclude their evaluation, AST identifies inspection items, terms and conditions, and any procedures the operator performs before launch.

Safety Assurance

Once AST has issued the license, the inspection team takes over. They perform safety inspections with a risk-based approach. They ensure the operator complies with the applicable federal regulations, verify the representations they made in their application, and provide oversight on the operator's launch operations.

"To do our jobs, we rely heavily on the products produced by our teams in the Safety Authorization and Safety Analysis Divisions," says Jesse Hanson, AST's Safety Assurance Division Central Branch Manager and mishap program lead in Houston, Texas. "Safety assurance is the pointy end of the process; our safety inspectors are out there with the operators on a day-to-day basis verifying compliance as operations occur."

Inspection teams perform preflight, launch, and postflight activities, attending onsite flight safety system testing to verify performance as expected during the launch. Inspectors are onsite with the commercial operator at flight readiness reviews confirming that ground and flight safety systems, safety equipment, and launch operator personnel in safety-critical roles are prepared for the mission. They're also at emergency response rehearsals to ensure the operator is ready to respond should a mishap occur.

Safety Assurance confirms that the operators have established hazard areas and processes and procedures to ensure that the public remains outside of those areas. That includes NOTAMs and NOTMARs (Notice to Mariners) to protect the site and ensure the public is advised about where there will be a hazard, particularly around the launch area or where an expended rocket stage will impact.

"My safety inspectors at Cape Canaveral and the Kennedy Space Center work closely with NASA and the Space Force to ensure compliance for commercial launches from federal ranges," says Safety Assurance's East Branch Manager Erin Moll. She heads up the Cape Canaveral Space Force Station field office in Florida. "We coordinate with the ranges to ensure that our public safety criteria, our regulations, and the standards and requirements of the Air Force are being met."

Houston, We Have a Problem

Each mission is unique and presents new and different challenges. Therefore, the FAA requires all licensed



Jessie Hanson, Safety Assurance Division Central Branch Manager.

commercial space transportation operators to have an FAA-approved mishap plan containing processes, procedures, and checklists for reporting, responding to, and investigating mishaps.

The FAA identifies nine events that constitute a mishap, such as malfunction of a safety-critical system or high risk of causing a severe or fatal injury to any space flight participant, crew, astronaut, or member of the public.

"For a standard launch, we'll have one safety inspector on console, supported by a duty officer, and a mishap response coordinator," explains Hanson. "In the event of a mishap, the safety inspector, duty officer, and I ensure that we're making all the required notifications, coordinating



FAA Acting Administrator Billy Nolen signs an MOA regarding the investigation of commercial space mishaps with NTSB Chair Jennifer Homendy. NTSB Photo by James Anderson.

with stakeholders, and tracking the operator's implementation of their emergency response plan."

A recent example occurred in 2021 when Firefly's Alpha rocket veered off course just minutes after launch, triggering the Space Force launch team to initiate the flight safety system's destruct command to break up the vehicle.

After a mishap, the FAA requires the operator to investigate the root cause and identify and adopt preventative measures to avoid a recurrence. The AST safety inspector is on console and verifies if the operator implements their procedures under the representations made in their application or emergency response plan. This includes steps to minimize and contain the mishap, secure data and physical evidence, and provide the FAA with the proper notifications.

Based on the nature and severity of the mishap, AST may authorize the operator to investigate per their mishap plan under FAA oversight, or the FAA or NTSB may lead the investigation. Based on the commonality of launch vehicles and systems, NASA and Space Force personnel may observe commercial space mishap investigations.

This past year, the FAA and the NTSB signed a new memorandum of agreement on commercial space mishap investigations. The agreement identifies the NTSB as the lead agency to investigate commercial space launch or reentry mishaps that result in "a fatality or serious injury to any person, regardless of whether the person was on board the commercial space launch or reentry vehicle, or damage to property from debris that could reasonably be expected to cause death or serious injury, and the property is not associated with commercial space launch or reentry activities or the launch site." The FAA will lead investigations for all other commercial space mishaps.

To foster collaboration and share best practices and lessons learned in mishap investigations, representatives from the FAA, NASA, NTSB, and Department of Air Force meet regularly in the mishap Quad-Agency Working Group.

To Infinity and Beyond

With a milestone of over 530 licensed launches and counting, the FAA enjoys an exceptional safety record while balancing the extraordinary growth and demands in the commercial space transportation industry. The FAA continues to ensure the safe integration of commercial space ventures into the world's busiest airspace as we expand our horizons to the Moon, Mars, and beyond.

Jennifer Caron is FAA Safety Briefing's copy editor and quality assurance lead. She is a certified technical writer-editor in the FAA's Flight Standards Service.

LEARN MORE

AST's Compliance, Enforcement and Mishap page faa.gov/space/compliance_enforcement_mishap

AST's Licensing, Approvals, and Permits page **faa.gov/space/licenses**

SPACEPORTS ARE WHERE THE iternationiationationalessationales SPACESHIPS GO

Explore the Dawn of the Commercial Spaceport

By Paul Cianciolo

s the world of aviation in the 21st century blossoms, we grow rapidly beyond the standard aerodrome. Our field of dreams sprouts airports, heliports, vertiports, and spaceports — all regulated by the FAA as part of the safest, most efficient aerospace system in the world.

Every "port" has its purpose in our aerospace ecosystem. One of the most unique is the commercial spaceport. It has evolved beyond its natural habitat of just launching a simple rocket into space. We now have vertical launches, horizontal launches, and reusable vehicle reentries competing for resources in our National Airspace System.

'If You Build It, They Will Come.'

Who will come, you ask? That would be private industry vying for a piece of the commercial space transportation

market. The satellite business is booming. Tourists, as space flight participants, are lining up. NASA focuses on its research and contracting to transport astronauts and cargo. Then there is the future business of cleaning up all the space debris swirling around up there and getting in the way. Suffice it to say; we need to ensure safety as we get into the groove of the current space race.

ON-RAMP

That safety starts on the ground. Unlike the certification that the FAA does for airmen and aircraft, commercial spaceports, launches, and reentries are instead licensed by the FAA. This distinction is intentional. Congress created the difference in Title 51, United States Code, because of the uniqueness of commercial space transportation compared to aviation. In the case of commercial space operators, the uninvolved public's safety is paramount.

NASA Photo by Bill Ingalls.



Spaceport America in New Mexico. Photo copyright Spaceport America.

'Who's on First?'

The FAA regulates all private launch and reentry activities and the operations of launch and reentry sites. This task includes all commercial launches or reentries within U.S. borders or outside our borders when conducted by U.S. entities. All commercial space license types and procedures are in 14 CFR parts 413 through 460.

Congress also mandated that we "encourage, facilitate, and promote" commercial space transportation, which is the job of the FAA's Office of Commercial Space Transportation. As part of that team, the Office of Spaceports is responsible for developing policies that promote infrastructure improvements and strengthen the

The FAA's Office of Spaceports is responsible for developing policies that promote infrastructure improvements and strengthen the competitiveness of U.S. spaceports. competitiveness of U.S. spaceports. They support launch and reentry site licensing activities, provide technical assistance and guidance to existing and proposed spaceports, and collaborate with other countries



An Antares rocket readies for launch at the Mid-Atlantic Regional Spaceport on Wallops Island, Virginia. NASA photo by Bill Ingalls.

developing launch or reentry sites of their own. The FAA aims to be a global leader in commercial space transportation safety.

"Other countries are investing in spaceport capacity and incentivizing private companies through grants in space transportation development," notes Pam Underwood, FAA Office of Spaceports director.

"We are also starting to work with foreign governments to ensure that we can have a common level of safety, which should resonate with pilots because if you fly here or in another country, there are already agreements in place for international standards and safety practices for aviation. That's where we need to go for space as well. Our responsibility as the FAA is to provide consistent safety, regardless of where these launches occur."

'Go the Distance.'

The U.S. has 14 licensed spaceports, which includes launch and reentry site operators. An additional three sites, two of which are operated by SpaceX and the other by Blue Origin, are designated exclusive-use and do not require a license from the FAA. The FAA oversees public



safety at exclusive-use launch sites through the launch vehicle licenses that are required for all commercial space activities. There are also a few commercially-used federal ranges. See the spaceport and launch/reentry site map for locations.

Go to bit.ly/spaceports to get the details about each FAA-licensed commercial spaceport organized by state.

"Exclusive-use launch sites are ones owned and operated by a launch vehicle company for solely their own activities," explains Underwood. "At FAA-licensed spaceports, any operator can conduct operations so long as they have an FAA license — and approval from the spaceport operator."

Many factors are considered by operators when choosing the location of a launch including efficiency in reaching the intended orbit, safety of the uninvolved public, and cost.

"Locations like Alaska are perfect for polar orbits because you effectively take off, go north or south, and fly over the globe's poles. Some satellite launches need to be closer to the equator, making launch locations such as Florida ideal. It all depends on the specific function or purpose of the satellite," said Underwood. "Launches over the ocean are also very attractive because public safety concerns are mitigated — no one is out there. Also, you can usually access many different orbits from the ocean. You can even make polar orbits from many ocean locations."

The types of launch and reentry operations conducted at a spaceport determine its license type. A spaceport can also be co-located with an airport, often called an air and space port. "When point-to-point operations become a reality, it may be beneficial to have joint air and space ports. You could fly from your home airport to an air and space port and then hop on a launch vehicle to reach your final destination," thinks Underwood.

Most horizontal launches start attached to a traditional airplane, so a runway is used. Nine FAA licensed spaceports are for horizontal launches. Those vehicles take off like an airplane, and their rocket ignition occurs somewhere away from the spaceport.

"There's such a wide variety of launch vehicles that I'm not convinced the industry will solidify in on one type, like the airplane," elaborates Underwood. "We've even got people that want to launch things from tubes shooting the vehicle into space! This means we may never have a standard spaceport design."

Five of the 14 spaceports are purely for vertical launches — the traditional rocket that goes up.

Safety of the surrounding area, including any environmental impact, is the keystone to spaceport and reentry site license approvals. The 1970 National Environmental Policy Act ensures that commercial space transportation decision-makers understand the potential environmental effects of proposed licensing and permitting activities, disclose the potential impact on the human environment from the proposed activities, and evaluate reasonable alternatives to the proposed activities.



An Astra rocket lifts off from Pacific Spaceport Complex - Alaska. Credit Astra/Brady Kenniston.

'It's a Moonshot Homerun!'

The world of spaceports also opens doors to innovation and jobs beyond the launch/reentry. At Houston Spaceport, for example, incubator space for startup companies working in space transportation is in the works. A manufacturer assembles spacesuits for NASA, and another company is building a lunar lander onsite. In addition, the construction of a facility to start work on the first commercial space station is underway.

At other spaceports, testing of rockets and other launch technologies and the manufacturing of parts are happening. Jobs in the space transportation field continue to grow.

'Is This Heaven?'

There is now so much potential to safely enter the heavens thanks to the work of the FAA. However, pilot awareness around our nation's spaceports is essential, especially in general aviation operations.

Always consult the NOTAMs (Notice to Air Missions) before a flight. Interfering with a launch or reentry is risky and costly to everyone involved. There is always the potential for rocket failure in the launch zone. A returning vehicle component, which could be a reentry vehicle or expendable stages/components, coming in hot-and-heavy is just a glider and can't get out of your way.

Spaceports have various security measures in and around them too. The airspace may have permanent or temporary flight restrictions over and around the spaceport property. There are times when a launch may be delayed due to weather or another issue and rescheduled for the next day or even later that week. This is why reading the NOTAMs daily before operating your aircraft is essential.

'This is Our Field of Dreams.'

Sometimes when you believe the impossible, the incredible comes true. With more than 500 launches and counting and an impeccable safety record, we are poised to lead the world through the commercial space race. The next phase in aerospace safety is upon us.

Paul Cianciolo is an associate editor and the social media lead for FAA Safety Briefing. He is a U.S. Air Force veteran and an auxiliary airman with Civil Air Patrol.

LEARN MORE

FAA's Office of Spaceports faa.gov/space/office_spaceports **HELP US STAY**



Receiving responses to the GA survey from all aircraft is essential to assess the need for aviation infrastructure and evaluate the impact of safety and aviation initiatives.

*Survey invitations were sent to a select group of aircraft owners/operators.

Understanding Flight Hours and Safety Metrics Reporting your flight hours is critical because of the direct linkage to computing accurate accident rates.

Not Reporting Your Hours = Higher Calculated Accident Rate

Reporting Your Hours = Lower Calculated Accident Rate

More Accurate

QUESTIONS? CALL 800-826-1797 OR EMAIL INFOAVIATIONSURVEY@TETRATECH.COM

SUA IN THE USA

As a pilot, having a clear understanding of Special Use Airspace (SUA) is critical to safety, no matter what area of the country you fly. Add in the booming commercial space market, and you have yet another reason to ensure you're not in the wrong place at the wrong time, especially when flying in unfamiliar territory. To help, here's a quick review of SUA in the USA.

Prohibited Areas

The first and most restrictive form of SUA is the prohibited area. As the name suggests, this is the airspace where all flight is prohibited within its boundaries, from the surface to the prescribed altitude. Prohibited areas are usually associated with national security, do not have an effective time, and can be surrounded by temporary flight restrictions (TFRs). Luckily, these most restrictive airspace areas are relatively rare. That said, the serious nature of any encounter with their boundaries provides a strong incentive to note and avoid them by a safe margin. You'll find prohibited areas indicated on charts with a "P" and a two or three-digit number. For example, P-40 — the designated area surrounding the presidential retreat at Camp David, Md. — is marked as a cyan box, circle, or another shape.

Restricted Areas

Unlike prohibited areas, restricted areas constrain, but do not completely outlaw, operations within the boundaries. A restricted area may not go all the way down to the surface, while prohibited areas protect something on the surface.

A key difference is that restricted areas, in many cases, are more about airspace. Also, restricted areas are only restricted when they are "active," meaning that a pilot may pass through this airspace outside of that "active" window.

Restricted areas are more common than their prohibited cousins. They are labeled on the charts with an "R" and a number, usually three or four digits, and possibly a letter. An example would include R-2517 around Vandenberg Space Force

Base, home to extensive space flight operations with eight launch complexes (both vertical and horizontal).

The best way to ensure that you are transiting during the inactive time is to contact the controlling ATC facility or operate on an IFR flight plan.

Warning Areas

The twin to a restricted area is a warning area. While the two are nearly identical in depiction and description, a warning area differs because it extends beyond three nautical miles off the coast, where the U.S. does not have sole jurisdiction. Since the FAA can't technically restrict airspace outside the country, the agency has established warning areas to identify airspace that pilots should avoid without contacting the controlling ATC facility.

Warning areas also differ from restricted areas in that pilots are not banned from the airspace under threat of enforcement action but rather warned that the activities within could be hazardous to non-participating aircraft. Both warning and restricted areas are depicted on the charts as cyan boxes.



Restricted area R-2517 around Vandenberg Space Force Base.

Military Operations Areas

Next are Military Operations Areas (MOA). These are areas where the military can practice activities that may require more space than the restricted area will allow. However, MOAs differ from restricted areas because IFR pilots may be cleared through an active MOA if ATC can provide separation. Also, a MOA is not technically restricted, meaning that VFR pilots may enter a MOA even if it is active. Similar to how a Flight Service briefer will tell you VFR is "not recommended" during bad weather, entering an active MOA is likewise "not recommended." MOAs usually have a name (e.g., Bull Dog or Avon Park) and are depicted on charts as magenta boxes.

Alert Areas

Another type of area that should concern pilots is the alert area. These are areas of increased flight training or other unusual aeronautical activity. Alert areas are designed to keep transient traffic away from pilots doing air work or other operations that might not fit neatly with through traffic.

Alert areas don't have a controlling ATC facility, so you don't have to ask

permission to enter or transit the alert area. It's only charted so that you can be aware of it and not be surprised by the airplane that could be maneuvering unpredictably. Florida has several alert areas due to the close proximity of many flight schools. Alert areas are depicted on charts with magenta hash marks and an "A" followed by numbers and possibly a letter.

Controlled Firing Areas

As defined by the Aeronautical Information Manual, controlled firing areas (CFA) contain activities that, if not conducted in a controlled environment, could be hazardous to non-participating aircraft. CFAs are usually set up for ordnance disposal or static testing of large rocket motors.

The difference between CFAs and other special-use airspace is that activities must be suspended when a spotter aircraft, radar, or ground lookout position indicates an aircraft might be approaching the area. Another interesting fact is that CFAs are not charted since they do not cause a non-participating aircraft to change its flight path.

National Security Areas

Unlike the mandatory nature of prohibited or restricted areas, a National Security Area shows airspace that pilots are requested to avoid. National Security Areas could include military



Prohibited area P-40 and restricted area R-4009 surrounding the Camp David Presidential Retreat.

installations or a nuclear plant. In other words, it would not require designation as a prohibited area, but it's an area that the FAA or other agencies would prefer pilots avoid. They are depicted by dashed heavy magenta lines and a text box with an explanation. A word of caution: these areas may be subject to a TFR issued by a Notice to Air Mission (NOTAM).

Other Airspace Areas

There are still other airspace areas that are of importance to pilots. These include parachute jump operations, a special flight rules area (SFRA), and a TFR, to name a few. See the airspace chapter in the FAA's *Pilot's Handbook of Aeronautical Knowledge* for more details (bit.ly/2nBxvNT).

Aircraft Hazard Areas

We want to highlight one relatively new term you may want to learn more about — the aircraft hazard area (AHA). An AHA is a term used by ATC to segregate air traffic from a space launch or reentry vehicle and any debris this activity might generate.

AHAs are designated via NOTAMs and may include a combination of different special-use airspaces to protect any transiting aircraft — TFRs, restricted areas, warning areas, and what's known as an altitude reservation (ALTRV) to protect airspace

users from any operational anomalies and falling debris.

For GA pilots, the accompanying TFRs and restricted areas are what you'll most likely see graphically depicted on a flight planning chart before a launch. You can find out more about AHAs and the FAA's efforts toward minimizing their impact on the aviation community in this issue's feature article, "Let's Give 'Em Some Space."

A Few Final Tips

Please be aware that some of these special-use airspace types can overlap. For instance, you could encounter a restricted area sitting on top of a prohibited area. Just because you flew over the prohibited area doesn't mean you're free and clear. You may also see restricted areas and MOAs that overlap or abut.

The bottom line — there are three basic strategies you can use to avoid an unpleasant run-in with a SUA:

- 1. Learn what types of SUA you may encounter in your route of flight and the requirements of each one.
- 2. Get a good briefing to know what's active and what's not.
- 3. Stay in contact with ATC when possible. That could mean filing IFR or requesting flight following to help you avoid any last-minute SUA and TFR issues.

James Williams is FAA Safety Briefing's associate editor and photo editor. He is also a pilot and ground instructor.

Tom Hoffmann is the editor of FAA Aviation News. He is a commercial pilot and holds an Airframe and Powerplant certificate.

LEARN MORE

FAA Safety Team Course ALC-42, Airspace, SUA, and TFRs bit.ly/ALC-42

"Proceed with Caution: A Review of Special Use Airspace," FAA Safety Briefing, Jan/Feb 2015 bit.ly/FAASBJanFeb15

Pilot's Handbook of Aeronautical Knowledge, Chap 15, Airspace bit.ly/2nBxvNT

Aeronautical Information Manual, Chap 3, Section 4, Special Use Airspace bit.ly/AIMChp3Sec4

Special Use Airspace Map, FAA's Aeronautical Data Delivery Service **bit.ly/40y9yVY**

AC 91-92, Pilot Guide to a Preflight Briefing bit.ly/FAABriefingGuide

DRONES AND SPACE LAUNCHES

People of my generation probably remember the feeling of excitement and anticipation when a teacher rolled the TV cart into the classroom on launch day. We all joined NASA command in the countdown at "T minus ten," and the room erupted with cheers as the shuttle lifted off. Watching a space launch used to be a rare and special occasion. Today, space launches have become so common that many of us don't think twice about them, and I can't remember the last time I stopped what I was doing to join in on the countdown.

With the increase in the number of commercial space launches (we're averaging more than one per week), what does this mean for drone pilots? It means learning about the dangers and restrictions of flying near a commercial (or any) space launch site.

Getting your drone in the air for that perfect shot or video of a space launch may seem super tempting. In fact, it's so tempting that many traditional aircraft pilots try to do this very same thing! Although it's understandable as to why it makes sense to keep traditional aircraft away from active launch sites, it may seem as if drones would pose a smaller risk. After all, most drones are very small, with no pilots aboard, so what harm could they actually do?

Actually, drones do pose a significant risk to launch operations. They can interfere with or disrupt the launch, and if a drone collided with the rocket, it could result in significant damage.

Commercial space launches are complex operations that require a lot of planning, preparation, and coordination. The FAA establishes temporary flight restrictions (TFRs) around



(Both images) Commercial space launch TFR and restricted operations notice depicted on the B4UFLY app.

launch sites to restrict the operation of drones and other aircraft for everyone's safety and as a matter of national security. The TFRs extend vertically and laterally from the launch site. Their shape can vary depending on the specific launch operation and typically extend several miles in all directions.

According to FAA Aviation Safety Inspector Tim Beglau, the restricted airspace area isn't arbitrary. Based on past incidents as well as safety requirements, the airspace restrictions are large enough to protect the launch zone and also the area that might be part of a mishap investigation if things don't go as planned. If you fly your traditional aircraft or drone in these restricted areas, you risk losing your pilot certificate, being fined, and possibly face criminal charges.

It's important for drone pilots to understand the restrictions

gov), by calling 1-800-WXBRIEF, or by using the B4UFLY app. The FAA may establish TFRs as early as forty-eight hours or as late as six hours before a launch and they may remain active up to two hours after a launch. Operating a drone within a TFR requires specific approval, usually granted through the special governmental interest waiver (SGI) process. More information on the SGI process can be found at bit.ly/43mwbP1.

By checking for airspace restrictions and following the rules and regulations, drone pilots can help ensure the safety and success of commercial space launches.

Rebekah Waters is a senior communications specialist in the FAA's UAS Integration Office.

commercial space launch sites. The consequences of flying near a space launch can be severe. It could cause the operator to scrub the launch or possibly create a launch mishap. If you plan

to fly near a location used for commercial space launches, it is vital that vou check for NOTAMs online (notams.aim.faa.

SEE A SAFETY ISSUE? FILE A NASA REPORT

If I see upcoming road hazards, such as an accident or a disabled vehicle, I flash the headlights to my fellow drivers in the opposite lane. Where I live, it is a goodwill gesture to let fellow drivers know to be vigilant. That same mentality drives us to step forward, speak out, and let other people know when something's not right.

As a maintenance professional, you are on the industry's front lines, and we (the FAA) need your valuable input. If you, or other mechanics in your shop, see either brand new issues or "that same old problem" that you believe compromises aviation safety, please say something — and not just to those in your shop. Report your concerns to the aviation community and file a "NASA Report" online at asrs.arc.nasa.gov.

Your NASA Report is free, confidential, online, and there's no punishment for reporting.

What is a NASA Report, and How Does It Work?

The "NASA Report" is the popular nickname for the officially-named NASA Aviation Safety Reporting System (ASRS). ASRS is a voluntary safety-reporting program funded by the FAA and administered by the National Aeronautics and Space Administration (NASA). The "NASA Report" moniker arises from the fact that NASA, not the FAA, collects and analyzes aviation safety incident reports and keeps them confidential.

NASA's ASRS welcomes all users to report any safety issue, especially information that could help prevent an accident. They protect your identity and the identity of all other parties involved. In fact, the FAA may not seek, and ASRS may not release to the FAA any information that might reveal the identity of any party.

ASRS collects de-identified information and the reporter's narratives to spot deficiencies and discrepancies in the National Airspace System (NAS). These narratives provide a rich source of information for understanding the nature of hazards and enhance the basis for human factors research and recommendations for future operations.

At ASRS, human eyeballs review every single report. A minimum of two expert aviation analysts review these reports to classify the aviation hazard, de-identify it, and flag critical safety information for immediate action.

For example, when ASRS receives a high-priority/safety critical report, an alerting message goes to the appropriate FAA office or aviation authority about the safety concern. But while the FAA gets the details of the incident, they know nothing about you.

ASRS completely removes names, N-numbers, dates, times, and anything that could identify those involved. They keep your de-identified report in the database to improve safety for everyone in the NAS and so that others can learn from you.

It's So Much More

ASRS is a living directory of invaluable information on all types of aviation safety data.

Anyone can access NASA's ASRS database online; visit asrs.arc.nasa.gov. Aviation safety researchers, the NTSB, and GA advocate organizations such as AOPA, aircraft manufacturers, and others use the information to improve safety and training. But, the key ingredient to its success is hearing from you. If you want a glimpse (or more) of ASRS value, take a look at their *Callback* newsletter (asrs.arc.nasa.gov) and subscribe. You'll find aircraft maintenance themes in the newsletter too, like this one on MEL-related incidents at go.nasa.gov/3Js9pvS.

See Something? Say Something.

Maintenance technicians, pilots, ground personnel — anyone who uses the NAS — can file a "NASA Report." You can submit a report about any incident or situation that you believe compromises aviation safety — something that you saw, experienced, or were involved in — any safety issue that needs to be addressed.

Report as many times as you need, as often as you need. There's no limit.

Although ASRS receives over 100,000 safety reports annually, the lion's share comes from air carriers. ASRS gets only a small percentage of these safety reports from AMTs in general aviation.

We can do better! Speak up, do your part, and file a report at asrs.arc.nasa.gov. By sharing things you see or do, you may just save someone else's life.

Jennifer Caron is FAA Safety Briefing's copy editor and quality assurance lead. She is a certified technical writer-editor in the FAA's Flight Standards Service.

LEARN MORE

Check out the Advisory Circular (AC 00-46F) on the Aviation Safety Reporting System (ASRS) at bit.ly/3XNxpA9.

HELICOPTER WAKE TURBULENCE



U.S. Army photo.

A 2022 video showing a small plane caught in helicopter wake turbulence while coming in to land has garnered much attention at 1.3 million views (bit.ly/3zzqMGV).

According to a National Transportation Safety Board report, the pilot survived the crash at the California airport with only minor injuries, but the Cessna had "substantial" damage.

The video brings attention to the danger posed by helicopter wake turbulence.

"I think there's a big misunderstanding with turbulence in general," said Jessica Meiris, a Colorado helicopter pilot producing a safety video on helicopter wake turbulence with the FAA-industry Rotorcraft Collective. "In school, we're taught about wake turbulence from jets and planes. I think helicopter-induced turbulence is widely misunderstood."

Any aircraft generates wake turbulence in flight. Much of the aviation community's attention has focused on larger planes because they produce the most turbulence. Wake turbulence occurs as a function of an aircraft producing lift, resulting in the formation of two counter-rotating vortices trailing behind the aircraft. Wake turbulence can force an aircraft to roll and cause the pilot to lose control.

Helicopters present a more unique situation. In a slow hover taxi or a stationary hover near the surface, helicopter main rotor blade(s) generate downwash, producing

high-velocity outwash vortices to a distance about three times the rotor's diameter, according to the FAA's *Aeronautical Information Manual* (AIM). When rotor downwash hits the surface, the resulting outwash vortices have characteristics similar to wing tip vortices produced by fixed-wing aircraft. However, the AIM states that the vortex circulation is outward, upward, around, and away from the main rotor blade(s) in all directions.

In forward flight, departing or landing helicopters produce a pair of strong, high-speed trailing vortices similar to wing tip vortices of larger fixed-wing aircraft. According to the AIM, pilots of small aircraft should use caution when operating behind or crossing behind landing and departing helicopters.

To mitigate risks, the FAA urges pilots to wait several minutes for the turbulence to dissipate or maintain a safe distance from the rotor downwash. How long you should wait depends on wind conditions and the terrain. A rule of thumb in the aviation community is to wait at least two minutes or keep a distance of three nautical miles. FAA guidelines recommend that pilots of aircraft weighing 41,000 pounds or less, which covers most helicopters and small planes, avoid operating within three main rotor diameters of any helicopter operating in a slow hover taxi or a stationary hover.

"A helicopter in a hover is a moving microburst," Meiris noted.

With regard to a forward flight for aircraft in general, the FAA provides a set of recommendations based on the multitude of aircraft and weight classes that travel U.S. skies, with an emphasis on larger aircraft. The recommendations are available in Chapter 7, Section 4 of the AIM (bit.ly/AIMchp7sec4). For helicopters flying behind another helicopter, you should generally stay above the aircraft in front of you to avoid the wake turbulence.

The key takeaway is that helicopter wake turbulence exists, and it can be dangerous. Please take the proper precautions.

I would like to end this column with some important news. On March 8, 2023, the FAA published a Special Airworthiness Information Bulletin (SAIB) for crash-resistant fuel systems described in the May/ June 2023 Vertically Speaking department. Through the SAIB, owners of rotorcraft built after April 5, 2020 (i.e., those not covered by the law requiring crash-resistant fuel systems) are encouraged to install equipment that helps protect helicopter occupants from post-crash fires.

Gene Trainor works as the communications specialist/ executive technical editor for the FAA's Compliance and Airworthiness Division.



www.Facebook.com/groups/GASafety



Check out our GA Safety Facebook page at Facebook.com/groups/ GASafety.

If you're not a member, we encourage you to join the group of nearly 16,000 participants in the GA community who share safety principles and best practices, participate in positive and safe engagement with the FAA Safety Team (FAASTeam), and post relevant GA content that makes the National Airspace System safer.

Pilots: The Old and The New Dear Susan,

Thank you for "Shiny Side Up," another great spot of easy to understand enlightenment for new and old airplane pilots (bit.ly/3ZyWP4L). I don't know how you have consistently written such interesting and informative articles for all these years (not that we are getting old!).

Just wanted to say hi and congratulate you for your continuing contribution to general aviation safety.

— Jim

Hi Jim. Thanks so much for the kind feedback! Glad you enjoyed the article.

It's been fun writing for FAA Safety Briefing for all these years and I guess maybe we (or at least I!) really AM *getting old. I will be retiring from the* FAA at the end of Jan 2023, so the JanFeb 2023 issue will be my swan song. I'm not quite sure what comes next, but I suspect it will involve continuing to write in some way.

Best. Susan

Are You a Professional? Tom,

It was a pleasure to read the article in the brief of an FAA Safety Briefing on the topic of professionalism and modeling the path in Aviation Maintenance (bit.ly/3KyLuND).

Your thoughts, language, and examples were refreshing during a time when the standards, practices, and method of earning the Mechanic Certification have dramatically changed over the last several decades.

I have flown for over 55 years and flew in the Army starting about 51 years ago, and I have had some meaningful special moments in a career where I've been blessed more than I deserve, but this is about

Aviation Maintenance, GA and to share the importance of what you brought to the surface in your writings. That is what I appreciate! Thank you.

— Ierrv

For more stories and news, check out our new blog "Cleared for Takeoff" at medium.com/FAA.

Let us hear from you! Send your comments, suggestions, and questions to SafetyBriefing@faa.gov. You can also reach us on Twitter @FAASafetyBrief or on Facebook at facebook.com/FAA. *We may edit letters for style and/or* length. Due to our publishing schedule, responses may not appear for several issues. While we do not print anonymous letters, we will withhold names or send personal replies upon request. If you have a concern with an immediate FAA operational issue, contact your local Flight Standards Office or air traffic facility.



The 3 P's of Risk Management

All pilots can benefit by adding steps to assess risk in their own operations. First you Perceive or identify the hazard. Next, you Process the hazard by assessing the likelihood of it occurring, assessing the severity of the consequences if it does, and developing a plan to mitigate it. Then you Perform or execute your plan to change the situation in your favor. Find more resources, flight risk assessment tools (FRAT) and FAASTeam videos in our latest #FlySafe topic: bit.ly/3ZLRE2j.

WITH STARS IN THEIR EYES

The stars don't look bigger, but they do look brighter. -Sally Ride, Astronaut and Physicist

It was only 15 minutes before launch time when I picked up my two young daughters from school and hurried them into the car to get to our viewing spot. We made our way to a soccer field I had scoped out earlier with a decent view of the eastern horizon. I was unsure what to expect as we anxiously waited for Rocket Lab's new Electron rocket to launch about 200 miles away at Wallops Island, Va. Then, about 90 seconds after launch, we noticed what appeared to be a fuzzy pink star that slowly descended and eventually disappeared behind a distant tree line.

"That's it," I shouted gleefully to my kids, who were struggling to see why I was so excited about a fuzzy star. While this somewhat visually underwhelming event may have registered as more of a "meh" moment for my daughters — who were clearly more interested in the mac and cheese I promised to make at home — I was definitely more awe-struck by personally witnessing another important step in the advancement of space exploration.

Affectionately dubbed "Virginia is for Launch Lovers," this mission was Rocket Lab USA's first launch on U.S. soil. It also debuted the use of NASA's autonomous flight termination unit (NAFTU). As the name implies, this system allows for an automated termination of the launch should something go wrong and does so more quickly and efficiently than existing methods. This preemptive safety mechanism also provides measurable cost savings to the operator and, more critical to this audience, sets up the potential for smaller and shorter downrange airspace restrictions.

Back home, with my kids happily chomping away at their dinner, I tried my best to segue back to the launch. "You know, astronauts eat mac and cheese in space," I said. With their attention gained, I went on to explain how we're turning a new page on space exploration and how there will be a growing need for future workers in the space industry, especially around the time they finish school. I mentioned some of the many career options, like an engineer, scientist, or even a flight controller.

It is exciting to think about the future career opportunities for my daughters in this burgeoning industry. Developing a space workforce of the future is an important subject on the FAA's radar as well. In addition to regulating the commercial space industry, the FAA is also tasked with promoting this vital arena. That includes supporting and encouraging a pipeline of diverse talent.

The Commercial Space Transportation Advisory Committee (COMSTAC) bit.ly/COMSTAC, which advises the FAA on commercial space matters, has a STEM working group committed to helping the FAA find ways to encourage greater diversity and participation in STEM education.

The working group recommended using spaceports as education hubs to promote space industry activities for students early in their education. They also suggested working more with universities and student organizations to highlight job opportunities and identify points of engagement with the FAA. Another key element of this STEM initiative is the Space Workforce Pledge 2030, an internship program to



Rocket Lab USA's first launch on U.S. soil at Mid-Atlantic Regional Spaceport. Photo copyright Rocket Lab.

advance diversity, equity, and inclusion in commercial space (swf2030.org). For more on the FAA's overall STEM initiative, see faa.gov/education.

If you're interested in some additional interstellar inspiration, check out a recent FAA podcast ("It's Just Rocket Science") that highlights the career trajectories of two women in the field of space and proves curiosity can lead to out-of-this-world realities bit.ly/3meaGyX.

Editor's note: Before signing off, I'd like to take a moment to acknowledge my talented predecessor, Susan Parson, whose words have graced these pages for well over ten years. It's not often that someone comes along during your professional career and truly makes a difference. I wish Susan the absolute best in her retirement and offer her my deepest gratitude for helping me be a better writer and person. *Merci mon amie.*

Tom Hoffmann is the editor of FAA Aviation News. He is a commercial pilot and holds an Airframe and Powerplant certificate.

GLENN RIZNER

Senior Technical Advisor, FAA Office of Commercial Space Transportation

Since the dawn of aviation, young people have been influenced by what they read and watch. Disney's 1967 "The Boy Who Flew with Condors" is what inspired Glenn Rizner to a flying career. That true-life adventure of a California teenager who sailed the skies with the endangered condors led Glenn to his hometown airport in Southbridge, Mass. There, a glider got his attention and would be a catalyst for a truly "out of this world" aviation career.

"I decided to learn to fly airplanes and then transfer to flying gliders," said Glenn.

By his junior year of college, Glenn had earned his commercial pilot and flight instructor certificates. After graduating, he established and co-owned a Part 141 flight school and Part 135 air taxi operation in Connecticut. Glenn also volunteered with the FAA as an accident prevention counselor — a predecessor to the volunteer FAA Safety Team Rep we have today.

After earning his master's degree, he had a chance encounter that led him to AOPA's Air Safety Foundation as the director of seminar programs. Glenn and the foundation team flew around the country in a Cessna 210 delivering safety messages. At the same time, he also served as the acting executive director of the Seaplane Pilots Association.

After a decade with AOPA, Glenn became the manager of technical affairs at the National Association of State Aviation Officials. There he advocated for state programs that tested and often introduced new technologies that complemented federal initiatives.

In the 90s, Glenn joined Helicopter Association International as the

vice president of operations. He also served on the board of directors of the Aero Club of Washington. After 25 years of industry work, Glenn answered the call to civil service in 2003.

His first assignment was in the FAA Flight Standards Service's General Aviation and Commercial Division, looking at how unmanned aircraft development was unfolding.

"It became apparent that the nascent [drone] industry was going to permeate across the agency," said Glenn. "From Global Hawks having the wingspan of a 737 to the smallest UAS sitting in the palm of our hand, the issues of airspace access, security, certification, and operational regulatory issues were coming."

Coincidentally, it was a briefing by Glenn about introducing drones into the National Airspace System (NAS) that caught the attention of the FAA's Office of Commercial Space Transportation (AST) — who were looking for something similar as the new commercial space race was primed to take off. Since then, Glenn has stayed with commercial space serving in various roles and is currently a senior technical advisor to the Office of Strategic Management. He is also the manager of AST's Learning and Development Branch.

The learning and development program ensures that FAA employees working in commercial space transportation get the training and experience they need to do their jobs. The program also has to keep up with changes as policies and technologies evolve, and it provides project management and mentorship training.

As an avid general aviation pilot and safety advocate, Glenn reminds



other pilots that learning about the operational requirements of launch and reentry vehicles is vital to the safety of the NAS. "The days of the space shuttle only returning to the Cape and Vandenberg are gone," he warns. "Pilots have to be aware of the increasing cadence of launch activities and of the geographic areas they operate in to ensure the safety of their flight." He adds that a review of upcoming launch/reentry activities should now be included as part of a pilot's preflight activities.

Space vehicles and capsules are being "human-rated," and capacities are increasing. Even the development of the next space station, which is planned for commercial and government use, is underway. The number of licensed launch and reentry sites is also increasing. This advancement is similar to the initial growth of commercial air travel from years past, and it bodes well for the future of commercial space travel becoming accessible to all of us.

Paul Cianciolo is an associate editor and the social media lead for *FAA Safety Briefing*. He is a U.S. Air Force veteran and an auxiliary airman with Civil Air Patrol.



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"For safety information that's out of this world, I read FAA Safety Briefing."

Robert "Hoot" Gibson, retired U.S.
Navy Captain, Academy of Model
Aeronautics Ambassador, and NASA
Space Shuttle Commander



faa.gov/news/safety_briefing

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