WRITTEN STATEMENT OF

AIR LINE PILOTS ASSOCIATION, INTERNATIONAL (ALPA)

BEFORE THE

SUBCOMMITTEE ON AVIATION

OF THE

COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION

UNITED STATES SENATE

SEPTEMBER 24, 2019

"Improving Air Traffic Control for the American People: Examining the Current System"

Air Line Pilots Association, International
1625 Massachusetts Avenue, NW
Washington, DC 20036
(202) 797-4033

Chairman Cruz, Ranking Member Sinema and members of the committee, thank you for the opportunity to testify on Air Traffic Control. The Air Line Pilots Association, International (ALPA), represents more than 63,000 professional airline pilots flying for 35 airlines in the United States and Canada. ALPA is the world's largest pilot union. We are the recognized voice of the airline piloting profession in North America, with a history of safety and security advocacy spanning more than 88 years.

The Federal Aviation Administration (FAA) maintains the safest, most efficient air traffic control system in the world. For more than a decade it has been focusing on implementing multiple programs to modernize the National Airspace System (NAS) under the Next Generation Air Transportation System (NextGen) modernization initiative. The FAA's NextGen initiative has introduced new technologies, airspace changes, and operating procedures across the NAS. More of the NextGen implementation activity is still to come.

However, in order for the National Airspace System (NAS) to remain the safest, most efficient system in the world, continuous improvements in the NAS are needed to ensure that growth in traffic levels does not threaten airline safety. Technological and infrastructure improvements are required to efficiently manage current NAS operations. Emphasis should be placed on the NextGen automation tools and airport infrastructure improvements that can provide seamless gate to gate operations that can reduce taxi delays, reduced airborne reroutes, and ensure that on time arrivals can proceed directly to their gate. Modernization must continue to keep ahead of the demand from the wide variety of aviation users that are present and emerging. The technologies and procedures that are needed must now also consider new entrants into the NAS. The future of air transportation will bring a combination of commercial air carriers, remotely piloted vehicles, general aviation, and commercial space flight. The airspace system of the future will involve a great many more operations and a wider variety of operations than we have today and will result in an increasingly complex environment. We must also remain vigilant to ensure that staffing levels are adequate for the continuously increasing traffic levels.

Furthermore, the FAA cannot afford to experience another shutdown like we experienced earlier this year. In addition to the stress and human costs imposed on the dedicated air traffic controller staff, the shutdown had an impact far beyond just the one month when it was occurring. For example, due to the need to re-plan training and reschedule around upgrades that were also delayed within each Air Route Traffic Control Center, the FAA's NextGen Data Comm program will now take 18 additional months beyond the original completion date to accomplish – mid-2021 rather than late-2019. This delays the safety and efficiency benefits for pilots, air traffic controllers, and airlines. In short, the funding of FAA needed to implement NextGen and also accomplish its day to day operations must be assured.

This is why we support S. 762, the Aviation Funding Stability Act. It is appropriate to allow the FAA to temporarily use funds from the Airport and Airways Trust Fund during a government shutdown situation. More fundamentally, government shutdowns must be avoided as they are not good governance and, in the aviation sector, introduce unacceptable risks to our transportation system.

The rapid growth in Unmanned Aircraft Systems (UAS) and commercial space launches has put additional pressures on the NAS that the FAA will need to address. To date, the FAA segregates commercials space operations from commercial aviation operations with large blocks of sterilized airspace. It is our view that the FAA needs a comprehensive plan to integrate commercial space operations and avoid major disruptions for the other users of the NAS as the demand for access to the NAS for increases. As commercial space operations increase there is a need to reduce NAS impacts while maintaining a high level of safety. At some point, segregation of commercial aviation operations from commercial space operations will not be a viable solution.

In *The Annual Compendium of Commercial Space Transportation: 2018*, FAA projects U.S. orbital launches to increase over the next several years, with a near-term spike of about 55 launches a year, then averaging out to about 40 launches per year thereafter, which is about twice the number of launches experienced from 2010-2016. It is important to note that this number does not include the pending start of suborbital launches for space tourism, or the launches of large constellations of small communications satellites for mobile communications services. These could add potentially hundreds or thousands of launches per year.

When looking at the challenge presented by the orbital launch facilities in the U.S., they are all located on the coast and launch with trajectories over the ocean. Ironically, it is the oceanic areas which currently have the least Air Traffic Management infrastructure (e.g.

communications, surveillance, and ATC automation), and therefore have the least ability to tactically manage airspace.

The FAA's Office of Commercial Space Transportation and NextGen recognize the criticality of developing the means to safely and efficiently integrate the ever-increasing number and variety of space operations with an already-crowded airspace system, both domestically and internationally. However, at this time, there is no detailed, comprehensive long-term plan for true integration of commercial space operations into the NAS, nor is there a long-term plan for oceanic air traffic management evolution beyond near-term enhancements. This is a significant shortfall.

ALPA proposes that this shortfall presents an opportunity for the commercial aviation and commercial space communities to jointly advocate for investments in oceanic airspace capabilities which can return benefits to both.

Beginning to Evolve from Accommodation Toward Safe Integration

As a key stakeholder, ALPA has been actively involved in technical and steering committees involving commercial space and Air Traffic Management. These groups include: RTCA technical groups, the NextGen Advisory Committee, the Access to Airspace Aviation Rulemaking Committee, to name a few. Similarly, ALPA's involvement in such programs as ADS-B, DataComm, RNAV/RNP and other groups have given us a detailed understanding of the level of effort required to realize the safety and efficiency benefits made possible through these programs. The commercial space industry as well as FAA AST is in the midst of an ongoing, exhaustive effort of testing and evaluating vehicles and launch processes that must eventually lead to safe, reliable, repeatable operations. The efforts needed to develop the necessary comprehensive plan to integrate commercial space operations with commercial aircraft operations will be complex and require a similar level of effort, and therefore should be started sooner rather than later.

The FAA has recognized that the current method of segregation, whereby ATC closes large volumes of airspace for extended time periods, while safe, is not efficient and is not sustainable as a long-term solution. Further, the FAA clearly understands that moving away from today's model will require infrastructure investments in hardware, software, procedures, and training for air traffic management. A 2014 FAA Commercial Space Concept of Operations document notes that:

"This approach was adopted due to current planning and real-time shortfalls, which include manual interfaces, lack of integrated safety and capacity/efficiency evaluation processes, lack of standardized planning and real-time processes, lack of surveillance, and the inability of existing automation systems to process and display space vehicle data."[1]

CNS/ATM Improvements Would Benefit All

To a large extent, the same tools that would safely improve the efficiency of airplane oceanic operations would be beneficial in reducing the impact of orbital space operations from the

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[1] Management of Space Vehicle Operations in the National Airspace System Concept of Operations, Federal Aviation Administration, August 2014, pg. iii

coasts on civil airspace. Airline pilots and dispatchers, air traffic controllers, air traffic management facilities and spacecraft operations centers would all benefit from having improved ATC services that provide a common set of real-time data on which to base both strategic and tactical operational decisions.

In the broadest sense, space flights will need to be planned and flown using similar processes and safeguards as airliners. There needs to be a filed launch plan (similar to a flight plan); the plan needs to describe in detail the mission parameters (route, altitude, time); the plan needs to be communicated to other airspace users and traffic management functions in adequate time to effect shared situational awareness; and provisions must be made to accommodate irregularities. A controlling entity will need to take all that information and apply procedures that ensure all users of the airspace remain clear of other airspace users by the current safety protocol for safe separation standard, as well as to avoid weather and other hazards, etc. The procedures will have to take into account the performance characteristics of all vehicles being controlled, and any ATC instructions will need to be communicated to airline pilots and to space operators simultaneously in real-time.

The FAA also recognizes that many of the advancements needed to achieve full integration can be provided by tools under development by NextGen for more efficient management of traditional aircraft traffic. Many of these tools already have significant applicability in oceanic airspace.

For example, compared to domestic operations, oceanic communication between aircraft and controllers is slow and cumbersome, surveillance information is received more sporadically and with latency, and automated tools for controllers necessarily operate on a more strategic level as tactical control is not possible. Aircraft are routed on parallel tracks with much larger separations than are used domestically (e.g. dozens of miles instead of the three to five miles when in domestic airspace).

Thus, we see a strong connection between the technology that can be employed to safely improve efficiency in oceanic airspace and the use of that technology to reduce the impact of space flight on commercial air traffic. More accurate and frequent data exchange, ATC automation improvements, surveillance, and real-time voice and data communications will aid pilots in safely conducting operations. These tools will allow more precise, timely identification of closed airspace with an ancillary benefit of providing information on weather hazards.

Data Exchange and ATC Automation

Currently, space operators have very detailed information about the status of their launches via data telemetry – much more than an airline has on a typical flight. The challenge to date has been to develop a data exchange mechanism to pass this information along to other parties. The FAA's Space Data Integrator (SDI) under development is a move in this direction. SDI will provide controllers and traffic managers with situational awareness of a space flight mission through real-time data on vehicle state and operational status; calculate the location and extent of potential hazard areas; and provide visibility into mission progress. SDI will afford the capability for FAA and, by extension, other airspace users to benefit from a detailed level of knowledge of a space mission as it progresses through shared airspace. In addition, the real-time, detailed view provided by SDI allows alert and execution of contingencies if off-nominal events occur.

Surveillance

Another example is Automatic Dependent Surveillance-Broadcast (ADS-B). Currently deployed using ground stations for civil aviation, ADS-B represents a major advance in efficient air traffic management and pilot situational awareness, with the potential to safely increase the capacity of the NAS. However, application in oceanic airspace has lagged due to the difficulty of deploying ground stations on the water. The solution being developed is space-based ADS-B. Simply put, this is the same capability (and therefore advantage) as the current ground-based ADS-B, but information is received by a satellite constellation instead of ground stations and relayed to air traffic controllers in real time. Space-based ADS-B has the potential to provide surveillance information equivalent to en route radar surveillance for global airspace including over the ocean.

A similar capability, if employed by commercial space operators on orbital/suborbital and boosters during the launch or recovery phases, could give all airspace users timely information on each other, thus improving all airspace users' ability to safely and efficiently operate.

Voice and Data Communications

Advances in communications are similarly possible. Data communications (DataComm) is in use internationally to supplement voice communications with digital messaging. This reduces the likelihood of missing or misunderstanding instructions in the flight deck and on the ground. DataComm is currently used over the ocean; however, it is limited to more strategic communications, because DataComm is not as immediate as (for example) direct controller-pilot voice communication via VHF radio used in domestic airspace. More timely performance-based voice and data communications via satellite and possibly by next generation HF radio to both airborne aircraft and space operators can help reduce the separation buffers among the two, both physically and in time. More timely communications will also provide the capability for better dissemination of weather and similar data that directly impact both aircraft and space operations.

ATC Procedures and Separation Standards

In the near and mid-term, higher fidelity CNS data and the ability to exchange this data in real time would allow better definition, geographically and temporally, of the protected airspace needed for space operations (both commercial and government-sponsored), and to disseminate this information to ATC and other airspace users.

As an example of the opportunity, consider the booster separation failure during the October 11, 2018 manned Soyuz MS-10 launch. The failure occurred approximately 122 seconds after liftoff[2]. At the time of the booster failure and separation of the crew capsule, the spacecraft was at an altitude of about 50km (164,000')[3], well above the altitudes used by commercial aviation. Because of the altitude and speed of the spacecraft, the various spacecraft elements took several minutes to fall back to lower altitudes and the ground, with the crew capsule landing about 17 minutes 39 seconds after the booster failure and capsule separation, after reaching a peak altitude of 93 km (300,000').[4]

In addition to the discussion about the need for ATC modernization to support commercial space operations, the integration of UAS requires a robust infrastructure as well. Small UAS (sUAS) will operate in airspace at altitudes that are generally considered to be "below the NAS." The low-altitude sUAS operations will need some form of assistance in ensuring safe separation to avoid collision with manned aircraft, other sUAS, terrain, and obstacles. The FAA's work in Unmanned Traffic Management is just getting started, and certain foundational decisions need to be made about the role of the FAA in offering low-altitude separation services. ALPA recommends that the air navigation services at low altitude be provided by the same service provider of all other airspace in the NAS. In other words, the

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[2] Harwood, William, "Rocket Failure Forces Emergency Landing for US and Russian Astronauts", *Cbsnews.com*, October 11, 2018, https://www.cbsnews.com/news/soyuz-rocket-launch-abort-mission-iss-nasa-astronaut-russians-ballistic-descent/, retrieved April 11, 2019.
[3] RussianSpaceWeb.com, "Soyuz MS-10 Makes Emergency Landing After A Launch Failure", October 11, 2018, http://russianspaceweb.com/soyuz-ms-10.html, retrieved April 11, 2019.
[4] Burghardt, Thomas, "NASA and Roscosmos Trying to Avoid An Empty Space Station", October 18, 2018, https://www.nasaspaceflight.com/2018/10/nasa-roscosmos-trying-avoid-empty-space-station/, retrieved April 11, 2019.

FAA should be providing the separation services and safety oversight. This ensures consistent application of safety risk mitigation policies and procedures.

The integration of large UAS also requires the FAA to provide air traffic control services for operations that may not be the norm for most of today's flights. For example, UAS of the future may loiter over one area for many hours or days. However, there are limitations in the existing ATC systems that create barriers to this type of UAS operations. The non-standard design of UAS when they lose their command and control datalink with the remote pilot potentially creates significant problems that will likely require FAA investments to overcome. Because the FAA recognizes UAS as different than traditional commercial aircraft in many different ways, the FAA's modernization efforts will also likely need to shift focus to ensure that UAS can be accommodated.

Aircraft Equipage to Support NextGen Procedures

The NextGen modernization initiative has resulted in the creation of new performance based navigation departures, arrivals, and instrument approaches. These procedures reduce noise, aircraft greenhouse gas emissions, and airspace congestion. However, not all of the airline aircraft can fly these new procedures. In some circumstances there may be 15-20 percent of the airline aircraft that are unable to utilize the new procedures. Unfortunately, air traffic controllers are unable to maintain the integrity of these operations with such high levels of non-equipped aircraft.

In order for the NextGen procedures to become the standard (instead of the exception), the commercial aircraft fleet needs standardized equipage capabilities that meet the navigational requirements for flying the NextGen procedures. In recent years, there have been attempts to implement NextGen procedures with the assumption that pilots will utilize work-arounds to offset the limited navigation capabilities on some of the aircraft. These work-arounds often add complexity and workload, which is counter to the anticipated benefits from NextGen. In reality, pilots are working harder than ever to make the aircraft comply with the NextGen way of navigating. At times, instead of flying approaches with both precision lateral and vertical guidance that is automated with the assistance of an autopilot, pilots are also asked to hand-fly non-precision approaches on some of today's airline aircraft that lack the necessary NextGen navigation capability.

ALPA has been steadfast in working to ensure that pilots are not asked to take a step backwards in safety, in order to accommodate the desire to utilize NextGen procedures. Because of our concerns, the FAA and airline industry have backed away from their planned implementation of certain types of arrivals and approaches when simultaneous independent parallel approach operations are underway, until aircraft equipage levels have risen to enough aircraft that air traffic controllers can efficiently operate with the NextGen procedures as the default procedure.

Conclusion

The NAS continues to perform at very high levels of safety and efficiency. The NextGen program has made progress, and ALPA continues to support the FAA's efforts to continue the modernization initiative. However, more focus on implementing capabilities that will fully integrate UAS and commercial space operations is needed. ALPA also remains diligent in our efforts to ensure that aircraft equipage is keeping up with NextGen procedures design. The Unites States must maintain a commitment to modernize our aviation system that stays ahead of the growth our industry continues to experience. The growth is vital to our nation's economy, and the safety of travelers and shippers cannot be placed in jeopardy because the capacity levels are not keeping pace with growth. ALPA stands at the ready to work with this Committee, the FAA and other aviation industry stakeholders to ensure that our aviation system is safe and efficient now and into the future. We appreciate the opportunity to share the ALPA perspectives with you today.