



A New ERA in High-Speed Aerospace Transportation

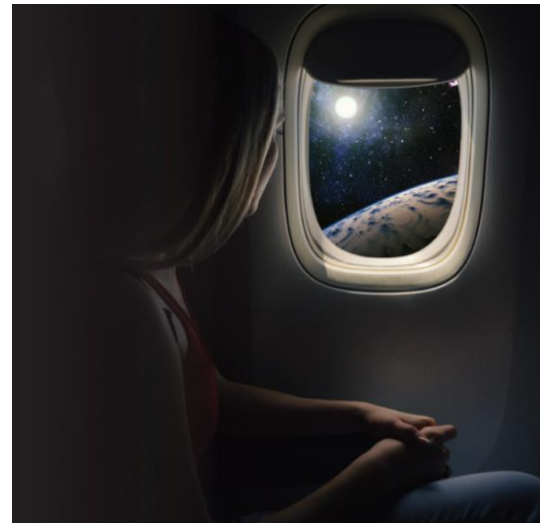
HSAT™¹

From Industry Push to Market Pull

Foreword

We need for the people of the United States and the free World to decidedly ask anyone who would listen, to be able to fly faster, to go anywhere on earth and back, to get tangible goods delivered from anywhere on earth, no matter how far, on the same day, and to do so safely, reliably, sustainably, and economically as well.

After sixty years of ever safer, cleaner, and more efficient subsonic air transportation, we are all moving into a renewed era of high-Speed Aerospace Transportation or HSAT™. The public demand to “shrink the planet” anywhere to anywhere in one-business-day, is to be the future new normal, it is an unstoppable movement and a must-have human capability, which will align the digital and physical worlds and greatly improve the quality and way-of-life of all on earth.



The first vehicles will be supersonics Mach 2-3 evolutions of existing high-speed transonic (Mach .935 business jets). Then hypersonic Mach 3-10, vehicles will prelude the most ambitious of HSAT programs: rocket-based and/or boost-glide profiles, which will blur the lines between atmospheric and orbital point-to-point flight profiles. Depending on flight distance, the vehicles optimal flight paths may be endo or exo atmospheric. Thus, aircraft and spacecraft regulations will apply, and in some cases, a possible new hybrid realm of regulations and standards might emerge.

HSAT success will need a multi-dimensional sustained push in various areas, including decisive and sustained capital investments, synergies of academic-practical and “genius” knowledge sharing from not only the aerospace industries, but peripheral industries such as travel-hospitality, air transportation energy, A.I., quantum computing and others. Then, capital formation and investments will increase exponentially, reducing the time to market, years,

¹ IFG coined the term HSAT and expanded it through a series of industry workshops, trade marking the term HSAT™ www.highspeedflight.com



rather than decades. Investment areas including public demand for HSAT, integration into the subsonic system, aerospace flight research, air space frames, powerplant and propellants development, flight guidance systems, and importantly, phased demonstrations-test-evaluations, for safe, reliable, and scalable entry into service and subsequent maturity in commercial operations.

The return on such investment, and the direct indirect and induced economic impact to the world, will be an order of magnitude higher than the investment, well into the high single digit trillions by 2050².

The ability to conduct high-speed, long-distance transportation, specifically point-to-point transportation through space, will be a major game-changer, both for national security, and for economic competitiveness. This is an area that the United States needs to lead.

Global Spaceport Alliance

National Spaceport Network Development Plan, June 1st, 2020-Present



→ Airspace

HSAT™ air and space vehicles will be evolutionary and revolutionary at once (what I call (R/E)-revolutionary). They will be flown through both air and space, will utilize FAA-licensed airports,



spaceports which sometimes will be collocated, and will manage HSAT™ traffic seamlessly for departure and arrival procedures.

Operations, like take off-climb-cruise acceleration and deceleration, descent, and landing from/to hypersonic speeds, whether in atmospheric flight or with orbital launch and reentry phases, will also need to be seamlessly integrated.

² <https://www.hermeus.com/halcyon>



HSAT has published airspace corridors set of guiding principles for suborbital and orbital flight and is collaborating with Standards development Organizations (SDO's) and Technical Committees to develop supersonic and hypersonic guiding principles as well.

→ **United States National Airspace (NAS)**

In the United States, HSAT seamless integration into the National Airspace System (NAS) is necessary to ensure minimal impact on other, non-involved commercial flight operations, and equitable sharing of airspace volumes with the existing VFR and IFR abiding traffic. A new High-Speed OR "HSAT-IFR" rule could be developed and set, evolving into a possible Space Flight Rules (SpFR) rule set. Both rules' sets will evolve and come to be accepted to be enabled operationally a standardized "box to tick" on commercial flight plans.



→ **United States National Airspace, DOT, FAA AVS and COMSTAC**

Several aspects of NAS integration and spaceports have been highlighted in the COMSTAC's R&D surveys. These and other HSAT considerations present themselves as topics worthy of the COMSTAC's exploration and recommendations to the FAA and DOT and other agencies.

→ **FAA and Regulations**

Through its NexGen, Space Data Integrator (SDI) and Joint Space Operations Group (JSpOG) the FAA is currently developing several new capabilities to safely integrate supersonic, hypersonic, and commercial space vehicles into the NAS. Looking beyond today, the FAA is investigating concepts around dynamic hazard areas to further increase safety and efficiency to keep pace with the increasing frequency and complexity of commercial supersonic, hypersonic, and suborbital/orbital launch and reentry operations.





HSAT operations, whether endo or Exo atmospheric, the dynamics involved, and integration into the NAS should be considered in the NexGen, SDI/JSpOG and other tools follow-on planning to seamlessly integrate HSAT™ new entrants into the NAS.

Air traffic management specialists monitor SDI at FAA Air Traffic Control System Command Center in Warrenton, Virginia. Credit: Bill Carey

→ **Spaceport considerations**

In its National Spaceport Network Development Plan, published in June 2020 (available on the GSA website here <https://www.globalspaceportalliance.com/wp-content/uploads/2023/08/National-Spaceport-Network-Development-Plan.pdf>), the Global Spaceport Alliance makes the following observations and recommendations:

- The ability to conduct high-speed, long-distance transportation, specifically point-to-point transportation through space, will be a major game-changer, both for national security, and for economic competitiveness. This is an area that the United States needs to lead.
- The Office of Spaceports could be a focal point for these initiatives, in anticipation of the day when point-to-point transportation through space is routinely available.
- The U.S. Government should establish a goal of leading the world in Point-to-Point transportation through space. Accomplishing this challenging goal will require a partnership between government, industry, and academia, and will involve not only advances in engineering and technology, but also work in policy, law, regulations, customs and security, flight and ground operations, market analysis, and economics.

The same logic and reasoning above are true for airports and the U.S. Government leadership for endo atmospheric Point-to-Point HSAT™ transportation. The FAA and the FAA Office of Commercial Space (AST) converge precisely.

→ **Defense and National Security**

According to the COMSTAC and other groups like High-Speed Flight-FF, GSA, further, language contained in the FY 2021 National Defense Authorization Act (NDAA) highlights the value of commercial spaceports, and specifically “encourages the Department of Defense to leverage existing inland spaceports with accompanying range and airspace for land-based testing” of hypersonic platforms. This extension into hypersonic and supersonic vehicles and the airports that accommodate such vehicles, creates an opportunity to leverage the more than 5,000



commercial and general aviation National, regional, county and community airports in the Nation.

The NDAA goes on to note that “these facilities and complexes could improve the resiliency of U.S. launch infrastructure and help ensure consistent access to space.” This group believes that high-speed flight and launch and reentry capabilities must be interoperable for operators and users. Spaceports, and airports may find support of HSAT activities complementary to their endo atmospheric flight traffic and orbital launch, making returns on investments in these facilities, particularly for dedicated spaceports, more attractive.

As orbital operations ramp up to become weekly or even daily occurrences at many of these sites, experience conducting dynamic HSAT operations will provide a baseline for these ever-dynamic evolutions with positive effects in both national security and the economy.

→ **Future regulatory framework**

The FAA AST, in its role to “facilitate the strengthening and expansion of the United States space transportation infrastructure,” and the FAA in its role to provide the safest, most efficient aerospace system in the world, offer a unique position to ensure safety, and help encourage, facilitate, and promote HSAT™ in the two segments of commercial atmospheric and spaceflight.

It is certain that human-rated endo atmospheric HSAT vehicles will be certified under rules evolving from subsonic aircraft. And it is also very likely that human rated HSAT concepts will need to move beyond an informed consent regulatory construct to something more akin to traditional regulation to begin routine commercial operations.

At the same time, the regulation for certification, permitting and licensing of HSAT vehicles will need an innovative and greater degree of flexibility to keep up with an ever-increasing pace of innovation and iteration.

In the spirit of making this regulatory burden as light as possible, while providing the requisite certification, oversight, and safety of paying passengers and the public, discussion should begin now to determine the best paths forward for these unique HSAT architectures and operations.

The roles of the FAA and of FAA AST in the process of making HSAT™ reality, should be explored and defined.



→ **Recommendation**

HSAT-Fast Forward, COMSTAC, GSA, HSF and other relevant groups should examine HSAT™ and associated airport and spaceport operations as well as their integration into the NAS as discussed above and make recommendations to FAA and FAA AST regarding regulatory considerations.

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