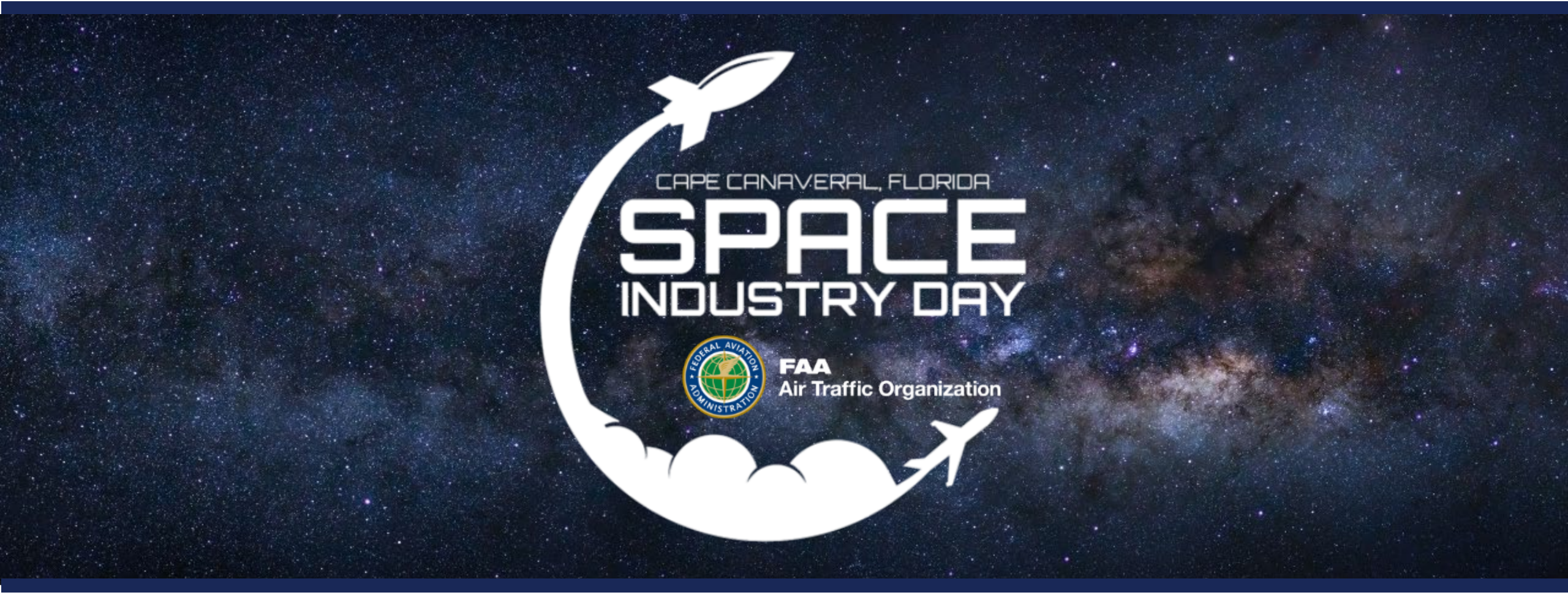
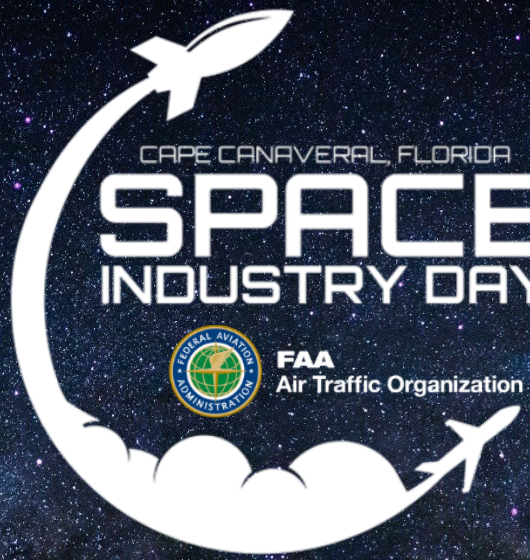


June 28, 2023

Space Florida
Cape Canaveral, Florida



Agenda

Morning Sessions

1 | Opening

Alyce Hood-Fleming
Vice President
FAA ATO System Operations

2 | Introductions

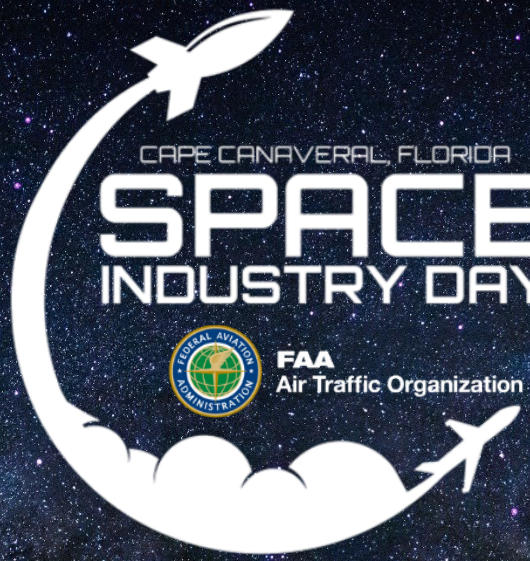
3 | Leadership Addresses

Timothy Arel
Chief Operating Officer
FAA Air Traffic Organization

Kelvin Coleman
Associate Administrator
FAA Office of Commercial Space Transportation

4 | Briefing

Notice of Updated Factors for Optimizing Use of the National Airspace System



Agenda

Morning Sessions

5 | FAA ATO Space Operations Integration Efforts

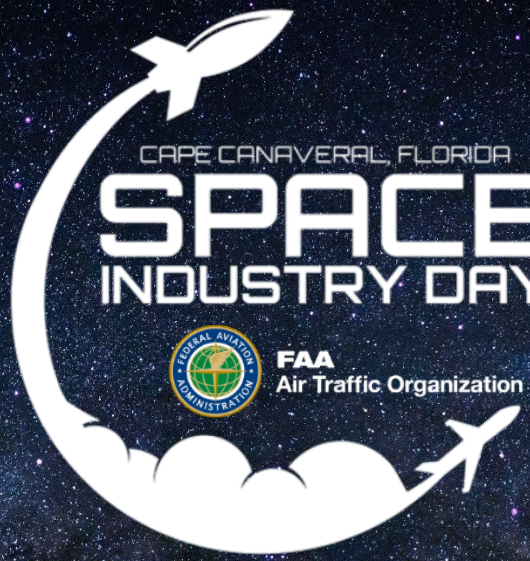
Duane Freer
Group Manager
FAA ATO Space Operations

6 | Collaborative Decision Making Highlights

Duane Freer
Group Manager
FAA ATO Space Operations

Vern Payne
Manager
FAA Collaborative Decision Making and International Operations

Lunch
11:45am - 1:30pm



Agenda

Afternoon Sessions

7| Panel: Industry Perspective

Moderator:
LaKisha Price
Director, National Airspace System Operations
FAA ATO System Operations

8| Open Forum

9| Closing

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Space Florida

Dale Ketcham

Vice President Government and Community Relations
Space Florida

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Opening

Alyce Hood-Fleming

Vice President
FAA ATO System Operations

The FAA's continuing mission is to provide the safest, most efficient aerospace system in the world.

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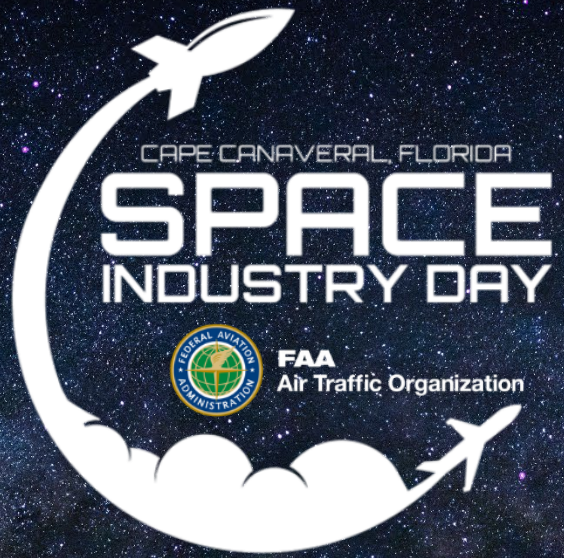
Introductions

Please share your:

- Name
- Organization/Company
- Briefly your role



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Leadership Addresses

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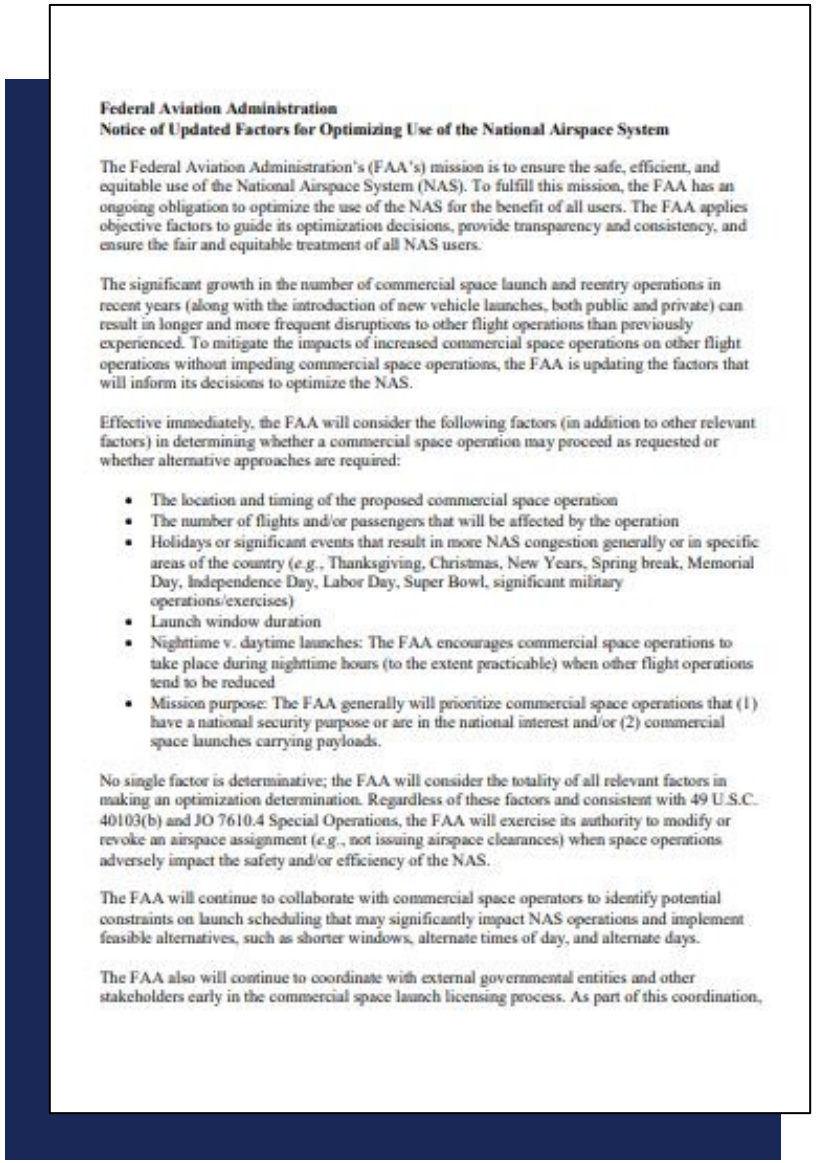
Briefing:

Notice of Updated Factors for Optimizing Use of the National Airspace

Notice of Updated Factors for Optimizing Use of the National Airspace System

- Optimize and provide access to in-demand airspace near launch sites
- Balance the needs of space launch operators, airlines, general aviation and the military to minimize airspace disruptions



Federal Aviation Administration
Notice of Updated Factors for Optimizing Use of the National Airspace System

The Federal Aviation Administration's (FAA's) mission is to ensure the safe, efficient, and equitable use of the National Airspace System (NAS). To fulfill this mission, the FAA has an ongoing obligation to optimize the use of the NAS for the benefit of all users. The FAA applies objective factors to guide its optimization decisions, provide transparency and consistency, and ensure the fair and equitable treatment of all NAS users.

The significant growth in the number of commercial space launch and reentry operations in recent years (along with the introduction of new vehicle launches, both public and private) can result in longer and more frequent disruptions to other flight operations than previously experienced. To mitigate the impacts of increased commercial space operations on other flight operations without impeding commercial space operations, the FAA is updating the factors that will inform its decisions to optimize the NAS.

Effective immediately, the FAA will consider the following factors (in addition to other relevant factors) in determining whether a commercial space operation may proceed as requested or whether alternative approaches are required:

- The location and timing of the proposed commercial space operation
- The number of flights and/or passengers that will be affected by the operation
- Holidays or significant events that result in more NAS congestion generally or in specific areas of the country (*e.g.*, Thanksgiving, Christmas, New Years, Spring break, Memorial Day, Independence Day, Labor Day, Super Bowl, significant military operations/exercises)
- Launch window duration
- Nighttime v. daytime launches: The FAA encourages commercial space operations to take place during nighttime hours (to the extent practicable) when other flight operations tend to be reduced
- Mission purpose: The FAA generally will prioritize commercial space operations that (1) have a national security purpose or are in the national interest and/or (2) commercial space launches carrying payloads.

No single factor is determinative; the FAA will consider the totality of all relevant factors in making an optimization determination. Regardless of these factors and consistent with 49 U.S.C. 40103(b) and JO 7610.4 Special Operations, the FAA will exercise its authority to modify or revoke an airspace assignment (*e.g.*, not issuing airspace clearances) when space operations adversely impact the safety and/or efficiency of the NAS.

The FAA will continue to collaborate with commercial space operators to identify potential constraints on launch scheduling that may significantly impact NAS operations and implement feasible alternatives, such as shorter windows, alternate times of day, and alternate days.

The FAA also will continue to coordinate with external governmental entities and other stakeholders early in the commercial space launch licensing process. As part of this coordination,

Optimization Factors

The factors that inform decisions to optimize the NAS include:

Continuing ongoing cooperative industry engagement

- Collaborative Decision Making (CDM) process
- Airspace Access Priorities (AAP) Aviation Rulemaking Committee (ARC)

Considering relevant factors

- Location and timing
- The number of flights and/or passengers affected
- Holidays or significant events
- Launch window duration
- Nighttime vs. daytime launches
- Mission purpose

Expanding the use of tools and procedures

- Space Data Integrator (SDI)

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ATO Space Operations Integration Efforts

Duane Freer

Space Operations Group Manager
FAA ATO

FAA
Air Traffic Organization

ATO SPACE OPERATIONS INTEGRATION EFFORTS

State of Space Operations by the Numbers

State of Space Operations by the Numbers

Launch Cadence

Completed Missions per Calendar Year with 2023 Projection
As of June 15, 2023

CY 2022 vs 2023

28%

Projected increase in operations

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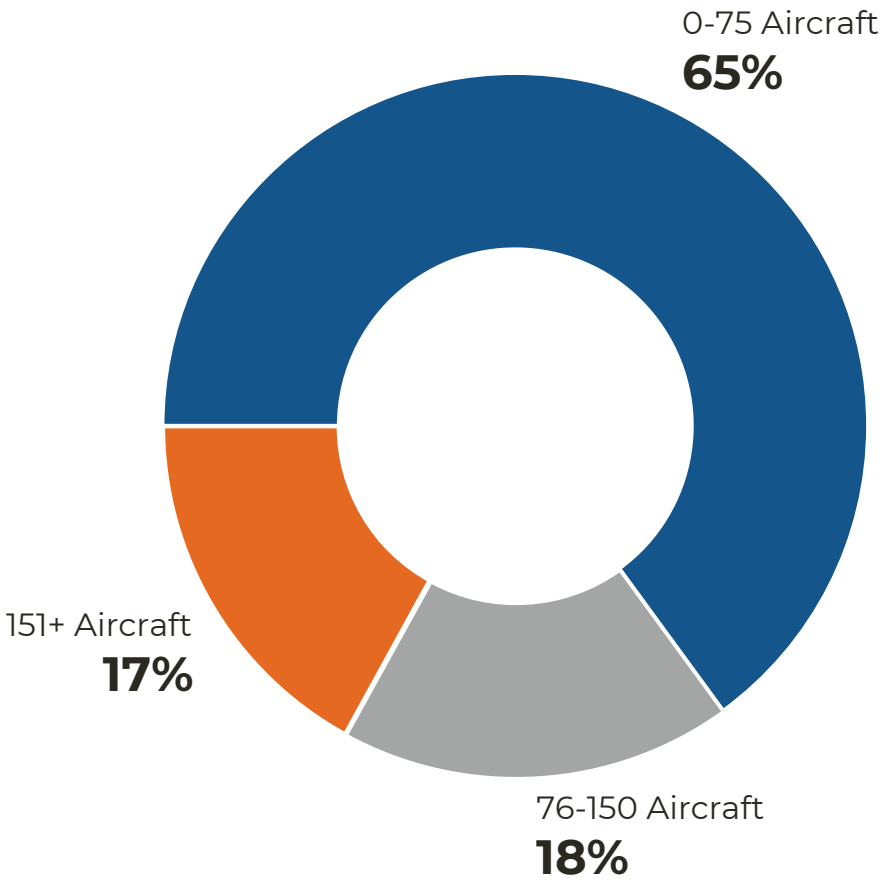
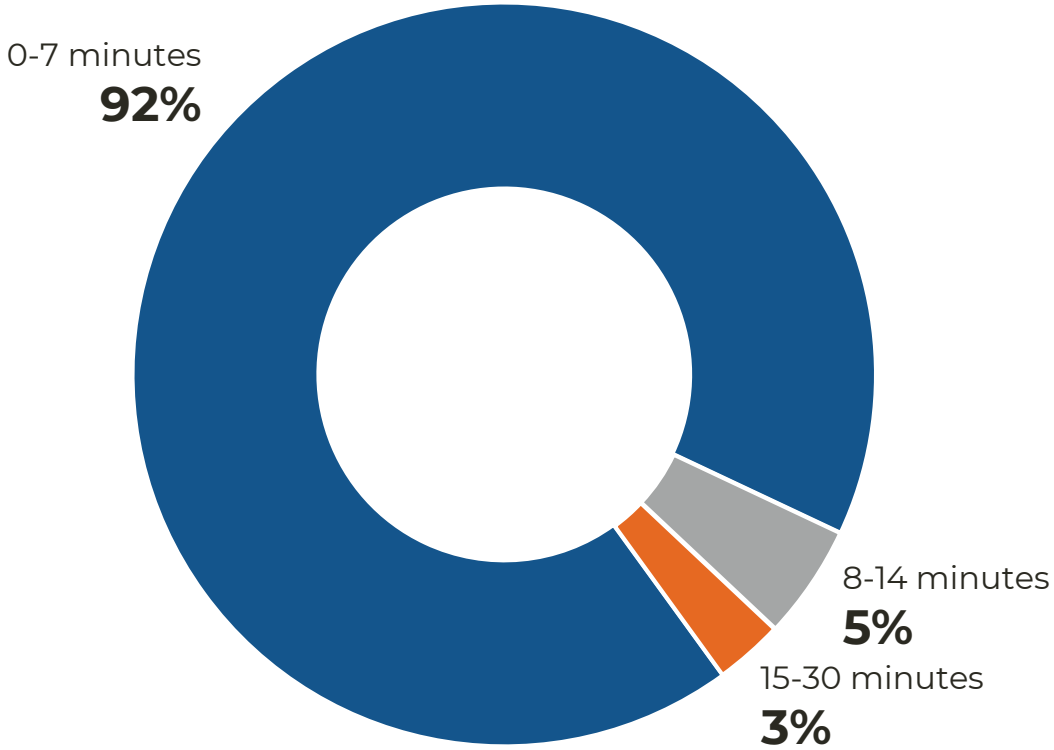
State of Space Operations by the Numbers

2022 Launch and Reentry Review

2022 Projected Number of Aircraft Impacted/Launch



2022 Projected Average Minutes of Delay/Launch



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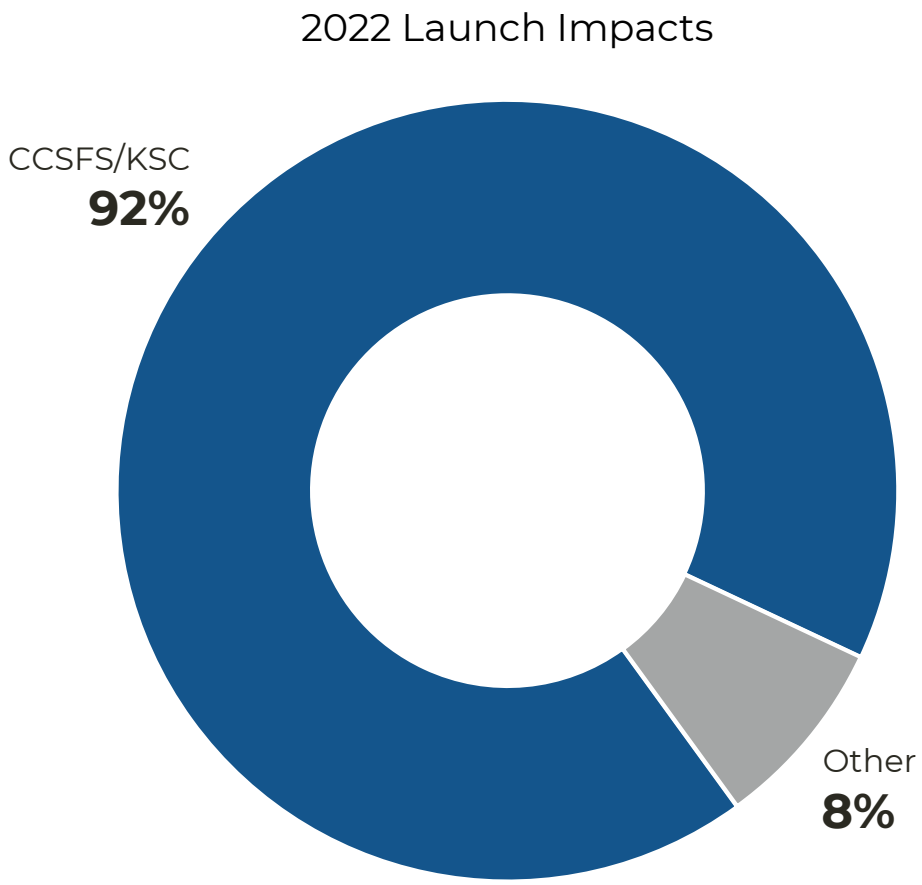
State of Space Operations by the Numbers

Focus on Florida



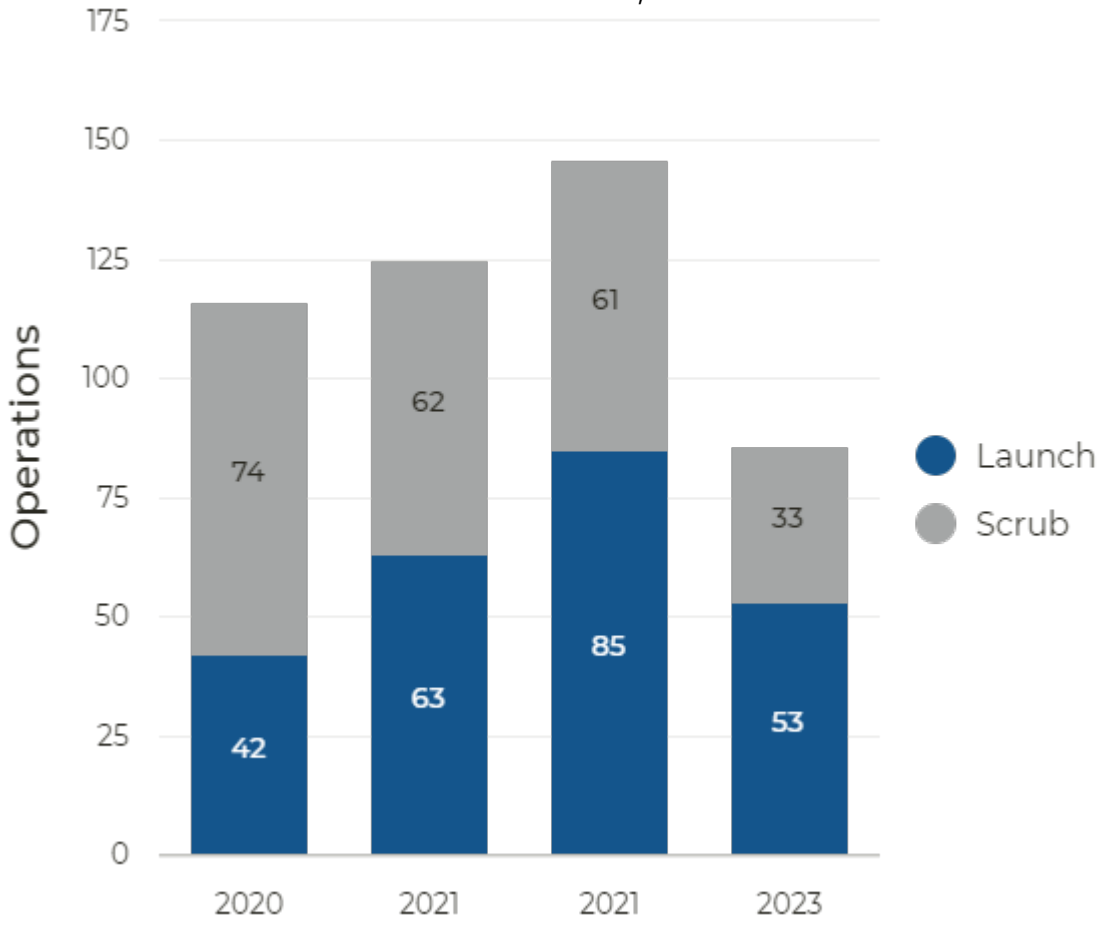
CCSFS/KSC Initiatives

- Time Based Launch Procedures (TBLP)
- Dynamic Launch and Reentry Windows (DLRW)
- CCSFS/KSC Playbook Routes
- Critical Decision Windows (CDW)
- **Special Use Airspace (SUA) Management** new

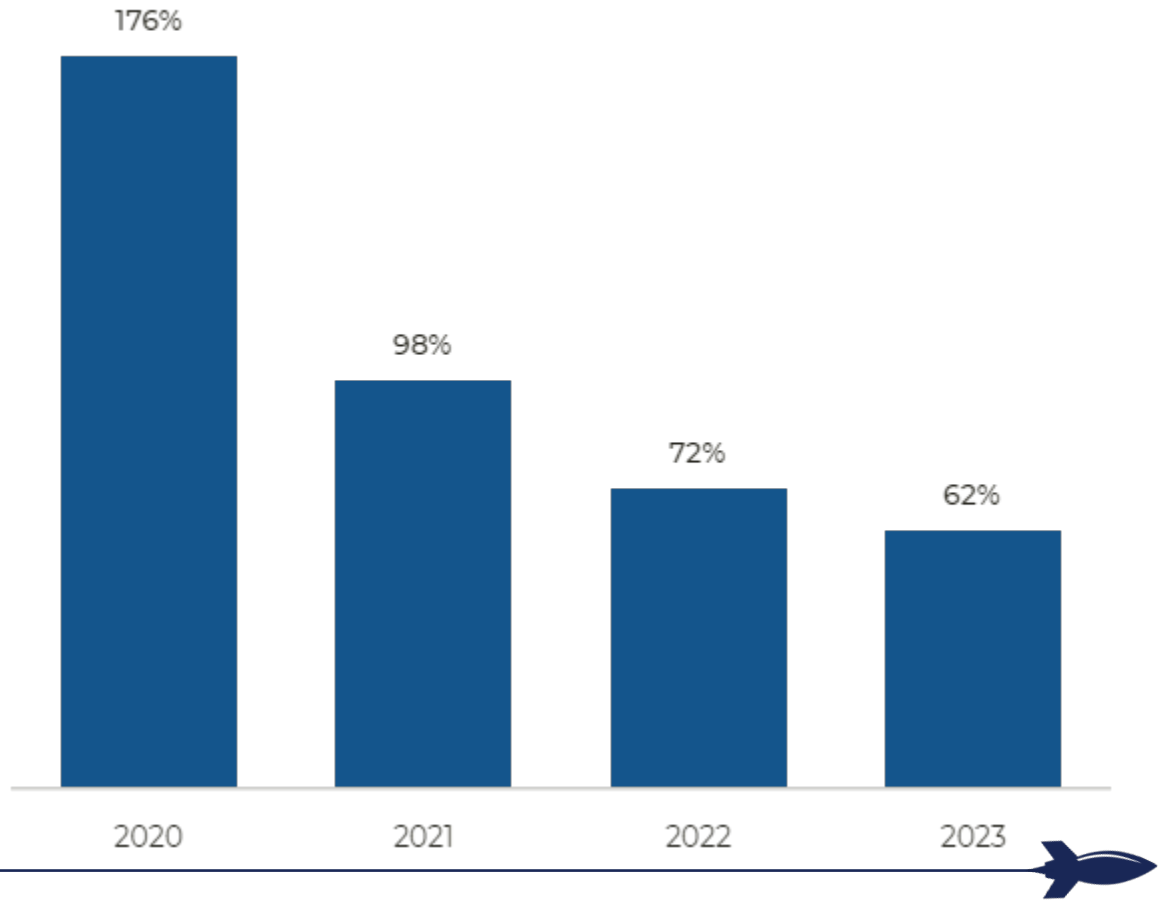
State of Space Operations by the Numbers

Launch vs. Scrub*

Yearly Launch and Scrub
As of June 15, 2023



Percentage of Scrubs per Mission
As of June 15, 2023



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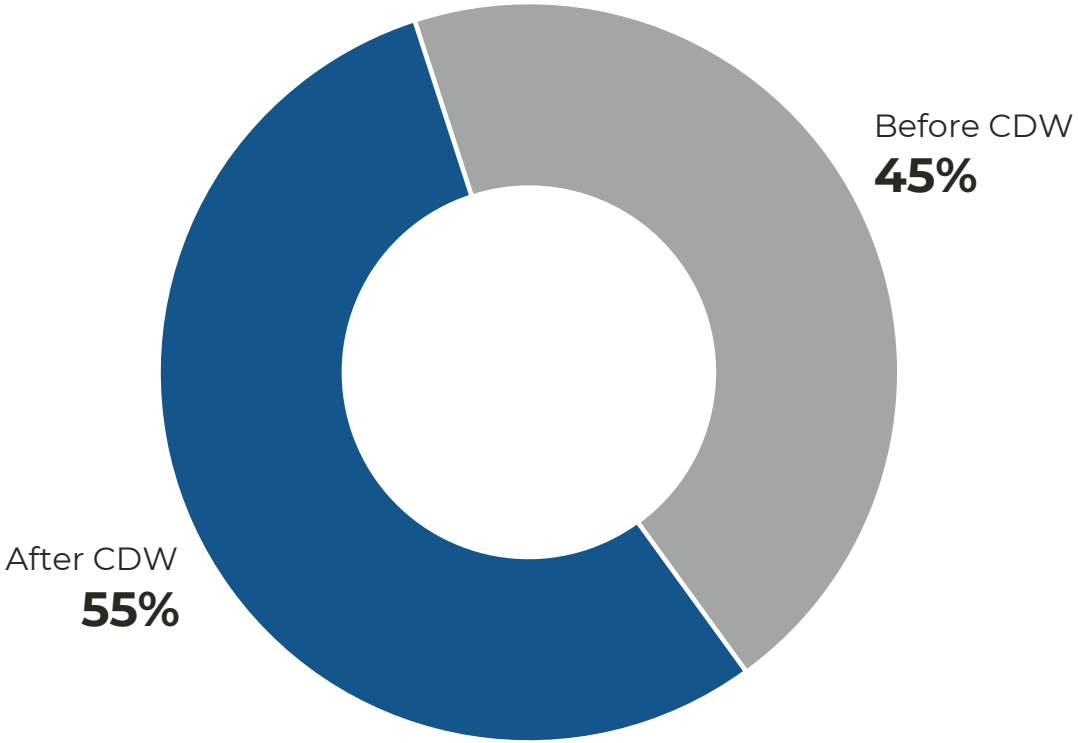
*Scrub: Postponement of mission within 24 hours of intended T-0

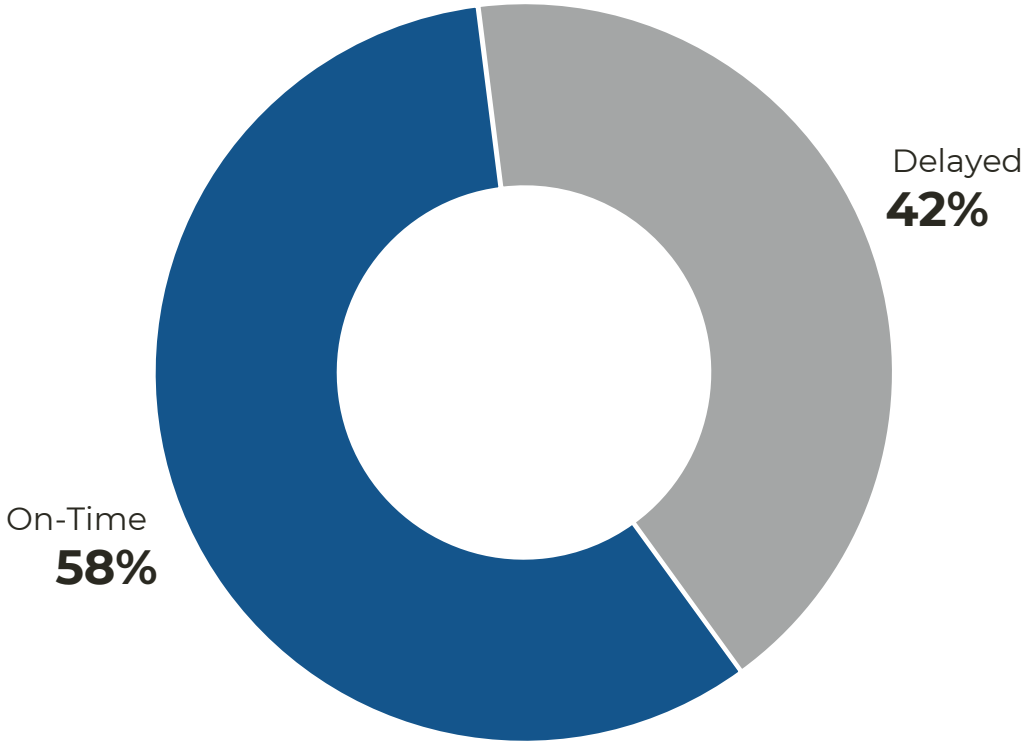
State of Space Operations by the Numbers

Critical Decision Windows

2023 Launch Scrubs*: Before and After Critical Decision Windows
As of June 15, 2023



2023 Percentage of On-Time Launches
As of June 15, 2023



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*Scrub: Postponement of mission within 24 hours of intended T-0

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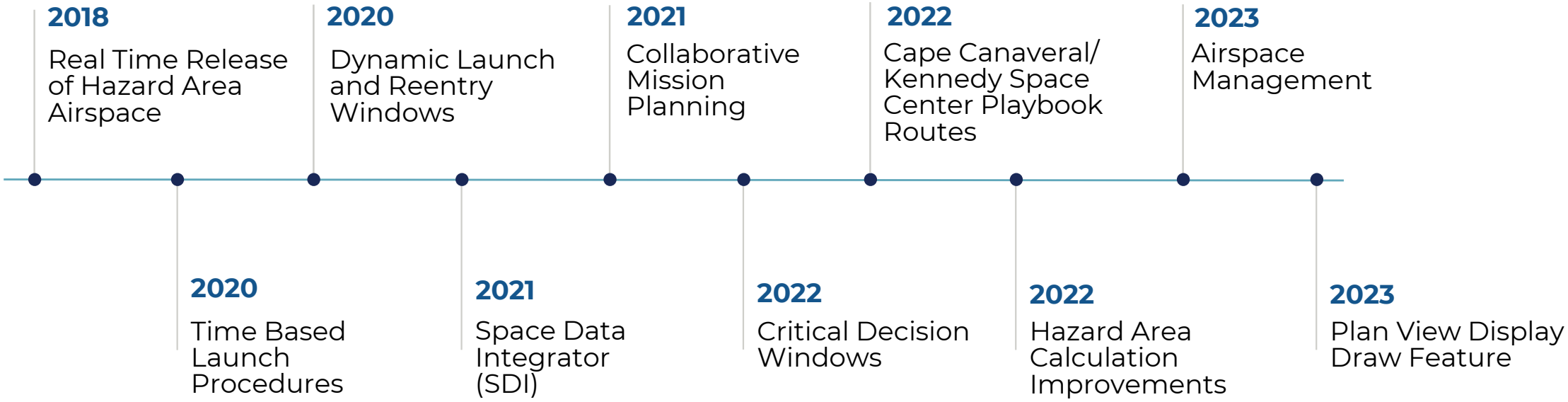
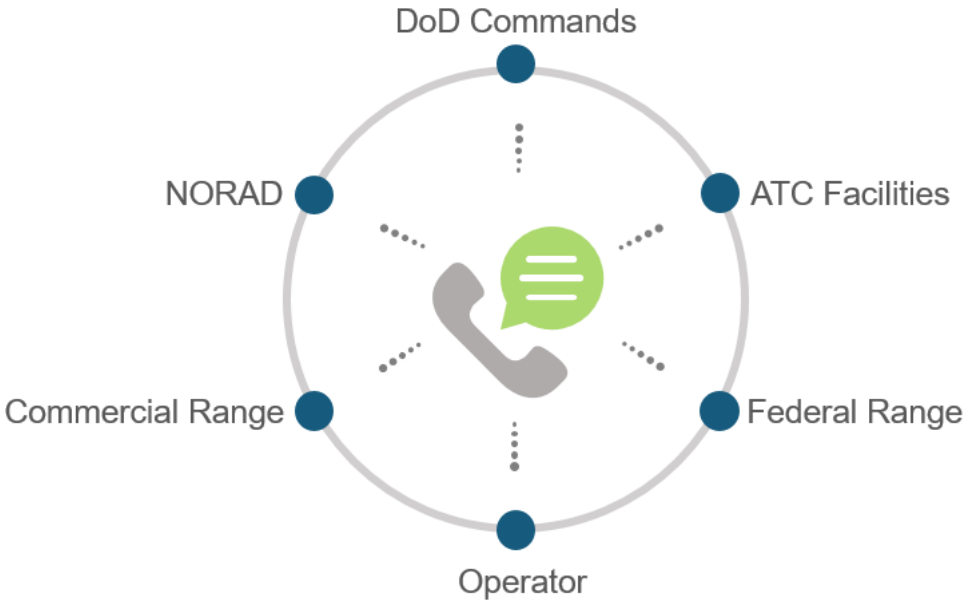
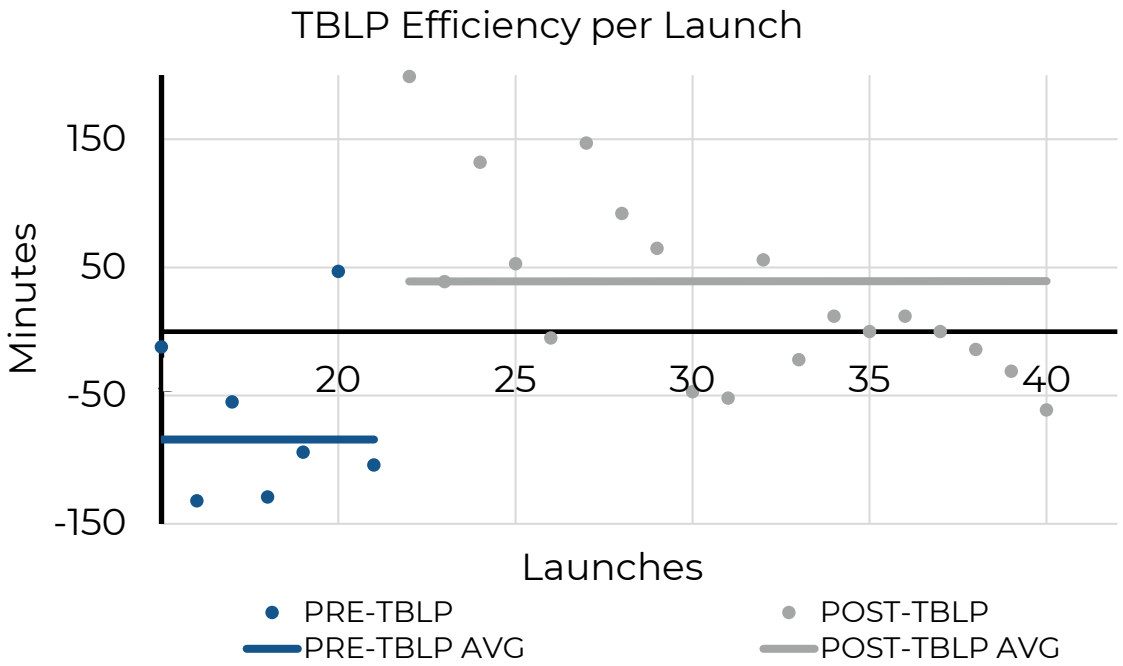
ATO SPACE OPERATIONS INTEGRATION EFFORTS

ATO Launch Efficiency Efforts

Launch Efficiency Efforts







Real time Release of Hazard Areas

Goal: Gain efficiency through real time situational awareness

- **2019:** Hotlines introduced at all launch locations
- Real time situational awareness between ranges, operators, and Air Traffic Control facilities **shaved hours off of airspace closure**

Time Based Launch Procedures

Goal: Reduce impacts through time based management

- **2018:** Analysis indicated that 65% of all NAS impacts were due to missions from CCSFS/KSC with Atlantic Route closure
- **2020:** TBLP introduced at CCSFS/KSC launches with Atlantic Route closure
- TBLP has saved **an average of 114+ minutes** of Atlantic Route closure for these missions

9,215

DLRW Minutes Saved

Last 12 months

Dynamic Launch and Reentry Windows

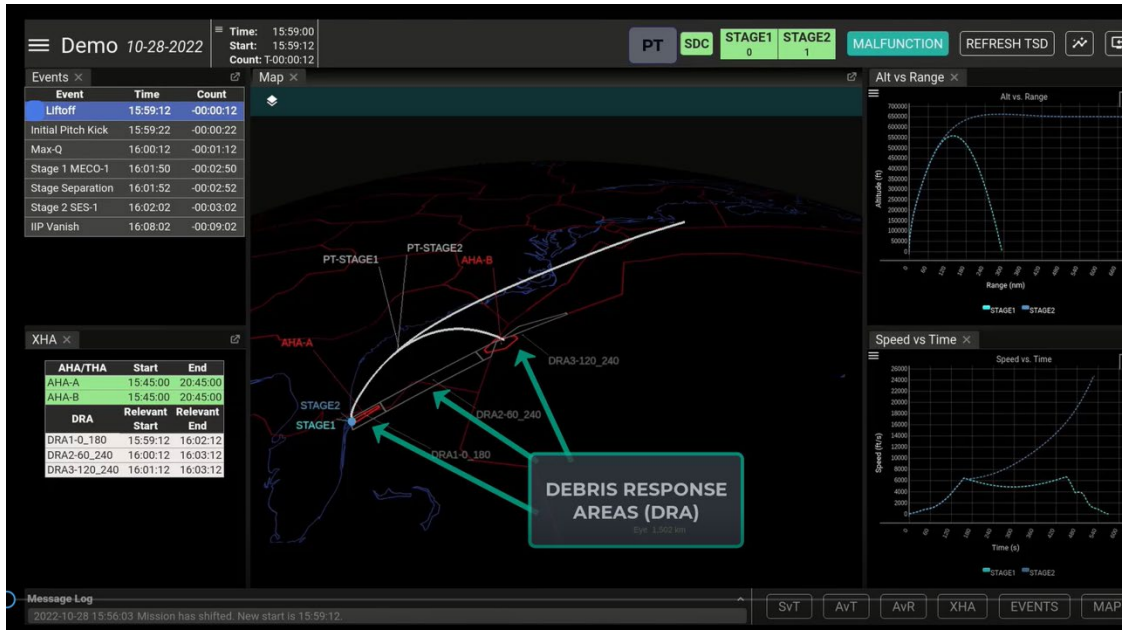
Goal: Leverage operator mission triggers to reduce airspace closure

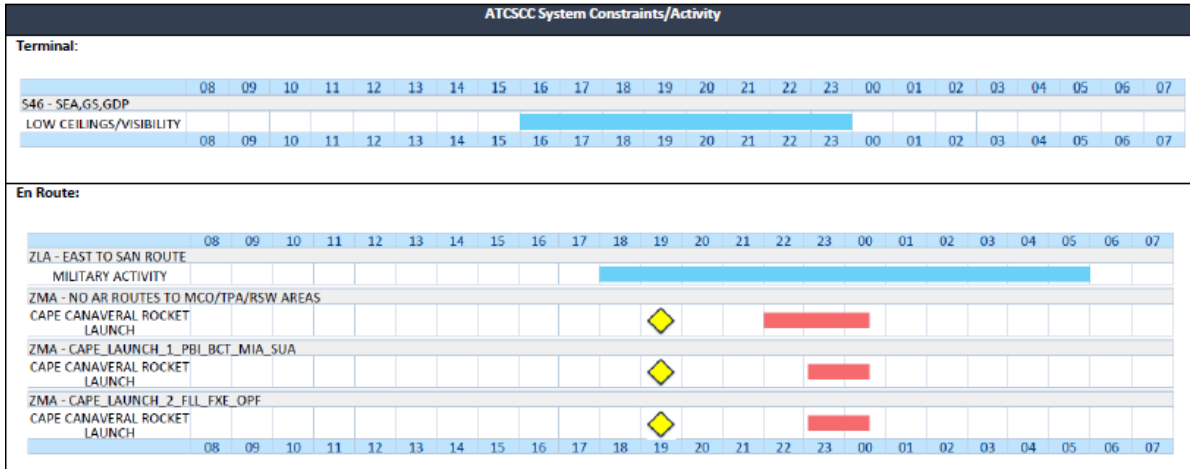
- **2020:** DLRW introduced at all launch locations
- Leverages operator mission triggers to dynamically manage hazard airspace and Traffic Management Initiatives (TMIs)
- Average annual **3,600+ minutes in airspace closure reduction**

Collaborative Decision Planning

Goal: Leverage data metrics to facilitate better operator decision making

- **2020:** Data-driven analysis used in operator's mission planning process to mitigate impacts
- Hazard area windows and adjusted to mitigate NAS impacts





Space Data Integrator (SDI)

Goal: Utilize real time telemetry to dynamically manage airspace

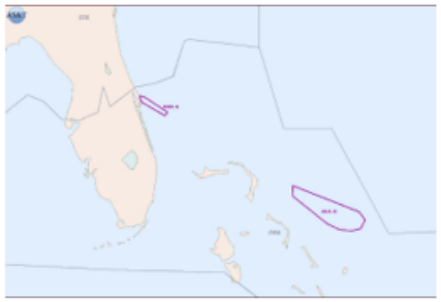
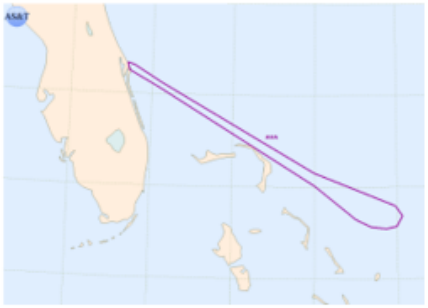
- **2020:** SDI was fielded as an operational test demonstration system
- Allows for **real time decision making** from the Challenger room based on vehicle telemetry
- **Facilitates Debris Response Areas** allowing Air Traffic Control to respond in real time to a vehicle anomaly

Critical Decision Windows (CDW)

Goal: Eliminate lost capacity due to scrubs

- **2021:** CDWs introduced at Pacific Spaceport Complex Alaska to encourage scrub decisions prior to PACOTS route structure publication
- **2022:** CDWs introduced at all launch sites
- **42% all missions scrubbed before CDWs**

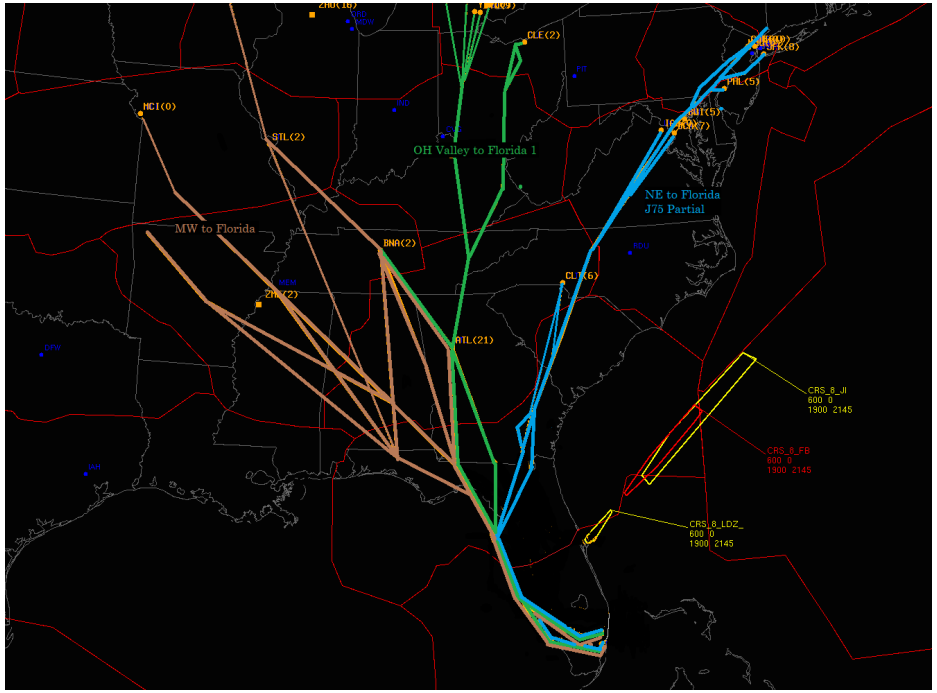
Starlink 6-4 Comparison

Mission Date	5/29/2023	5/29/2023
Mission Time	1900-2319	1900-2319
Flights Affected Per Day	43.6	327.30
Excess Distance per Aircraft	8.87	34.33
Excess Distance per Day	386.85	11237.49
Delay (minutes) per Aircraft	1.22	4.65
Delay (minutes) per Day	53.10	1521.30
		

Hazard Area Calculation Improvements

Goal: Improve and where possible reduce hazard area size

- Hazard areas naturally shrink with flight-proven vehicles
- **2022:** Decoupling of hazard areas from Special Use Airspace (SUA)
- **2022:** Hazard area reduction implemented for "life-leading" reusable boosters



Cape Canaveral/Kennedy Space Center Playbook Routing

Goal: Develop repeatable procedures for launch missions from CCSFS/KSC

- **2022:** Playbook routings implemented for CCSFS/KSC missions

Special Use Airspace Management

Cape Canaveral Space Force Station/Kennedy Space Center

BEFORE

Busy route from the northeast U.S. to central Florida closes during all space launches.
Flights rerouted to other busy routes resulting in arrival delays.

FOR A TYPICAL LAUNCH:

- Up to **36 flights** re-routed
- Up to **4,300 passengers** affected
- Up to **300 minutes** of delay
- Up to **1,500 extra miles** flown

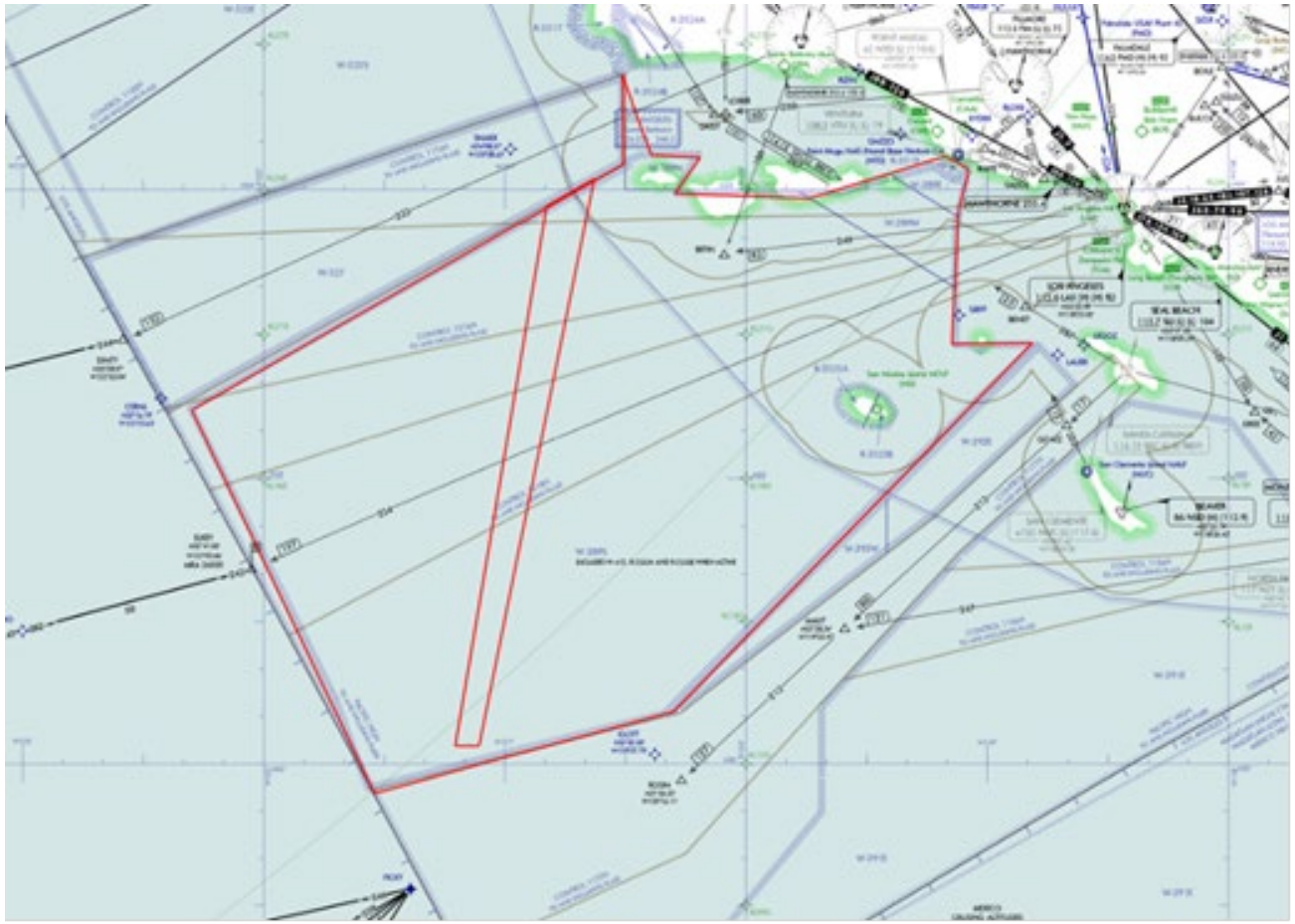
AFTER

Busy route from the northeast U.S. to central Florida remains open during most space launches.
Flights remain on efficient routes, avoiding additional delays.

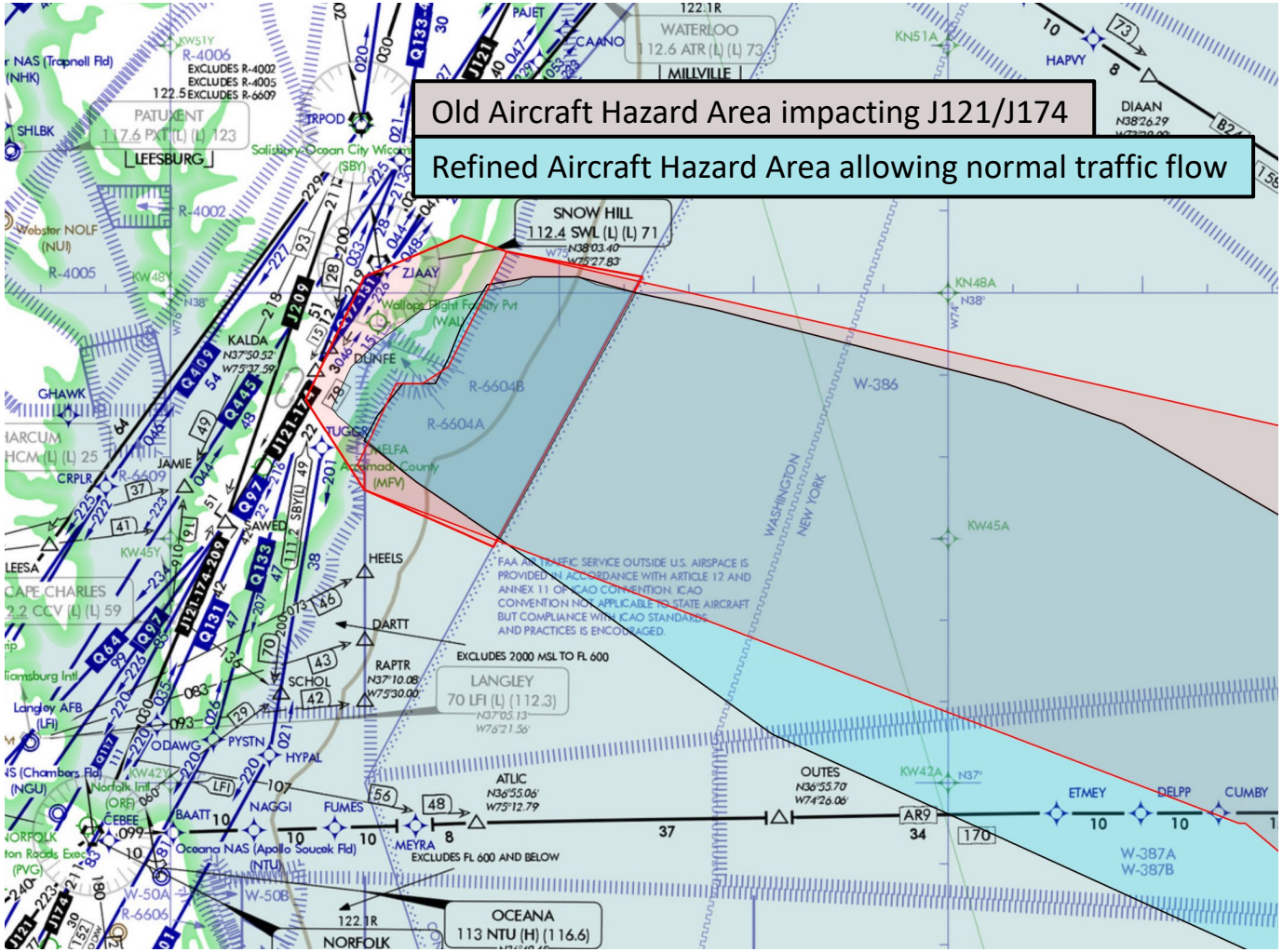
FOR A TYPICAL LAUNCH:

- **NO** flights re-routed
- **NO** delays
- **NO** impact to passengers
- **NO** extra miles flown

Vandenberg Space Force Base



NASA Wallops Flight Facility



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ATO SPACE OPERATIONS INTEGRATION EFFORTS

What's Next?

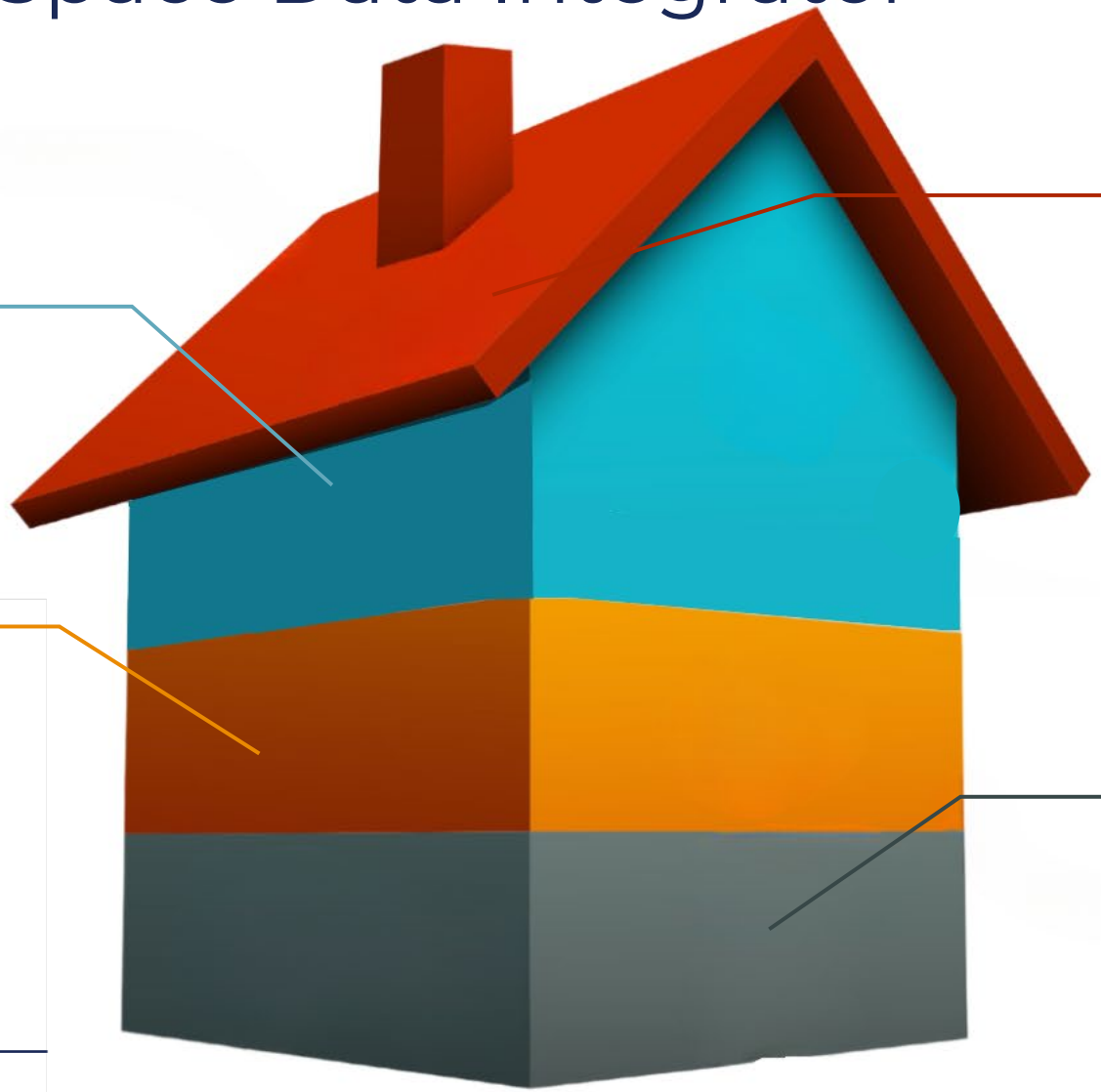
What's next?

Space Data Integrator

NAS Space Integration Capabilities (NSIC)

Controller decision support tools

Real time hazard area notification to controller scope



Future enhancements

SDI operational prototype

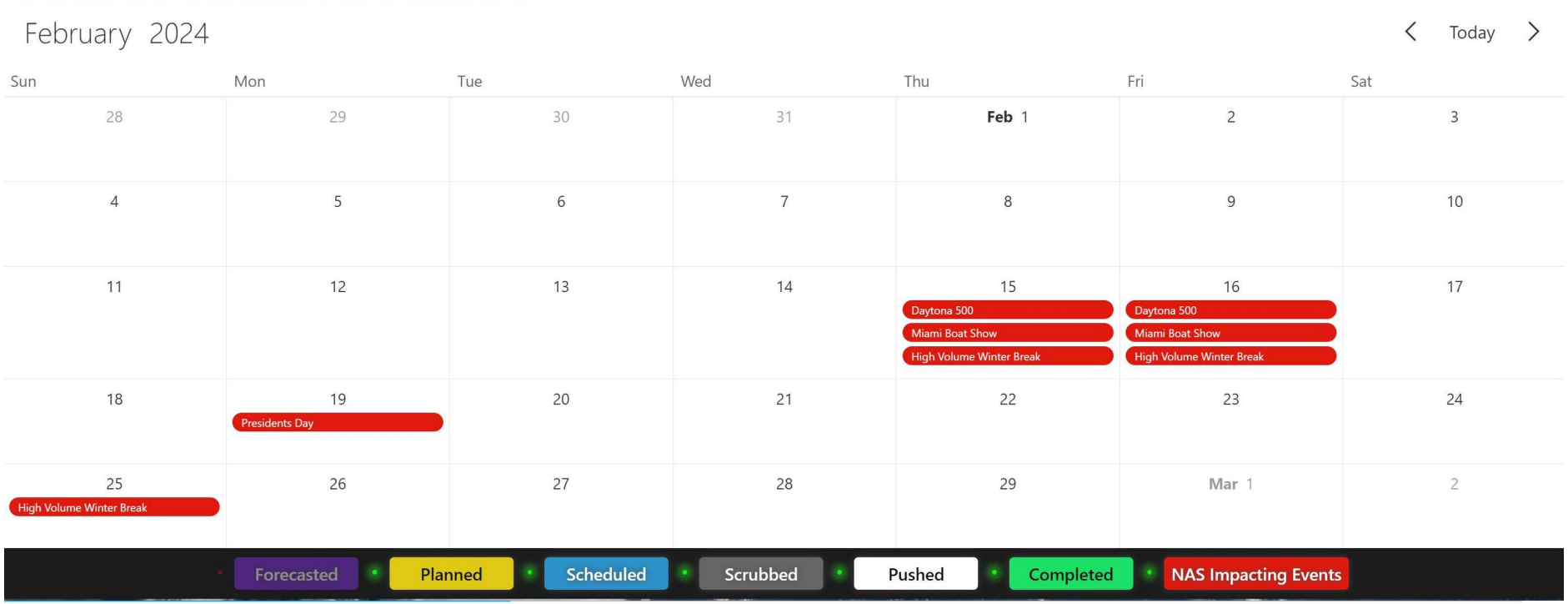
Today | Back | Next

July 2023

Month | Week | Day

Sun	Mon	Tue	Wed	Thu	Fri	Sat
25	26	27 VG Unity 26(Galactic 01) - KC,RS,CG 00:00 - 00:00 (SpaceX) CRS-28 Reentry -GC,GS, CG 00:00 - 00:00	28	29	30	01 Cert-1 (ULA Vulcan) -RS 00:00 - 00:00 SpaceX Euclid - NV, GS 15:06 - 15:17
02	03	04	05	06	07 SpX USSF-52 FH -RS 16:00 - 04:00	08
09 Starlink 6-5 -KC,RS 00:00 - 00:00	10 Starlink 6-6 00:00 - 00:00	11	12	13	14	15 RS1 DEMO 2 (ABL) 00:00 - 00:00 Starlink 6-15 00:00 - 00:00
16	17	18	19	20 32	21 CFT (ULA). 21:18 - 21:38	22
23	24	25 SpaceX mPOWER-C 00:00 - 00:00	26	27	28 (SpaceX) SDA-0B -GS 00:00 - 00:00	29
30	31	01 NG-19 00:00 - 00:00	02	03	04 Starlink (TBD) 00:00 - 00:00	05 Starlink 6-10 00:00 - 00:00

Forecasted • Planned • Scheduled • Scrubbed • Pushed • Completed • NAS Impacting Events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Daytona 500
Miami Boat Show
High Volume Winter Break
Daytona 500
Miami Boat Show
High Volume Winter Break
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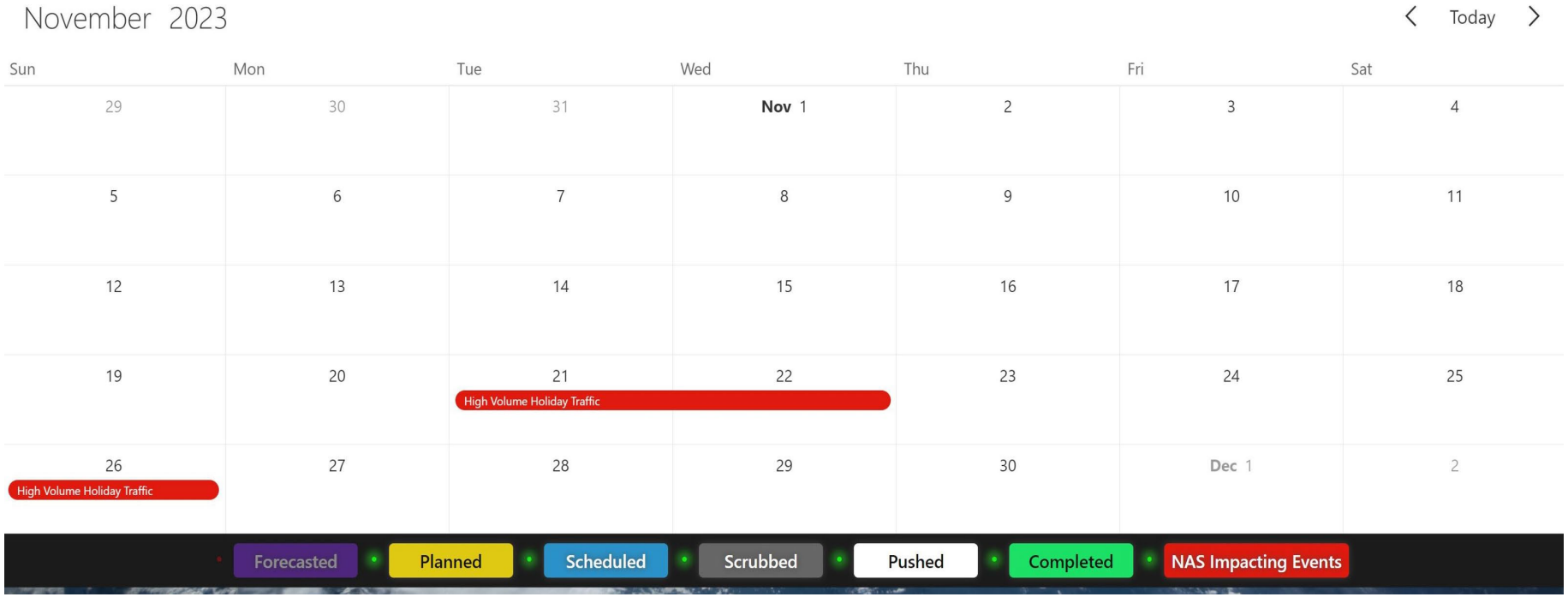
NAS Impacting Events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High Volume Holiday Traffic
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High Volume Holiday Traffic
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Forecasted
Planned
Scheduled
Scrubbed
Pushed
Completed
NAS Impacting Events

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Air Traffic Organization

Collaborative Decision Making Highlights

Duane Freer

Space Operations Group Manager
FAA ATO

Vern Payne

Manager, Collaborative Decision Making and International Operations
FAA ATO

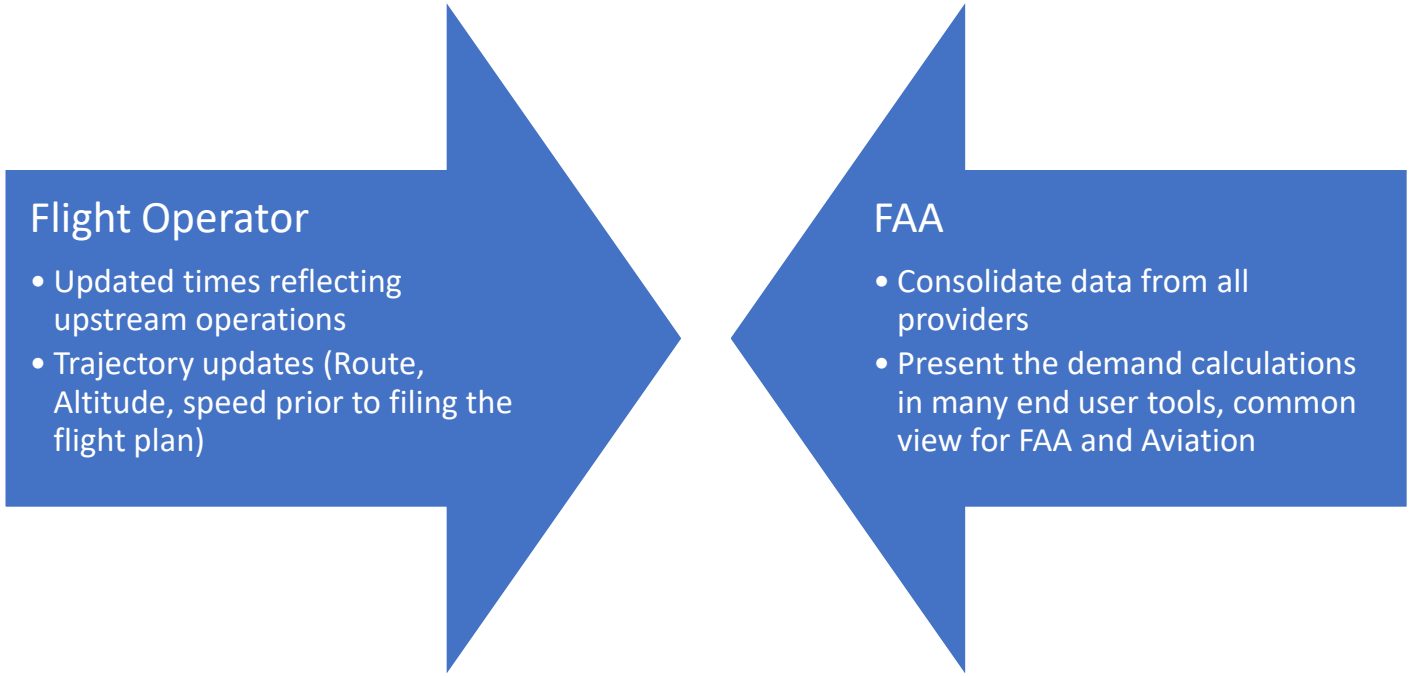
FAA
Air Traffic Organization

Collaborative Decision Making Highlights

FAA Aviation Collaborative Decision Making

Collaborative Decision Making – Why?

- Began 30 years ago as an experiment to see if additional data from flight operators could improve the flow management decision making process.
- At the core is data exchange. Unique data from flight operators to update demand models, consolidated data from FAA for common situational awareness.



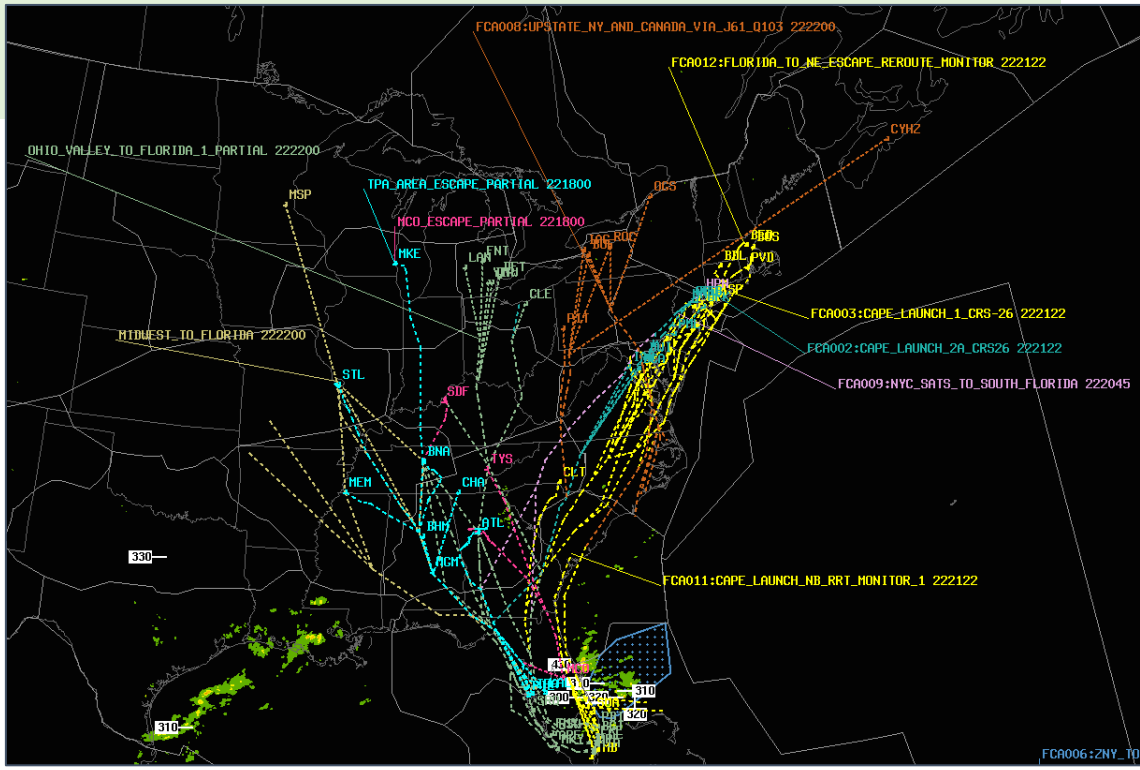
Collaborative Decision Making – Today

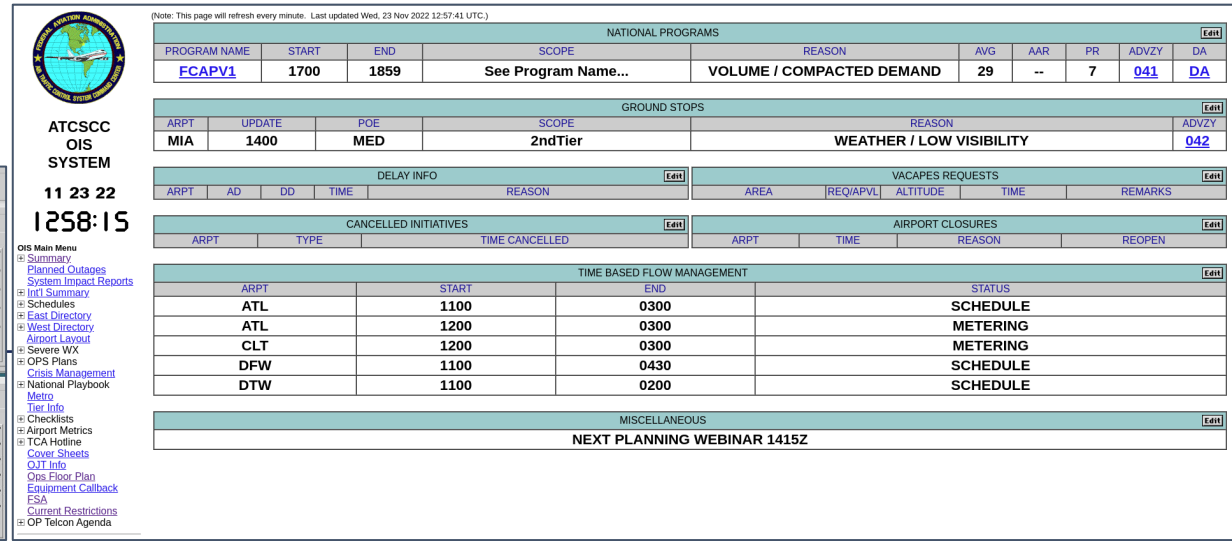
- Both a data exchange as well as a philosophy
- Philosophy is that FAA and Industry collaborate on planning, execution, and review
  - Advance Plan
  - Day of – Webinar every two hours
  - Next Day – review of previous day
  - Periodic:
    - Monthly: NAS Collaboration Forum (NCF)
    - Annually: NAS Performance Review (NPR) and CDM General Session

- CDM Sub-Teams (FAA and Industry) collaborate to work on taskings

Aviation CDM: Accomplishments applicable to launch operations

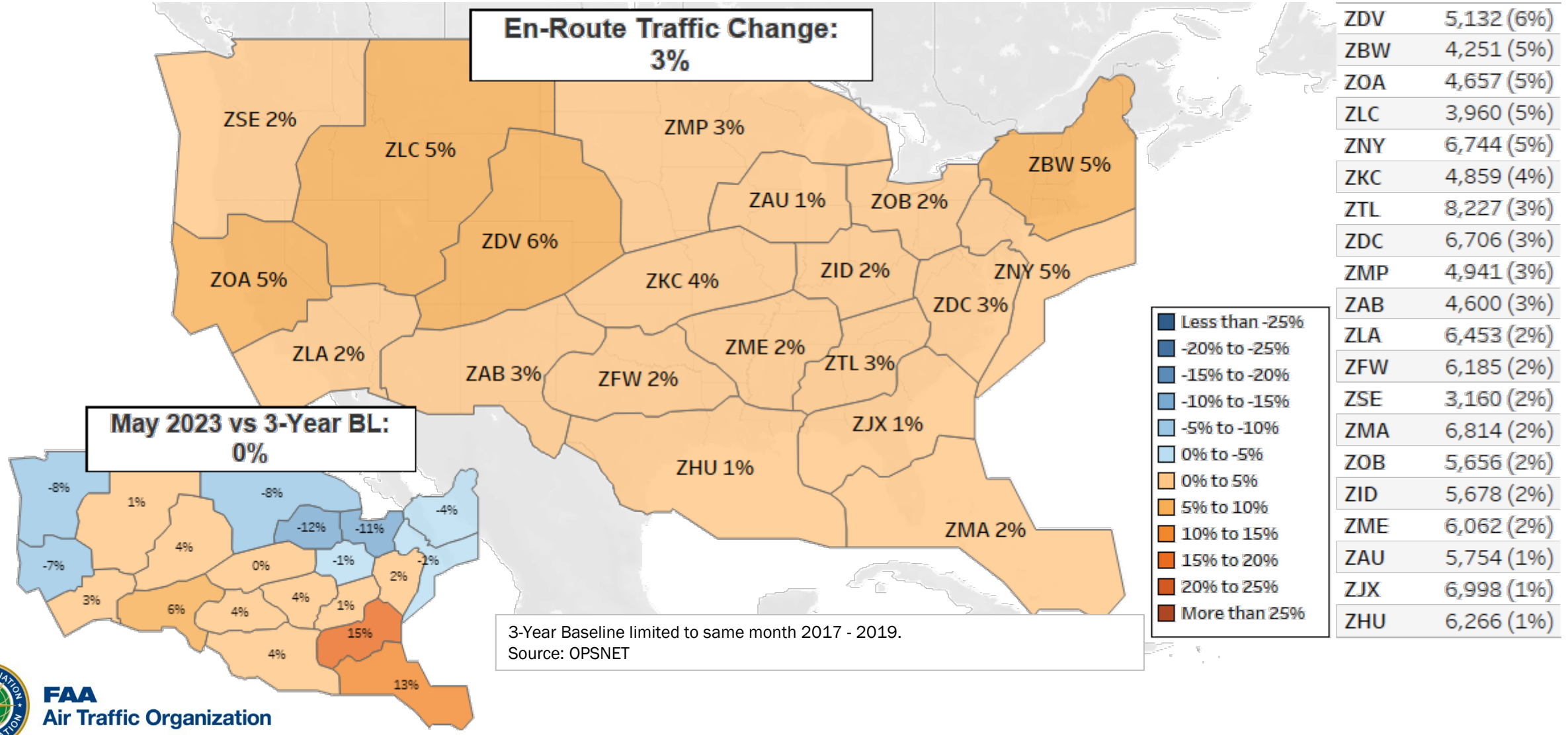
- Collaborative Weather Forecasts
- Airspace Flow Programs
- Required Routes
- Playbook Development
- Operational Information System
- Pre-Departure ReRouting (PDRR)
- AirBorne ReRouting (ABRR)





FAA Air Traffic Organization

En Route Flight Activity
May 2023 vs May 2022



ZDV	5,132 (6%)
ZBW	4,251 (5%)
ZOA	4,657 (5%)
ZLC	3,960 (5%)
ZNY	6,744 (5%)
ZKC	4,859 (4%)
ZTL	8,227 (3%)
ZDC	6,706 (3%)
ZMP	4,941 (3%)
ZAB	4,600 (3%)
ZLA	6,453 (2%)
ZFW	6,185 (2%)
ZSE	3,160 (2%)
ZMA	6,814 (2%)
ZOB	5,656 (2%)
ZID	5,678 (2%)
ZME	6,062 (2%)
ZAU	5,754 (1%)
ZJX	6,998 (1%)
ZHU	6,266 (1%)

3-Year Baseline limited to same month 2017 - 2019.
Source: OPSNET

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Collaborative Decision Making Highlights

FAA ATO Space Collaborative Decision Making (SpCDM)


ATO SPACE CDM
“COLLABORATION IS THE ONLY WAY WE WILL ACHIEVE COMPREHENSIVE SPACE INTEGRATION”
Executive Steering Committee

At-a-Glance

Recommendation of the Airspace Access Priorities Aviation Rulemaking Committee (AAP ARC)

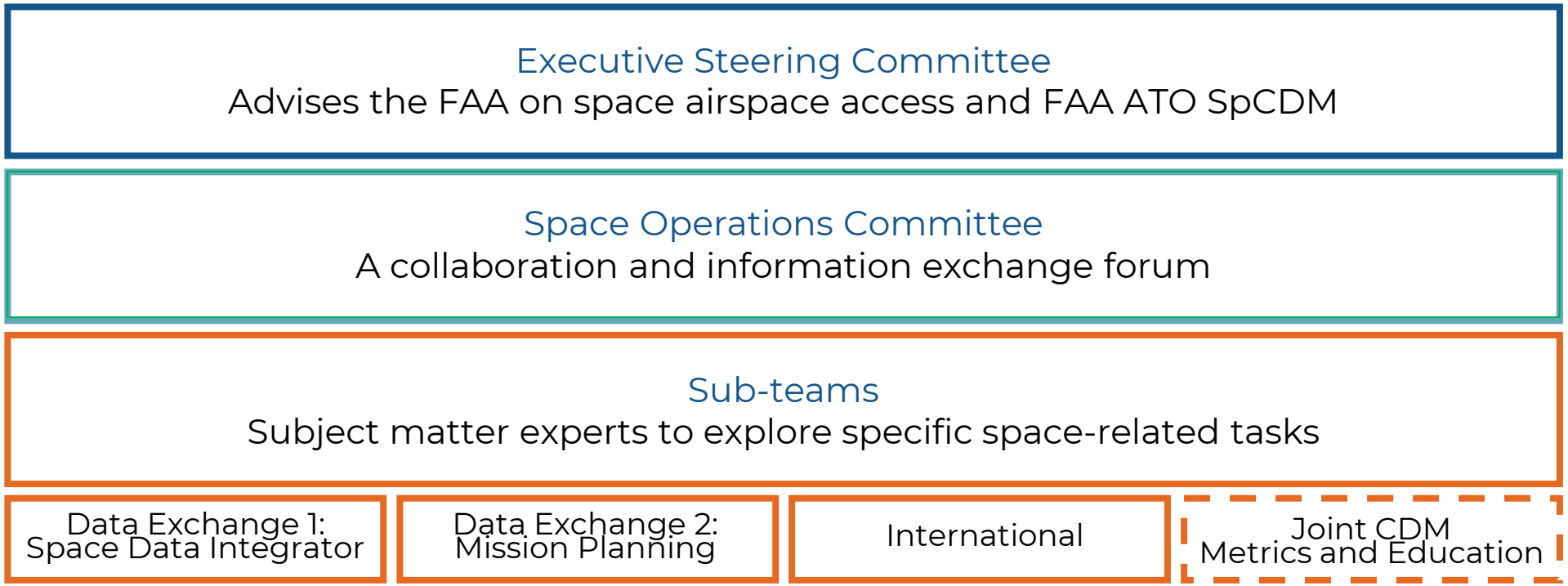
– 8/21/19 report

"...the FAA establish a CDM-like space operations committee to recommend appropriate **information to be exchanged with the FAA for more dynamic airspace management and situational awareness** and to help implement the details charted by the steering committee."

–Page 21

FAA ATO Space Collaborative Decision Making (SpCDM)

At-a-Glance



FAA ATO Space Collaborative Decision Making (SpCDM)

At-a-Glance

FAA ATO SpCDM launched in June 2021

- February 2021: ATO COO brief and concurrence
- June 2021: SpCDM kick-off
- September 2021: Charter published
- December 2021: SDI sub-team pilot launched
- June 2022: First Space Operations Committee meeting
- October 2022: Mission Planning and International sub-teams launched

3 active sub-teams

- December 2021: Data Exchange 1 - Space Data Integrator
- October 2022: Data Exchange 2 - Mission Planning
- October 2022: International

10 SpCDM meetings over 24 months

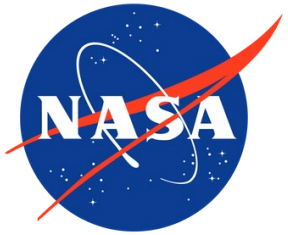
- 5 Executive Steering Committee (ESC) meetings
- 5 Space Operations Committee (SpOC) meetings

20 member organizations represented by 70+ individuals

- 12 space companies
- 5 associations
  - Airlines for America (A4A)
  - Commercial Spaceflight Federation (CSF)
  - International Air Transport Association (IATA)
  - National Air Traffic Controllers Association (NATCA)
  - National Business Aviation Association (NBAA)
- 3 government agencies
  - FAA
  - NASA
  - U.S. Space Force

FAA ATO Space Collaborative Decision Making (SpCDM)

20 Member Organizations



FAA
Air Traffic Organization

FAA ATO Space Collaborative Decision Making (SpCDM)

Data Exchange Sub-team 1
Space Data Integrator

Statement of Task

- Increase operational efficiency in NAS traffic management of space operations by incorporating real time data from the launch providers for improved FAA situational awareness

Expectations

- Host targeted, topic-specific industry forums to educate space launch and reentry operators (LROs) on the Space Data Integrator (SDI)

Accomplishments

- Informational sessions for operator engineering and software development teams
- SDI status updates at ATO SpCDM meetings
- Pilot program for sub-team framework

FAA ATO Space Collaborative Decision Making (SpCDM)

Data Exchange Sub-team 2
Mission Planning

Statement of Task

- Explore tools and processes to improve the pre-mission data exchange between the FAA, LROs, and other stakeholders

Expectations

- Host one group meeting per month
- Targeted, task-orientated meetings for stakeholder input

Accomplishments

- User testing of portal functionality and usability
- Continual engagement and activity emphasizing collaboration and information exchange
- Provide subject matter expertise through the portal transition to NASA Ames

FAA ATO Space Collaborative Decision Making (SpCDM)

International Sub-team

Statement of Task

- Inform LROs of best practices for preparing and disseminating space operations-related airspace coordination and to foster a greater understanding of the value of leveraging ICAO and CANSO connections for efficient airspace utilization during space operations.

Expectations

- Host biweekly meetings

Accomplishments

- Creation of ANSP guide for space operators to reference during mission planning with CANSO and CADENA
- Standardized international NOTAM request format for space operations
- Provide feedback on space operation international coordination guidance materials
- CANSO and ICAO informational briefs to operators

FAA Collaborative Decision Making Programs

Joint sub-team Work

FAA ATO Space Industry Day

Aviation and Space CDM leadership joint planning committee

CDM Executive Steering Committees

Plan for aviation and space CDM executive steering committees to meet biannually

- First meeting will be October 26, 2023

Forming joint working group on metrics

Tasked to identify common metrics for assessing airspace efficiency

Forming joint working group on outreach and education – current activities include:

Airspace efficiency materials

- Tailored articles for internal audiences, e.g., Southwest Airlines article in folders

Educational Materials Website

Learning website with educational materials: https://tfmlearning.faa.gov

FAA ATO System Operations (AJR) Courses

- 50113: National Traffic Management
- 50114: Altitude Reservation (ALTRV) and Space Operations

Opportunities for information exchange at FAA ATO SpCDM meetings

October 2022: Delta Air Lines provided an operational brief at SpOC meeting

January 2023: Southwest Airlines hosted SpOC meeting and provided tour of Network Operations Control

Questions

Aviation CDM: CDM@faa.gov

Space CDM: SPOC@faa.gov

FAA
Air Traffic Organization

Panel: Industry Perspective

Moderated by:

LaKisha Price

Director NAS Operations
FAA ATO

Patrick Butler
Director
Mission Execution
Florida Launch Operations

Duane Freer
Group Manager
ATO Space Operations

Rob Goldman
Senior Manager
Air Traffic Management and
Industry Affairs

Paul Litke
Director
Surface Operations, Network
Operations, ATS

Vern Payne
Manager
Collaborative Decision
Making and International Operations

Mike Lapidus
Director
Government Affairs


FEDERAL AVIATION ADMINISTRATION
FAA
Air Traffic Organization
Open Forum


FAA
Air Traffic Organization
Closing

Supplemental

Acronyms

AAP ARC	Airspace Access Priorities Aviation Rulemaking Committee
ABRR	Airborne Rerouting
AHA	Aircraft Hazard Area
AJR	ATO System Operations (FAA)
ALR	Acceptable Level of Risk
ALTRV	Altitude Reservation
ANG	Office of NextGen (FAA)
ANSP	Air Navigation Service Provider
AR	Atlantic Routes
ARE	Adaptive Risk Envelopes
AST	Office of Commercial Space Transportation (FAA)
ATC	Air Traffic Control
ATO	Air Traffic Organization
AvCDM	Aviation Collaborative Decision Making
CADENA	CANSO ATFM Data Exchange Network for the Americas
CANSO	Civil Air Navigation Services Organisation
CCSFS	Cape Canaveral Space Force Station
CDM	Collaborative Decision Making
CDW	Critical Decision Windows
DLRW	Dynamic Launch and Reentry Windows
DRA	Debris Response Areas
ESC	Executive Steering Committee
FAA	Federal Aviation Administration
HA	Hazard Area
ICAO	International Civil Aviation Organization
KSC	Kennedy Space Center
LOA	Letters of Agreement
LRO	Launch and Reentry Operator
NAS	National Airspace System
NCF	NAS Collaboration Forum
NOTAM	Notice to Air Mission
NPR	NAS Performance Review
NSIC	NAS Space Integration Capabilities
PACOTS	Pacific Organised Track System
PDRR	Pre-Departure Rerouting
PMO	Program Management Office (FAA ATO)
PVD Draw	Plan View Display Draw
SDI	Space Data Integrator
SpCDM	Space Collaborative Decision Making
SpOC	Space Operations Committee
STC	Space Transition Corridors
SUA	Special Use Airspace
TBLP	Time Based Launch Procedures
TMI	Traffic Management Initiatives
ZLA	Los Angeles Air Route Traffic Control Center
ZMA	Miami Air Route Traffic Control Center