Importance of an Airspace Management Plan (AMP) for Space Launch Operations

Case Study by Piarco FIR

Presented by Trinidad and Tobago

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How Space Launches Impact Civil Aviation

- Temporary danger areas within controlled airspace
- Risk of falling debris during normal and failure scenarios (RUD - Rapid Uncontrolled Disassembly)
- Potential disruption to international and regional traffic
- Structured planning is required to preserve aviation safety

IMPACT OF SPACE OPERATIONS ON PIARCO FIR

In 2025, 13 space launches impacted operations within the Piarco FIR.

Information is received from either FAA ATO Space Operations or Centre National d'Études Spatiales (CNES).

Two (2) types of areas:

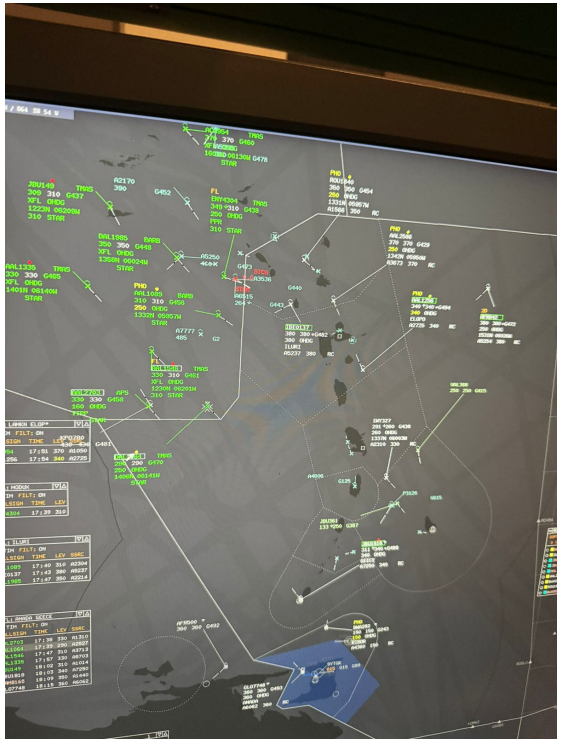
- Danger areas (represents hazardous area to aircraft operations).
- 10 ^-7 - Risk based on the probability of an event occurring and the potential severity of its consequences.

Depending on time and duration of launch, there have been occasions when as many as thirty (30) flights were affected.

Effects ranged from departure delays, en-route holding, diversion to alternate, return to point of departure.

Increased workload on Air Traffic Controllers and other ANS personnel.

Difference in handling flights in continental airspace as opposed to flights in oceanic airspace.



What is an Airspace Management Plan (AMP)

- A coordinated framework to manage airspace safely
- Defines danger areas, buffers, and Debris Response Areas (DRA)
- Provides information on any required TMMs
- Developed in accordance with ICAO provisions
- Supports safe integration of space and aviation operations

Objectives of the AMP

- Protect aircraft and passengers from launch-related hazards
- Maintain acceptable levels of safety
- Minimize disruption to air traffic
- Ensure coordination among all stakeholders

AMP Phases of Operation

- Strategic Phase – planning and communication
- Pre-Tactical Phase – traffic analysis and preparedness
- Tactical Phase – real-time air traffic flow management

Planning Phases

Strategic

•Mission briefing from relevant stakeholders.

•Assessing the affected area to determine the airspace reservation and affected routes.

•Assessing traffic numbers during affected periods.

•Internal discussion on Airspace Management Plan (AMP).

•Collaborative Decision Making (CDM) with adjacent Air Navigation Services Providers (ANSPs) and airlines - CADENA ad hocs.

•Sharing of information to Terminal Control Areas (TMAs) within the Piarco FIR.

•Finalization of Traffic Management Measures (TMMs) and AMP.

•Promulgation of relevant NOTAMs.

Pre-tactical

•Assessment of actual traffic.

•Notify adjacent ANSPs and TMAs of start time for relevant TMMs.

•Final briefing for ATS Supervisors.

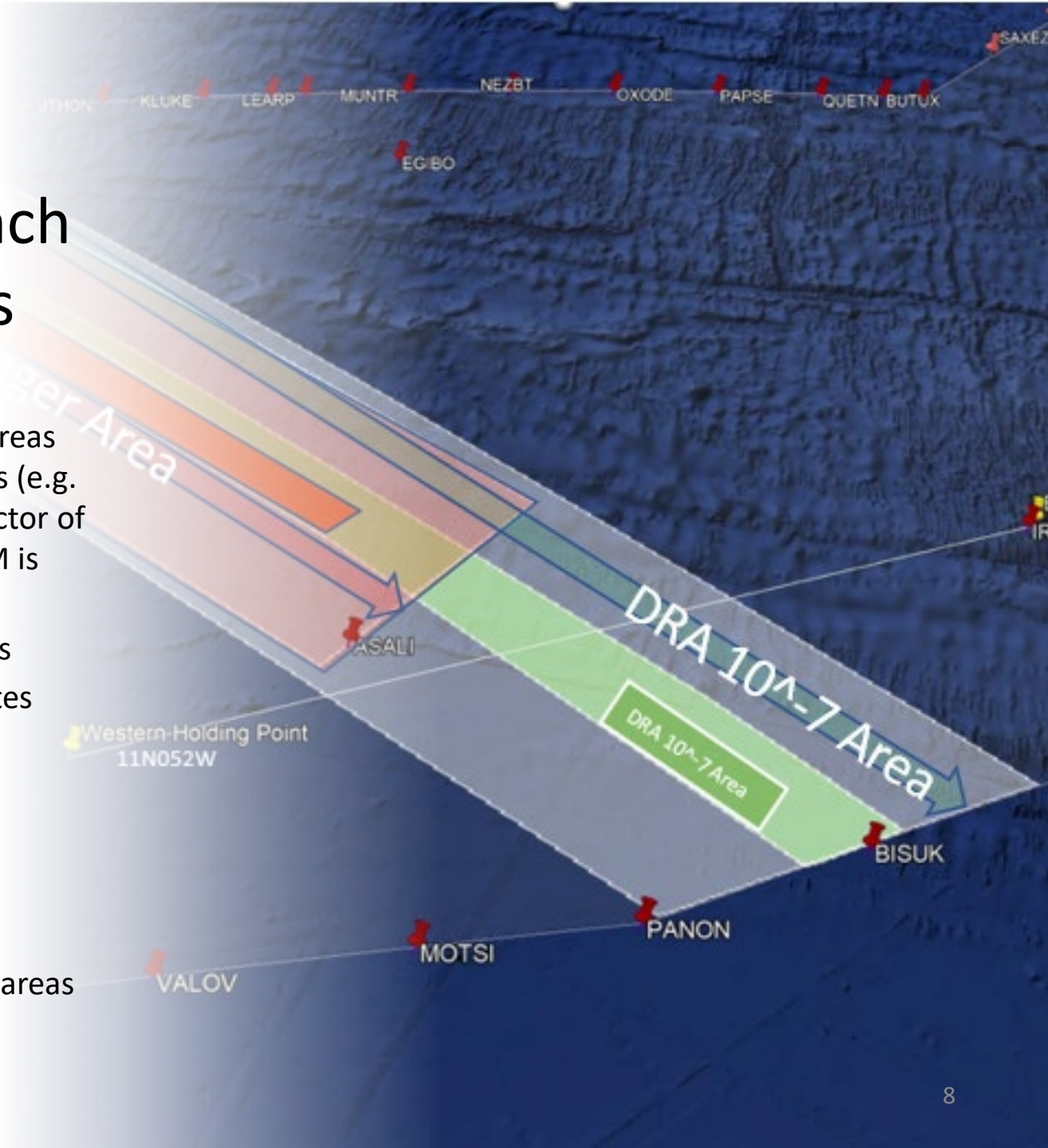
Tactical

•Engage in live teleconferences with FAA ATO Space Operations.

•Participate in CADENA ad hoc tactical virtual conference.

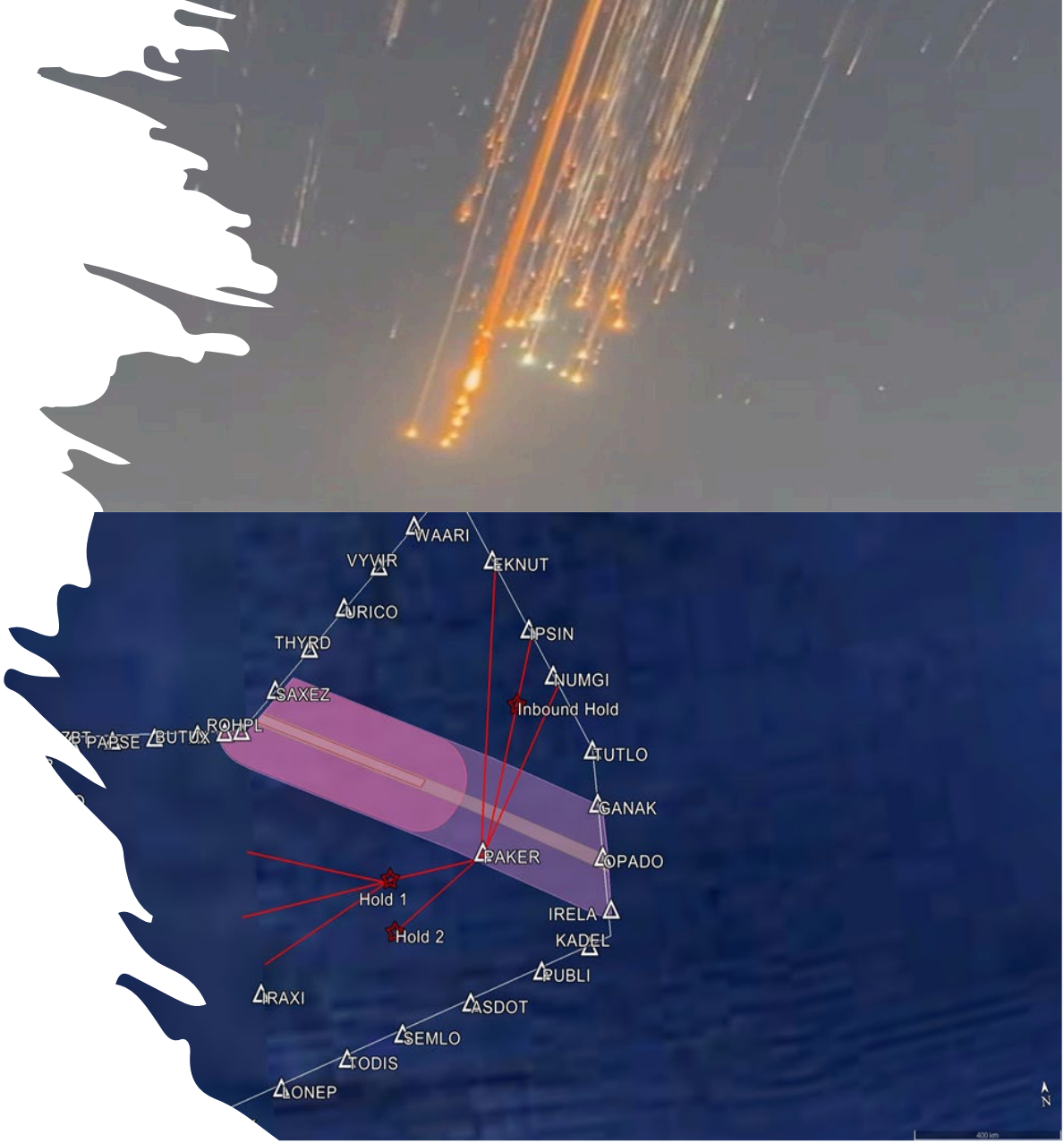
Managing Normal Launch Operations

- Activation of danger areas with applicable buffers (e.g. within the Oceanic Sector of the Piarco FIR – 50 NM is used)
- Publication of NOTAMs
- Defined alternate routes
- Traffic Management Measures – TMMs:
  - Re-routes
  - Miles entrail
  - GDP
  - En-route holding areas



Responding to a Launch Failure (RUD)

- Immediate activation of the DRA
- Holding or rerouting aircraft
- Rapid exit of aircraft from affected airspace



Safety Case within AMP

- Formal risk assessment using likelihood and severity
- Identification of high-severity hazards
- Layered mitigations reduce risk to manageable levels

Coordination and Technology

- Real-time coordination with FAA Space Operations
- Tactical coordination via CADENA
- Space-based ADS-B (Piarco) for enhanced situational awareness in oceanic sector

Lessons Learned/The Way Forward

Lessons Learned

•CDM extremely critical amongst all stakeholders to agree on measures to be implemented

•Development of an AMP

•Timely publishing of relevant NOTAMS

•Live teleconferencing during the event – aids tactical decision making in the event of an anomaly

•Post operational analysis for continuous improvement

The way forward

•CDM with stakeholders to reduce restrictions and to allow tactical operations in some portions of the airspace

•Discussions with operators to develop “Tailored” plans for flights in the oceanic sector

•Continuous discussion with Space Launch service providers, regional ANSPs and Aircraft Operators to improve processes

Conclusion

SPACE LAUNCHES INTRODUCE UNIQUE AVIATION HAZARDS

AN AMP PROVIDES A DEFENSIBLE SAFETY FRAMEWORK

ESSENTIAL FOR SAFE INTEGRATION OF SPACE OPERATIONS

Example of an AMP by Piarco

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