2026 Workshop on APAC Region ATM Contingency Framework

ROK's Experience in Airspace Management for Space Launch Activities

13-17 July 2026, Tokyo Japan

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Agenda

01 **Korea’s Space Launch Overview**
Roles & organizational framework, Launch Vehicle

02 **ATS Authority’s ASM and Coordination**
FUA implementation, International Coordination with affected States

03 **Operational Limitations & Challenges**
Weather, Internal coordination, communication, Reroute FPL

04 **Discussion & Proposals**


Nuri(KSLV Ⅱ) 4th Launch / Nov 2025

01. Korea's Space Launch Overview

🚀 Roles and Responsibilities mapped against the **APAC Regional Guidance framework**

- LAUNCHING STATE -

Republic of Korea

Policy & National Authority

- Korea AeroSpace Administration(KASA)
- Ministry of National Defense(MND)

- LAUNCHING STATE APPROPRIATE ATS AUTHORITY -

Ministry of Land, Infrastructure and Transport

Air Traffic Management Office

ASM & International Coordination (Led by ATFM Division)

- Establish airspace support plans for launch operations
- Coordinate FUA(Flexible Use of Airspace) based detour routes

- LAUNCH AND RE-ENTRY OPERATOR -

Public & Private Operators

KARI – Korea Aerospace Research Institute
ADD – Agency for Defense Development
Hanwha Aerospace – Private System integrator

- AFFECTED APPROPRIATE ATS AUTHORITIES -

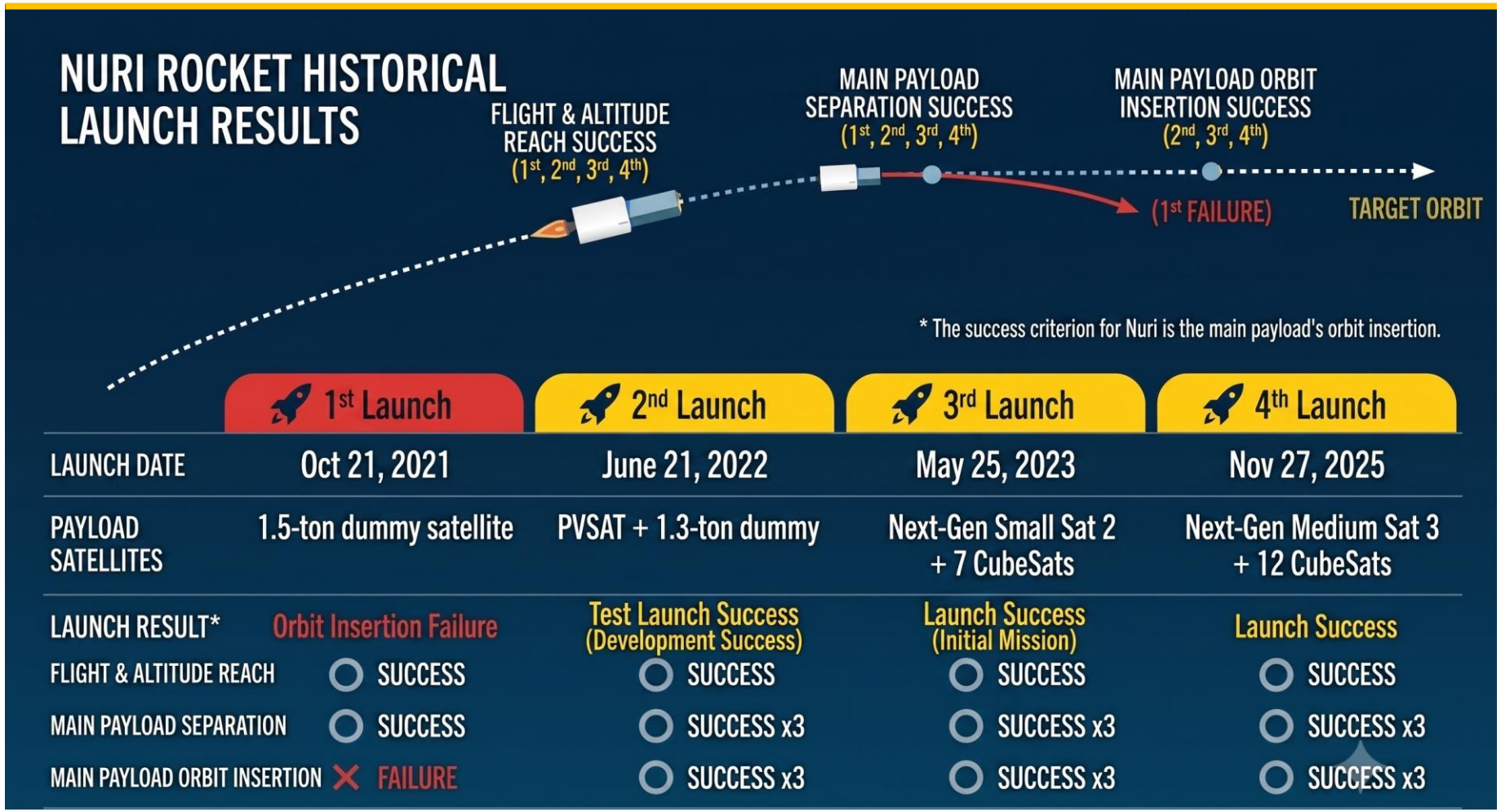
States Affected by ROK's Launch

JAPAN - JCAB
PHLIPPINES - CAAP
UNITED STATES - FAA
NEW ZEALAND - CAA

01. Korea's Space Launch Overview

Launch Scheduled for Sep 2026

- **Korea's Path to Space** : Naro Rocket(KSLV-I, 2009~2013) → Nuri Rocket(KSLV-II, 2021~2027) → Nex-Generation Launch Vehicle(KSLV-III,2030~)



01. Korea's Space Launch Overview

Launch Site and Constraints

Naro, Nuri Rocket

Defense Space Launch Vehicle
(2023, 2026~)

NARO Space Center

Offshore Launch Platform

- Geographical Constraints -

1. Blocked Direction

- East : Blocked by Japan
- West/North: Blocked by China/N. Korea

2. The Only Route: Due South

- Only safe area for stage dropping
- Extremely narrow corridor to avoid islands

3. Orbital Limitations

- Possible: Polar / Sun-Synchronous Orbits
- Impossible: Geostationary Orbits

02. ATS Authority's ASM and Coordination

Objectives of the ATS Authority for Space Launches

- **Ensure the Safety of Civil Aviation** : Prioritize the **safe separation of aircraft** operating in the vicinity of the launch trajectory and designated falling zones.
- **Maximize Operational Efficiency** : Establish **the most direct detour routes** to avoid restricted airspace, thereby minimizing flight delays and additional fuel costs for airlines.
- **Enhance Predictability and Responsiveness**: Facilitate **real-time information sharing** regarding launch schedules and dynamic changes with domestic stakeholders(ATC, airlines) and affected States

Key Tasks for Space Launch Support

02. ATS Authority's ASM and Coordination

Coordination Team : Close coordination and information sharing

Team by Air Traffic Management Office

Head of Team

Director of the ATFM Division

ASM Division	Focal point ATFM Division/Unit	ATC Facility(ACC)
• Coordination of airspace restrictions • Verify the launch trajectory	• Traffic Impact Analysis, Planning • Coordination with Affected States • NOTAM Issuance, Information Sharing	• Airway Restrictions & Rerouting • Implement ATC Safety Measures

Cooperating Agencies

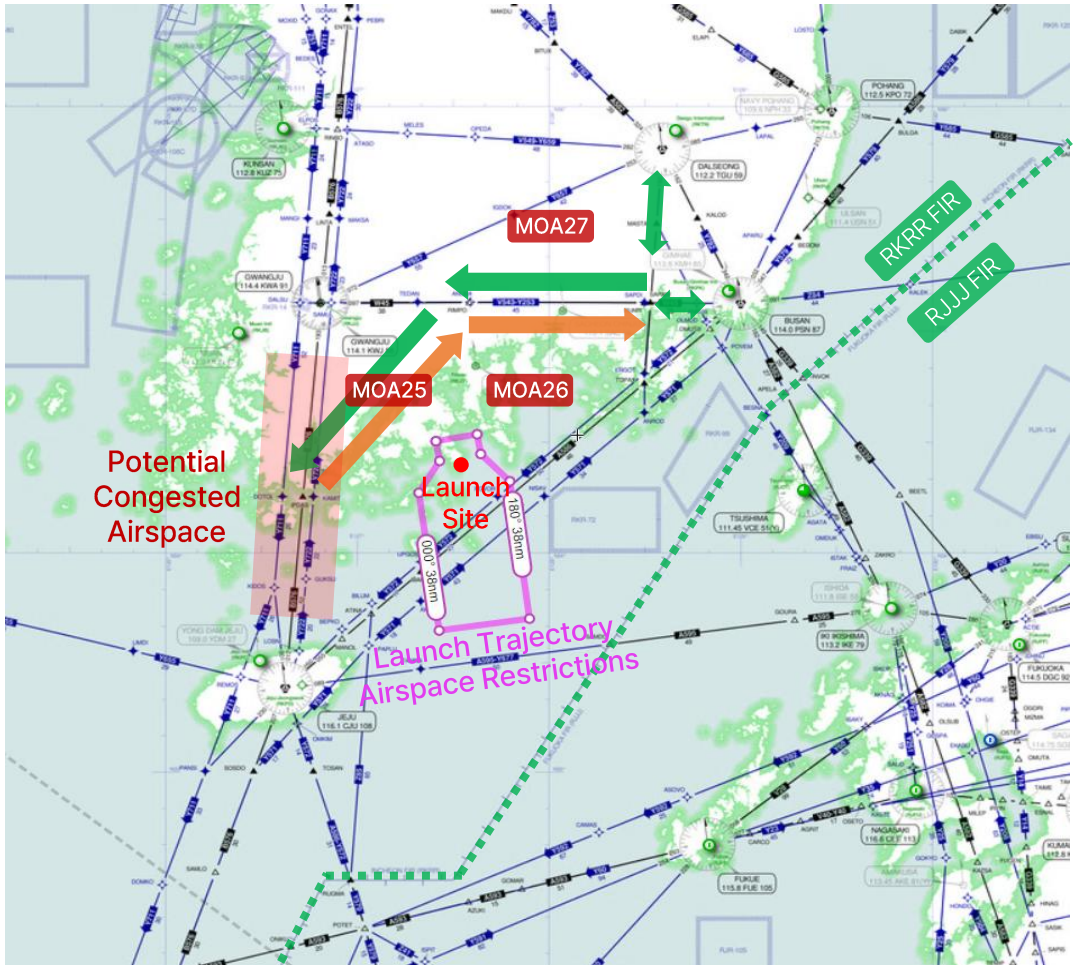
- **Launch Control Room**
- **ATC Facility** (TWR, APP)
- **Airport Operators**
- **Airspace Users**
- **Air Force**
- **Aviation MET Office**
- **Affected States ATS**

02. ATS Authority's ASM and Coordination

Airspace Management : FUA Application & Rerouting for Minimizing Air Traffic Flow Impact

** To mitigate traffic congestion, assess traffic impact, review the necessity of ATFM, execute sector split operations.*

NARO(KSLV-Ⅰ), NURI(KSLV-Ⅱ) Rocket
NARO Space Center, Goheung Jeollanam-do



Establish the shortest reroutes to minimize operational impact

02. ATS Authority's ASM and Coordination

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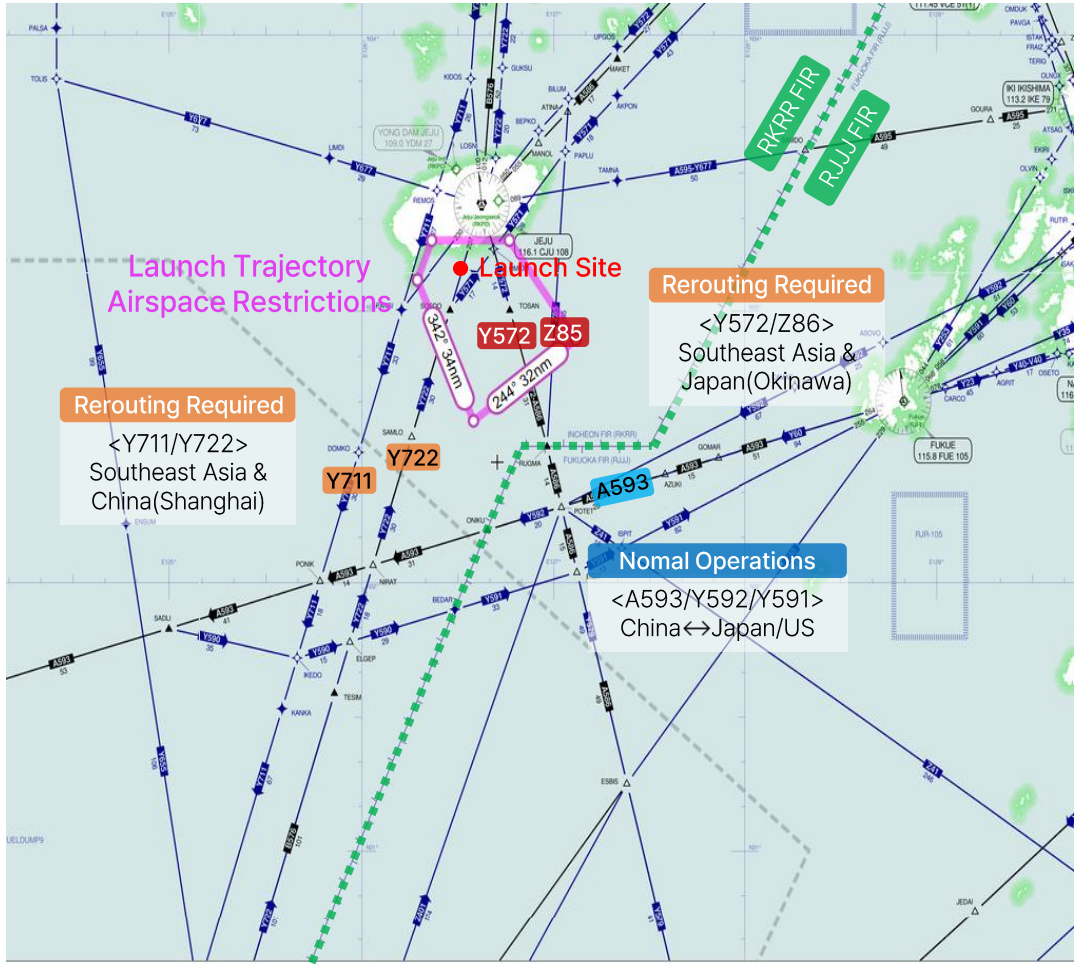
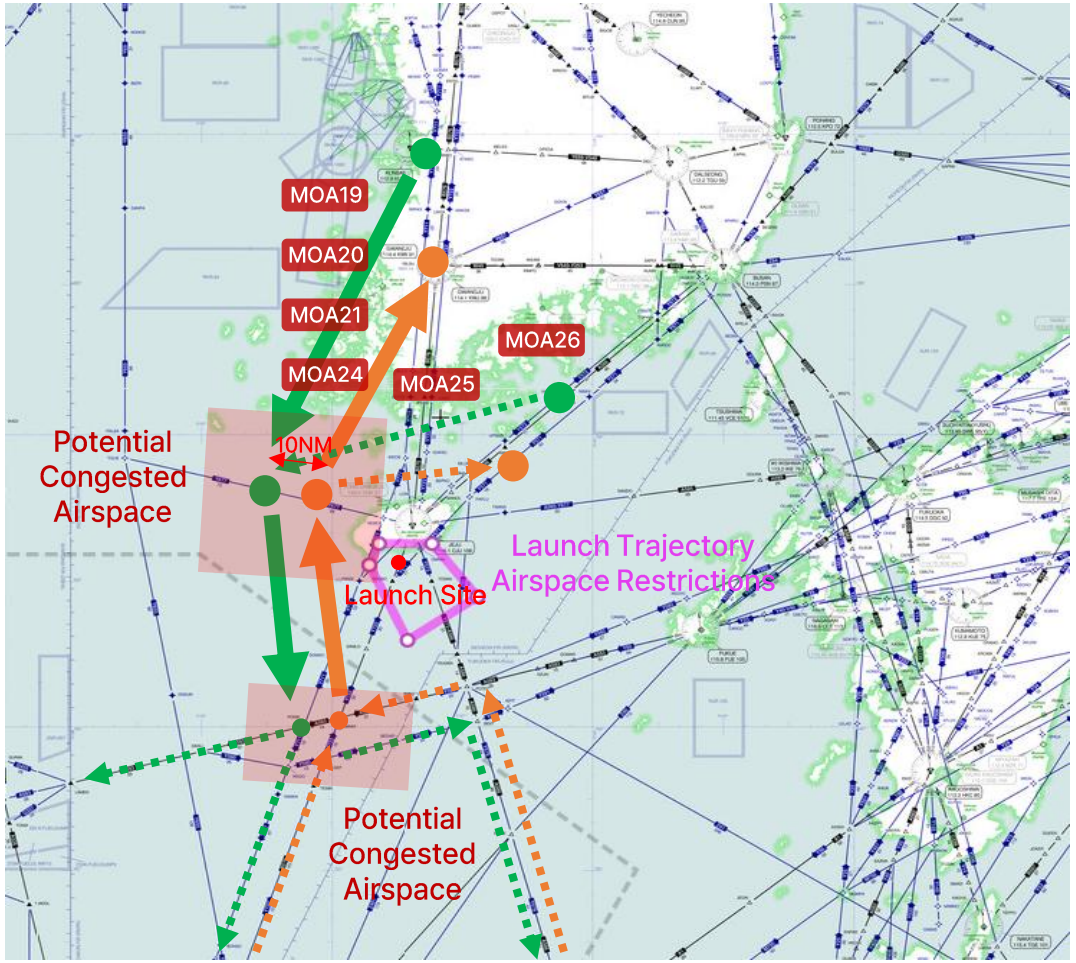


Defense Space Launch Vehicle, 2026(Plan)
Offshore Launch Platform, South of Jeju island



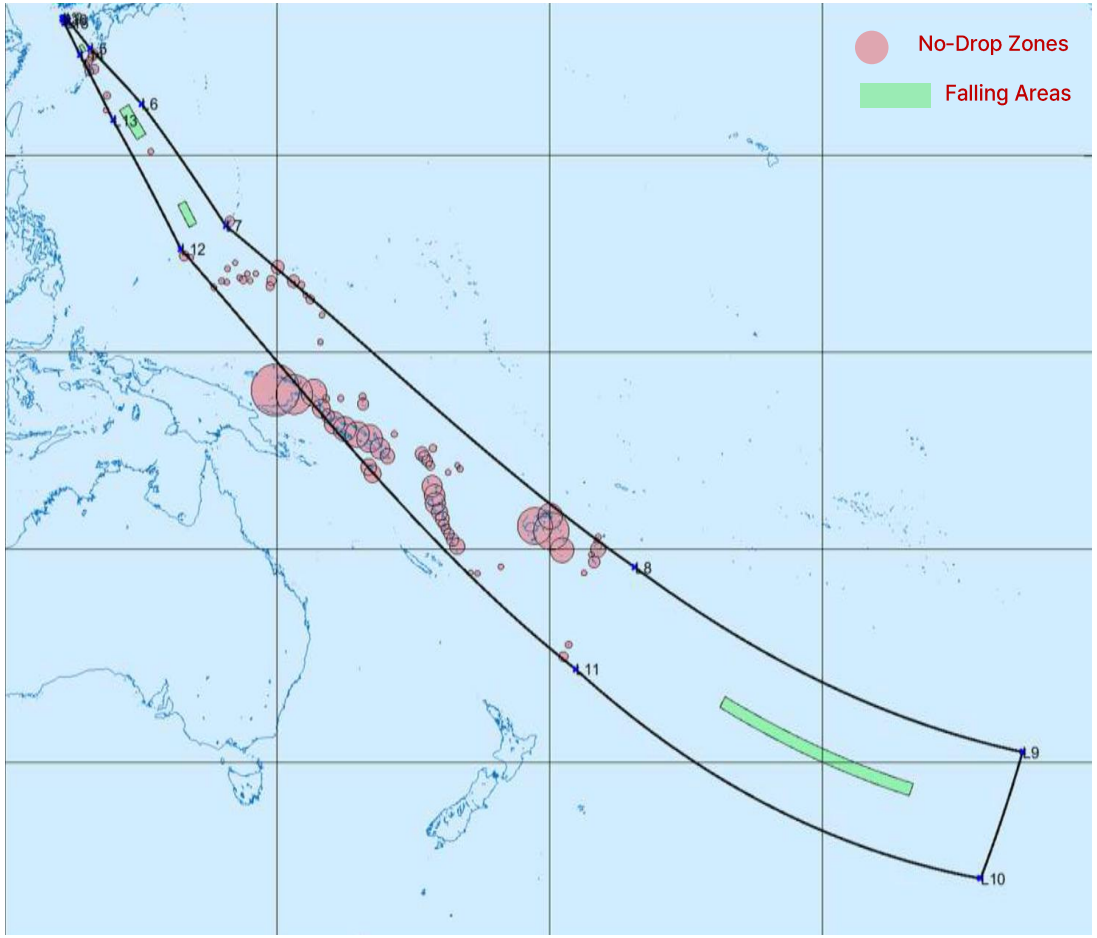
Establish the shortest reroutes to minimize operational impact

02. ATS Authority's ASM and Coordination

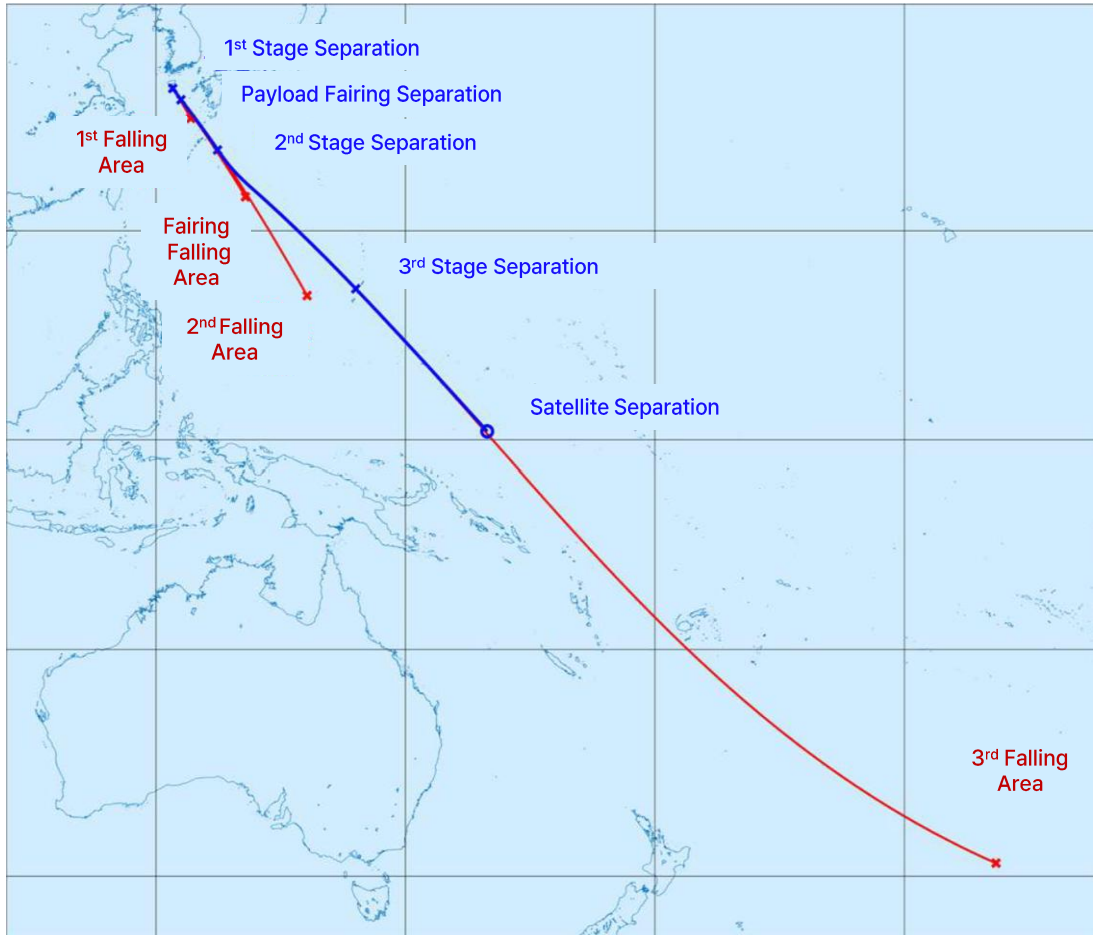
- **International Coordination :** Coordination and Dissemination of Space Launch information

  ** Asia/Pacific regional guidance for Space Object Launch and Re-Entry Activities Coordination(ver 1.0)*

Impact Limit Line



Flight Trajectory



02. ATS Authority's ASM and Coordination

International Coordination : Coordination and Dissemination of Space Launch information

** Asia/Pacific regional guidance for Space Object Launch and Re-Entry Activities Coordination(ver 1.0)*

Launching State

- Identification of POC in the Affected ATS Authority
- Preparation of materials for launch falling area

D-30

- Coordination of detour routes with adjacent State(Japan)
- (If possible) Information(draft) sharing by E-mail

D-30 ~ D-14

- Information sharing by AFTN/AMHS, E-mail(supplemental material)

D-14(Ideally) ~ D-10

- NOTAM Published

D-7

- Notification of the Confirmed Launch Date
- Positive Coordination

D-3 ~ D-1

- Notification of the Confirmed Launch Time
- Real-time Info Sharing

D-0

Affected State

- Traffic Impact Assessment
- Establishment of alternative routes
- (As required) Coordination with adjacent states

- NOTAM Published

- (During Activity) Avoiding Falling Area
- (Upon Completion) Resume normal airspace operations

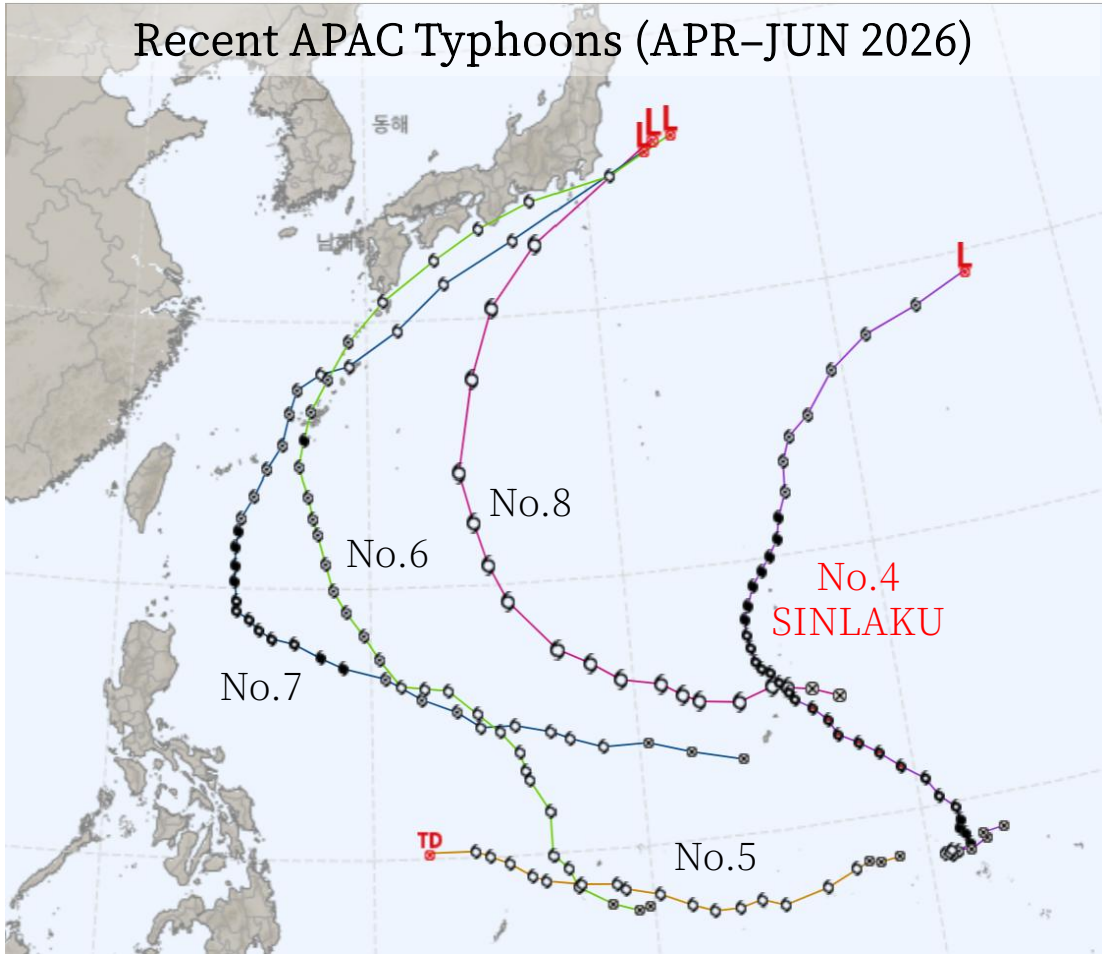
03. Operational Limitations & Challenges

Weather Volatility

01. Challenge

Weather Vulnerability & Frequent Postponement

- **High Sensitivity to Sea States**(Offshore Launch) : Wave height can scrub a launch window
- **Weather Threats in APAC region** : Typhoons affect launch sites and downrange falling zones
  ** Damage to tracking stations(Guam/Weno)*
- **Cascading Workload from Delays** : Frequent postponements require extensive re-coordination among ATC, airlines, and affected states



03. Operational Limitations & Challenges

Internal Coordination

02. Challenge

Difficulties in Airspace Coordination

- **Operational Impact** : Establishing Temporary Restricted Airspace and reroutes disrupts civil traffic, military operations, and training flights
- **Complex Consensus** : Aligning conflicting schedules to agree on Flexible Use of Airspace consumes substantial lead time.
- **Delayed Notifications** : This invisible internal workload often delays the finalization of official notifications for external partners.

Workload & System Limitations

03. Challenge

Lack of Automation & Heavy Manual Workload

- **Lack of Automated FPL** : No system to automatically revert 'rerouted FPLs' to normal routes when a launch ends early
- **Excessive ATC Workload** : ATC must manually adjust routes and separate aircraft via voice communication(radar vector)
- **"Blind ATC" Operations** : No real-time tracking of the launch vehicle on ATC radar display

04. Discussion & Proposals

🚀 Enhancing Procedures in the APAC Guidance for Space Object Launch & Re-entry

1. Managing Short-Notice Schedule Changes

1) Current Gaps in Procedure:

- Guidance stipulate that positive coordination must be established no later than 24 hours prior, but lack specific protocols for sudden shifts from Primary to Backup dates within the 24-hour window.
- Communication Blind Spots: Unclear coordination channels when primary Points of Contact(POCs) are unavailable(e.g., weekends, after-hours)

2) Proposals for Improvement:

- **Define Sub-24-Hour Protocols**: Establish clear, step-by-step actions for schedule changes occurring close to the launch time.
- **Establish a Dual POC System:** Designate a 24/7 operational unit as a Secondary POC alongside the Primary POC(Launch Manager), explicitly maintaining contact details (AFTN, Email, Phone, Operating Hours). Furthermore, ensure real-time internal information sharing between the manager and the operational unit to respond to immediate changes prior to launch.

04. Discussion & Proposals

Enhancing Procedures in the APAC Space Launch & Re-entry Coordination Guidelines

2. Contingency Plans for Launch Failures & Trajectory Deviations

1) Current Gaps in Procedure:

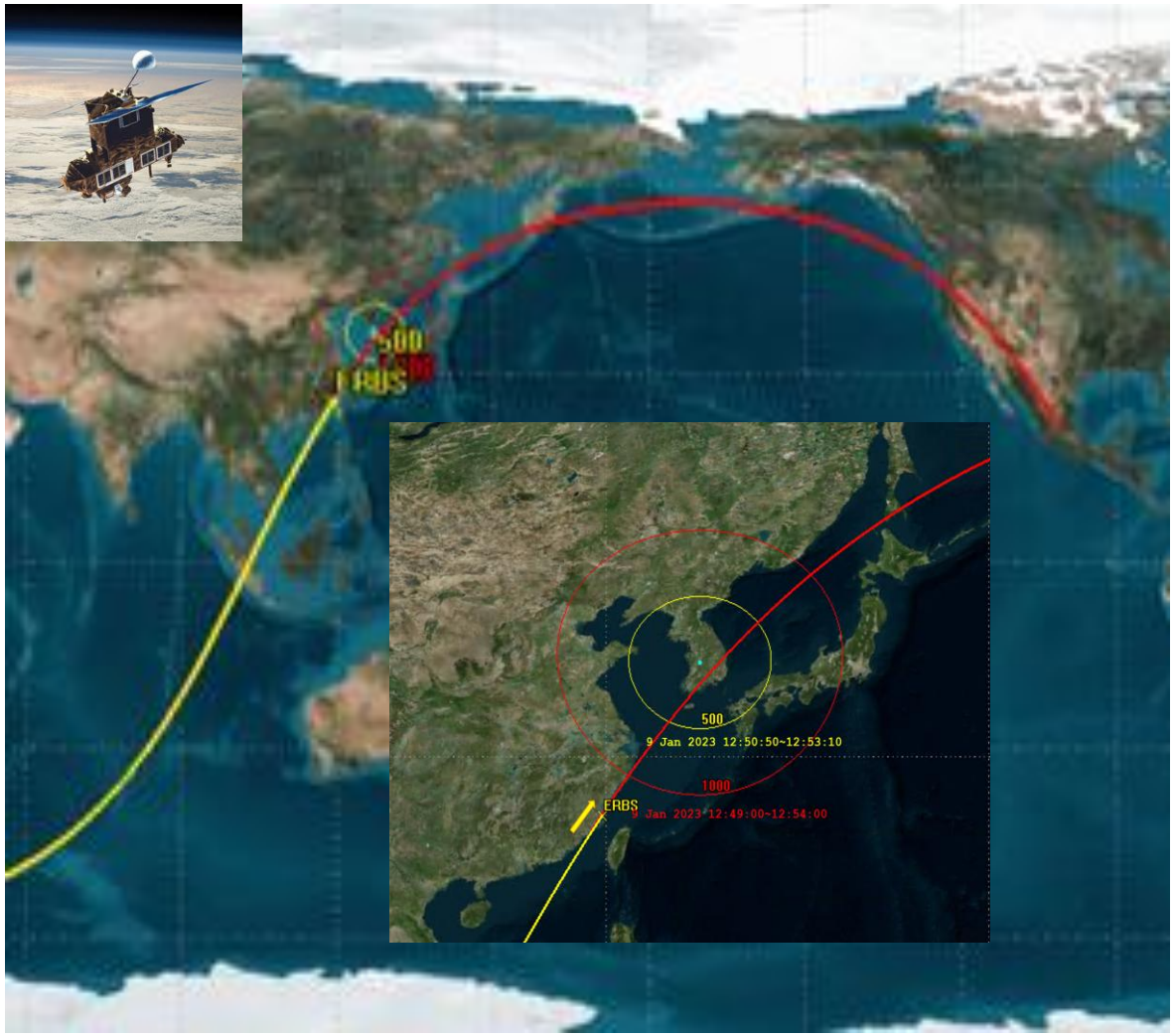
- Lack of detailed procedures for unexpected falling of debris outside designated hazard zones (e.g., due to failure to reach orbit or stage separation anomalies).
- Need protocols for the rapid dissemination of updated coordinates and times provided by the launch operator.

2) Points to consider

- **Proactive Information Sharing**: Should we distribute space launch plans not only to initially affected States but also to adjacent FIRs to ensure rapid response capabilities during emergencies?
- **Standardized Data Exchange**(Long-term Vision): Is it necessary to develop standard data formats for space launch information to replace our current manual coordination processes?
- **ATC System Integration**(Long-term Vision): Would it be beneficial to enable the immediate integration and display of updated falling zones on ATC systems to facilitate prompt aircraft rerouting?

04. Discussion & Proposals

Uncontrolled Space Debris: How Do We Assess and Respond?



1. Case : NASA ERBS Satellite Re-entry(Jan 2023)

- NASA's Earth Radiation Budget Satellite (ERBS) made an uncontrolled re-entry, with its trajectory passing directly over the Korean Peninsula.
- **Risk Probability**: The estimated risk of harm to anyone on Earth was approximately 1 in 9,400.
- **Characteristics**: Most of the 5,400-pound satellite was expected to burn up in the atmosphere, but some components were expected to survive and fall to Earth.

04. Discussion & Proposals

🚀 Uncontrolled Space Debris: How Do We Assess and Respond?

2. Dilemmas & Challenges

- How should Air Navigation Service Providers(ANSPs) assess the risk of a "1 in 9,400" probability?
- Should we completely restrict take-offs, landings, and en-route traffic? Halting operations ensures zero risk but causes massive airspace disruption based on extremely low probabilities.
- There are no standardized guidelines or common risk assessment matrices for civil aviation authorities to confidently determine airspace closures during uncontrolled re-entries.

3. Proposals

- **Develop a Common Risk Assessment Matrix**: Establish clear, shared thresholds for when to issue advisories vs. when to enforce airspace restrictions.
- **Standardize Contingency Protocols**: Create unified operational guidelines for uncontrolled space debris within the APAC region to prevent uncoordinated over-reactions or under-reactions by individual States.