GNSS Interference:

An Air Traffic Management Perspective

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Background

- **The United States (US) National Airspace System (NAS) provides pilots with navigation services using both legacy systems (e.g., VOR, DME) and GNSS-enabled systems.**
- **The NAS must be agile enough to continue operations when planned and unplanned outages impact GNSS Position, Navigation, and Timing (PNT) services.**
  - We need to know where interference is occurring
  - We need to understand what GNSS PNT services are lost
  - Air Traffic Management components must work effectively to support aviators and resolve the interference.

NAS safety and efficiency must be preserved during GPS interference events

ATM Objectives During GPS Interference

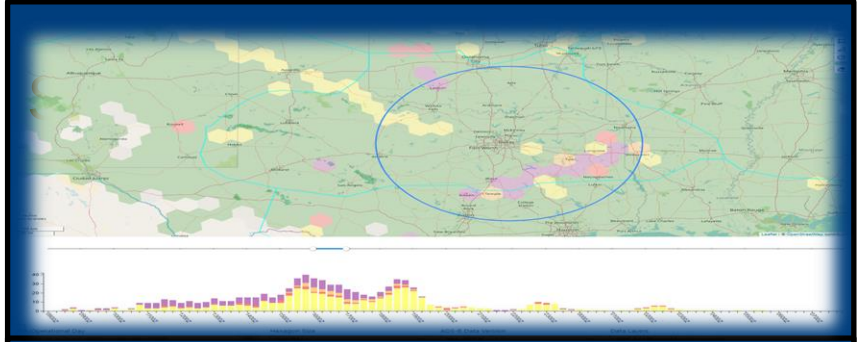
- Preserve safety and integrity of operations
- Mitigate the impacts of the interference upon system efficiency
- Identify the scope and nature of the interference
- Identify and locate the source of the interference
- Cause the interference to stop if human produced
- Resume normal operations when acceptable to do so

US ATM Approach

Combined, these five elements comprise the ATO's approach

Response Toolkit

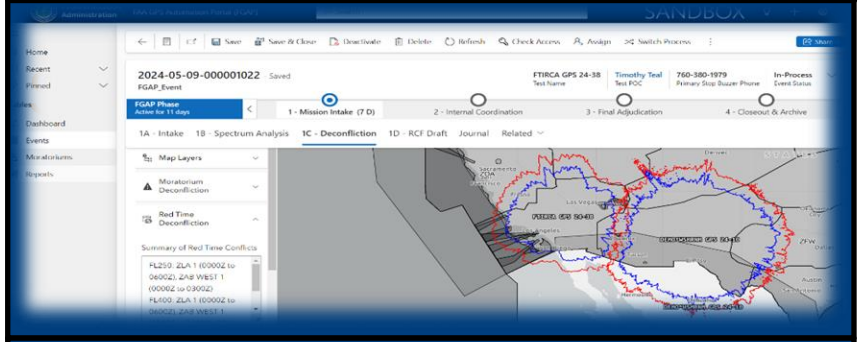
Navigation and Operations Planning Agility Suite (NOPAS)



NOPAS provides:

- Interference and spoofing heatmap
- Analysis of lost GPS services
- Analysis of legacy alternatives
- Linkage with FGAP
- Uses both official (SBS) and crowd-sourced (ADS-B Exchange) data
- Enables US ATM to determine size and scope of an interference event

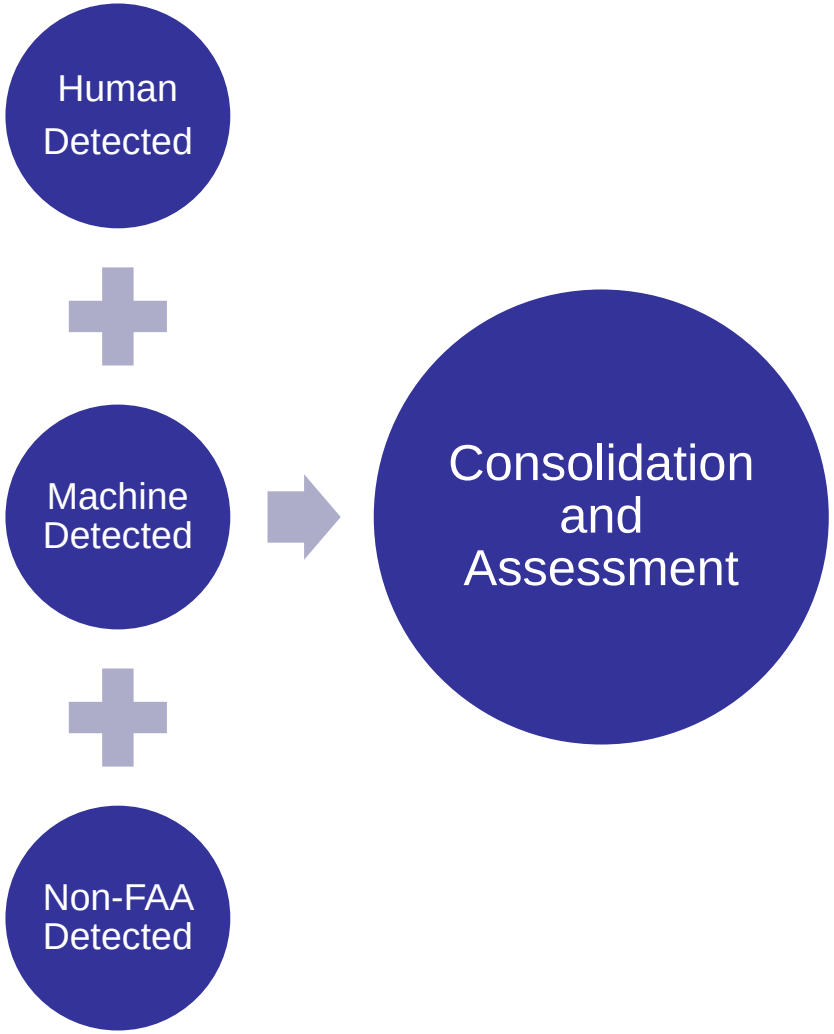
FAA GPS Automated Portal (FGAP)



FGAP provides:

- Streamlined coordination of scheduled GPS test events
- Identifies conflicts with scheduled and unscheduled GPS interference events
    - Space launches, moratoriums, special events, etc.

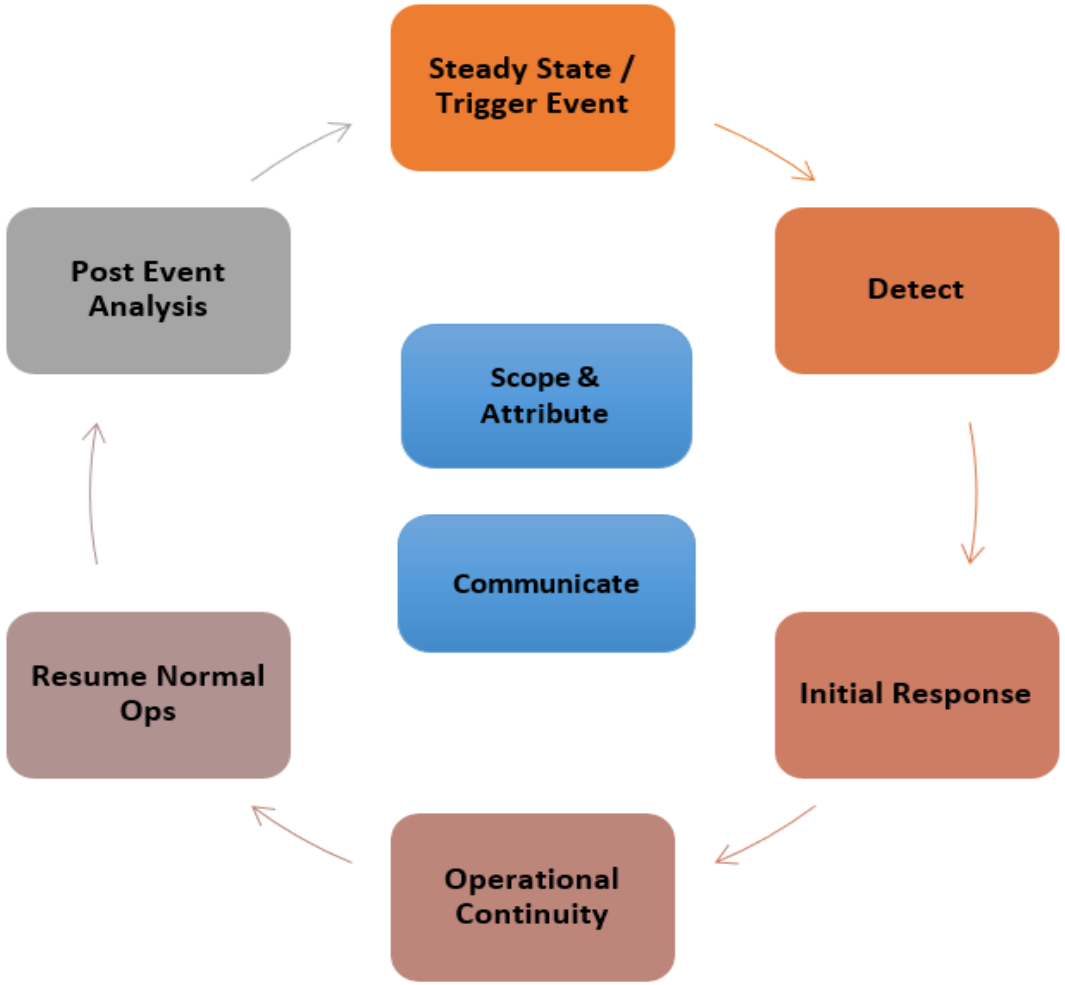
Response Strategy – Steady State Monitoring/Escalation



	Low Significance to Efficiency	High Significance to Efficiency
Low Severity on Safety	There is negligible effect on overall NAS operations, and no evidence that safety is urgently compromised. For example, there is one report at Santa Monica that one aircraft had to go around because of GPS issues on one approach.	Late at night, pilots from ten different aircraft stated they lost GPS, but were able to carry on using legacy navigation capabilities. ATC asked for an increase in miles entrail to have sufficient time to reissue non-GPS routings. All aircraft were kept on track with radar vectors and legacy navigation. Small delays were incurred. After an hour, the issue resolved and did not return.
High Severity on Safety	Pilot from one flight stated their aircraft made an uncommanded turn while flying on an assigned IFR air route. No other aircraft made such a report.	Major GLOS event: During an evening arrival push, pilots from multiple aircraft are claiming uncommanded turns and loss of GPS. ATC has reverted to radar vectors and legacy navigation. They have asked for Traffic Management Initiatives to reduce demand to match a new, lower capacity. The issue appears to be continuing.

Table 9-1 GLOS Severity and Significance

Response Strategy – Phases



Summary

- **All ATMs should have the ability to respond to GPS Loss of Service (GLOS) events.**
  - Know that they are happening
  - Know the area and services affected
  - Have a plan for response

- **The Air Traffic Organization is preparing with unified response toolkit, strategy, information, and coordination.**

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Questions?