

# RTCA SC-206 EUROCAE WG-76

**AIXM / WXXM Conference  
Presentation:**

**Integrating AIS / MET Data  
Link Applications with  
Onboard Databases**

Presented by: **Gary Livack, FAA, AFS-400**

Date: **May 13, 2009 (FINAL SLIDES)**



**Federal Aviation  
Administration**



# Presentation Outline

- **Vision**
- **AIS / MET applications**
- **Standards development**
- **Coordination**



## Terms...

- **AIS... Aeronautical Information Services**
- **MET... Meteorological (aviation weather)**

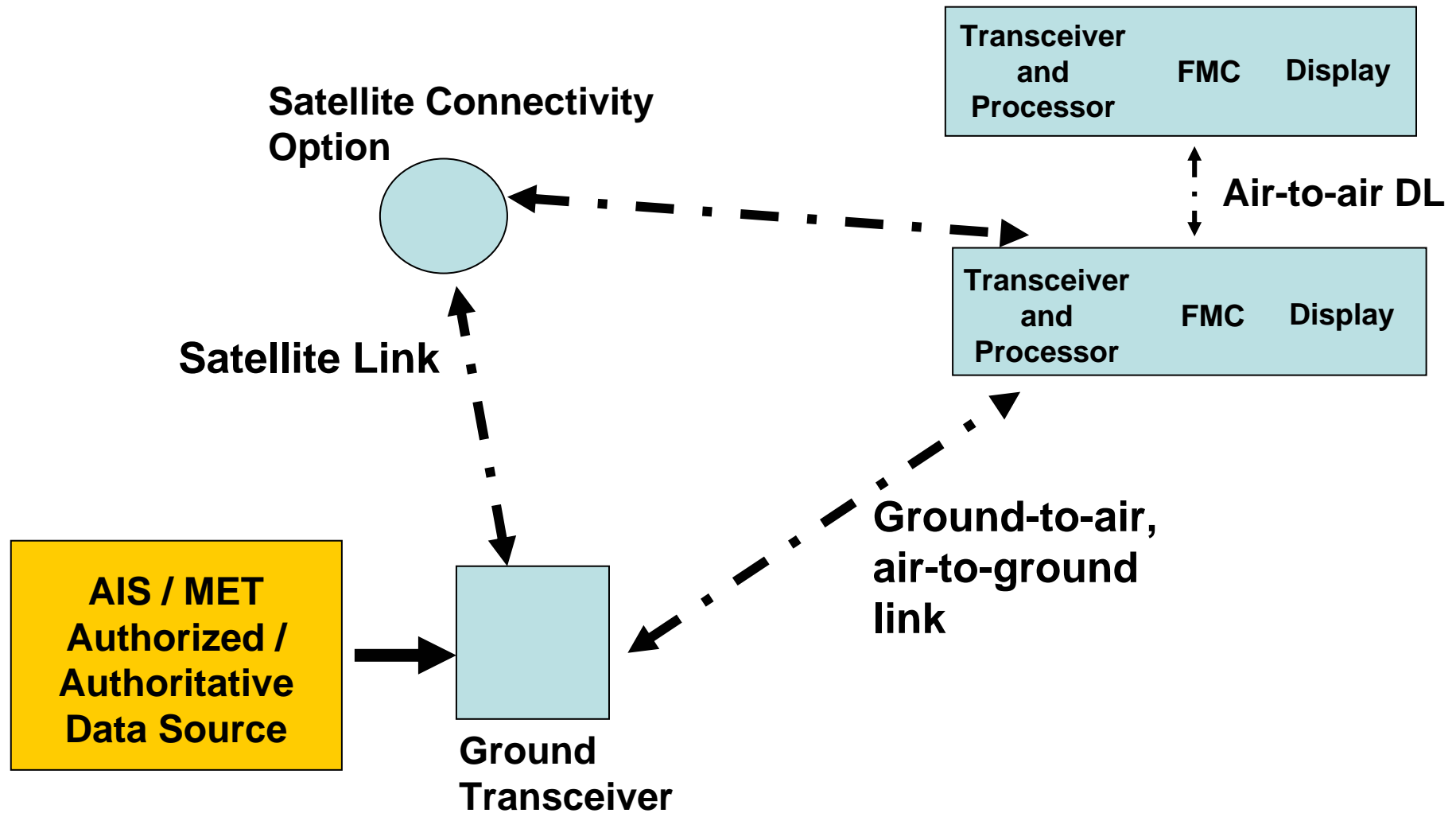


## **Integrated AIS & MET Database & Data Link “Vision”**

- **Provide timely, accurate, authoritative and current AIS & MET data to any user -- anywhere -- at any time**
- **Provide “Gate-to-gate” (airline) and “Chock-to-chock” (GA) services**
- **Update onboard databases using data link technology**
  - **Data combined electronically onboard the aircraft into meaningful depictions**
  - **Data suitable for use by onboard automation systems, including the aircraft’s Flight Management System (FMS)**



# AIS / MET System-Level Architecture



# Data Link Functions

- **Types of data link services planned:**
  - Uplink of AIS data
  - Uplink of MET data
  - Crosslink / downlink of MET data
- **Provides “Advisory” as well as “Safety-critical” functions**
  - Vision goes well beyond current RTCA’s DO-267A (FIS-B MASPS)
  - DO-267A defines FIS-B data as “Non-control, advisory” use information



# AIS Updates & Syncs

## (Aeronautical Update and Baseline Synchronization Services)

- **General:**
  - Intent is to provide up-to-date aeronautical information via data link to the flight deck (and to the cockpit!)
  - Breaks with the paradigm of the 28-day AIRAC cycle
  - Lays foundation for future (quasi) real-time provision of aeronautical data
- **Aeronautical Update Service:**
  - Provides permanent and temporary changes of aeronautical information via data link
  - Updates are independent of databases resident on the flight deck
- **Baseline Synchronization Service:**
  - Updates (via data link) the aeronautical information resident in onboard databases
  - Requires considerable data link capabilities



# **AIS Updates & Syncs Could Replace or Modify the Following Onboard Data...**

- **Navigation data**
- **VFR & IFR charts**
- **Instrument procedure charts**
- **Aerodrome charts**
- **Electronic terrain and obstacle data**
- **Other data -- Dispatch release forms, including weather briefing materials, etc.**





# MET Services

- **Three MET pilot support categories defined:**
  - **Immediate decisions**
    - Immediate to less than 3 minutes
  - **Near-term decisions**
    - 3-20 minutes
  - **Planning decisions**
    - Greater than 20 minutes
- **“Immediate” product use will require effective crew training and procedures**
- **Same data could have different intended functions depending upon the phase of flight**



# Data Link Services Envisioned

- **Three types of AIS & MET data link services envisioned:**
  - **Demand (Request / Reply)**
  - **Contract**
  - **Broadcast**



# Delivery Means

- **Multiple data link delivery means:**
  - **Space-based**
  - **Ground-based**
- **National, regional and airport specific products would likely be transmitted over different links**
- **Could use demand, contract, or broadcast services, depending upon the intended use and criticality of data**



# Cockpit Display Means

- **Head-down installed systems**
- **Use of ancillary displays such as Electronic Flight Bags (EFBs)**
  - **EFBs are economical equipage options that use COTS-like technologies otherwise not practical when compared to the cost of a glass-cockpit modification**
- **Head-up display systems?**



# Think Glass!



# Boeing 777 Class 3 EFB



## Today's Flight Information Data Link Services

- **Today's AIS / MET data link products provide:**
  - **Various weather (MET) products**
    - **Textual products**
    - **Graphical products**
  - **Aeronautical information (AIS) products**
    - **Airspace status**
    - **NOTAMS – textual (and some graphical)**
- **“Non-controlling, advisory use” data**



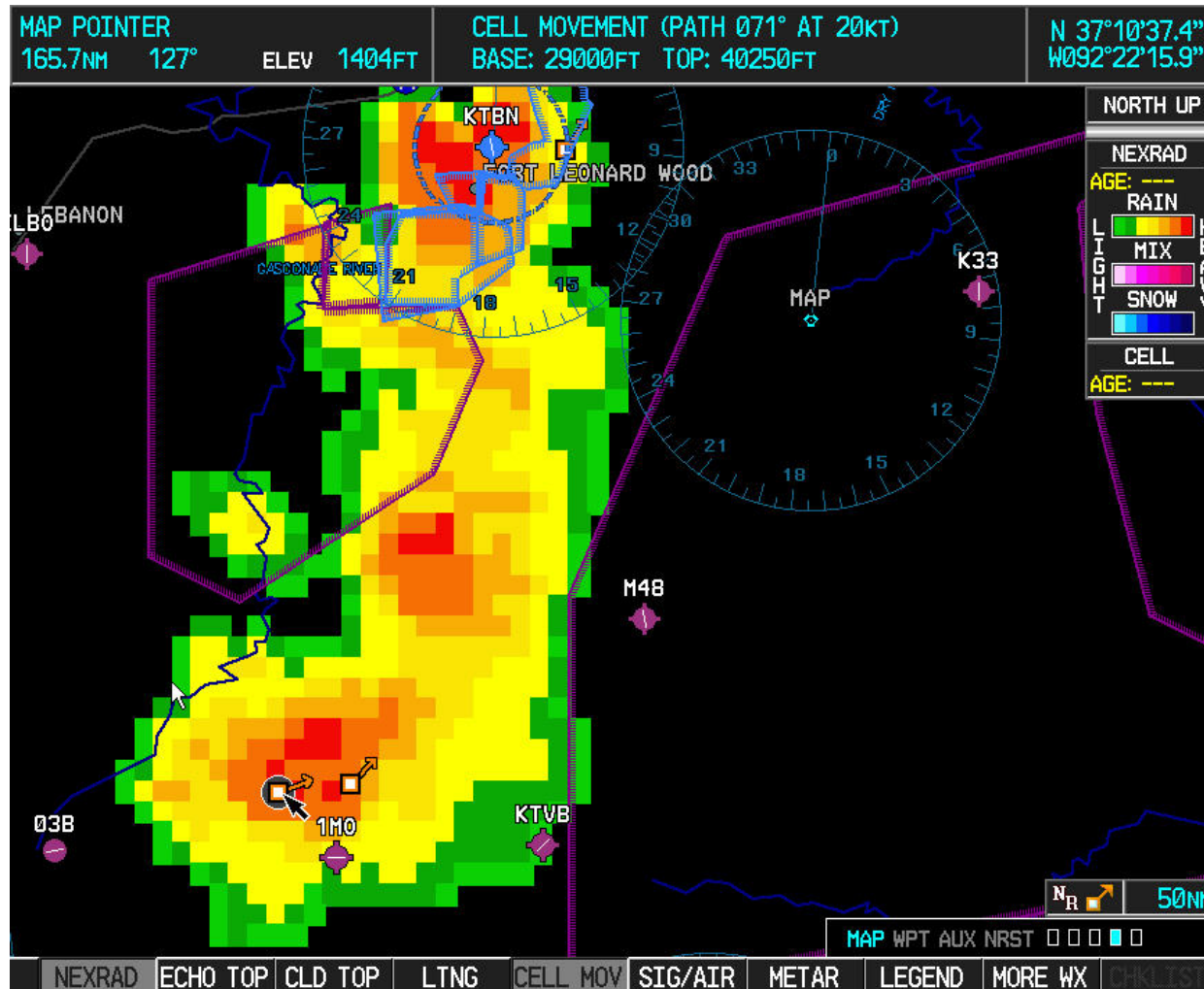
# Today's MET Data Link Products

- **Services and products provided today:**
  - **Textual MET products:**
    - METARs / SPECIs, TAFs, SIGMETs, AIRMETs, PIREPs
  - **Graphical MET products:**
    - **NEXRAD radar (regional and CONUS)**
    - Graphical SIGMETs, AIRMETs (i.e., G-AIRMETs)
    - Graphical METARs
    - Wind, temperatures aloft, echo tops, convective cell movement, lightning depictions
    - Surface analyses charts
    - Turbulence and icing depictions





# Regional NEXTRAD (Showing Cell Movement)

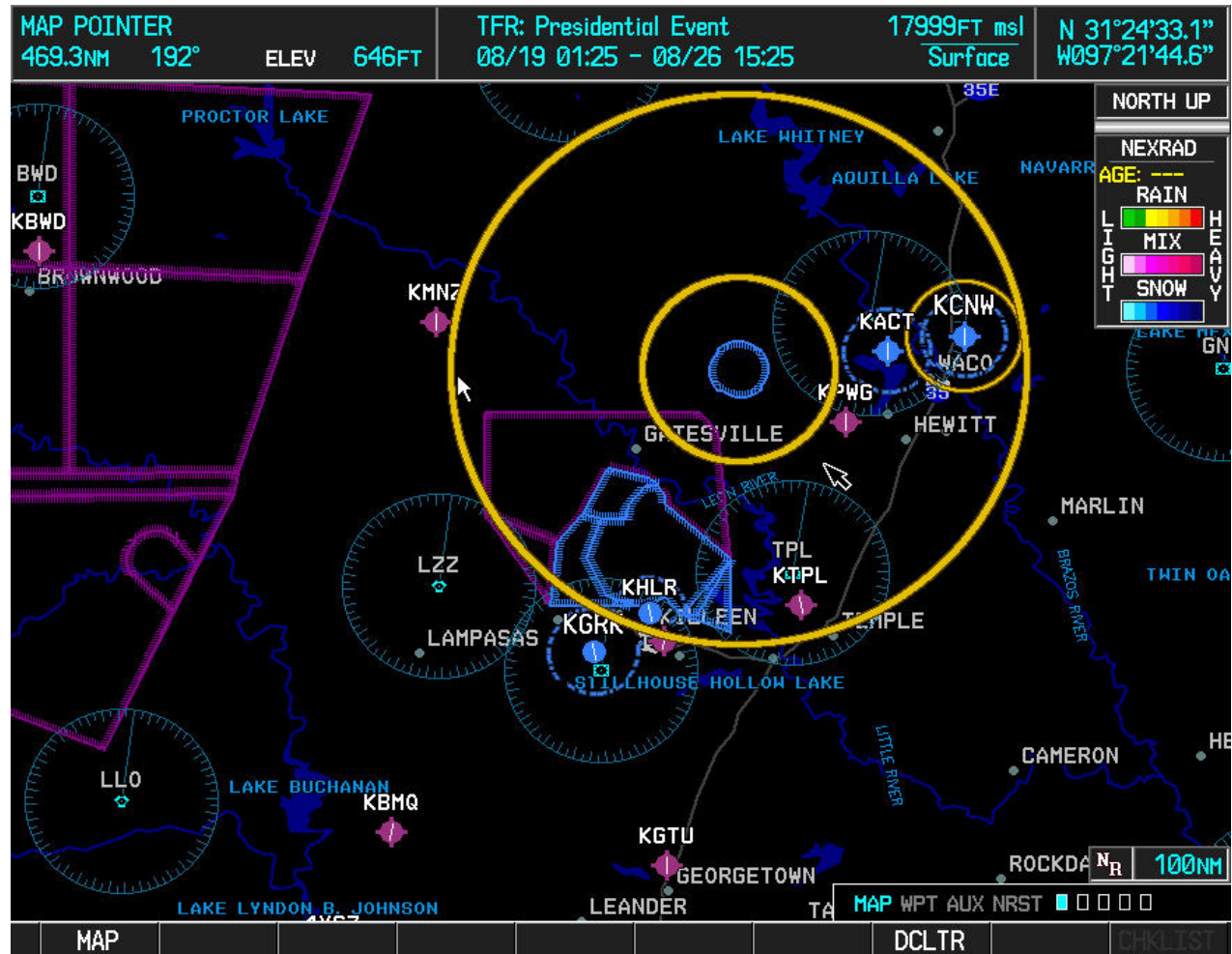


# Today's AIS Data Link Products

- **Airspace AIS / NOTAM information Services and products provided today**
  - **Temporary Flight Restrictions (TFRs)**
  - **D-ATIS**
  - **Airport specific NOTAMs**
  - **Special Use Airspace (SUAs)**



# Presidential Event TFR



## On the Horizon...

- **New AIS & MET data link products / applications**
  - MET products supporting “immediate use” pilot decision-making
  - AIS products updating / replacing onboard databases
  - Both AIS & MET services providing both **“Safety-of-flight-critical”** and **“advisory use”** data

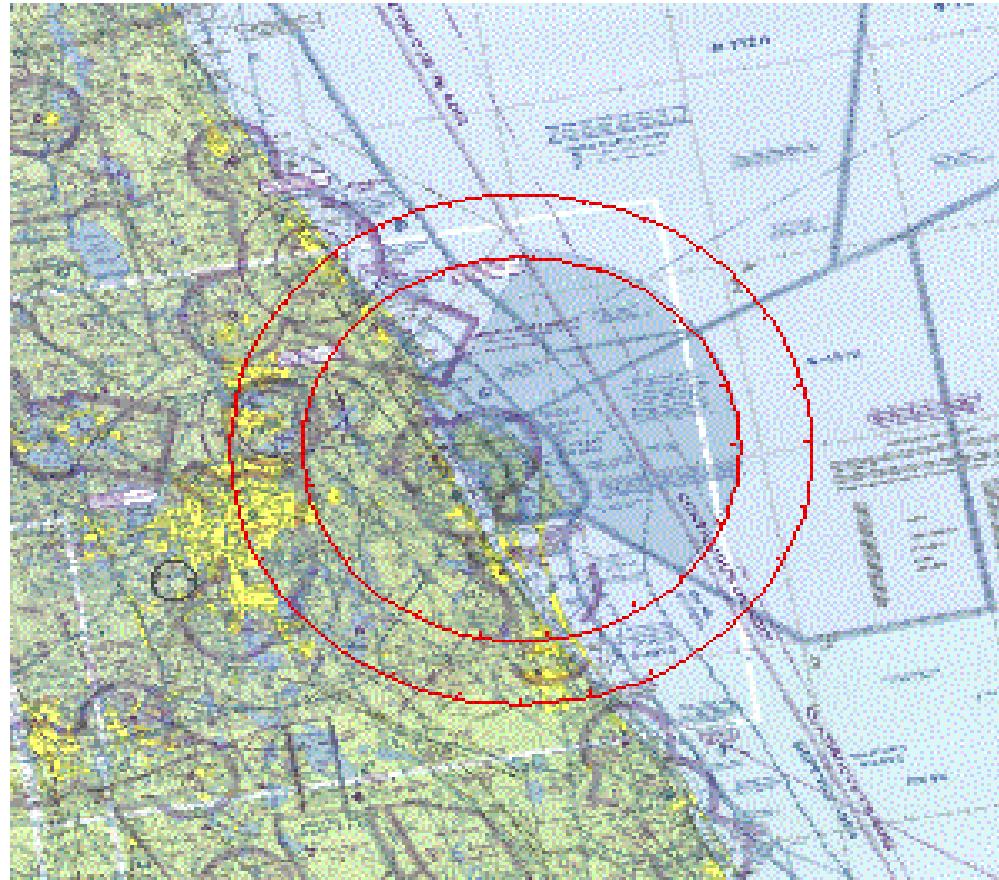


# Potential Future AIS Applications

- **Graphical TFR & SUA status (Safety-critical)**
- **Graphical airport surface “Overlay” NOTAMs**
- **Graphical GNSS NOTAMs**
- **Environmental data**
- **Space debris NOTAMs**
- **Navigation aids and en route NAVAID outages**
- **Laser light hazards**
- **Volcanic ash and ozone area depictions**



## Example #1: Graphical TFR & SUA status



## Example #1: Same TFR (Textual Version)

FDC 9/6996 ZJX PART 1 OF 5 FLIGHT RESTRICTIONS CAPE CANAVERAL, FL, MAY 11, 2009 LOCAL. PURSUANT TO 49 USC 40103(B), THE FEDERAL AVIATION ADMINISTRATION (FAA) CLASSIFIES THE AIRSPACE DEFINED IN THIS NOTAM AS 'NATIONAL DEFENSE AIRSPACE'. PILOTS WHO DO NOT ADHERE TO THE FOLLOWING PROCEDURES MAY BE INTERCEPTED, DETAINED AND INTERVIEWED BY LAW ENFORCEMENT/SECURITY PERSONNEL. ANY OF THE FOLLOWING ADDITIONAL ACTIONS MAY ALSO BE TAKEN AGAINST A PILOT WHO DOES NOT COMPLY WITH THE REQUIREMENTS OR ANY SPECIAL INSTRUCTIONS OR PROCEDURES ANNOUNCED IN THIS NOTAM: A) THE FAA MAY TAKE ADMINISTRATIVE ACTION, INCLUDING IMPOSING CIVIL PENALTIES AND THE SUSPENSION OR REVOCATION OF AIRMEN CERTIFICATES; OR B) THE UNITED STATES GOVERNMENT MAY PURSUE CRIMINAL CHARGES, INCLUDING CHARGES UNDER TITLE 49 OF THE UNITED STATES CODE, SECTION 46307; OR C) THE UNITED STATES GOVERNMENT MAY USE DEADLY FORCE AGAINST THE AIRBORNE AIRCRAFT, IF IT IS DETERMINED THAT THE AIRCRAFT POSES AN IMMINENT SECURITY THREAT. PURSUANT TO TITLE 14 CFR SECTION 99.7, SPECIAL SECURITY INSTRUCTIONS, ALL AIRCRAFT FLIGHT OPERATIONS ARE PROHIBITED WITHIN A 40 NMR OF 283700N/0803700W OR THE MLB004030.6 UP TO BUT END PART 1 OF 5 FDC 9/6996 ZJX PART 2 OF 5 FLIGHT RESTRICTIONS CAPE CANAVERAL, FL, NOT INCLUDING 18000 FT MSL EFFECTIVE 0905111041 UTC (0641 LOCAL 05/11/09) UNTIL 0905111914 UTC (1514 LOCAL 05/11/09). WITHIN A 30 NMR OF 283700N/0803700W OR THE MLB004030.6 UP TO BUT NOT INCLUDING 18000 FT MSL EFFECTIVE 0905111041 UTC (0641 LOCAL 05/11/09) UNTIL 0905111914 UTC (1514 LOCAL 05/11/09). EXCEPT AS SPECIFIED BELOW AND/OR UNLESS AUTHORIZED BY ATC: A. ALL AIRCRAFT OPERATIONS WITHIN A 30 NMR AREA LISTED ABOVE ARE PROHIBITED EXCEPT FOR: 1. MILITARY AIRCRAFT AND AIRCRAFT ASSOCIATED WITH CAPE CANAVERAL OPERATIONS, RESCUE/RECOVERY, MEDICAL/LIFEGUARD, EMERGENCY EVACUATION, LAW ENFORCEMENT, DEPARTMENT OF STATE AND FIRE FIGHTING OPERATIONS WHICH ARE PERMITTED ONLY WITH PRIOR APPROVAL FROM THE APPROPRIATE ATC FACILITY. ALSO, IFR REGULARLY SCHEDULED COMMERCIAL PASSENGER AND ALL-CARGO CARRIERS OPERATING UNDER ONE OF THE FOLLOWING TSA-APPROVED STANDARD SECURITY END PART 2 OF 5 FDC 9/6996 ZJX PART 3 OF 5 FLIGHT RESTRICTIONS CAPE CANAVERAL, FL, PROGRAMS/PROCEDURES: AIRCRAFT OPERATOR STANDARD SECURITY PROGRAM (AOSSP), FULL ALL-CARGO STANDARD SECURITY PROGRAM (FACSSP), MODEL SECURITY PROGRAM (MSP), TWELVE FIVE STANDARD SECURITY PROGRAM (TFSSP) ALL CARGO, OR ALL-CARGO INTERNATIONAL SECURITY PROCEDURE (ACISP) AND ARE ARRIVING INTO AND/OR DEPARTING FROM 14 CFR PART 139 AIRPORTS ARE AUTHORIZED TRANSIT WITH ATC APPROVAL. B. FLIGHT OPERATIONS WITHIN THE AREA OF RESTRICTION ARE AUTHORIZED TO PROCEED ABOVE AND





## Example #2: Airport Surface NOTAM “Overlay” Application

- **Could provide fight crews with graphical depictions of:**
  - **Closed full or partial runways.**
    - **Note: May need to address effective runway slope.**
  - **Closed full or partial taxiways**
  - **Stand activity (e.g., closed stands, stands under construction)**
  - **Surface clutter / contamination (e.g., SNOWTAMS, slush, icing; includes Level 1 & 2 clutter)**
  - **Runway / taxiways markings (perhaps hidden by clutter)**



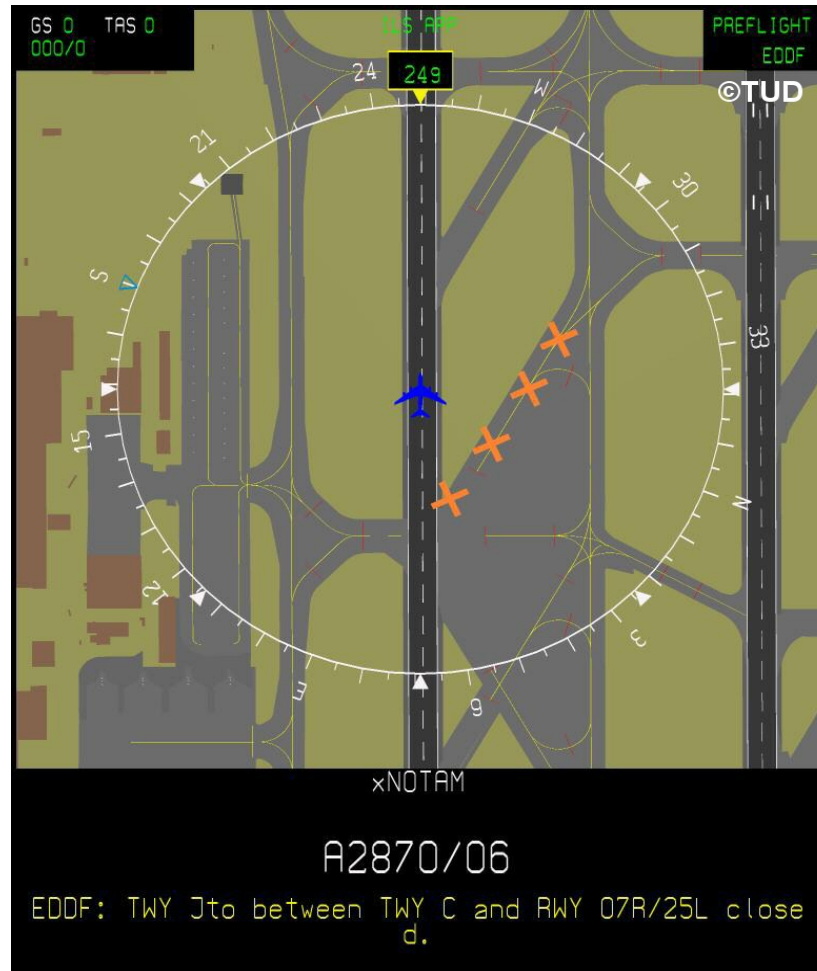


## Example #2: Additional Airport Surface NOTAM Overlays

- Temporary construction sites
- Men and equipment adjacent to runways
- Runways that are open only during daylight hours. (Depict as "closed" during nighttime hours.)
- Missing runway / taxiway signs. (Note: Data for features less than 1/2 meter in height such as signs are currently not collected.)
- Temporary obstacles on airports (e.g., cranes)
- **+ More...**



# Example #2: Notional Airport Surface D-NOTAM Depiction



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## Example #3: Graphical GNSS AIS NOTAMs

- **Supports use of GNSS for navigation and as a position source for various ADS-B surveillance applications**
- **Since GNSS AIS NOTAMs are a joint FAA / EUROCONTROL activity, future GNSS AIS NOTAMs may need to consider applicable Glonass and Galileo NOTAMs**



## Example #3: Graphical GNSS AIS NOTAMs / Continued

- **GPS / Glonass / Galileo:**
  - Interference events (e.g., scheduled / predicted, and unscheduled / reported)
  - GPS RAIM prediction (en route)
  - GPS terminal service and approach outages (textual only?)
- **WAAS / SBAS:**
  - Geographic outages and / or large scale outages of WAAS service
  - WAAS terminal service and approach outages (textual only?)
- **LAAS / GBAS:**
  - LAAS station outages

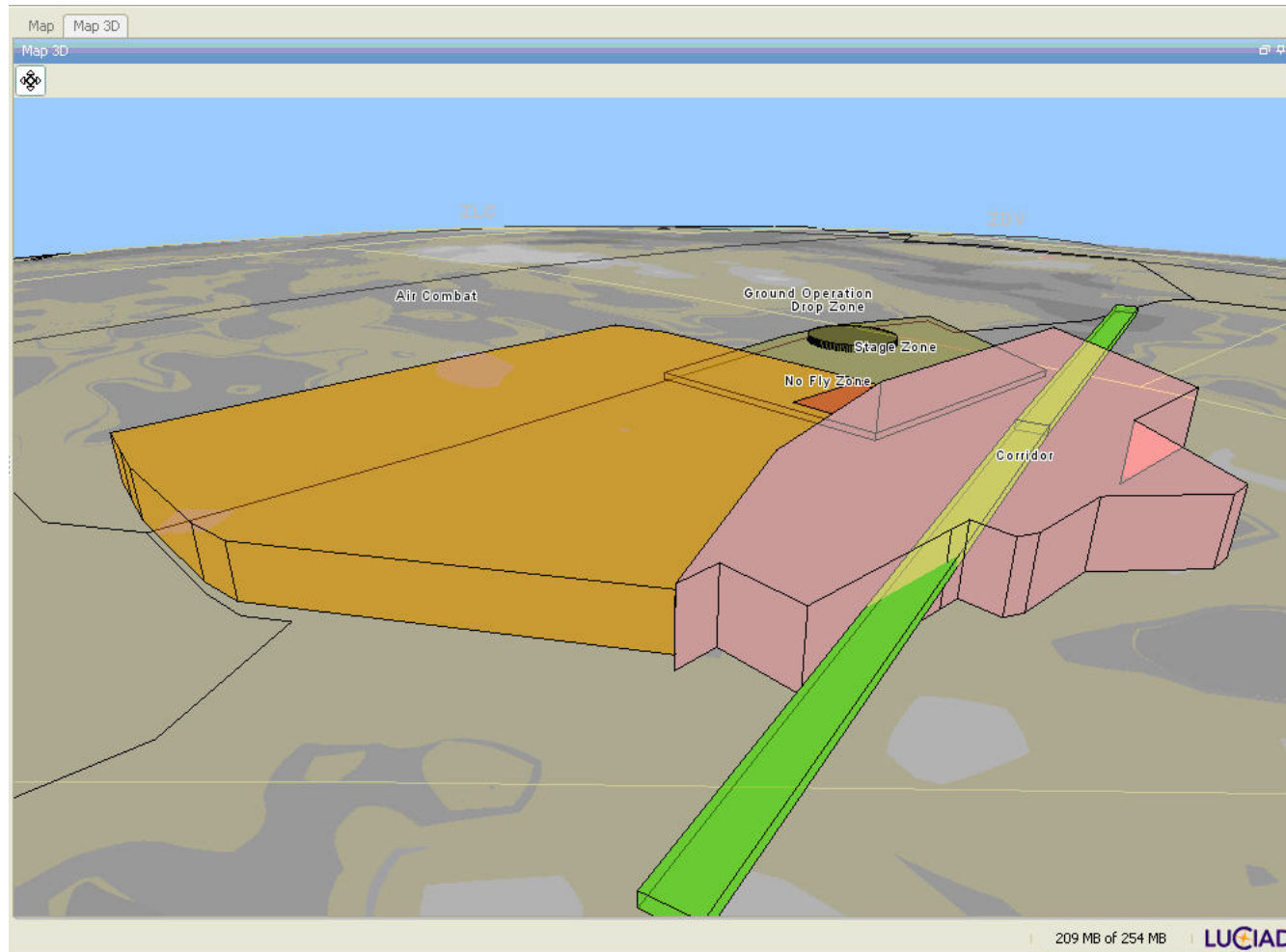


## Example #3: Textual GPS NOTAMs Examples (Today)

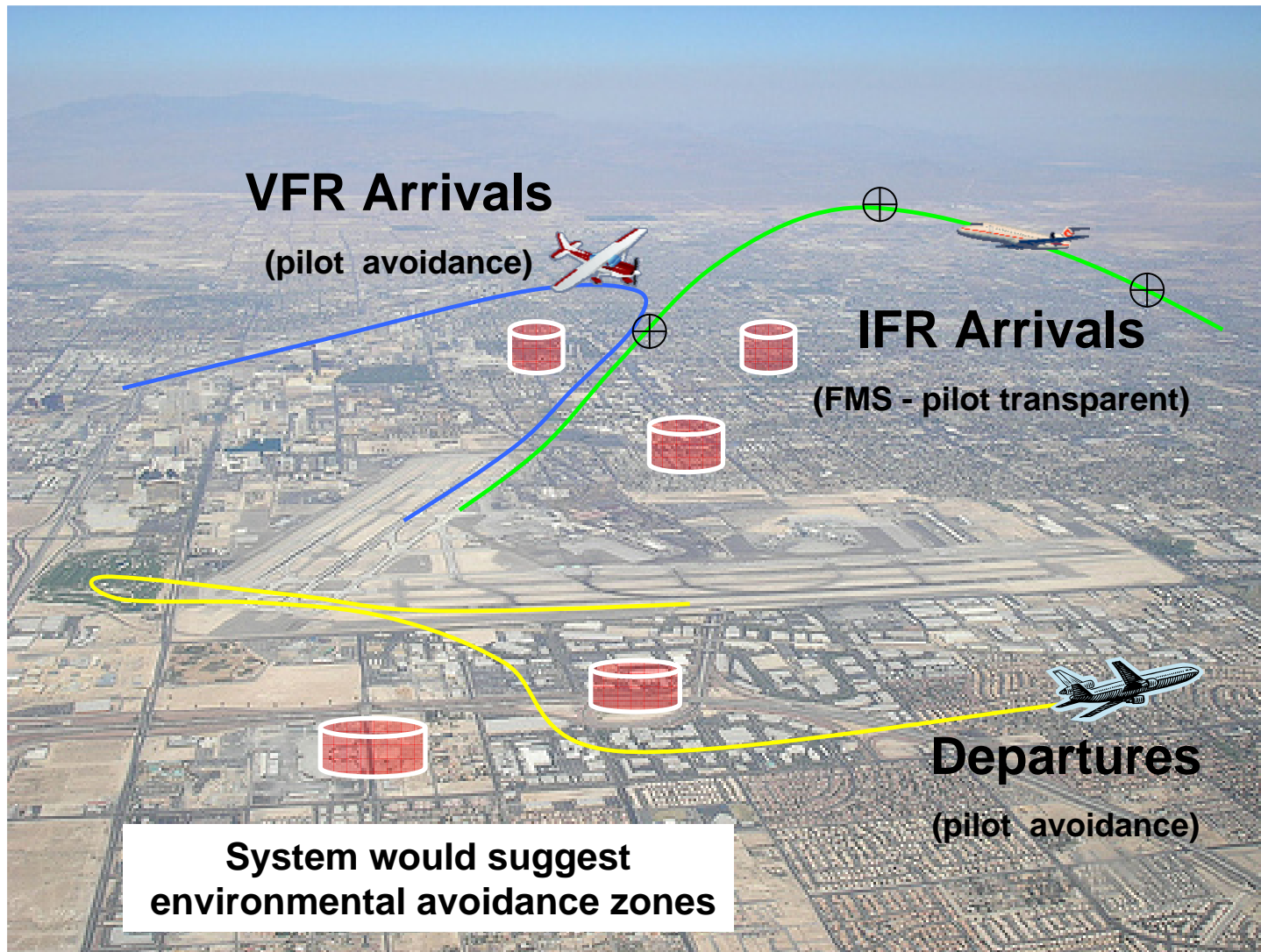
- **GPS 12/051 ZDC NAV GPS IS UNRELIABLE AND MAY BE UNAVAILABLE WITHIN A 35 NM RADIUS OF 381541N / 762601W (LOCATED WITHIN PATUXENT RIVER NAVAL AIR STATION) AT AND BELOW FL400 1300-2100 MON-FRI. WEF 0812151300-081219210.**
- **GPS 12/052 GPS PRN 5 OTS. WEF 0812171900-0812180700.**



# Example #3: Potential Future Graphical GPS Outage NOTAM



# Example #4: Environmental Avoidance Zones Depiction



## Example #5: Space Vehicle Debris AIS Application

### Gander Oceanic

**060122 CZQX GANDER FIR. CZQX THE DESIGNATED AIRSPACE HANDBOOK IS AMENDED AS FOLLOWS:**

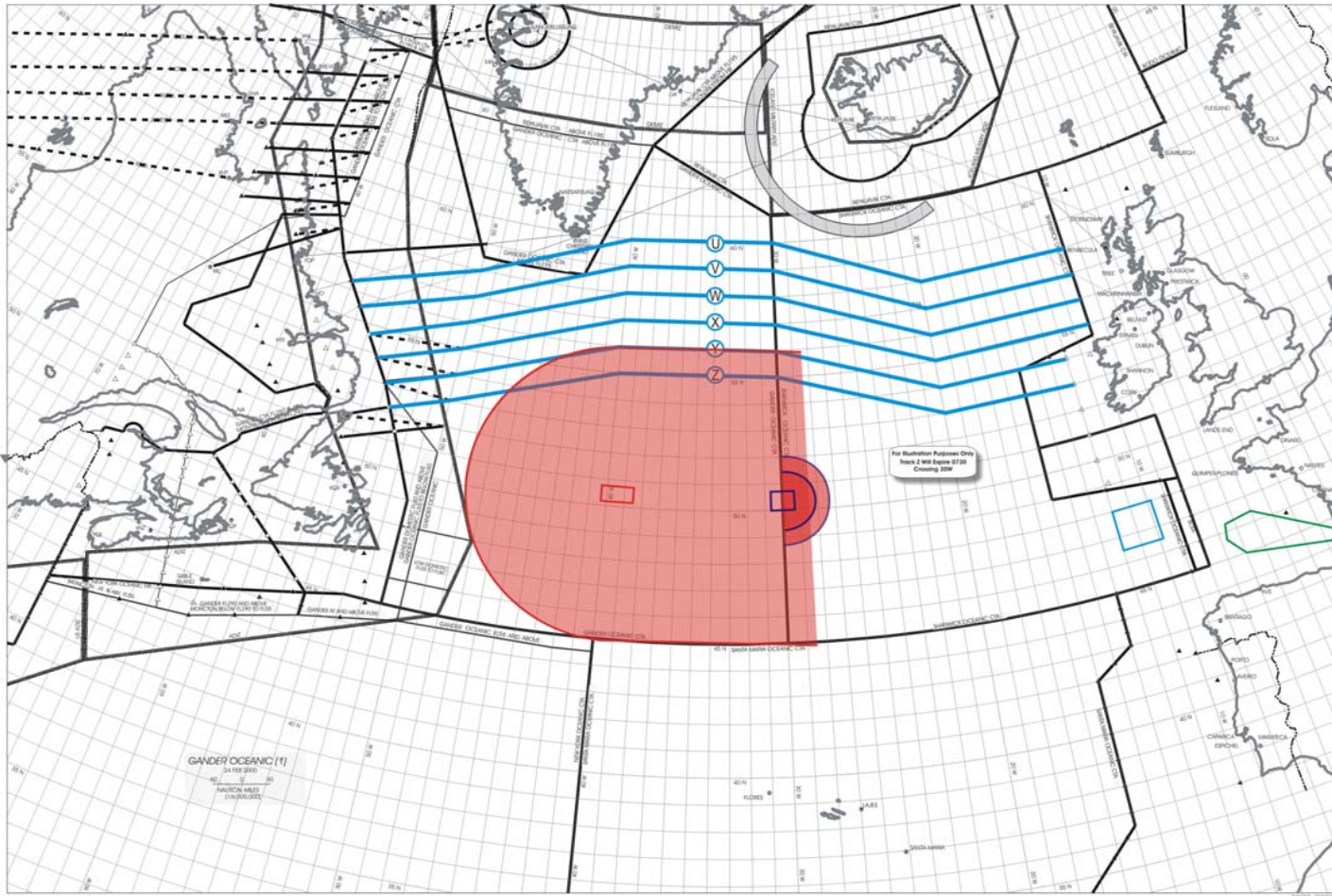
**CYD 748 ATLANTIC: ROCKET HAZARD AREA: BOUNDED BY A LINE BEGINNING AT 504000N 304000W TO 504000N 92000W TO 500000N 292000W TO 500000N 304000W TO POINT OF BEGINNING. SFC TO UNL. CYD 749 ATLANTIC: ROCKET HAZARD AREA: BOUNDED BY A LINE BEGINNING AT 504500N 401000W TO 504500N 383000W TO 502000N 383000W TO 502000N 401000W TO POINT OF BEGINNING. SFC TO UNL. 0830/1300 DLY 0611090830 TIL 0611101300**





# Example #5: Space Vehicle Debris AIS Application

-- (Graphical Depiction of Previous Slide NOTAM) --

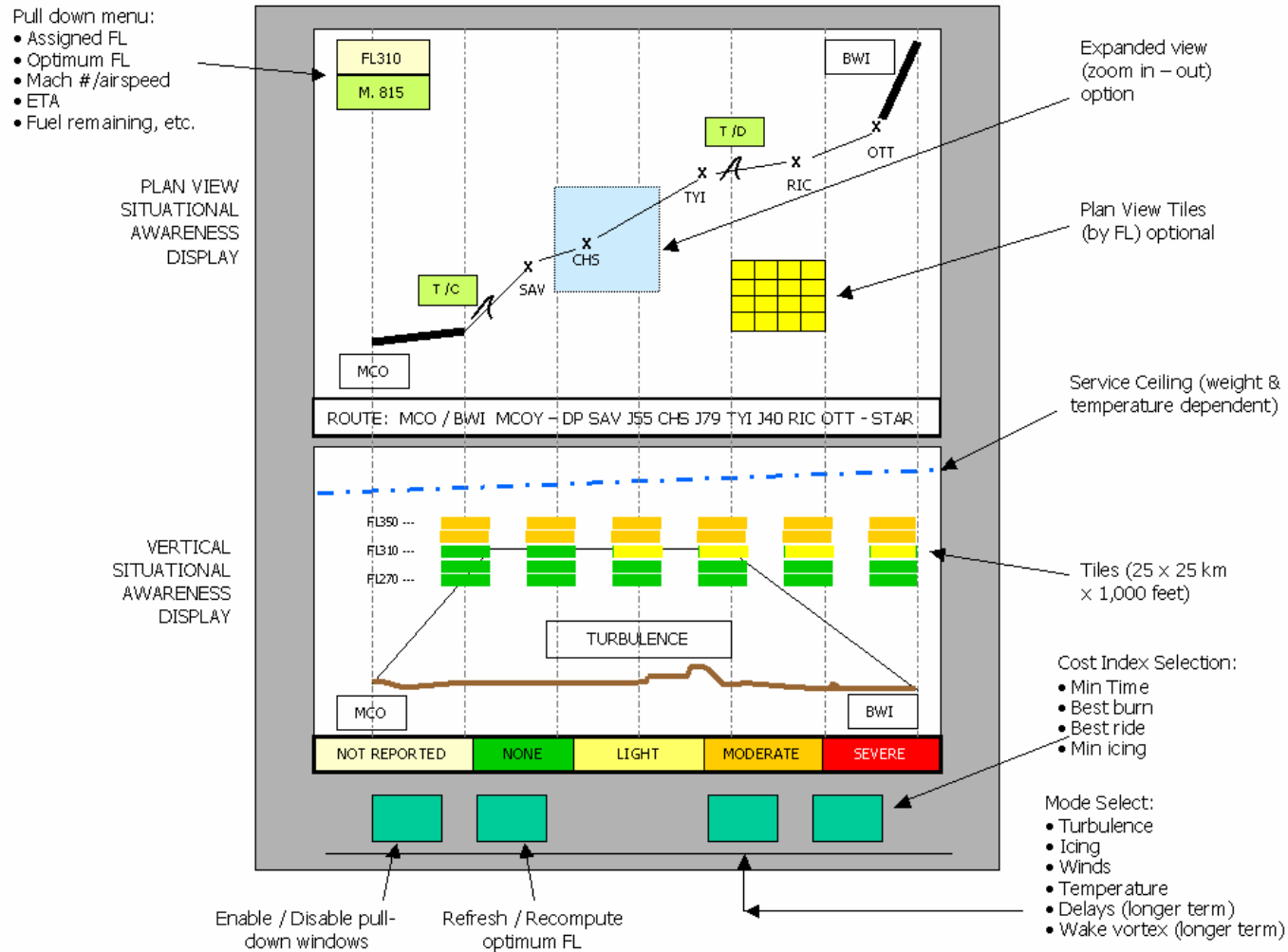


# Potential Future MET Applications

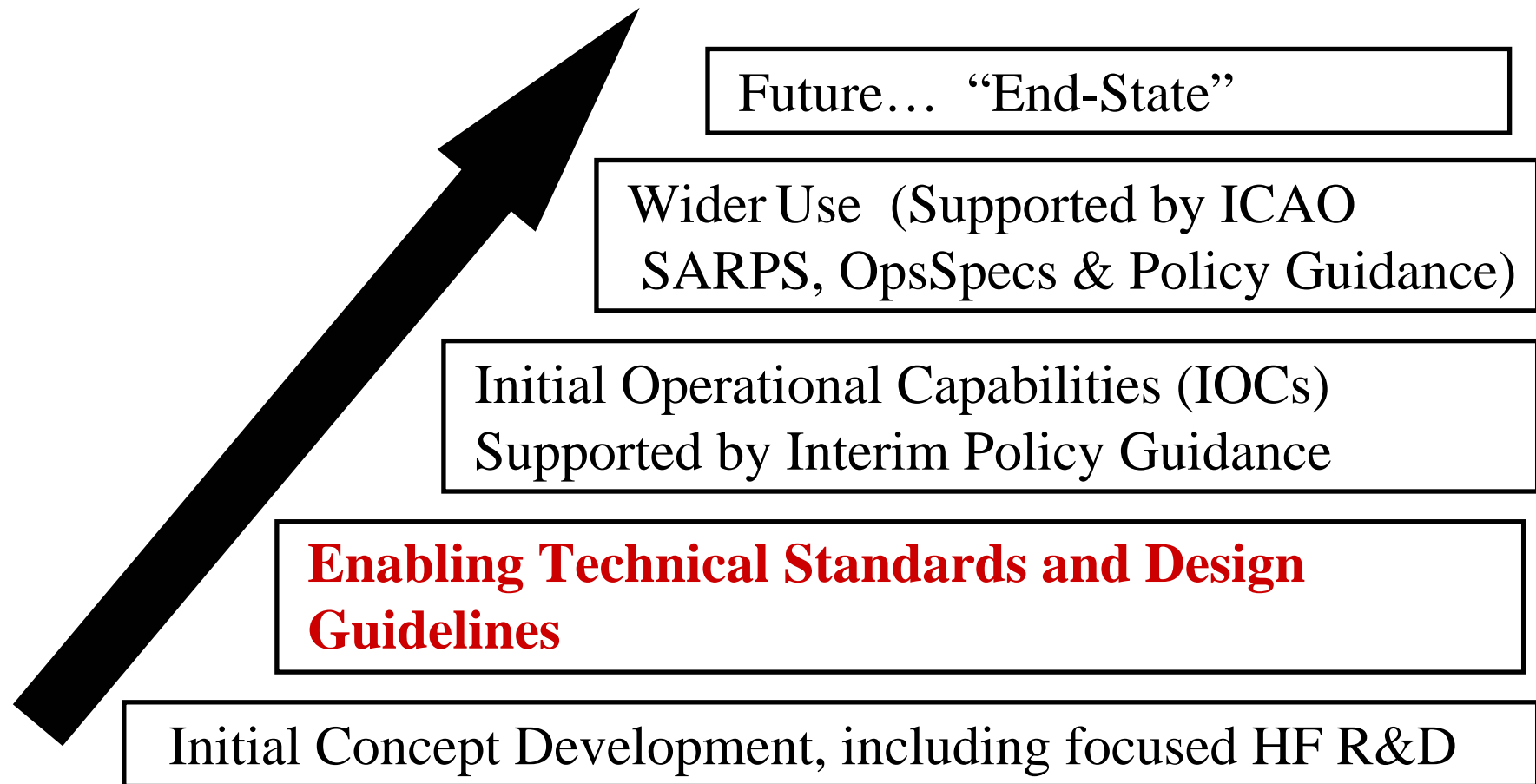
- **New MET data link products possible:**
  - Based upon source data from planned 4D Weather Data Cube
  - Data published using the WXXM-compliant weather XML-based exchange model
- **Examples:**
  - **Turbulence reports and forecasts**
  - Winds and temperatures
  - Icing and “wintry mix” depictions
  - Wind shear alerts
  - Downdrafts



# Example: Conceptual En Route Turbulence EFB Depiction



# Standards Development -- “Systems” Approach to MET / AIS Technology Development & Implementation



# Data Link Standards Development

- **RTCA SC-206 / EUROCAE WG-76 (AIS DL Services)**
  - **Committee Organization**
    - **AIS (WG-1)**
      - **Aeronautical Update Service and Baseline Synchronization Service**
    - **MET (WG-2)**
      - **Immediate use applications**
      - **Near-term planning applications**
      - **Planning use applications**



# RTCA SC-206 / EUROCAE WG-76 (AIS DL Services)

- **Documents:**
  - **OSD for AIS & MET data link services (DO-308, published December 2007)**
  - **SPR and INTEROP documents**
    - **Ultimately, these requirements will need to be tailored to meet the capabilities (and limitations) of each candidate link**
  - **MASPS / MOPS to support avionics hardware / software certification (SC-206 only)**
    - **Requirements cascade upwards to help define cockpit display attributes**
    - **Requirements cascade downwards to help define requirements for the ground architecture / source data**
    - **MOPS often invoked by TSOs / E-TSOs**



## Other AIS & MET Standards Work -- May 2009

- **RTCA SC-214 / EUROCAE WG-78 (Air Traffic Data Communications Services – primarily textual)**
- **RTCA SC-217 / EUROCAE WG-44 (Terrain, Obstacles, and Airport Mapping Databases)**
- **New RTCA SC on Wide Area Airport Data Link (based upon IEEE 802.16e)**
- **AEEC interface standards**
- **SAE G-10 (Human Factors)**
- **FAA / EUROCONTROL digital NOTAM implementations**
  - **ICAO formatted NOTAMs (AIXM-5 and beyond)**



# Notionally, How Might All This Come Together?

(Example #2: Airport Surface Moving Map Application)

Aerodrome Data Base “Updates” and  
“Syncs” (SC-206)

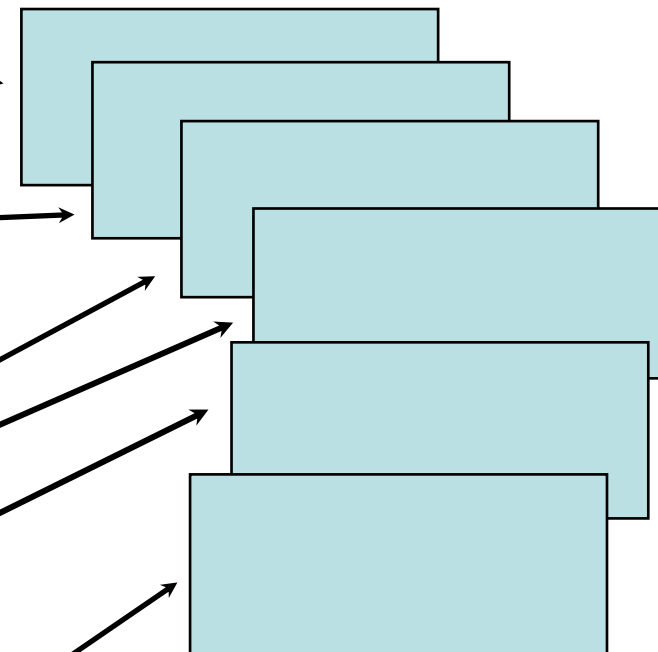
D- (Aerodrome) NOTAMs  
(SC-206 / 214)

D-Taxi (Airport Surface CPDLC) (SC-214)

D-(Aerodrome) Lighting (SC-217)

D-Traffic (e.g., ATSA-SURF  
& ATSA-SURF IA) (SC-186)

Navigation Function (Own-ship Position)  
(Guidance published as DO-257A)



MFDs / EFBs





# Summary...

- **Think in terms of data link**
- **Combined with onboard data**
- **Resulting in entirely new operational functionalities and benefits**
- **Supporting NextGen & SESAR**

**THE END**



**Questions.....**

**[Garret.livack@faa.gov](mailto:Garret.livack@faa.gov)**

**(202) 385-4619**



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