

**TAMDAR Datalink Development**

**For**

**Weather Accident Prevention Annual Project Review**

**Cleveland, Ohio, Hilton South**

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# TAMDAR Objectives



WxAP - Weather Information Communications



Use aircraft operating below 20,000 ft altitude to sense and report

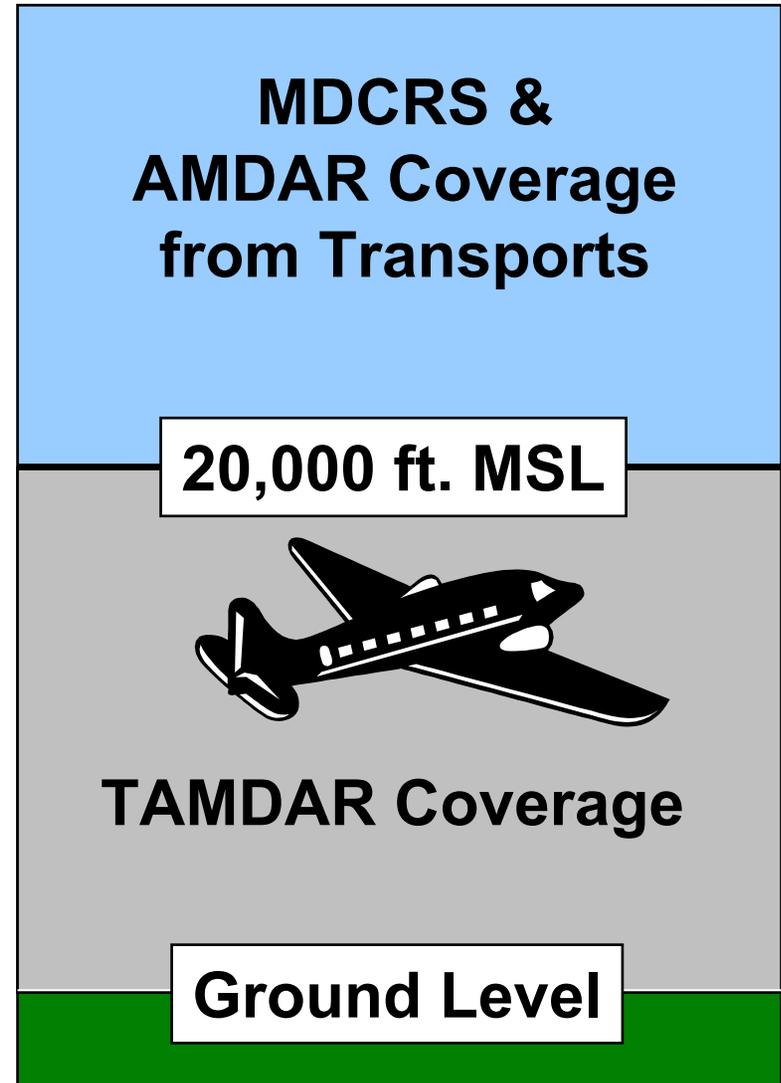
- Moisture
- Temperature
- Winds

to be used by

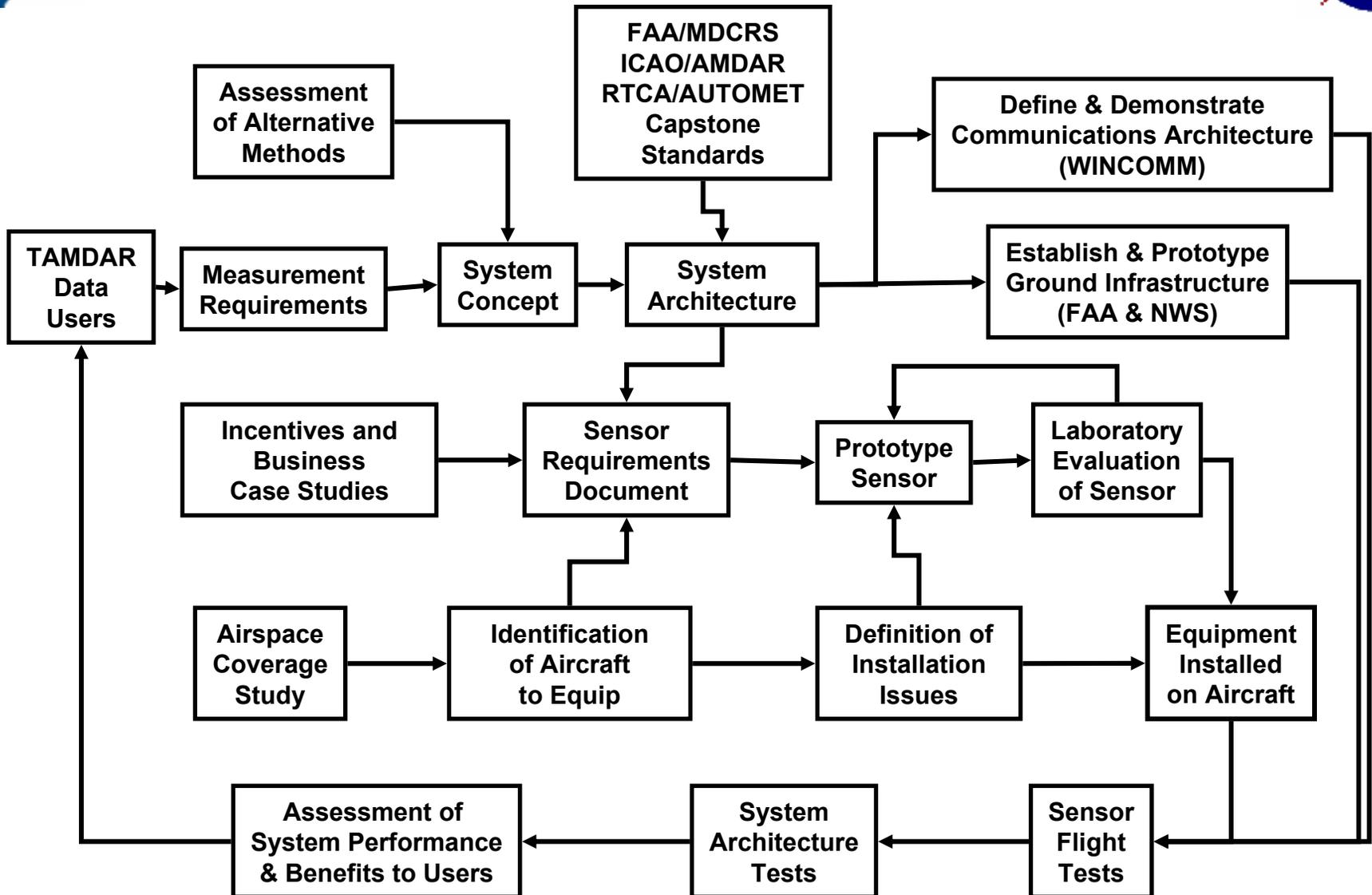
- Forecast models
- Weather briefers
- Controllers
- Other aircraft

NASA Inter-Agency Effort

- NASA Glenn Research
- NASA Langley Research



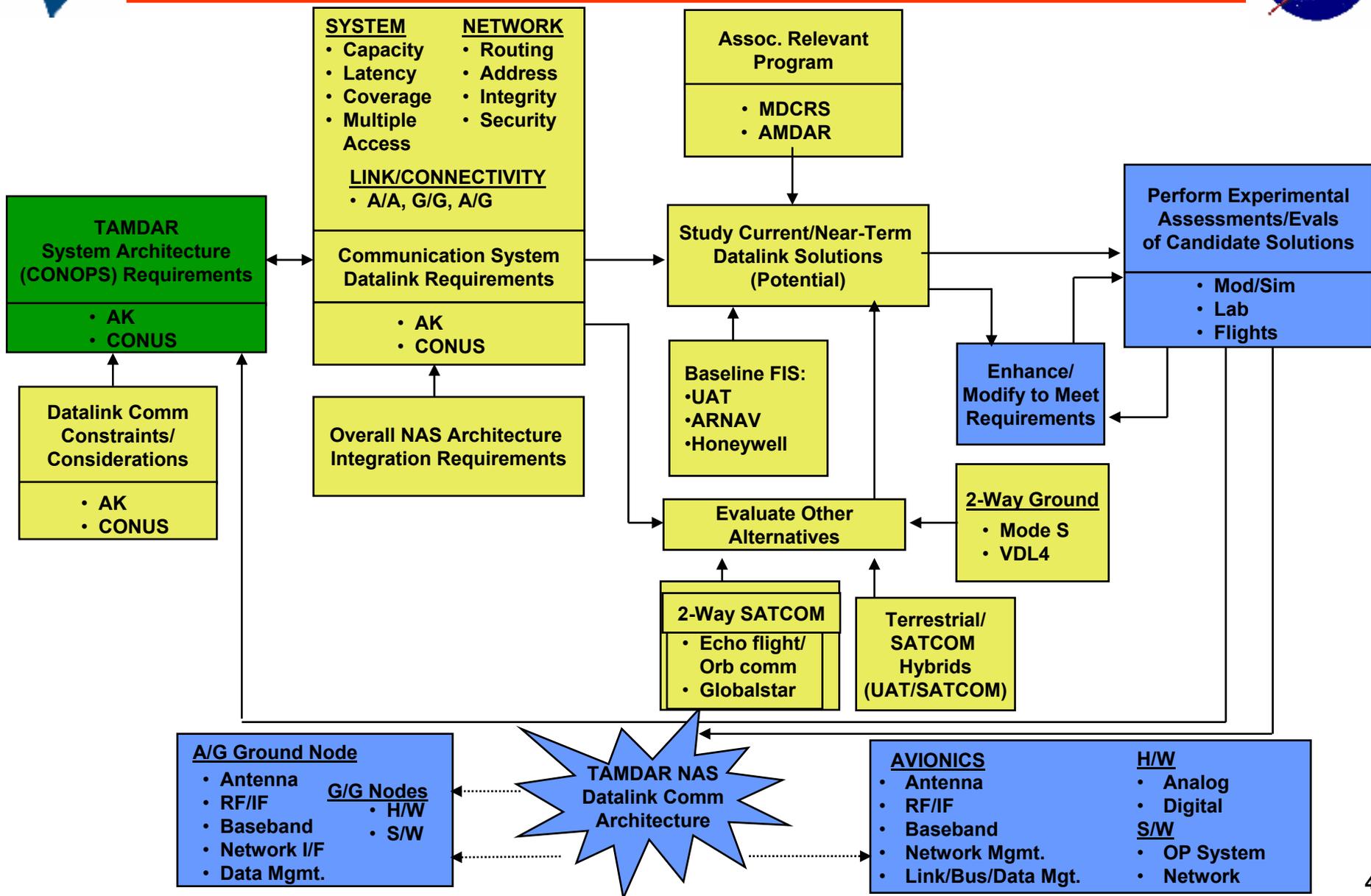
# TAMDAR Flowchart



# TAMDAR Datalink Architecture Development



WxAP - Weather Information Communications



# TAMDAR Conops



**WxAP - Weather Information Communications**



**Conops Development by team of FAA, NASA, NOAA, and NWS.**

- **Based on the RTCA DO-252, Minimum Interoperability Standards (MIS) for Automated Meteorological Transmission (AUTOMET)**

## **General Communication Considerations**

- **Support plane to plane communications**
- **Ascent, descent and en-route sensitive sampling rates.**
- **Immediate updates of HAZMET type reports (icing)**
- **5 min latency from sample time to weather processing center**
- **Data rate based on precision, sample rate, and update rate.**

# TAMDAR Com Activities



WxAP - Weather Information Communications



## Studies

**ADS-B Candidates: UAT, MODE S, VDL 4**

*Issue: Surveillance band (UAT and MODE S), VDL4 questionable near term solution.*

**FIS G-IPPA's Honeywell, ARNAV**

*Issue: Broadcast only license.*

**2 Way VDL-2\_ARINC, SITA**

*Issue: targeted towards carriers.*

**Satellite Based\_Globalstar, Orbcom/Echoflight, Generic Satellite Systems**

*Issue: Financial stability.*

# TAMDAR Com Activities



WxAP - Weather Information Communications



**FAA TAMDAR Architecture Study**

**Flight Experiments**

- **UAT Cessna Demonstration**
- **Orbcom/Echoflight Cessna Demonstration**

**Capstone Collaboration**

# CAPSTONE



**WxAP - Weather Information Communications**



## **Roles and Responsibilities**

**(Task A: TAMDAR Datalink Architecture)**

**NASA WINCOMM will:**

- **Perform UAT laboratory assessment**
- **TAMDAR flight sensor**
- **UAT flight assessment**
- **UAT for TAMDAR datalink assessment/evaluation**
- **Jointly develop plans for TAMDAR insertion into Capstone**
- **Overall TAMDAR datalink architecture validation in Capstone environment**

**FAA Capstone will:**

- **Provide a UAT flight transceiver and associated support avionics**
- **Provide a UAT ground station**
- **Jointly develop plans for TAMDAR insertion into Capstone for a multi-aircraft demonstration**
- **Provide field assistance for TAMDAR field testing in Capstone**
- **Provide demonstration aircraft and integration of TAMDAR and Capstone equipment.**
- **Provide field performance data for analysis**

# CAPSTONE



**WxAP - Weather Information Communications**



## **Roles and Responsibilities**

**(Task B: SATCOM FIS Augmentation)**

**NASA WINCOMM will:**

- **Perform analyses of potential candidate SATCOM systems for AK. Analyses will investigate footprint coverage, link budgets, and system information capacity, latency and integrity.**
- **As necessary, provide access to NASA-owned facilities, communications system hardware such as SWIS, Globalstar, and Echoflight and test instrumentation for the investigation.**
- **Jointly develop necessary test plans**
- **Perform end-end system assessment of SATCOM augmentation scenarios.**

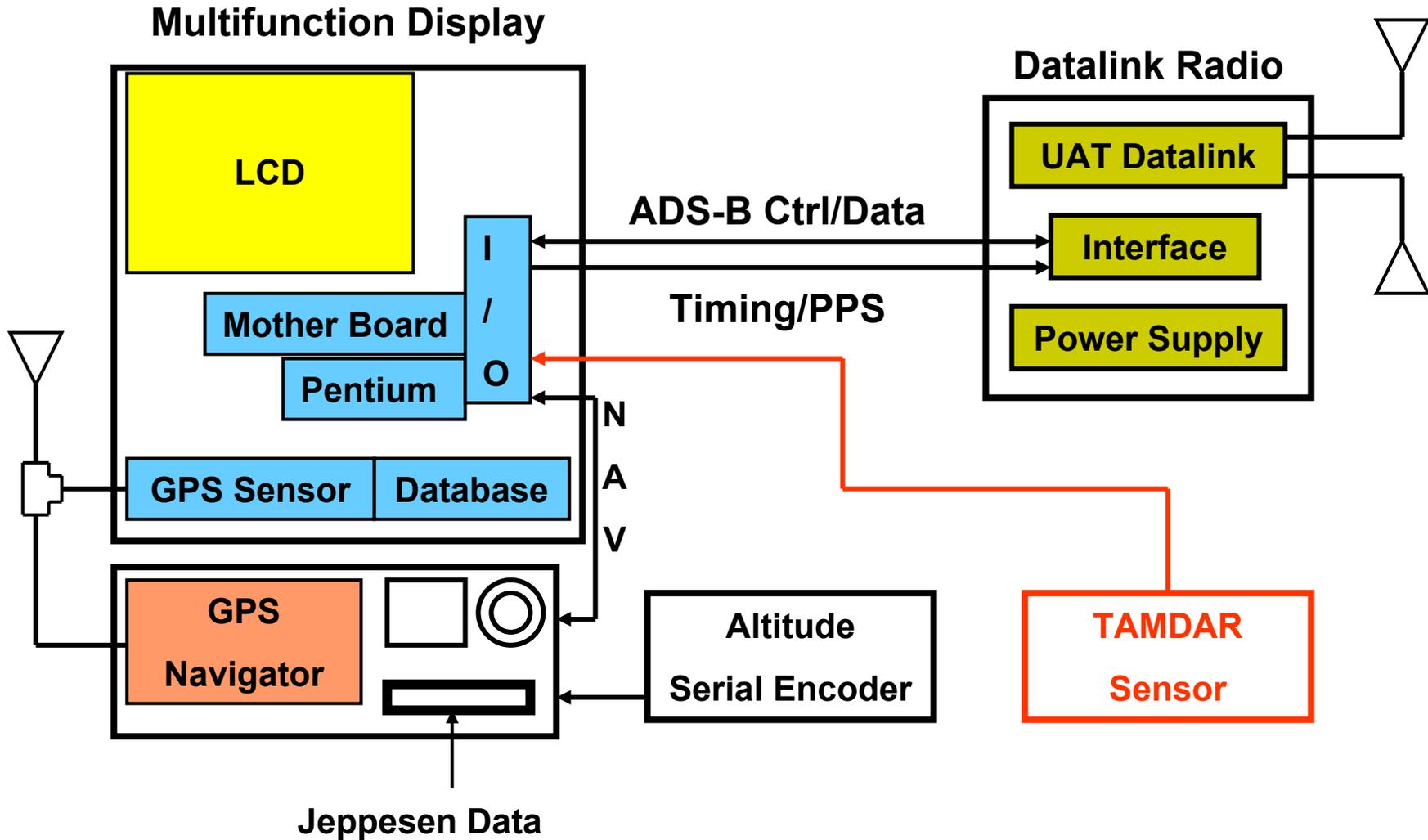
**FAA Capstone will:**

- **Provide AK region operational datalink requirements**
- **As necessary, provide access to Capstone infrastructure and integration of SATCOM hardware for end-to-end field evaluation**
- **Jointly develop necessary test plans**
- **Provide field performance data for analysis and final documentation**

# UAT Avionics Architecture



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# *UAT TAMDAR Flight Experiment*



**WxAP - Weather Information Communications**



**UPS AT assisting in software modifications to avionics and ground station (GBT)**

- **Combined avionics, ground station, and sensor demonstration**
- **Modify avionics to accept 15.5 byte TAMDAR data**
- **Encapsulate TAMDAR data in a extended type message**
- **Modify GBT to output TAMDAR data**
- **Maintain current UAT framing and signaling**

# *Orbcom/Echoflight Flight Experiment*



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- **TAMDAR messages encapsulated into email messages and transmitted through Echoflight system.**
- **Ground based systems receive and store email messages with TAMDAR data.**
- **Evaluate message reliability and delay**

# ADS - B Studies



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**UAT, MOD-S, VDL 4 assessment will be accomplished by JHU-APL**

- **Leverage existing JHU-APL work for ADS-B simulations**
- **Will evaluate air communication only**
- **Ground communication assessment will accomplished at NASA Glenn**
- **Transfer models to NASA Glenn**

# WINCOM Studies



**WxAP - Weather Information Communications**



## ARINC Study

- **Assess current MDCRS architecture in supporting new participants (part 121, part 91)**
- **Investigate data link coverage and availability**
- **Investigate ground distribution and loading**
- **Assess and propose plans for improvement**

## Honeywell and ARNAV

- **Leverage existing Cooperative Research Agreements**
- **Work with vendors to complete assessment**

## Satellite Based

- **Leverage existing and on-going in-house architecture studies**
- **Include assessment of in-house laboratory experimentation**

# FAA Task



## Task 3 FISDL Communications Assessments:

### Subtask 1 of 2

“... provide assessments of communications alternatives for implementing a national system for collecting, processing and disseminating electronic pilot report data ...”

### FAA Needs:

- Assessment and recommendations of data link communications technology and ground communications infrastructure that supports national downlinking of electronic pilot reporting.

### Schedule

- Final Report            9/01