

TAMDAR Datalink Development
For
Weather Accident Prevention Annual Project Review
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TAMDAR Objectives

WxAP - Weather Information Communications



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

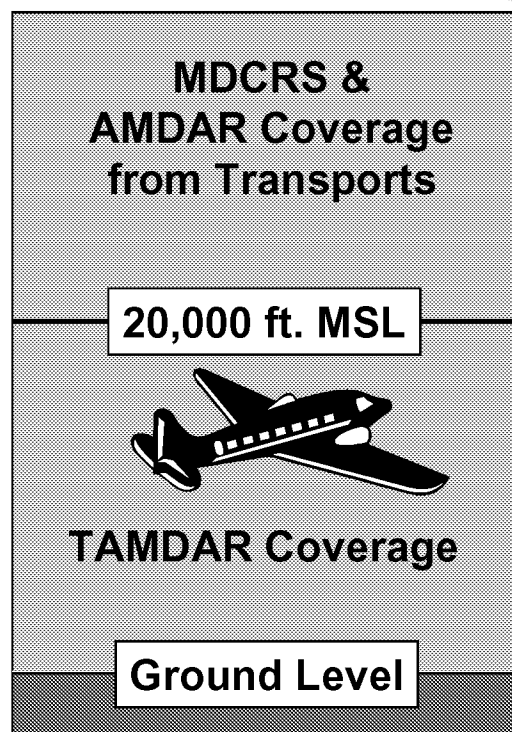
- Moisture
- Temperature
- Winds

to be used by

- Forecast models
- Weather briefers
- Controllers
- Other aircraft

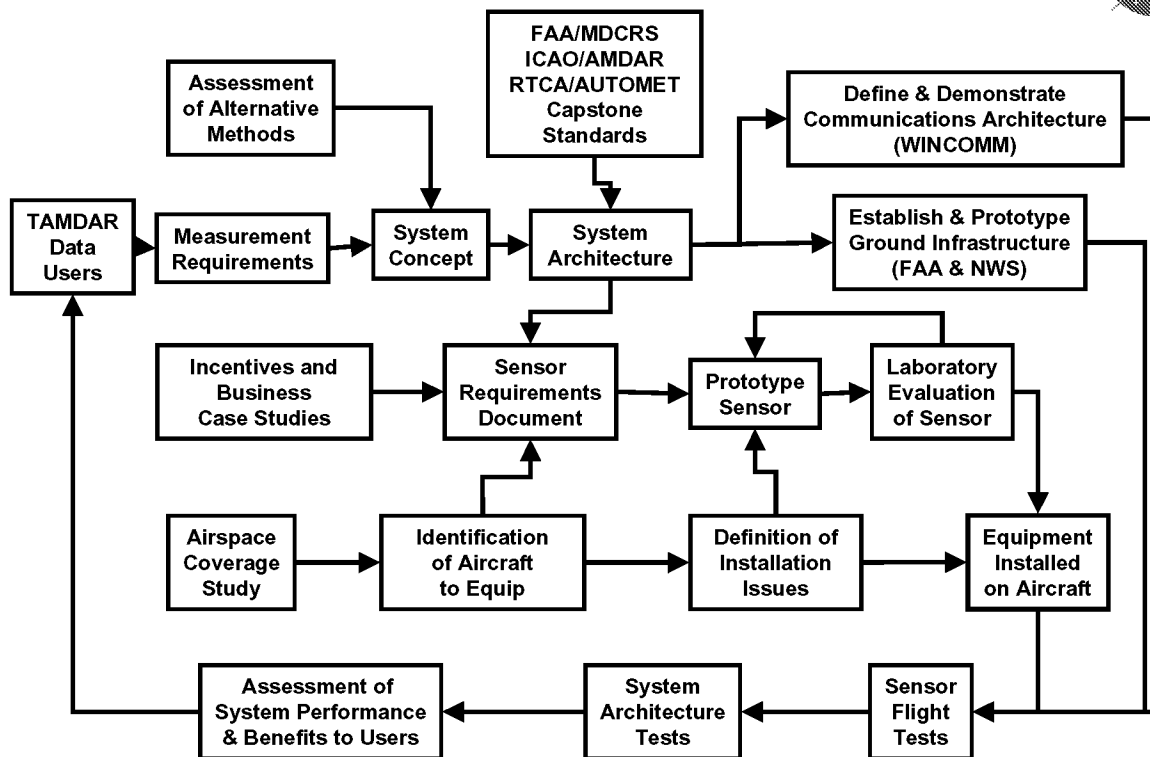
NASA Inter-Agency Effort

- NASA Glenn Research
- NASA Langley Research



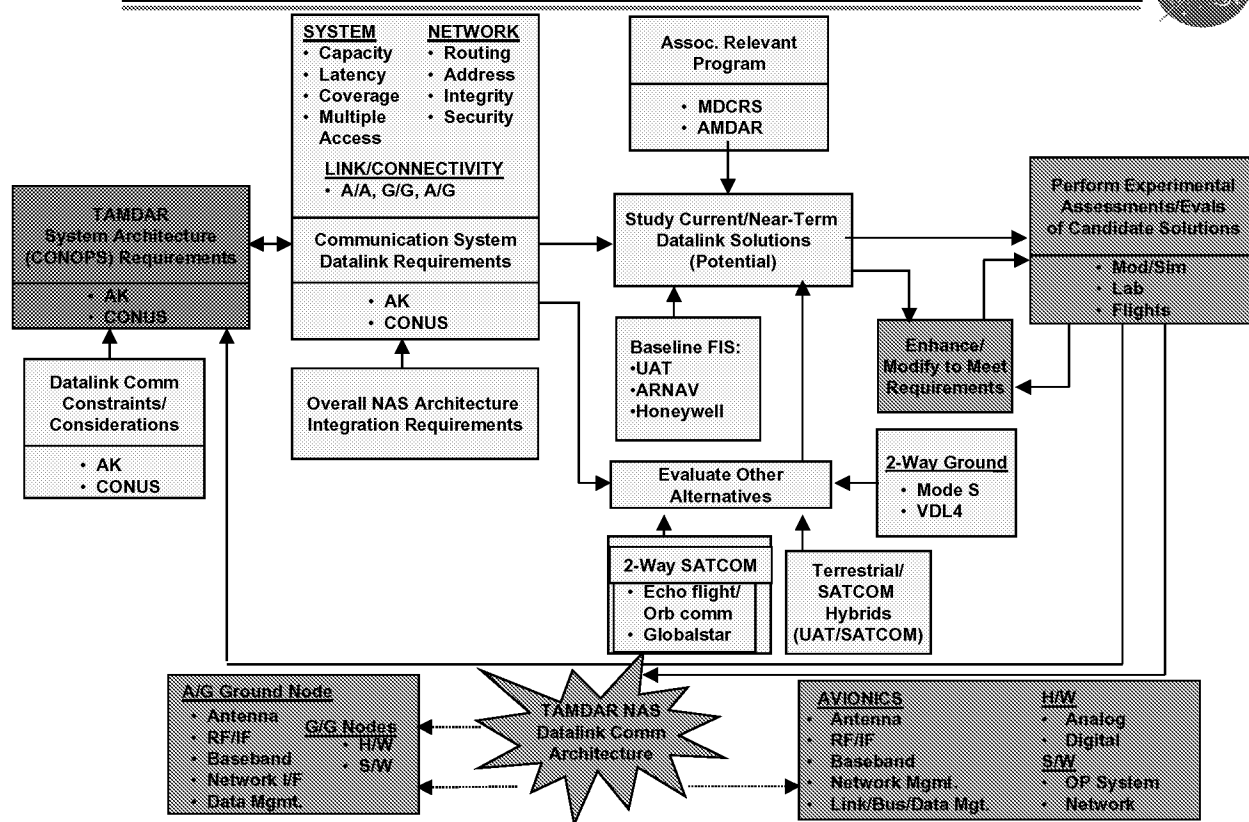
TAMDAR Flowchart

WxAP - Weather Information Communications



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

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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:

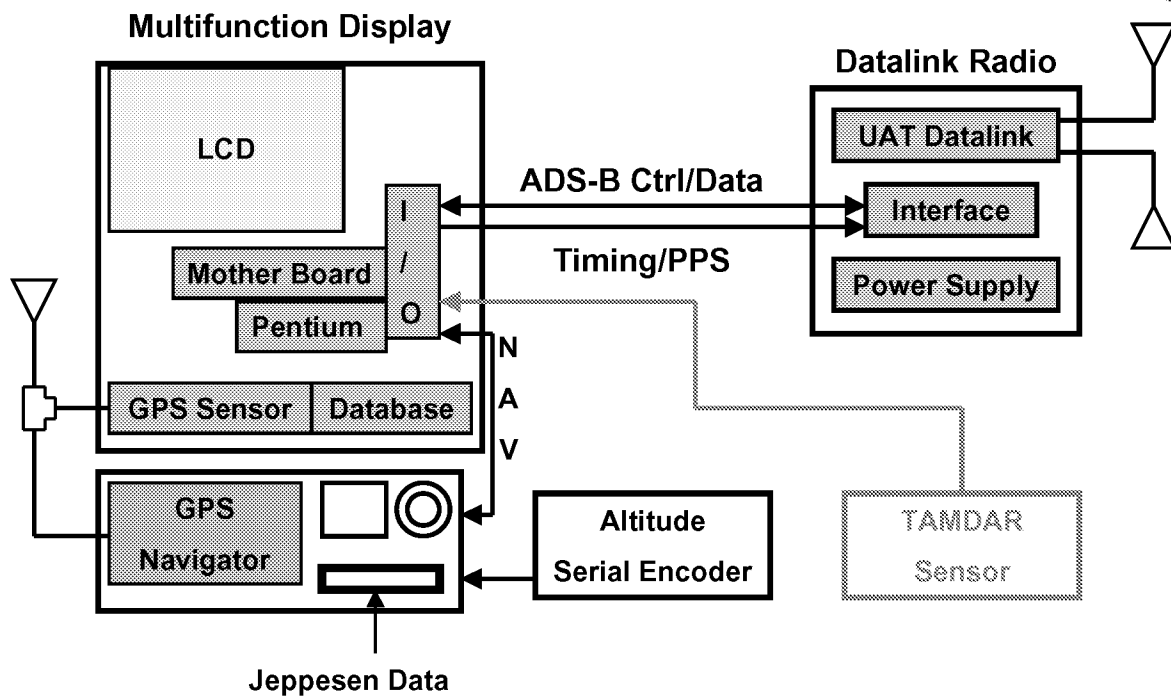
- Perform analyses of potential candidate SATCOM systems for AK. Analyses will investigate footprint coverage, link budgets, and system information capacity, latency and integrity.
- As necessary, provide access to NASA-owned facilities, communications system hardware such as SWIS, Globalstar, and Echoflight 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

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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

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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

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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