IWGADTS

Interagency Working Group for Airborne Data and Telecommunication Systems

Briefing at Joint Meeting of

UNOLS Scientific Committee for Oceanographic Aircraft Research (SCOAR)
and
Interagency Coordinating Committee for Airborne Geosciences and Applications (ICCAGRA)

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Abstract

The Interagency Coordinating Committee for Airborne Geosciences Research and Applications (ICCAGRA) was established to improve cooperation, foster awareness, facilitate communication among sponsoring agencies having airborne platforms and instruments for research and applications, and serve as a resource to senior level management on airborne geosciences issues. The Interagency Working Group for Airborne Data and Telecommunications Systems (IWGADTS) is organized as a subgroup to ICCAGRA for the purpose of developing recommendations leading to increased interoperability amongst airborne platforms and instrument payloads, to produce increased synergy with DoD research programs with similar goals, and to enable the suborbital layer of the Global Earth Observing System of Systems. The purpose of this paper is to introduce the reader to the objectives of the IWGADTS and its strategy for achieving these objectives.

IWGADTS: Background

Background discussion

Future = Layered Sensor Webs

Vision:
Intelligent, Affordable Earth Observation System

Global Earth Observing System of Systems

GEOSS

Earth System Models
- Oceans
- Cryosphere
- Land
- Atmosphere
- Solid Earth
- Biosphere

Predictions and Analysis

High Performance Computing; Communication Visualization

Decision Support
- Assessment
- Decision Support Systems

Policy Decisions

Management Decisions

Assimilation

Other Data Sources
Socio-economic data

Earth Observation Systems
- *In situ*
- Airborne
- Space-based

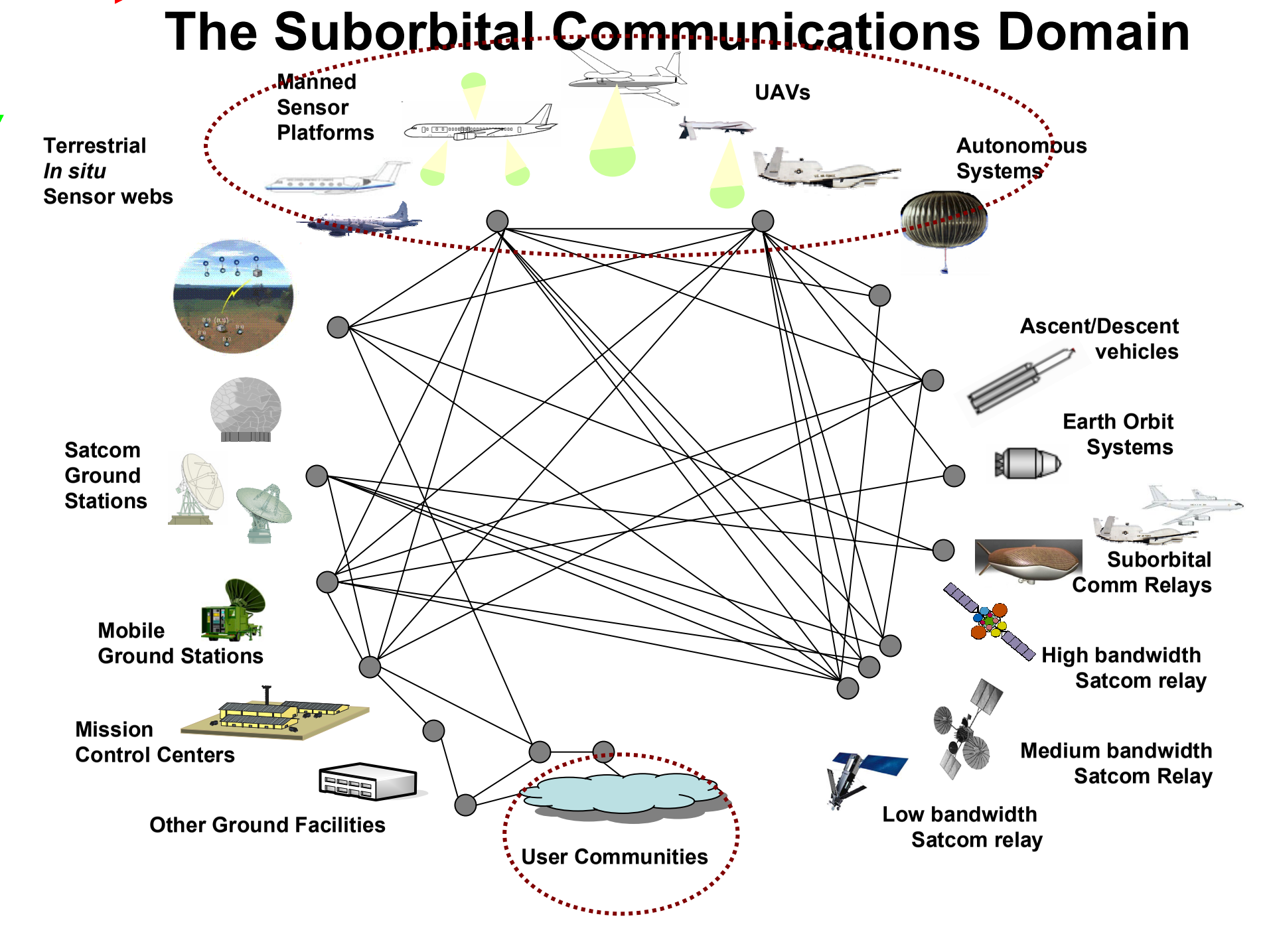
Standards & Interoperability

Observations

Ongoing feedback to optimize value, reduce gaps, and account for human activity

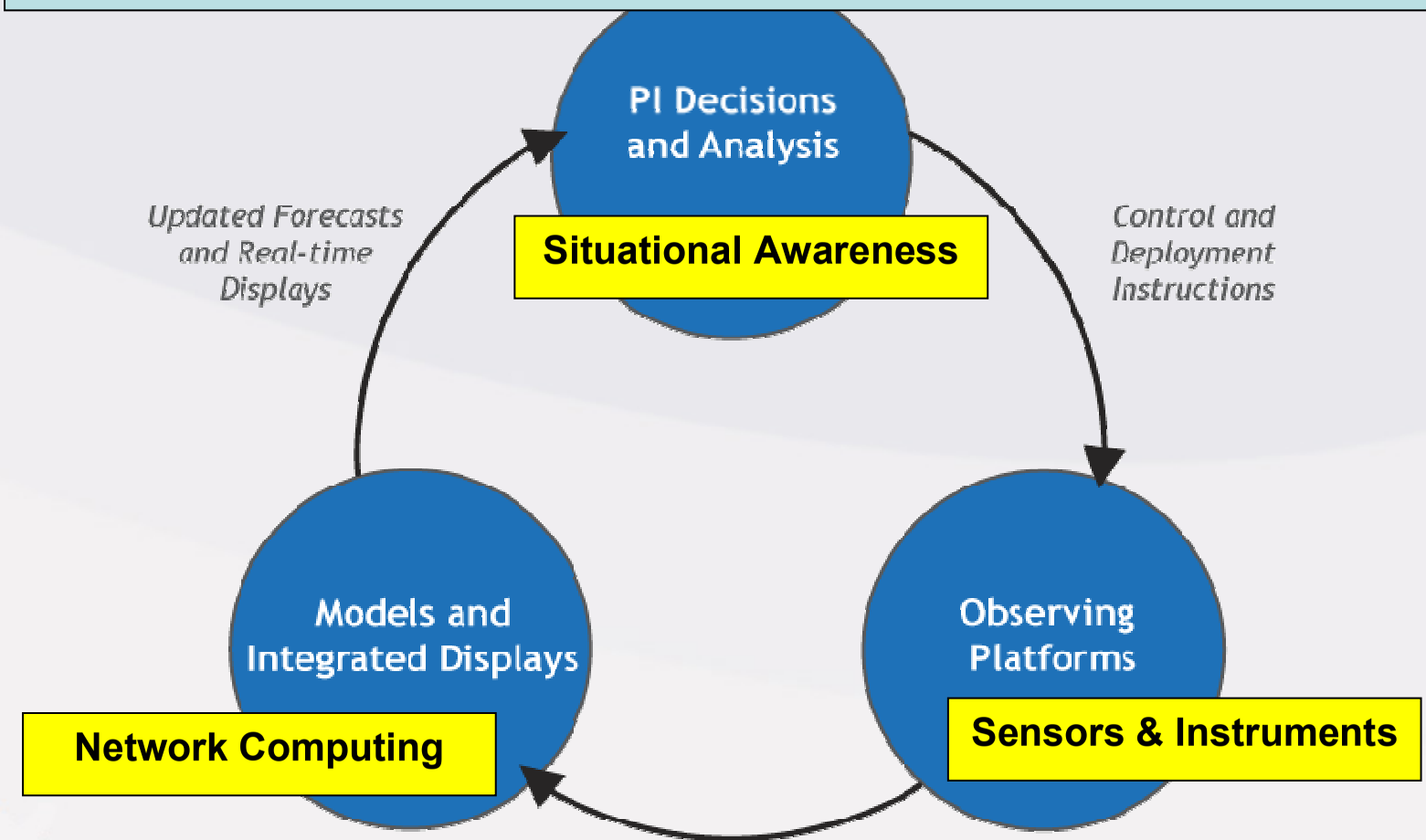
- **National/Int'l collaboration**
- **Time correlated global data collection**
- **Integrated metadata**
- **Integrated system analysis**
- **Reliable long term archival**
- **Easy access but secure archive**
- **Near realtime observation**

The Suborbital Communications Domain



IWGADTS: Themes

Goal: make the best possible use of available time…
better capabilities… greater capacity



Credit: NCAR/EOL - Mike Daniels

IWGADTS: Themes

- Work toward a suborbital platform fleet that is an effective and sustainable component of the to-be-implemented Integrated Earth Observation System

- Interoperability occurs over networks; important contributions emerge through software interfaces and protocols, not through the hardware systems that generate that information.

- Telecommunication implies interactive connectivity with the airborne networks. Over time, instrument networks on suborbital platforms migrate toward being observation nodes on a suborbital “sensor web”.

IWGADTS: Charter

Charter discussion

IWGADTS: Charter (Purpose)

- Identify interagency needs for data and networked systems
- Improve interoperability of airborne platforms between agencies
- Enhance opportunities for interagency sharing of aircraft resources, airborne instrumentation and data to minimize duplication, and to expand science investigators' access to interagency assets
- Provide technical standards recommendations to senior level decision makers
- Evaluate the current state of interoperability and recommend, as appropriate, interagency standards to facilitate the development of common data and networking systems leading to a fully interoperable global observing system which includes suborbital and space-based components

IWGADTS: Charter (administrative)

Membership

- Principal geosciences research aircraft sponsoring agencies (NSF, NOAA, NASA, ONR, DOE, DOI,…)
- Academia & other platform representatives
- Leadership via elected chairman & executive secretary

Meetings & correspondence

- Twice per year
- Inter-meeting communication via *iwgadts@eol.ucar.edu*

Review the charter every three years (2008)

Participation is voluntary (no direct funding source)

IWGADTS: Progress

Status & Progress discussion

Progress: Data Exchange – ASCII packet

IWGADATS is developing extensible “standard packets” for sharing commonly used information. First cut at ASCII Specification:

- String will be prefaced with ‘IWG1’ as the magic-cookie to identify this stream.
- DateTime (UTC) will use iso-8601 which is of the form 'yyyy-mm-ddThh:mm:ss'.
- Values will be comma separated. This will allow for little loss of bandwidth for missing values.
- Data values other than date will be in any format acceptable to the ANSI C string-to-double function strtod(3).
  - Recommend to implementers to use appropriate significant figures.
  - 'inf' and 'nan' are acceptable.
  - Fields not supplied or available will be left empty (e.g. '...,4.523,,48.234,...).
- String will be terminated by \r\n (carriage return, newline).
- IWG1,yyyy-mm-ddThh:mm:ss,value,value,……,value,,value\r\n
- The list of variables will be fixed in the following order, these are all platform 'best' values:

ASCII Realtime Packet Definition

IWG1,yyyy-mm-ddThh:mm:ss,value,value,……,value,,value\r\n
IWG1,yyyy-mm-ddThh:mm:ss,value,value,……,value,,value\r\n
IWG1,yyyy-mm-ddThh:mm:ss,value,value,……,value,,value\r\n
…
…

IWG1
Date/Time
Lat (dec deg)
Lon (dec deg)
GPS_Alt (m)
Press_Alt (feet)
Radar_Alt (feet)

Grnd_Spd (m/s)
True_Airspeed (m/s)
Indicated_Airspeed (knots)
Mach_Number
Vert_Velocity (m/s)
True_Hdg (degrees_true)
Track (degrees_true)
Drift (degrees)
Pitch (degrees)
Roll (degrees)
Side_slip(degrees)
Angle_of_Attack (degrees)
Ambient_Temp (degrees_C)
Dew_Point (degrees_C)
Total_Temp (degrees_C)
Static_Press (mbar)
Dynamic_Press (mbar)
Cabin_Pressure (mbar)
Wind_Speed (m/s)
Wind_Dir (degrees_true)
Vert_Wind_Spd (m/s)
Solar_Zenith_Angle (degrees)
Sun_Elev_AC (degrees)
Sun_Az_Grd (degrees_true)
Sun_Az_AC (degrees_true)

IWGADTS

…

Progress: Interface Descriptions

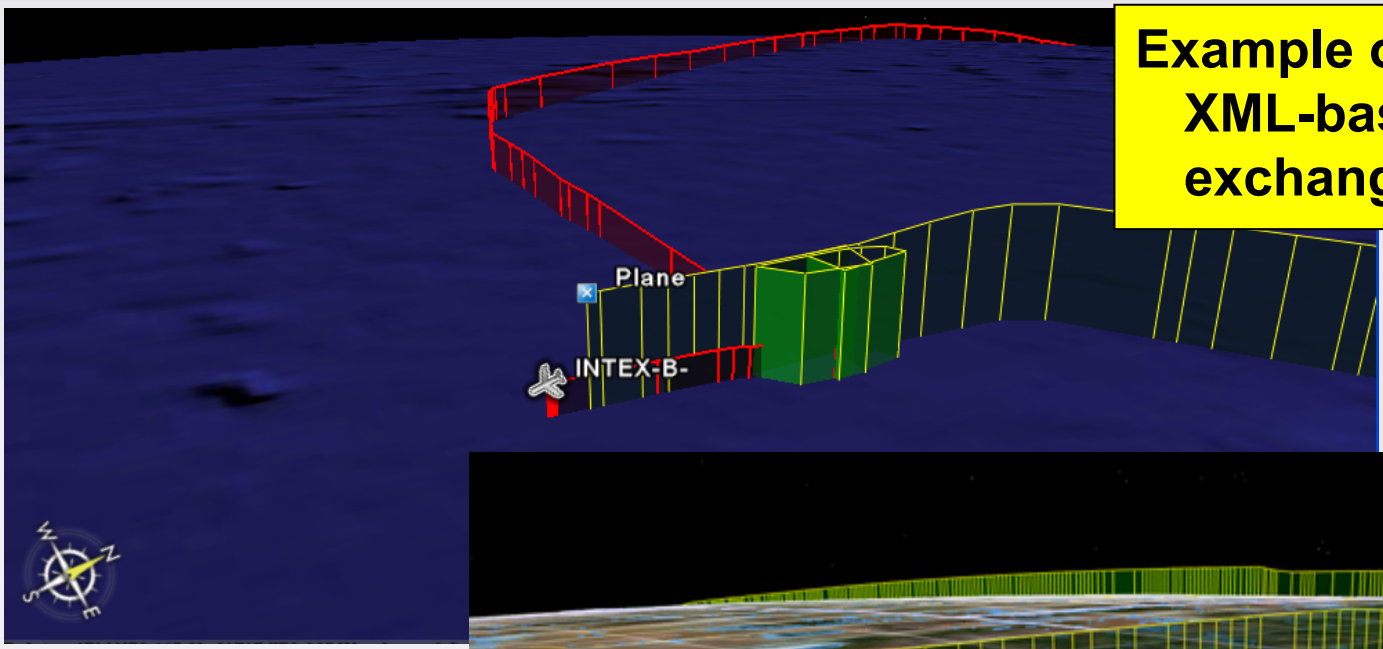
IWGADTS has discussed XML schema as part of interface control and data exchange documentation

- Common language for describing data enables interoperability
- Machine-readable interface descriptions is important for *automating* interoperability
- Portability, platform, language, vendor independence
- Structured, tailorable, extensible
- Widely implemented & growing
- Widely available tools

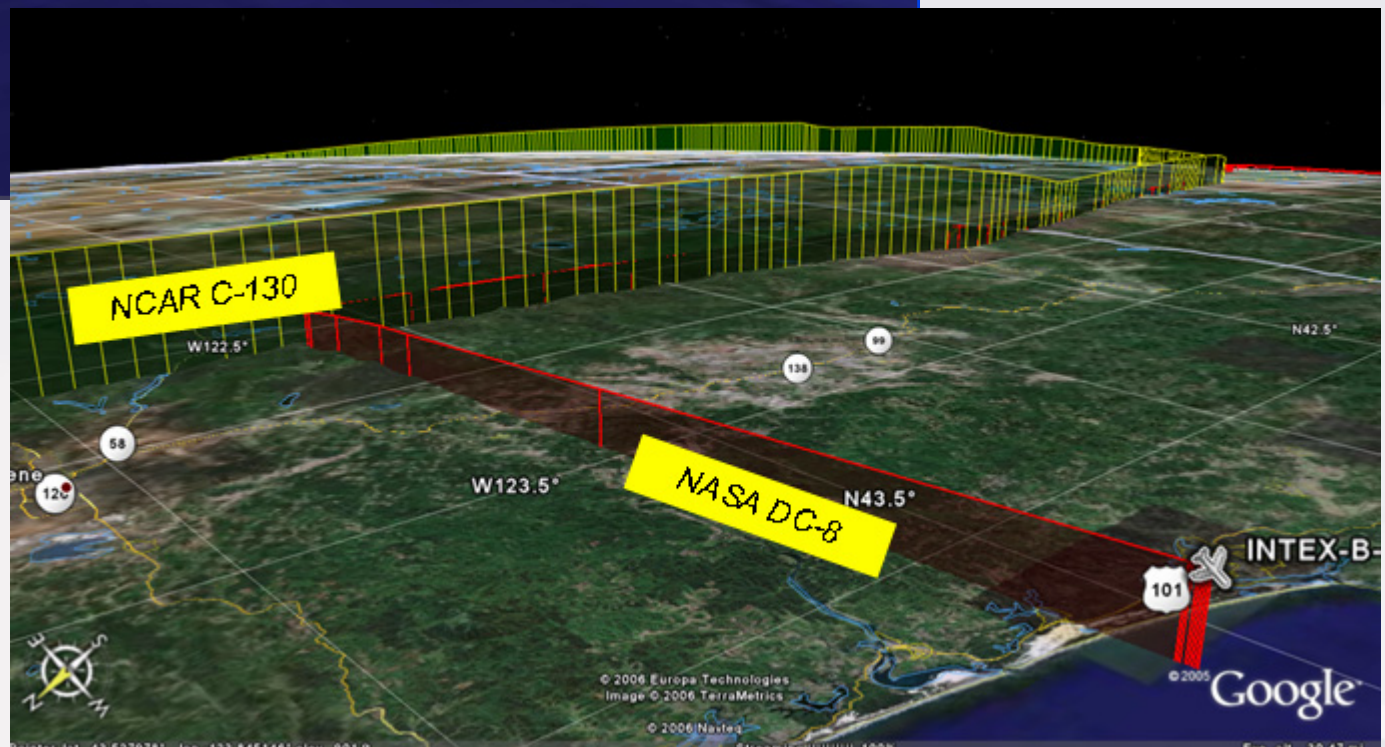
Interface Descriptions: NcML example

```
<netcdf format="classic">
<variable name="magic-cookie" shape="Time" type="String">
  <attribute name="long_name" type="String" value="Keyword identifying this
    output"/>
  <attribute name="units" type="String" value="IWG1"/>
</variable>
<variable name="Time" shape="Time" type="String">
  <attribute name="long_name" type="String" value="time of measurement"/>
  <attribute name="standard_name" type="String" value="time"/>
  <attribute name="units" type="String" value="iso-8601"/>
</variable>
<variable name="Lat" shape="Time" type="float">
  <attribute name="units" type="String" value="degree_N"/>
  <attribute name="long_name" type="String" value="GPS Latitude"/>
  <attribute name="valid_range" type="float" value="-90.0, 90.0"/>
  <attribute name="standard_name" type="String" value="latitude"/>
</variable>
<variable name="Lon" shape="Time" type="float">
  <attribute name="units" type="String" value="degree_E"/>
  <attribute name="long_name" type="String" value="GPS Longitude"/>
  <attribute name="valid_range" type="float" value="-180.0, 180.0"/>
  <attribute name="standard_name" type="String" value="longitude"/>
</variable>
…
```

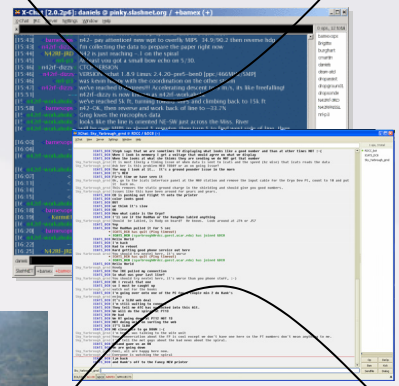
Progress: Multi-Aircraft Displays



Example of leveraging XML-based data exchange interface



Progress: Network Chat



Concluding Comments

- IWGADTS assembled in Jan 2005
- Met twice since accepted under ICCAGRA
- Demonstrating ability to coordinate ongoing activities for mutual benefit
- Demonstrating viable consensus approach to joint innovation
- More to come!
- Email us at *iwgadts@eol.ucar.edu*

Parting thought: Why Network Computing?

"…to enable men and computers to *cooperate* in making decisions and controlling complex situations without inflexible dependence on predetermined programs"

- J. C. R. Licklider, 1960

IRE Transactions on Human Factors in Electronics,
volume HFE-1, pages 4–11, March 1960. http://memex.org/licklider.pdf

The lack of situational awareness causes lost opportunity.
Sensor webs to enhance decisionmaking are the reason the Internet exists!!!