



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)

May 23rd, 2006

CIRPAS Facility, Marina California

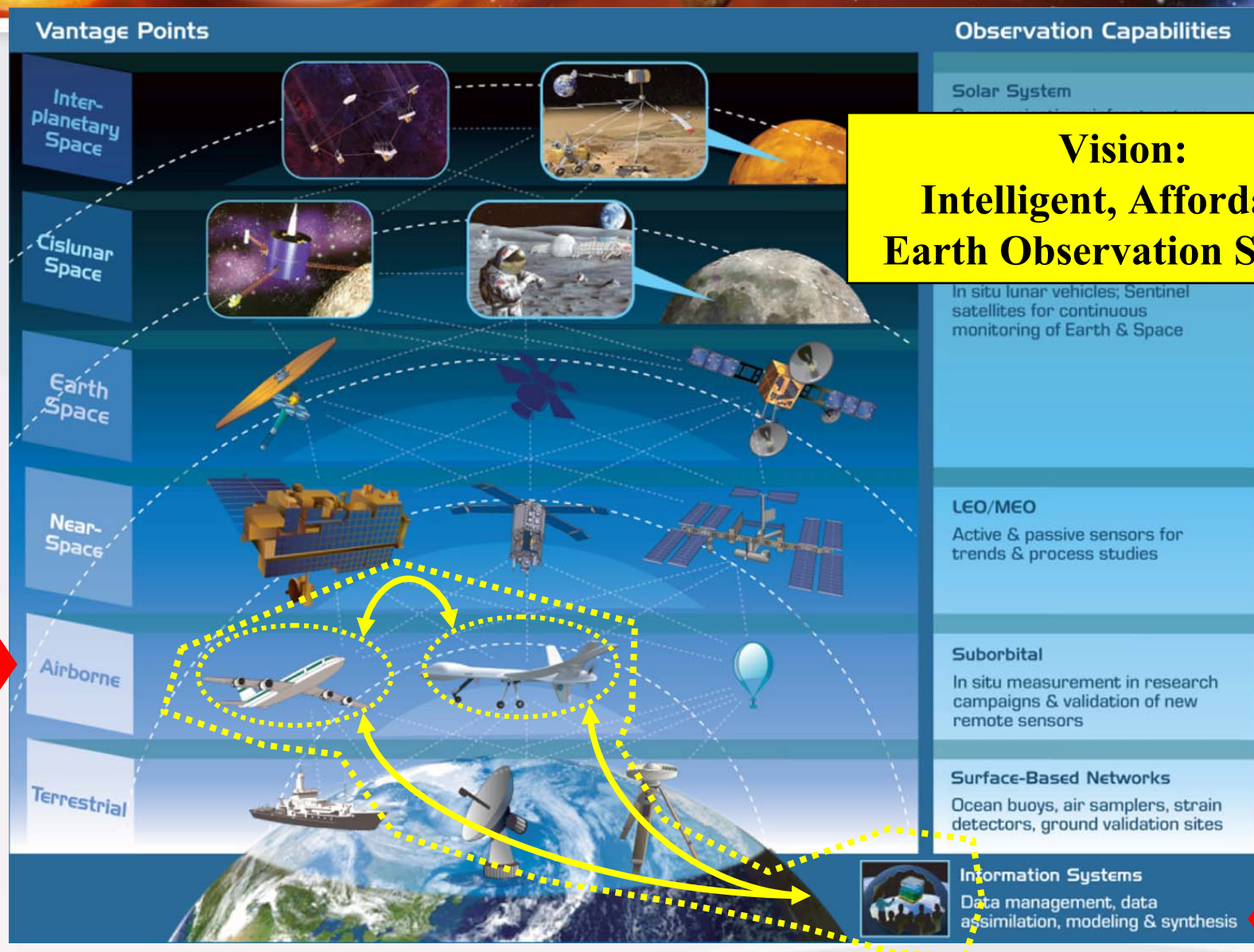
Larry Freudinger, NASA Dryden Flight Research Center
Chris Webster, National Center for Atmospheric Research

Abstract

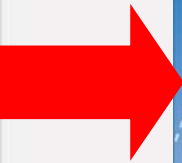
The Interagency Coordinating Committee for Airborne Geosciences Research and Applications (ICCAGRA) was established to improve cooperation, foster awareness, facilitate communication among sponsoring agencies having airborne platforms and instruments for research and applications, and serve as a resource 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.

Background discussion

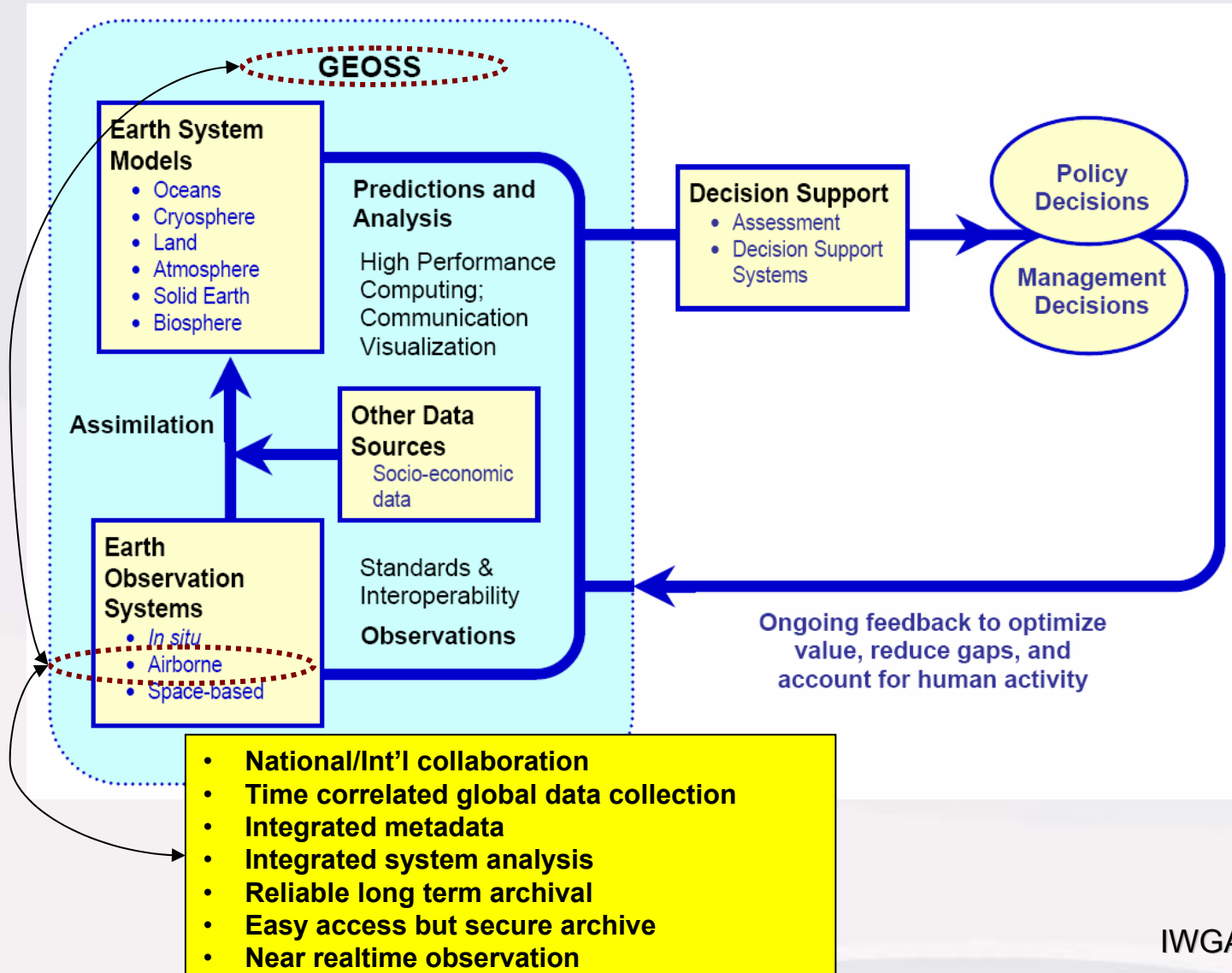
Future = Layered Sensor Webs



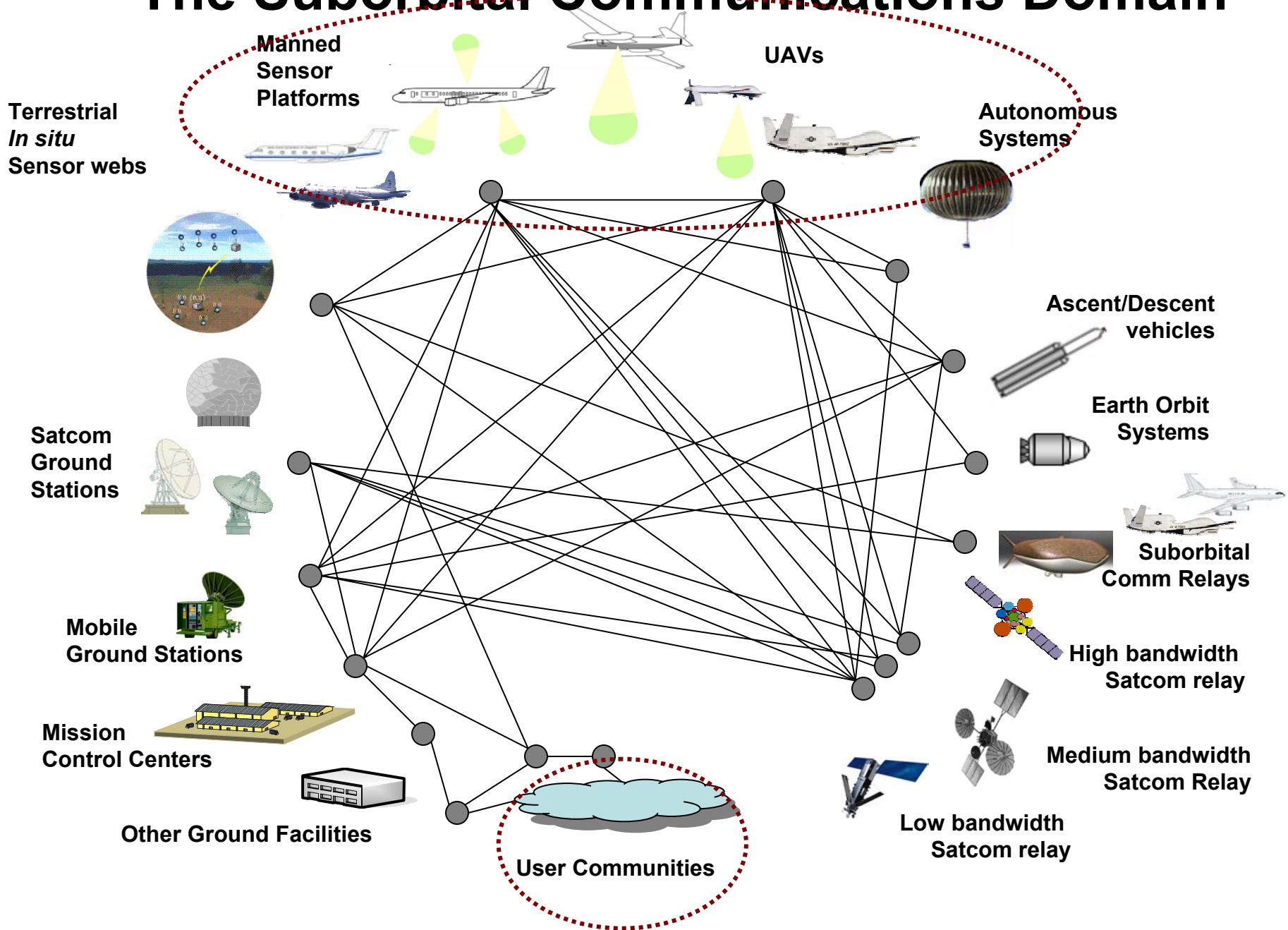
Vision:
Intelligent, Affordable
Earth Observation System



Global Earth Observing System of Systems

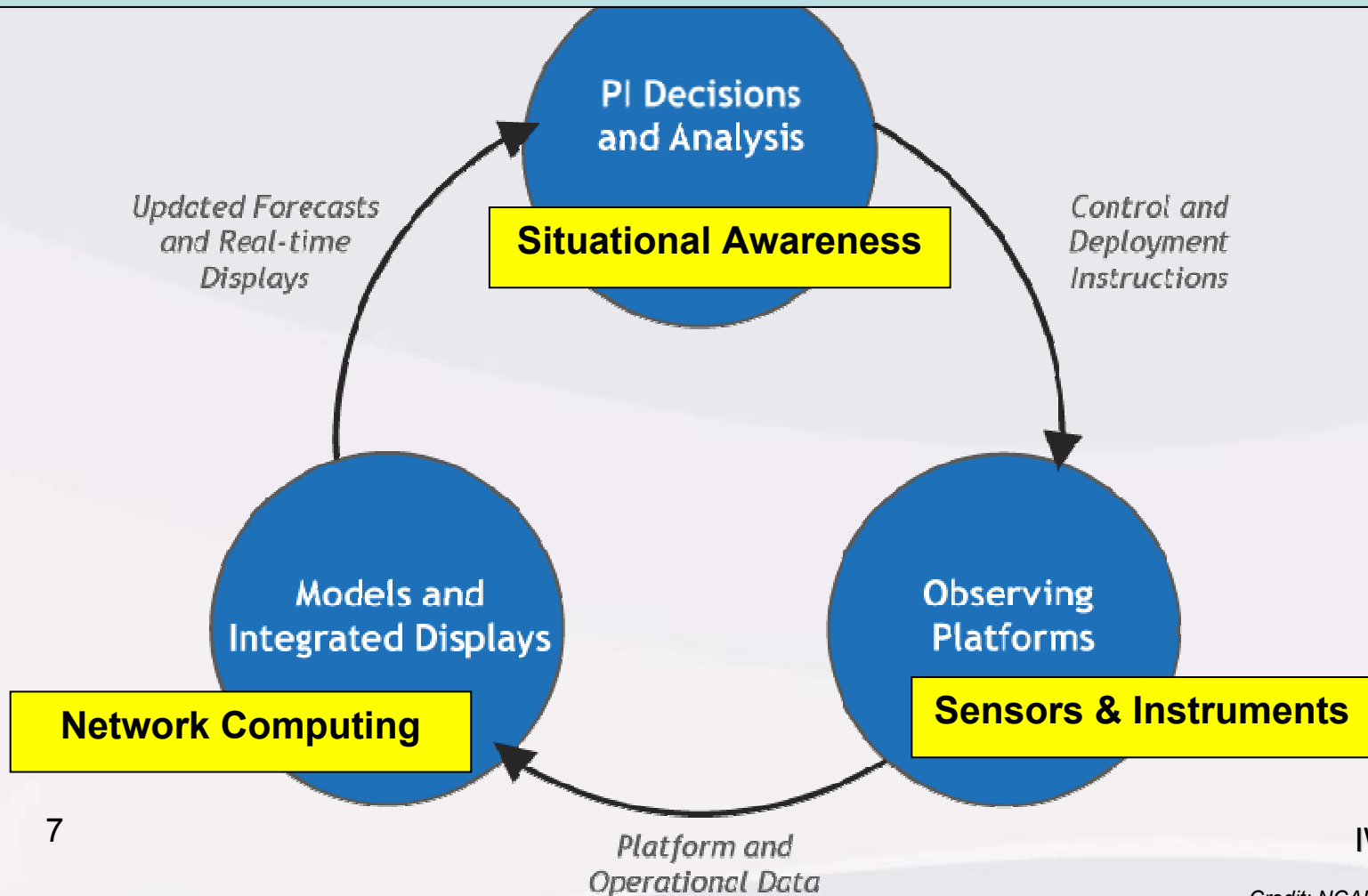


The Suborbital Communications Domain



IWGADTS: Themes

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



- 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”.

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, “best practices” 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)

Status & Progress discussion

Progress: Data Exchange – ASCII packet

IWGADTS 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\nIWG1,yyyy-mm-ddThh:mm:ss,value,value,.....,value,,value\r\nIWG1,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
```

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

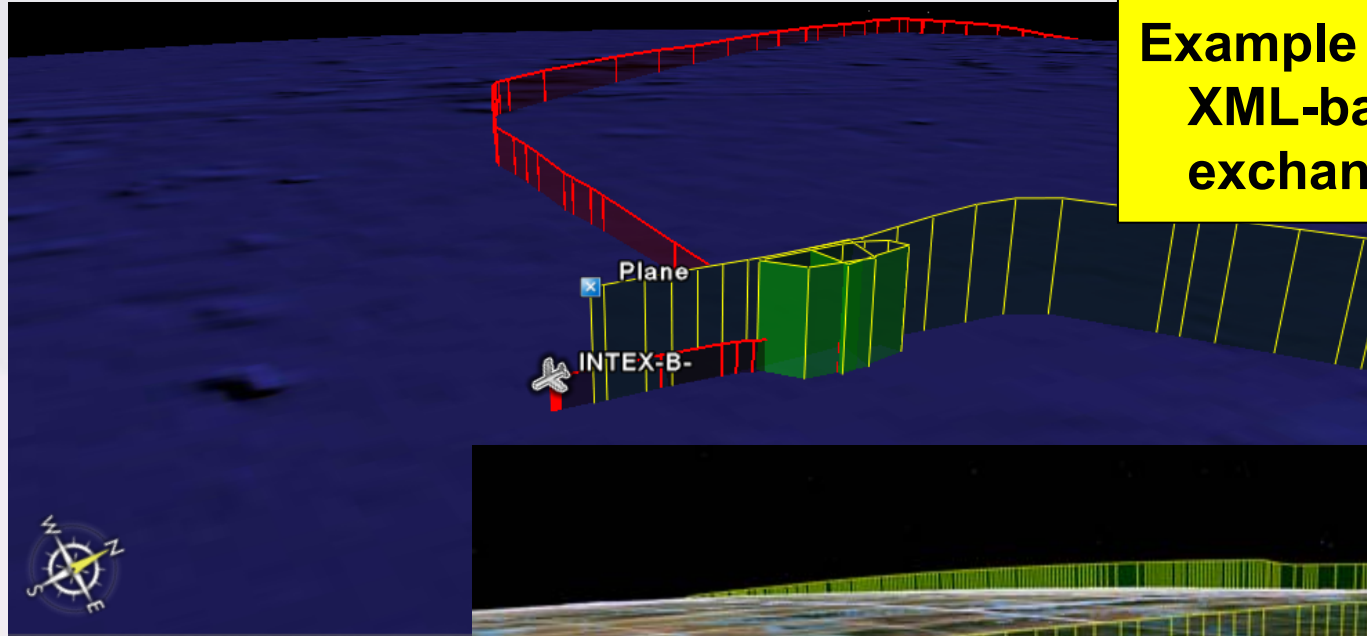
- Common language for describing data enables interoperability
- Machine-readable interface descriptions is important for *automating* interoperability
- Portability, platform, language, vendor independence
- Structured, tailorable, extensible
- Widely implemented & growing
- Widely available tools



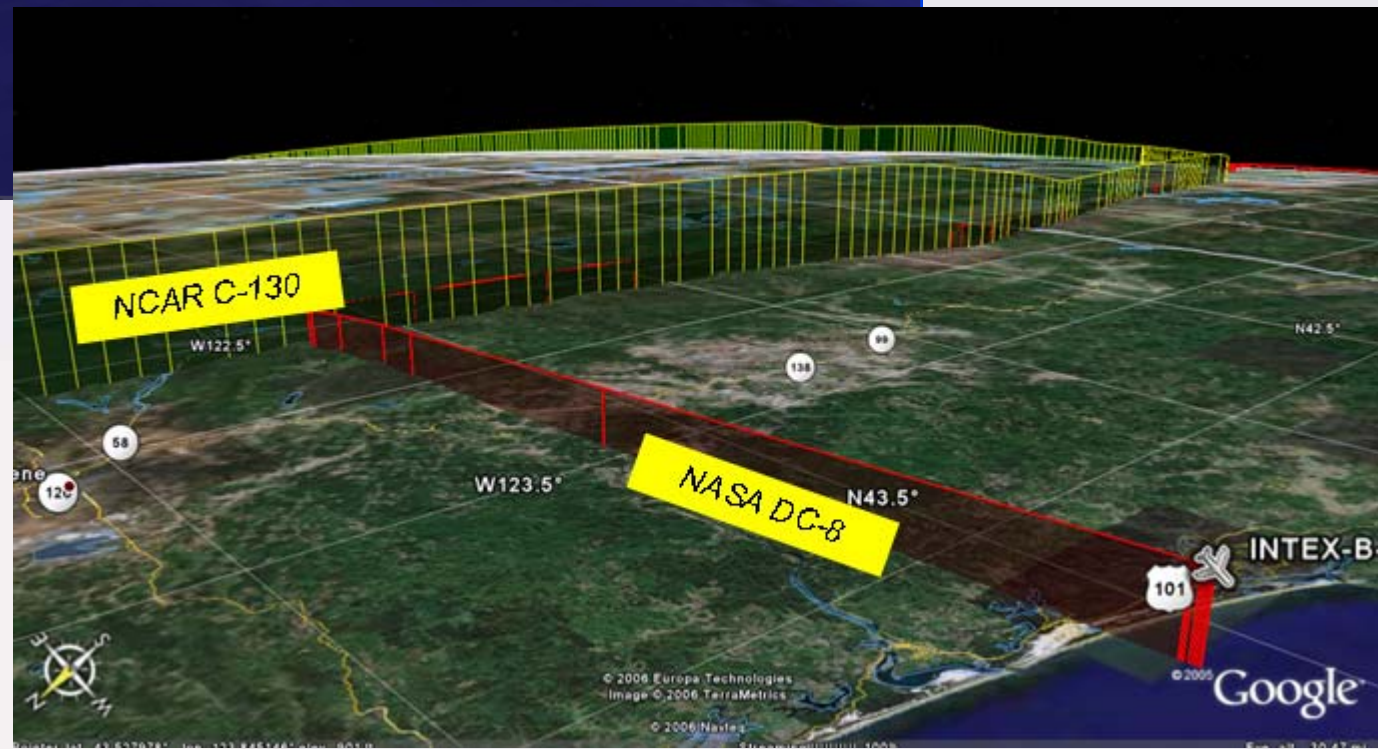
Interface Descriptions: NcML example

```
<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



```
root@kali:~# ssh root@10.10.10.10
root@10.10.10.10:~# cat /etc/passwd
root:x:0:0:root:/root:/bin/bash
daemon:x:1:1:daemon:/usr/sbin:/usr/sbin/nologin
bin:x:2:2:bin:/bin:/usr/sbin/nologin
sys:x:3:3:sys:/dev:/usr/sbin/nologin
games:x:5:12:games:/usr/games:/usr/sbin/nologin
uucp:x:6:5:uucp:/usr/lib/uucp:/usr/sbin/nologin
lp:x:7:7:lp:/var/spool/lpd:/usr/sbin/nologin
mail:x:8:8:mail:/var/mail:/usr/sbin/nologin
news:x:9:9:news:/var/spool/news:/usr/sbin/nologin
uux:x:10:10:uux:/usr/lib/uucp:/usr/sbin/nologin
operator:x:11:11:operator:/root:/usr/sbin/nologin
_ftp:x:14:50:ftp:/var/fsp:/usr/sbin/nologin
nobody:x:65534:65534:nobody:/nonexistent:/usr/sbin/nologin
mysql:x:153:153:mysql:/var/lib/mysql:/bin/false
```





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!!!*