# INTERAGENCY WORKING GROUP FOR AIRBORNE DATA AND TELECOMMUNICATION SYSTEMS:

*An Introduction*

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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.

## Introduction

Airborne science in the United States is conducted by multiple U.S. government agencies. Collectively, these agencies maintain numerous manned and unmanned aircraft platforms that serve a global research community and hundreds of sensor systems designed for atmospheric in situ and earth-observing remote sensing measurements. Each of these aircraft have evolved data systems and services over the years that are, not surprisingly, independently designed and largely incompatible. This creates a detrimental effect on the productivity of researchers with instruments that need to migrate amongst platforms.

Today's environment offers both impetus and opportunity to improve the overall effectiveness and value of airborne science activities. The impetus grows from the vision for building a global-scale system of Earth observation capabilities. The Commission on the Future of the United States Aerospace Industry concluded in 2002 that increased investment is needed in test and measurement infrastructure and the development and demonstration of the capability to continuously monitor and survey the Earth, its atmosphere, and space for a variety of military, civil, and commercial applications[1].

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That same year, the World Summit on Sustainable Development highlighted the urgent need for coordinated observations relating to the state of the Earth.

That summit meeting triggered a cascade of international and national coordination and planning, with the United States forming an *ad hoc* Interagency Working Group on Earth Observations (IWGEO)[2]. This group developed a strategic plan for the development and implementation of the U.S. Integrated Earth Observation System. Today, the *ad hoc* IWGEO has been replaced by the United States Group on Earth Observations (US GEO) and since March 2005 has been a standing subcommittee of the National Science and Technology Council Committee on Environment and Natural Resources.[3]

The U.S. contribution to the envisioned Global Earth Observing System of Systems (GEOSS) is the Integrated Earth Observation System (IEOS). GEOSS and IEOS will facilitate the sharing and applied usage of global, regional and local data from satellites, ocean buoys, weather stations and other surface and airborne Earth observing instruments. The end result will be access to an unprecedented amount of environmental information, integrated into new data products benefiting societies and economies worldwide.

The Integrated Earth Observation System is a logical next step for the airborne science community. In 2004, discussion among airborne science platform operators began to focus on the lack of interoperability or commonality amongst the data systems on these platforms. Each platform has in fact its own legacy data system that tends to have its own hardware interfaces and its own software data formats. Advances in information technology simply made most of these interface-related issues unnecessary. New manned platforms like NCAR's G-5 HAIPER and numerous uninhabited vehicles were already driving the development of the next generation of data systems. For instruments that migrate across any of these platforms, the detrimental impact of repetitive platform-specific integration efforts was no longer considered an acceptable way of doing business.

The first meeting was held in Boulder, Colorado in January 2005, under the banner of a Multi-Agency Data Distribution Systems Working Group[‡]. The group drafted a charter and decided at that meeting to organize as the Interagency Working Group for Airborne Data and Telecommunications Systems (IWGADTS)[§], a working group under the auspices of the Interagency Coordinating Committee for Airborne Geosciences Research and Applications (ICCAGRA). ICCAGRA has worked for nearly a decade to improve cooperation, foster awareness, facilitate communication among sponsoring federal agencies having airborne platforms and instruments for research and applications, and has been a resource to senior level management on airborne geosciences issues.

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[‡] The need for moving forward with a meeting was first recognized and proposed by Andrew C. Roberts.

[§] Apparently we reserve all our acronym-crafting skills for the data systems we create.

## IWGADTS Charter

The working group addresses interagency cooperation issues as they pertain to the use of airborne platforms and instrument payloads for individual investigators as well as national and international field campaigns.

**Purpose and Functions**
The primary purpose of IWGADTS is to increase the effective utilization of the Federal airborne fleet in support of airborne geoscience research programs conducted by the individual agencies. Specifically, the IWGADTS will:

- 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

**Structure**
The IWGADTS will consist of representatives from the principal geosciences research aircraft sponsoring agencies, e.g., NASA, NOAA, NSF, DOE, DOI, and ONR. A Chairman and an Executive Secretary will be elected annually from the principal agencies.

**Meetings**
Committee meetings will be called by the Chairman, who will also approve the agenda. The Committee will meet at least quarterly for the first year and thereafter on a suitable schedule as decided by committee members, but no less than two times per year. Minutes of each meeting will be prepared by the Executive Secretary and distributed in a timely manner to all participants.

**Review**
The charter for this committee will be reviewed every three years, commencing February, 2005, in consideration for continuation.

**Termination**
A member may withdraw from the committee at anytime by giving written notice to the other charter members.

**Strategy**

IGWADTS has not formalized a strategy beyond what is conveyed via its charter, but from that charter the following strategy elements can be inferred:

1. Work toward a suborbital platform fleet that is an effective and sustainable component of the to-be-implemented Integrated Earth Observation System
2. *Interoperability occurs over networks*; important contributions emerge through software interfaces and protocols, not through the hardware systems that generate that information.
3. *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".

The term sensor web is used with some trepidation; there is no broadly accepted definition of what a sensor web is, and there are significant technical and programmatic funding gaps between today's operations and the visionary descriptions of intelligent, automated, realtime tasking of adaptive observation elements, sometimes by other observation elements. Regardless of the specific definition used, the envisioned Integrated Earth Observation System at least encapsulates airborne sensors as one or more suborbital sensor webs.

Our approach to managing progress is modest and pragmatic: focus on making it easier for sensor operators to get their instruments on various platforms, on making every flight hour more productive and more valuable. For mature sensors that cannot afford to adapt to newly introduced services, we adopt a "no instrument left behind" philosophy that eliminates the risk of current sensors becoming obsolete solely because of legacy data system interfaces. Instead, new data systems will be able to emulate old configurations for specific instruments/platform pairs. Thus, the data system developers will be able to manage the migration to the Integrated Earth Observation System without disrupting ongoing operations.

**Status and Plans**

The working group has only met twice since being accepted by ICCAGRA, so it's fair to say IWGADTS is still getting traction. Nevertheless, demonstrable progress is being made in the area of realtime data distribution. Specifically, the group has collaborated on the use of realtime situational awareness displays (Google Earth primarily) and on the definition of "standard packets" of commonly needed information. These standard packets could be used on multiple platforms to simplify data fusion in multi-platform operations and/or offer operators a packet of information that looks the same on different aircraft.

Equally important, the working group is investigating the use of XML-oriented schema for defining these packets and for other data exchange uses. XML-based schema offer standard ways to *describe* data being exchanged, ultimately paving the way for levels of

interoperability required for autonomous sensor webs. In the near term, however, we are targeting more modest goals of simply improving productivity. First use of the standardized data packets are planned for upcoming operations like NAMMA or TC-4, and in general the working group generally looks for opportunities to make progress with each multi-agency mission.

Finally, another planned activity is the implementation of a mechanism for the group to interact directly with the instrument PIs in order to build and maintain a more comprehensive and current list of platform customer needs.

## Concluding Comments

Integration does not happen by accident. An Interagency Working Group for Airborne Data and Telecommunication Systems has been established to seek out and leverage opportunities for the fleet of airborne science platforms to increase their value by becoming more interoperable with each other and by collaborating on the development of new tools, techniques, and services.

## References

[1] Final Report of the Commission on the Future of the United States Aerospace Industry, November, 2002. Available at URL http://www.ita.doc.gov/td/aerospace/aerospacecommission/-AeroCommissionFinalReport.pdf

[2] The Johannesburg Declaration on Sustainable Development and Plan of Implementation, World Summit on Sustainable Development, September 2002. Available at URL http://www.johannesburgsummit.org/.

[3] CENR/IWGEO. 2005. *Strategic Plan for the U.S. Integrated Earth Observation System,* National Science and Technology Council Committee on Environment and Natural Resources, Washington, DC. Available at URL http://usgeo.gov/docs/EOCStrategic_Plan.pdf