NASA Airborne Science Program

Joint Airborne Science Sensor Integration Working Group (JASSIWG)

Presentation to ICCAGRA

M. Gaunce
NASA Ames Earth Science Project Office

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Goals

Improve Science Investigator access to NASA Airborne Platforms by…

1. Coordinating NASA aircraft instrument integration requirements across Airborne Science platforms.

2. Increase information availability.
   - Instrument design.
   - More demand for aircraft.

3. Generating common data flows across centers.

4. Reducing or eliminating redundant or unnecessary integration requirements.

Background

- Study initiated by ASP Mgr in mid-FY07.
- Joint Airborne Science Sensor Integration Working Group (JASSIWG) formed.
  - 1st WG team mtg in Oct 07.
  - WG agreed on three initial products (Phase A).
- FY08 activity developed initial products, follow-on activities, and summary report.
- Review & concurrence of Phase A products currently underway.
- 2nd WG mtg late Jan/early Feb 09 at DFRC.

Study Platforms

Platform	Lead Center	POC	Phone
DC-8	DFRC	A. Webster	701-330-7090
ER-2	DFRC	M. Kapitzke	661-276-2575
Ikhana	DFRC	K. Howell	661-276-3654
G-III	DFRC	M. Holtz	661-276-3934
Global Hawk	DFRC	M. Graham	661-276-3202
WB-57	JSC	S. Baccus	281-244-9807
B-200	LaRC	R. Yasky	757-864-2251
P-3	WFF	M. Cropper	757-824-2140
Learjet 25	GRC	E. Emery	216-433-5694
S-3	GRC	E. Emery	“
Twin Otter (DHC-6)	GRC	E. Emery	“

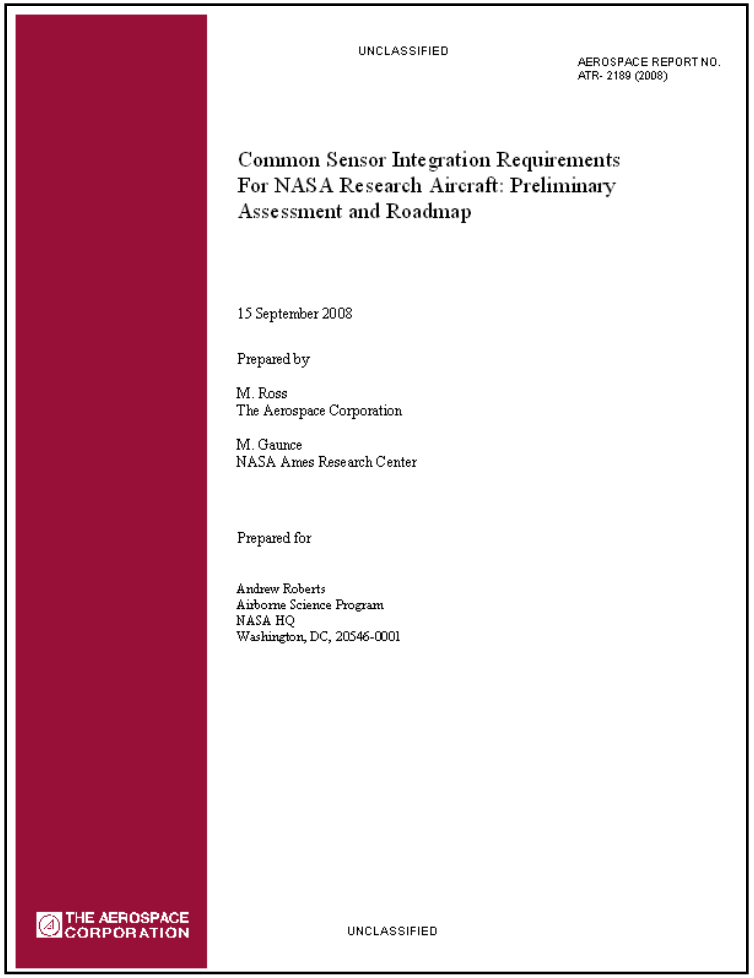
FY 08 Accomplishments

1. Working Group kick-off, charter, platforms, initial products.

2. Review of existing Experimenter Handbooks and PDPs.

3. Generated draft products.
   - Common Payload Data Package.
   - Platform Performance & Design Characteristics.
   - Standard Experimenter Handbook format.

4. Aerospace Technical Report.
   - Working review of draft report prior to issue.
   - Distribution to all stakeholders.



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AEROSPACE REPORT NO.
ATR- 2189 (2008)

Common Sensor Integration Requirements For NASA Research Aircraft: Preliminary Assessment and Roadmap

15 September 2008

Prepared by

M. Ross
The Aerospace Corporation

M. Gaunce
NASA Ames Research Center

Prepared for

Andrew Roberts
Airborne Science Program
NASA HQ
Washington, DC, 20546-0001

THE AEROSPACE CORPORATION

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Future Plans

- *FY09*
  - Complete and implement Phase A.
    - Community review and feedback of products.
    - Post/host documents on ASP web site.
  - Initiate Phase B.
    - Review and extract subsystem requirements by platform.
    - Review center engineering processes & reviews.
    - Assess based on desirability and LOE to make common (“benefit” analysis).
- *FY10*
  - Complete Phase B requirements assessment.
  - Initiate Phase C.
    - Develop common design requirements & guidelines document for NASA airborne science platforms.

Phase B Analysis Approach - Notional

Aircraft Design Requirements Assessment

- Extract requirements from platform Experimenter Handbooks and other center engineering documentation.
- “Bin” requirements into categories and store in database.
- Assessment Categories (this still needs work):
  - Requirement
  - Rationale
  - Heritage
  - Heritage Type
  - Subsystem Type
  - Commonality Ranking
- Preliminary cross-platform comparative and commonality “cost-benefit” analyses.

Phase B Analysis Approach - Notional

Aircraft Design Requirements Assessment

Study Platforms: DC-8, ER-2, G-3, Global Hawk, WB-57, P-3, B-200, S-3, Twin Otter, Learjet 25, and SIERRA.

Subsystem Type: Mechanical, Electrical, Thermal, Safety

Heritage Type:

1. Flight Safety
2. Industry Standard
3. Agency Standard
4. Center Standard
5. Best Practice/Lessons Learned/Common Sense

Commonality Ranking:

1. Unique to system, fundamental flight safety involved (not likely to be changes or modified).
2. Possible to change or standardize, but with ‘significant’ effort/resource.
3. Possible to change or standardize with reasonable or readily achievable effort/resource (low-hanging fruit).
4. Obsolete or superseded, should be deleted to changed to standard practice.
5. Standard practice, no change required.

Aircraft Design Requirements Assessment

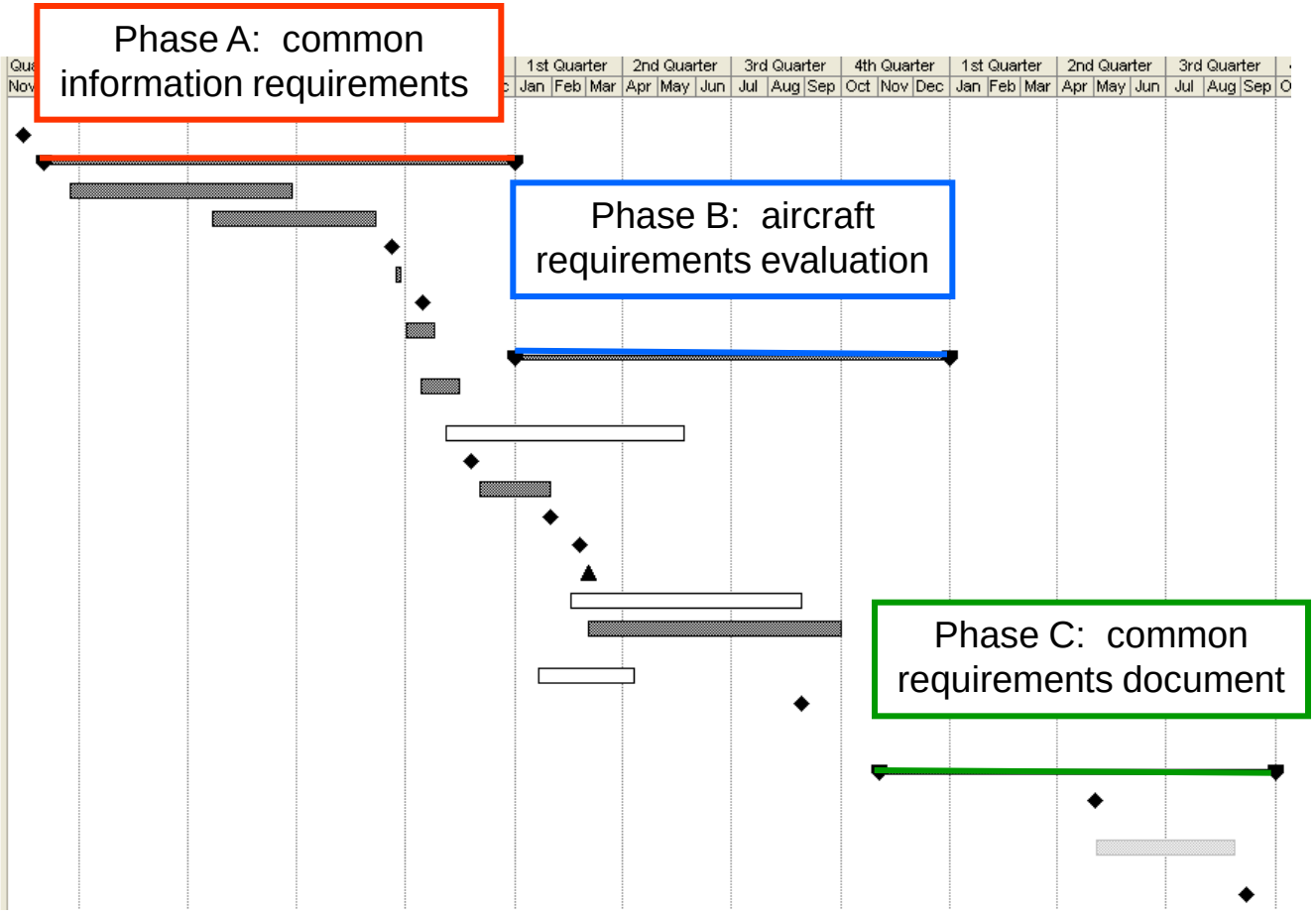
Example

Platform: WB-57						
Requirement	**Rationale**	**Heritage**	**Heritage Type**	**Subsystem/Type**	**Commonality Ranking**	**Comments**
Minimum Factor of Safety of 1.5 between design loads and documented material ultimate strength.	Standard engineering practice for aerospace flight hardware systems.	Long-standing requirement (50+ years); currently mandated by the FAA for aircraft design limits.	Industry Standard	Mechanical	5	

Back-up Charts

Overall JASSIWG Plan

	Task Name	Start	Finish
1	Start	Mon 10/1/07	Mon 10/1/07
2	WG Meeting	Thu 11/15/07	Thu 11/15/07
3	Phase A	Mon 12/3/07	Wed 12/31/08
4	Phase A Data Collection	Mon 12/24/07	Fri 6/27/08
5	Analysis	Mon 4/21/08	Fri 9/5/08
6	Draft Report to WG	Fri 9/19/08	Fri 9/19/08
7	WG Initial Reviews	Mon 9/22/08	Fri 9/26/08
8	Publish Report	Wed 10/15/08	Wed 10/15/08
9	Stakeholder Reviews	Wed 10/1/08	Fri 10/24/08
10	Phase B	Thu 1/1/09	Thu 12/31/09
11	Synthesis of Stakeholder Reviews	Mon 10/13/08	Fri 11/14/08
12	Phase B Data Collection	Mon 11/3/08	Fri 5/22/09
13	Revised Documents to WG	Mon 11/24/08	Mon 11/24/08
14	JASSIWG Webpage Dev	Mon 12/1/08	Fri 1/30/09
15	WG Concurrence Meeting	Fri 1/30/09	Fri 1/30/09
16	JASSIWG Webpage Deploy	Mon 2/23/09	Mon 2/23/09
17	New Documentation Adopt	Mon 3/2/09	Mon 3/2/09
18	Phase B Analysis	Mon 2/16/09	Fri 8/28/09
19	Phase A Monitor and Maintenance	Mon 3/2/09	Wed 9/30/09
20	Center Visits	Mon 1/19/09	Fri 4/10/09
21	Draft Report: Phase A Implementation Status and Preliminary Phase B	Fri 8/28/09	Fri 8/28/09
22	Phase C	Mon 11/2/09	Thu 9/30/10
23	Issue Draft Common Design Requirements	Mon 5/3/10	Mon 5/3/10
24	Common Design Requirements	Mon 5/3/10	Fri 8/27/10
25	Issue Final Documentation	Mon 9/6/10	Mon 9/6/10



Common Payload Data Package

Phase A Product 1

1. Incorporates information needs sufficient to satisfy experiment requirements of all platforms (union of all data requirements).

2. One document that PI can carry platform to platform and will serve needs of all platform engineering / integration.

3. Common PDP information is union of needs for all platforms.

4. Does not modify any platform requirements!

5. Produced by PIs, for Centers, using HTML-based application.

6. Input, review, and concurrence from platforms and PIs.

Platform Performance & Design Characteristics

Phase A Product 2

Platform: DC-8				
Parameter	***Value***	***Units***	***Notes***	***Comments***
Aircraft Performance				
Altitude	41,000	ft	Max	
	33,000 - 41,000	ft	Cruise	
	1000-41,000	ft	Operational range	Can go as low as 500 ft over very flat terrain or 300 ft over large expanses of water.
Cruise Speed	450	kts	TAS	Range from 220-500.
Rate of Climb		ft/sec		
Duration	10	h		12 h max
Range	5400	nm		R/T
Turn Radius	8.1	nm	20 deg bank, 450 KTAS	Range from 2-34 nm.
Loiter Time	-	h		
Minimum Runway Length	8000	ft	at sea level	
Duty Day	14	h		
Payload Physical Characteristics				
Payload Weight (total)	30,000	lbs		40000 maximum, 35,000 with max fuel load.
Payload Volume		ft3		
Payload Dimensions		in	Max length, width, height	
Compartment Max Payload/Description				
Main Cabin		lbs		Multiple payload racks. (List max wt. per rack?)
Cargo Compartment		lbs		
Wing Pylons	200	lbs	2 at 100 lbs ea	
Payload Electrical Characteristics				
Available Power Types/Forms/Options	115	V, 400 Hz, 1 or 3-phase		Total of 30 pwr stations available. 28 VDC and 220 VAC available on request. 400 Hz recommended for experiment use.
	115	V, 60 Hz, 1 phase		
Max Sensor Power	20	Amps	115 VAC, 60 Hz.	
	20	Amps	per phase, 115 VAC, 400 Hz.	
Total Aircraft Power	80	kVA	40 for 400 Hz and 40 for 60 Hz.	

Standard Experimenter Handbook

Phase A Product 3

1.0 Introduction

2.0 Aircraft Description

3.0 Payload Accommodations

4.0 Environment

5.0 Communications, Navigation, and Data Acquisition

6.0 Payload Design Planning, Engineering, and Integration Processes

7.0 Payload Design and Construction Requirements

8.0 Aircraft – Payload Interfaces

9.0 Flight Operations

10.0 Ground Operations

Appendices