National Aeronautics and Space Administration

NASA

EXPLORE EARTH

Outbrief from Fall 2023 Meeting of the Interagency Coordinating Committee for Airborne Geophysical Research and Applications (ICCAGRA)

Matt Fladeland, NASA SMD Airborne Science Program
- Committee Chair

Briefing to SCOAR
November 1, 2023

ICCAGRA Charter

- Established to improve cooperation, foster awareness, facilitate communication among sponsoring agencies having airborne platforms and instruments, and serve as a resource to senior level management on airborne issues.
- Primary purpose is to increase the effective utilization of the Federal airborne fleet.
- Purpose and Functions
  - Identify interagency needs and exchange research program schedules
  - Improve coordination
  - Identify airborne requirements of participating agencies
  - Create opportunities for interagency sharing of aircraft, instruments and data
  - Provide expertise about airborne science issues to decision makers

ICCAGRA Fall 2023 Meeting
NASA Langely Research Center
Oct 14-15

Participants:

In person:

NASA – Bruce Tagg, Derek Rutovic, Matt Fladeland
NOAA AOC – Nick Underwood (tentative)
USGS – Matt Burgess, Lance Brady, Tom Cecere
NRL – Nic Peter
NEON/NSF – Nick Marusich
DOE - Jason Tomlinson
USFS - Jeremiah Henry, Zachary Holder
USCG – Zachary Speck

Virtual via Teams

DOI – Brad Koeckeritz, Keith Raley,
Cherokee Nation – JC Coffey
USFS – Everett Hinkley, Chris Bolz
US Navy – Stephen Rorke, Luis Levine
NSF – Nick Anderson, John Breitenbach
DIU - Klay Bendle
NOAA UXS – Mark Rogers
USAF – Amanda Nelson

ICCAGRA Platform Survey

ASP-funded aircraft

Platform Name	Operator	Duration (hou	Useful Payloa	GTOW (lbs.)	Max Altitude	Air Speed (kn	Range (Nmi)	V
DC-8 - AFRC	NASA AFRC	12.00	50,000	350,000	42,000 ft.	460	5,400	I
ER-2 - AFRC	NASA AFRC	12.00	2,900	40,000	70,000 ft	410	5,000	I
Gulfstream C-20A (GIII) - AFRC	NASA AFRC	7.00	2,500	69,700	45,000	460	3,400	I
Gulfstream III - LaRC	NASA LaRC	7.50	2,610	69,700	45000	459	3,767	I
Gulfstream V - JSC	NASA JSC	13.00	8,000	91,000	51000	500	5,500	I
P-3 Orion - WFF	NASA WFF	10.00	18,000	135,000	30,000 feet (1	300	3,500	I
WB-57 - JSC	NASA JSC	6.50	8,800	72,000	60,000 ft and	410	2,500	I

Other NASA Science A/C

Platform Name	Center	Duration (hou	Useful Payloa	GTOW (lbs.)	Max Altitude	Air Speed (kn	Range (Nmi)	V
B200 - LARC	NASA LaRC	6.20	4,100	13,500	35000 ft	260	1,250	I
B200 (#801) - AFRC	NASA AFRC	6.00	1,850	13,420	35,000 ft. MS	280	1,300	I
C-130H - WFF	NASA WFF	11.00	36,000	155,000	33,000 feet (1	320	3,200	I
Cirrus Design SR22 - LaRC	NASA LaRC	6.10	932	3,400	17,500 ft (lim	175	970	I
Gulfstream III - JSC	NASA JSC	6.00	2,610	69,700	45,000	460	3,650	I
Gulfstream IV - LaRC	NASA LaRC	7.50	5,610	73,200	45000	459	5,130	I
SIERRA - ARC	NASA ARC	9.00	110	480	13,000 ft.	60	520	I
Viking-400	NASA ARC	11.00	100	520	15000	60	600	I

Day 1

Tuesday, October 24th, 2023 (All times EDT)

8:30AM – Coffee/Breakfast (B2102 cafe)
9:00AM – Roll call, introductions, and review of previous minutes
9:20AM – NASA Airborne Science Program Briefing –Derek Rutovic
9:50AM – Naval Research Lab VXS-1 - Nic Peter
10:20AM – Break
10:30AM – NOAA Aircraft Operations Center – Nick Underwood
11:00AM – NOAA UXS – Mark Rogers
11:30AM - Department of Interior – Keith Raley
12:00PM – Lunch
1:00PM – USGS – Brad Koeckeritz and Lance Brady
1:30PM – USFS – Zach Holder, Jeremiah Henry
2:00PM – Break
2:30PM – DOE/PNNL – Jason Tomlinson
3:00PM – Business Jet requirements discussion – Rutovic/Fladeland
3:30PM – HAPS update - Fladeland
4:00PM - General Discussion
5:00PM – Adjourn
6:00PM – Happy Hour (TBD)

Day 2

Wednesday, October 25th, 2023 (All times EDT)

- 9:00AM – EUFAR - Thomas Ruhtz
- 9:30AM – NSF - Nick Anderson, Pavel Romashkin
- 10:00AM – NEON/NSF – Nick Marusich
- 10:30AM – Break
- 11:00AM – USCG – Zach Speck
- 11:30AM – Review of Actions/ Discussions
- 12:00PM – Lunch
- 1:00PM - Test & Evaluation Simulator (TES) for Lunar Landing simulation – Artemis Spacecraft Handling Qualities Simulation (POC: Victoria Chung, RSD/SDAB)
- 1:45PM - B1244/Hangar
  - LOFTID (POC: Richard Bodkin, ED/MSB)
  - UAS Lab (POC: Jenn Fowler, RSD UASB)
  - B777, B200, GIV (POC: Glenn Jamison, RSD Director)
- 4:00- Adjourn

VXS-1 Warlocks

Who We Are

Scientific Development Squadron ONE is the premier science and technology (S&T) research squadron for the Department of Defense providing light, medium, and heavy lift aircraft for the Naval Research and Development Enterprise including the Office of Naval Research (ONR), the Naval Research Laboratory (NRL), Naval Air Systems Command (NAVAIR), and many other governmental and non-governmental agencies to conduct airborne research towards the technological advancement of leading edge capabilities for the future of the United States

What We Do

- Provide a pathway for early prototyping, experimentation and demonstration of technological enhancements that can directly improve and effect existing capabilities to support Maritime superiority for the Navy after Next

✓ Operate and maintain uniquely configured aircraft for airborne S&T Research
✓ Assist research projects in the design and installation of S&T systems in our aircraft
✓ Coordinate Interim Flight Clearances (IFC) and airspace requirements for project execution
✓ Conduct world-wide detachments when needed for S&T to rapidly demonstrate technological enhancements.

VXS-1 Aircraft

NP-3C (2)

RC-12M (1)

UV-18 Twin Otter (1)

Aircraft Reporting Custodian Duties

Tiger Shark UAS (10)

POC: Nic Peters

Current NOAA AOC Fleet

Two WP-3D Orions

One Gulfstream IV

Four DHC-6 Twin Otters

Two BE350 King Airs

POC: Nick Underwood

NOAA AOC Aircraft Acquisitions

- N65RF King Air BE300
  - December 2023
- Two Gulfstream G550s
  - Jan 2025, 2026
- Twin Otter
  - ~2025
- X C-130s
  - ~2028

POC: Nick Underwood

DOE ARM Aerial Facility at Pacific Northwest National Laboratory

- Platforms
  - Bombardier Challenger 850 Regional Jet
  - ArcticShark Group 3 UAS
  - Tiger Shark Group 3 UAS

POC: Beat Schmidt/Jason Tomlinison

NSF/NCAR C-130

- Owned by NSF, operated by NCAR
- C-130 Hercules (EC-130Q)
- Placed in service by the US Navy in 1984, NCAR in 1992
- Life Cycle likely into the 2040s
- Capabilities:
  - 27,000-foot altitude ceiling
  - 10-hour flight endurance
  - 2,900 nautical mile range
  - 13,000 lb payload capacity

NSF/NCAR Gulfstream V (GV)

- Owned by NSF, operated by NCAR
- Gulfstream V
- Placed in service by NCAR in 2005
- Life Cycle likely into the 2040s
- Capabilities:
  - 49,000-foot altitude ceiling
  - 7,000 nautical mile range
  - 5,600 lb payload capacity

University of Wyoming King Air

- Owned by the state of Wyoming, operated by the University of Wyoming under a Cooperative Agreement with NSF
- King Air 350 (Replacing the 50-year old King Air 200T)
- Intended to be placed in service in 2024
- Capabilities:
  - 33,000 to 35,000-foot ceiling
  - ~4 hour duration
  - 2100 nm 1-way range
  - 3,100 lb payload capacity

NOAA Uncrewed Aircraft

APH-17		Aerial Imaging Solutions	Size: 17 inch diameter Max Flight Time: 30 minutes Max Payload: 11 lbs
APH-22		Aerial Imaging Solutions	Size: 22 inch diameter Max Flight Time: 35 minutes Max Payload: 2 lbs
APH-28		Aerial Imaging Solutions	Size: 28 inch diameter Max Flight Time: 40 minutes Max Payload: 5 lbs (3 batteries), 6 lbs (2 batteries)
APO-42		Aerial Imaging Solutions	Size: 42 inches Max Flight Time: 40 minutes Max Payload: 4 lbs (2 batteries), 7 lbs (4 batteries)
MD4-1000		Microdrones GMBH	Size: 42 inch diameter Max Flight Time: 20-45 minutes Max Payload: 2.7-11 lbs
Skydio 2		Skydio	Size: 13.5 inch diameter Max Flight Time: 23 minutes Max Payload: Integrated Camera
Skydio X2		Skydio	Size: 26.1 x 22.4 x 8.3 inches Max Flight Time: 35 minutes Max Payload: Camera
DJI S1000		DJI	Size: 28 inch diameter Max Flight Time: 15 minutes Max Payload: 21 lbs
DJI Phantom 4		DJI	Size: 13.7 inch diagnal Max Flight Time: 30 minutes Max Payload: Takeoff weight of 3 lbs
DJI Mavic Pro		DJI	Size: 13.1 inch diagnal Max Flight Time: 27 minutes Max Payload: Takeoff weight of 1.64 lbs
DJI Matrice 210		DJI	Size: 25.3 inch diameter Max Flight Time: 34 minutes Max Payload: 2.95 lbs standard, 2.7 lbs RTK

DJI Matrice 300		DJI	Size: 31.9 x 26.4 x 16.9 inches Max Flight Time: 55 minutes Max Payload: 2.7 kg
DJI Matrice 600		DJI	Size: 44.6 inch diameter Max Flight Time: 35 minutes Max Payload: 13.2 lbs
Solo		3DR	Size: 16.5 inch diagonal Max Flight Time: 25 minutes Max Payload: 1 lb
Anafi USA		Parrot	Size: 8.5 inch diagonal Max Flight Time: 32 minutes Max Payload: Integrated Camera
Anafi USA GOV		Parrot	Size: 8.5 inch diagonal Max Flight Time: 32 minutes Max Payload: Integrated Camera
Meteodrone SSE		Meteomatics	Size: 15.9 inch diameter Max Flight Time: 17 minutes Max Payload: No payload
MM-641		Meteomatics	Size: 18.9 inch diameter Max Flight Time: 30 minutes Max Payload: Max take-off weight 2.23 lbs
Splashdrone 3		Swell Pro	Size: 18 inch diameter Max Flight Time: 20-23 minutes Max Payload: 2.2 lbs
EVO II		Autel	Size: 15.6 inch diameter Max Flight Time: 38 minutes Max Payload: Max take-off weight 4.4 lbs
H520G		Yuneec	Size: 20.5 inch diameter Max Flight Time: 28 minutes Max Payload: Max take-off weight 5.8lbs
Range Pro X8P		Terraview	Size: 30.7 inch diagonal Max Flight Time: 70 minutes Max Payload: 2.2 lbs
Coptersonde		University of Oklahoma	Size: 400mm x 393mm x 145mm Max Flight Time: 18.5 minutes Max Payload: 1kg

eBee		SenseFly	Size: 38 inch wing span Max Flight Time: 40 minutes Max Payload: Max takeoff weight 1.6 lbs
Puma AE		AeroVironment	Size: 9.2 ft wing span Max Flight Time: 3.5 hours Max Payload: Takeoff weight 13.5 lbs
S2		Black Swift	Size: 10 ft wing span Max Flight Time: 90 minutes Max Payload: 5 lbs
S1		Black Swift	Size: 5.5 ft wing span Max Flight Time: 90 minutes Max Payload: 5.5 lbs
			HYBRID
FireFly 6 Pro		Birds Eye View Aerobotics	Size: 5 ft wing span Max Flight Time: 59 minutes Max Payload: 1.5 lbs
Trinity F90+		Quantum Systems	Size: 7.85 ft wing span Max Flight Time: 60 minutes Max Payload: 1.54 lbs
Edge		Flightwave	Size: 51 inch wing span Max Flight Time: 125 minutes Max Payload: Max takeoff weight 2.45 lbs
FVR-55		L3 Harris	Size: 13 ft wing span Max Flight Time: 4-5 hours/Final state: 10 hours Max Payload: 10 lbs
WingtraONE		Wingtra	Size: 54 x 26 x 9 inch w/4.1 ft wing dimension Max Flight Time: 59 minutes Max Payload: Sensor

POC: Mark Rogers

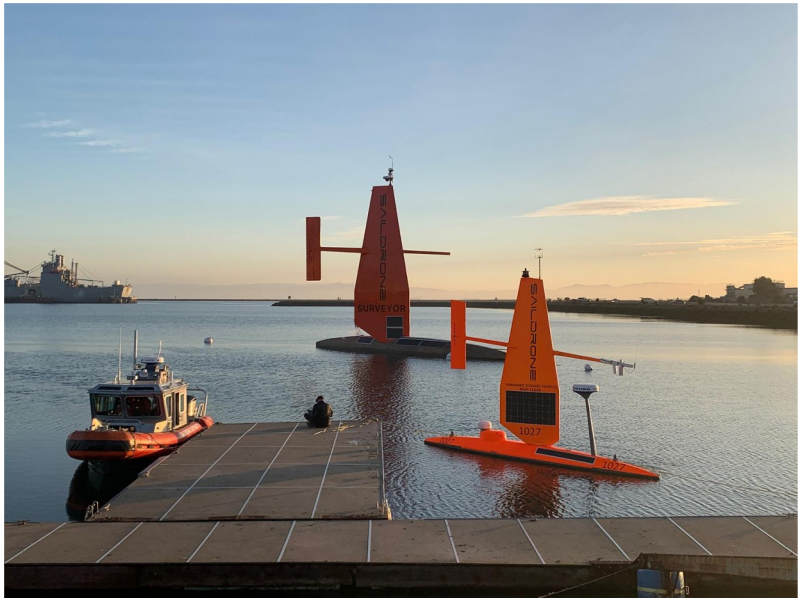
NOAA use of PMEL FVR-55 / FVR 90

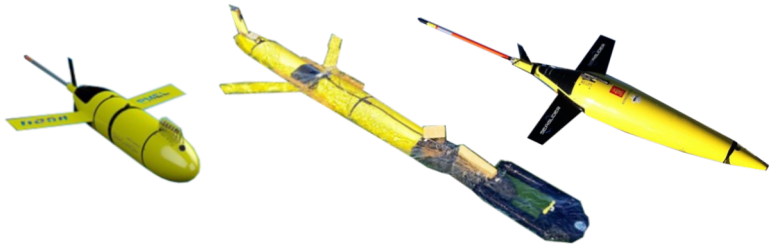
SPECIFICATIONS	
Functional	
Endurance	Up to 10 hrs (payload dependent)
Maximum Dash Speed	65 knots (120 km/hr)
Launch and Recovery	VTOL capable from land or boat in ≥ 20 ft x 20 ft area (6m x 6m)
Datalink	Bridged IP and RS-232
Primary Datalink Range	100+ km
Primary Datalink Latency	<500 ms
Datalink Security	AES 256
Primary and Secondary Data Links	
Payload modularity via front bulkhead Universal Interface	
Payload Capacity	Up to 10 lb (4.5 kg)
Main Payload Voltage	12 VDC
Payload Power	200 W
Mechanical provision for dedicated payload GPS antenna	
Fuel Consumption Monitoring	Within 5% accuracy
No critical data stored onboard aircraft	
Loss-of-Link Capability	Autonomous return to base, loiter, and landing
Total Number of Personnel to Operate	2
Time to Deploy (Shipment to Launch)	< 1 hour
Pre-Flight/Post-Flight	30 minutes

SPECIFICATIONS		
General Characteristics		
Length	98 in	(2.5 m)
Wingspan	185 in	(4.7 m)
Height	26 in	(0.66 m)
Empty Weight	70 lbs	(31.75 kg)
Gross Weight	120 lbs	(54.4 kg)
Max Nose Payload	22 lbs	(10 kg)
Power Plant	P4F B100i horizontally opposed 2-stroke	
Maximum Speed	65 kts	
Cruise Speed	50 kts	
Minimum Speed	38 kts	

UMS

Stand alone in-situ / Force multiplier





USGS – Current UAS Platforms


DJI Matrice M600 Pro


Watts Prism Sky

WingtraOne Gen II


3DR Solo


Skydio X2D


DJI Mavic Pro

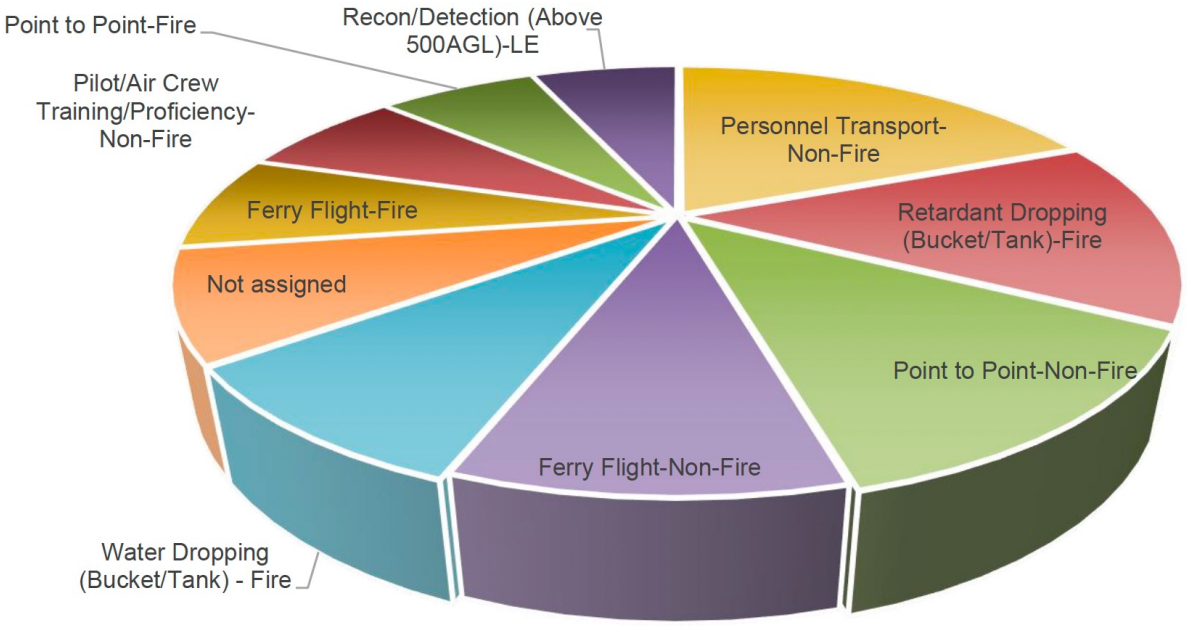
USGS UAS Inventory (September 2023)

DJI Matrice M600 Pro ……..... 23
BirdsEyeView FireFly 6 Pro ..…… 8
3DR Solo ……..……..…….. 114
DJI Mavic Pro ……..…… 27
Parrot Anafi ……..…….. 23
Parrot Anafi USA (Blue)……..…….. 1
Skydio X2D (Blue)…….…..…….. 2
Vantage Vesper (Blue)……..……1
Pulse Vapor ……..……..1
Wingtra One Gen II……..8
Watts Prism Sky……..1

Total UAS @ USGS ……..…….. 209

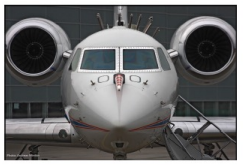
POC: Lance Brady

FY23 FLIGHT USAGE STATISTICS – Breakdown by Top 10 Mission Codes



Total Missions
15,439

ANNUAL FLIGHT USAGE STATISTICS



What is EUFAR?

- EUFAR is the European Facility for Airborne Research in Environmental and Geosciences
- AISBL (International non profit Organization) since 2018
- EUFAR links the operators of research aircraft and their instrumentation, scientific users and funding agencies
- EUFAR aims to enhance collaboration, spread best practice, promote efficiency and enhance user access to both the facilities and their data
- EUFAR website www.eufar.net provides a central information portal

Look Ahead

NOAA

- Hurricane Season (WP-3D, G-IV, June - November)
- Gravity for the Redefinition of the American Vertical Datum [GRAV-D] (WP-3D, November)
- Atmospheric River Reconnaissance (G-IV, December - February)
- Emerging Technologies / UAS Testing (WP-3D, March)
- Snow Survey, Marine Mammals, Coastal Mapping (Light Aircraft, Ongoing)

NSF OUTLOOK

2024 – 2025 Schedule of Activities

C-130:

- CAESAR (Feb-Apr 2024)
- APAR Testing (July-Aug 2024)
- Heavy Check (Dec 2024 – Apr 2025)
- GOTHAAM (July-Aug 2025)
- APAR First Panel Installation (Oct-Dec 2025)

GV:

- ACES-Eclipse (Apr 2024)
- MAIR-E (Jun-Jul 2024)
- Requested project (Oct-Nov 2024)
- CGWaveS (May-Jun 2025)
- Requested Project (Aug-Oct 2025)

King Air:

- Requested Project (Winter 2024-2025)
- SLC-SOS (Summer 2025)

Matthew M. Fladeland

- **Airborne Science Manager** at NASA Ames Research Center
- Chair, ICCAGRA

- **Subtopic Manager and COR** for NASA SBIR projects including Vanilla 001, BlackSwift S2, Swift HAPS, and Electra HAPS

Past projects:

- **Principle Investigator** for NASA SIERRA-A UAS

- **Co-Principle Investigator** for NASA Dragon Eye