NASA Global Hawk
Project Overview and Future Plans

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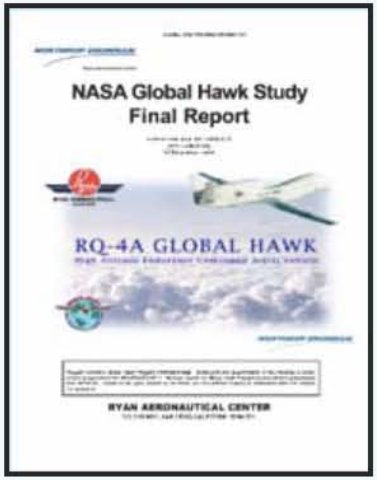
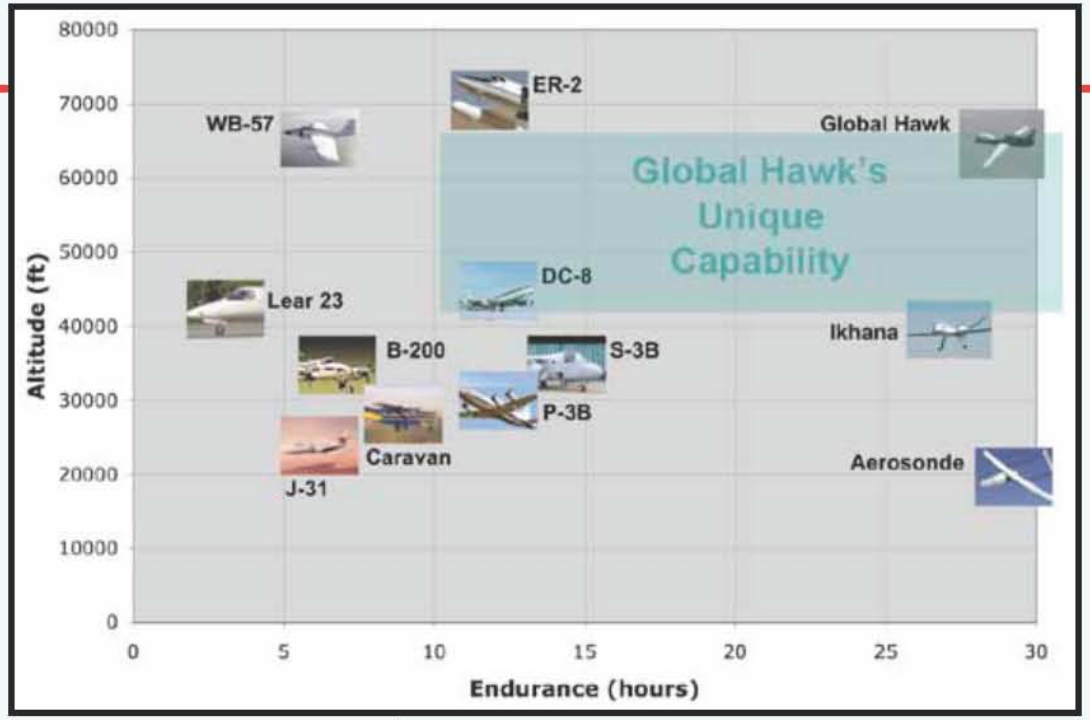
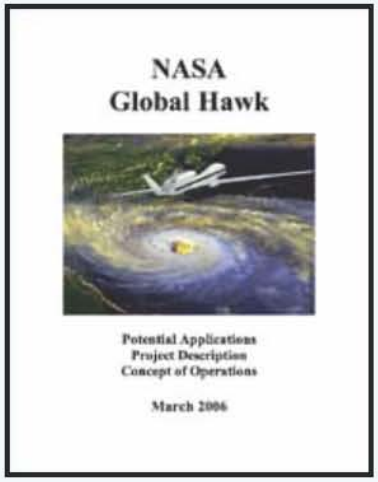
Presentation Content

- Why is NASA operating Global Hawks?
- Where is NASA Global Hawk located?
- How did this project get off the ground?
- What is needed to operate Global Hawk?
- How are payloads Integrated?
- What has been accomplished to date?
- What are the future plans?

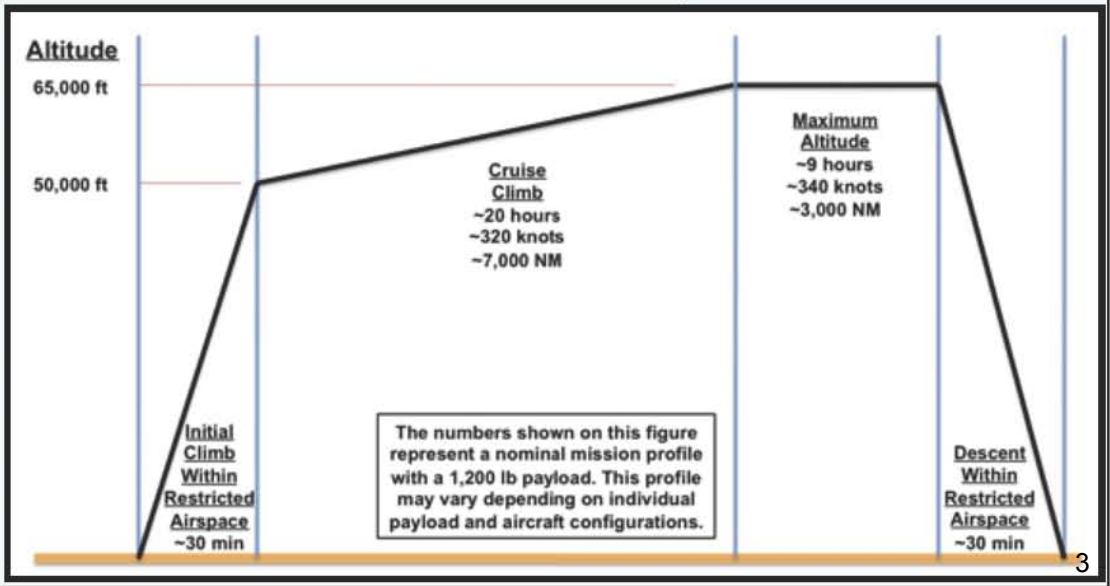
Why Global Hawk For NASA?



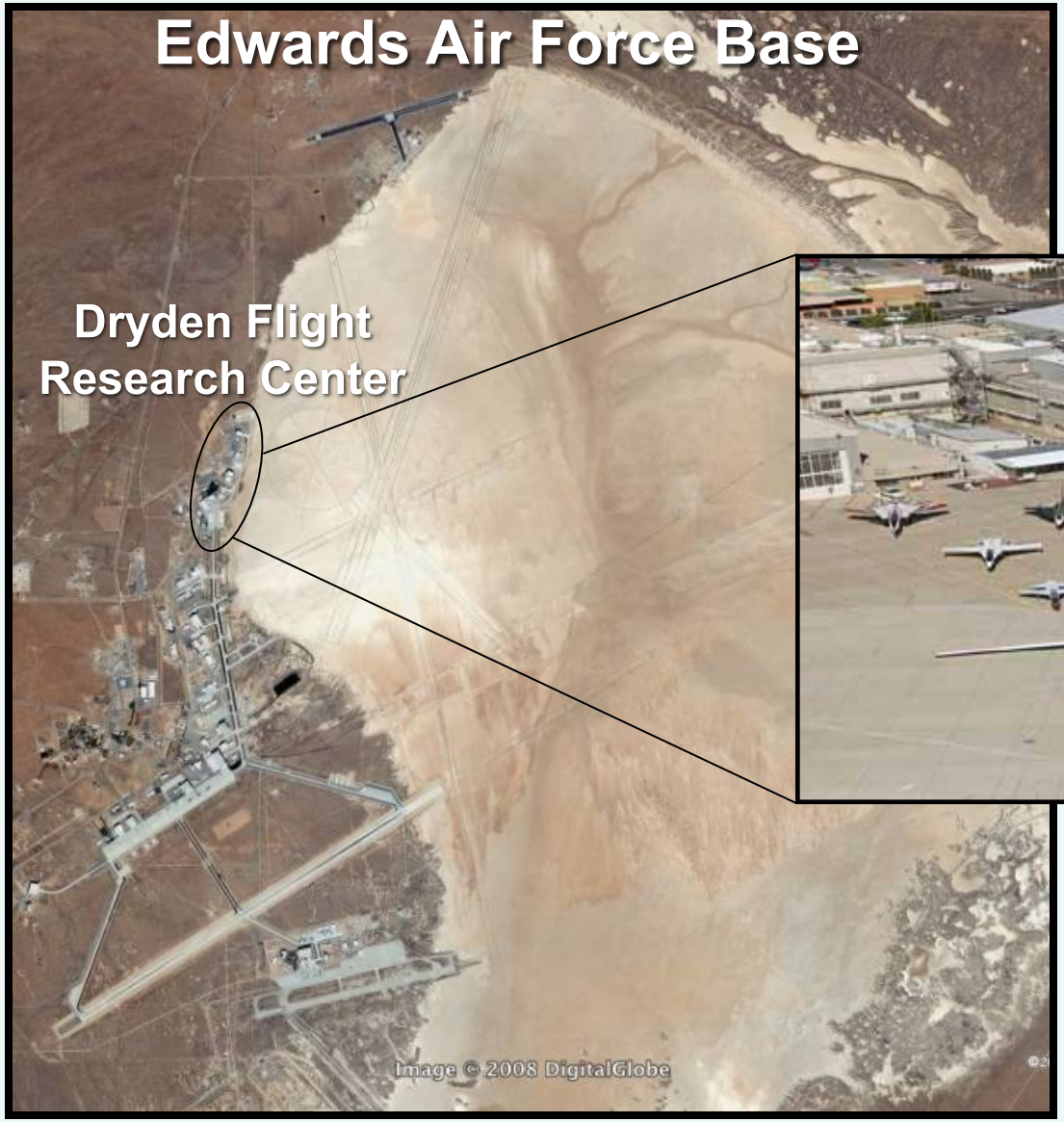




Endurance	> 30 hours
Range	>10,000 nmi
Service Ceiling	65,000 ft
Airspeed (55K+ ft)	335 KTAS
Payload	1,000-1,500 lb
Take-off Weight	26,750 lb
Length	44 ft
Wingspan	116 ft



Edwards Air Force Base and NASA Dryden Flight Research Center



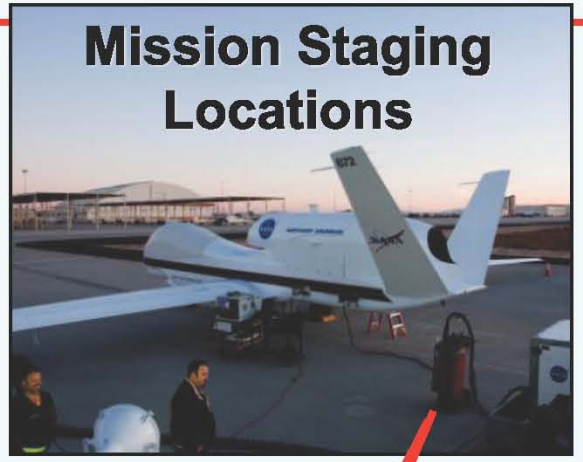
NASA Dryden Aircraft Fleet

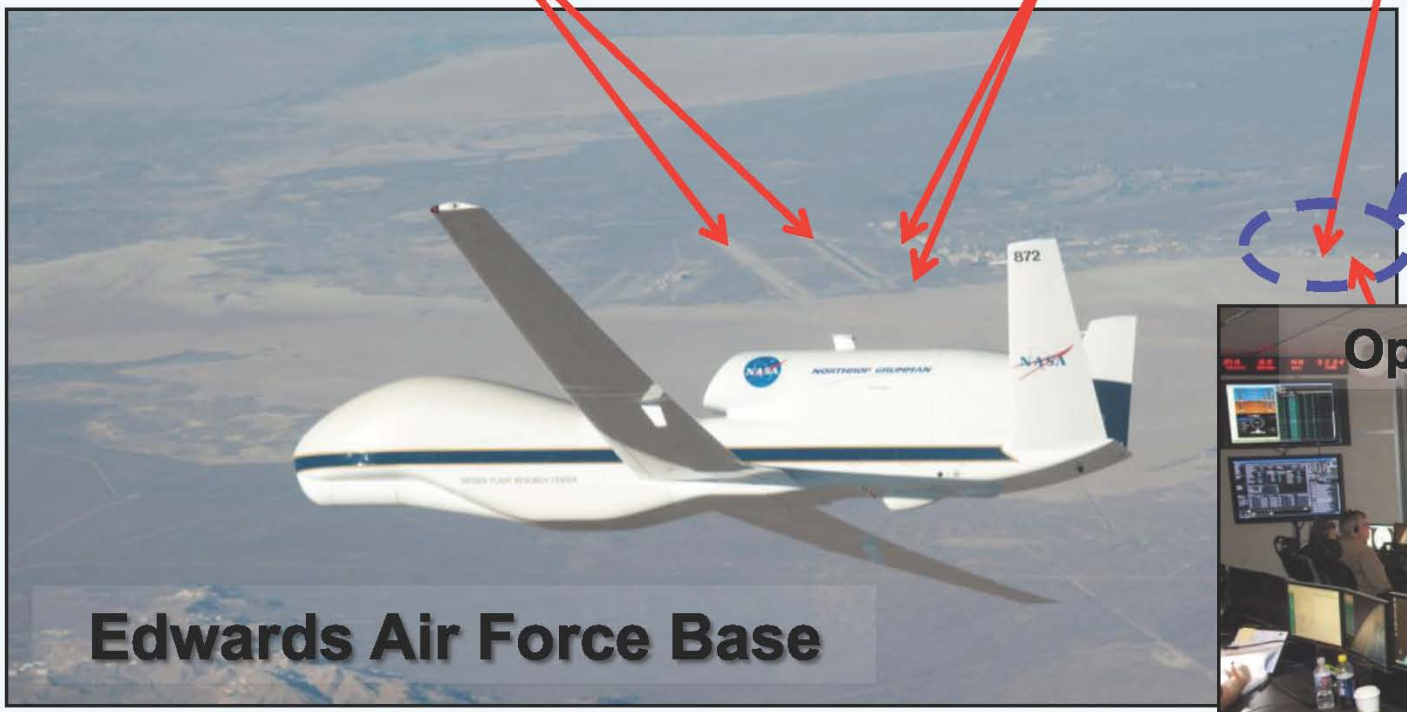
Edwards and Dryden are ~75 miles north of Los Angeles

Establishment of the NASA Global Hawk Project

- Two USAF Pre-Production Global Hawk aircraft (ACTD) were transferred to NASA in September 2007.
- A 5 year Global Hawk partnership was established in 2008 between NASA and Northrop Grumman.
- Each partner provides 50% of the start-up and yearly investment and receives 50% of the access to the aircraft.
- The Airborne Science Program of the NASA Science Mission Directorate provides the NASA funding.
- A combined NASA/Northrop Grumman team is maintaining, modifying, and operating these 2 aircraft.

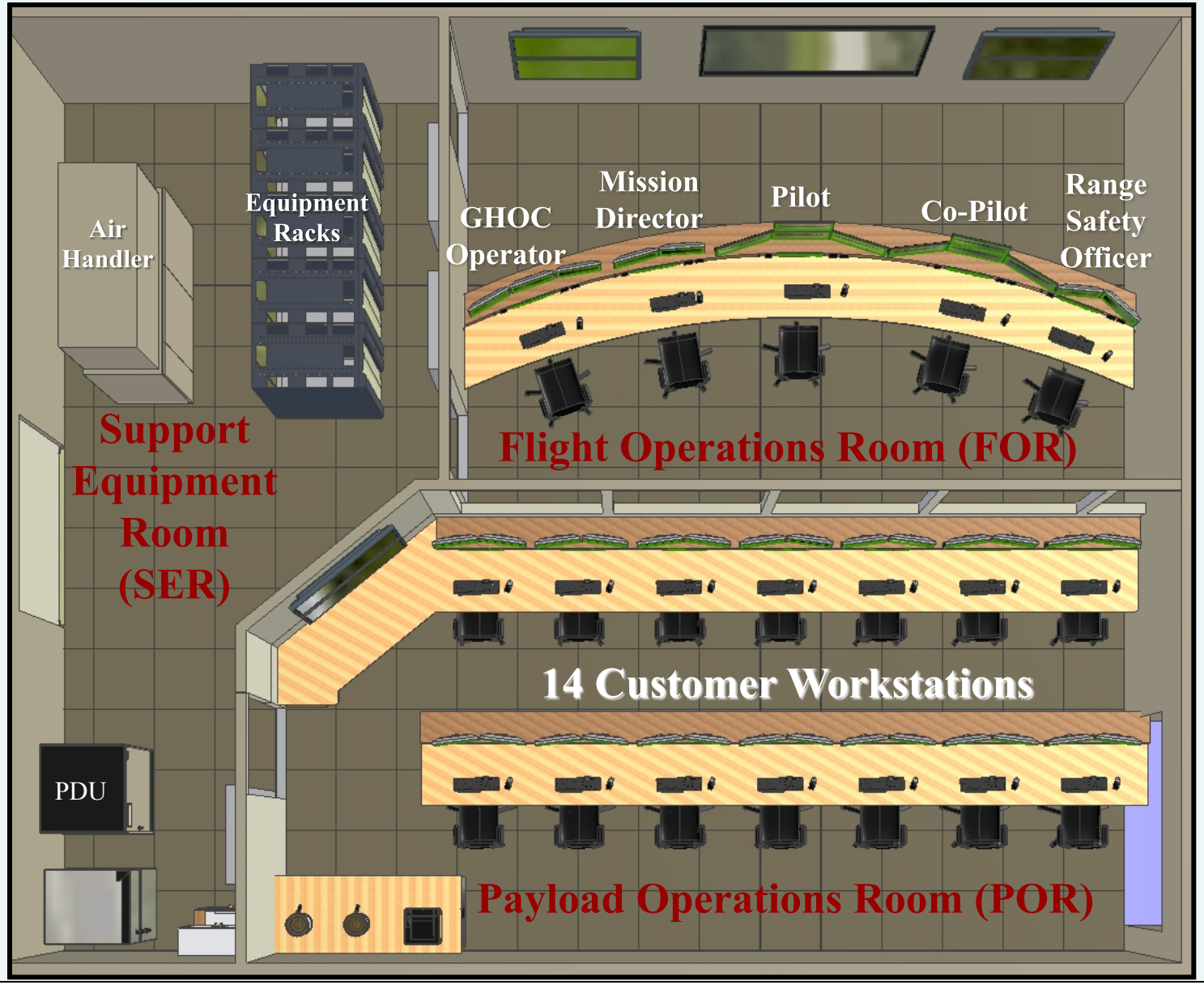
NASA Global Hawk Operations Overview





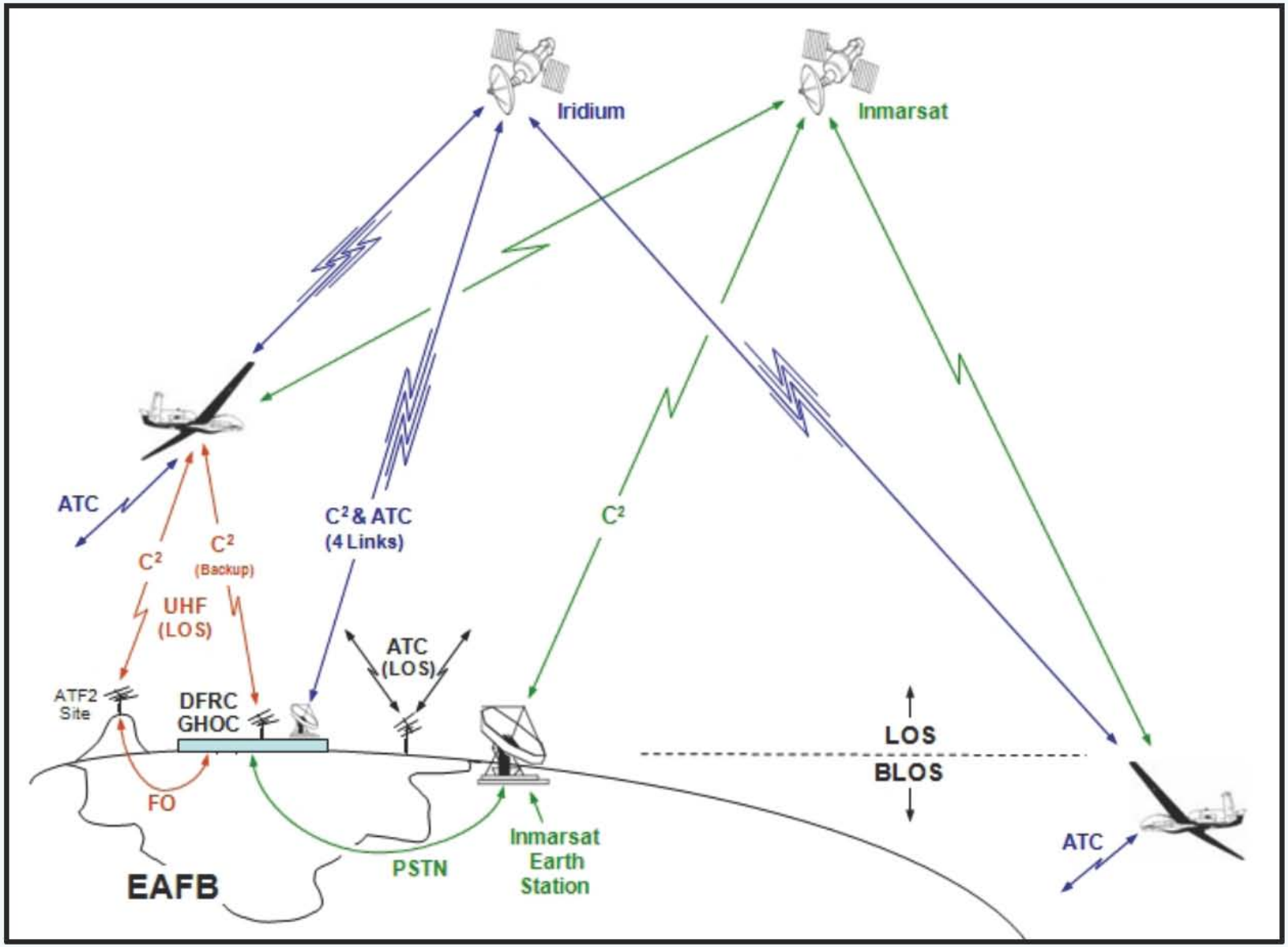
NASA Dryden Flight Research Center

Global Hawk Operations Center (GHOC), Located at DFRC

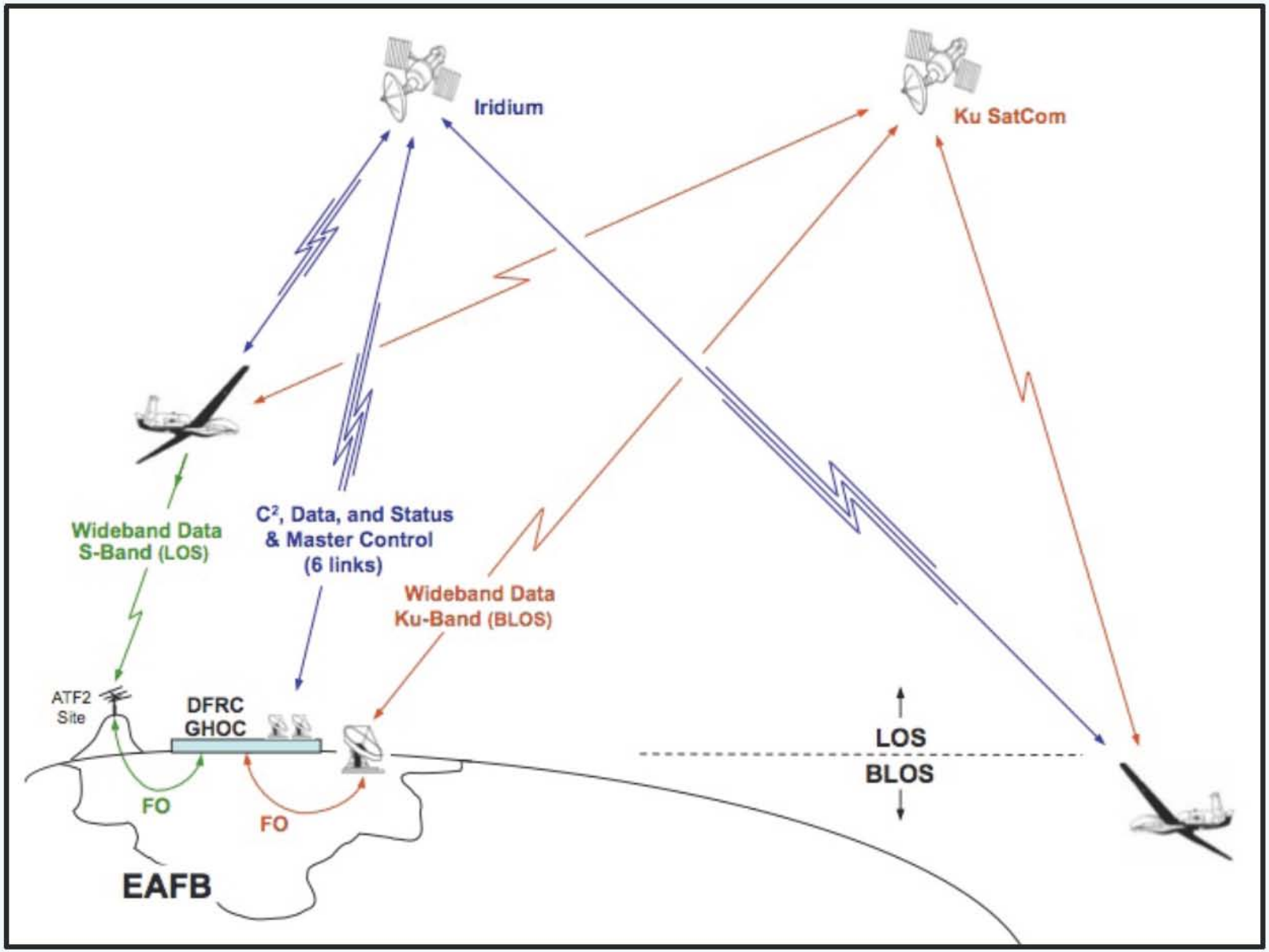


GHOC Fully Staffed During a Hurricane Mission

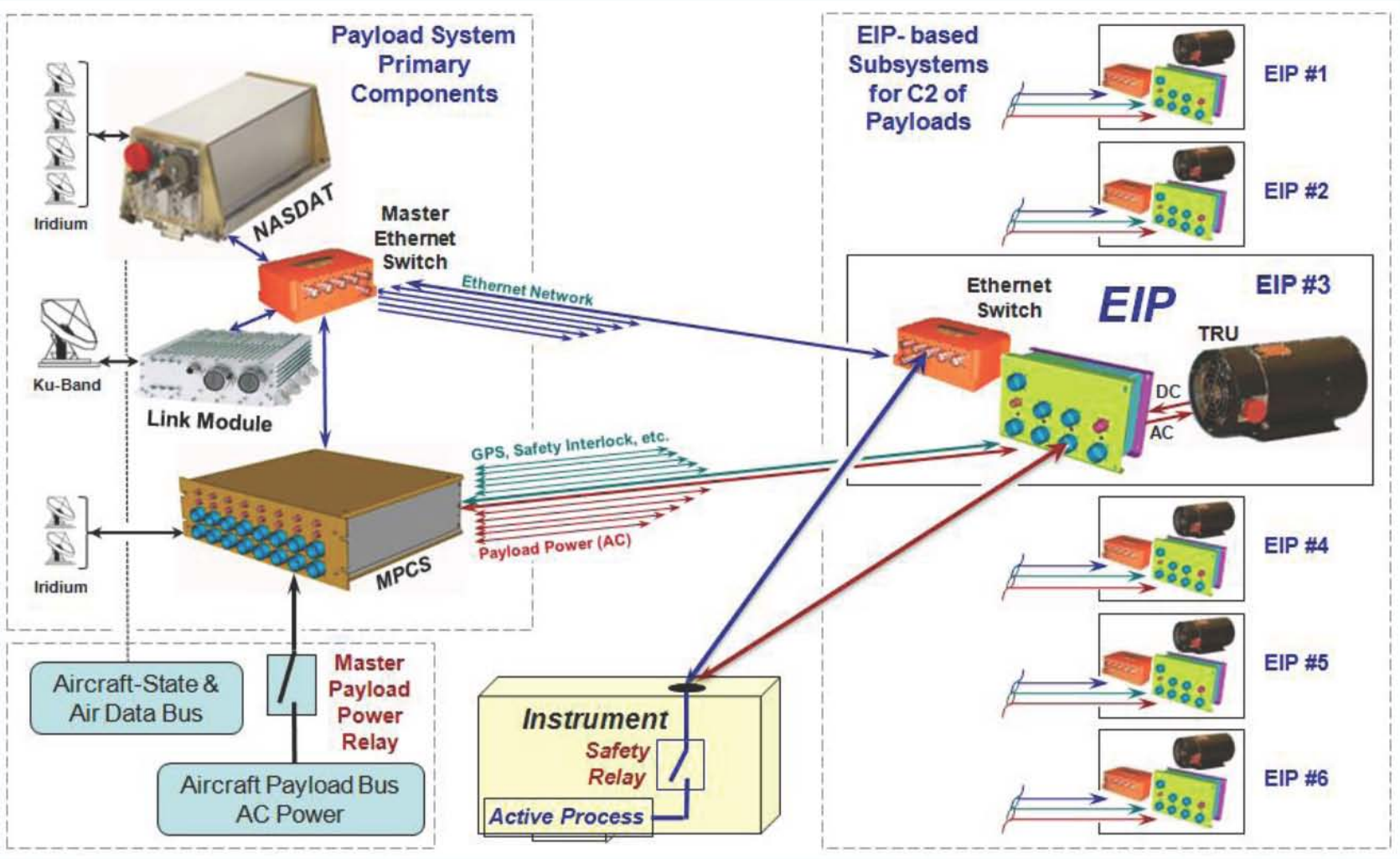
Aircraft Flight Control and Air Traffic Control Communications Architecture



Payload Communications Architecture (Independent of Aircraft C2 and ATC)

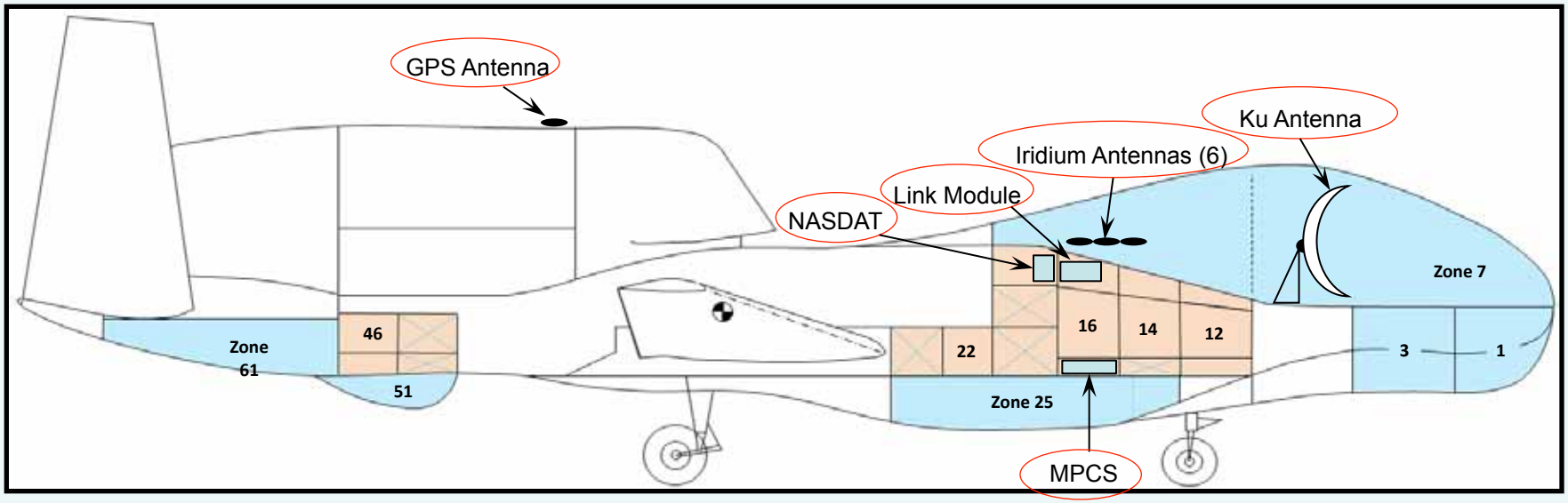


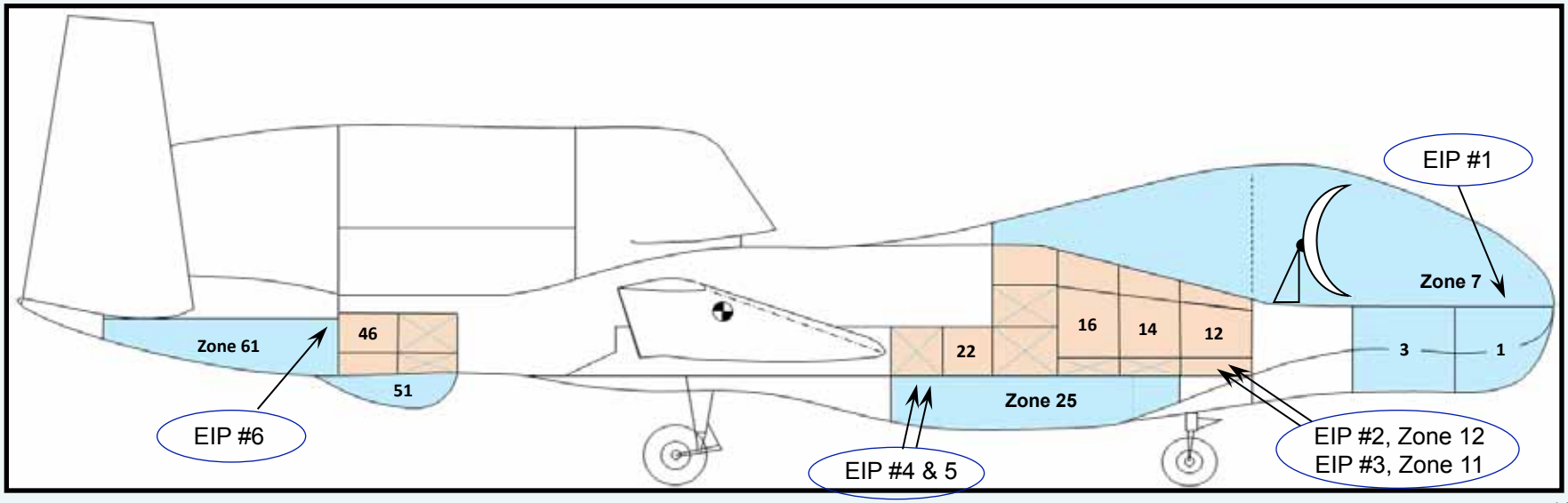
Overview of the Airborne Payload C³ System (APCS)



NASA Ames Developed and Operates this Integrated System for Global Hawk

APCS Subsystems Locations and Payload Bays





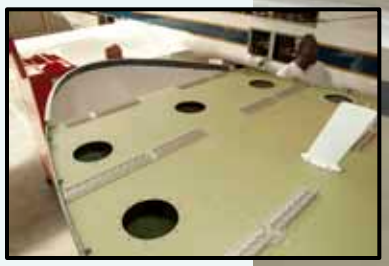
Payload Integration and Accommodations

Payload Power and Aircraft Data

Payload C^2 and Payload Data

Experiment Interface Panel & Ethernet Switch
(6 sets distributed on aircraft, each set supports up to 4 payloads)

Payload Integration Test Bench
(Pre-Integration Checkout)



Mounting Rails

Tail Volume

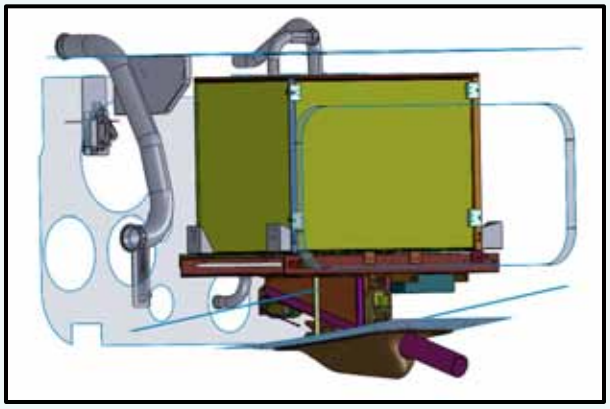
Bay Under the Nose

Pallets and Hatches

Mounting Hard Points

Payload Integration Process (1 of 2)

- Site visit at customer's location; initial discussion of payload details and operational concept.
- Receipt of payload solid models and design/integration data from customer.
- Integration engineering (performed by DFRC and/or NGC).
- Avionics harness fabrication at DFRC.
- Fabrication and fit-check of payload mounting structure.
- Initial mechanical integration on aircraft.



Payload Integration Process (2 of 2)

- Environmental tests on payloads, as required.
- Electrical integration on payload test bench.
- Final integration on aircraft.
- Payload communications setup in the GHOC.
- Combined System Test with all aircraft and payload systems operating.
- Range check-out flight.






NASA Global Hawk Flights Through March 2011

Date(s)	TN871 (AV-1)		TN872 (AV-6)		Takeoff Location	Landing Location	Flight Areas	Flight Objective
	Flt #	Duration, hr	Flt #	Duration, hr				
10/23/09			0044	4.0	EAFB	EAFB	EAFB Range	Return to flight for AV-6, Functional Check flight
10/29/09			0045	2.8	EAFB	EAFB	EAFB Range	Completion of Functional Check Flight objectives
11/4/09			0046	1.4	EAFB	EAFB	EAFB Range	Pilot Proficiency
11/9/09			0047	0.9	EAFB	EAFB	EAFB Range	Pilot Proficiency
11/9/09			0048	1.2	EAFB	EAFB	EAFB Range	Pilot Proficiency
3/3/10			0049	2.6	EAFB	EAFB	EAFB Range	Checkout flight for Payload Support System
3/5/10			0050	9.2	EAFB	EAFB	EAFB Range	Checkout flight for Payload Support System
3/11/10			0051	10.3	EAFB	EAFB	EAFB Range	Checkout flight for Payload Support System
4/2/10			0052	6.3	EAFB	EAFB	EAFB Range	GloPac Instrument check-out flight
4/7/10			0053	14.1	EAFB	EAFB	Pacific	GloPac Science Flight #1, Arctic Vortex
4/13-14/10			0054	24.4	EAFB	EAFB	Pacific	GloPac Science Flight #2, Tropics
4/23-24/10			0055	28.6	EAFB	EAFB	Pacific, Alaska, Arctic	GloPac Science Flight #3, Arctic Zone
4/30/10			0056	9.3	EAFB	EAFB	Pacific	GloPac Science Flight #4
5/27/10	0068	4.1			EAFB	EAFB	EAFB Range	Return to flight for AV-1, Functional Check flight
6/15/10	0069	0.7			EAFB	EAFB	EAFB Range	Pilot Proficiency
6/15/10	0070	0.8			EAFB	EAFB	EAFB Range	Pilot Proficiency
6/22/10	0071	0.8			EAFB	EAFB	EAFB Range	Pilot Proficiency
6/22/10	0072	1.0			EAFB	EAFB	EAFB Range	Pilot Proficiency
6/29/10	0073	4.3			EAFB	EAFB	EAFB Range	Pilot Proficiency
8/15/10			0057	6.1	EAFB	EAFB	EAFB Range	GRIP Instrument check-out flight
8/24/10			0058	2.5	EAFB	EAFB	EAFB Range	Dropsonde test flight
8/28/10			0059	15.3	EAFB	EAFB	Pacific	GRIP Science Flight #1, TD Frank
9/1-2/10			0060	24.2	EAFB	EAFB	CONUS, Gulf of Mexico, Atlantic	GRIP Science Flight #2, Hurricane Earl
9/12-13/10			0061	24.3	EAFB	EAFB	CONUS, Gulf of Mexico, Caribbean	GRIP Science Flight #3, TD AL 92
9/16-17/10			0062	25.2	EAFB	EAFB	CONUS, Gulf of Mexico	GRIP Science Flight #4, Hurricane Karl
9/23-24/10			0063	25.1	EAFB	EAFB	CONUS, Gulf of Mexico, Caribbean	GRIP Science Flight #5, TS Matthew
10/13/10	0074	1.0			EAFB	EAFB	EAFB Range	Pilot Proficiency
10/13/10	0075	1.7			EAFB	EAFB	EAFB Range	Pilot Proficiency
10/21/10	0076	0.8			EAFB	EAFB	EAFB Range	Pilot Proficiency
12/8/11			0064	1.4	EAFB	EAFB	EAFB Range	Wake Survey with King Air
1/19/11			0065	1.5	EAFB	EAFB	EAFB Range	Dropsonde 15k ft Altitude test
1/21/11			0066	5.1	EAFB	EAFB	EAFB Range	Wake Survey with Proteus
1/27/11			0067	2.4	EAFB	EAFB	EAFB Range	Dropsonde 30k ft Altitude test
2/4/11			0068	8.5	EAFB	EAFB	Pacific	Dropsonde High Altitude test
2/10-11/11			0069	20.5	EAFB	EAFB	Pacific	WISPAR Science Flight #1, Atmospheric River
3/1/11			0070	13.5	EAFB	EAFB	EAFB Range	IMMC Clearance Flight
3/3-4/11			0071	24.1	EAFB	EAFB	Pacific	WISPAR Science Flight #2, Winter Storm
3/9-10/11			0072	25.1	EAFB	EAFB	Pacific, Alaska, Arctic	WISPAR Science Flight #3, Atmospheric River, Arctic Zone
3/29/11			0073	1.0	EAFB	EAFB	EAFB Range	Pilot Proficiency
3/29/11			0074	1.1	EAFB	EAFB	EAFB Range	Pilot Proficiency
Totals	**9 flts**	**15.2**	**31 flts**	**342.0**				

Flights Outside the EAFB Airspace

NAS Flight Summary

- 13 Flights
- 310 Hours
- ~100,000 nmi

2 Certificates of Authorization

- Pacific-Alaska-Arctic
- Western Atlantic-Caribbean-Gulf of Mexico

Completed Science Campaigns

- Global Hawk Pacific (March-April 2010)
  - 11 instruments
  - 4 science missions, 76 hours
  - First Global Hawk Science Mission
  - Flights spanned 12 to 85 deg N Latitudes

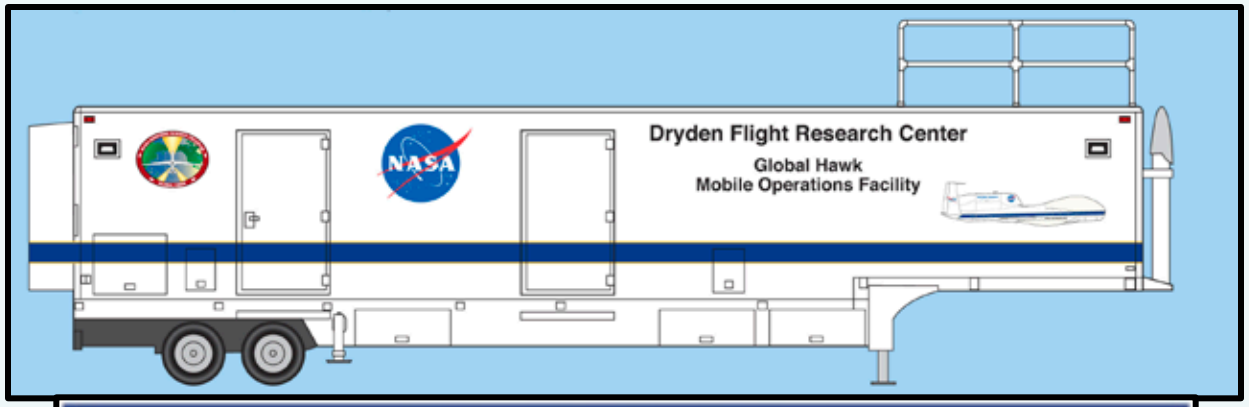
- Genesis and Rapid Intensification Processes (August-September 2010)
  - 4 Instruments
  - 5 science missions, 114 hours total
  - First Global Hawk severe storm over flight

- Winter Storm Pacific and Atmospheric Rivers (February-March 2011)
  - 2 Instruments
  - 3 science missions, 70 hours total
  - First operational dropsonde deployment from a UAV

Future Plans

Capability Developments for Deployments

All Three Systems will be on-line by October 2011

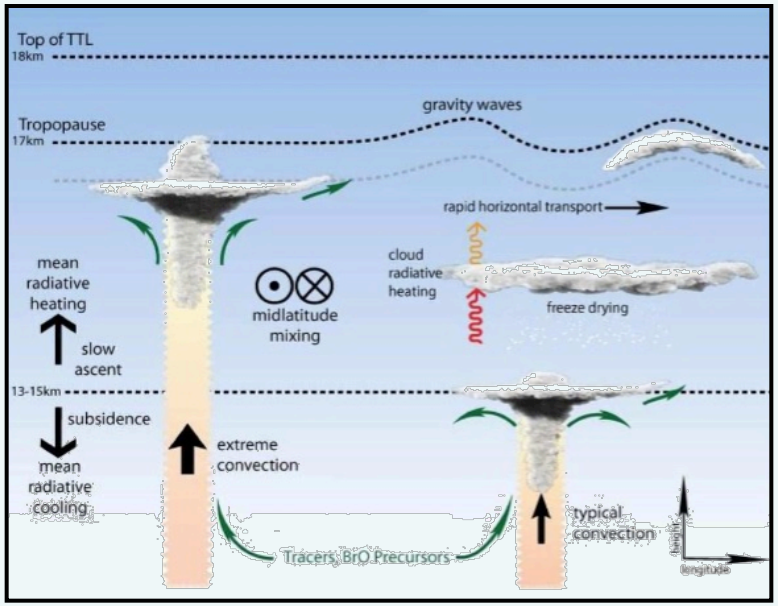


Portable Aircraft Command and Control Facility

Portable Ku Ground Station, used for Payload Data

A Portable Payload Operations Facility, with extendable sides and accommodations for 14 Scientists, is in development

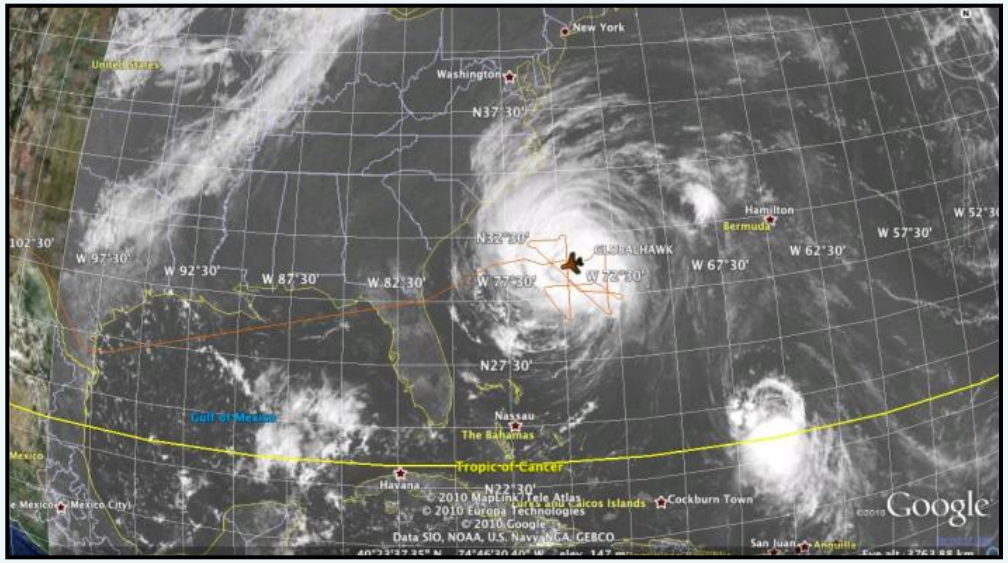
Future Missions



ATTREX (2011-2014)

Airborne Tropical TRopopause Experiment

(Base of Operations in the Western Pacific)



HS3 (2011-2014)

Hurricane and Severe Storm Sentinel

(Base of Operations in the US East Coast)

UAVSAR

Reconfigurable polarimetric L-band SAR designed for repeat pass deformation measurements.

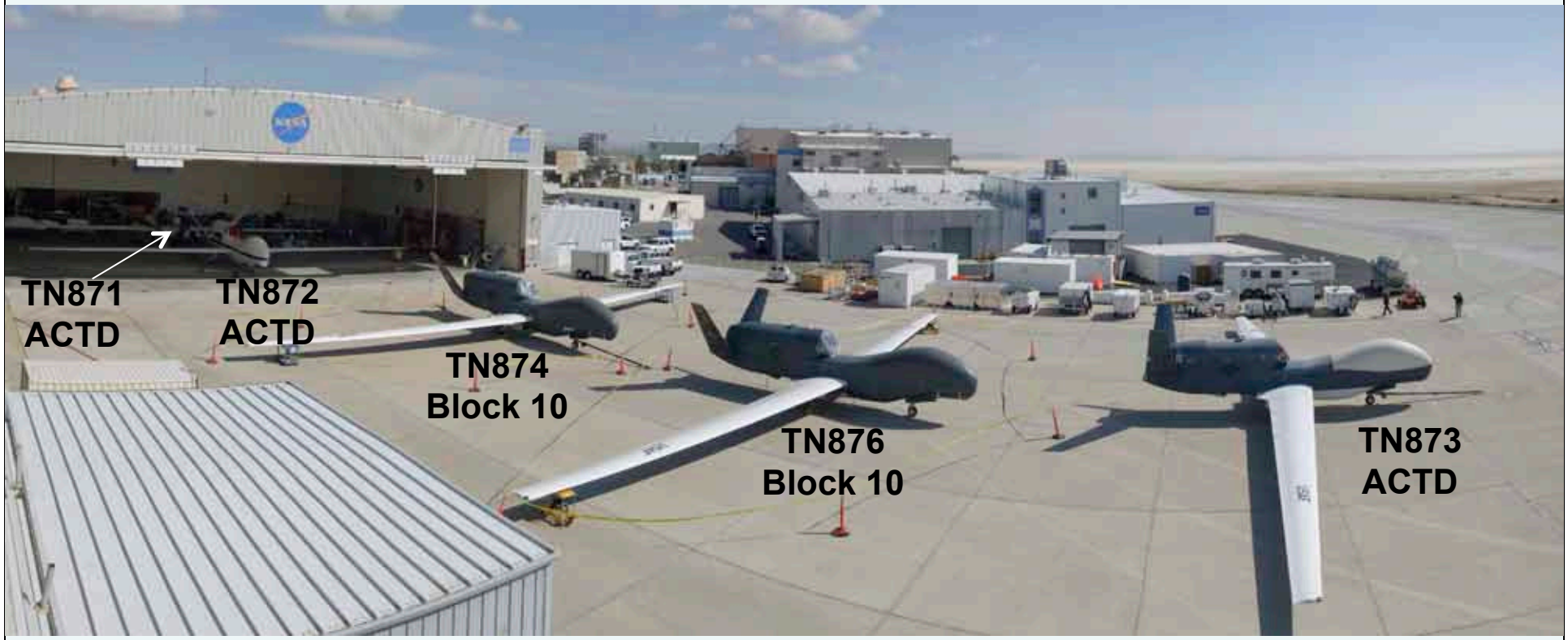
Current NASA Global Hawk Fleet

Two Operational Aircraft

TN871, TN872

Three "Spares" Aircraft

TN873, TN874, TN876



Project Summary

- NASA Global Hawk is operational and supporting Earth science research.
- 40 Flights have been conducted since the start of operations in October 2009, with a total of 357 flight hours.
- Three science campaigns have been conducted with all major objectives met.
- Two new multi-year science campaigns begin this year.

Global Hawk Project Manager

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661-276-2149

Tropical Depression Frank - Aug 28, 2010