



NASA's Hurricane & Severe Storm Sentinel



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Wallops Role Supporting UAS



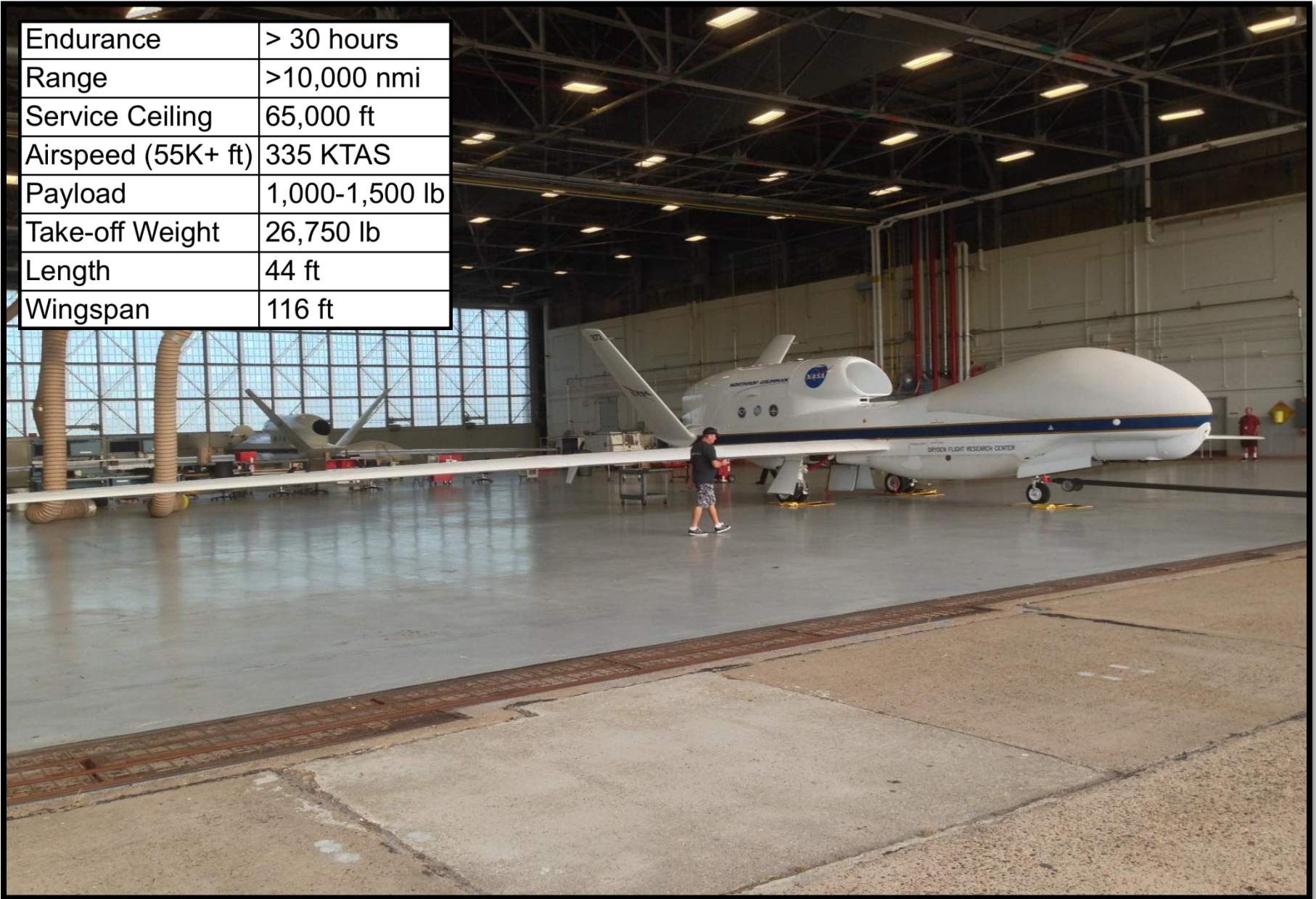
- Carriers
 - Aircraft & ground systems
 - Mission management and payload integration
 - Airworthiness certification
- Mission Operations
 - Facilities
 - Instrumentation
 - Safety
 - Project management
 - Logistical services
- Technology Development
 - Examples: Satellite communications, science payload development power/data system miniaturization

- NASA airliner flight control research
- NASA Earth Science sensor demos
- USCG shipboard evaluation
- Navy mine detection
- Navy radar detection testing
- Navy abort site for UCAS & Global Hawk
- DHS port & maritime security demos
- Commercial aircraft development demos

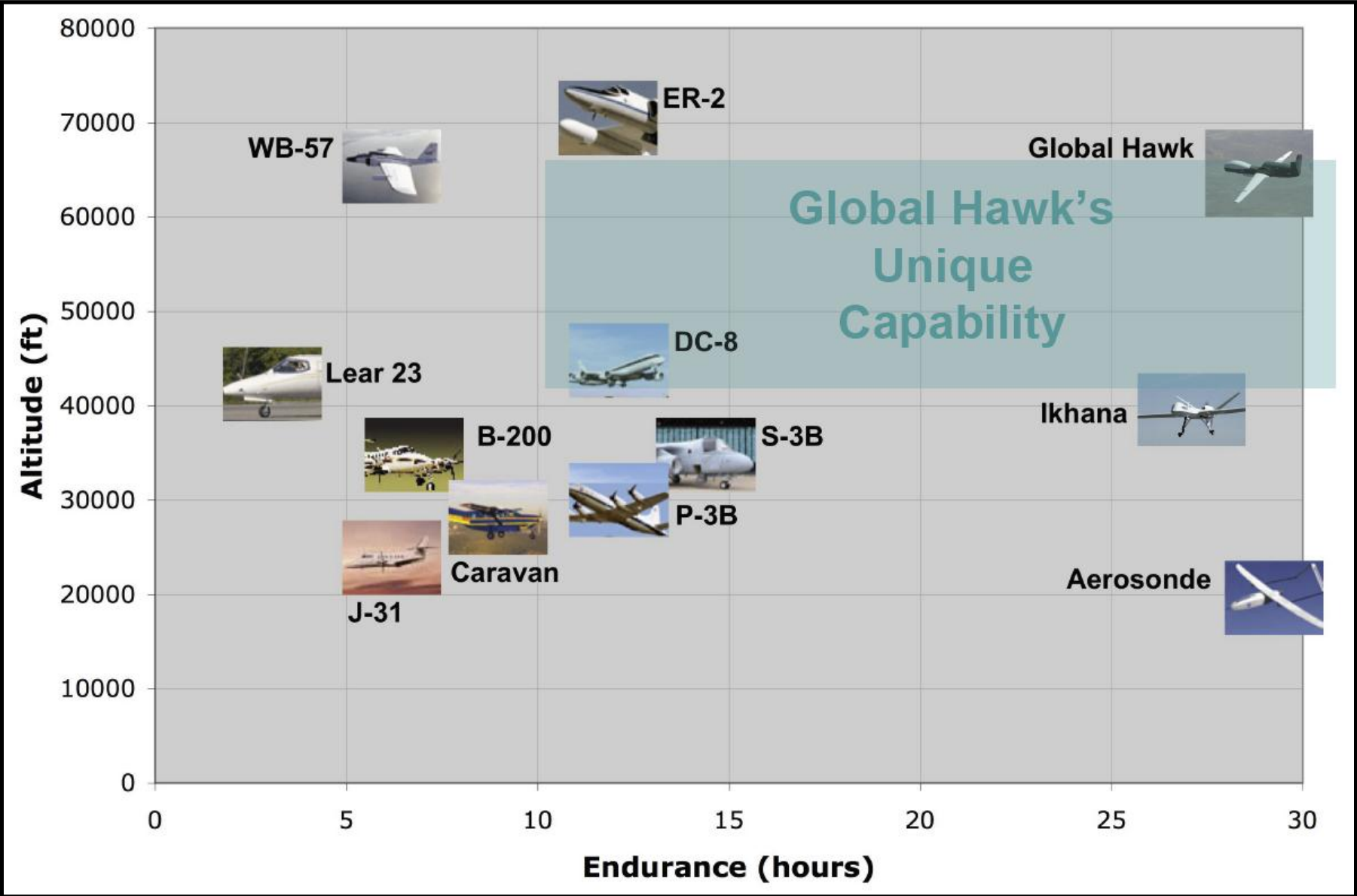


Global Hawk Overview

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



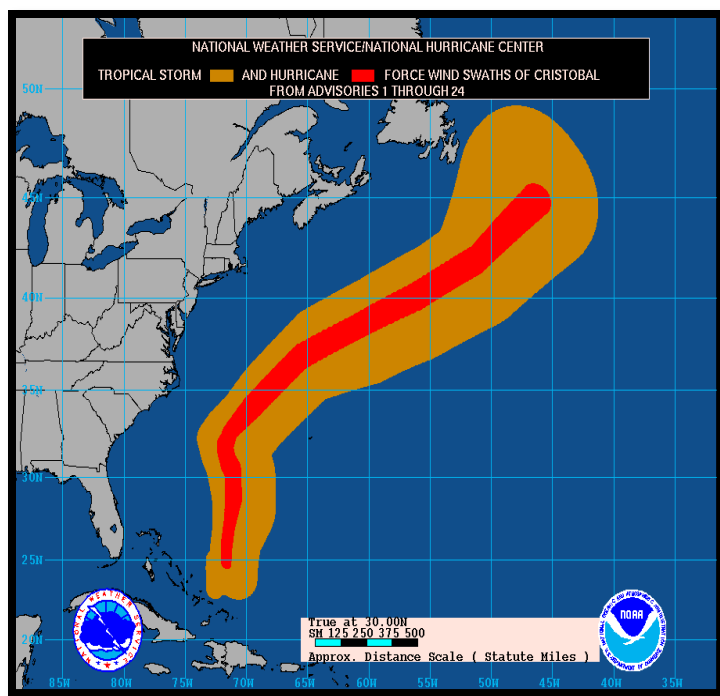
Why NASA Uses Global Hawks



Hurricane Sandy

Boardwalk at 16th Street
Ocean City, MD



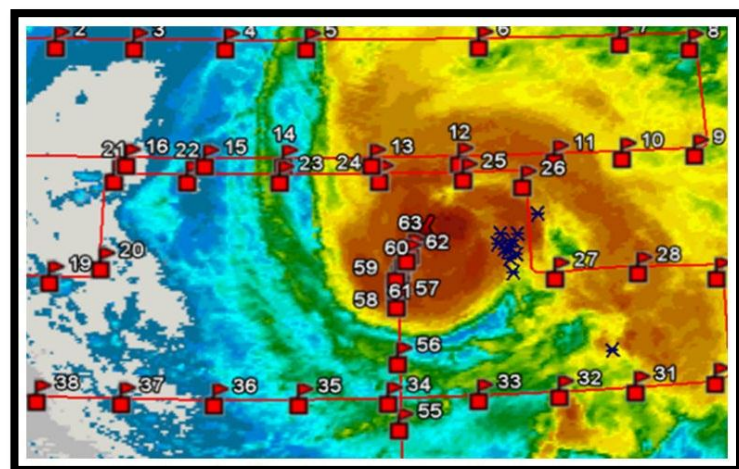


HS3 is a five-year mission specifically targeted to enhance our understanding of the processes that underlie hurricane intensity change in the Atlantic Ocean basin.

The HS3 science question:

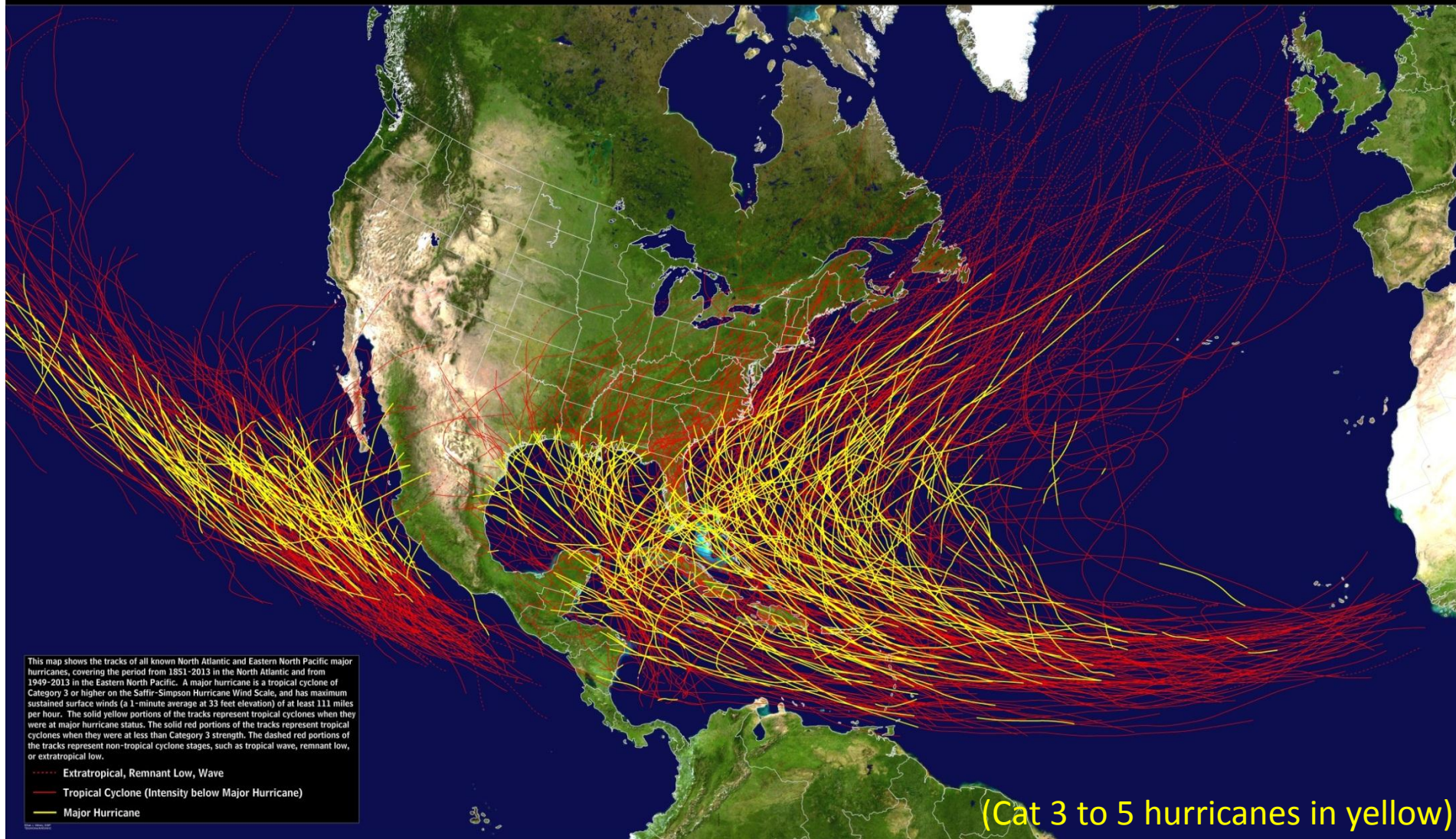
Is storm formation and intensification mainly a result of:

- The Large-Scale Environment, or
- Internal Processes?



Major Hurricane History

Data from 1949 in the Pacific, from 1851 in the Atlantic

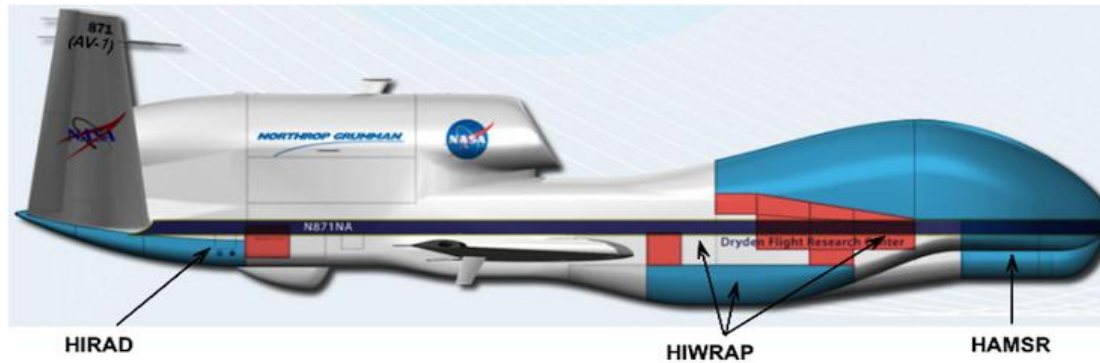


This map shows the tracks of all known North Atlantic and Eastern North Pacific major hurricanes, covering the period from 1851–2013 in the North Atlantic and from 1949–2013 in the Eastern North Pacific. A major hurricane is a tropical cyclone of Category 3 or higher on the Saffir–Simpson Hurricane Wind Scale, and has maximum sustained surface winds (a 1-minute average at 33 feet elevation) of at least 111 miles per hour. The solid yellow portions of the tracks represent tropical cyclones when they were at major hurricane status. The solid red portions of the tracks represent tropical cyclones when they were at less than Category 3 strength. The dashed red portions of the tracks represent non-tropical cyclone stages, such as tropical wave, remnant low, or extratropical low.

- Extratropical, Remnant Low, Wave
- Tropical Cyclone (Intensity below Major Hurricane)
- Major Hurricane

(Cat 3 to 5 hurricanes in yellow)

Tail 871 Over the Storm

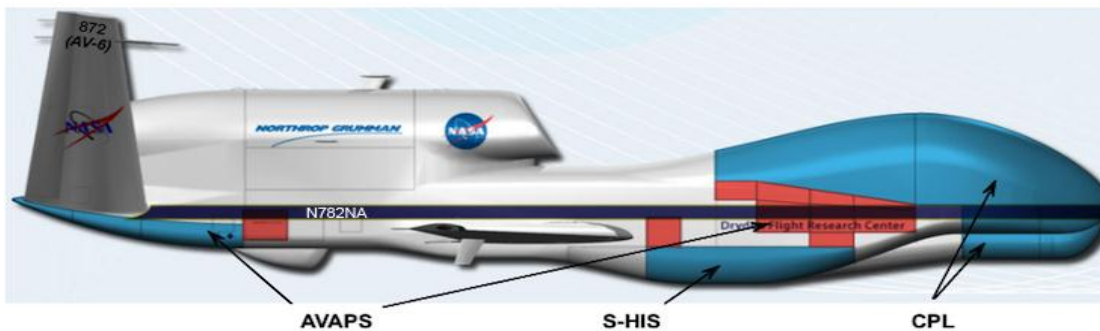


HIRAD Radiometer (MSFC)

HIWRAP Ku/Ka radar (GSFC)

**HAMSRS 60/119/183 GHz
radiometer (JPL)**

Tail 872 Around the Storm



AVAPS dropsonde (NOAA)

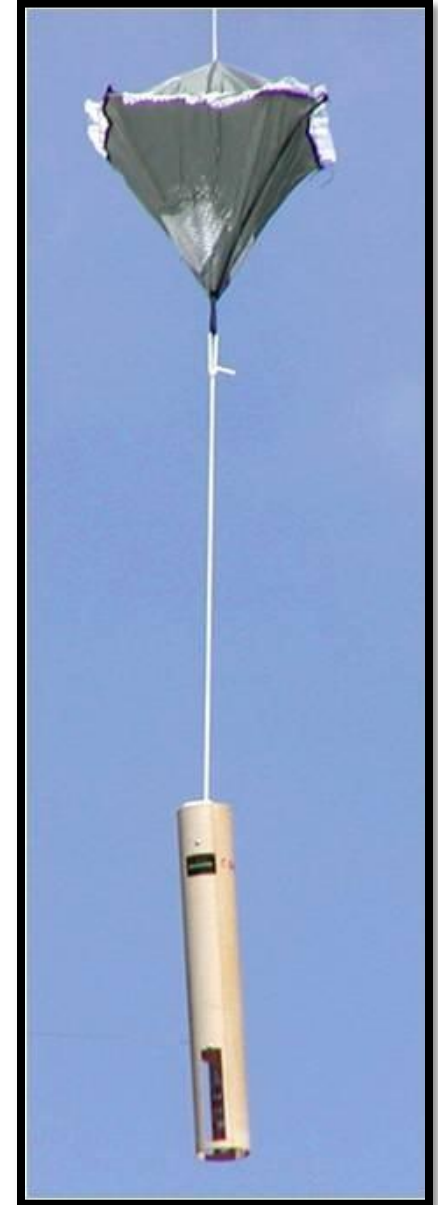
**S-HIS interferometer
U. of Wisconsin**

CPL lidar (GSFC)




Dropsondes



- GPS Antenna
- GPS Receiver
- Microcontroller (qty=2)
- Vaisala Pressure sensor (backside)
- 400 MHz Transmitter
- Vaisala RH Sensors
- Vaisala Temperature Sensors



Global Hawk Flight Timeline

SUN	MON	TUE	WED	THR	FRI	SAT
		COB Prior to T-1 Day Submit Flight Zones to FAA 	T-1 Day	T-2 hrs Submit IFR Flight Plan (2-4hr prior) T-0 Takeoff  <div data-bbox="1116 873 1336 968"> 25 Hour Flight </div> 	T+25 Landing	

NASA T-34 Chase Aircraft



Global Hawk Ops Center (GHOC-E)



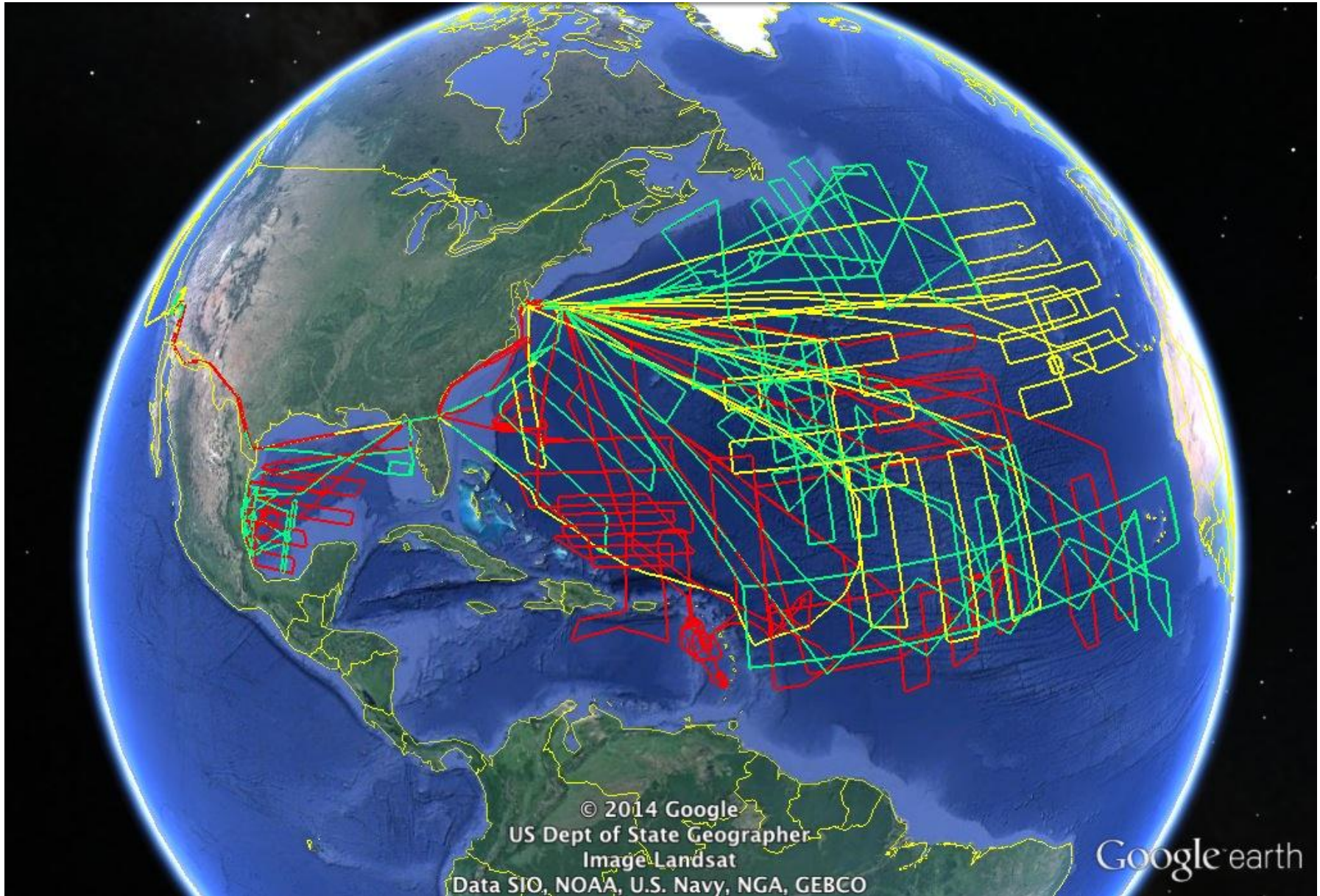
4.9-Meter Ku-Band Satcom Terminal



Global Hawk Landing at Wallops



2012-2014 Flight Trajectories



2012-2014 HS-3 Flight Summary

Overall Data

68% of all flights (30/44) and 87% of all hours flown (642/739) dedicated to science.

Year Flights Hours Sondes Named Storms

2012	8	174	343	2
2013	12	232	433	3
2014	10	236	649	3
Total	30	642	1425	8

Flights Hours Flown

TN871	6	94
TN872	24	548
Total	30	642

2012

Leslie – 1 Flight
Nadine – 5 Flights

2013

Gabrielle – 4 Flights
Ingrid – 1 Flight
Humberto – 1 Flight

2014

Cristobal – 2 Flights
Dolly – 1 Flight
Edouard – 4 Flights

19 Flights Over Named Storms

