



# NRL/VXS-1

## 2009 UPDATE





# Establishment of NRL



**THOMAS A. EDISON**

**“GOVERNMENT SHOULD MAINTAIN A GREAT RESEARCH LABORATORY TO DEVELOP GUNS, NEW EXPLOSIVES AND ALL THE TECHNIQUE OF MILITARY AND NAVAL PROGRESSION WITHOUT ANY VAST EXPENSE.”**

**THOMAS A. EDISON,  
THE NEW YORK TIMES MAGAZINE  
SUNDAY, MAY 30, 1915**

## A WORLD-CLASS LABORATORY

- **Idea followed the sinking of the Lusitania in 1915**
- **Secretary Josephus Daniels Established Naval Consulting Board with Edison Chair, meeting October 7, 1915**
- **August 29, 1916 Congress appropriates funds to establish the Lab**
- **Delayed by WW-I, Assistant Secretary of the Navy, Theodore Roosevelt, Jr. Commissions the Lab at Bellevue site on July 2, 1923**

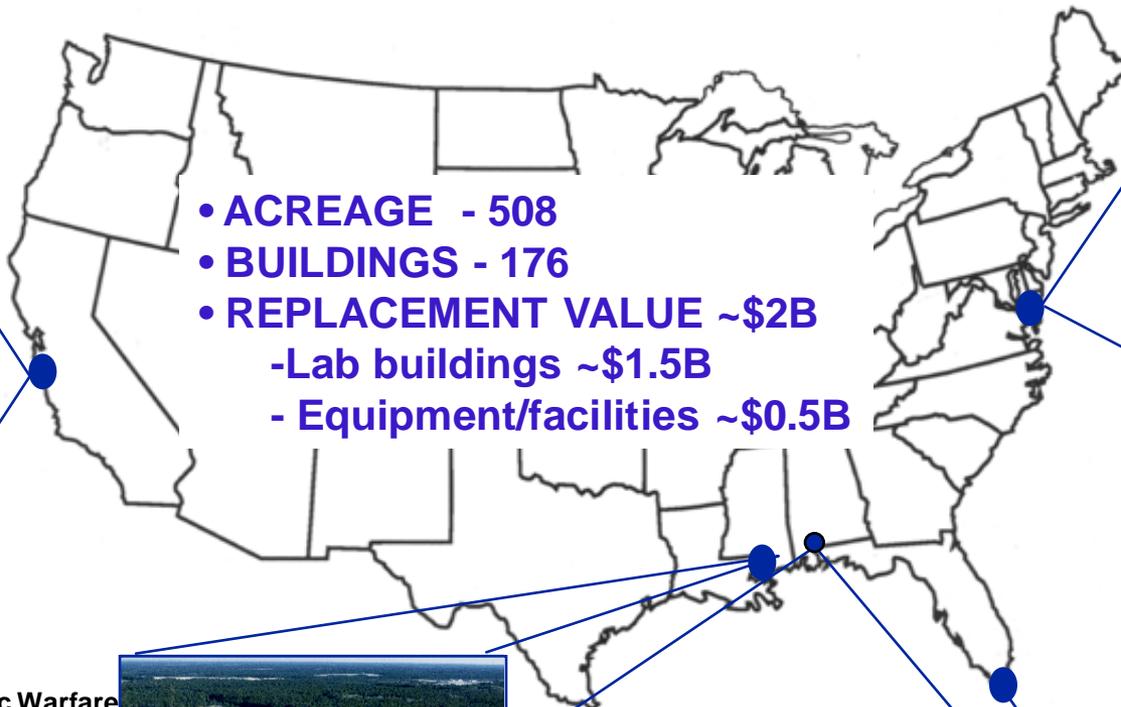
*Navy and Marine Corps Corporate Laboratory*



# Naval Research Laboratory



**MONTEREY, CA**



- **ACREAGE - 508**
- **BUILDINGS - 176**
- **REPLACEMENT VALUE ~\$2B**
  - Lab buildings ~\$1.5B
  - Equipment/facilities ~\$0.5B



**PATUXENT RIVER  
VXS-1 Squadron**



**NRL D.C.**

**Chesapeake Bay Div  
Tilghman Is.  
Midway Res Ctr  
Blossom Point  
Pomonkey**



**BAY ST. LOUIS, MS  
John C. Stennis Space Center**



**MOBILE, AL  
Ex-USS Shadwell**

**NAF,  
KEY WEST  
Marine  
Corrosion  
Facility**

## Mission Focus Areas:

- Sensors, Electronics and Electronic Warfare
- Materials/Processes
- Battlespace Environments
- Undersea Warfare
- Information Systems Technology
- Space Platforms
- Technology Transfer



# Scientific Development Squadron ONE (VXS-1)



- Provides airborne research capability to NRL
- Sensor and system test bed, airborne surrogate
- Worldwide deployable
- **5** Aircraft (and over 200 UASs)
  - **2** Research Modified NP-3D
  - **1** AEW Rotodome NP-3D
  - **2** Research Modified RC-12
- **12** Officers, **76** Enlisted, **4** Civilians





# VXS-1 2009 Milestones

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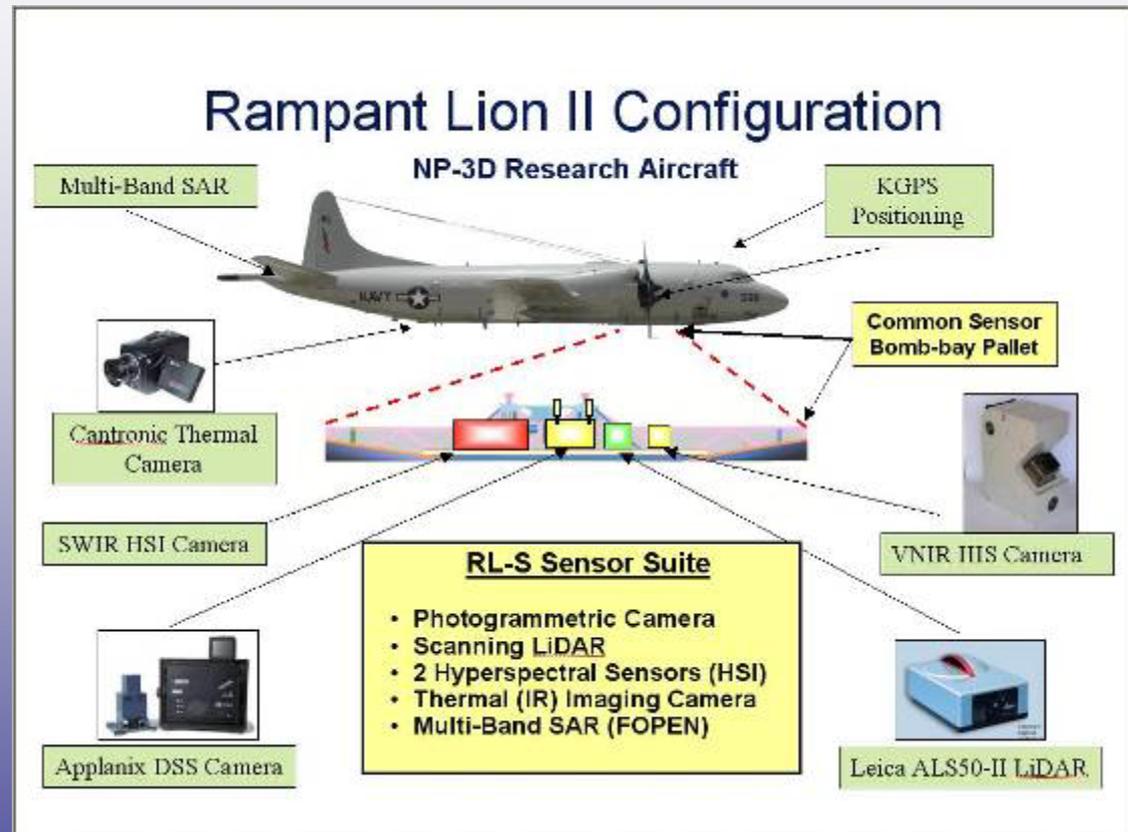


- Iraq deployment in Nov 2008 (90 hrs)
  - Captain Spiecher crash site
- Greenland deployment Nov 2008 (13 hrs)
  - Search for Coast Guard Grumman Duck crash from 1942
- Columbia deployment in Jan 2009 (100 hrs)
  - Riverine areas
  - Self Propelled Semi-Submersible (SPSS)
- Completed project modification on C-12 aircraft
  - Wing pods under development
- Acquisition of 4 Scan Eagle UAV aircraft
  - Ongoing NEO program flights
  - Initial payload up-grade flights flown
  - Available for project flights



# Rampant Lion Capabilities

- Hyperspectral, IR & Photogrammetric Optics, FOPEN Multi-band SAR, LiDAR terrain mapping
- Sensor Suite data is *co-registered* by K-GPS, and recorded on RAID storage
  - 10's of Terabytes of data will be gathered
- Only quick-look data visible during flight, so unable to execute in-flight tasking, but...
- Photogrammetric data gathered can be rapidly distributed to end user
- SAR, hyperspectral and LiDAR require extensive post-processing (months)





# Rampant Lion III

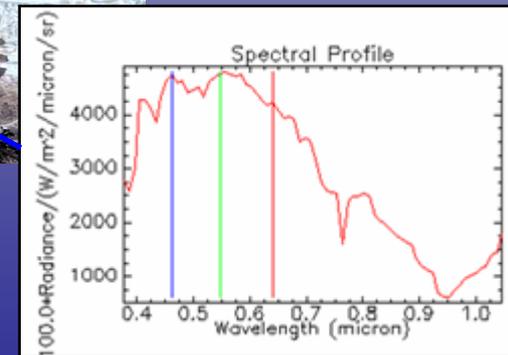
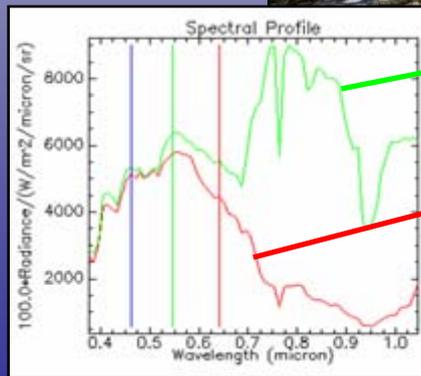
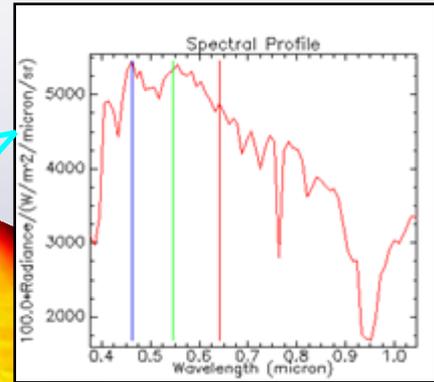
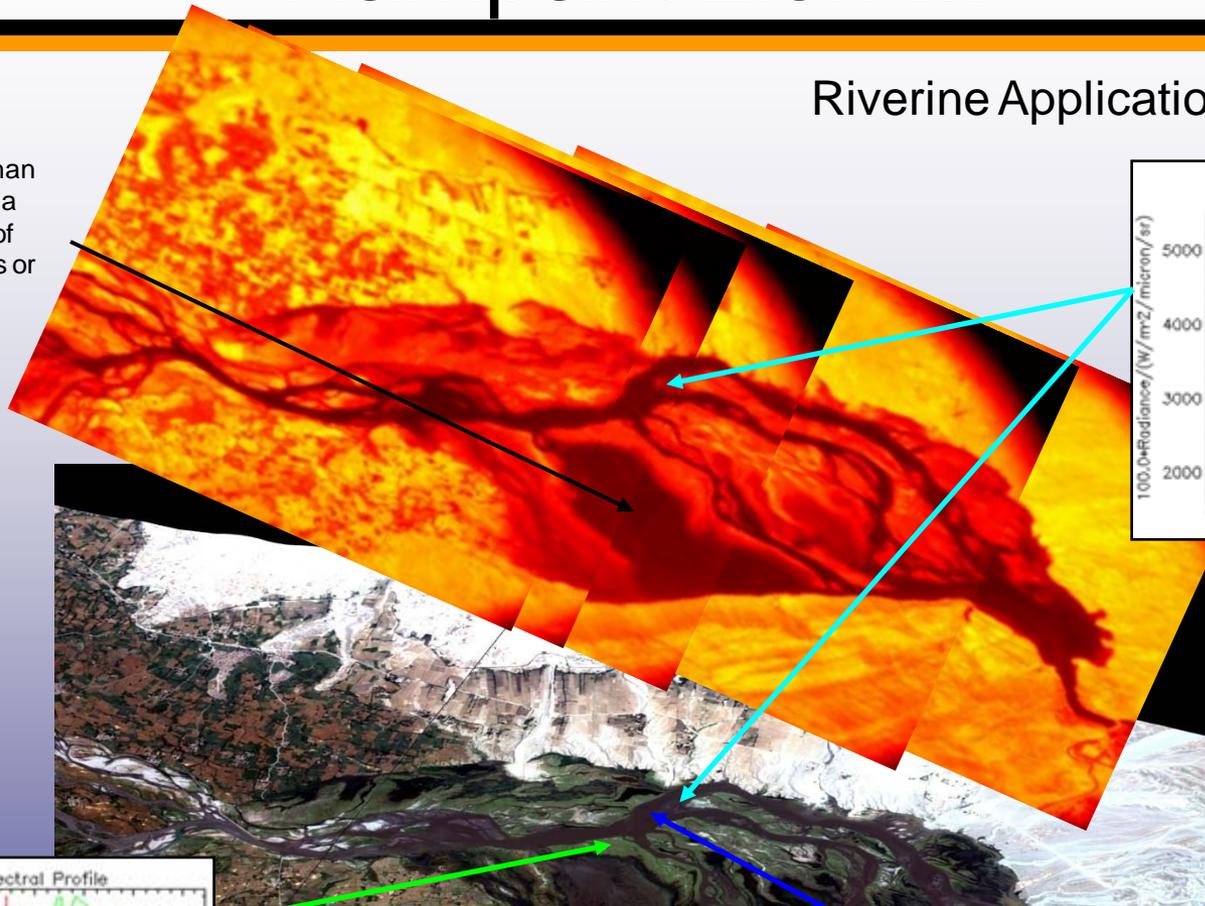
## Riverine Applications

This area warmer than main river, which is a possible indication of depth, flow changes or effluent

Warmer

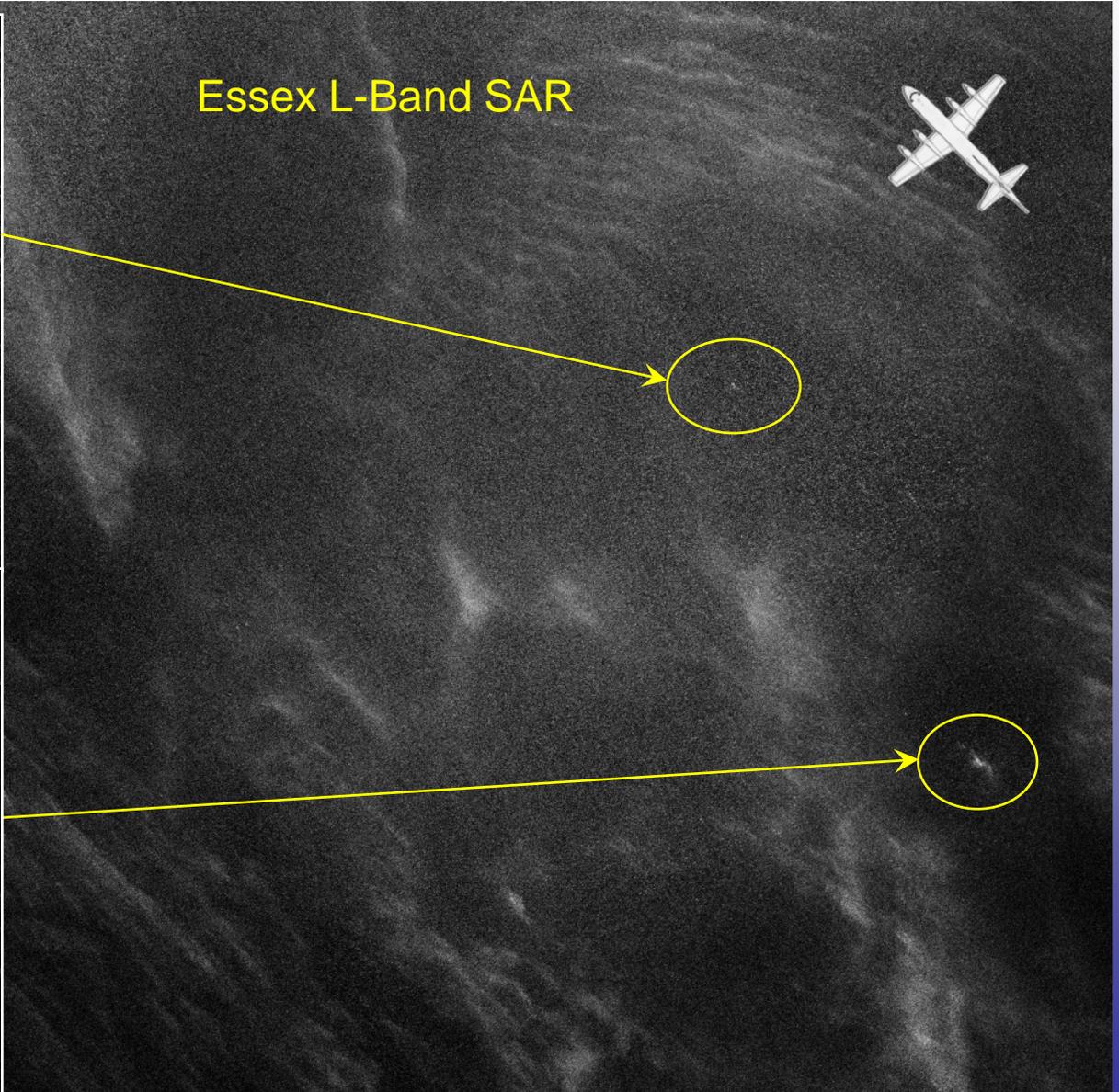
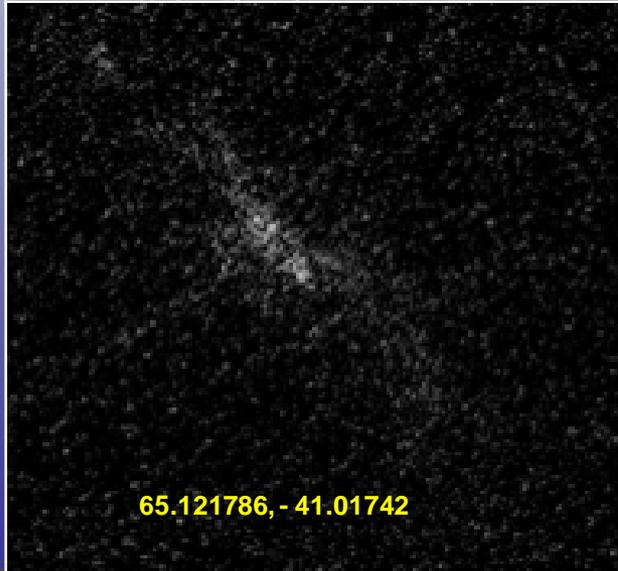
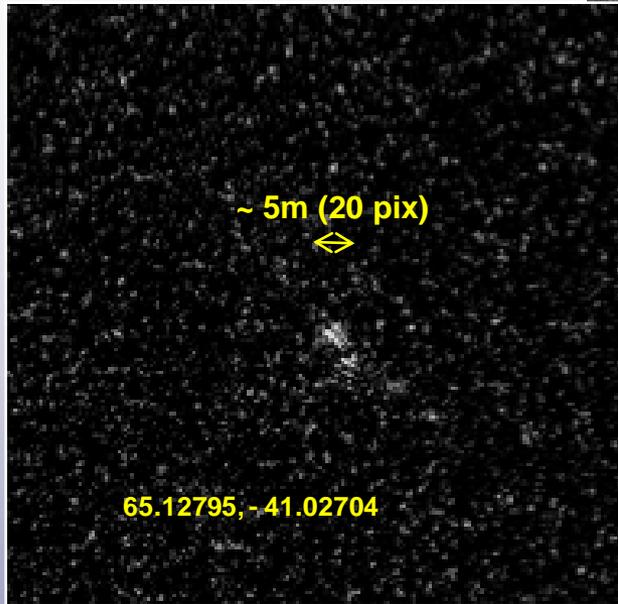
TEMPERATURE

Colder





# Greenland Mission





# Rampant Lion South

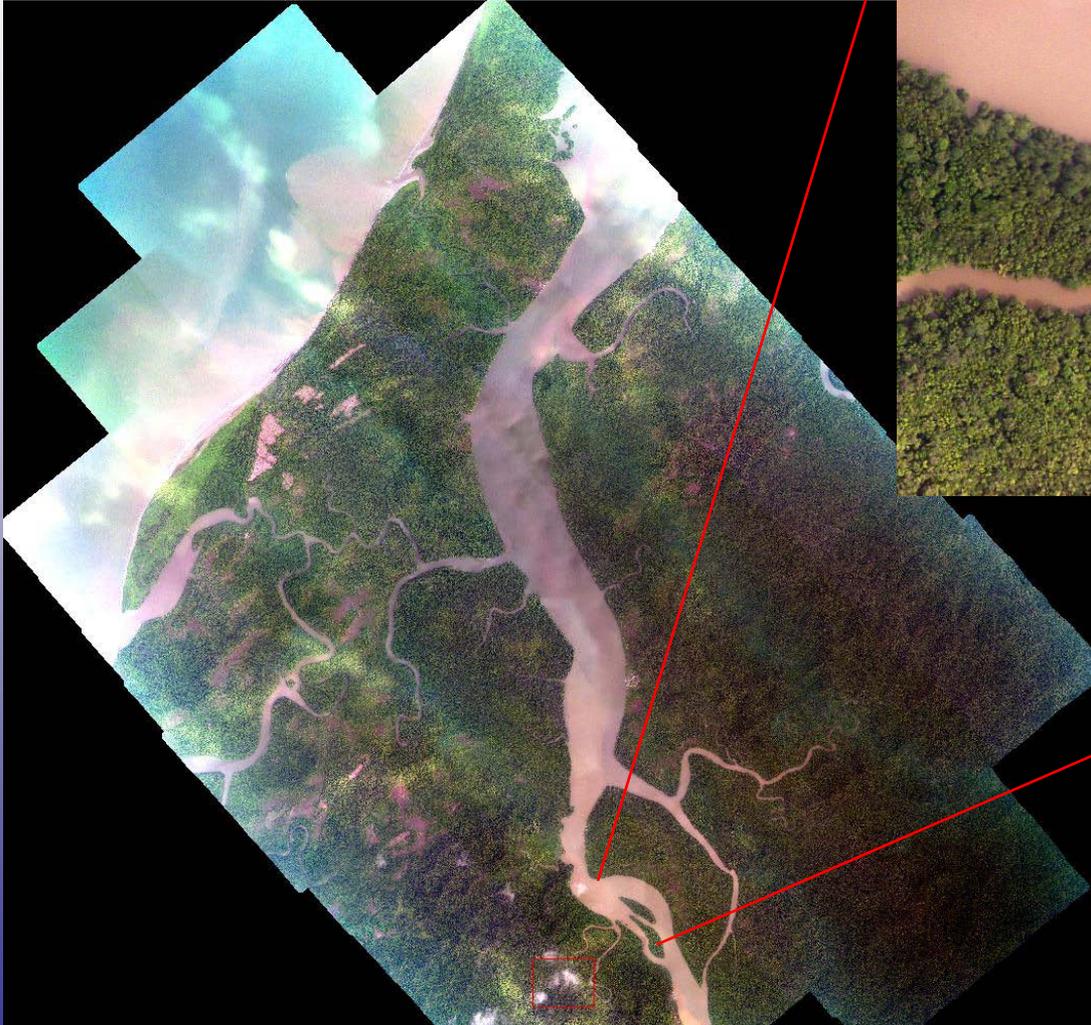


- Who
  - 9 USN Aircrew, 7 USN Maint, 8 Civilian Scientists, 1 HN Rider
- What
  - Detach 1 NP-3D to Curacao
  - Fly 55 total hours in 5 flights of ~11 hours each
- When
  - Jan 5-26 2009
- Where
  - Coastal Colombia, and the Valle del Cauca, Colombia
  - Numerous point targets provided by EIFC/SOUTHCOM including fopen test site
- Why
  - To advance the Science & Technology of remote sensing in jungle environment
  - Riverine mapping and CN applications



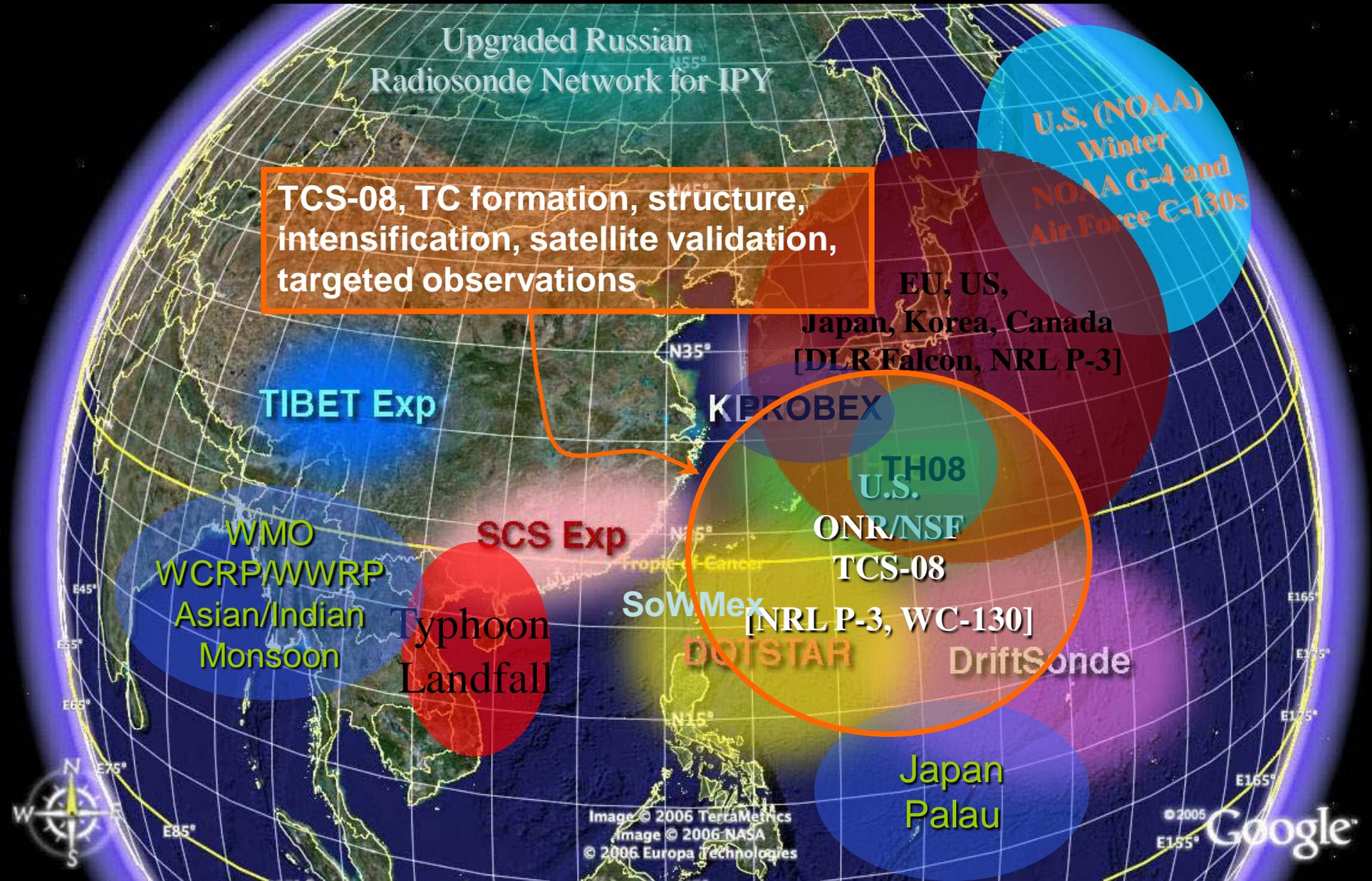


# Photogrammetric Camera



- Camera has about 30 cm resolution

# THORPEX-Pacific Asian Regional Campaign/Tropical Cyclone Structure-08 Experiments and Collaborative Efforts





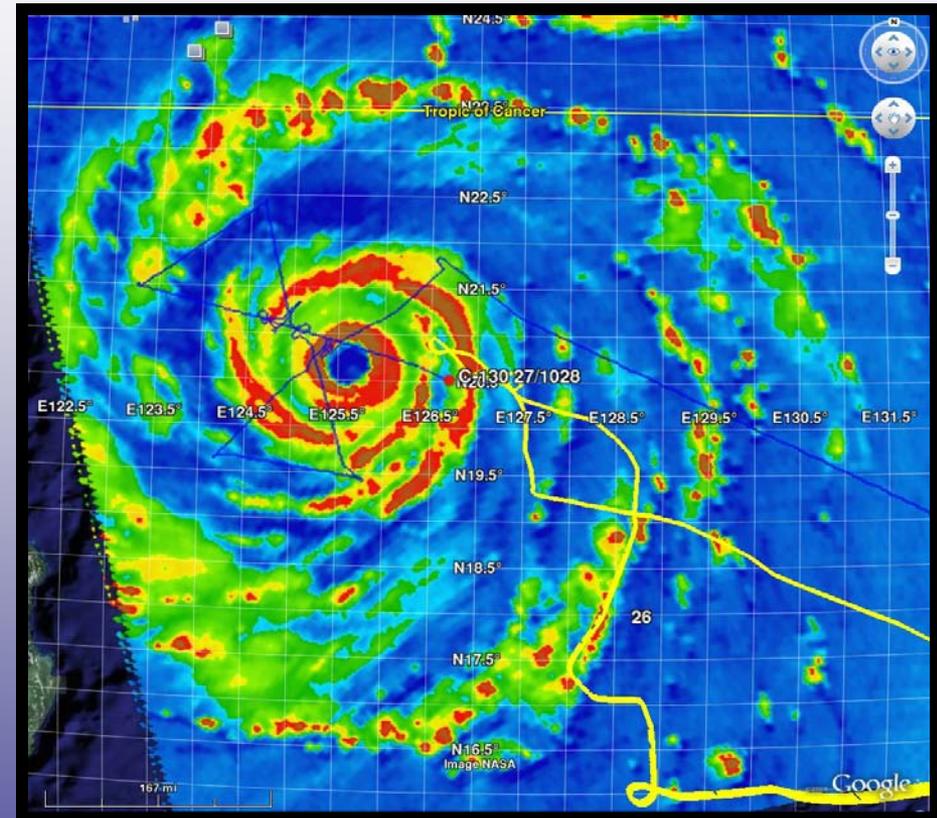
# Super Typhoon Jangmi



29 September 2008 WC-130 track (blue), NRL P-3 track (yellow)

## Mission objectives

- NRL P-3
  - TC formation, structure, intensification, TUTT structure, targeting for formation, extratropical transition
- WC-130J
  - TC formation, structure, intensification, satellite validation, targeting for formation and track, extratropical transition
- FALCON
  - Typhoon targeting, extratropical transition, targeting, ridge-building, tropical water vapor transport
- DOTSTAR
  - Typhoon targeting





# VXS-1 Future Efforts



- Persistent Autonomous Surveillance System (250 hrs)
  - Local ONR research
  - C-12 and P-3 flights
- Ocean Magnetic Forecast Experiment (30 hrs)
  - Local flights to Paxtuxent River, off of New Jersey Coast
- NOAA Alaska Gravity Survey (150 hrs)
  - C-12 based out of Fairbanks
- Johns Hopkins APL / SPAWAR EW (150 hrs)
  - Local EW testing
- Ongoing MDA range clearing efforts



# Project Modifications for

## VXS-1 C-12 Aircraft

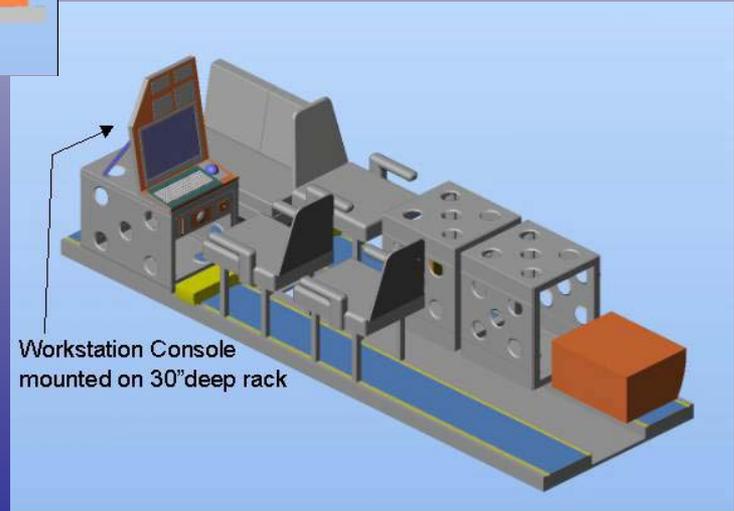
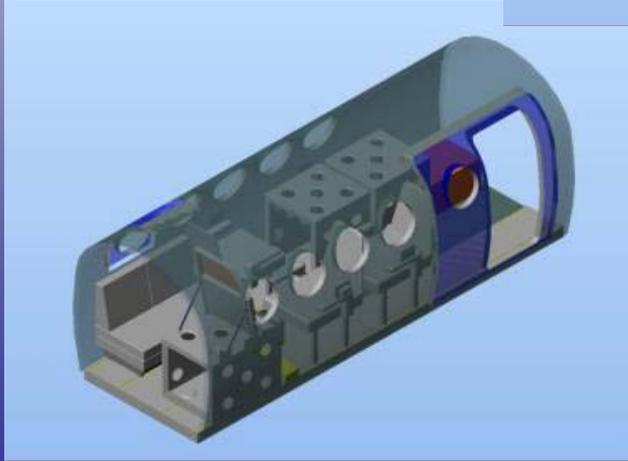
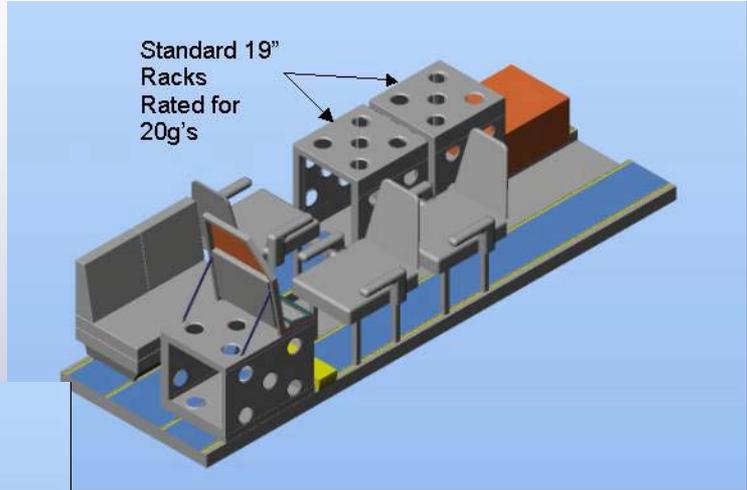
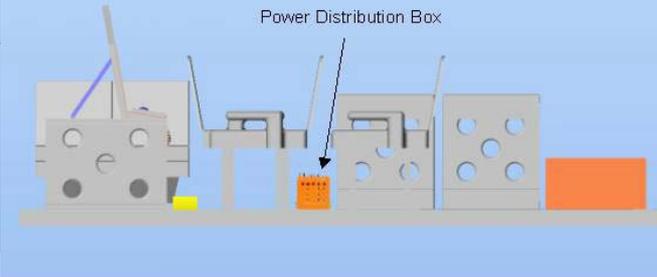
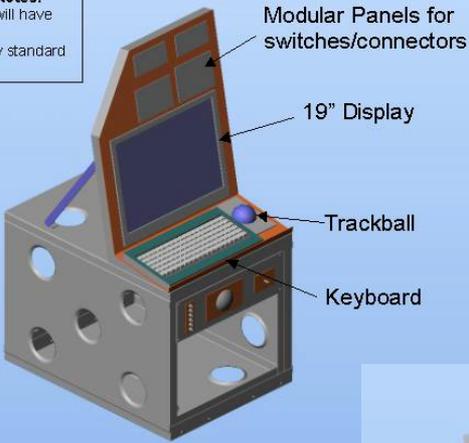




# C-12 Internal Rack Configuration



**Workstation Notes:**  
- Modular panels will have Dzus rails  
- Designed for any standard 19" display





# Scan Eagle Parameters



## PERFORMANCE

- Max Horizontal Speed 75 knots
- Cruise Speed 48 knots
- Ceiling 19,500 ft
- Endurance 12+ hours

## DIMENSIONS

- Wing Span 10.2 ft
- Fuselage Diameter 7 in
- Length 5 ft

## WEIGHTS

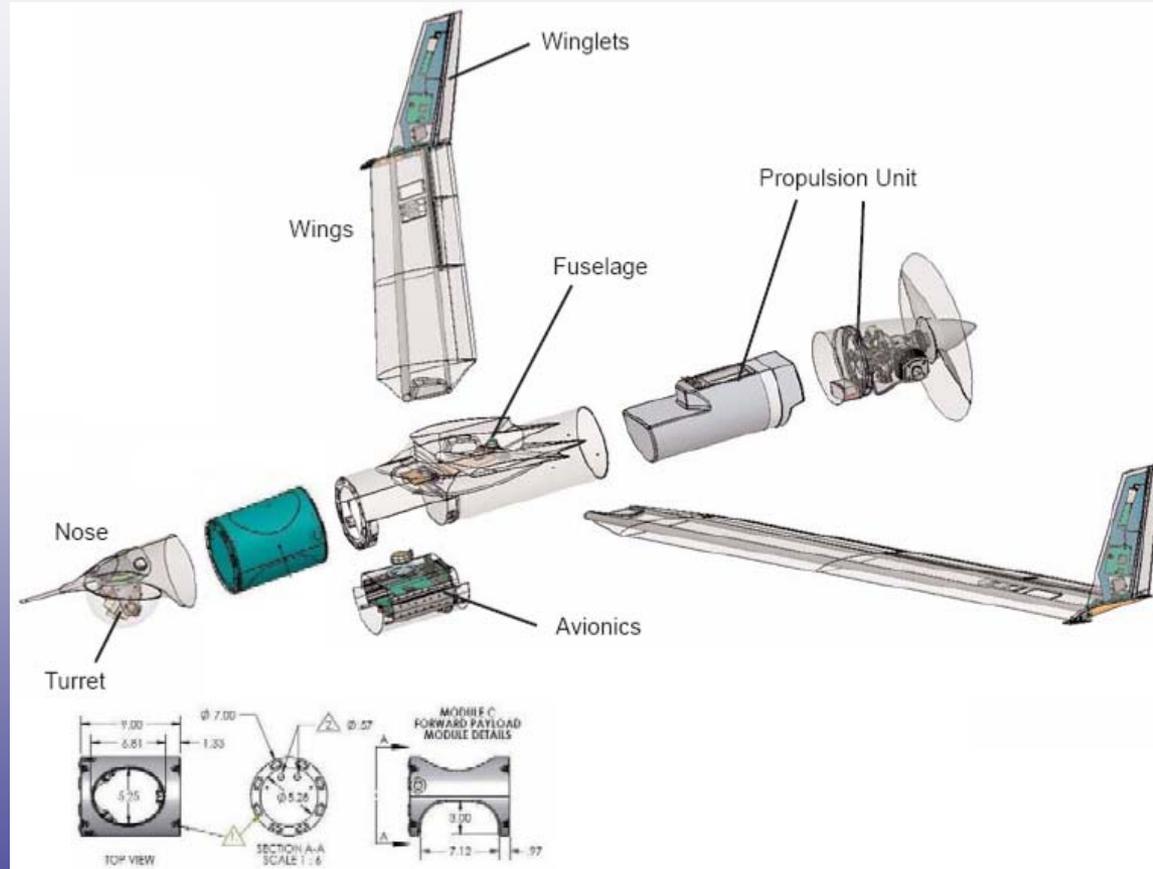
- Empty Weight 28 lb
- Fuel and Payload 15 lb
- Max Fuel 12.1 lb
- Max Takeoff Weight 44 lb

## FREQUENCIES (MHz)

- C2/Telemetry: 1350-1390
- Video Downlink: 2300-2500

## PAYLOADS

- Sony FCB-EX780 EO Camera
- DRS Tech. E3500 IR Camera



**SE UAS has over 100,000 hours of flight time in theater**



# NRL UAS Inventory



Vehicle Name	Type	JUAS Cat	Status	Buno #	Serial #	Size		(WS)	Wt (lb)	Code 1400 Rep	LLA Assigned	NAVAIR Certified
CICADA	Micro	T1	Active	not applicable		6.8	in	(WS)	0.7	None	None	
Dragon Eye	Mini	T1	Active	not applicable		3.75	ft	(WS)	5.5	None	None	Yes, expired
SENDER-2	Mini	T1	Active	not applicable		6	ft	(WS)	10	None	None	Non Navy Sponsor
SBXC	Mini	T1	Active	not applicable		14.3	ft	(WS)	11.5	None	None	
Windex	Mini	T1	Active	not applicable		13.4	ft	(WS)	16.5	None	None	
XFC	Mini	T1	Active	not applicable		10	ft	(WS)	16.5	None	None	
Joker	Mini	T1	Active	not applicable		6	ft	(RD)	18	None	None	Non Navy Sponsor
Senior Telemaster-4	Mini	T1	Active	not applicable		8	ft	(WS)	20	None	None	
NDM-3	Mini	T2	Active	not applicable		12	ft	(WS)	25	None	None	
12Ft Telemaster	Mini	T2	Active	not applicable		12	ft	(WS)	30	None	None	
Ion Tiger	Mini	T2	Active	not applicable		17	ft	(WS)	35	None	None	
SPIDER	Mini	T2	Active	not applicable		7.3	ft	(RD)	40	None	None	Non Navy Sponsor
FINDER	Macro	T2	Active	not applicable		8.6	ft	(WS)	59	None	None	Non Navy Sponsor
Tern	Macro	T2	Active	not applicable		11.3	ft	(WS)	130	None	None	Non Navy Sponsor
Vantage	Macro	T2	Active	not applicable		8	ft	(RD)	350	None	None	Yes, expired
MAC-1	Mini		Concept	not applicable		3.75	ft	(WS)	5.5	None	None	Non Navy Sponsor
MARES	Macro		Concept	not applicable		10	ft	(WS)	30	None	None	Non Navy Sponsor
Matador	Macro		Concept	not applicable		10	ft	(WS)	30	None	None	Non Navy Sponsor
READY	Macro		Concept	not applicable		4	ft	(WS)	30	None	None	Non Navy Sponsor
SLED	Macro		Concept	not applicable		6	ft	(WS)	50	None	None	
ALICE	Macro		Concept	not applicable		14	ft	(WS)	165	None	None	
Crystal Sun	Macro		Concept	not applicable		8	ft	(RD)	350	None	None	
BITE-Wing	Micro	T1	Historical	not applicable		16 to 20	in	(OL)	0.1	None	None	
Delphinopter	Micro	T1	Historical	not applicable		1	ft	(WS)	0.1	None	None	
Pectenopter	Micro	T1	Historical	not applicable		1	ft	(WS)	0.1	None	None	
MITE 1,2,3	Micro	T1	Historical	not applicable		10 to 24	in	(WS)	0.7	None	None	
Samara	Micro	T1	Historical	not applicable		2	ft	(WS)	0.7	None	None	
Pink Eye	Micro	T1	Historical	not applicable		2	ft	(WS)	1	None	None	
Mars Kitty Hawk	Mini	T1	Historical	not applicable		5.3	ft	(WS)	3	None	None	Non Navy Sponsor
CG Shift Displaced Tail	Mini	T1	Historical	not applicable		4	ft	(WS)	4	None	None	
MOLE	Mini	T1	Historical	not applicable		3	ft	(WS)	4	None	None	
Pendulus	Mini	T1	Historical	not applicable		6	ft	(WS)	4	None	None	
Sea ALL	Mini	T1	Historical	not applicable		3.75	ft	(WS)	4.5	None	None	
High Point	Mini	T1	Historical	not applicable		2	ft	(OD)	5	None	None	
DT Shadow	Mini	T1	Historical	not applicable		8	ft	(WS)	5.5	None	None	Non Navy Sponsor
CG Shift Bird	Mini	T1	Historical	not applicable		6	ft	(WS)	6	None	None	
FLIRT	Mini	T1	Historical	not applicable		4	ft	(WS)	6	None	None	
SARA	Mini	T1	Historical	not applicable		6	ft	(WS)	6	None	None	
Kosovo Recon	Mini	T1	Historical	not applicable		6	ft	(WS)	8	None	None	
COVER	Mini	T1	Historical	not applicable		3	ft	(OD)	8	None	None	Non Navy Sponsor
NASA-723	Mini	T1	Historical	not applicable		7	ft	(WS)	8	None	None	Non Navy Sponsor
SENDER-1	Mini	T1	Historical	not applicable		4	ft	(WS)	10	None	None	
Small Ships Capatible Decoy	Mini	T1	Historical	not applicable		6	ft	(RD)	10	None	None	
Arsea	Mini	T1	Historical	not applicable		8	ft	(WS)	12	None	None	
RamWing	Mini	T1	Historical	not applicable		9	ft	(WS)	15	None	None	
BARC	Mini	T1	Historical	not applicable		8	ft	(WS)	18	None	None	
AAED-FF	Mini	T1	Historical	not applicable		5.6	ft	(OL)	20	None	None	Non Navy Sponsor
Senior Telemaster-1	Mini	T1	Historical	not applicable		8	ft	(WS)	20	None	None	
Senior Telemaster-2	Mini	T1	Historical	not applicable		8	ft	(WS)	20	None	None	
Senior Telemaster-3	Mini	T1	Historical	not applicable		8	ft	(WS)	20	None	None	
NDM-1	Mini	T2	Historical	not applicable		12	ft	(WS)	25	None	None	
NDM-2	Mini	T2	Historical	not applicable		12	ft	(WS)	25	None	None	
DARC	Mini	T2	Historical	not applicable		10	ft	(WS)	27	None	None	
Extender	Mini	T2	Historical	not applicable		10.2	ft	(WS)	31	None	None	
IAED	Mini	T2	Historical	not applicable		5	ft	(WS)	40	None	None	Non Navy Sponsor
LAURA (Joined Wing)	Macro	T2	Historical	not applicable		15	ft	(WS)	45	None	None	
Venture	Mini	T2	Historical	not applicable		26	ft	(WS)	47	None	None	
FLYRT	Mini	T2	Historical	not applicable		7.7	ft	(WS)	50	None	None	
VLIIRDT	Mini	T2	Historical	not applicable		6.25	ft	(OL)	50	None	None	
LAURA (Tandem)	Macro	T2	Historical	not applicable		20	ft	(WS)	55	None	None	
LAURA (Variable Span)	Macro	T2	Historical	not applicable		26	ft	(WS)	55	None	None	
LAURA (3Surface)	Macro	T2	Historical	not applicable		24	ft	(WS)	60	None	None	
Swallow	Macro	T2	Historical	not applicable		15	ft	(WS)	60	None	None	Non Navy Sponsor
AED	Macro	T2	Historical	not applicable		8	ft	(WS)	65	None	None	
LODED	Macro	T2	Historical	not applicable		10	ft	(WS)	65	None	None	
Eager	Macro	T2	Historical	not applicable		10	ft	(RD)	110	None	None	
Dakota-1	Macro	T2	Historical	not applicable		15.6	ft	(WS)	240	None	None	
Sierra	Macro	T2	Historical	not applicable		20	ft	(WS)	310	None	None	Non Navy Sponsor
Dragon Warrior	Macro	T2	Historical	not applicable		8	ft	(RD)	350	None	None	
STAPL	Macro	T3	Historical	not applicable		24	ft	(RD)	500	None	None	
Ghost	Macro	T3	Historical	not applicable		30	ft	(WS)	1100	None	None	Non Navy Sponsor
Para Eyes (Tayman)	Mini		Historical	not applicable						None	None	Non Navy Sponsor
Sail-A-Plane	Mini	T1	Inactive	not applicable		4.75	ft	(WS)	3.3	None	None	
Spider Lion	Mini	T1	Inactive	not applicable		8	ft	(WS)	5.6	None	None	



# NRL Flying UAS



Vehicle Name	Type	JUAS Cat	Status	Buno #	Serial #	Size			Wt (lb)	Code 1400 Rep	LLA Assigned	NAVAIR Certified
CICADA	Micro	T1	Active	not applicable		6.8	in	(WS)	0.7	None	None	
Dragon Eye	Mini	T1	Active	not applicable		3.75	ft	(WS)	5.5	None	None	Yes, expired
SENDER-2	Mini	T1	Active	not applicable		6	ft	(WS)	10	None	None	Non Navy Sponsor
SBXC	Mini	T1	Active	not applicable		14.3	ft	(WS)	11.5	None	None	
Windex	Mini	T1	Active	not applicable		13.4	ft	(WS)	16.5	None	None	
XFC	Mini	T1	Active	not applicable		10	ft	(WS)	16.5	None	None	
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Senior Telemaster-4	Mini	T1	Active	not applicable		8	ft	(WS)	20	None	None	
NDM-3	Mini	T2	Active	not applicable		12	ft	(WS)	25	None	None	
12Ft Telemaster	Mini	T2	Active	not applicable		12	ft	(WS)	30	None	None	
Ion Tiger	Mini	T2	Active	not applicable		17	ft	(WS)	35	None	None	
SPIDER	Mini	T2	Active	not applicable		7.3	ft	(RD)	40	None	None	Non Navy Sponsor
FINDER	Macro	T2	Active	not applicable		8.6	ft	(WS)	59	None	None	Non Navy Sponsor
Tern	Macro	T2	Active	not applicable		11.3	ft	(WS)	130	None	None	Non Navy Sponsor
Vantage	Macro	T2	Active	not applicable		8	ft	(RD)	350	None	None	Yes, expired



# NRL/VXS-1 Points of Contact



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