



NAWCAD Rapid Prototyping, Experimentation, & Demonstration (RPED)

27 October 2021

Presented to: NAWCAD Industry Day

Presented by: Christina Allee (NAWCAD RPED)

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WHAT WE DO

Get solutions into the War-Fighters hands.
Better. *Faster.*



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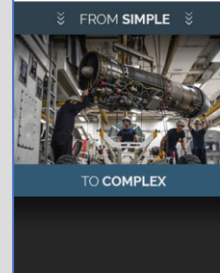
HOW WE DO IT



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RAPID PROTOTYPING

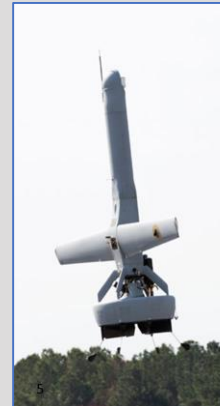


- ✔ Streamlined approach to prototyping emerging technologies and engineering innovation in response to Force & Fleet needs
- ✔ Accelerates fielding advanced warfighting capabilities
- ✔ Influences design and build processes
- ✔ Leverages NAWCAD resources such as Additive Manufacturing
- ✔ Partner with vendors outside of the gate

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EXPERIMENTATION / DEMONSTRATION



- ✔ Informs the acquisition and capability development process
- ✔ Develop Warfare center capabilities for experimentation – ATR, SAIL, other NAWCAD Labs, tools including JAAR, NSITE, iCOP
- ✔ Enables connections with other Warfare Centers

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ACCELERATED ACQUISITION/DASN (RDT&E)



- ✔ RPED Director is a dual hatted SSTM aligned to DASN(RDT&E) for accelerated acquisition
- ✔ RPED events influence the overall ANTX strategy and how experimentation can advance technology and deliver capability faster
- ✔ National leadership of six SSTMs across Naval Warfare Centers, NR&DE interface

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NAWCAD EXPERIMENTATION AND DEMONSTRATION

Advanced Naval Technology Exercise (ANTX)

- Forum for rapid prototyping, risk-mitigation early in the development cycle, and introduction of advanced capability to the warfighter
- ANTX / Test Ex (ATE)

NAWC ANTX 21

- Distributed Maritime Operations (DMO)
- Joint War at Sea, Long Range SUW
- Major Experiments - Checkmate 6.0 & 7.0, CNAL 5G Flight line of the Future, Limited Experiment BWUAS, Aviation Cyber Rodeo

• NAWC ANTX 22

- Operational Level of War (OLW)
- DoD Prototypes
- Industry & Academia
- NAVAIR SBIRs
- **Checkmate Series**
 - CUAS Experimentation Venue
 - DoD, Industry, & Academia



PATUXENT RIVER

- 665 Structures; 13,812 acres; 10 Hangars & 5 Runways
- 2,700 square miles Pax Special Use Airspace to 85,000 feet
- 50,000 square miles of additional offshore air and sea space
- Anechoic Chamber, Becker Lab, ACETEF, SAIL, APF, P&P
- Test Wing Atlantic, USNTPS,
- Controlled RF environment
- Over-water Approaches
- Instrumentation & Fabrication



WEBSTER OUTLYING FIELD

- 60 Buildings on 852 acres with 2 Active Runways
- Shipboard ATC/Combat ID
- Ship/Shore Communications
- Controlled RF environment
- Over-water Approaches
- Aircraft tracking opportunities
- Pier and shoreline access



LAKEHURST

- 123 Structures; 1,057,831 square feet; 7,400 acres
- Aircraft Platform Interface Lab
- EMALS Test Site
- Steam Catapult Complex
- Runway Arrested Landing Site
- Jet Car track Site
- Jet Blast Deflector Site
- Carrier Analysis Facility
- Prototype & Manufacturing Facility

In collaboration with NILE, looking to link numerous laboratory facilities across the country

Atlantic Test Ranges

Applying Range Resources & Technologies..... To Achieve RDT&E Objectives & Decision Quality Data.....

Range Resources

- Range Operations
 - Airspace/Space Mgmt
 - Test Align
 - Central Schedules
 - MIL-ANT A/C (Frequency Coordination)
 - Range Safety
 - MET (Local Forecasts)
 - Communications (Video, voice and data)
 - METS/TRES (COMB-AL, TIME)
 - Networked w/ NASA Wallops
- Range Instrumentation (Read and mobile)
 - Tracking (SIR)
 - Radar (Precision and Line of Sight)
 - Laser
 - GPS
 - Real Time Telemetry
 - A/C Signature Measurements
 - Radar Cross Section (RCS)
 - Interceptor
- Target Presentations (RTMO)
 - Land, Sea and Air

NAE Core T&E Capabilities

- Aerial Refueling (F/A-18)
- Carrier Deck Operations (F-35)
- Carrier Deck Operations (F-35B)
- Carrier Deck Operations (F-35C)
- Carrier Deck Operations (F-35D)
- Carrier Deck Operations (F-35E)
- Carrier Deck Operations (F-35F)
- Carrier Deck Operations (F-35G)
- Carrier Deck Operations (F-35H)
- Carrier Deck Operations (F-35I)
- Carrier Deck Operations (F-35J)
- Carrier Deck Operations (F-35K)
- Carrier Deck Operations (F-35L)
- Carrier Deck Operations (F-35M)
- Carrier Deck Operations (F-35N)
- Carrier Deck Operations (F-35O)
- Carrier Deck Operations (F-35P)
- Carrier Deck Operations (F-35Q)
- Carrier Deck Operations (F-35R)
- Carrier Deck Operations (F-35S)
- Carrier Deck Operations (F-35T)
- Carrier Deck Operations (F-35U)
- Carrier Deck Operations (F-35V)
- Carrier Deck Operations (F-35W)
- Carrier Deck Operations (F-35X)
- Carrier Deck Operations (F-35Y)
- Carrier Deck Operations (F-35Z)

Test Ranges

- F-18E/F/G
- F-4A
- AH-1UH-1
- CH-53K
- MQ-28A
- F-35BC
- H-60
- EMALS
- MQ-4C Triton
- MQ-38C
- V-22
- E-2C/D

Mission Control Rooms

Real-time Telemetry Processing System (RTPS) Project Engineers Stations (PES) (1 of 10 rooms)

EW Workstation

Main Control Room

P-155 MILCON Mission Control Room (MCR)

SAIL INTEROPERABILITY ASSETS & MISSION AREAS

STRIKE F-35, F/A-18, MH-60, P-8, E-2, MQ-8, MQ-4

ASW/ASUW

ISR

Multiple Link 16 nodes including:

- CINK-4
- BOSS
- NEWCOM
- Multiple TINT assets
- GEINT Unified Naval Streaming System (UNUSS)
- IBS (Embedded Naval Tactical Receiver (ENTR))
- TTWC-2
- NCCT
- UVS3
- PRC-117 (F & G)
- USF
- ADIS
- Blue Force Tracker
- SDREN, JMETC, SPDR, DREN
- RF to Fiber connections to most NAVAIR facilities

Live, Virtual, Constructive and Hybrid Environments

Atlantic Targets & Marine Operations (ATMO)

Target & Threat Support Services for RDT&E and Fleet Training

Target & Threat Support Services for RDT&E and Fleet Training

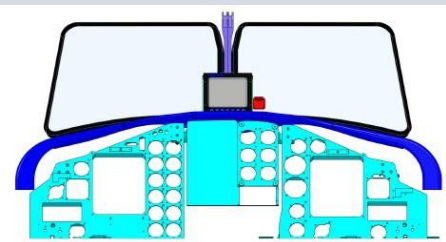
Supporting ANTX's MQ-4 IFU EC-16, 17, & 18



FY21 Rapid Prototype Highlights

E-2D AR Optical

- Optical cueing system installed on E-2D to determine physical position during aerial refueling.
- Collaboration with PMA-231
- Filling the fleet need to reduce the likelihood of F/A-18 exhaust on the E-2D rotodome
- Completion of software and demonstration, using 2373 for contract the Navy will own the prototype software.



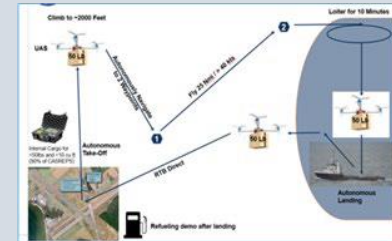
Augmented Reality Remote Maintenance Support System (ARRMSS)

- Technology Demonstration
- Coordinated effort with Lakehurst
- Successfully demonstrated FY20
- Reduce weapons system/aircraft down time by directly linking the maintainer to the SME over a secure DoD network
- FY21 At sea Period
- PMA-251



Blue Water Log UAS

- Technology Demonstration
- Skyways Prototype/Experiment conducted flight Demo for Commander Material Supply Command; Led to USN Shipboard experiment FY21
- **USFFC and MSC identified solution for Maritime logistics**
- FY21 at Sea Period





Blue Water Log UAS (BWUAS) Skyways V2.5

❖ Feb '21 - USS Ford

- Pier Side Experiment

USS Ford - Pier Side Experiment

- On 18 October 2020, CNAL Proposed doing a demonstration from the FORD (while in port). This ship to shore demonstration is intended to display the ability off the autonomous UAS to perform a resupply mission for a small critical part.



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Experimentation Plan

- Multiple Shore-Ship and Ship-Shore Flights
- Demonstration Objectives
 - Shipboard Cargo Air Drop
 - Shipboard Landing and Cargo Unloading
 - Shipboard Takeoff
 - Shore-Ship and Ship-Shore technology demonstration



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❖ July '21 - USS Bainbridge & USNS Joshua Humphries

- At Sea Experiment

BWUAS Ship-to-Ship Experiment

- BWUAS demonstration planned as part of NTGe-21 event
- BWUAS involved Skyways V2.50 UAS executing ship to ship mission from MSC replenishment vessel USNS Joshua Humphries (T-AO-188, JHY) to destroyer, USS Bainbridge (DDG-96, BAI)
- Demonstration executed to prove capability of low cost UAS to execute small cargo logistics mission in fleet representative maritime venue



Figure 1: DDG-96



Figure 2: T-AO-188



Figure 3: Precision Landing Target



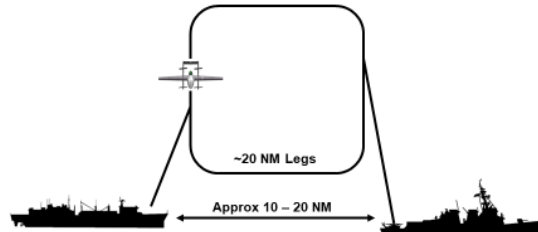
Figure 4: V2.50 UAS and Dimensions

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NTG-21 Sequence of Events Ship Positions - Planned



- Actual event took place within LOS due to link and Sense and Avoid limitations during the experiment
- Further effort required to address this limitation

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10





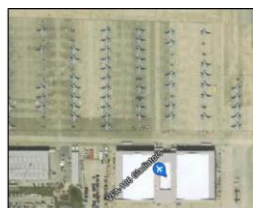
CNAL 5G Flight Line of the Future

Flight Line of the Future

- Utilize existing capabilities to monitor aircraft spotting and convert to SE tracking on flightline
- Utilize existing carrier flight deck modeling approach
- Display real-time, mixed reality, and historic location and status data



Digital Ouija Board (ADMACS)



Where & When

- Strike Fighter Wing Atlantic spaces at NAS Oceana
- August 30, 2021 1200-1630 (flexible)
- Invitation lists for those that should observe the event are managed by CNAF and NAWC staffs



JOINT WAR AT SEA

5GISE

5G IDENTIFICATION OF SUPPORT EQUIPMENT

BACKGROUND

5G Identification of Support Equipment (5GISE) is a RPED collaboration effort with NAWC Lakehurst, Cisco, and Strike Fighter Wing Atlantic. 5GISE utilizes commercial off the shelf and existing

DoD capabilities together with a carrier flight deck modeling approach to display real-time, mixed reality, and historic location and status.

ENGINEERING OBJECTIVES

- Demonstrate Flightline Of The Future solutions using Long Range Wide Area Network sensor technology
- Capture operational data for future process improvement
- Explore future opportunities utilizing 5G bandwidth

WARFIGHTER BENEFITS

- Reduce weapons system/aircraft down time by providing real time location and status of support equipment, tools, and personnel
- Improve situational awareness for flightline management through a graphical user interface

RPED

DANIEL BRAMOS & KEVIN LARKINS

NAWC
NAVAL AIR WARFARE CENTER

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ACCELERATED ACQUISITION/DASN (RDT&E)

- ✓ RPED Director is a dual hatted SSTM aligned to DASN(RDT&E) for accelerated acquisition
- ✓ RPED events influence the overall ANTX strategy and how experimentation can advance technology and deliver capability faster
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Tools in the Tool Box

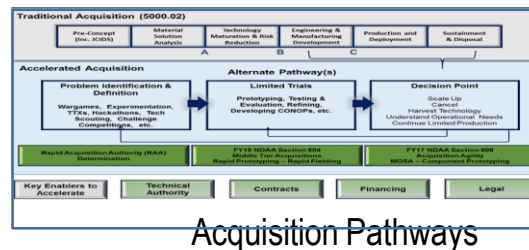
To encourage innovation with industry, NAWCAD utilizes several non-FAR-based tools and other methods to engage with industry and academia

Non-FAR Based Tools

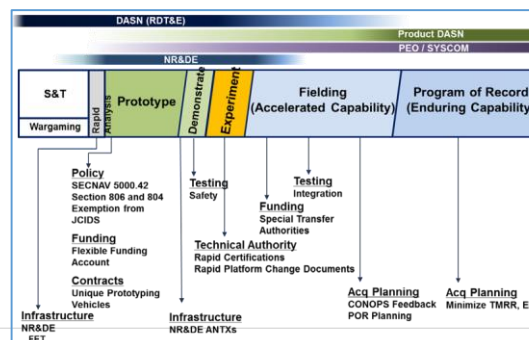
- Partnership Intermediary Agreements (PIAs)
- The NavalX Southern Maryland Tech Bridge
- The Naval Aviation Systems Consortium (NASC)
- Small Business Innovation Research (SBIR) and Small Business Technology Transfer Research (STTR)
- Commercial Service Agreements (CSAs) which provides industry access to Navy ranges, labs, and resources; and
- Education Partnership Agreements (EPAs)

Contracting Tools

- Cooperative Research and Development Agreement (CRADA)
- Other Transaction Authority (OTA) for Prototype Projects – Sec 2371
- Procurement for Experimental Purposes – Sec 2373
- Prize Challenges – Sec 2374a



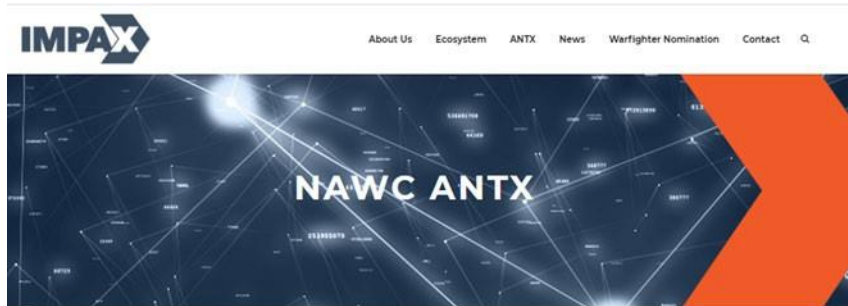
Acquisition Pathways





Industry/Academia Technology

GOAL: Reaching Industry/Academia to determine the “art of the possible”



IMPAX Website (for Ecosystem)

For communications from the website

<https://impax.tech/ecosystem>

IMPAX Website (for submissions)

For our Industry and academia outreach effort

<http://impax.tech/nawc-antx>

IMPAX Website will be the interface and collector of data from industry sources regarding the specific technologies that NEO/RPED is planning on taking a look at during ATE22. This will be the basis of information for our industry/academia scans that will be conducted in conjunction with RPED.

NAWC ATE21

ADVANCED NAVAL TECHNOLOGY EXERCISE (ANTX)/TEST-EX

ARE YOU AN INNOVATOR SEEKING AN OPPORTUNITY TO SHOWCASE YOUR TECHNOLOGIES WITH THE NAVY?

With the rapidly changing threat environment, our National Defense Strategy and other guiding strategic documentation identify a need to adapt quickly and rapidly to take advantage of technological innovations. To do this, technologists need a better understanding of the operational challenges and context, and warfighters need a better understanding of what the technological innovations can do for them. To gain this interaction, innovative organizations across industry, academia and government need forums to allow for technical and operational exchanges. ANTXs allow for this type of interaction without much of the bureaucratic restrictions that typically limit interaction, speed to fleet or stifle good collaboration.

ANTX's focus on bringing relevant opportunities to appropriate transition pathways quickly. ANTXs are a venue for warfighters, technologists, engineers and sponsors to collaborate and exercise new technology and prototypes prior to government investment. Shape tomorrow's technology today at the lowest resource point practical. Try it before you buy it!

NAWCADs ATEs are conducted utilizing a comprehensive set of Live, Virtual & Constructive (LVC) resources across the country and will sharply focus on emerging components of Naval Warfare in support of Distributed Maritime Operations (DMO).

NAWCADs overall ATE supports efforts in the following categories:

- Mission specific annual topic (i.e. Distributed Lethality, Long Range Surface Warfare (LRSUW), Joint War at Sea (JWAS), etc.)
- Demonstrate ability to fill capability gaps or advance technology of NISE funded projects.
- Opportunity to test Naval Air concepts and ideas from the Warfare Center and Naval Test Wing Atlantic (NTWL) Squadrons
- Program of Record (POR) opportunities
- Opportunity for Fleet Forces to risk/reduce experiment prior to inclusion in fleet events
- LVC Environment for Programs Capabilities Based Test and Evaluation (CBTAE) Testing
- Inclusion of industry to Demonstrate New Acquisition Guidance and Opportunities



Experimentation Opportunities

- 1. Risk reduction and support for Fleet experimentation**
 - Valiant Shield, LSE-xx, NTGe-XX
- 2. Provide mission relevant environments from which projects and programs can conduct experimentation and testing**
 - Limited Objective Experiments (LOEs)
 - Assistance in pulling an LVC environment together to support simulating fleet objectives
- 3. Experimentation Planning**
 - Design, Environments/Venues, Execution, Data Management
- 4. Technical Experimentation/CBT&E**
- 5. Utilization of Accelerated Acquisition Opportunities**
 - 2371b, 2371, 2372, OTAs, CRADAs, etc.
- 6. Opportunity to Assess Enabling Technologies**
 - Avionics, Power Plants, Structures, etc.



Experimentation Opportunities

(continued)

7. Holistic NAWC Strategy on experimentation

- Working with NAWCWD Collaboration and assigned POCs at NAWCAD sites:
 - NAWCAD LKE
 - NAWCTSD

8. Collaboration with NAWCAD, NAVAIR and other Warfare Centers

- Coordinating with Dahlgren for LRSUW opportunities
- Coordinating with Military Sealift Command (MSC) for capability gap definition

9. Navy RDT&E NILE Events

- Building Blocks and Risk Reduction for experimentation

10. PMA Opportunities

- Support development with NISE projects
- Provide venue through ATE events

11. SBIR Opportunities

- Provide opportunities for SBIR projects in the 2-2.5 range to conduct efforts
- Looking at options to interject ANTX experimented technology and interject into the program.



NAWCAD Resource Investments (FY21)

Provide a comprehensive walk-on UAS (Group 1-3) experimentation and developmental test capability at NAWC

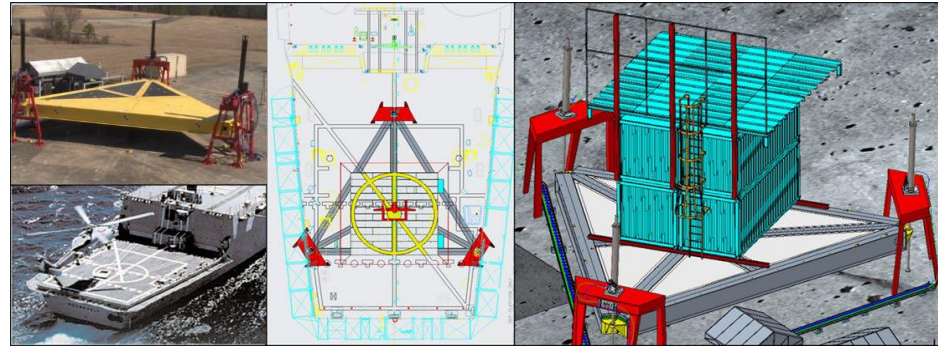
Aerodrome Facility @ Webster

- Grp 1/2 su60ft (w) x 120ft (l) x 40ft (h)
- pport, Grp 3 for ground
- Tracking internally, connection to White Cell



Ship Motion Platform @ Lakehurst

- Sea State Levels up to 3/4 for Navy Ships
- DDG physical deck (1000 lbs limit)
- Allows for development of AI/ML vision systems training using "Vertical Data Set"
- Allows for synthetic data set(s) development



UAS Assets

- Modernization of Aerostar (RQ-26A)
- All-Electric Experimentation UAV
- Gas-Electric Hybrid Experimentation UAV



Marshall Tag system

- Grp 1's/2's UAV Tracking in the field
- Supports CHECKMATE (commercial products)
- Info immediately available for analysis





RPED leverages the entire Warfare center

- Test Wing Atlantic
 - VX-20, HX-21, VX-23, UX-24
- Atlantic Test Range
- 128 state-of-the-art laboratories
- UAS Experimentation Assets
- C-38 “Flying Laboratory”
- Targets
- Aerodrome Facility
- Secure Environment
- Naval Integrated Live Virtual & Constrictive (NILE)
- Warfare Effectiveness Department (WED)
- Aircraft Prototype System Division
- Mission Operations & Integrations Department
- Airborne Systems Integration Division
- AirWorks
- Experimentation Tools (NTGS, JARR, NSITE)

The NAWC provides a world class venue for experimentation and test that is replicated nowhere else in the world.



WE MAKE AN IMPACT

[HTTP://WWW.NAVAIR.NAVY.MIL/NAWCAD](http://www.navair.navy.mil/nawcad)

A NAVAIR COMMAND



Backup

Alternative Acquisition Pathways and Authorities

Objective - Accelerate development and fielding of capabilities required or Naval Forces to achieve mission success

- Policy on Accelerated Acquisition governance
 - Urgent and emergent needs
 - Accelerated Acquisition
 - Policies to accelerate decision making
- Leverage nascent NDAA authorities and reforms
 - Mid-Tier Acquisition (FY16 NDAA, Section 804)
 - Acquisition Agility (FY17 NDAA, Section 806)
- Other Transaction Authorities (OTA)
 - 2371, R&D OTA authority
 - 2373, Purchase of items of military utility
 - 2374a, prize authority
- 3rd Party Financing (3PF)
- FY2022 NISE 219 Investment Strategy
- Advanced Naval Technical Exercise (ANTX)
 - 2021/2022 PAX/Test-Ex

