Unmanned Air Vehicle Operator Selection: Ensuring A High Reliability Organization Through Applied Aeromedical Research

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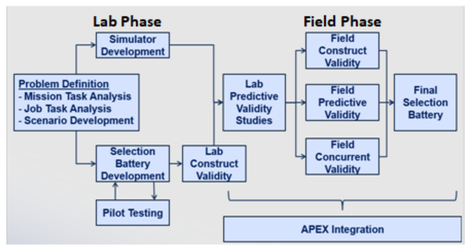
GOAL: Develop and deliver to the Fleet a selection test to identify the best qualified candidates for the Navy's Unmanned Aerial System Air Vehicle Operator communities

Background

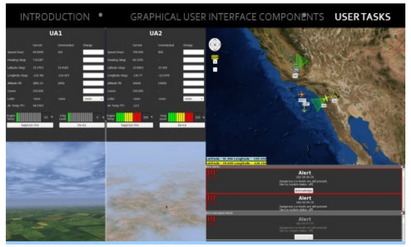
- The Department of the Navy continues to rely on Unmanned Systems (UxS) to increase *Lethality*, enhance *Readiness*, and project *Power*.
- The Knowledge, Skills, and Abilities (KSAs) required to operate these systems are fundamentally different from those needed to operate manned platforms.
- Successfully manning UxSs requires a strategy to manage selection, training, and interface design as equal parts of a common approach for optimizing Human System Integration (HSI).
- This poster summarizes a Joint research effort to develop/transition the first-ever tool for selecting Unmanned Aerial System (UAS) Operators. The tool was instrumental in establishing the Navy's first Air Vehicle Operator Community (NAVADMIN 315/20).
- The principles and techniques developed here can be applied to establishing additional UxS Operational Communities as High Reliability Organizations, and provide a foundation for realizing the CNO's vision of delivering a larger, hybrid fleet seamlessly integrated with our manned platforms.

Methods: Select individuals with KSAs that *predict* future job success

- Approach integrated models of skill and domain knowledge acquisition with taxonomies of cognitive (ability), affective (personality), and conative (motivation, interest) traits (Ackerman, 1988; Ackerman & Kanfer, 1993).
- Included a *"Lab Phase"* to build & refine the selection tool, and a *"Field Phase"* to operationally assess & validate the tool; transitioned to the platform which supports the Navy's manned Aviation Selection Test Battery (ASTB).
- The *Lab Phase* covered four validation studies & included a UAS simulator that mirrored UAS mission profiles using 14 scenarios that required operators to respond to commands & alerts, make decisions, & manage varying workload levels. The *Field Phase* included five different studies, with Tri-Service participation.
- The complete selection tool included 15 different tests.



Workflow of phases for tool development



Screen-shot of UAS simulator

15 Tests
- Memory (2)
- Spatial (4)
- Math/Quantitative (3)
- Knowledge (1)
- Perceptual Speed (3)
- Completion (1)
- Traffic Navigation (1)

Suite of tests comprising the tool

Results

Lab Phase

- Existing USN & USAF manned aviation selection tests accounted for <40% variance in UAS test battery (60% unique variance).
- Strong predictive relationship between prototype test battery (15 tests) and UAS simulation performance (N=225; *r=.50*).
- Predictive validity improved with use of "optimized" test battery - 7 most predictive tests (N=136; *r=.56*).

Field Phase

- UAS test battery administered to ~500 enlisted and officer personnel across USA, USN/USMC, and USAF with different levels of experience with a variety of UAS platforms.
- No significant gender differences, but large differences between officer and enlisted.
- Attrition data showed those with higher test scores were less likely to leave training.

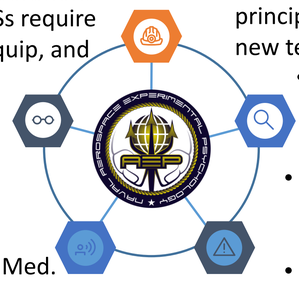
Alignment to High Reliability Organization (HRO) Principles

- HROs operate in complex, high-hazard domains for extended periods without serious accidents or failures.
- The current effort demonstrates the value of reliable and valid selection systems towards achieving this goal by enhancing workforce competence, safety and motivation, satisfaction, and organizational commitment.
- These factors combine to ultimately enhance readiness & performance and reduce mishaps.

The Five HRO Principles Applied to UAS Operator Selection

Sensitivity to Operations

DoN leaders recognized that UxSs require new ways to select, train, and equip, and endorsed this effort:
- Chief, Naval Air Training
- PEO, Unmanned Aviation & Strike Weapon
- USMC Aviation Expeditionary Enablers Branch
- BUMED Director of Aerospace Med.



Deference to Expertise
- Our team coordinated across the DoN, with other Services, and with Academia and Industry to understand the different UxS missions & platforms.
- As a result our selection tool has been rigorously reviewed, tested, and validated.

Commitment to Resilience
- Our Aerospace Experimental Psychology team treats HRO principles as a cycle to be continually revisited and updated as new technologies, processes, and policies arise.
  - Through managing the manned aviation selection test, we manage the effectiveness of the UAS selection test.

Reluctance to Simplify
- The selection tool is driven by a deep understanding of the KSAs required to effectively operate UxS across a range of missions and environments.
- Includes a detailed battery of tests validated using a UAS simulator to replicate operational conditions.

Preoccupation with Failure
- The more effectively we select operators, the more effectively and efficiently we can deliver training & build control interfaces.
- The "price of success" is the cost saved by selecting those who are less likely to attrite from training.

Impact and Future Work

- Using HRO principles, the Aerospace Experimental Psychology team identified the unique KSAs necessary for the operation of UAS and developed a reliable and valid set of tests to measure them.
- Results of this work will be used to select candidates for the newly established Warrant Officer AVO community who will operate the MQ-25 Stingray, the first carrier-based UAS in the Navy.
- As UxSs increase in both availability and use, operator selection may be improved through:
  - Highly specific tests that focus on KSAs designed for very narrow mission domains;
  - More generalized tests targeting a broad set of KSAs that allow operators to move from one domain to another.
- As UxS operations become more automated, a single human operator may control multiple UxSs simultaneously.
- These shifts in roles & responsibilities will expand upon the technical scope of this effort, with integration from other domains, like Artificial Intelligence, to exploit efficiencies in data analysis, prediction, and generalizability.

References

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- NAVADMIN 315/20 Establishment of the Aerial Vehicle Operator (AVO) Warrant Officer (WO) Community December, 2020.