ELECTRONIC WARFARE CONTINUUM ASSESSMENT PROGRAM FOR NAVAL AVIATION

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ABSTRACT

The need to document warfighting readiness and training effectiveness is a major concern for warfare sponsors, operational commands and training system developers. The Electronic Warfare Continuum Assessment Program (EWCAP) is a low cost method for rapid evaluation of electronic warfare (EW) readiness and training effectiveness across the careers of Naval Aviation personnel. EWCAP provides documentation of EW performance and training deficiencies, and recommends solutions to identified training deficiencies. To produce a snapshot view of EW knowledge and skills, microcomputer-based tests have been developed and administered to the EA-6B, E-2C, F/A-18, and A-7 communities, and are in development for the S-3, A-6 and F-14 communities. Repeated testing of each platform determines whether changes implemented in the training cycle significantly impact operational performance. Each test is carefully constructed to offer maximal training benefits through the use of extensive instructional feedback. Fleet response to the EWCAP for both training and testing has been overwhelmingly positive.

INTRODUCTION

The Electronic Warfare Continuum Assessment Program (EWCAP) is designed to address the issues of electronic warfare (EW) training availability and operational readiness throughout the entire career of Naval aviation personnel. The objectives of the Naval Training Systems Center (NAVTRASYSCEN) EWCAP program are to: (1) determine the EW readiness of the fleet, (2) develop a method for obtaining rapid evaluations of each aviation platform, (3) provide the Chief of Naval Operations (CNO) with documented evidence of training deficiencies, and (4) recommend solutions to problems identified. Sponsors of the EWCAP are CNO, OP-59, and Naval Air Systems Command, PMA-205. With current capabilities, the EWCAP is one of the first concerted efforts to derive training requirements and validate training programs using efficient, automated approaches and empirically-based performance data.

It was required that the program be low cost, provide a quick turnaround, and impose no paper work on the fleet. In order to accomplish the program objectives within this framework, a computer based testing tool [1] was developed under government contract by SWL, Inc., and extensively modified by NAVTRASYSCEN. The Skill and Knowledge Assessment Tool (SKAT) consists of software programs designed to develop and administer tests, and collect data to document levels of knowledge over a wide range of subject matter areas. This software package incorporates both graphics and text to provide the opportunity for complex scenario development and extensive instructional feedback.

EWCAP TEST METHODOLOGY/COMPOSITION

Each test is composed of instructional screens, demographic collection screens, and test question sequences (Figure 1). Each test sequence is composed of the question, remedial instruction or positive feedback, at the minimum. Optionally, a test sequence may also include introductory text or graphics, and a hint screen (Figure 2).

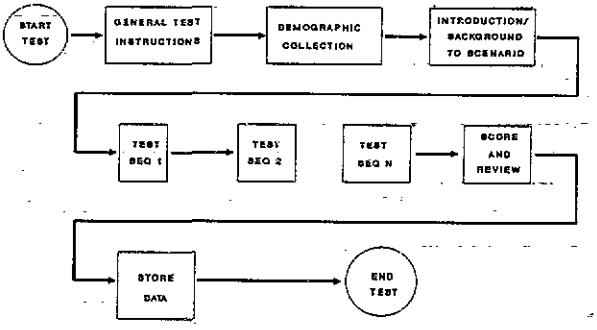

Figure 1: EWCAP Overall Test Sequence

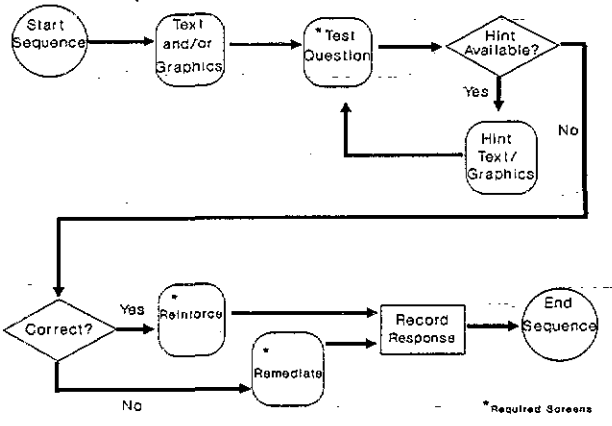

Figure 2: EWCAP Test Question Sequence

Text screens provide the user with tactical background, scenario building information, and battle updates throughout the course of the test. Test screens require a response from the user and are directly followed by remedial or feedback screens. These screens ensure that errors are immediately remediated and misconceptions are not carried through the test.

While the primary goal of the EWCAP is to evaluate the skills and knowledge of the aviation community, each test is carefully constructed to offer maximal training benefits through the use of extensive instructional feedback. Therefore, in addition to correcting errors and clarifying ambiguities, supplemental information related to the question, such as changes in weapons systems, new threat data, or new methods of employing specific tactics can be included. So, in addition to more routine testing and training functions, EWCAP can be used to rapidly disseminate new EW data.

At the conclusion of the test, the user is allowed to review incorrectly answered questions and associated feedback, in order to further resolve misconceptions. The user is given a final score and a summary of performance across categories. Finally, the user is allowed ample space to relay comments back to NAVTRASYSCEN on any facet of the EWCAP test. This information has provided NAVTRASYSCEN important feedback which has lead to significant improvement of the program.

SPECIFIC TEST DEVELOPMENT

Platform specific tests are developed through extensive collaboration between Fleet subject matter experts (SMEs), appointed by the Type or Functional Wings, and NAVTRASYSCEN personnel. These SMEs are primarily EW instructors or EW officers. At working group meetings, mission requirements are discussed at length. The distribution of questions across categories is determined by rating the relative importance of each category to overall mission success. In general, questions fall into one of the following categories: theory, threat, equipment/weapons, offensive and defensive tactics. However, question categories can be tailored to a specific community. For example, the EA-6B community placed more emphasis on EW theory than the F/A-18 community; and the S-3 community combined the tactics categories into an overall integrated EW category.

SMEs generate specific questions, scenarios, introductory material, and required graphics. Questions and scenarios are developed using current threat and tactical data. Several scenarios can be created to serve as a framework for many of the questions throughout a test. Scenarios include geographic displays, electronic orders of battles, intelligence reports, external communications, and battle updates. The scenarios provide a framework in which the user must assimilate and apply tactical and intelligence data to the test problems. Using the specific platform's mission as a context for testing allows for a more realistic evaluation of EW knowledge and skills.

Once development is complete, tests are reviewed by the appropriate platform desk at the Naval Strike Warfare Center. This review ensures that test information does not contradict tactical doctrine. As a final quality control measure, each platform test is given to a small number of operational personnel prior to full Fleet administration.

TEST ADMINISTRATION

EWCAP tests are administered using a computer based testing format. Each aviator is issued a single disk with the full test and demographic survey. Test question responses, latencies, and demographic information are stored on that same disk. All disks are collected and returned to NAVTRASYSCEN for subsequent data analysis.

All aircrew in operational, deployed, and fleet replacement squadrons, are tested. By testing only active fleet personnel, the assessment addresses only those officers who must maintain a high level of EW readiness. Therefore, identified deficits reflect problems in our operational community.

DATA ANALYSIS

Each evaluation identifies specific strengths and weaknesses within the community tested and documents areas requiring remedial and training enhancing actions or policies. The original evaluation for each platform serves as a benchmark for future analyses. Repeated testing of each community will determine whether changes implemented in the training cycle significantly impact operational performance. This allows for documentation that performance changes over time are attributable to factors, such as new training, increased training, and/or the effectiveness of specific courses.

Demographic data collected serve as independent variables. These variables include: rank, operational experience, position in cruise cycle, flight hours, simulator time, EW courses, combat experience, experience with specific systems, mission qualifications, etc. Examination of relationships between these variables and test performance identifies EW deficiencies along with factors that positively impact EW performance. For example, specific courses, time on specific trainers, and position in the cruise cycle can be linked to better performance on the EWCAP. Through examination of these data and discussions with fleet personnel, potential training solutions to identified deficiencies are recommended.

RESULTS

To date, the EWCAP has developed a method of rapid evaluation. This includes software tools for test

development, administration and data reduction as well as a methodology for conducting question bank development and review cycles.

Early findings of the EWCAP demonstrated that: (1) EW capabilities can only be evaluated in the context of the mission, (2) areas of skill emphasis vary widely among platforms, (3) test development must include a broad question base distributed across evaluation categories, and (4) acceptable performance in one community may not be adequate for another [2].

The evaluations of four platforms (EA-6B, E-2C, A-7, and F/A-18) have been completed with two in progress (A-6 and S-3) and two planned (F-14 and EP-3). The question bank is currently at approximately 700 questions and 20 scenarios.

Test development, administration and analysis methods have evolved over the course of the program. During the first testing phase of the A-7 and F/A-18, problems were identified and have been addressed, such as the need for more detailed demographic data collection and a broader question base. The most serious problem encountered in the EA-6B evaluation was that aviators were able to take the test, but exit the program prior to inputting demographic information. This limited the discriminatory value of some of the data collected. A software correction solved this problem for subsequent platform evaluations, by requiring demographic collection at the beginning of the test.

The A-7 and F/A-18 analyses were basically a preliminary Beta testing of the program, but did provide important data highlighting the need for additional training with EW gear and on knowledge of the threat. This was particularly true of the junior officers who lacked operational experience with EW the equipment. Finally, EW performance was found to increase with EW training. The following courses had a positive impact on test performance: EW Officer's Course, Weapons Training Officer's Course, and Strike Leader Attack Training Syllabus (SLATS) Course.

The EA-6B evaluation for Electronic Countermeasure Officers (ECMO) showed that EW scores increased with rank and operational experience, and performance was highest during mid-cruise. Specific courses related to improved performance were also identified (Table 1). This documented the positive impact of current EW training programs.

Table 1
EA-6B ECMO Scores by Specific Courses

Course Title (# Attended)	Attended Course: Yes	No	
TACAIR Course CNEWS (12)	77%	71%	*
Pilot Course CNEWS (3)	87%	71%	*
EWO Course VAQ-129 (31)	76%	70%	*
SLATS at NSWC (22)	79%	70%	*
Med Attack Weap School (44)	77%	69%	*

*$p < .05$

The E-2C assessment is nearly complete with additional demographic data collection to include trainer specific information (e.g., Device 15F8, Tactics Trainer, Device 2F110, Operational Flight Trainer, Device 2C20B, Cockpit Procedures Trainer), hours with specific EW systems, and time in each qualification. This assessment, administered late 1990/early 1991, will yield particularly interesting data given its overlap with Desert Shield/Desert Storm activities.

CONCLUSIONS

The EWCAP provides a snapshot of aviator skills and knowledge for each platform. It is this picture that allows for the identification of EW strengths and weaknesses across the spectrum of Naval Aviators' careers, "cradle to grave". Thus, the EWCAP evaluations can be used to define and support training requirements and to defend budgetary plans for implementation of training solutions. Repeated testing provides documentation of the effectiveness of specific training interventions (e.g., new or modified courses and part task trainers).

As previously stated, the EWCAP is carefully constructed to offer maximal training benefits through the use of extensive instructional feedback. Therefore, the EWCAP not only serves to document overall platform readiness, but it also provides direct and immediate diagnostic feedback and training to the individual aviator.

Fleet response to the EWCAP for both training and testing has been overwhelmingly positive. Comments received from EA-6B ECMO's have included: "Very good. Would like to see a training program made available in the same format," "Good review. Like to see more of the same. Valuable training tool," and "Very well written. Enjoyable, showed me my weak areas and I will plan my studying accordingly."

In evaluations to date, perhaps the most notable finding is the strength of specific EW courses. These courses are taken primarily by the more senior officers. Increasing access to the critical information taught in these courses, perhaps through computer-based

training, may decrease performance discrepancies between junior and senior officers.

As EWCAP continues, the program will be further refined. The software itself is in the process of being translated from Basic to C to increase program speed and graphics presentation. More detailed demographic collection, such as the use of specific trainers, will provide more in-depth understanding the differences in performance and assuring efficient training operations across the EW continuum.

The EWCAP's value as an improved and low-cost method for defining training requirements and controlling the quality of training programs is being demonstrated for EW. Application of this methodology could easily be expanded to address the needs of civilian, academic, and other military communities.

REFERENCES

[1] SKAT (1988). SKAT: A Skill and Knowledge Assessment Tool. McLean, VA: SWL, Inc.

[2] Moskal, P. J., Bergondy, M. L., Moser, V. J., and Nida, R. J. (1989). Electronic Warfare Continuum Assessment Program for Aviation. (Report No. NAVTRASYSCEN TR 89-021) Orlando, FL: Naval Training Systems Center.

ABOUT THE AUTHORS

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