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| <p>► The Naval Aerospace Medical Research Laboratory is studying the use of cognitive, perceptual-motor, and multiple-task (CPM) tests to predict aviator inflight performance. If successful, these tests may facilitate aircrew selection, training pipeline assignment, and post-training aircraft assignment. The research objectives are to develop relevant automated tasks, test them on aircrew, and then relate aircrew test performance to actual inflight performance. All of these objectives depend on being able to identify reliable measures of inflight performance.</p> <p>In our first study, 18 F-4 pilots completed automated tests and then performed in Fleet Fighter ACM Readiness exercises. We found that their overall ACM grade (OAG), resulting from the Tactical Aircrew Combat Training System (TACTS) ACM performance evaluation, was significantly related to the subjective OAG measures: offensive</p> |       |   |  |   |                               |  |
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maneuvering, situational awareness, and mutual support. In addition, the OAG was significantly, but negatively, related to the objective TACTS measures: mean time-to-first kill, adversary aircraft missile shots, and the number of times a pilot was "killed" in the simulated exercises. In other words, a higher ACM grade was associated with shorter times-to-first kill, being shot at less often by adversary aircraft, and being "killed" fewer times. Statistical analysis indicated that four ratings/measures reliably predicted the OAG: situational awareness, offensive maneuvering, number of times killed, and mutual support. (SD)

We correlated the OAG and the above four criterion measures with the CPM test performance of the F-4 pilots. A composite kill-difference score, based on the total number of ACM kills minus the number of times a pilot was killed, was also analyzed. We found that dichotic listening test measures obtained during multiple-task performance were significantly related to offensive maneuvering, OAG, and the kill-difference composite score. Thus, our tests reliably predicted ACM performance for a small sample of F-4 pilots.

In a second study, we examined the TACTS ACM competitive performance of 125 F-14 naval aviators participating in Fleet Fighter ACM Readiness Program Exercises at NAS Oceana. Results indicated that a few measures--kill-difference composite score, situational awareness, energy management, and mutual support measures--could reliably predict the OAG. We also analyzed the reliability of the Fleet Fighter ACM grading process. Based on a prediction model of OAG, overall ACM Grades were computed for eight different pilot subsamples and then correlated with the actual OAG. The mean correlation value was .88, which indicates that the OAGs obtained from the prediction model were highly similar to actual OAGs, regardless of the subject sampling procedure. From these results, we conclude that the Fleet Fighter ACM Readiness program grades are reliable criteria for validating tests designed to predict F-14 pilot ACM performance.

In a third study, we computed correlations between TACTS ACM criteria and pilot experience measures (age and type of flight hours). Mean time-to-first-kill score was consistently related to both age and flight experience. Also, pilot experience influenced performance in TACTS ACM, especially in achieving visual identification kills and improved time-to-first kill scores. Neither pilot age nor flight experience was related to engaged kill, number of times killed, situational awareness, visual tally, and visual identification range, criteria.

In conclusion, the successful validation of synthetic tests to predict ACM performance should be valuable for improving the quality and capabilities of fighter aircrew through their initial selection and subsequent assignment to training pipelines and aircraft.

# RESEARCH INFORMATION BULLETIN



*A series of reports by the  
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No. 88-1

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## **PREDICTING AIR COMBAT MANEUVERING (ACM) PERFORMANCE: FLEET FIGHTER ACM READINESS PROGRAM GRADES AS PERFORMANCE CRITERIA**

The Naval Aerospace Medical Research Laboratory is studying the use of cognitive, perceptual-motor, and multiple-task (CPM) tests to predict aviator inflight performance. If successful, these tests may facilitate aircrew selection, training pipeline assignment, and post-training aircraft assignment. The research objectives are to develop relevant automated tasks, test them on aircrew, and then relate aircrew test performance to actual inflight performance. All of these objectives depend on being able to identify reliable measures of inflight performance.

In our first study, 18 F-4 pilots completed automated tests and then performed in Fleet Fighter ACM Readiness exercises. We found that their overall ACM grade (OAG), resulting from the Tactical Aircrew Combat Training System (TACTS) ACM performance evaluation, was significantly related to the subjective OAG measures: offensive maneuvering, situational awareness, and mutual support. In addition, the OAG was significantly, but negatively, related to the objective TACTS measures: mean time-to-first kill, adversary aircraft missile shots, and the number of times a pilot was "killed" in the simulated exercises. In other words, a higher ACM grade was associated with shorter times-to-first kill, being shot at less often by adversary aircraft, and being "killed" fewer times. Statistical analysis indicated that four ratings/measures reliably predicted the OAG: situational awareness, offensive maneuvering, number of times killed, and mutual support.

We correlated the OAG and the above four criterion measures with the CPM test performance of the F-4 pilots. A composite kill-difference score, based on the total number of ACM kills minus the number of times a pilot was killed, was also analyzed. We found that dichotic listening test measures obtained during multiple-task performance were significantly related to offensive maneuvering, OAG, and the kill-difference composite score. Thus, our tests reliably predicted ACM performance for a small sample of F-4 pilots.

In a second study, we examined the TACTS ACM competitive performance of 125 F-14 naval aviators participating in Fleet Fighter ACM Readiness Program Exercises at NAS Oceana. Results indicated that a few measures--kill-difference composite score,



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situational awareness, energy management, and mutual support measures--could reliably predict the OAG. We also analyzed the reliability of the Fleet Fighter ACM grading process. Based on a prediction model of OAG, overall ACM Grades were computed for eight different pilot subsamples and then correlated with the actual OAG. The mean correlation value was .88, which indicates that the OAGs obtained from the prediction model were highly similar to actual OAGs, regardless of the subject sampling procedure. From these results, we conclude that the Fleet Fighter ACM Readiness program grades are reliable criteria for validating tests designed to predict F-14 pilot ACM performance.

In a third study, we computed correlations between TACTS ACM criteria and pilot experience measures (age and type of flight hours). Mean time-to-first-kill score was consistently related to both age and flight experience. Also, pilot experience influenced performance in TACTS ACM, especially in achieving visual identification kills and improved time-to-first kill scores. Neither pilot age nor flight experience was related to engaged kill, number of times killed, situational awareness, visual tally, and visual identification range, criteria.

In conclusion, the successful validation of synthetic tests to predict ACM performance should be valuable for improving the quality and capabilities of fighter aircrew through their initial selection and subsequent assignment to training pipelines and aircraft.

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