

A TACTS Range at Your F and Other High-Tech Marvels on

by Derek Nelson

During your first Tactical Aircrew Combat Training System (TACTS) debrief, did you notice any differences between the actual event and what you remembered? Debriefs are much more constructive when you can watch a replay of the flight, constructed from data collected at highly instrumented training ranges. Until recently, this TACTS-type technology has been limited to

instrumented training ranges at only a handful of locations around the country. However, with recent advances in computer technology, high-fidelity replays of missions have come of age and may soon be available to anyone with access to a PC.

Several projects are underway, including the Computer-Aided Performance Assessment System, or CAPAS for short, one of a number of computer-aided debriefing tools for flight training now commercially available. CAPAS digitally captures flight, voice and video data from simulator missions and replays it during the debrief [See inset photo on page 18]. On a desktop computer in the debrief room, you can display flight instruments, gauges, flight paths, and tactical plots. You can also see a 3-D graphic of the simulated aircraft, viewed from any external angle (from a wingman's view, the LSO platform or tower, or from the pilot's view inside the cockpit). You also have both video and audio of the aircrew.

CAPAS lets instructors digitally "mark" specific maneuvers or actions of the crew for rapid recall



When analyzing the flight you just finished, would you rather have your HUD tape, kneedboard notes and memory, or this interactive display? DCS Corporation's Mission Analysis and Replay System (MARS), using a military version of the software product FlightViz, can give you a PC-based tool for analyzing and assessing your most recent mission. This view shows a Navy F-18E taking off.

Fingertips on the Horizon

and replay during the debrief [*See photo at right*]. This ability dispenses with cumbersome rewinding and searching associated with analog tapes, and it improves the fidelity and focus of debriefs.

The CAPAS field testing was initially funded by the SECNAV's Office of Safety and Survivability. The system was integrated into the FRS training program, using Spirent Computer Aided Debriefing System animation and marking-device software. CAPAS is part of a larger effort by the Naval Air Board's Human Factors Quality Management Board, which was chartered to reduce the rate of mishaps caused by human error. The board's Training Improvements Working Group also recognized CAPAS as a potent tool for Crew Resource Management (CRM) efforts to improve aircrew situational awareness, decision-making under pressure, and other factors that contribute to human error.

Material problems are increasingly under control, so human error has emerged as the target of opportunity in mishap prevention. From FY95 through FY99, human error was a factor in 131 of 155 Navy and Marine Corps Class A's, more than double any other single factor. Skill-based errors (defined as errors in basic aviation skills, such as stick-and-rudder control, scan in and out of the cockpit, or following checklists) figured into 52 of these mishaps. In FY00,



Flight instructor Lt. Mike Kozub (middle) uses the Computer-Aided Performance Assessment System (CAPAS, for short), during a debrief with Ltjg. Mike Gawlas (left) and Ltjg. Scott Berg. CAPAS captures flight, voice and video data from simulator missions so you can replay it during the debrief.

human error was a factor in 17 of 29 Class A's; skill-based errors were a factor in 14. These two categories are the "low-hanging fruit" in the focus of our current efforts to reduce mishaps.

This category of errors has long been acknowledged as a causal factor in our mishaps. In the early '90s, skill-based errors were a factor in about 40 percent of all TACAIR and helo Class A's. That percentage has now climbed to above 60 percent. This dramatic statistic is prominent in the current "tapestry" brief by RAdm. Skip Dirren, Commander, Naval Safety Center. The brief correlates data from MIRs, Naval Safety Center surveys at more than 40 commands, Cultural Workshops at more than 60 aviation units, SSWG meetings, ASC briefings at Monterey, the IG report on naval aviation spares and readiness, and debriefs after ORM immersion training.

The conclusion: The adage "to err is human" is still accurate. Inadequate training, insufficient manning, and lack of equipment can also contribute to mishaps. The fact that skill-based errors are on the rise is cause for concern. Given that flight hours may not increase any time soon, we have to



SimAuthor's FlightViz is already in use in commercial aviation. The image at top is from the animated version of a 737 making its approach. The inset image shows the data available from the Computer-Aided Performance Assessment System; at the upper right of that image is video of the aircrew, with an S-3B at lower right.



figure out how to make the most of the training events and feedback available. That's where this new technology comes in.

Previous aircrew-coordination training programs used generic scenarios in annual, 3-to-4-hour sessions. With CAPAS, instructors have been able to study trends, evaluate shortcomings of curricula, and replay and analyze events that have noteworthy training value. Another unforeseen benefit has been that students' self-assessment and crew-assessment skills have also improved.

The next logical step in this technology is to apply CAPAS-type systems to daily operations. The airline industry has extracted flight data as part of a program known as Flight Operations Quality Assurance (FOQA) since the early 1990s. The focus of this program was to monitor instances when pilots exceeded threshold limits, and then to use the information to provide

feedback into training curricula and modify procedures to improve safety. Similarly, CAPAS can help analyze performance and behavior, with a view toward modifying and improving training.

A few other initiatives use similar technology. One project (sponsored by NAVAIR PMA-209) uses the Crash Survivable Flight Incident Recorder (CSFIR) to record flight data. This data is then fed into a PC-based animator, which essentially replays the flight similar to CAPAS. Although this system was designed to recon-

struct mishaps, the information recorded can be extracted on a routine basis.

Another system that can reconstruct a flight, using flight-animation software similar to the aforementioned systems, is MARS, or Mission Analysis and Review System. MARS is a proprietary system that combines flight-data-visualization software called FlightViz (made by SimAuthor) and DCS Corporation's advanced software for collecting aircraft data to display and replay the mission. MARS can combine the data from flights of one or more aircraft and replay it for aircrew debrief.

The data collected also has many other applications. It can help you answer all those post-flight questions from the people in intel, ops, safety, and maintenance, and you won't have to rely on the good old kneeboard, your highly subjective memory, or data from the HUD tape.

MARS collects flight data using equipment already onboard most Navy and Marine Corps aircraft. It allows that data to be input to a desktop computer and formats it so the aircrew can play it back, displaying a 3-D scene of the aircraft and its computed path, along with airports and runways, terrain, cockpit instruments, navigational charts, and nav aids [See photo at right]. They can zoom, pan, and search for events. They can also analyze their performance against planned mission profiles or maneuvers and generate detailed reports. It provides a much better way to study safety-of-flight incidents. It can also give instructors quantitative feedback on mission performance, which can improve training.

CAPAS, MARS and similar tools are designed to allow aircrews to fly smarter and safer, despite increasing workloads in the cockpit and decreasing numbers of flight hours.

What's the status of these promising tools? VS-41 and HSL-41 were the Navy's beta-test sites for CAPAS. Since then, other CAPAS-type systems have been installed at HSL-40 and VAQ-129. The next install site is planned for VT-31. MARS has been pitched to NAVAIR, and the designers are looking for inputs from Topgun and NSAWC to further militarize it. FlightViz, as a stand-alone simulator debrief tool, will soon be installed on the new CH-60 simulator.

The big bogey, as always, is funding. 🛩️

