

MARINE CORPS OPERATIONAL TEST & EVALUATION ACTIVITY

MCOTEA Journal



Change is in the Air

MCOTEA is Ready

Validating Warfighting Systems

VOLUME IV ISSUE I

MARCH 2011



From the Director

Team, Stakeholders, Family and Friends of MCOTEA,

What an exciting update is contained within this edition of the Journal. The overarching theme is the ability to continue to provide valuable support in a changing landscape. The landscape refers to changes in policy, fiscal constraints, process execution, and maximizing internal efficiencies. This is visibly experienced in the change of address of MCOTEA as we executed the LONG awaited move. We were thrilled to have the Assistant Commandant preside over the ceremony and have the preponderance of military and civilian Acquisition Leadership present to share in the occasion.

The entire MCOTEA Team has continued to be leaders in Rapid Assessments, Integrated Testing, Design of Experiments, and employing internal control measures such as the Resource Tracker to accurately reflect the true cost of operational testing. The continued refinement of our process is evidenced in the after-action report for the test and evaluation of Global Combat Support System, which is significant in that it was conducted in a true live operational environment.

Next is an update on the accomplishments of Forward Operational Assessment (FOA) Team XV and the growing and exciting role of FOA XVI. Captain Todd Richardson is leading this successful venture in Afghanistan and has lined up multiple near-term assessments.

While my excitement abounds pertaining to the continued accomplishments of this exceptional team, this edition is also bittersweet for me personally. My replacement has been screened and slated and Col Pasagian is eager to accept the Directorship this summer. Evidence once again of the Marine Corps Command Selection Board Process and how it continuously hits home runs! I cannot easily put into words how fulfilling and rewarding these last three years have been to work with you all. You all are the sole Operational Test & Evaluation Activity for the Corps and the main conduit and liaison to the Director, Operational Test & Evaluation, who reports directly to the Secretary of Defense and Congress. You certainly deserve your valued reputation and I know you will continue to excel in the future.

Thank you and Semper Fidelis,

Colonel Dave Reeves
Director MCOTEA

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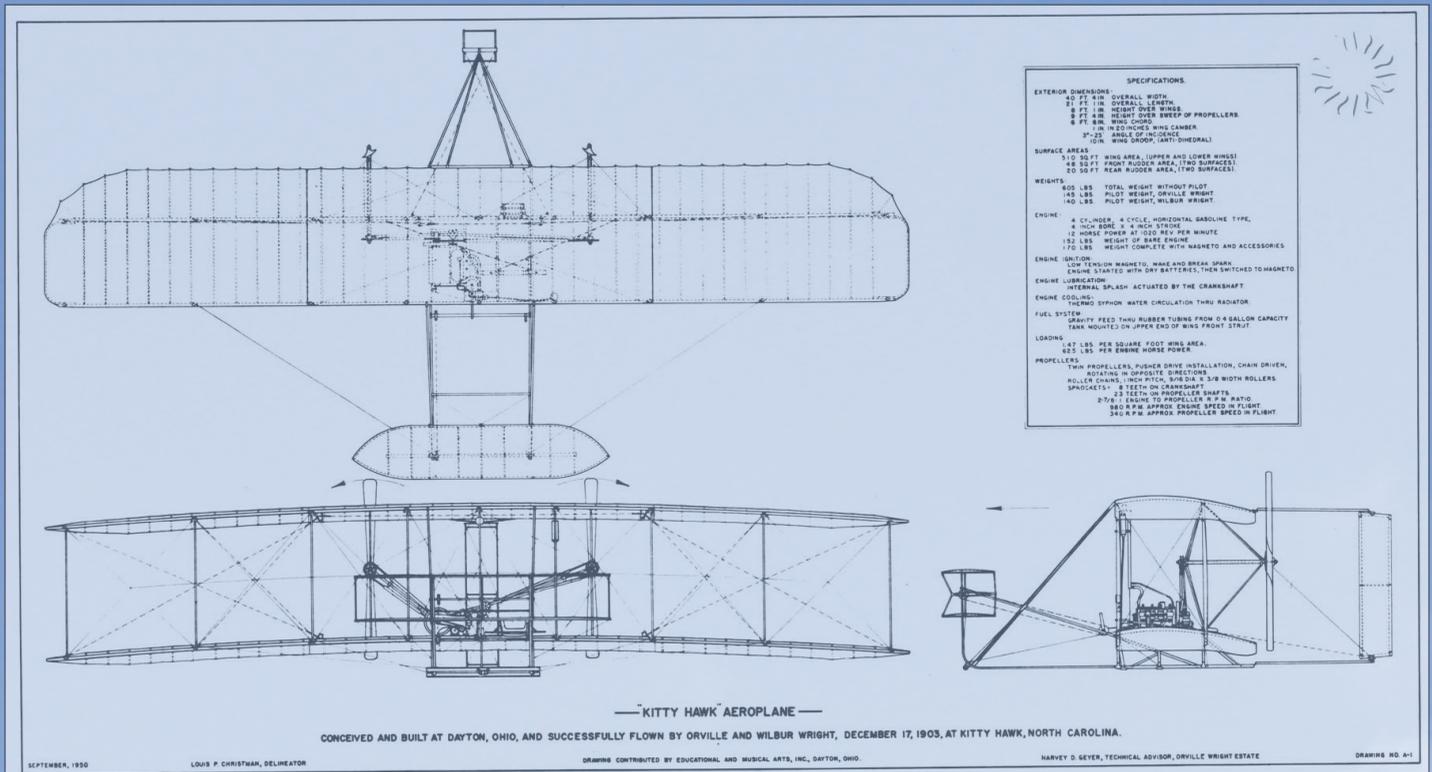


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About the Cover



The full schematic used on the front and back covers of this issue of the MCOTEA Journal.

On 17 December 1903, Orville Wright sent a telegram from Kitty Hawk, NC, announcing the first successful powered, heavier-than-air machine to achieve controlled, sustained flight with a pilot aboard. More than 100 years later, MCOTEA is engaged in test and evaluation of the latest generation of unmanned aerial vehicles (UAV).



The Small Tactical Unmanned Aerial System (STUAS) Integrator. The STUAS Integrator is able to carry a payload of up to 37.5 lb, has a max horizontal speed of more than 80 knots, and can travel for up to 24 hours straight. See page 9 for more on MCOTEA's work with the STUAS.

MCOTEA: Out of the Old, Into the New



To ring in the New Year, MCOTEA began packing up and moving out of a building that has seen better days. Moving trucks, shipping containers, and box after cardboard box ferried office equipment, appliances, and files from old work spaces to new, just down the street to refurbished quarters. The old red building is set to be demolished.

The entire MCOTEA staff pitched in to help make the move as efficient as possible, from Mr. Vince Willard, MCOTEA Logistics specialist (below), to Mr. Paul Johnson, MCOTEA Scientific Advisor (top right).

Relics from MCOTEA's past were uncovered, such as a commemorative plaque found by Mr. Mannie DeJesus, MCOTEA S-1. "It had something to do with NASA," Mr. DeJesus recalled, "but none of the writing was in English."

See the next two pages for coverage of the ribbon-cutting ceremony at the new MCOTEA building, featuring the visit of General Joseph F. Dunford, Assistant Commandant of the Marine Corps.





General Dunford Honors MCOTEA at Ribbon-Cutting Ceremony

Gen Joseph F. Dunford, Assistant Commandant of the Marine Corps, paid a special visit to Quantico on 18 February to cut the ribbon for MCOTEA's new quarters at 2032 Barnett Avenue. Gen Dunford, who was accompanied by Mrs. Dunford, addressed a crowd of MCOTEA staff and well-wishers that included BGen Daniel O'Donohue, Director, Combat Development and Integration; BGen Michael Brogan, CG, Training Command; BGen Frank Kelley, Commander MSCS; SgtMaj Reed, Marine Corps Combat Development Command; and Mr. William Taylor, PEO Land Systems.





Above left, MGySgt Shifflett, MCOTEA, with ribbon-cutting scissors in readiness. Above, Mr. Taylor, BGen Brogan, Gen Dunford, and Col Reeves during the national anthem. Left, Gen Dunford greets members of the band.

In remarks to the gathering, Col Reeves cited the audience for being “the pioneers and the architects that led to a lot of the things we achieved over the last few years in acquisitions within the Corps.”



Creating a Career from the Right “Break”



Maj Antonio Scofield

Major Antonio (Tony) Scofield arrived at MCOTEA in September 2010 thanks to a broken backpack nine years earlier. The short version of the story is that he had been dismayed by the shortcomings and design complexity of the Modular Lightweight Load-carrying Equipment pack—the MOLLE—and wondered how the Marine Corps acquired and tested such gear. The longer version is that his varied and interesting career in the Marine Corps has provided him with deep experience for becoming an acquisition professional.

Maj Scofield’s career began in 1991 when he enlisted and first served with 3d Supply Battalion in Okinawa and later 2d Supply Battalion in Camp Lejeune. He eventually attained the rank of Sergeant before being commissioned a Second Lieutenant in 1997. He graduated from Campbell University in North Carolina with a degree in psychology, a natural choice for such a people-oriented person.

In his current position as Branch Head of the Information Systems Test Branch at MCOTEA, Maj Scofield emphasizes that his first responsibility is to take care of his people, a group that includes everyone who supports the branch, whether Marine, civilian, contractor, or families.

“I am in a position of special trust

and confidence, and that is a huge responsibility,” he says. “I want to take care of my people so that they have the mental and physical strength to accomplish their mission. I want them to make their own decisions and know with certainty that they will be supported throughout the Activity.”

Caring for his people extends to an overall look at the professional landscape. Maj Scofield constantly scans that landscape to see how it could be improved, advice he received from a deputy Program Manager and took to heart while serving at Program Manager Training Systems, Orlando, FL, in 2002. By that time he was professionally interested in acquisition, and while studying acquisition management, he was told to apply something from every course he took to the betterment of the organization. He did so and also continued his own educational betterment by acquiring a Master of Science degree in Management in 2002 as well as an MBA in 2005.

Maj Scofield gained combat logistics support experience with III MEF in 2005 and deployed to Iraq from December 2005–June 2006. In 2007 he arrived at Marine Corps Systems Command (MCSC), where he served as Functional Subject Matter Team Lead for the Global Combat Support System-Marine Corps (GCSS-MC). This ACAT I program is a targeted information technology solution for a modernized, improved, and effective logistics capability for the Marine Corps.

The GCSS-MC program, built on a commercial-off-the-shelf application, epitomizes Maj Scofield’s belief that the Marine Corps can and should exploit commercial business solutions (without creating vulnerabilities) to become a more effective fighting service. “I don’t believe we can be effective without help from the commercial side,” he says. With that kind of help, “the Marine Corps can be state-of-the art rather



than 10 years behind the times,” he adds. The GCSS-MC program has completed initial operational test for capability release 1.1 and is preparing for testing of level 1.2.

Transitioning from system development work at MCSC to operational test at MCOTEA was a natural move for Maj Scofield after achieving DAWIA Level III certification and the acquisition professional MOS early in 2010. Since arriving at the Information Systems Test Branch, Maj Scofield has quickly absorbed the fundamentals of the MCOTEA test process, which he describes as “very good—defensible by data and rooted in scientific analysis.”

He is also busy with plans for implementing recent DOT&E guidelines for testing Information and Business Systems. He envisions immediate savings in cost and schedule through use of the guidelines, which essentially define the level of operational testing for IT and business software to be scoped according to performance and operational mission risk factors. Combined with MCOTEA’s regular test process, the new IT and business system guidelines provide another opportunity for improving the professional landscape.

Maj Scofield’s long-range personal and professional development desires call for application, if nominated, to the Industrial College of the Armed Forces, selection for LtCol, and eventual return to MCSC as a Program Manager, the last of which he might not have considered if it weren’t for that broken backpack many years earlier. 🦋

Honestly Enjoying The Job

Ms. Lacey Roderick has worked on programs including the Mine-Resistant Ambush Protected Vehicle (MRAP) and Command and Control (C2) systems such as the Common Aviation Command and Control System (CAC2S) and the Common Tactical Network (CTN). From Capitol Hill to Quantico, Ms. Roderick brings a wide range of experience to MCOTEA.

Q - What attracted you to the world of test and evaluation?

A - The test and evaluation (T&E) field is a dynamic environment and plays a critical role in ensuring that our Warfighters receive future products. Every day when I go to work I know that my duty is to provide a Marine with a new or updated resource to accomplish the mission. Be it an MRAP or a C2 system, they are all equally important to the Warfighter. I have been very fortunate to be part of those programs. Very few individuals can honestly look at their career and say they enjoy their job, but I do. For me, the T&E field continues to provide a tremendous amount of job satisfaction.

Q - How do you see your wide range of career experiences contributing to your work at MCOTEA?

A - I have been fortunate to have a diverse work background ranging from Capitol Hill to Quantico. I have been able to bring experiences from each job to my current duty in MCOTEA because T&E of C2 systems is multifaceted, touching many disciplines such as personnel and schedule management, site and facility suitability assessment, and interagency coordination of resources and documentation. I honestly cannot identify anything more significant in my career than attributing credit to some former bosses. To elaborate, I was given opportunities to make my jobs learning experiences, enabling me to grow both personally and professionally. A wide range of experience and outstanding mentorship allows me

to look at situations from multiple perspectives, thus permitting me to make decisions based on factual information.

Q - What has been the biggest challenge for you at MCOTEA so far?

A - Although I have worked as part of a DOD T&E program as a contractor, the learning curve of Marine Corps procedures and C2 systems as a civilian USMC employee has been steep. However, the assistance of my co-workers, contractors, and leadership enabled me to meet these challenges to see the CTN T&E program to completion and embark upon CAC2S Initial Operation Test, slated for early Spring 2011.

Every day when I go to work I know that my duty is to provide a Marine with a new or updated resource to accomplish the mission.

-Ms. Lacey Roderick

Q - What were some interesting experiences during CTN testing?

A - The most interesting experience during CTN was witnessing personnel from USMC active duty units, USMC reserve units, MCOTEA, contractors, and other government agencies contribute not only as individuals but also as members of a cohesive team that overcame multiple challenges to successfully conclude the test. Additionally, I again learned a lesson we are all taught as very young children...lightning is not our friend!

Q - What lessons did you learn working with CTN that you can bring to your work with CAC2S?

A - The most important lesson I take forward to all future tests is that teamwork is the key to success. Although we continually strive to foster teamwork, pressure from unexpected events can



Ms. Lacey Roderick

break down the team. However, this is the most important time to have teamwork as the team sees you through the challenges. I was extremely fortunate to have an excellent team on the CTN test that allowed concise execution of the Follow-On Test.

Also, clear communication and coordination is vital during the planning and execution of a test so every team member is completely comfortable with their assigned tasks.

Lastly, I will continue to nurture a close working relationship with the Program Office and Requirements Office. Building the relationships and trust enables the triad of offices to understand what will be executed during the test so MCOTEA can generate comprehensive, rigorous test trials, ensuring that a system meets its intended requirements.

Q - What's your number one priority to accomplish during your career at MCOTEA?

A - There are actually two things I want to accomplish. First, I want to gain as much knowledge as possible of C2 systems and DOD testing programs to better facilitate MCOTEA test programs. Second, I want to take my new-found knowledge and experiences to train and mentor newly assigned test leads within MCOTEA. 🌱

TECMIPT Conference Examines the Past, Present, and Future of CBRN

In a first for MCOTEA, the Activity hosted the Test and Evaluation Capabilities and Methodologies Integrated Process Team (TECMIPT) on 23-24 February. This conference brought together 19 organizations to develop consensus T&E Standards for the Joint and interagency Chemical, Biological, Radiological, and Nuclear (CBRN) Defense Program.

The TECMIPT provides technical recommendations for T&E strategies, advises the CBRN T&E Executive on the adequacy of existing T&E capabilities, infrastructure, and methodologies; and identifies capability gaps for the purpose of POM budgeting.

The products provided by the TECMIPT include the development and review of T&E standards packages for T&E capabilities, which are produced through Capability Area Process Teams (CAPAT) for each commodity area. The CAPATs are working groups made up of T&E subject matter experts (SME) from each of the CBRN T&E stakeholder organizations. The SMEs provide rigor to T&E standards development.

Ms. Ann Gossage, MCOTEA CBRN Branch Head, and Ms. Megan Holste, Senior CBRN Engineer for Team BAE Systems, provided information about the conference.

Q- What was the dominant theme of discussions?

We did not discuss specific Programs of Record. Instead, we talked about the T&E capabilities, methodologies, strategies, and infrastructures to support obtaining reliable, reproducible data to meet T&E community data needs.

We focused on how best to do the following:

- Provide high quality data and a common understanding that can be shared by all.
- Reduce redundant testing, program cost, and schedule slips.
- Achieve cross-community buy-in for standardized procedures.



The Chemical Biological Defense Program's logo includes the Latin words for "Examine the Past, Examine the Present, Examine the Future."

- Obtain/improve the ability to compare data between validated facilities, trials, phases—DOD, industry, interagency, and international.

- Better understand and use data more widely to ensure T&E meets decision needs throughout the entire testing process.

- Increase the Warfighter's confidence in the quality of Chem-Bio Defense equipment.

Q- What was the total attendance? How many organizations were represented?

Total attendance was 96. The group was highly diverse and in-

cluded SMEs from Joint Program Executive Office for Chemical and Biological Defense, Deputy Under Secretary of the Army-Test and Evaluation, DOT&E, Defense Threat Reduction Agency, EPA, Dugway Proving Grounds, Naval Surface Warfare Center, National Institute of Standards, Department of Homeland Security, Oakridge National Laboratory, Battelle LLC, Edgewood Chemical Biological Command, Joint Requirements Office, Army Materiel Systems Analysis Activity, OPTEVFOR, ATEC, AFO-TEC, and the Joint Science and Technology Office.

Q- What were some challenges inherent to running a Joint conference?

As expected, communication is always key in putting on a conference of this caliber. But this is a very professional and cohesive working group, and as such the challenges were minimal.

Q- Was the conference a success? What do you think was the primary lesson attendees took away?

The conference was very successful as a working IPT. These conferences are the center of gravity for CBRN Defense T&E Standards Development.

MCOTEA expects to remain closely involved in helping to develop T&E standards for the CBRN Defense Program. Challenges for the future include government-wide funding and personnel issues; synchronization with Industry test standards; and recent DOD 5000 focus on pre-Milestone B activities. Conferences such as the recent TECMIPT contribute to the community coordination essential for success. 🌱

STUAS Flies Towards Assessment

In partnership with Commander Operational Test and Evaluation Force, MCOTEA participated in an Early Operational Assessment (EOA) for the Small Tactical Unmanned Aerial System (STUAS) program from 11 Jan–11 Feb 2011. This assessment was performed on an off-the-shelf pre-Early Development Model version of STUAS named the Commercial Integrator by its contract developer, Insitu Inc. The Commercial Integrator is an evolution of the ScanEagle UAS, which has proven itself in combat in recent years.

STUAS will become the second tier in the Marine Corps UAS Family of Systems. Intended for employment with the Division, Regimental, and Marine Expeditionary Unit, the STUAS will provide dedicated day, night, and diurnal Intelligence, Surveillance, and Reconnaissance (ISR) coverage, targeting, and voice/data communications relay.

No previous government testing has been performed on the commercial

Integrator. The intent of the January EOA was to provide an operational perspective to help guide developers as they transform the Integrator into the STUAS.

In addition to its planned use by the Marine Corps, the STUAS will also be employed by the U.S. Navy in both maritime and land-based environments in support of Naval Special Warfare units. The system will consist of sufficient Air Vehicles, Surface Components (Ground Control Stations and Ground Data Terminals), Launch and Recovery Equipment, and Mission Payloads to provide continuous ISR, targeting and communications relay for 12 hours daily up to 180 days.

Once fielded, the STUAS will provide commanders on the ground with an organic, long-range endurance sensor capability that will greatly enhance their overall battlefield situational awareness. 🛩



The STUAS at takeoff.



The STUAS provides ISR coverage for ground personnel.

MCOTEA at Modern Day Marine



Mr. Ralph Croce showing off MCOTEA's booth at the 2010 Modern Day Marine Expo.

The Modern Day Marine Expo, held on 28–30 September 2010 at MCB Quantico, provided material developers and Marines the chance to discuss requirements, goals, and hopes for future equipment and systems. This year, thousands of Marines and hundreds of companies were onsite to help shape the future of the Corps.

The expo gave MCOTEA the chance to display its work and explain the importance of what it does. Mr. Ralph Croce, MCOTEA Live Fire Test & Evaluation Analyst, manned the display booth and fielded questions about the Activity. The booth features information and pictures from some of MCOTEA's largest and most important tests in recent years. 🛩

FOA XV Blazes a Trail for MCOTEA

As reported in the September 2010 issue of the MCOTEA Journal, MCOTEA is performing Forward Operational Assessments (FOA) in Afghanistan in conjunction with the U.S. Army's FOA XV effort. The focus of the overall FOA effort is to gather critical information on the mission performance of select systems supporting both OIF and OEF operations. MCOTEA supports OEF only; its team remains in country for 6 months at a time.

The candidate systems for assessment are designated by theater and Service commanders as well as program sponsors and developmental managers.

For FOA XV MCOTEA supported assessments for the Self-Protection Adaptive Roller Kit (SPARK) OEF mine roller, SPARK Plus mine roller, MRAP All Terrain Vehicle (M-ATV), Afghan Mission Network (AMN), Land Warrior (LW), Goldie handheld detection device, and Task Force Observe Detect Identify Neutralize (TF ODIN). Each of these systems is briefly described in the following paragraphs.

The SPARK OEF and Spark Plus is a modular mine roller system

designed to be mounted on tactical wheeled platforms, with the system's sole purpose being the defeat of any Improvised Explosive Device (IED).

The M-ATV is an MRAP vehicle derived from the Medium Tactical Vehicle Replacement (MTVR) platform.

AMN is an internal communications network shared by the United States and NATO allies to establish a common network.

LW is an integrated ensemble worn by dismounted soldiers that enhances their combat efficiency. Land Warrior consists of a helmet-mounted display, a small computer for situational awareness and navigation, and a headset with radio connectivity.

Goldie is a handheld detection device used by Combat Engineers or Explosive Ordnance Disposal soldiers to detect IEDs.

TF ODIN is a U. S. Army aviation battalion made up of manned and unmanned aircraft created for reconnaissance, surveillance, and target acquisition operations to combat insurgent operators.

Team Bulldog completed three Marine Corps-specific system as-

sessments, the Banshee Counter IED System, the Secure Electronic Enrollment Kit (SEEK), and the Experimental Forward Operations Base (Ex-FOB).

Banshee is a counter-IED system mounted on a Panama City mine roller, which is pushed by an MTVR.

SEEK is a biometrics system.

Ex-FOB is a system of systems designed to augment the energy of company-size and smaller forward operating bases in OEF.

The FOA XV team arrived home safely in early February.

On 4 February 2011, Captain Todd Richardson, Mr. Jon Floyd, and Mr. Brian Jones departed to Afghanistan in support of FOA XVI, MCOTEA's second participation in the U.S. Army's series of assessments. En route to Afghanistan, they met in Kuwait with FOA XV members, Mr. Blake Davis and Mr. Chris Huiett, for a 4-day turnover. Davis and Huiett are now members of the rear support team for FOA XVI. The team will leverage their experience heavily in assessing Marine Corps systems between now and August 2011. 🇺🇸



Clockwise from top left: The FOA XV Assessment Team; filling out assessment surveys; LtCol Kennedy in the MTRV cab; outside Camp Leatherneck



Below left: The Bazaar in the Musa Quela district of Helmand province, Afghanistan; below top right: the motor pool at FOB Lagman; below bottom right: "The Castle," a fortress in Qala City, Afghanistan, built by Alexander the Great and in continuous use for more than 2,000 years. Photos by Blake Davis.



ACHIEVING EFFICIENCIES IN A CHANGING LANDSCAPE

MCOTEA Process One Year Later

Change for the Long Term, Change for the Better

On October 1, 2009, MCOTEA released its new Operational Test and Evaluation Manual, which sets forth a complete test and evaluation process in a single volume, complete with paradigm explanation, in-depth evaluation methodologies, guidance for test planning, document templates, and administrative requirements such as archiving and lessons learned.

As the manual landed on desks a number of questions naturally arose, chief among them “how much change does this book represent? If I’m a tester, do I have to learn my job all over again?” The answers to those questions were straightforward: the manual contains a great deal of change in terms of integrated testing, planning for and evaluating test data, and documenting MCOTEA’s activities throughout the life of a program. But the manual contains no significant change in terms of

test execution—MCOTEA already knew how to take a test to the field.

In fact, the bulk of new processes and responsibilities fell not to Operational Test Project Officers (OTPO) or Test Managers (TM) but to the Operations Analysts (OA). As Col Reeves said in his transmittal letter, “The MCOTEA manual combines elements of Marine Corps missions and tasks with systems engineering, decision analysis, and design of experiments ...”. The OAs were charged with writing the mathematical portion of MCOTEA’s new System Evaluation Plan (SEP) and then applying the SEP’s math and evaluation methods to all accumulated test data.

The first few SEPs through the pipeline were a learning experience for all involved, but SEP development has now solidified into a smoothly running process. OT-

POs, TMs, and OAs work together to craft a comprehensive plan for evaluating data, combining system and mission knowledge with mathematically based analytical rigor. The SEP process is further supported by MCOTEA’s Scientific Advisor and the Decision Sciences experts in the S-2, resulting in a plan that provides a clear evaluation roadmap for the life of the system under test.

With a well-developed evaluation process now providing “bookends” around the testing process, MCOTEA can focus on further developing the OT&E Manual to incorporate ongoing change in the test and acquisition community. A second edition is due out this spring, which will incorporate new chapters on Reliability, Availability, and Maintainability as well as Modeling and Simulation and Verification, Validation, and Accreditation. 🚀

When It Needs to be Fast

A key feature of the changing OT&E landscape is the need to achieve efficiencies through shorter test cycles. While large, complex programs usually require in-depth and often lengthy testing, MCOTEA also responds to requests for Quick Reaction Assessments (QRA).

For example, in October 2009 MCOTEA received an urgent request, coordinated through Deputy Commandant, Combat Development & Integration, to compare the performance of Marine rifle squads equipped with combinations of the infantry automatic rifle, the squad automatic weapon (SAW), and the para-SAW. On December 22, 2009, MCOTEA delivered its assessment report of squad performance to the Assistant Commandant of the Marine Corps.

In the intervening 85 days, MCOTEA put together a test team, prepared a test plan, gathered required resources, traveled to Twentynine Palms, executed the test in both day and night operations, and returned to Quantico to analyze the data and write the reports.

Such a quick turnaround is made possible by the existence of a solid paradigm for performing operational test that can be abbreviated when needed without sacrificing quality results. MCOTEA's test paradigm is

contained in its *OT&E Manual*.

The paradigm for a program of record focuses on systematically reducing all risks associated with deploying a system, while the QRA paradigm is intended only to identify as many risks as possible associated with deploying the system.

The key to QRA success is MCOTEA's firm understanding of the main issue and what is driving the request for rapid response. With this knowledge in hand, MCOTEA assigns appropriate Measures and test venues to the main issue. If standards (thresholds, objectives, and current capability levels) are not already known, MCOTEA works with the QRA originator and subject matter experts to assign standards to each Measure before testing. Doing so enables MCOTEA to determine satisfactory performance and assess capability relative to the standards.

MCOTEA then examines the main issue by applying the same rigorous process used to evaluate the mission capability level of any operational issue. The system's capability is assessed by comparing actual system performance to the requirements of the previous standards.

As time allows, to help identify areas of risk related to the main operational issue, MCOTEA examines

other issues such as system performance, suitability, and survivability, again using an abbreviated form of the regular OTA process. However, in the QRA paradigm, MCOTEA does not attempt to assign Measures, standards, or test venues to these related issues. The issues are used only to aid in risk identification.

Time permitting, MCOTEA will consider the obvious impact of deploying the rapid system on existing fielded systems, the relative safety of deploying the system versus not deploying it, and may also examine ways to mitigate the identified risks. However, the goal is simply to *identify* as many risks related to rapid deployment as possible.

Performing a QRA itself involves risk of a different nature, namely that the speed required for response might cause the tester to miss some risk areas in the program. In addition, the scope of QRA testing might be constrained by the availability of resources.

Upon completing the QRA, however, MCOTEA will have conducted a thorough, independent, unbiased, quantitative assessment of the main operational issue. The decision maker can be assured that the quality of this analysis is the same as any other MCOTEA analysis of an operational issue. 🚀

MCOTEA provides a "menu" of products to choose from when requests for QRAs or other types of nontraditional programs are received, ensuring a standard approach to testing and evaluation of even the fastest-moving programs.

Non-Programs of Record, AAPs, ACAT IV(M), and QRA						
	Concur with request for no OT; no further program involvement	Witness DT and comment on test conduct, but provide no assessment or MCOTEA-led event	MCOTEA-led event with no assessment	Provide assessment based solely on DT	Provide assessment based solely on MCOTEA-led test	Provide assessment based on both DT and a MCOTEA-led test
	Operational Task Analysis (OTA) not required			OTA required		
ACAT Designation Letter	X	X	X	X	X	X
SAP				X	X	X
Observation Plan		X		X		X
Observation Report		X		X		X
Test Plan			X		X	
Test Report			X		X	
DT Report Endorsement Letter*		X*		X**		X**
SAR				X	X	X

Design of Experiments: Math Statisticians in Their Element

The technical definition of Design of Experiments (DOE) is the process of planning purposeful changes to input factors of a system or process so that effects on output factors may be observed. Perhaps surprising to learn is that DOE has been a proven scientific method for almost 100 years.

Director, Operational Test & Evaluation (DOT&E) introduced DOE guidance for the T&E community in 2010 to improve testing and experimentation by increasing test plan rigor.

MCOTEA has moved forward with DOT&E's recommendations by implementing DOE methods in programs that have already worked through their test concept, including Logistics Vehicle System Replacement (LVSr), Common Aviation Command and Control System (CAC2S), and Unit Fire Hit Discriminator (UFHD).

To begin the process of design development, MCOTEA's Math Statisticians work collaboratively with test teams and subject matter experts to define factors, also known as conditions. In operational testing, the important factors are the variables of a mission that affect what is being measured; defining these factors is often the most difficult stage of the DOE.

To assist in guiding the team, fishbone diagrams (also known as Ishikawa diagrams) are used and often include such factors as weather, vehicle type, terrain, or time of day. Once these factors are established, the team must determine which ones will be testable (factors to analyze). Remaining factors are categorized as either controlled or nuisance. Controllable factors are set at a constant level for the duration of a test to reduce variability in the output. Nuisance factors are randomized to minimize their effect.

Randomization, replication, and control are the basic principles of DOE. A completely randomized



The MCOTEA S-2 Decision Sciences Team applies DOE expertise to test plans. Left to right, Dr. Jeanne Hartzell, Ms. Shannon Krammes, Ms. Brittany Cates, and Maj Robby Mitchell, with Dr. Laura Freeman, Institute for Defense Analyses

experiment will usually average out bias, the effect of factors that are not pertinent. In replication, each factor combination, or run, is replicated, allowing an analyst to discern if statistical differences are present within the data. Replication also enables a more accurate sample mean to be obtained since experimenter error would be reduced. Control, or blocking, is used to eliminate effects of nuisance factors, which could affect the experiment but are not factors of interest.

Once testable factors are identified, Math Statisticians are able to determine the optimal design; several design possibilities include Factorial, Fractional Factorial, and Blocking. Resources and schedule can affect the type of design, so it is imperative for the design to be developed early in the program's schedule. If completed while the Test and Evaluation Master Plan is in development, the DOE will drive the resources required for testing. Failing to complete the DOE before the TEMP is signed can result in limited resources. It can also ultimately produce low power in the design, power being the level at which the team is able to determine significant differences in the output.

MCOTEA strives to achieve a power of at least 0.80 when planning for a test. Power can be increased by having a larger sample size, which requires more resources. The best method for increasing test power is to have a continuous response output such as time or distance. In plans where a binary response (probability of success for example) is the most valuable output, sample size must be increased drastically in order to gain more power in the test.

MCOTEA has initiated contact with DOT&E, discussing unique designs with Dr. Laura Freeman from the Institute for Defense Analyses. Dr. Freeman recently assisted MCOTEA with a design that did not allow for complete randomization, which is often the case in operational testing. MCOTEA was advised that during an operational test, factors are strategically varied because of the operational nature; however, without complete randomization, confounding of uncontrollable variables may occur. MCOTEA plans to continue to ensure that DOE is properly addressed in upcoming test plans through contact with DOT&E and continued improvement of the MCOTEA process. 🌟

Integrated Testing Pulls the Past Into an Efficient Future

Why integrate testing? The chief reasons that form the basis of DOD policy are to increase overall test efficiency, reduce the cost of testing, and reduce the likelihood of discovering problems in Operational Test and Evaluation (OT&E).

The most obvious benefit of integrating testing is to reduce the cost of the test. The Defense Acquisition Guide states that developmental test (DT) and OT events should be combined whenever feasible to gain the optimum amount of testing benefit for reasonable cost and time. Test events can be expensive. Cost drivers include support personnel, per diem charges, and transportation of personnel and test equipment.

Integrating DT and OT events can shorten the duration of the test and cut down on transportation expenses. This is the approach MCOTEA took when conducting the MRAP MATV High Altitude test last year. Developmental and operational testers used the same test articles at the same test site. Executed separately, the total time at the test site would have increased by about 30 percent and the equipment transportation costs would have doubled.

This is just one example of combined execution. Other examples include dovetailing an operational assessment with a developmental test. A variation of the DT/OT integration is the approach MCOTEA took with the LVSR OT conducted last year. The test team integrated two OT events (Wrecker OT and Tractor OT) and used the same test team to run both events concurrently. In this instance, economies of scale led to a reduction of cost.

Yet another opportunity to reduce cost is to integrate OT with existing Operating Forces training events. MCOTEA suggests such an approach whenever it is feasible.

Arguably the more important justification for integrated test is to reduce the likelihood of problems being discovered in OT. Adding operational realism in early testing can reveal failure modes and performance issues that might not be recognized until later stages of a program. Devices can perform flawlessly in controlled environments and also fail miserably on the battlefield.

While DT is always the first step in testing a device, integrated OT can shape the development of the system in a way that will be operationally effective and suitable.

Integrated T&E is a logical extension of the thinking that led to OT&E in the first place. The purpose of OT&E is to identify operational problems before equipment is fielded; the purpose of integrated test is to identify potential operational problems before IOT&E

By integrating operationally flavored test events early, design issues can be uncovered and corrected before too much money has been spent.

Integrated testing is policy that makes good sense. Integrated testing can create a hat-trick and improve cost, schedule and performance. It is in everyone's best interest to make integrated testing work. Get involved early in your programs and actively participate in T&E WIPTs. Follow the definition of integrated testing: collaboratively plan and collaboratively execute and share data. 🚀

Inegrated Testing is the collaborative planning and collaborative execution of test phases and events to provide shared data in support of independent analysis, evaluation, and reporting by all stakeholders, particularly the developmental (both contractor and government) and operational test and evaluation communities.

Office of the Secretary of Defense, Memorandum, Definition of Integrated Testing, 2008.



Adding Value with Modeling & Simulation, Properly Vetted by V V & A

When conducting Operational Testing and Evaluation (OT&E), it is often useful to consider supplementing the data obtained during live testing with data supported or generated by Modeling and Simulation (M&S). MCOTEA uses M&S to augment, but not replace, operational testing. M&S can help MCOTEA examine a system when operational testing is infeasible or inefficient.

For example, the Ground/Air Task Oriented Radar (G/ATOR) is a new expeditionary radar system. Since G/ATOR emits radiation in the form of radar signals, it could come under attack by an Anti-Radiation Missile (ARM). Therefore, it would be useful to understand G/ATOR's ability to detect, identify, and track the ARM threat, but it isn't safe or practical to fire an ARM at the radar during operational testing. However, a simulator is under development that could be used to simulate an ARM threat. If this simulator is good enough, the test team could evaluate the G/ATOR's ability to detect the ARM threat as well as the system operators' reaction to the threat, thus evaluating a



Early model of the G/ATOR

key part of the system's operational survivability.

It is clearly advantageous to use M&S in the G/ATOR example if the simulators under development are good enough. But how do we know

Using M & S to Gain Efficiencies

In Test Planning

- *As an aid to scenario development and test setup*
- *To predict outcomes before testing occurs*

In Test Execution

- *To stress systems under test with large numbers and higher densities than feasible during actual testing*
- *To present test situations that could not safely or practically be done during actual testing*
- *To present enemy threats, systems, or counter measures not otherwise available during actual testing*

In Evaluation

- *To examine alternative environments and conditions*
- *To examine the implications of system deficiencies and test limitations*
- *To apply test data to conditions, subjects, and scenarios that cannot otherwise be safely or practically tested*

when a model of simulation is good enough to play such a critical role in OT&E? That is where Verification, Validation, and Accreditation (VV&A) comes in.

First, some definitions.

Verification: The process of determining that a model, simulation, or federation of models and simulations, and their associated data **accurately** represents the developer's **conceptual description and specifications**.

Validation: The process of determining the degree to which a model, simulation, or federation of models and simulations, and their associated data accurately represents the real world from the perspective of the intended uses.

Accreditation: The official certification that a model, simulation, or federation of models and simulations, and its associated data are

acceptable for use for a specific purpose (DODI 5000.61).

The words in bold indicate that Verification contains two elements, the first of which is accuracy. If the model is a computer code, there will always be undetected errors in the code; the larger the code, the more undetected errors (think Blue Screen of Death). The goal is to minimize the number of undetected errors, thus ensuring the code is "accurate."

The second element of Verification is to ensure that the code reflects the specifications spelled out for its construction. If the code doesn't do what it was supposed to do, it doesn't matter how accurately it codes. Typically, model developers will emphasize this aspect of verification because it is easy to list requirements and show how they will be verified. Checking the M&S for accuracy is arguably more

“Confidence in a particular model or simulation must be justified before its results are used to make decisions involving large sums of money or risk to human life.”

difficult, but several techniques for both Verification and Validation are available.

Once the decision has been made to use M&S to support a program’s OT&E, the MCOTEAs test team must decide the Specific Intended Uses (SIU) for the M&S. SIUs are a statement of how the test team expects to use M&S results in support of the MCOTEAs evaluation. The statements should be detailed enough for the M&S developer to deliver exactly what is needed.

Before using any M&S in operational testing, MCOTEAs must acquire confidence in the accuracy and suitability of a model. “Confi-

dence in a particular model or simulation must be justified before its results are used to make decisions involving large sums of money or risk to human life” (SNI 5200.40). The VV&A process provides an unbiased assessment of the M&S that leads to the required confidence.

The MCOTEAs VV&A process is a disciplined, quantitative approach (fig. 1), much like all MCOTEAs processes. Just as MCOTEAs is involved in developmental testing through integrated testing, MCOTEAs is also involved in V&V activities. This is an important point. Although MCOTEAs’s responsibility is to accredit M&S (or

not), the accreditation cannot be accomplished in a vacuum. MCOTEAs is actively involved in planning and observing V&V activities.

VV&A activity is resourced by the Program Office responsible for the program preparing for OT&E. Ideally, the resources exist for VV&A activities to be properly funded. However, if VV&A efforts must be underfunded to an extent that MCOTEAs is not able to accredit an SIU for OT&E, the inability to use M&S for the SIU during OT&E creates a corresponding limitation to the OT&E.

The VV&A process gives MCOTEAs an understanding of M&S capabilities, reduces the risk associated with using the M&S, and allows MCOTEAs to make informed decisions on the use of an M&S in support of OT&E.

For MCOTEAs to reuse an M&S based on a previous accreditation, three key elements must not have changed: the SIUs, the version of the M&S under consideration (that is, the M&S has not changed), and the criteria that were used to determine if the M&S performed the SIUs in an acceptable way.

MCOTEAs is very deliberate and careful in its accreditation of M&S as a supplement to OT&E, at the same time recognizing that the appropriate use of M&S can result in a stronger system evaluation. MCOTEAs will continue to leverage high quality M&S in cases where its use will strengthen the OT&E. 🛠️

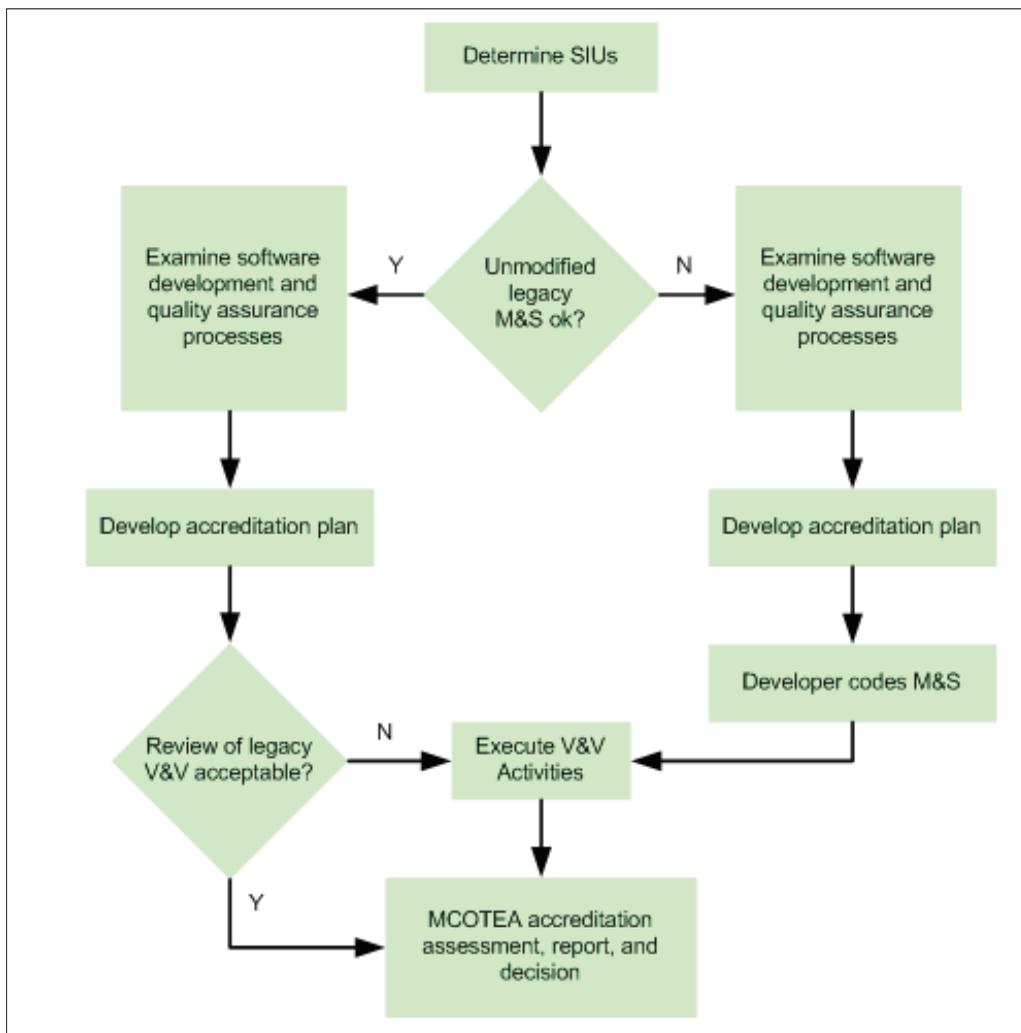


Fig 1. General MCOTEAs VV&A Process

Pulling It All Together

MCOTEA and the Future of

Efficient, Effective Test and Evaluation



LtCol Brock McDaniel is MCOTEA's MAGTF C4ISR Division Head. LtCol McDaniel has been on both sides of program testing, Developmental and Operational. He joined MCOTEA in 2010 and has overseen test and evaluation of some of MCOTEA's most high-profile systems. His experience has allowed him to help MCOTEA move forward into the age of Integrated Testing. See page 15 for more information on MCOTEA's participation in Integrated Testing.

Q- How has integrated testing become easier to execute in recent years? How do you see it advancing in years to come?

Each of the major stakeholders in the acquisition community (CD&I, MCSC, PEO Land Systems, and MCOTEA) recognizes that effective testing is critical to determining whether or not a system should be fielded. As a result, the *USMC Test and Evaluation Handbook* was developed and approved by acquisition leadership codifying the need

to utilize integrated testing. In my opinion, this Handbook serves as Commanders Intent and we now all have the endorsement to smartly execute integrated testing in an efficient and cost effective way. Integrated testing is now the expected norm and will only get better in the years to come.

Marine Corps operational testing costs are so low because MCOTEA does an outstanding job of continually looking for ways to execute efficient and effective test events.

-LtCol Brock McDaniel

Q- How have you seen MCOTEA's implementation of DOE lead to more efficient testing?

DOE is a great tool for optimizing the structure of test trials in an operational environment. The MCOTEA S-2 Team and Scientific Advisor have done a superb job keeping our test teams out in front of Dr. Gilmore's memo regarding the implementation of DOE. The CAC2S test plan is a perfect example. The trials were developed to produce quantifiable results that can be expressed with a specified degree of confidence. The output of information that DOE produces will enable the Milestone Decision Authority to truly understand how well the system performs and assist him with understanding the system's technical capabilities.

Q- When is it most appropriate and advantageous to use modeling and simulation?

Advanced and detailed planning is always a key ingredient for success. Opportunities to implement modeling and simulation should be explored and planned for as earlier as possible. Effective modeling and simulation can be used to demonstrate capability, mitigate risk, and even reduce cost if appropriately planned and implemented into the acquisition and testing strategies.

Q- How do all of these topics (integrated testing, DOE, and M&S) add up to making MCOTEA a more efficient OTA?

When looking at a program's lifecycle costs, testing only accounts for a very small percentage of a program's budget. In fact, in many cases, testing costs comprise less than 1 percent of the program's total cost. The reason Marine Corps operational testing costs are so low is because MCOTEA does an outstanding job continually looking for ways to execute efficient and effective test events. Good planning coupled with the utilization of DOE and M&S serve as tools by which MCOTEA streamlines costs while conducting more rigorous tests that produce scientifically based results. It is a winning combination that illustrates that MCOTEA is a good steward of the taxpayers' money while executing its mission. 🌟

Willis Shifflett Promoted to MGySgt

MCOTEA's Willis Shifflett was promoted to Master Gunnery Sergeant at the National Museum of the Marine Corps in Triangle, VA, on 25 March 2011.

In his opening remarks, Colonel Reeves explained to the large crowd that the rank of Master Gunnery Sergeant is the "pinnacle of enlisted ranks." The rank was originally created in the late 1800s during the Spanish-American War, but fell out of use until the reorganization of ranks in 1958 and 1959. The rank's current incarnation was created in response to the technological advances in warfare. Before arriving at MCOTEA, MGySgt Shifflett served at Parris Island as a recruiter, at the Marine Barracks 8th and I, at the Chemical, Biological Incident Response Force, and with various

Fleet Marine Force units.

MGySgt Willis has orders to join the Marine Forces Pacific in April. While stationed there, he will be their CBRN (Chemical, Biological, Radiological, Nuclear) Chief.

1stLt Megli, MCOTEA S-3, read the promotion warrant. MGySgt was pinned on by Mr. Barry Perry and Ms. Ann Gossage of MCOTEA's CBRN branch, both retired Master Gunnery Sergeants.

In his remarks, MGySgt Shifflett said, "Everyone I have come in contact with in the Marine Corps has put me in the position to be a Master Gunnery Sergeant." He was joined by his children and friends. 🌿



Newly promoted MGySgt Shifflett

GCSS-MC Test Surmounts All Challenges

The Global Combat Support System-Marine Corps (GCSS-MC) Operational Test Agency (OTA) Operational Evaluation Report (OER) was signed on 28 Sept 2010 amid praise for the efforts of the entire test team. The signing ceremony marked a pivotal point for MCOTEA as it showcased the opportunity for testing in a live operational environment, in this case Okinawa, Japan.

GCSS-MC is the physical implementation of the enterprise

information technology architecture designed to support enhanced Marine Air-Ground Task Force (MAGTF) Combat Service Support (CSS) functions and information requirements.

In addition to working in a live environment, the GCSS-MC test team was the first to successfully test a net-centric system using primarily quantitative data rather than the more typical qualitative (survey-based) data for judging mission success. The live environment and quantitative data afforded a far more accurate picture of system performance. In essence, GCSS-MC performance is now "known" instead of "predicted."

The team worked on an accelerated timeline to deliver the data to the Assistant Commandant

of the Marine Corps as soon as possible.

Upon signing the OER, the Director congratulated the team and offered encouragement for the way ahead in the continued testing of GCSS-MC in the deployed environment.

Having completed testing for GCSS-MC Release 1.1, the team is now intensively preparing to test Release 1.2. This release is intended to bring GCSS-MC logistics capabilities to the deployed environment, which under legacy systems has been a significant challenge. The test team is planning for Integrated Developmental Testing during June and July 2011 in CA at Marine Corps Tactical Systems Support Activity and Space and Naval Warfare Systems Center Pacific, with plans for Follow-on Operational Test in 1st Quarter FY12 with the 31st MEU. 🌿



GCSS test team meets for final report signature.

Fellowship at MCOTEA

On 29 October 2010 MCOTEA celebrated the 235th Birthday of the United States Marine Corps, the third consecutive year that MCOTEA hosted its own ball.



Clockwise from top: Ceremonial cutting of the birthday cake; the official MCOTEA Birthday Ball Program (photo credit Amanda L. Weis); attendees take to the dance floor after the formal ceremony for the remainder of the evening.



MCOTEA activities, such as hot dog cookouts and a chili cook-off, are enjoyed by all.

Personnel News

Promotions and Awards



1stLt Allen Ammerman (right), MCOTEA Fiscal Officer, was promoted to Captain on 3 January 2011.

MCOTEA bids fond farewell to staff members moving on to retirement or other opportunities.

Military Farewells

LtCol Putnam, MAGTF C4ISR
Division Head and former Deputy
(Legion of Merit)

Maj Shawn Charchan,
Operations Research Analyst
(Navy and Marine Corps
Commendation Medal)

Civilian Farewells

Ms. Patricia Brown, Ms. Regina
Campbell, Mr. James McCormick, Mr.
John Neylon, Mr. Michael Pavalok,
and Ms. Vanessa Sawyer.



Capt Christopher Carter, an OTPO for MCOTEA's Ground Division, was promoted to Major on 5 April 2011.



At the 20 Oct 2010 MCOTEA All-Hands meeting, Mr. Mannie DeJesus, MCOTEA Management Analyst (left), received a Letter of Recognition for his dedicated service to the Activity. Mr. Andy Archetti, Team BAE Systems (right), was presented with a Certificate of Appreciation from the Army Evaluation Center for his work on the NGEN program.



Hitting the Road

Events to Note

11th Annual Science & Engineering
Technology Conference/DOD Tech
Exposition

Charleston Convention Center
North Charleston, SC
12-14 April 2011

2011 Test Instrumentation Workshop

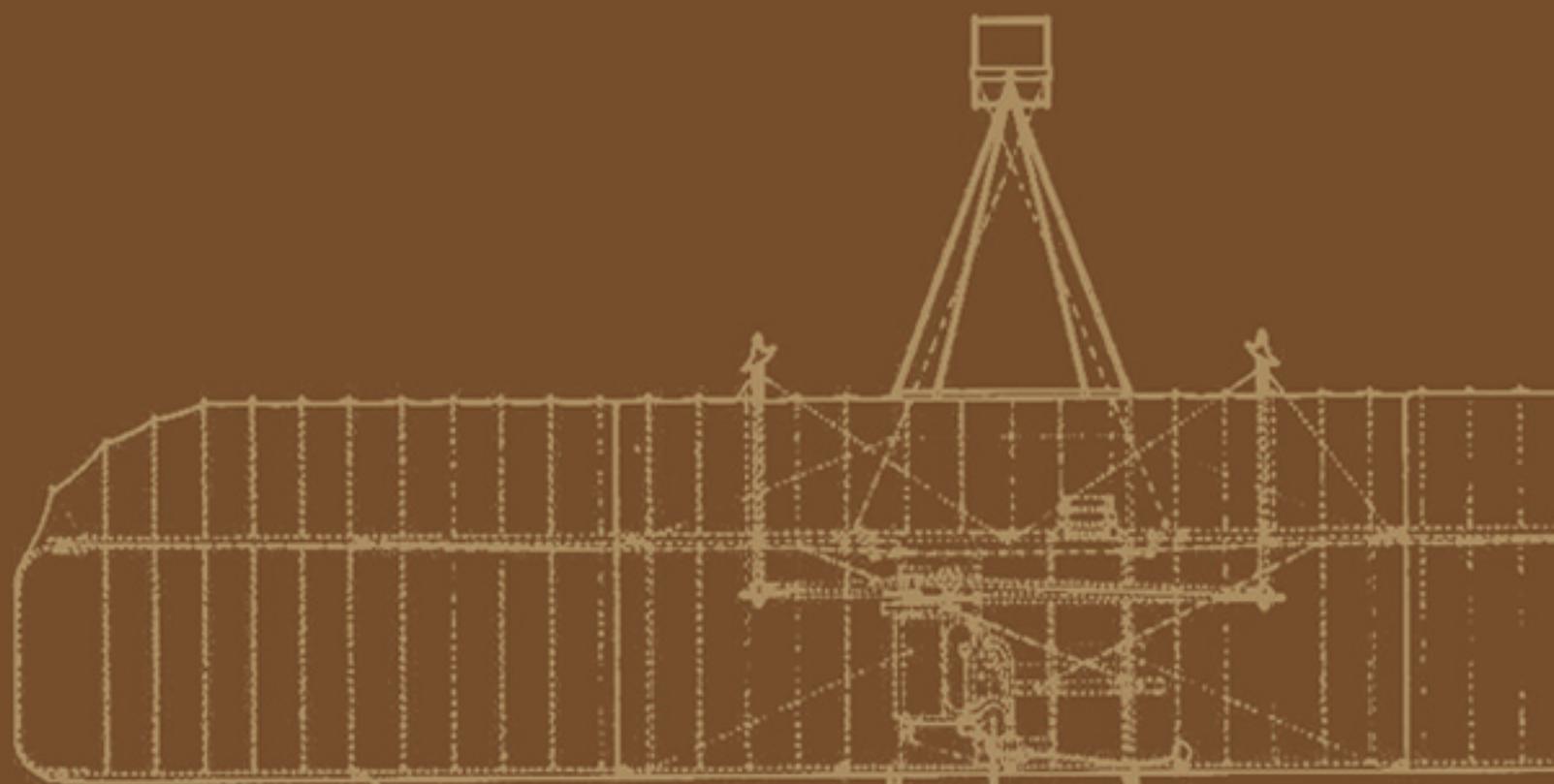
9-12 May 2011
Las Vegas, NV

USMC Historic Half Marathon

15 May 2011
Fredericksburg, VA

Test Week 2011

13-17 June 2011
Huntsville, AL
www.testweek.org



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