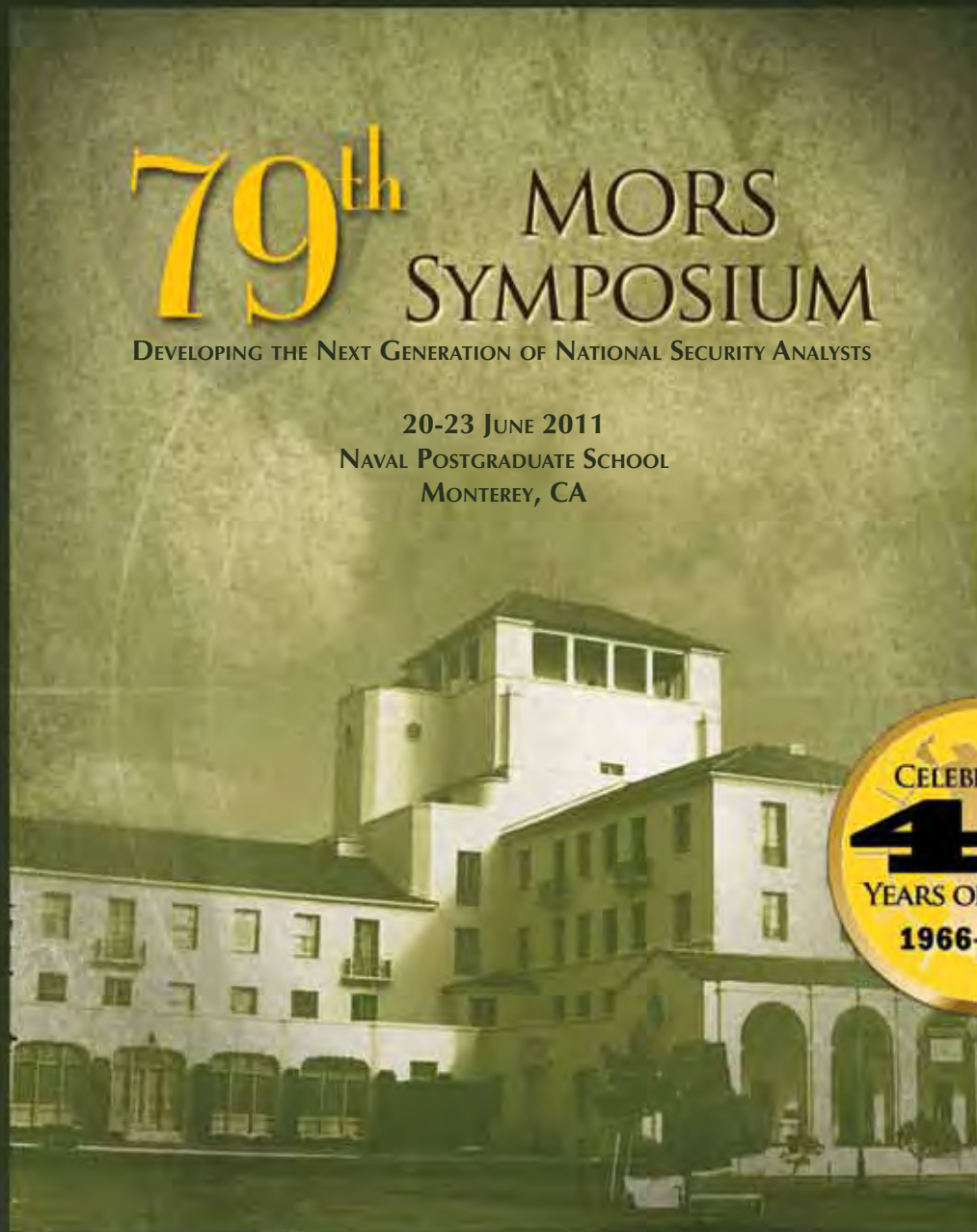


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79th MORS SYMPOSIUM

DEVELOPING THE NEXT GENERATION OF NATIONAL SECURITY ANALYSTS

20-23 JUNE 2011
NAVAL POSTGRADUATE SCHOOL
MONTEREY, CA



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First President, Lewis A. Leake p. 13

Plenary Speaker, The Honorable John Scott Redd,
Vice Admiral, United States Navy (Ret.)

THE BATTLE FOR INFLUENCE



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President's Letter

Terry McKearney, MORS President, terry.mckearney@therangergroup.com

Fellow MORSians,

Hom^er tells us that Ulysses traveled far and wide and learned much in his travels. It seems the same with our Society over the past few months: we've held variety of events literally across the country and in doing, so, we've learned much and helped expand the field of operations research as it's applied to national security issues.

Our travels since my last column in these pages began in March, where we hosted our annual Education Colloquium for the first time at the historic Virginia Military Institute in Lexington, Virginia. This event, under the leadership of **Col Simon Goeger** and **LTC Daryl Ahner**, brought together students in OR-related curricula from several schools to learn about the challenges they will face as analysts and to participate in a competition that allowed them to work on a contemporary problem in operations analysis. Based on the quality of the efforts these young analysts displayed, I'd say that our profession is in good hands in the future.

Just few weeks later, more than ninety MORSians gathered in San Antonio, Texas, for a unique special meeting on the analytic challenges facing our cyber warriors. Focused on mission assurance in the face of emerging cyber threats, the special meeting was done with extensive support from the USAF's 24th Air Force, its cyber defense command. We were particularly honored to have the commander of the 24th, **Maj Gen Richard Webber**, address the meeting and give his frank assessment of the U.S. military's efforts to fight and win in the cyber "battlefield." The importance of the topic was also emphasized by the participation of **Dr. Mark Maybury**, Chief Scientist of the Air Force, and **Dr. Jacqueline Henningsen**, USAF A9. This meeting, under the leadership

of **Dr. Lee Lehmkuhl** and **Maj Michael "Saint" Artelli**, drew not only analysts with a background in classic quantitative techniques, but technical and operational experts in the cyber field. This gathering of operations analyst practitioners and domain experts is absolutely essential as our profession grows in scope. Broadening the range of national security issues and problems that our analyst community can address is a fundamental goal for our Society; MORS needs to lead the way in the dialog necessary for this expansion.

Our efforts to serve wider communities and broader national security issues was at evidence again during our May special meeting on Maritime Domain Awareness (MDA), our first event to be held in San Diego, California. This meeting, co-hosted with the Canadian Forces Centre for Operational Research and Analysis, was a gathering of both U.S. and "Five Eyes" experts on the fields of port security, antipiracy, interagency data sharing, and intelligence. Lead by **Steve Notarnicola**, **Tom Denesia**, **Roy Mitchell**, and **Kirk Michealson**, this special meeting offered analysts and others interested in the complexities of MDA the opportunity to meet and study some of the more critical issues our countries share. San Diego was a uniquely representative location for this: a border city with a major port and the largest naval complex in the world. This meeting was enhanced by a wide range of speakers headed by **ADM James Winnefeld**, NORTHCOM/NORAD and a tour of the Navy Southwest Regional Operations Center.

As you read this, we're in final preparations for our 79th MORS Symposium, this year to be held in Monterey, California, at the Naval Postgraduate School. This year's Symposium promises to stretch

the bounds of our annual symposium with Program Chair **John Hummel** and his crew pulling out all the stops in making this a memorable event: expanded tutorials, thirty-four working groups, plus several special sessions and social activities culminating with dinner at the world renowned Monterey Bay Aquarium. As our final journey of the MORS year, Monterey is one trip we should all make!

Speaking of journey's end, my personal journey as president of our Society is rapidly coming to an end and this will be my last column as president. This has been a challenging year: as I note above, we have traveled the length of the country to tell the MORS story, something that I feel we need to do as the debate about the future shape of our military forces continues and our nation faces new and nontraditional threats. As Ulysses found in his travels, it's the people you meet who make the journey memorable and I have the fondest memories for those MORSians I have had the privilege of meeting and working with over this past year. Special thanks go to the Board of Directors I have served with, especially the Executive Council, President-elect **Trena Lilly**, VP for Finance and Management **Steve Reise**, VP for Meeting Operations **Bob Koury**, VP for Societal Services **Mike Garrambone**, VP for Member Services **Rafael Matos**, Secretary **Arch Turner**, and Immediate Past President **Kirk Michealson**. Of course, special thanks to our Chief Executive Officer **Krista Paternostro**, who keeps the Society on an even keel on a daily basis. Krista has been my sounding board and the first person to turn to for anything related to the Society. Her steady and creative hand is at evidence in everything we've accomplished this year.



Greg H. Parlier, MAS President, gparlier@knology.net

First, thanks to **LTC Doug Matty**, our MAS Program Committee rep for the Chicago INFORMS “Analytics” conference this past April, and to guest speakers **LTC Scott Nestler** from NPS, **Col Chris Hill** from CAA, and **Keith Costanzano** from BAH for their very informative and well-received presentations. They covered military OR contributions, applications, and challenges from their experiences and perspectives, including Iraq and Afghanistan. Their briefings are posted on the MAS website so you can check them out. MAS also sponsored a cluster of four sessions along with a tutorial presentation during the early May INFORMS Northeastern Regional Conference held at the University of Massachusetts in Amherst. Thanks to session chairs **Randy Avent**, **Richard Moynihan**, and **Shawn Weil**, our 12 presenters, and both conference chair **Hari Balasubramanian** and program co-chair **Les Servi** for encouraging our participation.

We annually recognize top undergraduate OR students at our Service Academies during their awards ceremonies just prior to graduation each May. Although recipient names have not yet been announced as I write this, special thanks to those who presented the awards on behalf of MAS at each of the academies: **LCDR Lee Stenson** at the Coast Guard Academy, **CDR Walt DeGrange** at the Naval Academy, **Col John Andrew** at the Air Force Academy, and **Professor Pat Driscoll** at West Point. We are now soliciting nominees for our other annual awards as well, including the Seth Bonder Scholarship, and both the Koopman and Steinhardt prizes. Details for each of these can be found on our website; please contact our awards committee chair, **Past**

President Pat Driscoll, if you wish to nominate a worthy colleague.

For upcoming events, planning is underway for our 2012 Annual MAS Conference to be held next spring in Monterey, California, near the Naval Postgraduate School. Please let us (either **MAS Vice President Bill Fox** or me) know if you would like to participate in conference planning or program development, including cluster and session chairs. For scheduled events remaining in 2011, details can be found on our INFORMS and MAS community websites, but here are the highlights:

- *Midwest Regional Conference*: Ohio State University, Columbus, OH, 1–2 August 2011. A “Military Operations Research” cluster has been established with MAS sponsorship; early registration deadline is 27 June.
- *Annual INFORMS Conference*: Charlotte Convention Center, NC, 13–16 November 2011. Let us know soon if you want to chair a session/present a paper in the MAS cluster. Early registration deadline is 7 October.
- *19th Triennial Conference of the International Federation of Operational Research Societies (IFORS)*: Melbourne, Australia, 10–15 July 2011. The scientific program covers all aspects of Operations Research, see www.ifors2011.org for details.

Of special note on IFORS in Australia this year: we established a new “stream” on “Military, Defense, and Security Applications” for this international conference. Among 60 conference streams, this turned out to be third largest with

10 sessions including more than 40 papers. Also, one of the anticipated by-products for this stream is a special issue of *International Transactions in Operational Research*. Thanks to all who are contributing, especially to my “volunteer” co-chair **Brandon Pincombe** from the Australian Department of Defence. Other international OR conferences later this year include the *28th International Symposium on Military Operational Research (28ISMOR)*: Hampshire, UK, 29 August – 2 September (www.ismor.com) [See article on following page of this issue for further details]; *International Conference on Operations Research (OR2011)*: Zurich, Switzerland, 30 August–2 September 2011 (www.or2011.ch) and the *40th Annual Conference of the Operations Research Society of South Africa (ORS-SA)*: Victoria Falls, Zimbabwe, 18–21 September 2011 (www.orssa.org.za). And congratulations to our Canadian counterparts, especially Military Applications chair **Rene Seguin**, for a very successful 2011 *CORS* this year in St. John’s, Newfoundland.

Finally, our very best wishes to **Trena Lilly** as she begins her MORS Presidency. On behalf of our entire MAS membership, many of whom are also MORS members, we thank and commend all MORSians—past and present—for their valuable contributions to both the practice and discipline of military operations research on this special occasion celebrating your 45 years as a professional society. And all the best for a productive, record-breaking MORSS this June in Monterey.

“*Veni, Vidi, Duci*”



The 79th MORS Annual Symposium: “Developing the Next Generation of National Security Analysts”

Dr. John R. Hummel, 79th MORSS Program Chair, jhummel@anl.gov

Mr. Tom Denesia, WG/CG Coordinator, thomas.denesia@northcom.mil

Mr. Don Timian, Special Sessions Coordinator, Donald.Timian@us.army.mil

Ms. Lisa M. Kaiser, Tutorials Coordinator, lisa.m.kaiser@us.army.mil

Mr. Daniel D. Dassow, Demo/Poster Coordinator, daniel.d.dassow@boeing.com

The annual symposium at the Naval Postgraduate School in Monterey is just a few days away. Although every symposium is a special event in a MORS year, this year’s symposium has added meaning as it marks the 45th year of service to the National Security Community. This year’s theme stresses how we are working to ensure that we provide another 45 years of service (and more) to the community.

For the 79th MORSS we are rolling out the revised Working Group (WG) and Composite Group (CG) structure that was the product of a two-year effort to revise and update our portfolio of disciplines. This structure, included in this article, is built around seven Composite Groups. In addition, this year we are introducing two Distributed Working Groups (DWG), which cover topics that cross multiple WGs and CGs. Finally, there are two Focus Sessions (FS) that will be introducing topics that could be considered as future working groups.

MORSS Working Groups

We have had an overwhelming number of quality topics (more than 630 at the time this article was prepared) submitted for presentation in the various groups, special sessions, tutorials, and poster/demonstration sessions.

The 79th MORSS will also offer many networking opportunities as well as time for some fun: the First Timer’s Social on Monday evening, the Mixer on Tuesday evening, Wednesday evening at the Monterey Bay Aquarium, and the 3rd Annual 5K Run on Thursday.

CG-A	Homeland and International Operations
WG-1	Strategic Operations
WG-2	Chemical, Biological, Radiological, and Nuclear (CBRN) Defense
WG-3	Non-Proliferation, Threat Assessment, and Threat Reduction
WG-4	Infrastructure Analysis, Protection, and Recovery
WG-5	Homeland Security, Homeland Defense, and Civil Support
CG-B	C4ISR and Net-Centric Operations
WG-6	Battle Management Command and Control (BMC2)
WG-7	ISR and Intelligence
WG-8	Space Acquisition, Testing, and Operations
CG-C	Joint Warfare
WG-9	Air and Missile Defense
WG-10	Joint Campaign Analysis
WG-11	Land and Expeditionary Warfare
WG-12	Maritime Operations
WG-13	Power Projection and Strike
WG-14	Air Warfare
CG-D	Resources/Readiness/Training
WG-15	Casualty Estimation and Force Health Protection
WG-16	Strategic Deployment and Distribution
WG-17	Logistics, Reliability and Maintainability
WG-18	Manpower and Personnel
WG-19	Readiness
WG-20	Analytic Support to Training
CG-E	Acquisition
WG-21	Experimentation
WG-22	Measures of Merit
WG-23	Test and Evaluation (T&E)
WG-24	Analysis of Alternatives (AoA)
WG-25	Cost Analysis
WG-26	Decision Analysis



79TH MORS ANNUAL SYMPOSIUM

CG-F Interdisciplinary Advances in OR

- WG-27 Modeling and Simulation
- WG-28 Operational Environments
- WG-29 Computational Advances in OR
- WG-30 War Gaming

CG-G Hybrid Warfare

- WG-31 Information and Cyber Operations
- WG-32 Special Operations and Irregular Warfare
- WG-33 Social Science Methods and Applications
- WG-34 Computational Social Sciences

Focus Sessions

- FS-1 National Security Risk Management
- FS-2 Red-Blue Teaming

Distributed Working Groups

- DWG-1 Human Behavior and Performance
- DWG-2 Unmanned Systems

79th MORSS Special Sessions, Don Timian, Special Sessions Coordinator

For the 79th MORSS we're breaking the mold as to when Special Sessions are scheduled. Instead of Special Sessions being restricted to the "SOP" 1530-1700, Tuesday through Thursday time-slot, the Sponsor's Hot Topic and the Army, Navy, Air Force, Homeland Security, Joint Staff, and Office of the Secretary of Defense Special Sessions time slots have been moved. This was done to avoid competition among sessions.

While not new to the Special Session agenda, the Deployed Analyst Special Session — Wednesday, 22 June, 1530–1700 — will be chaired by **Ms. Jane Krolewski** and will feature an analyst from each Service, who has been recently deployed, presenting a short paper on the analysis efforts they did in Theater and what tools they used along with the insights, recommendations, and/or feedback they gave to Senior Leaders they were supporting. And if their recommendations were implemented, what was the result.

As you can see, on Tuesday, the 21st of June (1530-1700), **Dr. Ann Willis** from the Director of National Intelligence Office, like last year at Quantico, will be chairing a Special Session and **Dr. Dean Simmons** from the John Hopkins Applied Physics Lab will again be chairing a Climate and Energy Special Session. **Dr. Katherine Warner** (Science Advisor OSD Director of Operational Test and Evaluation) will be hosting a Test and Evaluation Design of Experiments Special Session on Thursday the 23rd from 1030 to 1200. And lastly, (apologies to James Brown) "the hardest working man in MORS," **Mr. Mike Garrambone**, will be hosting a series of four Military Wargaming Sessions: a Military Wargaming Tutorial on Monday the 20th, two Lunchtime Tutorial "Gaming Sessions" on Tuesday and Wednesday, and a Military Wargaming and Analysis Close-out Special Session on Thursday the 23rd from 1330 to 1500. If you have any questions about the Special Sessions, please contact **Mr. Don Timian**, Donald.Timian@us.army.mil.

MORSS Special Sessions

Tuesday, 21 June 2011

Session Title	Time
Sponsor's Hot Topics	1330–1500
MORS Heritage	1530–1700
Strategist's Corner	1530–1700
Prize Paper Session — Rist and Barchi Prize Presentations	1530–1700

Wednesday, 22 June 2011

Session Title	Time
Army Special Session	0830–1000
Navy Special Session	1030–1200
Homeland Security Special Session	1330–1500
U.S. Navy STORM—Synthetic Theater Operations Research Model	1330–1500
Deployed Analyst	1530–1700
Climate and Energy Imperatives for Future Naval Forces: Navy, Marine Corps, and Coast Guard	1530–1700
Junior/Senior Analyst Special Session	1530–1700
Director of National Intelligence	1530–1700

Thursday, 23 June 2011

Session Title	Time
Air Force Special Session	0830–1000
Combined OSD/Joint Staff MORS Sponsor Special Session: Force Sufficiency, Sizing, and Shaping	1030–1200
Interagency Collaboration Special Session: Tools and Best Practices for Interagency/Multi-agency National Security Efforts	1030–1200
Test and Evaluation Design of Experiments Special Session	1030–1200
Military Wargaming and Analysis Close-out Special Session	1530–1700

See *79th MORSS* on following page...



79TH MORS ANNUAL SYMPOSIUM

79th MORSS from previous page...

Tutorial Session

This year's tutorials at the 79th MORSS will start the Monday prior to the beginning of the symposium. The tutorials will be highly informative and instructive. Last year, 58 classroom hours of instruction were delivered to the symposium attendees of all ranks and educational levels by an array of outstanding educators, experienced practitioners, and renowned subject matter experts. This year you will find several back-by-popular-demand "repeat" performances and a large number of new presentations on many of the topics that support new techniques and concepts that are now being applied to modern analytical thinking. The tutorials are free to MORS members and \$75 for the day for non-members. The longer presentations on Mondays run from one-hour overviews up to eight-hour in-depth classes.

This will be the first year that the Soft Skills Workshop will be taught at the MORS Symposium. The course will also qualify for 10 Continuing Educational Units through George Mason University. The workshop has evolved over the past three years as we have received feedback from participants and colleagues. We have learned over time what skills are most needed, which workshop techniques are succeeding, and how we can help extend and reinforce the development of soft skills with analysts when they return to their workplace. We continue to revise the content so that the workshop will be a fresh experience for returning participants.

During the week, tutorials are one-hour during the lunch break. You can find an up-to-date listing on the MORS website. The tutorial schedule listed here is up to date as of Wednesday, 6 April 2011. Attendance might be limited for some tutorials because of room size. If you have ideas, questions, or comments, contact the Tutorial Coordinator, **Ms. Lisa Kaiser** (lisa.m.kaiser@us.army.mil).

MORSS Tutorial Sessions

Monday, 20 June 2011

U.S. and Partner Nation Deployed OR Analyst Selection and Training
Soft Skills Workshop: Real-World Skills for Analysts
Visualization and Exploratory Data Analysis
Part 1: Introduction to Design of Experiments (DOE)
Part 2: Design of Experiments (DOE) for Real World Problems
An Overview of MORS and the 79th MORS Symposium
A Practical Approach to Dynamic Programming
Wargaming to Anticipating Defense Technological Needs Through Wargaming
Review of MORS Special Meetings
Human Behavior and Performance (HBP) in Military Operations
A Method for Effectively Assessing Knowledge in your Organization
Antisubmarine Warfare in World War I
How to Validate Your Models and Simulations

Tuesday, 21 June 2011

Drive on METZ: Game-on I
Scipio in a Box: Strategy, Artificial Intelligence, and Cognitive Amplification
No "Average" ORSA Practice
Milwiki and other online collaborative tools available to ORSAs

Wednesday, 22 June 2011

Drive on METZ: Game-on II
Bauman's Inferno - The Divine Comedy of Analysis Quality
What ORSAs Do and Why They Do It
Efficient Modeling and Simulation Using Design of Experiments Methods

Thursday, 23 June 2011

Root Cause Analysis: Tools of Lean Six Sigma
Wargaming 101
The Challenges of Modeling and Assessing Irregular Warfare
Irregular Warfare Wargame Development: Insurgency Theory as Applied to the Algernon Wargame
Social Network Analysis of Dark Networks



Demonstrations and Poster Session

The 79th MORSS offers a full program of demonstrations and poster sessions. These sessions provide great opportunities for presenters to showcase their work and collaborate with peers.

We are offering presenters the chance to demonstrate software, simulations, databases, and other tools at the Naval Postgraduate School venue at Monterey. Whereas many demonstrations have historically been simulations, we widened the demonstrations to include interesting applications of spreadsheets, modeling environments, and data collection and analysis technologies. We're hoping to have some demonstrations available in a common area for attendees to drop by at their leisure and admire the presenters' handiwork. This is also a great opportunity for presenters to supplement their working group presentation with a demonstration of their analysis tools. As of Monday 4 April 2011, the Demonstration Session has nine demonstrations scheduled, which are noted below.

- Demonstration of Data Collection with JWinWam
- DTRA Visual Crosswalk Analysis Tool
- The Joint Medical Analysis Tool (JMAT)—A Critical Force Health Protection Component
- JMP® Software for Data Exploration, Visualization, and Experimentation
- Maritime Simulation Model
- PACOM PALITS (Packaging and Logistics Integrated Transfer Solution)
- Similarity-Based Intelligence Data Fusion in the Human Battlespace

- STORM Demonstration
- Surrogate Modeling of Discrete Event Simulation Outputs to Develop an Interactive Decision Support Application

The 79th MORSS will also provide another fantastic opportunity to see great analysis through our expanded Poster Session, which will run Tuesday afternoon through Thursday noon. Posters will be displayed in the symposium working area to provide greater visibility. The poster will provide presenters the opportunity to showcase their work either in addition to, or in place of, the usual working group presentations. As of the time this article was prepared, nine posters will be presented. Look for more details at the MORS website and symposium announcements. For more information, contact the Demo/Poster coordinator Mr. Dan Dassow (daniel.d.dassow@boeing.com).

A Final Word

My 79th MORSS Planning Team and I cannot give enough thanks to the Session Coordinators, the Chairs and their teams, the NPS Site team, and the MORS staff for the long hours and extraordinary effort required to assemble the 79th MORSS—your symposium. I also want to express my thanks and gratitude to **Mr. Bruce Wyman**, my Program Chair Deputy; **Mr. Tom Denesia**, the WG/CG Coordinator; and **Ms. Rochelle Anderson**, the WG/CG Deputy. It was a pleasure and honor to work with you.

— *John R. Hummel,*
79th MORSS Program Chair

Networking Opportunities at the 79th MORS Symposium, 20–23 June 2011

For more than 40 years, MORS Symposia have been forums for sharing information and making connections. This year is no exception. Take advantage of these great opportunities to make the most of the 79th Symposium and for networking with your peers.

First Timer's Orientation

Monday, 1730–1800, San Carlos IV, Monterey Marriott

New to the Symposium? Start off right with an overview on how to make the most of your Symposium experience.

Member Reception*

Monday, 1800–2000, Ferrante's Bayview, Monterey Marriott

Relax, unwind, and reconnect during the MORS quarterly member reception while enjoying breathtaking views of the bay from the top floor of the Monterey Marriott.

Welcome Mixer

Tuesday, 1715–1900, Hermann Hall Ballroom, Naval Postgraduate School

To welcome you and thank you for attending the 79th MORSS, you're invited to this classic setting for conversation, hot appetizers, and a cash bar.

A Night at the Monterey Bay Aquarium*

Wednesday, 1900–2230, Monterey Bay Aquarium

Please join us for this special MORS-only evening event, including a delicious dinner buffet set among the Aquarium's wondrous sights and sounds!

MORS 3rd Annual 5K Run*

Thursday, 0630, along the water on the pedestrian pathway.

Now in its third year, the MORS 5K Run will not disappoint! The course will be finalized soon, but will include a run along the ocean! Your entry fee earns you a free race t-shirt.

*Additional fees may apply.



The MORS Future

Kirk Michealson, Immediate Past President

Each June, at the MORS Board of Directors Meeting, the Directors elect officers for the upcoming MORS year. This year, the following Officer positions will be selected: President-Elect, Vice President for Finance and Management, Vice President for Meeting Operations, Vice President for Member & Society Services, and Secretary. These officers, along with the President, the Immediate Past President, and the MORS Chief Executive Officer, comprise the MORS Executive Council. This is an opportunity for current MORS Board members to continue their time on the Board in the senior leadership positions.

The President-Elect is the member of the Executive Council that serves for more than one year (in this case, three years)—as President Elect, President, and

Immediate Past President. Candidates for this officer position come from current members of the Board. In June 2010, **Trena Lilly** was elected President-Elect and will take over as President from **Terry McKearney** in June 2011, at which time Terry will transition to Immediate Past President. Additionally, the Board will elect up to nine new Board members for four-year terms. These candidates are members of the Society who have previously demonstrated leadership, energy, and dedication to the Society.

This year, it is my privilege to announce the candidates for the Officer positions on our Executive Council:

- President-Elect: **Mike Garrabone** (article on page 10)
- Vice-President for Finance and Management: **Bob Koury** and **Rafael Matos**

- Vice-President for Meeting Operations: **Renee Carlucci** and **John Hummel**
- Vice-President for Member & Society Services: **Simon Goerger** and **Steve Riese**
- Secretary of the Society: **Jerry Diaz** and **Clark Heidelbaugh**

Trena Lilly will introduce the new Officers and new Board members during the plenary session of the 79th MORS Symposium at the Naval Postgraduate School on 21 June 2011. Please take the time to congratulate your new officers at the Symposium.

79th MORS Symposium Plenary Speaker Announced

The Military Operations Research Society is pleased and honored to welcome **Vice Admiral Scott Redd** as the keynote speaker during the opening Plenary session at the 79th MORS Symposium, 21 June 2011. VADM Redd had led ten organizations in government and the private sector as a commander/CEO. In forty years of public service, he launched two organizations critical to U.S. national security: The U.S. Navy's FIFTH fleet in the Middle East and the National Counterterrorism Center (NCTC) in Washington, D.C.

From 2005 to 2007, Admiral Redd served as the first Senate-confirmed Director of NCTC, a presidential appointee at the deputy secretary level. In that capacity, he was responsible to President Bush for integrating all instruments of U.S. national power into the nation's first war plan for the global war on terrorism. He was also responsible to the Director of National Intelligence for leading the U.S. Government's efforts in analyzing and integrating all terrorism intelligence, foreign and domestic.

For his service, he was awarded the National Security Medal and the National Intelligence Distinguished Service Medal.

Prior to NCTC, VADM Redd served as Executive Director for the Commission on the Intelligence Capabilities of the United States Regarding Weapons of Mass Destruction (the Silberman-Robb "WMD Commission") in 2004/5. Commission's report was adopted as the President's blueprint for implementation of Intelligence Community reform.

During his 36 years in uniform he commanded eight operational organizations at sea and served in several senior staff positions in the Pentagon.

His last assignment on active duty was as Director of Strategic Plans and Policy (DJ-5) on the Joint Staff. In 1995, VADM Redd founded the first new U.S. Navy fleet in half a century, serving as the first Commander FIFTH Fleet (COMFIFTHFLT) since the World War II era. Admiral Redd's military awards include three Defense and two Navy Distinguished Service Medals, the highest non-combat awards for joint and naval service. He also wears the Order of Bahrain.

A native of Sidney, Iowa, VADM Redd graduated with leadership and academic honors from the United States Naval Academy in the class of 1966 (2 of 869), majoring in mathematics and physics. Following graduation, he studied as a Fulbright Scholar in Uruguay and as a Burke Scholar, receiving a Master of Science degree in Operations Analysis from the Naval Postgraduate School. He also attended the Program for Senior Executives at the Massachusetts Institute of Technology (MIT).

VADM Redd is past President of his Naval Academy Class and has served on the board of several corporations and non-profit organizations. An avid amateur radio operator, VADM Redd has won eleven world championships and is a member of the CQ Amateur Radio Hall of Fame.

A full biography is available on the MORS website, www.mors.org.



Special Meetings 2011–2012

Tim Hope, Whitney, Bradley & Brown, Inc., thope@wbbinc.com

The Special Meetings' Committee is pleased to announce the slate for the 2011–2012 Special Meetings. With input from the Sponsors, the draft 2011–2012 Special Meeting Slate is listed here. Please note that contacts and dates are tentative.

The Terms of Reference (TORs) for each meeting are currently being drafted

and the draft and final TORs will be posted on the MORS website as soon as they are available (www.mors.org). The TORs will provide the objectives and goals of each meeting as well as specify individual Working Groups and the leadership for the meeting. The Special Meeting Committee is working with the meeting leadership to ensure that

the output of each Special Meeting is an actionable recommendation that is usable by the Sponsors or other Senior Leaders. If you are interested in participating in any of the Special Meetings please contact the MORS Office at 703-933-9070 or the Special Committee Chair (Tim Hope, thope@wbbinc.com) or the POCs at the email addresses listed in the table.

Special Meeting Slate 2011-2012

“Risk, Trade Space, and Analytics in Acquisition”

The purpose of this meeting will be to increase the analytic rigor in developing risk assessments for acquisition programs across the Department of Defense. Increasingly, Congress and the Office of the Secretary of Defense are demanding more fidelity in the risks they are to assume in the cost, schedule, and performance of very expensive acquisition programs. The national security analytic community must step up and fill this requirement for greater rigor in this analysis.

Army/Mr. Jeffrey Geroso, Army Materiel Systems Analysis Activity
jeffrey.geroso@us.army.mil
September 2011

“OR Methods and Analysis Support for High-Value Security Issues”

The purpose of this meeting is to develop a community of practice surrounding operations research methods for high-value issues including counterterrorism, counternarcotics, and counterproliferation, particularly focused on customers and methods outside the traditional defense scope. While operations research methods are in use in these fields, their application is of a less mature and developed nature than in traditional problem areas such as military planning, logistics, and counterinsurgency.

DHS/Dr. Steve Riese
Stephen.Riese@jhuapl.edu
November–December 2011

“Adaptive Planning”

The purpose of this workshop is to promote an exchange of ideas, capabilities, and methodologies within DoD and across the interagency in the areas of strategy assessment, operational planning and plan assessment. One aspect of the workshop would investigate the degree with which adaptive planning and execution (APEX) methodologies, tools, and data can be leveraged across the operational planning, capabilities development, and PPBE processes.

OSD/Mr. Bexfield
James.Bexfield@osd.mil
January 2012

“Common Framework /Measure for Network C2 Systems”

This MORS Special Session Workshop will encourage participants in the analysis, development, integration, test and evaluation, and certification communities for networked command and control systems to present respective measurement frameworks; discuss measurement links, commonalities, and disparities; and develop a proposal for how the different activities can better integrate and link measurements together. Participants will discuss the development of a framework for decomposing operational-level measures into performance-level measures.

USN/Terry McKearney
terry.mckearney@therangergroup.com
March 2012

“Analytic Dynamics of Non-Proliferation”

This workshop will focus on exploring this range of questions and how analysis can inform them: How do we evaluate our efforts to sustain deterrence, and to sustain the Nuclear Enterprise as a whole? How do we provide insights to the QDR/NPR/NSS/NMS and how can those insights inform policy and strategy?

What are the approaches that illuminate non-proliferation and counter-proliferation? What role does arms control play and how does analysis inform? What is the role of analysis in illuminating these questions, potential insights, and relevant courses of action? USAF/STRATCOM/Dr. Clay Bowen
Clayton.Bowen@pentagon.af.mil
April 2012



Operations Research in Defense of the Nation

Mr. Mike Garrambone, InfoSciTex Corporation, Vice President for Societal Services, michael.garrambone.ctr@wpafb.af.mil



It is my opinion that serving MORS in any capacity is both a great privilege and a distinct honor. For forty-five years the Society has en-

deavored to serve the Nation by bringing together its intellectual resources, applying its knowledge to further the profession, and sharing the discoveries of its diverse analytical research efforts. I know that if I am elected, leading the Society as president will truly be a privilege and will most certainly be a challenge in the complex environment in which we live.

To begin, my rationale for seeking this office is simple but has three components.

The first is my desire to give back to the Society a measure of the benefits I have enjoyed at the hand of the leaders who precede me. I have enjoyed working for the Society in a multitude of tasks and leadership positions and it is my desire to come forward and lead based on this experience.

The second reason is mentorship. I have been taught, cajoled, counseled, and inspired for the last 20 years by no fewer than the one hundred senior mentors at MORS who have shown me through constant support how to be a MORSian. Dozens of presidents, vice presidents, fellows, sponsors, committee and working group chairs, staff members, and even oral history interviews have supported my training for this job—to all I owe a great allegiance and will strive to follow in their footsteps.

The third reason I am seeking this office is personal, as I have taken great pleasure in working for MORS for these many years and I know it to be an outstanding and noble society. Nonetheless, I believe there are some things we can do to further our goals and I would like to pursue these as president to make our Society even better.

The Mission and Nature of the Society

MORS exists to bring smart people together to collaborate on new and difficult problems faced by the Nation and to exchange scientific and technical information across organizations and a variety of disciplines. We are unique in that we study operational problems at classified levels and derive our mission and support from our Military Services and Departmental Sponsors. We are a nonprofit economic entity that provides products and services, principally creating intellectual property and cutting-edge, timely, technical interchange meetings. We are supported by defense contractors, educators, policy generators, and an array of decision makers. We take on exploratory problems of interest to our Sponsors, engage in venues ranging from social sciences to cost analyses, and gather at institutions that support and educate our members. We derive revenue from our Sponsored government contract, but predominately from attendance at our various meetings. Although our functions are attended by a spectrum of different analytical community members, our official membership and our Board of Directors is our strength and our mechanism for building our future. We are a historically strong volunteer organization with a very small professional full time staff, the MORS Office. We are governed by our State of Virginia Charter and our living MORS Operations Manual. We are supported by a Board of Directors structure of some twenty committees, overseen by six executive council members. We endeavor to be “squeaky clean” and unbiased in all financial, legal, inter-Service, and interagency matters, and desire to sustain the Society forever. I believe a president must know and understand all of this.

Vision for the Future

My vision of MORS is that of a financially sound, operationally strongly, service-rendering, well-known, and enduring professional society. I see MORS as the organization that reaches out to its members and provides a unique Community of Practice for Operations Research in all aspects of National Defense. It is our mission to pull together the eclectic disciplines that serve the Nation as in previous eras. We need to seek to build membership from sources yet untapped who need our help (and might not know it). Aside from our low fees and minimal membership expenses, I envision a benefit of belonging to MORS, like other noteworthy societies, will be its clear “signature” of professionalism. We will need to become great communicators of this status, pushing beyond our current media capabilities. Most important to our future is the planning and conducting of highly relevant well-attended special meetings, workshops, symposia, and colloquia. We need to continue to seek topics early, obtain sponsored attendance support, create mentored and seasoned meeting-execution teams, and advertise within applicable organizations. I see MORS directing our inherent analytical talent to looking at our own operations. We will need to better understand our own economic landscape by conducting in-house operational studies and market assessments. Interesting to training analysts, we are now providing tutorials to thousands of attendees at our functions with the next step of going onsite into the community to support analytical training. We have the power to do this, and only need to create the organization to see it through. Many MORS mentors have given me the benefits of their wisdom over time and I support our plans for more mentoring for our members and a return to more mentoring within our Board of Directors.



PRESIDENT-ELECT CANDIDATE STATEMENT

Focus Areas and Things to Do

There are twelve printed goals of the Society but there will always be more to do than can be attempted in a single year. With the help of the membership, I would like to focus on four areas and activities.

First, I want to focus on our people and foster the development of all stages of defense analysts. We can do this by mentoring and reaching out through our tutorials and current publications to all members of the society be they in school, on the job, or in the field. We can offer historical and recent DoD case studies on National Defense and Lessons Learned by our practitioners world-wide through our publications and future streaming video capabilities. We can build access to members through our new online web services and expand our current list of MORS traveling tutors.

My second focus area is reaching out to the yet untapped defense communities. Operations research applications run the gamut from industrial processes to disaster relief. I support studies to identify the agencies that would benefit from our talents and techniques and the creation of outreach teams. I am suggesting first cold calls and visits in identifying these targets of opportunity and then liaisons. Another focus area is our meetings and meeting attendance. Although our process has been very successful in the past, we need to plan for meetings that are both cost effective “for meeting conditions” and attractive to individuals and agencies in austere funding environments. In our search, we need to look at meetings that directly support warfighters and national defenders on topics of their interest, perhaps on turf of their own choosing.

My last area of focus is mentorship within our Board of Directors. Our Board is young in many respects and has not had the opportunities of previous Boards in having senior mentors close at hand. I am

recommending we “call in” those Senior Past Presidents, Fellows of the Society, previous Advisory Directors, Senior Meeting Chairs, and invite them to mentor our Board Members and contribute to all of our standing committees.

Summary

As you can see, I am not suggesting expensive ideas or overwhelmingly obscure and difficult tasks. My objective, with your help, is to strengthen the society both economically and through the development of analysts, and to expand our service throughout the National Defense. If elected, I will focus on mentoring, organization, assessments, and planning in the creation of quality products and continued high-quality meetings. I will be diligent as President-Elect and will solicit your ideas. I promise to bring exuberance and excitement to the Society and to serve you as a dynamic and articulate leader. I thank you for reading my thoughts and giving me the opportunity to serve.

Biography

Mr. Mike Garrambone is a Senior Military Operations Research Analyst for the InfoSciTex Corporation supporting the USAF’s Aeronautical Systems Center. He is currently serving the Simulation and Analysis Facility (SIMAF) at Wright-Patterson AFB as an Operations Research weapons system analyst and study team leader. He is a retired Army combat engineer and Military Operations Research Analyst (FA 49) and is currently MORS’s Vice President for Societal Services, VP (SS). He holds a BS in Engineering Science and Mechanics from the University of Florida, an M.Ed and an MBA from Georgia State University, and a MS in Operations Research from the Florida Institute of Technology. While on active duty, he served in various military operations centers at battalion, brigade,

and general staff-planning levels and was a combat engineer unit commander in Germany. His Air Force assignments were as Director, Combat Modeling and Simulation, C3CM Joint Test Force, and instructor, Air University, College of Aerospace Doctrine, Research, and Education. He taught at the Air Force Institute of Technology, Department of Operational Sciences and mentored 25 thesis students to graduation. Mr. Garrambone was a Course Director at the Army Logistics University, where he taught Decision Risk Analysis for Engineers, the Logistics Executive Development Course, and the Operations Research/Systems Analysis Military Applications Course. He is a distinguished graduate of the ORSA (MAC1) and the Army Command and General Staff College. Mr. Garrambone has been a member of MORS for the last 23 years and has provided numerous presentations, highly attended tutorials, and interesting heritage special sessions. He has served as several working and composite group chairs and senior advisors. He was elected to the MORS Board of Directors in 2000 and again in 2007. He has served or chaired nine MORS standing committees, including Ed&PD, Heritage, Communities of Practices, Publications and Awards (several times); and has served on the Executive Council as Secretary, VP for Management and Finance, VP for Professional Services, and VP for Societal Services. His forte has been leading/supporting Educational Colloquia, MORS Tutorials, Heritage Sessions, and several Special Meeting Synthesis Working Groups. He has authored numerous articles for MORS, and has garnered and published noteworthy heritage literature and Oral Histories. He reviews for MORS’s publications, and continues to be a frequent guest speaker and ambassador for this society.



MORS 2011 Education and Professional Development Colloquium: "Meeting National Security Challenges through OR!"

COL Simon R. Goerger, OSD (P&R)—Readiness Directorate, Simon.Goerger@osd.mil
LTC Darryl Abner, Air Force Institute of Technology, Darryl.Abner@afit.edu

The MORS 2011 Education and Professional Development (EPD) Colloquium was held 8–10 March 2011 at the magnificent facilities of the Virginia Military Institute, Lexington, Virginia. This year's theme was "Meeting National Security Challenges through OR!" The Colloquium was honored to have numerous Sponsor and MORSian speakers provide insight to the community and students on how Operations Research is being used and applied throughout DoD and Homeland Security to address security issues.

This year's Education Colloquium consisted of 68 registered attendees and attracted undergraduate and graduate students as well as faculty from ten academic institutions, including USNA, USMA, USAFA, The Citadel, AFIT, George Mason University, Johns Hopkins University, VMI, and Old Dominion. The Colloquium attendees also included analysts and leaders from the four Services, the Joint Staff, the Office of the Secretary of Defense, the Department of Homeland Security, and the Federal Bureau of Investigations.

The colloquium consisted of numerous events including the traditional quick-turn analysis student competition. The colloquium started with a Keynote address by **Dr. George Akst**, Marine Corps Combat Development Command, before students headed to the quick-turn analysis student competition, where five teams competed for top honors. Competition topics included problem sets addressing DHS as well as DoD concerns. This year's third place team was Team "Gillis" consisting of **Caitlin Bradley** (VMI), **Ryan Harmer** (VMI), **Robert Kay** (USNA), **Eric Summers** (VMI), and **Kuo-Wei Yao** (The Citadel) for "Assessing the Effectiveness of Reconstruction and Development

Efforts in Afghanistan's Kandahar Province." The second place team was Team "Blue Ridge" and consisted of **Zachary Bunting** (USNA), **Marenglen Dalanaj** (NAVSEA 2005), **Taeseung Kwon** (VMI), **James Snyder** (VMI), and **Chimaphon Uttarawanich** (The Citadel) for "Evaluating Civil Affairs Support to Military Operations in Afghanistan." The first place team was Team "Allegheny" and consisted of **Alaina DiBisie** (USNA), Anderson Caldwell (VMI), **Timothy Higgins** (VMI), **Alexander Kozera** (GMU), **Wei-Fang Liu** (The Citadel), and **Nicolas Woods** (USNA) for "Assessing the Vulnerabilities of an Airport to a Terrorist Attack."

This year's poster competition was held during the well-attended Wednesday evening social mixer, with second place honors going to **Zachary Bunting** (USNA) for his poster entitled "An Integer Programming Approach to University Course Timetabling." First place went to **Craig Moore** (USNA) for his work entitled "Using Contact Tree Discovery to Predict Network Size Given Partial Observations."

In addition to Dr. George Akst, the Colloquium was pleased to have sponsor representatives **Ms. Virginia Beall** from the Office of the Chief of Naval Operations (N81), **Col Chris Hill** from the Center of Army Analysis, **Dr. Clayton Bowen** from Studies and Analyses, Assessments and Lessons Learned (HQ USAF/A9), and **LTC Rob Kolb** of OSD (Capability Assessment and Program Evaluation), who provided presentations on operations research needs within DoD. Sponsors also participated in a panel discussion with Colloquium attendees. In addition, representatives from the Services and DHS interacted with students in a new event for this



Dr. George Akst, the EPD keynote speaker.

year's Colloquium, the Career Round Table. This round table gave groups of five to six students an opportunity to discuss with a senior MORS Sponsor member or MORSian career opportunities and other OR related issues. Each group heard initial Table Lead responses to questions collected from students at the start of the Colloquium with time for follow-up questions before rotating as a group to the next table. Each student cluster had an opportunity to meet with five different OR professionals for fifteen to twenty minutes each. The speed sessions served as an outstanding addition to the Colloquium program.

Mr. Mike Garrabone provided the final presentation, entitled, "The History of OR." The presentation was an excellent bookend for the colloquium as it provided a much-appreciated context of the origins of the profession.

Next year's MORS Education Colloquium is still under coordination but holds great promise as another outstanding opportunity for students of the profession and Senior Practitioners to interact in an invigorating and meaningful event. Stay tuned for more to follow and sign-up your prodigies early for this fruitful event!!!



On the occasion of the 45th anniversary of the Military Operations Research Society, we are pleased to present this oral history of Mr. Lewis A. Leake, MORS' first President.

When I was the Chair of the Heritage Committee in 2006 my main focus was the MORS 40th Anniversary celebration. We compiled photos and highlights of most of the MORS Past Presidents' accomplishments. Regrettably, we were unable to find much information nor a photo of our first MORS President, Lewis A. Leake, FS. We did a full court press to find Lewis. Finally our investigation led to a tip that Lewis was living in St. George, Utah. Dr. Bob Sheldon, FS, and Mike Garrambone, MORS Vice President for Public Affairs, made immediate plans to conduct an oral history telephonic interview on 2 June

2008. After several hours on the phone, we agreed that a follow-on interview would be in order. Months later I was at a friend's wedding in Las Vegas, and subsequently drove to St. George to meet Lewis. On 30 November 2008 I met Lewis, his charming wife Sydney, and grandson David Hilton in St. George. Lewis was very humble about all of the attention he was receiving from MORS after so many years had passed. We conducted the second interview from his home with other Heritage Committee members and President Mike Kwinn participating by telephone. Lewis alertly recalled a surprising amount of detail about events that

occurred a half century ago. He loved to solve problems and believed in striving for perfection in all his endeavors. Lewis died 30 March 2010 at his home in St. George, Utah. He is greatly missed by all who knew him. Meeting and interviewing our first MORS President was an experience I will always fondly remember. Our Society, guided and cultivated by Lewis Leake and his successors, has proven extremely valuable to our MORS members, our sponsors, and more importantly, to our country's security. I hope you enjoy the oral history of our Founding President, Lewis Leake, FS.

—Bill Dunn, FS

Military Operations Research Society Oral History Project Interview of Mr. Lewis A. Leake, FS

Mike Garrambone, InfoSciTex Corporation, michael.garrambone.ctr@wpafb.af.mil

Bob Sheldon, FS, Group W, Inc., bs@group-w-inc.com

Bill Dunn, FS, Alion Science and Technology, William.H.Dunn@us.army.mil

Oral Histories represent the recollections and opinions of the person interviewed, and not the official position of MORS. Omissions and errors in fact are corrected when possible, but every effort is made to present the interviewee's own words.

Mr. Lewis Albert Leake, Fellow of the Society (FS), was the first President of the newly created Military Operations Research Society (MORS) chartered 29 April 1966. Mr. Leake was elected President of the Society at the first Board of Directors meeting on 25 April 1966 and served to 1967. In 1991, he was elected a Fellow of the Society. The first interview was conducted via telephone on 2 June 2008, with Mr. Leake in St. George, Utah, Mr.

Garrambone in Dayton, Ohio, and Dr. Sheldon in Alexandria, Virginia. A second interview took place on 30 November 2008. This second interview was led by Mr. Dunn who traveled to St. George to orchestrate this event from Mr. Leake's home in Utah. Mr. Dunn coordinated to have then MORS President, Mike Kwinn, and MORS Heritage Chair, Dr. Steve Pilnick, also participated in this interview via telephone.

Mike Garrambone: Mr. Leake, it was very difficult to find you. It seems like over the years you have moved around quite a bit. I understood you to be a very active individual.

Lewis Leake: Yes, I was very active until about four years ago when I had a severe stroke. I still remain fairly active, but not as physically active as I used to be.

Bob Sheldon: Can you give us your parents' names and tell us how they might have influenced you?

Lewis Leake: My father's name was Lewis Albert Leake. I was Junior. He died when I was fifteen years old, so I just dropped the junior. I guess that was technically not right, but I haven't used it since. My mother's maiden name was Margery Angus Walker.

Mike Garrambone: What was your mother's profession?

See **LEAKE** on following page...



LEAKE from previous page...



Lewis Leake: Her profession was a wonderful stay-at-home mom. Before she was married she worked for a year in New York City.

There she was a milliner and created high-fashion women's hats. After her children left home she designed and sewed elegant wedding dresses for at least one hundred brides and often the dresses for all of the girls in a wedding party. I think that her cheerful disposition and willingness to try anything (such as taking a ride in my brother's hot air balloon at age 80) had a big impact on me.

Mike Garrambone: Where were you born?

Lewis Leake: I was born 20 May 1925 in Denver, Colorado.

Bob Sheldon: What did your father do for a living?

Lewis Leake: My father was a printing press machinist for the American Type Founders Company in Denver. In 1932, he lost his job because of the Depression, so we moved to Salt Lake City, Utah, where he knew he could get work. He installed, repaired, and sold printing presses and related equipment and supplies—all but the paper. As a boy, I worked for him during school vacations and summers.

Bob Sheldon: Tell us where you went to grade school, junior high, and high school.

Lewis Leake: Almost all in Salt Lake City, except for the very first grades in Denver.

Bob Sheldon: Did you take an early interest in math and science?

Lewis Leake: After arithmetic, I got to algebra in junior high school and suddenly mathematics became very interesting to me. I enjoyed it from then on. Mathematics was my favorite subject in high school.

Mike Garrambone: Where did you go to high school?

Lewis Leake: I attended South High

School in Salt Lake City. I graduated in early June 1943.

Bob Sheldon: Did you go straight to college?

Lewis Leake: During that time we were at war. The Navy and the Army had recruiters come to the high schools and interview students who had any interest in becoming officers. They administered aptitude tests and so forth. I indicated that I wanted to be an aeronautical engineer and I was selected to be in the program that the Navy started on 1 July 1943. It was called the V-12, Naval College Training Program. The V-12 program was to guarantee an officer replacement pool for the Navy and Marines during World War II (WWII) and gave many young men the opportunity to attend college. The program was disbanded at the end of WWII, having trained thousands of students. First they sent me to Butte, Montana—to the Montana School of Mines—for two semesters. Before that time I had enlisted in the Naval Reserve and was on inactive duty and attended the University of Utah for two quarters in pre-engineering courses. I continued to enjoy and excel in mathematics and chemistry and was tempted to change my major to chemistry at that time.

Bob Sheldon: What did you do after those two semesters in Montana?

Lewis Leake: The Navy sent me to Purdue University in March 1944 where I was able to study aeronautical engineering. That's where I met my future wife, Sydney Anne Tuesburg of La Porte, Indiana.

Bob Sheldon: How long did you stay at Purdue?

Lewis Leake: I was there until late October 1945.

Mike Garrambone: So this was just after the war?

Lewis Leake: Victory over Japan (VJ)-Day occurred in August 1945 when I was in my seventh semester. The Navy decided to stop the program and they gave me a commission as an Ensign in November and sent me to the Naval Air Station (NAS), Dallas, Texas.

Bob Sheldon: Did you have your degree?

Lewis Leake: I didn't have the degree yet. That came after I was later released to inactive duty and I went back to Purdue on the GI Bill.

Bob Sheldon: What did you do in the Navy?

Lewis Leake: At that time the war was over and they were winding down. We were actually disassembling airplanes at the NAS, Dallas. For example, the F6F and the F4U aircraft were being dismantled there. We were saving some of the parts, and scrapping almost all the rest of the airplane. I was in what was called the Assembly and Repair Department but we were not repairing much.

Bob Sheldon: How much time did you spend in Dallas?

Lewis Leake: I was there from November 1945 until early June 1946. The Navy sent me for further assignment to COMAIRPAC in Hawaii where I was to be assigned further in the Pacific. It didn't make any sense. I tried to get them to change the orders, but I went to Pearl Harbor anyway. After I got there, the Assignment Officer said, "What did they send you here for?" I said, "That's what I asked for; I had tried to get the orders changed." So he said, "Well, I'll check around and see if anybody wants you. Come back tomorrow." I went back the next day, and he said, "Nobody wants you; we're writing Demobilization Orders for you." I spent about a week or ten days in Hawaii before I could get another ship back. Then my wife had a miscarriage and suddenly they put me on a priority list to be flown back to the mainland.

Bob Sheldon: Was she waiting for you at Purdue?

Lewis Leake: She was at her mother's home in Northern Indiana.

Mike Garrambone: Were you released from active duty when you came back?

Lewis Leake: Yes. I came to San Francisco and was released to duty as an Ensign in the Naval Reserve and was active in the Naval Reserve for quite a few years thereafter.

Mike Garrambone: So you took up residence in San Francisco?

Lewis Leake: No, I got on a train and went back to Indiana to be with my wife.



Mike Garrambone: You eventually got your degree in aeronautical engineering?

Lewis Leake: Yes. I started that fall and needed to take five hours of course work to finish a Bachelor of Science (BS) degree. I'd taken a lot of advanced courses during my undergraduate work and my professor suggested that I could readily get a Master of Science (MS) degree during the coming school year. Thus, I received my BS in February 1947 and my MS in June 1947, both in aeronautical engineering.

Mike Garrambone: That was pretty quick!

Lewis Leake: Yes, I took the needed courses in the fall semester, and wrote my thesis and took a few courses in the spring of 1947.

Bob Sheldon: What did you write your thesis on?

Lewis Leake: We had some former Air Force officers who had been at Purdue the prior year. For their MS degree they had set up a primitive gas turbine apparatus using an aircraft turbo supercharger. I finished some of the needed work, which included learning to weld parts of the improvised test equipment. I ran many tests and then wrote my thesis as an analysis of its performance characteristics. The setup made the equivalent of a crude gas turbine engine. We had a large burner between the output of the compressor and the turbine. It was an extremely inefficient device and would run for only about 30 seconds before overheating the turbine blades.

Bob Sheldon: What did you do after you finished your MS degree?

Lewis Leake: I went to Boeing's Jet Propulsion Unit in Seattle. I worked on things that were related to gas turbines and ramjets.

Mike Garrambone: Were you working on design or were you working on installation or material construction?

Lewis Leake: One interesting project had to do with designing and testing diffusers that were to collect the gases in a permanently installed turbine installation. I tried two design concepts. They were fabricated in our shop and I tested them to determine the performance

characteristics of the two. Initially I was surprised at which one was most efficient, but I could later understand why because it had more losses because of boundary layer effects.

Our office was directly across the street from Boeing Field. I vividly recall watching the first XB-47 take off with twenty jet-assist rockets in the aft part of the fuselage. They probably added about 20,000 pounds of thrust to get the aircraft off the short runway. We were given a high sign when takeoff was imminent. During the takeoff roll when those rocket engines were ignited, the aircraft took off at a steep angle. We knew that it had to fly more than 100 miles to Moses Lake, Washington, the nearest airstrip at which it could land. It was a very exciting thing to watch.

Mike Garrambone: How long were you in Seattle?

Lewis Leake: After about a year and a half, I left to teach at the University of Utah as an instructor in Mechanical Engineering.

Bob Sheldon: What classes did you teach?

Lewis Leake: I taught Statics, Dynamics, and Strength of Materials. I even taught a course on how to use a slide rule—now very antiquated.

Bob Sheldon: Do you still know how to operate a slide rule?

Lewis Leake: Sure do.

Bob Sheldon: How long did you spend on the faculty at Utah?

Lewis Leake: I stayed there just for one school year. It turned out to be a very low paying job. If I had stayed for the second year I would have received \$250 per month. I ended up going to what was then called the Naval Air Missile Test Center at Point Mugu, California. That's forty-five miles up the coast from Santa Monica and below Oxnard, which has now become a fairly good-sized town.

Bob Sheldon: What kind of work did you do for the Navy at Point Mugu?

Lewis Leake: I was involved in testing missiles and in particular I was initially in a group called the Launcher Division. It had to do with ensuring that launch operations were being conducted safely. I

was the test engineer involved in the first launch of the Sparrow missile from an airplane in the early 1950s.

Bob Sheldon: The AIM-7 Sparrow, Aerial Intercept Missile?

Lewis Leake: No, but this was its primitive forerunner. It was known as the Sparrow I—a radar beam rider missile designed by the company that was then known as the Sperry Gyroscope Corporation. The first launch was from an F6F Hellcat aircraft, which was outfitted as a drone.

Bob Sheldon: What size missile was that Sparrow?

Lewis Leake: It was 8 inches in diameter and 12 feet in length. The Sparrow I was the first in a sequence of three design concepts for a radar-guided air-to-air missile. The Sparrow II missile was under development by the Douglas Aircraft Company. It was to be a fully active, self-contained radar-guided missile of the same size as the other Sparrow missiles. It was a bold idea, but far ahead of the technology of that era. I don't think it ever reached the stage of flight testing. The semi-active radar-guided Sparrow III was designed by Raytheon.

Bob Sheldon: What time frame was that?

Lewis Leake: This would've been starting in about 1949 or 1950. I was at Point Mugu for another fifteen years, until 1964.

Bob Sheldon: Do you know if those early Sparrow missiles were used in combat?

Lewis Leake: Yes. Raytheon's Sparrow III missile actually went into service as the AIM-7. It was used in Vietnam.

Bob Sheldon: What aspect of the test cycle were you involved in? Did you set up the experimental design and go out and collect test data for analysis?

Lewis Leake: Yes. However, at this stage of the technology, we were not at the point of doing experimental designs such as your question implies. We were only at the stage of determining the feasibility of design concepts for the earliest guided missiles. There was no such thing yet as a production line and an ability to take samples for testing.

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One example of my work is from the first time a Sparrow I was launched. For safety reasons, that was done

from a ground-based launcher. The first launch attempt was a failure. We had instrumented the missile to measure (through telemetry) shock, vibration, and other parameters. I received an award for my report on the cause of the failure. I determined that the igniter for the rocket motor had induced a shock that caused the failure of the missile's guidance system. None of this, of course, was related to operations research. My interest in that came later.

Another interesting early example of my work was from a test of what was intended to become a naval surface-to-air missile, known as the Lark. It was intended eventually to be launched from naval ships toward incoming attack aircraft. A dummy test missile was designed at Point Mugu to evaluate the design concept for launching the test missiles. The first launch was a failure. Soon after launch, the missile ended up performing almost a cartwheel. We had good telemetry data and movies from which I could analyze what had happened. My report "hit the fan" as far as some people were concerned.

Bob Sheldon: What was the cause of the failure?

Lewis Leake: I was able to determine that the tail cone of the test missile had buckled. One of the two booster rockets had burned longer than the other. There was a resulting off-center thrust that caved in the thin-skinned tail cone of the test missile. My report was received very poorly, especially by the Russian-born designer of the test missile, who was very senior to me. He had convinced key people that my report was in error. A few weeks later a diver found the wreckage on the floor of the ocean a few hundred yards away from the launcher site. The tail cone had in fact caved in.

Mike Garrambone: That must have felt pretty good to know that you had figured that out.

Lewis Leake: Yes. I knew what had happened. I didn't have any doubt whatever, but now there was the supporting evidence.

Bob Sheldon: Did you have large sample sizes of test data to do statistical analysis?

Lewis Leake: No. As I mentioned earlier, at that time it was premature. Nothing was even in production yet. The fact is that we were taking relevant courses about statistical design of experiments, statistics, and probability under the auspices of UCLA, but application thereof didn't come during my time in missile testing.

Mike Garrambone: You were at Point Mugu until 1964, and we know that MORS came into being in 1966, so I'm beginning to wonder how your interest in MORS began?

Lewis Leake: I don't know if you ever heard of men named Royal Weller or Harold Gumbel. Dr. Royal Weller was the Chief Scientist at the Naval Air Missile Test Center which later became the Pacific Missile Range. I was working for Harold Gumbel in the Operations Research Group. Harold became involved in the very earliest phases of the MORS meetings. They were called Military Operations Research Symposia at that time; when MORS was incorporated, it came to stand for the Military Operations Research Society. I don't remember just how Harold got started, but he was involved therein. He became convinced that a lot of operations research was being done in different branches of the military and there was no interplay between the different groups. He felt there ought to be something considered in the way of symposia as a start for some cross talk between the different elements of the military. I think that he and Dr. Weller were in part responsible for getting something going.

Mike Garrambone: It sounds like he encouraged you to get involved?

Lewis Leake: He did. I recall one of my earliest Symposia (7th MORS) was in Seattle at the Boeing Aerospace Division. As an aside, while we were on our way to

Seattle on a Navy C-47, we were told that the Bay of Pigs assault had occurred. That was in April 1961.

Bob Sheldon: Can you tell us about that 7th MORS Symposium? Did you give any briefings or do you recall sitting in on any briefings and what their topics were?

Lewis Leake: I did not present there, but I do recall one very interesting paper. This goes way back to the time that we had the Air Defense Command and interceptor aircraft on alert at air bases around the perimeter of the country. We had the Oxnard Air Force Base close to where we lived in California. Interceptors at these bases were ready to scramble if Soviet bombers were detected coming in. One operational question had to do with where the interceptors might be able to land after performing their missions. At each base there was a meteorologist who was supposed to make hourly weather forecasts into the next few hours to estimate whether the field would be open to recover the interceptors. Statistical analyses were presented in that symposium that showed that you could have predicted whether the fields would be open for landings two or three hours ahead just as well by flipping a coin, based on weather statistics for that location. So, a lot of money was being spent on this forecasting system that wasn't of operational value.

Mike Garrambone: Were the symposia large back then? Were they classified?

Lewis Leake: Yes, I think about one hundred people attended these and they were classified.

Mike Garrambone: Did Harold Gumbel attend with you or did he just send folks that worked for him?

Lewis Leake: I am sure that he was there. He was a strong supporter of his analysts going to the symposia. Because MORS was in development, he wanted me to become a member of what was then called the Steering Committee. It was made up of mostly people on the West Coast. In fact, initially it was entirely from people on the West Coast.

Bill Dunn: And originally, it was all Navy folks then too?

Lewis Leake: Yes, as I recall.



Bob Sheldon: When did Air Force and other Service folks start attending the MORS Symposia?

Lewis Leake: I think at least a few from the Air Force attended the 1961 meetings in Seattle. However, I suspect that there were more from the other Services at the following symposia.

When I got your call about an oral history interview, I wrote a note to Harold Gumbel and he sent me a letter. He said that his old files of that era were inaccessible at the time, but he sent some of his recollections. I can quote a little bit from his letter.

“Our work on Guided Missile Evaluation had raised many operational questions. In pursuing these, I became aware that every military service department in the DoD did their own OR analysis. It was highly duplicative and in ignorance of what the other services were doing. That is, folks were in complete ignorance of what the other Services were doing around them. Because I was a member of the Operations Research Society of America, I thought that the work of similar organizations would be highly useful to those in the DoD, respecting of course the classified nature of said analyses. I mentioned my concerns to Royal Weller, the Chief Scientist.”

That brought it to the attention of people in the Office of Naval Research (ONR) and they began to sponsor the symposia. James Garvey was part of this; you probably know of him.

Bob Sheldon: Yes, I've heard his name many times.

Lewis Leake: I don't know any details at this point. I just know that James Garvey ended up being the person in ONR who became the focal point for sponsoring the symposia for a time. It came to the point where it was decided that it was important that ONR not be the sponsor anymore. They wanted an organization to be formed officially to continue the symposia.

Mike Garrambone: It seems like you were encouraged to attend and it sounded like your boss wanted you to get into some of the administrative parts as well.

Were there others with you that were driving the ship or interested in forming a society?

Lewis Leake: Yes, I think that most of the people who had become involved in the Steering Committee and others felt that it was important to continue to do so. Up to that point membership on the Steering Committee had been through a very informal process. When the ONR wanted to bow out and have it become a professional society, we were among those interested. There were around 20 to 25 participants then.

Bob Sheldon: You were President of MORS in 1966 when they incorporated. Tell us more about how you got elected President.

Lewis Leake: Preparations had been made to form the Military Operations Research Society. There were two strong-willed key candidates for being the first President. I guess it would be appropriate to say that they were somewhat controversial. I don't remember their names at this point, but I'm sure they had considerably more experience in military operations research than I did. Someone nominated me from the floor and to my surprise I was elected President. I had not near the extent of experience in military OR that the others had. I have always thought my nomination and being elected was because I was the “peace candidate.”

Bob Sheldon: We call the original MORS Directors from 1966 the “Founding Directors.” Are there any of these folks you can comment on?

Lewis Leake: I remember Clay (Clayton) Thomas very well. He was the Air Force sponsor's representative. He was an analyst and was really one of the people who were quite responsible early on for helping to form MORS in my opinion. Jack Borsting was another. He was at the Naval Postgraduate School in Monterey. Martin Chase was a strong and cheery person. Art Stein from Cornell University was very helpful. Robert Miller was the Secretary/Treasurer when Howard Berger was our Vice President. Vance Wanner was our administrator. He was the man who did all the leg work.

Bob Sheldon: We have an award named after him: the Vance Wanner Award.

Lewis Leake: Yes, it came about because he died not long after we formed MORS and this was a tribute to his key role in getting us started.

Mike Garrambone: Where was the MORS office located?

Lewis Leake: It was in Alexandria, Virginia.

Mike Garrambone: Did you run a symposium that year as President?

Lewis Leake: No. I chaired the 14th MORS Symposium in San Diego in 1964. But it was Dr. Dan Howland of Ohio State University who ran the symposium in May of 1966. He was the chair of the 17th MORS Symposium held at the Naval Postgraduate School in Monterey.

Mike Garrambone: Did they charge in those days to come to the symposia?

Lewis Leake: No. There was no charge at all.

Bob Sheldon: Did much change in the symposia when MORS was incorporated or did things more or less continue as they had been before?

Lewis Leake: It was initially quite similar to before. We continued the expansion that was begun from previous symposia like the early one in Norfolk.

Mike Garrambone: Did it seem risky to become incorporated?

Lewis Leake: It did not. It didn't seem risky at all.

Mike Garrambone: Did you have different working groups? It sounds like you were bringing the Army and the Air Force in with the Navy folks.

Lewis Leake: Yes, we did have working groups back then. They were on Command and Control, Special Warfare, Arms Control, Theory of Combat, and a host of other topics. We had already had our first national-level meeting, at Fort Monroe, Virginia, which included people associated with all the Services.

Mike Garrambone: I was noticing that some of those titles remain today. We have people that are looking at problems for different services or from different areas like Air Defense or Counter-Air. It seems like you were interested in the same

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things and especially Command and Control. How did the topics come up?
Lewis Leake: People had expressed their interests and then action was taken

accordingly. Those who were working in different establishments probably initiated having the subject of these meetings at their location.

Mike Garrambone: We would welcome any photos you have of early MORS activities because we don't have any photos of those early symposia.

Lewis Leake: At that time I don't think many records were being kept except by individuals. I don't remember any photos of that period. There was no publication of the proceedings then either.

Bob Sheldon: Were you surprised to see MORS grow consistently year after year?

Lewis Leake: No. It seemed to have a very valuable purpose and a lot of interest. I remember the growth of the attendance became amazing in terms of how it started.

Mike Garrambone: In the early days you used to do symposia twice a year. Today, it takes us all year to plan between each one. I can't imagine the pressure of trying to do two in a year.

Lewis Leake: It didn't seem like an extra burden then.

Mike Garrambone: But having to find a larger location each time could be. We've had difficulty finding locations for symposia.

Lewis Leake: Yes, I can understand that.

Bill Dunn: The Operations Research Society of America was founded around 1952 and I was curious if you had any involvement in that?

Lewis Leake: I was not much involved, although I was a member. Some of the members of the original committee were members and in fact Harold Gumbel who had been my boss at Point Mugu, California, was hoping to be able to make

some kind of marriage between the two. But the fact that MORS was a classified symposium was a key factor that was not relevant to ORSA. So it was not feasible for ONR to even begin to sponsor ORSA.

Mike Garrambone: How long did you stay on the Board?

Lewis Leake: As a Past President I was on for one year after my term. I don't remember how long I stayed thereafter, although I did continue attending symposia for a while.

Bob Sheldon: Did you ever study the participants that attended the MORS? It seemed like they were either from the West Coast in California or from the East Coast around Washington, D.C. Was there any difference in the attitudes of the analysts from those different geographic regions?

Lewis Leake: I can't remember anything of that nature, any generalization.

Mike Garrambone: Do you agree with Bob's premise that it was bimodal, East Coast and West Coast, not so many in the middle?

Lewis Leake: I think that's true because of the kinds of organizations that were involved. We didn't have a whole lot of people in the Midwest, for example, working these kinds of problems.

Mike Garrambone: When you were President and you had the first Board of Directors, was it hard to get people to sign up to compete to be on the Board or were there lots of people that were clamoring to do this?

Lewis Leake: They just gravitated as far as I was concerned. People would invite cohorts or friends perhaps, people that they respected to get involved in MORS, and then it just started growing naturally from that.

Mike Garrambone: Did you go to other organizations or other "think tanks" to promote what you all were doing at MORS?

Lewis Leake: Not in the sense that question implies. The people who were professionals in those organizations who participated were probably recommended by their peers to get involved. That's the way I got involved.

Mike Garrambone: Today we interface with the seven MORS sponsors, all the Services, and several Departments. We talk to the various schools and at the same time work with all the think tank organizations like the Center for Army Analysis (CAA), the Center for Navy Analyses (CNA), or our Pentagon folks. I'm not sure if you did that or had to do that back in the days?

Lewis Leake: People in organizations like that were members, or participants, and tended to even be on the Board or the early Steering Committee. They were not there as official representatives of their organizations—they were there because it was their career interest.

Bob Sheldon: The record shows you dropping off sometime after being Past President. We know you attended the 3rd MORSS in 1958 and stayed active with the Society through 1966 when MORS was incorporated.

Lewis Leake: Yes, I recall being on the Steering Committee for about a year and a half before the impetus for MORS becoming a national society began.

Mike Garrambone: I don't suppose you've been back to a symposium in a while?

Lewis Leake: No, I couldn't even get in. It's been a long time since I had a clearance. And it wouldn't be very feasible for me. I don't get around very well after my stroke in 2004.

Mike Garrambone: Going back to your job assignments, where were you after Point Mugu in 1964?

Lewis Leake: Well, in 1964 I decided to change my employment and became convinced that it would be more interesting to work in Washington, DC, and not out at a test range. I interviewed at the Operations Evaluation Group (OEG) and the Research Analysis Corporation. RAC was the Army's group that was the equivalent of OEG at the CNA.

Mike Garrambone: Which one did you choose, and when?

Lewis Leake: I went to RAC in June or July of 1964.

Bob Sheldon: Where was RAC located at the time?



Lewis Leake: In McLean, VA.

Bob Sheldon: How long did you work for RAC?

Lewis Leake: I worked for RAC from 1964 until 1971.

Bob Sheldon: So you were working for them while you were President of MORS?

Lewis Leake: Yes.

Mike Garrambone: What types of projects did you have?

Lewis Leake: The first project was under a man named Bob Gessert. We were commissioned by the Arms Control and Disarmament Agency (ACDA) to study the feasibility of monitoring compliance with a proposed nuclear weapons freeze in Germany, East Germany, and Poland. This was a careful analysis basically to determine whether was possible to assess whether or not the Soviets might be able to secretly transport nuclear weapons into the area. We were to analyze the feasibility of establishing an inspection system for all items being imported into that zone. We postulated possible inspection systems for all forms of transport from the USSR into Poland and East Germany. That included, for example, means of radiometric inspections of a large amount of rail traffic passing through transloading stations on the border between the USSR and Poland. Those stations were in place because wider gauge railway tracks prevailed in the USSR.

One of the most interesting studies in which I participated in at RAC resulted in a paper that I wrote entitled "A Method for Evaluating the Combat Effectiveness of a Tactical Information System in a Field Army." It won the prize as the best paper given at the 24th MORS Symposium in New London, Connecticut.

At the time, some people in the Army wanted to use computers to improve the flow of tactical information to and within Army headquarters units. You can hardly imagine how bad the situation was back in the 1960s and before. Conditions were little, if any, better than during WWII.

Communications to and within staffs had changed little. Reports from forward units, aircraft, advanced patrols, and the

like were generally received by radio and the results often handwritten for delivery to key staff officers.

In the process and under the press of time, important information often might get buried in a stack of papers or otherwise delayed. The importance of key items might not be appreciated by those involved. The desire of some in the Army was to develop means to use computers to help speed the flow of information between and within headquarters. But many in the Army thought it was more important to buy tanks and other combat equipment than to use limited funds to buy computer systems.

We were commissioned to do a study to find out whether or not the introduction of a Tactical Information System into the Army would pay off. Dr. Roland V. Tiede was the director of the study. He had been an artillery officer in combat in France and Germany. He reasoned that the best way to approach the question was through a series of wargames in which officers with experience in leading field forces in Europe would participate. The wargames were designed to have an appearance of reality in the flow of information from forward units, patrol aircraft, and the other sources. Communications were delayed as they were typically in the old manual system, and as postulated, they could be improved with the new envisioned system.

My principal part involved extensive study about the actual delays that had been experienced during combat. At that time, there was still a large amount of data available from actual staff records from units in combat in the European theater in WWII. As I mentioned earlier, it was amazing to see how key tactical information was often greatly delayed in getting to combat commanders. People on a staff might have key information but it wouldn't always get to the right people on the staff or it might get screened out. So the actual delay from the time that information went into a headquarters didn't have much to do with when it came to the attention of those who made decisions; it was highly variable.



Thus, I was able to characterize statistically those delays from a lot of good WWII historical data. At the time of our study, there was not much difference between the conditions that had existed during the war. During our wargames, we randomly imposed the kind of delays that were typical for forces not having the information speedups of a new data system. Then we also introduced the information delay estimates for a reasonably good Tactical Information System—one that got the information to the commanders much faster. We then ran a lot of wargames wherein the blue forces experienced information delays with and without the improved data system. The red force commanders were never provided the information speedups of a new data system. Theirs were characterized by the typical information delays that our forces had experienced during WWII. We were able to determine that having a new Tactical Information System was worth approximately the equivalent of adding one battalion to a division-level force. That force had nine combat battalions with all their infantry, tanks, artillery, and so forth. That is, the Tactical Information System was of equal value, in a sense, to adding another whole battalion to an Army division.

Mike Garrambone: Wow, that's quite a comparison and it uses measures commanders can fully relate to.

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Lewis Leake: It was not accurate, not precise by any means, but nevertheless, it was deemed significant, at least in some quarters.

Bob Sheldon: Can you point to decisions that the Army made for acquisition of the Tactical Information System that your analysis contributed to?

Lewis Leake: I do not know what actually ended up happening as any direct response to our study. I think that the advances that we might have gained from the primitive system under development in the mid 1960s have been dwarfed by the availability of new technology and the increased technical savvy of Army personnel.

Mike Garrambone: I assume this paper was classified?

Lewis Leake: No. It appeared in the *ORSA Journal* in the May–June 1970 issue, now available through Journal Storage (JSTOR).

Bill Dunn: I have a question sent by Gene Visco, FS. Gene wants to know what do you recall as the most significant study, or studies, that you participated in while at RAC?

Lewis Leake: One of the studies in which I participated took place during the Vietnam War. U.S. forces had made an incursion into Cambodia and overran Viet Cong (VC) listening posts. As a result, highest levels of command, up to the Joint Chiefs of Staff, became acquainted with what the Army Security Agency and likely the Defense Intelligence Agency (DIA) already knew. That is, it was very easy to exploit our tactical communications. At that time our forces were principally using unencrypted radios and rarely, if ever, changing call signs. Encrypted tactical radios were only beginning to be introduced into the forces. Ships had used the same call sign for years, I guess forever. Aircraft squadrons and other units typically had macho call signs that they didn't want to give up. The VC were easily reading our communications and knew what we were planning the night before combat actions.

At RAC, the group I was in was already engaged in a study to develop

feasible means for Army units to make daily changes in their call signs and their assigned tactical frequencies. We were given the task to study how to do similar things in all tactical forces. This study included the assignment to go to Army, Navy, Air Force and Marine headquarters units in South Vietnam, Thailand, the Philippines, Okinawa, and elsewhere. We also went aboard an aircraft carrier and the Navy's flagship on Yankee Station off the coast of Vietnam, and to other regions of the world.

We interviewed personnel at many levels of command and even at tactical outposts. That included pilots who had just returned from combat missions over North Vietnam. Partially through those interviews, we tried to assess how various potential changes in call signs and frequencies might be feasible to provide improved tactical security for our forces. We discussed possible changes and the impact they might have on their operations. Our final report was well received and we understand that changes were being made, somewhat along the lines we recommended. However, we had nothing to do with such implementations and I know nothing specifically about what eventually happened.

Mike Garrambone: How long did you get to work on studies like that one?

Lewis Leake: At that time this study was all of a sudden, but it lasted actually eight months.

Bill Dunn: Did you have a lot of interaction with the sponsor for the study? Were there frequent meetings and in-process reviews or were you pretty much told "Go away and do this and come back when it's through"?

Lewis Leake: We had a representative from DIA with us on our trips through much of this time. We were working closely with him, but when we finished the trip we did the analysis and put the final report together.

Mike Garrambone: It sounds like RAC had a very large purview back then. Would you say that it was the major study agency for the Army at the time?

Lewis Leake: Yes, it had been, but the conditions that led to its eventual

sale had been brewing for years. RAC had been formed as a follow on to the Operations Research Office (ORO) for the Army, which began in about 1948 under contract with the Johns Hopkins University. ORO was headed by Dr. Ellis Johnson, a scientist who had much relevant experience during WWII. His independent style aroused the ire of key Army leaders. In 1961 they brought about the transfer of the work and personnel to RAC, which had been newly formed as a Federal Contract Research Center, in effect a sister to the RAND Corporation, CNA, and the Institute for Defense Analyses (IDA).

Frank Parker became the president of the newly formed RAC. During the ensuing 12 to 13 years RAC was involved in a very wide diversity of studies. I'll give only a very few examples.

One was the design of military force structures, groupings of military units, to execute given missions in the most cost-effective manner. This required handling complicated arrays of data with manifold flexibility and interrelationships bearing on cost, effectiveness, deployment ability, and flexibility. Other tasks lay in the field of manpower where the Army asked RAC to help answer questions arising from the draft, its size and needs and capabilities to provide appropriate quantities of the right kind of manpower.

As time went on, there was much diversity in the nature of the studies performed by RAC. For example, there were studies of the nature and purposes of insurgency, counterinsurgency, and operations undertaken to stabilize societies under threat. This included examining the political and military aspects of regions where US-led forces were already operating or providing training. The studies considered both current and projected environments. Field offices were set up to study problems on the scene and provide the support and direct conjunction with local tests and local operations.

Much work involved the assessment of weapons requirements and of the comparative effectiveness of competing weapons systems. As I mentioned, there



were studies of military communications and proposing new ways to allocate radio frequencies and improve the dependability of communications nets. Other work encompassed helping the Army deal with emerging threats.

I have covered only a sample of the work of RAC. Some of this was in part taken from a publication entitled *The Research Analysis Corporation, a History of a Federal Contract Research Center* by Charles A.H. Thomson, published in June 1975, Library of Congress catalog card number 75-18909.

Bob Sheldon: Where did you go to from RAC in 1971?

Lewis Leake: At that time the future of RAC was up in the air. RAC was soon sold to the General Research Corporation. Before that occurred, Clive Whittenbury was a Vice President at RAC; he was one of my mentors. As the sale was imminent, he took a group of us with him to Science Applications Incorporated (SAI) with headquarters in La Jolla, California. We set up an office in Virginia. The name was later changed to the Science Applications International Corporation (SAIC). There were around fifteen of us in that early group that left RAC.

Bob Sheldon: What other projects did you work on for SAI/SAIC?

Lewis Leake: There were lots of them. One study pertained to a possible treaty to control (or abandon) all weapons of mass destruction—nuclear, chemical, or biological. It was interesting that my first studies at both RAC and SAI involved arms control issues.

Another one of my early tasks was to study potential threats to our ballistic missile submarine (SSBN) fleet. The Applied Physics Lab at Johns Hopkins University had a contract to research any technical means that might enable detecting submarines. Those means included, for example, (1) improved airborne magnetic anomaly detectors (MAD), (2) improved sonar sensors and detection algorithms, (3) an ability to use imaging techniques to detect the wake of a submerged submarine on the ocean's surface, and (4) any other physical means

by which submarines might be detected. We evaluated whether advanced sensors on platforms such as patrol aircraft, satellites, fixed buoys, and other systems might pose an economically feasible threat to our SSBN fleet. As one example, we evaluated new capabilities of MAD gear on a fleet of long-range patrol aircraft. In each case we would postulate a force and operations that might be used for doing the job. Thus, different kinds of sensor platforms and types of sensors were evaluated. One of our reports ended up being classified so we couldn't read it anymore.

Bob Sheldon: Did you continue your involvement in MORS after you went to SAIC?

Lewis Leake: I don't think so, except tangentially. I transferred within SAIC from Virginia to Denver in 1978, to the Foreign System Research Center. The head of the office was John Battilega. John ended up being one of the Directors of MORS. Judy Grange became his deputy and she too became a member of the MORS Board of Directors. I ended up doing a lot of work at Wright-Patterson Air Force Base in Ohio.

Mike Garrambone: So you would have to frequently fly from Denver to Dayton for project meetings?

Lewis Leake: I actually worked in Dayton for weeks at a time during our studies where we were evaluating possible threats.

Mike Garrambone: You had been doing a lot of Army work and now you were switching over to Air Force?

Lewis Leake: That's true to a degree, but the orientation was not Air Force individually. Our work evolved to analyzing how the Soviets thought and how they reacted to what we did. I described this as a global chess game.

Mike Garrambone: Were you a big-time computer user?

Lewis Leake: No. I used them, but not big-time at all. Actually in some of my work, when the small, powerful hand-held calculators started becoming available, I did a lot of the work with those. They were very valuable. I used them for a number of studies. I was never heavily involved in computers.



Mike Garrambone: This was in 1978.

Lewis Leake: Yes. From 1978 until 1987, I was working in Denver.

Bill Dunn: After all this time, what do you feel are the important precursors, either education or military experience or whatever, to make a good military operations analyst?

Lewis Leake: It seems to me that some people have an innate ability to think about problems in a rational way, not necessarily associated with the amount of schooling they've had.

Mike Garrambone: So there's kind of an art to it?

Lewis Leake: Yes.

Mike Garrambone: Do you remember any pressures or deadlines to get your studies done?

Lewis Leake: There was frequently a lot of pressure to get the final report done on time, of course.

Mike Garrambone: You had to do lots of briefings?

Lewis Leake: We gave lots of briefings. We made view graphs back then.

Mike Garrambone: It seems like you were doing a lot of work over that period of time. Was it enjoyable?

Lewis Leake: It was very interesting work. My wife was amazed when I decided to retire.

Mike Garrambone: So you retired in 1987?

Lewis Leake: Yes, in late 1987.

Mike Garrambone: Did you stay in Denver when you retired or is that when you moved to Utah?

Lewis Leake: Actually I began to serve missions with my wife for the Church of

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Jesus Christ of Latter-day Saints (LDS), which has the nickname, the Mormon Church. We started serving missions in January 1988 after a trip to Guatemala and Southern Mexico and a company paid retirement gift of a trip to Egypt and Israel.

Bob Sheldon: Which countries did you go to on your missions?

Lewis Leake: We first went for a year and a half to the Singapore Mission, which included nine months in India, three in Malaysia, and about two months in Indonesia. After that mission, we went to Spain three times, each time for a year and a half, first to the Canary Islands and then to Barcelona including Valencia and then to the Bilbao mission including service in La Coruna and Leon in Northern Spain.

We also served in Salt Lake City in the Family History Library of the Church (the Genealogy Library) for another year and a half where we were teaching and helping patrons as they came in for help. The last mission was for the same duration at our LDS Temple in Lima, Peru. There I had the privilege of being one of the two counselors in the Temple Presidency.

Mike Garrambone: That's quite a few missions.

Lewis Leake: Six in all.

Mike Garrambone: I thought the average for a volunteer was one mission?

Lewis Leake: For a lot of people it is, but we were in very good health, had the needed funds to pay our way, and the enthusiastic support of our family.

Bob Sheldon: Have you done your own genealogy?

Lewis Leake: Yes. I have one line that goes back to around 1100 A.D. in Sweden. That's the only one that's anywhere near that far back.

Mike Garrambone: How long have you been studying genealogy?

Lewis Leake: I have worked on genealogy since 1949 when I started collecting information from our extended family lines. It is far easier to do now using computers. Genealogy is actually one of the primary uses now of the Web—after pornography.

My source on that is perhaps eight years old.

Bill Dunn: Are you still doing genealogy work?

Lewis Leake: Not very much anymore. Our kids are still doing it.

Bill Dunn: Salt Lake City is certainly one of the key places in the world to do genealogy.

Lewis Leake: Oh, yes. That was very interesting to be there and have people come from all over the world to get help.

Bill Dunn: Does having that experience as a researcher and military analyst help when you're searching back through genealogy trying to come up with some of the nuggets to find out who was where?

Lewis Leake: I suppose it's the analytical frame of mind. It did help. I had success in some of my genealogy endeavors as a result of a lot of research.

Mike Garrambone: What if you were trying to make some more analysts today? What would you want to do with those folks to get them to do well in their new profession?

Lewis Leake: I think a lot of the universities do an excellent job in that regard with getting the students projects to work on, doing teams that design all kinds of things. I'm sure the same could be done in an operations research

type curriculum; just give them good problems, real-life problems to work on. Getting out and working with companies and groups that are actually doing operations research type studies and then learning from this. Young people can really get their teeth into it that way and begin to understand what's going on.

Mike Garrambone: MORS is always looking for ways to educate analysts. You might have done some sort of training in your day. Did they all come trained or did you help them out along the way?

Lewis Leake: I don't remember any attention to that focus during my time in MORS.

Mike Garrambone: So you already had all the pros?

Lewis Leake: That was part of it. Of course, essentially none of the pros were trained in operations research in the beginning. Early operations research people came out of different experiences. It just had to do with their mental outlook, their mindset, their ability to grasp concepts, and at a large scale rather than at the nuts and bolts level.

Bill Dunn: Do you have any other thoughts you'd like to express here in your history?

Lewis Leake: I'd just say, "Keep up the good work."

Mike Garrambone: It is because of people like you that we even have a society and we really appreciate all the efforts that you and our other predecessors did.

Lewis Leake: One thing I'd like to say is I don't feel like I was really a key at all. There were lots of people in those early times that were getting things going.





Military Social Science (MilSS) 2011 Colloquium, 18 March 2011

Dr. Kerry Fosher, Translational Research Group (TRG), USMC Center for Advanced Operational Culture Learning (CAOCL), kerry.fosher@usmc.mil

Dr. Yuna Wong, Operations Analysis Division (OAD), Marine Corps Combat Development Command (MCCDC), yuna.wong@usmc.mil

The MORS Social Science Community of Practice (CoP) and the USMC Center for Advanced Operational Culture Learning (CAOCL) cosponsored a colloquium on 18 March 2011 in the Gray Research Center at Marine Corps Base Quantico, Virginia, entitled “Military Social Science (MilSS) 2011.” The colloquium was attended by 40 participants from various Department of Defense (DoD) organizations currently using social science to address complex DoD issues.

The purpose of the colloquium was to provide a forum to present DoD social science research to other social scientists and to build the community of DoD social scientists. The colloquium was a follow-on event from the mini-symposium in October 2010 at George Mason University entitled “Social Science Underpinnings of Complex Operations.”

Colloquium Introduction

Col Raphael Brown, Director of MCCDC OAD, welcomed the attendees to Quantico and affirmed the need for rigorous social science applications in many of the challenges facing the Marine Corps, such as current operations in Afghanistan and planning for future irregular warfare. Dr. Kerry Fosher, CAOCL, and Dr. Yuna Wong, MCCDC OAD, introduced the day’s events. Ms. Victoria Jaspardo, CAOCL, and Dr. Bob Sheldon, MCCDC OAD, coordinated the colloquium’s activities.

Organization for the Day

The morning focused on social science applications within the Marine Corps, with a panel of Marine Corps organizations discussing social science directions related to their activities. The two morning presentations featured the two traditional ways that DoD has used social science, in a Marine context: using

social science to understand overseas populations and using social science to understand DoD itself.

The afternoon presentations and discussions broadened the theme to social science in the larger DoD community. The two featured afternoon presentations addressed two contemporary breakout areas for social science within DoD: social science and wargaming and DoD field ethnography.

Morning Panel: Social Science Directions within the USMC

Dr. Paula Holmes-Eber, Marine Corps University (MCU), led a panel discussion of “Social Science Directions within the USMC.” Members of the panel included Dr. Kendy Vierling, Marine Corps Training and Education Command (TECOM) Marine Air-Ground Task Force (MAGTF) Training Simulations Division (MTSD); Dr. Jennifer Edwards, Marine Corps Intelligence Activity (MCIA); Dr. Mireille Aprahamian, Marine Corps Information Operations Center (MCIOC); Dr. Yuna Wong, MCCDC OAD; Dr. Kerry Fosher, CAOCL, and Dr. Paula Holmes-Eber, MCU. The social science efforts in the Marine Corps can be summarized in four areas: 1) external research, 2) integration with operationally relevant activities, 3) training and education, and 4) operational support and reachback.

Morning Briefings on Social Science Applications

Dr. Frank Tortorello, CAOCL, and Dr. Paula Holmes-Eber, MCU, discussed “Assessing USMC Culture Training & Education—Challenges and Examples.” Dr. Tortorello offered a view of what is distinctly cultural and “Marine” about the Marine Corps Martial Arts Program. He then described how Martial Arts Instructor Trainers used tacit (embodied)

knowledge to assess the enculturation of Marine trainees into the Marine way of martial arts. Finally, he questioned, based on the complexity and tacit knowledge of cultural assessment, what field commanders and DoD entities think they are getting when they ask about “metrics” of cultural competence. Dr. Holmes-Eber presented an overview of some results of a survey conducted in 2010 by CAOCL and MCLL on “Attitudes to culture and language learning in the Marine Corps.” She discussed briefly a few highlights of the findings on predeployment culture and language training for Marines.

Ms. Karen Grattan, MCCDC OAD, and Mr. Henri Bore, CAOCL, briefed “Application of Operational Culture—Trans-Sahel Study.” CAOCL nominated and subsequently sponsored a study through the Marine Corps Study System, administered by MCCDC Operations Analysis Division. The study, entitled *Analytical Tools for the Application of Operational Culture: A Case Study in the Trans-Sahel* produced documentation and analysis of how operational planning teams (OPTs) access, analyze, and use cultural information in the Marine Corps Planning Process (MCP). Based on this work, an *Integrating Framework for Operational Culture* was developed with the aim of supporting and enhancing the use of cultural information in OPTs. Although the study yields many important insights, two overarching findings resonate throughout. First, thinking frameworks supporting continuous learning are desirable as support tools for OPT tasks and activities where the effort is to access, analyze, and use cultural information. Second, such efforts lay the groundwork for continued cross-organizational cooperation in support of USMC planning teams using MCP.

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Afternoon Presentations: Breakout Areas for DoD Social Science

Dr. Margaret McCown, Center for Applied Strategic Learning, National Defense University (NDU), briefed “Social Science and Wargaming.” Wargames have limited predictive power, but help refine how accurately one understands a problem. Dr. McCown discussed some of the topics from her article “The Social Sciences and Innovations in Gaming” published in *Joint Force Quarterly*, no. 58, 2010. (<http://ndu.edu/press/innovations-in-gaming.html>) Among her takeaways: “Game theory is not a theory of gaming, but can tell you useful things to consider when designing them,” and “One of the basic and most fundamental takeaways of the social science literature is that incentives matter and that they are shaped by the institutional rules of the game.”

Ms. Jennifer Clark and **Ms. Kristin Post**, CAOCL, discussed their personal experiences in “DoD Field Ethnography.” They described how ethnography in conflict zones can be both rewarding and challenging and argued that, as social scientists, we need to understand the challenges involved in order to mitigate them. These challenges include

acculturation into military culture as well as the indigenous culture and understanding how best to collect data in meaningful and ethical ways. They suggested that, as social scientists, we also need to determine if we best serve a need doing fieldwork in conflict zones or if we are better assets as teachers and trainers to military counterparts who serve in foreign locales.

Afternoon Panel: Social Science Directions in DoD

The afternoon panel, consisting of **Dr. David Adesnik**, Office of Secretary of Defense/Cost Assessment and Program Evaluation OSD (CAPE) Joint Data Support (JDS), and **Dr. Andrea Limbago**, Joint Forces Command (JFCOM), discussed social science directions in DoD. Dr. Adesnik observed that modeling and simulation (M&S) for population-centric warfare requires a deep understanding of the people at the center of such conflicts. He noted that the DoD analysis community has turned to social scientists to help provide such knowledge, but cautioned that the DoD might need to carefully examine the limits of social science and the kind of simulation it can support. Dr. Limbago discussed how the operational relevance of social science across the COCOMs seems to be growing.

Colloquium Wrap-up

Dr. Yuna Wong ended the colloquium by thanking all participants, but also noting previous historic patterns in how DoD has approached certain areas of social science. As during the Vietnam War era, contemporary challenges in conflicts such as Iraq and Afghanistan have increased demand for social science within DoD. However, the end of the Vietnam War saw certain social science capabilities disappear, only to need to be recreated decades later. The winding down of Iraq and Afghanistan could lead to a similar trend, and Dr. Wong saw one potential warning sign in JFCOM’s decision to significantly cut their social science capability while preserving the core of their engineering capabilities. Dr. Wong suggested continuing to build a DoD social science community partly to help strengthen the institutional memory of how social science might be used in future such environments.

Next Steps

Given the success of MilSS2011, we plan to hold a similar colloquium in the fall of 2011—date and location to be determined. In the meantime, the MORS Social Science CoP will continue to hold monthly brown bag meetings, and the annual MORS Symposium WG 33—Social Science Methods and Applications will address similar topics of interest.



MEETING ANNOUNCEMENT

28th International Symposium on Military Operational Research

Eugene P. Visco, FS, Lockheed Martin, evisco4@cfl.rr.com

The 28th International Symposium on Military Operational Research (28 ISMOR) is scheduled for 29 August through 2 September 2011, at New Place, Near Bishops Waltham, Hampshire, United Kingdom. The theme of this year’s symposium is “Defence and Security in an Uncertain World.” Papers devoted to other military operational analysis topics, such as capability

requirements, procurement, and support, are welcome as well. Syndicate sessions, a popular element of recent symposia, are planned around the theme, with a report-out session scheduled for the final Friday.

ISMOR is officially endorsed by the UK Ministry of Defence (sponsorship is under the Director (Scrutiny)), is co-sponsored by the Defence Special Interest Group of the Operational

Research Society, and is supported in part by MORS. The fee for 28 ISMOR is £1156, which includes room and board (12 meals) including the Gala Dinner on Thursday evening. The website, www.ismor.com, contains further information, including the archive of papers presented at earlier symposia.

New Models of Interdiction in Networked Systems

Alexander Gutfraind, Los Alamos National Laboratory, agutfraind.research@gmail.com

Fifty-six years ago, in 1955, General Frank Ross, formerly in charge of the U.S. Army's Transportation Corps in Europe, commissioned RAND analyst Ted Harris to solve a problem. General Ross wanted a plan for cutting the Warsaw Pact rail network in case of a hot war in Europe (Schrijver 2002). In that network, which rail nodes would need to be bombed in order to disrupt Soviet supply routes? Every possible route from the origin in the east to the battlefield in the west would have to be disrupted. Obviously, some railway lines have more capacity than others and traffic can be rerouted from damaged lines to functioning ones. Which one of the many target sets is best?

In network language, this problem is now called the "minimum cut problem": a railroad hub is represented by a node which is connected to nearby nodes using edges of some specified carrying capacities (Figure 1). The capacities correspond to the amount of cargo they can ship and also roughly to the difficulty of destroying them. The objective is to destroy some of those links so as to fully disconnect the supply nodes of the adversary from his targets. So, it was a monumental scientific achievement when Ford and Fulkerson pioneered methods for solving this problem optimally even on very large networks.

Ross' minimal cut problem was unusual in 1955, but is typical of today's battlefield. Whereas traditional battles were fought on land, sea, and air, increasingly the conflicts are set in networks: road and air transportation systems, clandestine networks, and most recently cybernetworks. Although in the past the objective was to protect your own territory or take the enemy's, today's objective is to protect your own networks while unwiring the enemy's. In the past, commanders relied on cartographers and logistics specialists, but today's strategists must also rely on network scientists. In this article, I survey recent developments in this field, or to be specific, the research presented at a session of the 2010 INFORMS annual meeting.

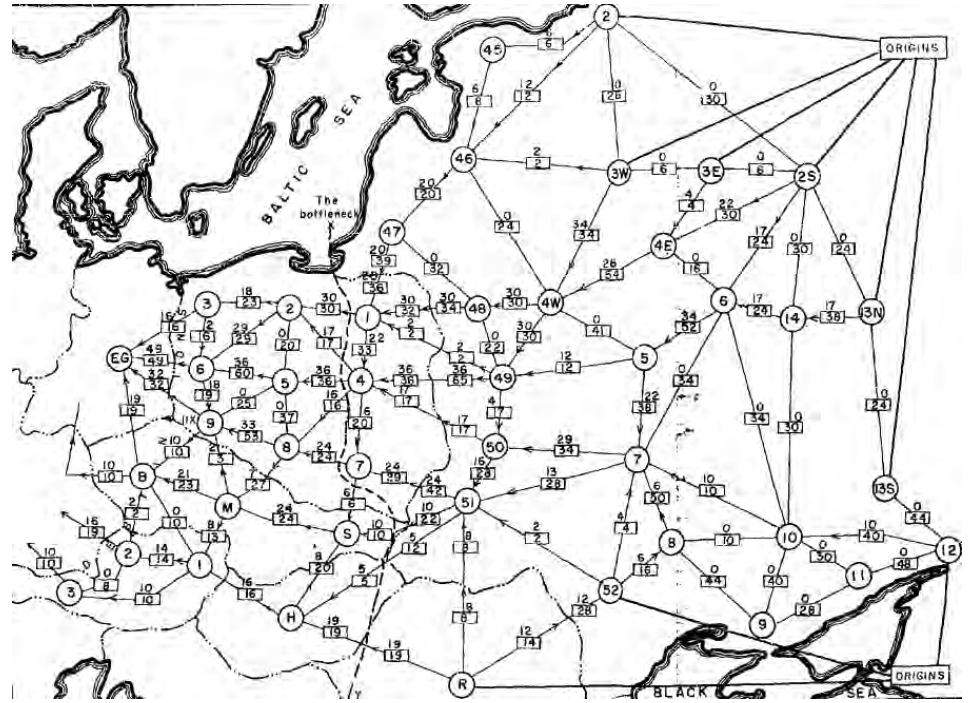


Figure 1. The East European railway network and its bottleneck, the minimal cut. From Harris and Ross (1955). Circles are labeled nodes and boxes give edge capacities (number of 1,000-ton trains per day). Numbers over boxes give the flow when the network is fully utilized as during a war.

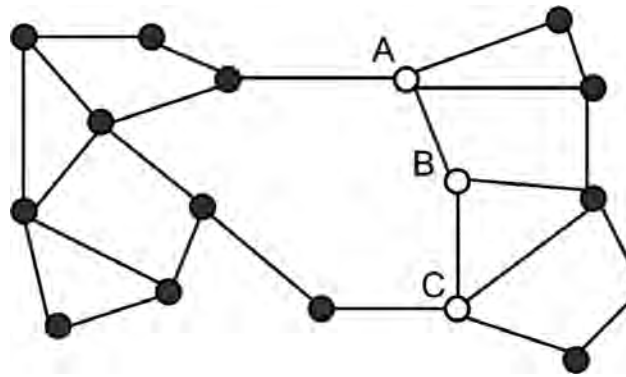


Figure 2. A connected cut is formed by nodes A, B, and C. The network could be infiltrated at A and C, then disrupted at B. When the three are removed, the left part of the network is separated from the right. Adapted from Banerjee et al. (2011).

The Connected Minimal Cut

Not every network disruption problem is like Ross' minimal cut. In a minimal cut, the disrupted edges can be far removed from each other, creating a cut through a subtle synergy. In practice, such distributed attacks might be infeasible and it is necessary for the disrupted edges to be close to each other. For example, in the case of air strikes, to make any arbitrary cut one might need to penetrate enemy air defense systems in multiple locations

far from each other. Far more practical is to suppress those defenses in part of the airspace and then disrupt the network in that area. A similar penetration problem is also relevant to cyberattacks. Finally, one can consider the social terrain: in disrupting clandestine networks such as terrorist groups, it is very difficult to cut the network by arresting enough individuals because many of the actors are difficult to access. A more realistic disruption plan is

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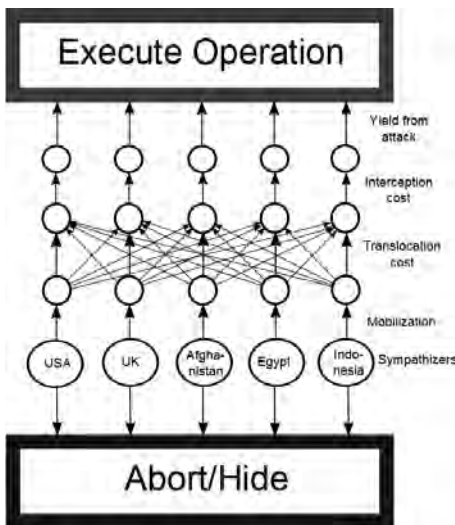


Figure 3. A small operational graph for transnational terrorists. Rows represent stages while columns represent countries. Every attack corresponds to a path from a sympathizer node in some country to the column of the country being attacked, and then to the “Execute Operation” node. The full model contains many more source and target nations.

to infiltrate the network and then disrupt or even recruit other nodes connected to the initial infiltration set (Figure 2).

The work of Banerjee and collaborators considers the *minimal connected cut* problem (MCC), where the network G is to be cut with minimal effort while requiring that the removed set forms a connected subgraph of G . Can such a subgraph always be found? Sadly, no. MCC is shown by the authors to be computationally hard, NP-hard (for the enthusiasts, MCC could be related to the Steiner Tree problem—the problem of building with the least cost, a spanning network between a specified set of nodes.) NP-hardness indicates that it would be computationally difficult to find the MCC on arbitrary networks. Fortunately, it is often possible to quickly find solutions that are good enough, if not quite optimal, even on large networks. Moreover, real-life networks are not truly arbitrary and often have a special structure. Indeed Banerjee et al. found an important special case: networks that sit on a plane (without crossing edges). In those planar networks, MCC is easy to find. This is great news because many infrastructure networks are

planar or nearly so. Cybernetworks as well as social networks are usually not planar: if 5 nodes are mutually connected, the graph is no longer planar. Therefore, an obvious future project is to develop algorithms that find high-quality solutions to MCC even on nonplanar networks.

Tactical Network Interdiction

The problems considered by General Ross and Ted Harris are sensible for a total war: all the enemy’s supply lines must be cut whatever the cost or collateral damage. In a limited war (or with a smaller attack force), a full network cut is not possible, and one might instead try to disrupt some of the network. Such a poor man’s cut is the *network interdiction* (NI) problem (Israeli and Wood 2002). In NI, success is measured by how much more difficult it becomes to cross the network.

To give a concrete example of recent interest, imagine that the enemy is a nuclear-armed terrorist who starts somewhere on the network and wishes to reach a destination. One might be able to deploy radiation sensors that detect the materials inside such a weapon, but the sensors are only feasible in some parts of the network such as border crossings. Those sensors increase the risk to the adversary and can force him to find long risky routes that bypass the sensors (see Morton et al. 2007).

Recently, Mehmet Ertem and Vicki M. Bier from the University of Wisconsin-Madison applied NI ideas to defending against cyberattacks. In their model, the network represents the “attack graph”—the set of all possible attack scenarios against the system. An attack scenario is just a path on the network that reaches from an entry point to another node—for example, secure data stored deep in the network. Each of the edges in the network has an associated success probability when traversed by the attacker. At this point, the defender deploys sensors that further reduce the probability of success. He might also install systems such as firewalls, which fully block suspected malicious traffic. The attacker and defender play a multistep game where the defender can learn from past attacks to add new sensors to the network. This problem could be represented as a multistage stochastic program. Because

programs of this type are hard to solve optimally, Ertem and Bier propose a number of heuristics that help find effective interdiction solutions.

Network Interdiction of Transnational Terrorist Networks

Much of the recent work in network interdiction was motivated by problems in counterterrorism. Indeed, terrorist operations rely on networks of many kinds: the internal organization of the terrorist group is a network, and a network can represent the travel routes toward the target.

A terrorist operation can itself be represented as a network with interdependent steps: the recruitment of operatives, the procurement of weapons, training with the weapons, and so forth. An important additional problem for a transnational terrorist organization like Al-Qaida or Hizbullah is the risk of crossing international borders: getting the travel documents, learning the language, and the logistics at the remote target. They must also consider the efficiency of law enforcement agencies and the value of different targets—countries.

One could reconstruct the calculus of the terrorists, that is, rebuild their operational network (Figure 3). In that network, much of the relevant information could be estimated from public sources (if only roughly). For example, the costs of crossing international borders are indirectly expressed in the amount of tourism or immigration between the relevant countries (properly adjusting for populations and distance).

After collecting such data, one can estimate the risk to different countries—that is, the likelihood of an attack—as follows. To be more specific, suppose T_{ij} represents the risk (that is, the probability of failure) when moving a cell from country i to country j . Also, let I_j be the risk of interception once at j , and Y_j the yield from a successful attack. Note that risks or probabilities can be converted to costs by the function $f(x) = -\log x$, which makes them comparable to the yield (note that costs are positive numbers, while yield is negative). Then “Bin Laden’s” problem is to find which country j to target:

$$\min_j (T_{ij} + I_j + Y_j)$$

To find the total risk to any country one must also consider the supply of cells in various source countries (which could be estimated from public opinion surveys and other data). The final estimate is as follows. The United States has the highest risk of any country from international terrorism. This is simply because by attacking the U.S., a terrorist organization hopes to affect the policy of the biggest player in the international arena. Of course, in the last decade the U.S. did not stand idle and made it much more difficult for terrorists to reach its shores. So, a possible scenario in the network is one where all edges entering the US are interdicted. In response, smart terrorist groups can be expected to shift to less protected but still valuable targets. Under the assumptions of the model, such a U.S. move would not measurably decrease the volume of attacks but would deflect them, greatly increasing the risk from terrorism to every other country.

The model is consistent with the increase in terrorism in Europe following the security measures implemented over the last decade: Islamist radicals based in Europe or going through Europe just could no longer reach the US! This effect points to the need for international security arrangements, because in the current environment much of the security effort merely fuels a competition

over which country is hardest to reach or has the most fortified embassies. In principle, a more effective strategy is to focus resources on stopping terrorists at their source nodes. In practice, such interdiction strategies might have unwanted effects of their own.

Weighing the costs and benefits of interdiction strategies and computing the vulnerabilities and resiliencies of networks is the task of network science. It is certain that this research area will only increase in significance as the world grows to become more and more a cake of overlapping networks.

Acknowledgements

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Author Biography

Dr. Alexander Gutfraind received a PhD from Cornell University and is currently a postdoctoral researcher at the Los Alamos National Laboratory. He develops mathematical models to illuminate problems in complex systems and counterterrorism using methods from the theories of complex networks, discrete optimization and dynamical systems.

International/Cross-Cultural Effects in Organizational Decision Making

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There is an increased interest in the U.S. Department of Defense (DoD) in the application of cognitive psychology in decision making. The DoD fiscal year 2011 budget (Department of Defense 2010) requests that efforts seeking to understand cognitive effects of heightened sensory input continue. Research interest within the department would leverage advances in mathematics, biology, psychology, and other relevant sciences to improve informational and decision-making tools. The complexity of decisions ranges from the strategic to the tactical level—from budgetary decisions to troop employment strategies. My personal experience with DoD personnel and individuals from

other agencies is that they bring certain organizational/cultural factors to decision support events that influence the manner in which the decisions are made.

For example, let us take the analysis of a notational next joint helicopter that would be used by the Army, the Navy, and the Marine Corps. The experiences of the individuals from these organizations are unique to their cultures. When placed together to decide on the capabilities the common platform (helicopter) would have, there would be some disagreement and healthy debate. Each member of the decision team would bring their own experiences and organizational objectives to satisfy service-specific goals. Depending on the manner in which the decision

support event is facilitated, all inputs would be considered and would contribute to the final output.

Similarly, the backgrounds, experiences, and cultural foundations of the individuals that make up the decision team might affect the decisions made by international and multicultural teams. In tandem with the interest of the military services, the Military Operations Research Society (MORS) has dedicated additional efforts in the last few years to explore social science applications to decision analysis and the enhancement of computational social sciences. In their annual symposium, MORS has expanded topics in computational social sciences, as well as human

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behavior and performance, to assess some of these elements within the national security analytic community (Matos 2010).

Decision-Making Approaches

Kahneman, Slovic, and Tversky (1982) present some concepts in decision analysis integration with cognitive processes and argue that certain attributes of participants affect the execution of collective decision-making events. Morton and Fasolo (2009) assert that the psychology of preference covered under behavioral decision theory (BDT) illustrates the process by which people naturally make choices without decision analysis aids. Psychology of preference also draws attention to how people think about decision analysis techniques. The decision maker's perception on a situation seems to bound BDT. According to Brooks et al. (2003), "behavioral decision ... has shown that people's judgments do not always derive from their underlying beliefs, but rather from the need to formulate their opinions as a result of having to express them."

There are many methods of analysis used when groups need to make decisions using multiple criteria, which are prone to individual biases. These include value tree analysis (Poyhonen and Hamalainen 2000); the analytical hierarchy process (Bhatta and Doppler 2010, Eagan and Weinberg 1999), which quantifies the significance of the factors using pair-wise comparisons (Whitaker 2007); value-focused thinking (Keeney and McDaniel 1992), which builds decision trees and utility functions; and the theory of constraints (Goldratt 1992), which looks at the most limiting factors in the decision-making process. There are also variations of these methods, such as the public value forum, which has been used in difficult options concerning environmental issues. Most of these methods, and others, use multi-attribute utility theory to evaluate a large number of alternatives. Decision makers select the impact an alternative might have on each one of the many attributes of the alternatives and articulate the importance each attribute has to them. The selection of attributes and the weights assigned to them supply an indication of their values and preferences.

The success of these methods depends largely on the level that decision participants understand each other's positions and explicitly discuss tradeoffs among the evaluated attributes. As robust as the mathematical methods are behind the surface of these models, they are highly dependent on subjective input from the participants. The knowledge base of the individuals engaged in the decision is a pivotal element for the mathematics to work. This concept has significant resistance at the advent of decision analysis techniques around the world (Cabantous, Gond, and Johnson-Cramer 2010). The competition against pure subjective rational choice theory received opposition from those who defended the point of view of expert intuition, which depends almost exclusively on subjective inputs (Raiffa 2002). The understated standing between a clean measure that removes numbers from subjectivity and measures of pure subjective judgment could inhibit decision analysis to fully benefit from the benefits of quantitative analysis. Those who support a purely objective approach to decisions critiqued its subjectivist roots. Pollock and Chen (1986) discovered that application of decision analysis in China was unsuccessful most likely due to the fact that Chinese decision makers were expecting the computer program to provide them with the ultimate optimal decision. Conversely, advocates of a subjectivist viewpoint on decisions evaluated quantification of subjective input as an "objectification" process, and argued that pressuring subjective judgments to a discrete set of mathematical laws removes them from their subjectivity (Cabantous, Gond, and Johnson-Cramer 2010).

More recent decision analysis efforts lay out a thought-provoking middle ground between these two extreme views. It displays how decision analysis experts have exercised their creativity to sustain a form of mechanizing subjective judgment (Porter 1996) providing structure and facilitating the expression of the decision makers' subjectivity. It is within this subjectivity that the international and cultural factors that can affect organizational decision making reside. Individual, organizational, social, and cultural bias, as well as personal preferences might also play an important role that could affect

the overall outcome of the decision being made. Individuals might find it challenging to express with precision the subjective information required to compute value scores and preference weights that are essential to these techniques.

How We Decide

Organizational decision making is at the center of the activities carried out by management teams in any organization. Baker (1975, cited in Adler and Gunderson 2008, p. 207) states that "for some people management is decision making." Given the extent to which businesses have been expanding throughout the globe, the individuals that are part of these teams can come from diverse populations with their own social and cultural elements to enrich the parent organization. International and cultural aspects of these foreign individuals and organizations might also have an effect on the way the organizations makes decisions.

There are certain elements of collective decision making that might be affected positively or negatively by inserting individuals with different international or cultural backgrounds in organizational teams that make top management decisions. Groups involved in decision making are composed of individual stakeholders and subgroups that bring many interests and perform multiple roles (Winn 2001). As organizations interact with international partners, the decision-making process must consider these elements. The typical decision-making process includes several logical steps that require a certain amount of discussion and consensus (Dewey 1933, cited in Adler and Gunderson 2007; Driver 1979, cited in Adler and Gunderson, 2007). It is important to have clear communication of expectations, roles, and goals during the execution of the decision support activities. Some studies have looked at identifying particular nonlinguistic aspects and successful communication strategies that could contribute to positive and effective international and cross-cultural business communication (Graham 1985, 2004; Du-Babcock 2006).

The basic elements of the decision activity include (1) recognizing and defining a problem, (2) gathering relevant information, (3) defining and characterizing the potential alternatives, (4) making

a selection from the alternatives, and (5) implementing and executing the results of the decision. All of the methodologies introduced previously use some definition of these steps, but the execution follows the same sequence.

International/Cultural Effects at All Steps

Problem Definition

Participants in the decision-making process must maintain a clear understanding of the goals of the process and the objectives of the outcome. This is done at the first step when they agree that there is a problem, it is explicitly defined, and there is a need to evaluate potential solutions. At this step we might find some conflict in the way that different organizations perceive the problem as presented. With international organizations or groups from different cultures, there might be some limitations on semantics, language, or the true interpretation and realization that the situation is in fact a problem.

If we revisit the helicopter example presented in the introduction (considering the military services involved as separate cultures), there might be the possibility that one of the military services involved is relatively content with the platform they currently have. The development and procurement of a new platform might be seen as an unjustified investment of scarce resources. If the benefits of a new platform outweigh the risk of a bad investment, this organization might consider exploring the alternatives, but would be perfectly fine with keeping the current platform. Dyer et al. (2009) looked at leadership and decision making in small and large groups. Their findings revealed that the size of the group as well as the presence of individuals not properly informed in the decision being made affect the speed with which small human groups decide between two opposing directional preferences and the likelihood of the group splitting. If individuals from diverse backgrounds and cultural experiences are not brought to the same playing field under which a decision is being made ahead of time, there can be a significant delay in achieving consensus and making a well-informed decision.

The researchers in this study found that only a small minority of informed individuals is needed to guide a large uninformed group.

Decision support facilitators might consider conducting some prebriefing or providing reading material well in advance of the actual execution of a decision support facilitation event to become aware of any misinterpretations or cultural elements that may be affecting the problem definition stage. All participants must become aware of potential disagreements due to interpretation and must attempt to minimize these or be prepared to address them as the decision-making activity takes place. If a problem is not well-defined or means something different to the participants, the decision reached may be flawed.

Information Search and Alternative Definition

Through information gathering and alternative definition, the organizations might be able to narrow the set of potential alternatives. To capture the skepticism of some participants, the alternative of doing nothing should always be included as a viable possibility. Alternatives can also have different meanings and provide different benefits or challenges to the participants of the decision. Increases in productivity levels in a corporation might require additional hiring efforts from a pool of candidates that may have been exhausted in some international partner countries. Elimination of a potential hindrance at the corporate level, for a set of international offices, can become a burden or involve additional challenges for others.

As an example of this, in the international arena, a political decision that might benefit a large group might become a hindrance to others. For example, in the last several years we have seen what appears to be an international consensus on countering piracy activities in the high seas, in particular of the coasts of Somalia and the Gulf of Aden (Guilfoyle 2008). International attention was brought to highly publicized incidents in the last several years. There has been a perceived support from the international community to increase the effort to eradicate this kind of activity

in international waters. There have also been some human rights issues arising from the arrest of piracy suspects. Captured piracy suspects are said to question their arrest, detention, and transfer (Guilfoyle 2010). However, there are also small villages in these countries that depend on piracy and the black market for their survival. They might not want the pirates completely gone, or if they were, government would need to find a solution to the poverty levels that make piracy dependency more appealing to these villages.

When identifying alternatives for a collective decision within the international and multicultural environment, participant should be aware of and become informed about potential social and cultural effects to the groups affected by the decision. There is also the influence of cultural factors that affect the types of alternatives for which particular individuals contemplate. These could be generational driven, as when older senior managers favor looking for policy change type alternatives, or younger Generation X employees favor technologically driven alternatives. Similarly, cultural effects might be seen in conservative cultures such as in England, compared to a more liberal look that might exist in counterparts from California (Adler and Gunderson 2008, p. 211).

Making a Choice

Once a set of viable alternatives is selected, it is time to employ some methodology to facilitate the selection of the alternative that most closely meets the criteria established in the problem definition stage. The mathematical examination embedded in decision tree analysis, analytical hierarchy process, value-focused thinking, theory of constraints, the public value forum methodologies, and others, provide sufficient analytical rigor to deliver defensible results. The manner in which any of these methods is implemented can be affected directly by individual, organizational, or cultural elements. The use of individual and collective rationale to reach a decision includes the identity features that characterize and set us apart. In the United States, it is typical to expect to march along smartly to making decisions

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quickly and decisively. Some other cultures pride themselves in the time they take to make decisions as a potential indicator of more rigorous analysis. Egypt and Pakistan serve as examples (Adler and Gunderson 2008, p. 213). The slow pace of some countries can create increased frustration from those who want to get the job done quickly.

Another aspect of this step is to consider the individuals who are called upon to make the collective decisions. Who are they? What are their positions? In most of the United States business models (as well as in the military), a small group of individuals in high-ranking positions hold this responsibility. At times, as in political decisions, one person ends up being the ultimate decision maker. Even the application of the rigorous methods discussed here end up with a set of potential viable alternatives, well-informed nonetheless, but the ultimate decision is made by someone with the political or financial responsibility to accept the consequences of such a decision. In other countries, such as Japan, it is important to include group consultation prior to making any decision. No matter who is involved with the final decision (individual or collectively), it would be imperative to avoid focusing too much into local, narrow scopes, as well as becoming overwhelmingly all-inclusive. Single point of determination might carry great accolades when correct and terrible failures when the decision is erroneous. I think that collectivistic cultures might be more likely to consider a faulty collective decision as acceptable as the result of group consensus, than individualistic cultures accept a wrong choice made by an individual even in the interest of the collective good.

The individual, or individuals, making decisions for organizations might be one or a select few at the top of a hierarchical structure, or might be a collection of representatives from different areas of the organization or group. In the United States there is a tendency to make employees feel part of organization-wide decisions by encouraging participation in surveys and queries of preferences for implementation of rules or policies. U.S. employees feel the need to be part of the process. In other countries such as India,

the employees feel better if the decisions are made at a higher level and they are directed by supervision. This removes the responsibility of the decision from the employees and puts the burden of the decision on management. In another example, Gyllenhammar (1977) highlights the way the Swedish employees in the Volvo plant at Kalmar created an environment where employees can bring up ideas and try them out in an attempt to develop employee ownership of an idea. Decisions for these innovations are generated on the work floor. Ultimately, top management would end up adopting or rejecting the recommendations coming from the employees. However, the sense of ownership and participation in the process empower the employees to feel like they are actually contributing to the organization and that they have significant influence in the process. This is in contrast with the Indian and other Middle Eastern counterparts who are more receptive to receiving direction and adopting the initiatives generated by the higher echelons of their organizations.

Execution

After the choice is made as part of the decision-making process, management of organizations would need to implement an execution plan to carry out the actions recommended by the decision. Otherwise, the whole decision process becomes an academic exercise and provides no value to the organization. Executives in the United States have the tendency to apply results of their decisions relatively quickly when compared to other cultures. This is especially true when dealing with situations of moral or ethical value, or implementation of labor policies (Brenner and Molander 1977). As presented earlier, other cultures, such as those in Middle Eastern countries, are deliberate in their decision-making processes and methodical in the implementation of policies or other actions that result from these activities. Some of the reasons for the delays in execution of required actions are attributable to the evaluation of a right or wrong decision, which has different interpretations in different cultures (Su 2006).

Multinational Teams Making Decisions

When multinational teams are formed, there is an expectation that decisions would need to be carried out at several levels—from the establishment of the teams and deciding the composition of the same, to the goals, objectives, work climate, and others. The managers of these teams would need to maintain a keen awareness of the cultural elements that could influence the performance of the team and the success of the organization. Ilgen, LePine, and Hollenbeck (1997, in Early and Erez 1997, p. 377), argue that generalized theories concerning behavior in international teams do not exist, and that there is little organized structure for addressing issues of behavior in these teams. They suggest a need for continued research in this area, which would be necessary if there is a genuine interest to contribute to the understanding of behavior in multinational teams.

An area that might need some emphasis is the role that culture and diversity play in organizational decisions, the value of collaboration, and the importance of learning, research, and analysis methods that might be applied to a diverse workforce. Many racial/ethnic policies in the United States assume that contact improves cultural ethnic relations (Dixon and Rosenbaum 2004). However, I do not think that general understanding of cultural aspects can be sufficient to be effective. Team members of a specific nationality or culture might bring a set of preconceived stereotypes about the cultures and nationalities of other team members. These stereotypes might be based on perceived generalizations and not on factual information observed from the actual individuals on the team. For instance, let us say we have three members of the team, say of Hispanic, Asian, and British background. In this case, we will assume they are all males. They bring their own experiences and backgrounds merged with their cultural identities. Some might expect the Hispanic member to have some kind of passive-aggressive demeanor based on his appearance. He might be expected to be opinionated and have a semihostile and abrasive character. The Asian member might be expected to be very smart, respectful, and kind in his demeanor. The British member,

with the perceived “proper” language of the mother country, might be perceived as highly educated, respectful, and with elegant manners. How do we integrate these personalities in the team construct and how do they affect the decision-making process?

The fact is that all of these fictional members as well as their American counterparts might exhibit the same traits, same personalities, and similar upbringing in terms of family life and education opportunities. They might communicate well in English, be kind, smart, generous, and open minded. If they are not the same and do exhibit personalities and traits that go along the preconceived stereotypes, then a team manager would need to be conscious of this detail and establish some rules of engagement.

In another example, let’s imagine a decision-support event in which we expect the effective collaboration of members from different military services working toward a joint resolution. These are the U.S. Army, Navy, and Marine Corps members mentioned at the beginning of this article. Members of the decision-support facilitation team might have several years of experience conducting this kind of event. When the list of participants comes in, which might implicitly include their background, military service, and experience level, the facilitators might develop a general impression of what to expect in the execution of the event. The military services stereotype processing is similar to ethnic and cultural stereotype processing mentioned previously.

In general, we could imagine some “gung-ho” U.S. Marines, no-nonsense Army soldiers, and Navy sailors that might be more laid back, but inflexible in their thinking. (These are just notional stereotypes.) In order to increase the probabilities of the success of the decision-making facilitation, the administrators of the event might need to run through some team-building exercises to bring all participants to a common ground. Depending on the background, seniority, and general demeanor of the participants, it would be prudent to focus their attention to the overall goal as it pertains to all of them collectively. The new helicopter platform in our case

would provide significant flexibility and added capabilities to all the services in the battlefield as well as during peacetime. The procurement cost of the alternatives that they would evaluate had a wide range of possibilities. However, the long term maintenance cost, procurement of common spare parts, and the ability to request assistance from aircraft mechanics from any other military service that use the same airframe, could be an added benefit. With that in mind, having a common platform that all the services use, might be an attractive goal to all the participants. They might come to the decision table with this knowledge already, but reemphasizing the overarching goal is an attempt to remove stovepipe thinking and parochialism.

Similarly, with multinational organizations, understanding the backgrounds, motivations, and stereotypes of the team members is a valuable first step on the way to effective decision making. Cultural differences do exist in these multinational teams (as well as the cultural differences of the military services in our example). These cultural characteristics are the result of individual’s conditioning by the same education, as members of the same institution, or by personal experiences (Early and Erez 1997, p. 383). There must be a common understanding (not necessarily acceptance) of the cultural differences among the team members. Moving beyond communications barriers that might exist, it would be imperative to focus the decision toward goals that all participants understand and that resonate with them.

A method that seems to facilitate common understanding and establishing commonality is the simple exercise of initial introductions in meetings. With this exercise, in which we would ask participants to introduce themselves with their name, the organization they represent, and a quick summary of their backgrounds, other team members can see beyond initial perceptions where the common traits are. Granted, this can be a double-edged sword, because some members might focus on the differences rather than the similarities. Some of the differences of the team members can work to their advantage as they might have impressive academic or experience backgrounds that downplay any cultural

or ethnic differences. These differences can be an asset to the team and to the decision-making process.

In the process itself, the cultural differences might have an effect on the initial problem definition and understanding of what they are trying to solve. The emphasis on the problem might have a different focus depending on cultural understandings and perspectives. Likewise, on the second step defined earlier, of searching and sharing information and defining the alternatives, there might be some conflicts in terms of what kind of information is acceptable to distribute because it might reveal information about the team members or their culture that they might not necessarily want to disclose. For example, a U.S. military officer might not want to admit to allowing some kind of flexibility in the execution of a combat mission that might be questionable, as it can give the impression of indecisiveness or not staying true to orders given. Cultural make up and loyalty to cultural background might confine or limit the decision-making abilities of some members. This in turn would delay the decision and affect the whole team. More discussions would need to take place and potential for interpersonal conflicts might arise.

When these conflicts take place, a significant amount of effort might be required to bring all parties involved within acceptable limits of consensus. All sides of the arguments would need to be heard and there might be a need to reach or accept some levels of compromise. The most important part of this situation would be to understand the tradeoffs, evaluate the risks, and contemplate the potential benefits of the compromise. One way to address conflict is to give each group with a different viewpoint an opportunity to present and defend their position, with equal or appropriate time to each side, much as it is done in courts of law or in legislative bodies. The intention is to gather as much information as possible to increase the probabilities of the team making a better decision. Sharing information and diverse cultural points of view can provide valuable insights to the team at large. It might also shed some light to the person or team with the discerning argument to realize that either their

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argument is not valid, does not apply to the current decision, or affects only some portions of the decision being made. With that, viewpoints can be highlighted, discussed and agreed upon, or ultimately discarded as nonproductive or not contributing to the decision goals.

Once an acceptable level of consensus is reached, and alternatives are evaluated with some level of rigorous analysis, then the team would need to make a selection of a course of action and agree on an execution plan to implement the decision. Additional conflict might arise in these stages as different cultural backgrounds might affect the way decisions are disseminated and put into practice. Highly hierarchical or vertical organizations might require an additional organizational vetting process to include the different echelons of the organization. Flatter or more horizontal organizations, might find it easier to circulate the decision and implement the execution plan.

In a multicultural setting of global partnerships, this could be a problem. Countries that require a hierarchical distribution of the new policy or working process methodology, for example, might be holding back the implementation of a valuable process in other countries where the decision could be implemented almost immediately. The corporate decision could be to time-phase the implementation of the decision or wait until all global partners agree on a corporate wide execution of the plan. We see this in the introduction of new products from many global corporations, such as Apple's iPad and iPhone around the world.

Conclusion

Decision making in heterogeneous teams is challenging in and of itself. Focusing on international or multicultural teams is just one type of heterogeneity that brings a particular set of challenges based on cultural attributes. These include language and communication barriers, mindsets, predispositions, and convictions. These attributes might have an effect on the way that organizations make

decisions. It would be of great value to bring to focus the decisions of these teams toward an understanding of common goals and general organizational benefits. This process intends to transform the team to a more homogenous one where the decision-making process might be less taxing. The manner in which this is done is highly dependent on the number of multicultural partners involved and the range of differences among those cultural partners. For example, a corporation might have a large presence in South America or the Middle East. If all the international partners are from the same region, the cultural differences among them might be small and the integration of the teams might be easier than integrating a team of partners from all continents.

The creation of multinational teams for political or economic reasons is valid and is intended in part to gain the inherent benefits of diversity, knowledge, skills, values, and experiences. When these teams come together to make collective decisions, the overall organization can fulfill very complicated, yet crucial goals, if the process is conducted effectively. Top leadership needs to have an awareness of the traits and attributes that may have an effect on the decision-making process and consider these when decisions are made. There is still a significant amount of room for research in this area. As more companies expand their reach to international markets, more information on success stories and not-so-successful ventures make it to the media outlets. It would be of particular academic interest, and global economic benefit, to further explore this topic and enhance international awareness of the benefits of a global economic community.

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Author Biography

Mr. Rafael E. Matos was born in San Juan, Puerto Rico. He obtained a bachelor of science degree in natural sciences from the University of Puerto Rico, and a master of science degree in operations analysis from the Naval Postgraduate School. Mr. Matos is currently a consultant for Whitney, Bradley & Brown Consulting. He is a key member of the Operational Concepts and Analysis sector, lead modeler and architect in the modeling and simulation center of excellence, and the lead instructor for the WBB Operations Analysis Training Course. His areas of expertise are statistical analysis, modeling and simulation, decision analysis, and organizational decision support facilitation. Mr. Matos is MORS' Vice-President for Member Services. He co-chairs the MORS Human Behavior and Performance Working Group and is a contributor to the Decision Analysis and Computational Social Sciences Working Groups. He is also a member of the American Psychological Association, the Society for Industrial and Organizational Psychology, INFORMS, the Military Officers of America Association (MOAA), and the National Society for Hispanic Professionals (NSHP). Currently Mr. Matos is completing the requirements for a doctoral degree in organizational psychology at Walden University.



Obituary of Dr. Clive G. Whittenbury

William R. Schilling, Nontraditional Warfare Center, Lansdowne, Virginia

Clive G. Whittenbury, an early member of the Operations Research Profession, was born 27 September 1933 in Manchester in the United Kingdom, and died at age 77 on 26 February 2011 in Yuba City, California. Dr. Whittenbury received his Bachelor of Science in Honors Physics from Manchester University in the United Kingdom. He moved to the United States to study for a Ph.D. in Aeronautical Engineering as a Fulbright Scholar and Fellow at the University of Illinois, becoming a U.S. citizen.

In his career, he held a variety of positions in the establishment and management of systems technology and operations research organizations. After starting in the Research Group at the then new Douglas Missiles and Space in 1959, he rose to become the Chief of Missile Defense Systems Analysis and Engineering. He moved to Washington, DC, in 1964 and became Vice President for Science and Engineering at the Research Analysis Corporation (RAC), one of the major DoD “think tanks” supporting the U.S. Army (RAC was the successor organization to the famous Operations Research Office (ORO) at the Johns Hopkins University.) When a then new SAIC expanded into Washington, he formed a new division in 1972 and later became Manager of SAIC Washington Operations. He moved to La Jolla, California,

in 1974 as SAIC Senior Vice President for Corporate Development.

In 1979, he took a leave from SAIC (where he continued on the Board until 1986) to manage a group of companies for Jack Erickson, who pioneered the use of the Sikorsky Skycrane in timber logging. The diversifying use of this helicopter required complete reengineering and a capability for remanufacturing. After managing that program, he continued on the Board of Directors of Erickson with working responsibility for their then decade-old conversion program for the Boeing 757 into cargo and logistics aircraft, a program that had over two dozen aircraft flying world-wide.

He consulted with the Lawrence Livermore Laboratory for 15 years as a reviewer of programs and was Chair, Emeritus, of the National Ignition Facility Review Committee.

During his first twenty years after graduating from the University of Illinois, he founded and directed programs in three research and system development corporations, all of which included projects involving extensive application of operations research. At Douglas Missiles and Space, he was responsible for applying operations research to missile programs (Nike Zeus, Skybolt, Sprint, and Terminal missile defense) and participated in a high-level program to predict the characteristics of Soviet Union Ballistic Missile

Defense Systems. As the Vice President for the Science and Engineering Department at RAC, he was responsible for leading all operations research analysis related to science and technology including:

- battlefield surveillance and target acquisition aircraft systems,
- the impact of advanced technology on military operations,
- candidate families of military aircraft,
- evaluation of the nuclear and anti-missile capability of surface- to- air missile defense systems,
- the utility of surface effect vehicles (SEVs) for defense and economic applications, and
- the role of Pershing Missiles as an element of the NATO Nuclear Strike Force.

While at SAIC, Dr. Whittenbury led a major R&D program sponsored by the Defense Nuclear Agency (DNA) to analyze NATO force survivability and interdiction of enemy attacks in nuclear environments.

Dr. Whittenbury was an early practitioner of operations research who continued as a practitioner and manager of operations research activities throughout his long and varied career.

He is survived by his wife Rachel and two children.

1LT (P) NATHANIEL D. BASTIAN

UNITED STATES ARMY MEDICAL DEPARTMENT



- MORS member since 2009
- My childhood ambition was to become an Army helicopter pilot. Nothing is better than the thrill and satisfaction of saving soldiers' lives as an aeromedical evacuation aviator!
- I became an analyst because I have a passion for problem-solving, specifically using advanced operations research and systems engineering techniques to provide military leaders with analytically-rigorous decision support. As an analyst, I aim to develop and implement more effective methods to improve our military's health service systems infrastructure.
- In 5 years I hope to have returned stateside from my duty assignment in Hawaii and completed my Ph.D. degree in industrial engineering as a National Science Foundation Graduate Research Fellow at Georgia Institute of Technology.
- MORS connects me with analysts and leaders nationwide who have a similar interest in applied and theoretical-based military operations research. It enables me to build relationships with other members for both professional mentorship as well as collaboration on ongoing problems within the national defense community.



FOCUSED. EAGER. INTELLIGENT.

These are just a few of the adjectives that describe the myriad of young analysts working within the national security analytic community that we are proud to associate with MORS. This year, we are celebrating their contributions to our community as we align ourselves under our new theme: **Developing the Next Generation of National Security Analysts.**



This new initiative will provide wide-ranging offerings for our young analysts, including both recognitions and new programs geared towards our emerging analyst community.

Today, we are celebrating young analysts who are making a difference in their organizations! We are proud to recognize First Lieutenant (Promotable) Nathaniel D. Bastian of the United States Army Medical Department.

Future issues of Phalanx will include spotlights similar to this one. These vignettes are just a small way for us to say "Thank you for all that you do for our Society!"

If you are a MORS member working within the national security analytic community with an interesting story to tell, we want to talk with you! Please send an email to Eric Hamp, MORS membership manager, at eric@mors.org. In the meantime, be on the lookout for upcoming feature stories in Phalanx and watch for updates on our website at www.mors.org!





The Ne(x)t Generation

John Willis, Augustine Consulting, Inc., jwillis@aciedge.com

*People try to put us d-down (Talkin' 'bout my generation)
Just because we get around (Talkin' 'bout my generation)
Things they do look awful c-c-cold (Talkin' 'bout my generation)
I hope I die before I get old (Talkin' 'bout my generation)*

— *My Generation*, The Who, 1965

As I prepare to head out to beautiful Monterey for the 79th MORS Symposium, my thoughts turn to the words “The Next Generation,” which make up part of this year’s Symposium theme. I began to think about the characteristics of those who will make up the next generation of operations research analysts: “Generation Z,” sometimes referred to as “The Net Generation.”

Often identified as being born after 1991 (or 2001 depending on the source), members of Gen Z would rather text than talk. They prefer to interact with others online—often with friends they have never met. They don’t spend much time outdoors unless adults organize activities for them. They can’t imagine life without cell phones. They have never known a world without the Internet or terrorism. They prefer computers to books and want instant results. They are growing up in an economic recession and are under tremendous pressure to succeed.

While named for the last letter of the alphabet, they’ll soon be at the forefront of solving some of the worst environmental, social, and economic problems in history. They haven’t received much attention yet—the media have mostly focused on the preceding generation,

the Millennials (Generation Y), known for their civic involvement and lack of independence compared to previous generations.

Larry Rosen, a professor at CSU Dominguez Hills who teaches a class called Global Impact of Technology, says of Gen Z students, “They are very collaborative and creative. They will change the workplace dramatically in terms of

So, get ready fellow MORSians—the Next Generation is coming to an analyst workstation near you!

work style and expectations.” Gen Z members seem to be more family-oriented, have a sense of duty and fairness (versus entitlement), and are generally healthier than their Gen Y predecessors. So, get ready fellow MORSians—the Next Generation is coming to an analyst workstation near you!

In this issue of *PHALANX*, we feature:

- A farewell column from our outgoing President, Terry McKearney;
- Meeting reports on the recent MORS Education and Professional Development Colloquium and Military Social Science Colloquium;

- Some final details as we prepare for the 79th MORS Symposium in Monterey, California;
- The Special Meeting slate for 2011-2012;
- A fascinating Oral History interview with Mr. Lewis A. Leake, FS; and
- Technical articles on networked systems interdiction models and cultural effects on decision making.

Remember, if you want to cause a b-big s-s-sensation, send us your articles, announcements, letters to the editor, and book reviews for publication in the *PHALANX*—please keep your contributions coming.

See you in Monterey!

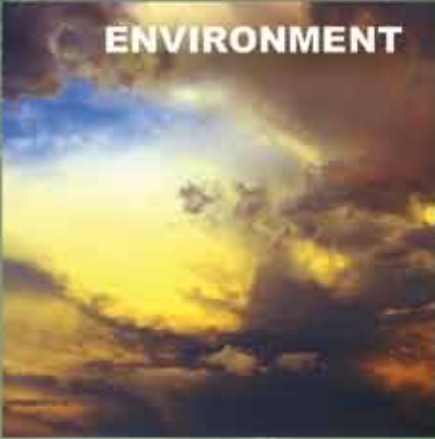
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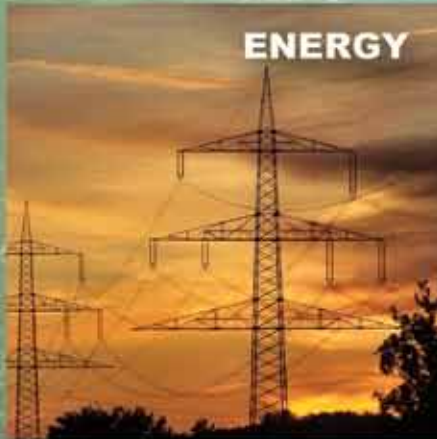
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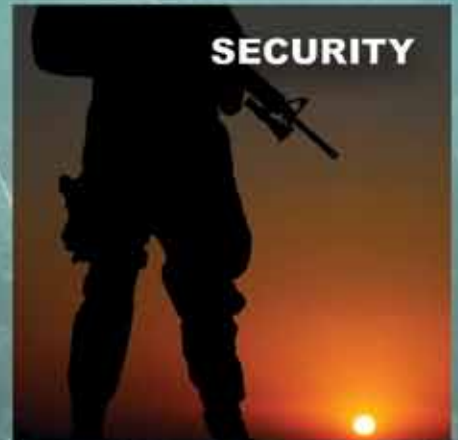
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