

## CNA's 60th anniversary

This year marks CNA's 60th anniversary. Our origins date back to World War II when the Navy asked scientists at MIT to help with the German U-boat threat. That work is generally credited as the beginning of operations research in the United States. It also established our field program of assigning research analysts to naval commands around the world.

We celebrated our 60th anniversary during our annual Field Meeting in March by dedicating a day of discussions to some of the periods of naval history in which CNA made significant contributions. We have many stories—ranging from our earliest work in World War II, to our support to the Department of the Navy on the All-Volunteer Force, our work on key technology issues like the early design of TLAM, and our work today on operations from Desert Storm through Enduring Freedom. Also during the Field Meeting, we focused on the Maritime Prepositioning Force, Vietnam, and two aspects of the Cold War—the outer air battle and the surface warfare threat.

Later this year we will combine these stories with many others throughout CNA and publish a 60-year retrospective of CNA's support to DON. (Contact: Ms. Christine H. Fox, (703) 824-2445)

## TACAIR performance in Operation Enduring Freedom

As part of our reconstruction and analysis of Naval contributions to Operation Enduring Freedom (OEF), we are examining the employment and performance of USN TACAIR in the operation. We addressed the effectiveness of TACAIR weapons employed, the nature and conduct of the missions flown, and how the missions supported the operation. Our analysis revealed

four essential characteristics of naval TACAIR in OEF:

- *Flexibility.* The rapidly changing nature of the conflict, particularly after the start of ground operations by opposition groups, required most naval strike-fighter aircraft to “flex” from previously fraged missions to other tasking. Many aircraft launched without pre-assigned targets. Fully 80 percent of the naval TACAIR missions flown in OEF demonstrated this mission flexibility.
- *Persistence.* Naval TACAIR struck Taliban and Al Qaeda forces continuously, 24 hours a day, 7 days a week. This relentless, persistent pressure in support of the CINC's objectives demonstrated the ability of naval TACAIR forces to conduct continuous, sustained combat operations for long periods of time. Carrier-based TACAIR was particularly important in this operation because the U.S. lacked access to air bases in neighboring countries from which to fly combat sorties.
- *Precision and accuracy.* Extensive use of precision-guided weapons, which accounted for more than 90 percent of the total ordnance expended, enabled naval TACAIR to strike targets accurately. The GPS and laser-guided weapons performed on a par with weapons specifications. The Mk-80 series bombs—so-called *dumb bombs*—also performed well because they were used against appropriate targets. OEF underscored the importance of having a mix of weapons available to accomplish mission objectives.

In addition to our TACAIR analysis, we are analyzing several other topics, including TLAM performance, operational logistics, intelligence support to the operation, and the integration of

coalition assets at sea. (Contact: Ms. Maureen Wigge, (703) 824-2490)

## Network performance and usage afloat

The introduction of information technology into the Navy's daily operations has outpaced the fleet's understanding of how best to use it. Thus, the Director, Space, Information Warfare, Command and Control asked CNA to identify performance metrics, establish baselines, and develop guidance on monitoring these systems.

*Availability*, *median-time-between-disconnect*, and *median-time-to-reconnect* are metrics used to quantify reliability—a function of whether the system is available; however, the frequency and duration of outages must also be characterized to understand normal system behavior. We analyzed data from more than 50 ships both on deployment and during exercises and found: (1) substantially lower average availability than currently reported, (2) no discernible difference between dual and single International Maritime Satellite (INMARSAT) ships, and (3) a median time between disconnects of less than 30 minutes. The Navy needs to be aware of these reliability issues when making investment decisions. The environment at sea is very different from that of an office. The frequent disconnects experienced by ships at sea can adversely affect the performance of commercial off-the-shelf applications that perform adequately in the private sector. The Navy may want to consider developing its own chat client and server software.

Frequent disconnects seriously affect the transfer of files between a ship and shore. Battle groups set limits on file size to reduce download time, but, if the transfer is interrupted, the file must be sent again in its entirety. The use of a program, like PDF Distiller, to compress files or the incorporation of a download manager into current applications would help conserve bandwidth. Our analysis of network metrics highlighted the critical importance of bandwidth management.

Dynamic bandwidth allocation—different applications sharing bandwidth as needed—has the greatest potential for increasing the efficient use of available bandwidth. Many applications in the Navy operate over dedicated circuits. When those applications are not in use, the dedicated circuit and all its associated bandwidth are idle. We found that SHF-equipped ships use less than 20 percent of the bandwidth dedicated to those circuits. The telephone use on smaller, INMARSAT-equipped ships is even lower. Voice over Internet protocol (VoIP) has the potential to recoup bandwidth that would otherwise be lost. For example, when a telephone circuit is not in use, VoIP would allow that bandwidth to be used by other IP applications, such as e-mail or web browsing. Switching to a VoIP system would yield additional bandwidth at a small cost to the Navy. (Contact: Dr. John Bentrup, (703) 824-2545)

## The P-3 replacement

After more than 30 years of service, P-3 and EP-3 aircraft are finally reaching the end of their useful airframe lives. Fatigue and corrosion problems have reached the point where the life span of the airframes cannot be extended without large investments, and operating and support costs have grown to inordinately high levels. The potential loss of the capabilities provided by these maritime patrol and reconnaissance aircraft creates significant warfighting deficiencies, especially for responsive wide-area tasking beyond the reach of battle-group assets.

As discussed in the April 2001 CNA *Quarterly*, CNA led a team of analysts in an analysis of alternatives that examined how the critical warfare capabilities provided by the P-3 and EP-3 can best be provided in the future. After looking at a wide range of potential solutions for maintaining the required capabilities, we concluded that manned aircraft capable of carrying significant payloads and operating at extended ranges from land bases are an essential element of any P-3 replacement. Medium-size aircraft were more

cost-effective than large ones, while still providing good capability. Sea-based manned aircraft cost about the same as medium-size land-based manned aircraft but provided much lower mission performance, peacetime access, and on-station time during the early days of conflict. Conceptual unmanned aerial vehicles (UAVs) capable of conducting all the P-3 missions are not available in the near term and would require extending the life of in-service P-3Cs. Thus, the UAV alternatives have a higher life-cycle cost than medium-size land-based manned aircraft, in addition to higher risk and lesser performance.

In related work, we examined the impact of foreign base denial and found it can be mitigated by means of alternative basing and aerial refueling. We also examined the potential for using the same large land-based aircraft for Air Force and Navy missions, but Air Force and Navy missions do not combine efficiently, and, even if they did, the higher cost of the larger aircraft would not be offset by the reduction in force levels.

We looked at the potential for employing UAVs for only some of the missions and found that a mixed force consisting of land-based manned aircraft and UAVs can bring new capabilities to maritime patrol, though at a higher technical risk than a force of manned aircraft alone. We also found that the mixed force is unlikely to save money, primarily because of the need to maintain a dispersed force and a minimum number of ready-alert manned aircraft. We looked at satellites as adjunct platforms and found they could potentially do only a fraction of maritime patrol functions and thus could have only a minor impact on manned aircraft force structure.

After we briefed our findings, OSD authorized going forward with the program. (Contact: Mr. Joe Penny, (703) 824-2789)

## **MV-22 “Osprey”**

The Marine Corps plans to buy MV-22 “Osprey” tilt-rotor aircraft to replace its aging fleet of

medium-lift helicopters. Following the loss of an aircraft in April of 2000, a successful operational evaluation increased confidence that the program was ready for a production decision in December. Prior to that decision, however, another loss grounded the MV-22 indefinitely, pending a thorough review to determine whether the program should proceed. A blue-ribbon panel review early in 2001 recommended that the Osprey be delayed and modified, but not cancelled. NASA-Ames conducted a technical review, engineering fixes were evaluated, and assessments of manufacturer and Navy program management practices began as well. That summer, at the Marine Corps’ request, CNA conducted a comprehensive analysis of aircraft and squadron requirements in the 2015 time frame and beyond. Subsequently, CNA was asked to compare possible alternatives to the MV-22.

We compared the operational effectiveness and cost of MV-22s with an alternative medium-lift helicopter represented by an EH-101, a European helicopter manufactured by the United Kingdom and Italy. We examined assault support in the scenarios used in our earlier study; compared combat power buildup of equal-cost force mixes, costs of forces achieving comparable lift performance, and performance in generalized logistic support missions; and assessed aircraft survivability. We found that more EH-101s than MV-22s can be procured and operated at equal cost, but the increased numbers cannot overcome MV-22 advantages in speed, mission radius, lift capability, and survivability. Likewise, the cost of EH-101s to achieve equal lift capability is considerably more than that of MV-22s. Overall, MV-22 forces have a decided advantage in buildup of combat power, are more survivable than helicopter forces, and cost less to field and operate.

Our analysis was one of many reviews that assisted in the decisions about how to proceed in the MV-22 program. We briefed the Under Secretary of Defense for Acquisition, Technology, and Logistics, who authorized going forward with the

program—under three conditions. It must be fully funded, production must be slowed to the minimum sustaining level, and a comprehensive and rigorous “event driven” flight test program must be conducted. Resumption of flight testing is scheduled to begin in April 2002. (Contact: Dr. Gary R. Phillips, (703) 824-2108)

### **China’s coming leadership changes**

Within the next year, the leadership of People’s Republic of China will undergo a significant generational change. As a result of the 16<sup>th</sup> Congress of the Chinese Communist Party (CCP) in October 2002 and the subsequent National People’s Congress in the spring of 2003, most of the national leadership of China’s party, state, and military organs will be replaced, which will have profound implications for China itself, for nations in the region, and potentially for the national interests of the United States.

The challenges these leaders will face are near-staggering. These men and women will have to (1) push forward economic and structural reforms while at the same time managing the increasingly apparent social and political dislocations attendant to those reforms; (2) move forward with the development of China’s Western regions and close the east-west gap in prosperity within China itself; (3) deal with the economic, social, and political fallout, as yet unknown, of China’s accession to the World Trade Organization; and (4) deal with the internal reform of the Party itself as the CCP races to stay relevant in a rapidly changing country.

This new leadership will also have to cope with a changing international security environment, which Chinese statements often describe as

complex at best and, at times, foreboding. The issue of Taiwan will present increasing challenges to China’s leaders as quick-paced political developments on that island become more complicated. The leaders will also have to cope with a United States that many in China still believe is determined to “westernize China” and “split China,” even as they assess that a stable relationship with Washington is ultimately in Beijing’s best interests.

It is remarkable that, after more than 20 years of “reform and opening up,” the Chinese political process and the backgrounds and predilections of an entire new generation of political and military elite remain shrouded, opaque, and little understood in the West. In an attempt to lift the veil and enhance our understanding, CNA’s “Project Asia” convened a major conference in December 2001 on China’s leadership succession. For two days, renowned international scholars of Chinese politics gathered to present papers and engage in discussions about China’s future leadership—at “the center,” in the provinces, in the military, and beyond. Although many questions still remain open-ended, the papers that were presented at the conference, and especially the discussions that followed, have helped to paint a clearer picture of this subject. A report on this conference will be released soon. (Contact: Dr. David Finkelstein, (703) 824-2952)