Department of Defense
Review of the Foreign Comparative Testing Program
FY2005 - FY2006

Deputy Under Secretary of Defense
(Advanced Systems and Concepts)

April 2007

FOREWORD

I am enthusiastic about the accomplishments of the Foreign Comparative Testing (FCT) Program and am pleased to sponsor this "*FCT Review of Fiscal Years 2005-2006.*"

The FCT Program is a key acquisition tool for the U.S. Department of Defense, taking advantage of global technology opportunities to affordably and rapidly add military capability to the operational force. FCT transitions world-class, innovative equipment to the warfighter, providing the testing incentives needed by industry and the Department to evaluate equipment and ensure safe and effective integration into acquisition programs of record.

Over the past several years, FCT has experienced an unprecedented increase in the successful qualification, procurement, and deployment of world-class military equipment for the troops fighting in Iraq and Afghanistan, and in other 'hot spots' supporting the war on terrorism. Examples include:

- Special Operations Forces' *7.62 mm Lightweight Machine Guns* from Belgium that significantly increases the organic firepower of SEAL platoons in Iraq.
- Army's *"Buffalo" Mine-Protected Clearance Vehicle*, developed in the Republic of South Africa, for clearing operations against Improvised Explosive Devices (IEDs).
- Air Force's advanced technology *25K "Halvorsen" Loaders* for airlift operations, from Australia.
- Marine Corps' *50 Caliber High Rate-of-Fire Machine Guns*, developed in Belgium, enables 180-degree defense fire from the rear and side doors of Marine Corps helicopters.
- Navy/Marine Corps' *Expeditionary Airfield Light Duty Mat Systems* from France for medical evacuation and Forward Arming and Refueling Points for rotary-wing aircraft.

I invite your attention to other FCT successes contained throughout this report, including support to critical mission capabilities for chemical/biological agent detection, protection, and decontamination; chaff/flare electronic countermeasures protection for combat aircraft; increased individual firepower; deployable satellite data receiving and processing for mission planning; and intrusion detection.

During Fiscal Years 2005 and 2006, 23 FCT projects transitioned to a program of record, resulting in first-time production procurements by the Services and U.S. Special Operations Command valued at $128 million. Follow-on, multi-year procurements worth $498 million stemmed from prior year FCT successes.

The FCT Program has an excellent track record of support to the U.S. warfighter over its twenty-seven year history; its contribution is evident today in our fight against terrorism. I am proud of these accomplishments and look forward to continuing successes.

John J. Kubricky
Deputy Assistant Secretary of Defense
(Advanced Systems & Concepts)

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OVERVIEW OF THE FOREIGN COMPARATIVE TESTING (FCT) PROGRAM

The Foreign Comparative Testing (FCT) Program[1] supports the warfighter by leveraging mature equipment and technologies from allied and coalition partner nations to satisfy U.S. defense requirements, thereby accelerating the U.S. acquisition process and lowering development costs. The Deputy Under Secretary of Defense (Advanced Systems and Concepts) administers the FCT Program within the Office of the Under Secretary of Defense (Acquisition, Technology and Logistics).

Compared to similar U.S. development programs, the FCT Program reduces by an average of 5½ years the acquisition cycle time for fielding world-class systems and equipment. Many FCT projects have also reduced total ownership costs of military systems, cutting overall acquisition and support expenditures while enhancing standardization and interoperability, improving allied cross-service support, and promoting international cooperation.

Each year the Military Services and U.S. Special Operations Command nominate candidate projects to the Office of the Secretary of the Defense (OSD) for funding consideration. The proposals are evaluated to ensure that: (1) the item(s) proposed for evaluation addresses valid DoD requirements; (2) a thorough market survey is conducted to identify all potential candidates; and (3) the sponsoring organization has developed a viable acquisition strategy to transition the item to the U.S. warfighter, demonstrating solid intent to procure the technology or equipment if it meets requirements and provides best value.

OSD evaluates, selects, and prioritizes the candidate proposals and notifies Congress of its intent to fund the new and continuing projects in the coming year. The sponsoring organizations obtain the items for evaluation, conduct the test program, and procure those that meet their requirements. Approved projects are normally funded for one or two years.

The *Comparative Testing Office Handbook* [2] contains further details on the program and describes how successfully to manage an FCT project, from the initial proposal phase through procurement.

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[1] The FCT Program is authorized by Title 10, United States Code, Section 2350a(g). Further guidance is found in the DoD FAR Supplement which addresses the acquisition of commercial and non-developmental items.

[2] For additional information concerning this report or to obtain a copy of the Handbook, contact the Director, Comparative Testing Office (CTO) by e-mail (Robert.Mattes@osd.mil), see the CTO Home Page at http://www.acq.osd.mil/cto/, or write to OSD(AT&L)/AS&C/CTO, 3700 Defense Pentagon, Room 3E144, Pentagon, Washington, DC 20301-3700.

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FCT PROGRAM ACHIEVEMENTS

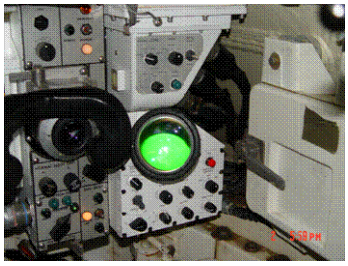
Since the FCT Program's inception in 1980, 567 projects have been funded. The Services and U.S. Special Operations Command have completed 497 projects, with 70 projects ongoing. Of the completed projects, 266 were successful and the equipment or technology evaluated met the sponsor's requirements. Of these 266 successful projects, 189 (71 percent) resulted in U.S. procurements valued at over $8.17 billion. [3] Over the same 27-year period, the program achieved an estimated Research, Development, Test and Evaluation (RDT&E) cost avoidance of $7 billion.

Leveraging the defense investments of our allies and coalition partners reduces our total ownership costs. For example, in 2005 the Marine Corps Systems Command qualified and procured ***Special Effects Small Arms Marking Cartridges and M249 Squad Automatic Weapon Bolt Conversion Kits***, developed by SNC Technologies of Montreal, Canada, avoiding an estimated $10 million in development costs, with anticipated production cost savings of about $20 million, and $10 million in expected life-cycle cost savings. Similarly, in 2006 the U.S. Special Operations Command qualified for low-rate initial production the Belgian FN Herstal ***Special Operations Forces' Combat Assault Rifle (SCAR)***, achieving an estimated developmental cost avoidance of $2 million. The FCT Program:

- Facilitates rapid fielding of crucial equipment
- Generates operational and life-cycle cost savings
- Improves and introduces new operational capabilities
- Reduces acquisition costs by avoiding new-start developments
- Contributes to risk reduction in major U.S. development programs
- Creates opportunities for industry teaming and production in the U.S.
- Contributes to international armaments cooperation

❖ Rapid Fielding

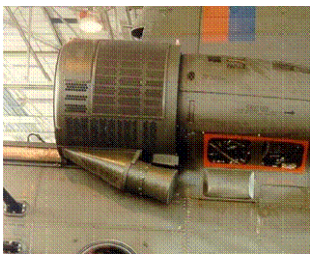
The FCT Program's focus on mature technologies and equipment, coupled with a clear path to procurement by the sponsoring Service, quickly puts needed equipment into the hands of U.S. warfighters. The importance of responding rapidly to our nation's immediate warfighting requirements has repeatedly been underscored by Operation Desert Storm in 1991; U.S. and coalition operations in Somalia, Bosnia, Kosovo, and Macedonia; and current combat operations in Iraq and Afghanistan. The FCT Program has demonstrated the ability to test, evaluate, and facilitate the procurement of systems quickly for use in the war on terrorism and other operations, such as peacekeeping and military operations in urban terrain. The Marine Corps procured and deployed ***Biocular Image Control Units (BICU)*** for its M1A1 Tank Battalions in Iraq within one year of initiating an accelerated FCT evaluation of the system developed by *Brimar of the United Kingdom*. The BICU enables 2nd generation Forward Looking Infrared (FLIR) imagery to be displayed in the Gunner's Primary Sight display, reducing gunner's fatigue and utilizing the best features of direct view optics and FLIR imagery to acquire and engage targets. ***"The gunman can kick back and look at the picture," said Lt. Col. Gaskill of the Marine Corps' Program Office for Tank Systems. "From now on, we are going to be able to lase through a target and we immediately get back the report on the target. Utilizing our communications we will be able to issue the first call for fire."***



[3] Amounts in FY 2007 constant year dollars.

❖ Operational and Life-Cycle Cost Savings

Many of the items or technical processes acquired as a result of the FCT Program are beneficial and cost less to maintain than the items they replace. For example, the Army's qualification and procurement in 2006 of ***"Short-Can" Engine Air Particle Separators (EAPS) for CH-47 helicopters***, manufactured by *Pall Aero Power Corporation of the United Kingdom*, achieved an estimated $14.4 million in operational life-cycle and T55-GA-714A engine replacement cost savings. The "long can" EAPS currently used by the Army must be moved forward on its mounting rails to open the engine cowling for engine maintenance or inspection. The British "short can" design allows maintenance to be performed without unfastening and moving the EAPS. The new configuration is being re-deployed to the CH-47 Fleet.



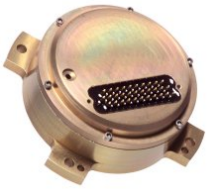
❖ Improved and New Operational Capabilities for U.S. Forces

FCT continues a very successful track record of qualifying items for procurement that meet a wide range of warfighter requirements, supporting all the Services and the U.S. Special Operations Command. FCT test and evaluation projects encompass tactical communications; chemical-biological detection and protection equipment; landmine detection and clearing; submarine and surface combatant systems; land warfare mobile electric power; direct-fire weapons and ammunition; naval mine countermeasures, and many others. In addition to providing new capabilities, FCT successes improve current capabilities and help support increased operational readiness and tempo. For example, the U.S. Special Operations Command successfully evaluated advanced 5.56mm and 7.62mm rifles to meet requirements for a modular combat rifle for Special Forces as a replacement for the aging M-4A1 carbine. Low-Rate Initial Production of the ***Special Operations Force Combat Assault Rifle (SCAR)*** family of weapons, manufactured by *FN Herstal of Belgium*, and including integration of the Belgian ***Enhanced 40mm Grenade Launcher Module (EGLM),*** was approved in June 2006. Full-Rate Production and follow-on procurements of SCAR/EGLM is expected to reach $28.4 million and future production cost savings are possible due to interest by the Marine Corps. Other successes during FY 2005-2006 include the Saab Bofors Dynamics ***AT-4CS (Confined Space) Disposable Shoulder-Fired 84mm Weapon***. This weapon gives U.S. Special Forces and U.S. Army gunners the capability to engage targets from confined spaces, a significant improvement for operations in urban areas, as evidenced by the weapon's employment in Afghanistan and Iraq. The project also achieved an estimated $25 million development cost avoidance by leveraging previous U.S. military AT-4 efforts, $5 million in production savings, and $2 million in operations/life-cycle cost savings. Appendix C describes other examples of improved operational capabilities resulting from the FCT Program.

❖ Reducing Acquisition Costs by Avoiding New-Start Development

The FCT Program reduces overall DoD acquisition costs by promoting the procurement of mature equipment and technologies nearing production or already in service in the host nation, thereby reducing expenditures for research and development. Qualifying an item already in production can lower the unit procurement cost for both the U.S. and the host nation's defense. Competition between foreign vendors also lowers acquisition costs and improves warranties or contractual guarantees from both U.S. and foreign vendors. ***Automatic Chemical Agent Detector Alarms (ACADA)*** manufactured by *Smiths Detection (formerly Graseby Dynamics) of the United Kingdom* were successfully evaluated, procured, and fielded by the Army in 1996. These sensitive remote detectors provide a nerve agent capability that the previous M43A1 detectors did not possess. The M22 ACADA is the standard detector for all Army and Special Forces units and is currently deployed worldwide and is also in use to protect domestic high-value installations, including the Pentagon. Over 32,000 units have been procured to date. This successful FCT achieved an estimated developmental cost avoidance of $311 million, production cost savings of $64 million, and accelerated fielding of 4 years. Appendix D provides more examples of estimated development cost avoidance from successful FCT projects.

❖ Risk Reduction in Major U.S. Development and Upgrade Programs



The FCT Program has contributed to reduced technical, cost, and schedule risk for several major U.S. development and upgrade programs. For example, The Air Force's Rocket Systems Launch Test Program successfully evaluated the ***Micro Electro-Mechanical Inertial Measurement Unit (SiIMU01/02)*** developed by *BAE Systems of the United Kingdom* as a potential alternative to an ongoing domestic development program, which was failing to meet the size, weight, and cost objectives. The British unit promised significant advantages over technologies employed in U.S. intercontinental ballistic missiles, reentry vehicles, and precision weapons requiring an IMU. In April 2006, the U.S. Army awarded *BAE, teamed with Northrop Grumman of the U.S.*, a three-year contract valued at $45.7 million to begin production of a derivative of the SiIMU02 MEMS IMU qualified in this FCT project, for the Army's Advanced Precision Kill Weapon System-II (APKWS-II) Missile Program. In addition, through the use of the FCT, an estimated development cost avoidance of $34 million was achieved, and production cost savings of $44 million over the three-year contract are anticipated.

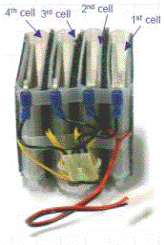
❖ Teaming Opportunities for U.S. and Foreign Industry

FCT projects often result in foreign industry-U.S. industry teaming. These business arrangements include marketing agreements and licensed production of the foreign item in the U.S. upon successful FCT project completion. This strengthens the U.S. industrial base, creating American jobs and improving the "two-way street," while helping U.S. domestic defense industries to sell their products overseas. FCT teaming and manufacturing arrangements have benefited 33 states and more than 40 defense industry company branches across a spectrum of industries including electronics, automotive, textiles, heavy equipment, and ammunition. The ***"Buffalo" Mine-Protected Clearance Vehicle*** developed by *Denel-Mechem of South Africa* was successfully evaluated by the Army and is now being produced by Denel's U.S. partner, *Force Protection, Inc. in Ladson, South Carolina*. The Buffalo is a blast-resistant vehicle designed to

protect soldiers from the effects of landmine explosions during route clearance operations and is currently operating with the 612th Engineer Battalion in Iraq as part of the Army's Ground Standoff Minefield Detection (GSTAMIDS) Task Force. Buffalo uses a hydraulic arm to investigate suspected mine sites, including Improvised Explosive Devices (IEDs). According to Battalion personnel, the Buffalo is extremely survivable, ***"These vehicles have been hit several times…and no one inside has ever been hurt…soldiers want to ride in this…find the IEDs and protect their fellow soldiers."*** Appendix D provides more examples of teaming opportunities and U.S. production resulting from the FCT Program.

- **International Armaments Cooperation**

The FCT Program supports U.S. international armaments cooperation by providing tangible evidence of the U.S. commitment to the "two-way street " in defense procurement. Substantial initial and follow-on U.S. procurements were made in FYs 2005 and 2006 from defense industries in countries such as Belgium, Canada, Germany, Sweden, and the United Kingdom. The FCT Program, in coordination with overseas U.S. Offices of Defense Cooperation, has broadened the potential arena, through in-country visits and briefings, to stimulate defense industrial participation. As a result, *FY Composites of Nokia, Finland,* is participating in the FCT Program for the first time, with the ongoing evaluation of its ***Composite Air Fan Shroud for the Navy's Landing Craft Air Cushion (LCAC)***. Similarly, FCT has cultivated relationships in the Pacific region with Australia, Republic of Korea, and Singapore. This particular outreach resulted in the participation by *MEETS, Ltd. Metal-Air Fuel Cells of the Republic of Korea* in 2006, with the on-going evaluation of its ***Emergency Battery System*** to meet requirements for lightweight alternative power sources for the individual Marine.



Appendix A contains additional details concerning participation in the FCT Program, including how the program is assessed, or measured; participation in FCT by country; and participation by each of the military components.

Appendix B lists the equipment selected for procurement as a result of successful FCT projects.

Appendix C summarizes FCT-evaluated and tested equipment that has been transitioned and procured in support of U.S. operational forces.

Appendix D summarizes additional FCT benefits, including estimated and projected acquisition costs and fielding time reductions associated with FCT projects implemented and examples of teaming arrangements between foreign coalition and U.S. industry partners.

HIGHLIGHTS OF THE FY 2005-2006 FCT PROGRAM

Projects Completed in FYs 2005 and 2006. The forty-two FCT projects that completed evaluation during FYs 2005-2006 are listed in Table 1.

Table 1. Projects Completed in Fiscal Years 2005 and 2006 (start year as indicated)

Sponsor	Project
Army	Engine Air Particle Separator for CH-47 – 2005 Laser Marksmanship Training System "Hummerbook" – 2005 Laser Obstacle Detection System – 2002 Lightweight Smoke Generator (Visual/Infrared Liquid Obscurant) – 2004 Miniature Synthetic Aperture Radar (MiniSAR) – 2005 Regenerative Drive System – 2004 Small Bundle Resupply – 2003 Unit of Employment Battle Command – 2006
Navy	Diver Hull Inspection and Navigation System – 2005 High Frequency Adaptive Antenna Receive System Replacement – 2002 Improved Specific Emitter ID System – 2003 MARIA Mapping (Tactical Geographic Information System) – 2001 Mine Countermeasures Small Unmanned Underwater Vehicle – 2004 Mobile Acoustic Support System – 2004 Next Generation Underwater Breathing Apparatus – 2005 Replacement Structures for Aircraft – 2003 Shipboard Anti-Jam GPS Antenna – 2003 Underwater Communications System (HAIL) – 2003
Marine Corps	Biocular Image Control Unit for M1A1 Battle Tank – 2004 Deployable Instrumentation for MAGTF Training – 2003 Deployable Multi-Purpose Moving Target System – 2004 Eye-safe Laser Rangefinder for M1A1 Battle Tank – 2003 Highly Mobile Oxygen Supplementation System – 2005 M16/M4 Training Bolt – 2005 Mounted Cooperative Target Identification System - 2004 Special Effects Small Arms Marking System – 2003
Air Force	Guidance Components for Missiles – 2004 MEMS Inertial Measurement Units – 2004 Missile Reserve Battery Replacement – 2003 Rayon for Heatshield and Motor Nozzles – 2003 Void-Sensing Fuze – 2006 Weather Scout Unmanned Aerial Vehicle –2005 Wideband Klystron for E-3 AWACS – 2000
U.S. Special Operations Command	40mm Enhanced Grenade Launcher Module – 2003 Advanced Family of Interfaces for Chemical-Biological Clothing – 2004 Amphibious Reconnaissance Insertion Vehicle –2006 Deployable GSM Cellular Network – 2004 Global Cellular Phone System Optimization – 2003 Low Probability of Intercept Communications Intelligence DF – 2004 MAAWS IR Illumination Round – 2001 SOF Combat Assault Rifle – 2004 Tethered Balloon ISR Platform – 2005

First-Time Procurements. The twenty-three projects listed in Table 2 (some of which were successfully completed in prior years) resulted in first-time production procurements by the Services and U.S. Special Operations Command in FYs 2005-2006 and early FY 2007, valued at $127.87 million.

Table 2. First-Time Procurements of FCT-Evaluated Products for Fiscal Years 2005-2006 and Early Fiscal Year 2007

Service	FCT Project	Country	Vendor	Value ($M)
Army	Engine Air Particle Separator for CH-47	UK	Pall Aero Power	11.50
Army	Laser Marksmanship Training System "Hummerbook"	Republic of Korea	Seoul Standard	0.13
Army	Individual Serviceman Non-Lethal Weapon (FN303)	Belgium	FN Herstal	4.90
Army	Unit of Employment Battle Command	Denmark	Systematics	0.25
Navy	Digital Flight Control System for EA-6B "Prowler"	UK	BAE Systems Avionics	10.70
Navy	Improved Specific Emitter ID System	UK	QinetiQ	0.39
Navy	Shipboard Anti-Jam GPS Antenna (inadvertently omitted from last FCT review)	UK	Raytheon Systems Ltd.	5.12
Navy	Star Tracker	Denmark	Terma Elektronik	3.50
USMC	Biocular Image Control Unit for M1A1 Tank	UK	Brimar	6.70
USMC	Deployable Instrumentation for Marine Air-Ground Task Force (MAGTF) Training	Sweden	Saab Training Systems	1.00
USMC	Deployable Moving Target System	Germany	Thiessen Training	1.00
USMC	Eye-Safe Laser Rangefinder for M1A1 Tank	Germany	Zeiss Optronic	13.63
USMC	M16A2/M4 Training Bolt	Canada	SNC Technologies	3.42
USMC	Skin & Open Wound Decontamination Lotion	Canada	O'Dell Engineering	0.17
USMC	Special Effects Small Arms Marking System, with M249 Squad Automatic Weapon Conversion Kit	Canada	SNC Technologies	1.65
Air Force	Airborne Video Recorder/Replay System	France	Enertec	15.20
Air Force	MEMS Inertial Measurement Units	UK	BAE Systems	15.23
USSOCOM	Advanced Lightweight Grenade Launcher Ammunition	Norway	NAMMO	18.22
USSOCOM	Body Worn Radar Detection Receivers	UK	QinetiQ	4.96
USSOCOM	40mm Enhanced Grenade Launcher Module (EGLM) – Low Rate Initial Production (with SCAR)	Belgium	FN Herstal	1.33
USSOCOM	Low Probability of Intercept COMINT Direction Finding	UK	TRL Technology	0.25
USSOCOM	Special Operating Forces Combat Assault Rifle (SCAR) – Low Rate Initial Production	Belgium	FN Herstal	8.26
USSOCOM	Wireless Local Area Network (LAN) Monitoring	New Zealand	TamoSoft	0.36
		Total First-Time Procurements		127.87

Follow-On Procurements. During FYs 2005 and 2006, follow-on procurements worth $496.63 million stemmed from prior year FCT successes. These items are listed in Table 3. These figures do not include any of the items listed in Table 2 (first-time procurements during FY 2005-2006).

Table 3. Fiscal Years 2005-2006 Follow-On Procurements of FCT-Evaluated Equipment

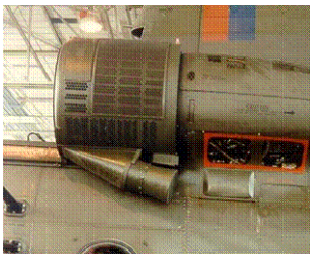
Service Sponsor	FCT Project	Country	Vendor	Value ($M)
Army	7.62mm Short Range Training Ammo	Canada	SNC Technologies	0.29
Army	40mm Training Cartridge MK281 (via USMC contract)	Germany	Nico Pyrotechnik	3.66
Army	Automatic Chemical Agent Detector Alarm (ACADA) and ACADA Power Supplies	UK	Smiths Detection	81.32
Army	Ground and Vehicle Mounting System	Germany	Sachtler GmbH	1.760
Army	Improved Battery Cells	Canada	Moli Energy	26.00
Army	Improved Chemical Agent Monitors	UK	Smiths Detection	29.30
Army	Less than 3KW Generator Sets (MEP)	Canada	Mechron Energy	7.08
Army	Light Anti-Tank Weapon (M72A3 LAW)	Norway	Raufoss/Talley Defense	18.22
Army	Mine-Protected Clearance Vehicle “Buffalo”	South Africa	Denel Mechem and Force Protection (U.S)	35.74
Army	One-Watt Linear Drive Coolers for HTI B-Kits	Germany	AEG Infrarot Modules	9.36
Army	Powered Multi-Fuel Burners	Canada	Teleflex	2.64
Navy	BOL Countermeasures Chaff/IR Flare Expendables for F-14	Sweden	Saab Avionics	3.80
Navy	BROACH Unitary Warhead for AGM-154C	UK	BAE Systems	21.68
Navy	Expeditionary Airfield Light-Duty Mat Systems (DoD-wide procurements)	France	Deschamps	7.11
Navy	HiPPAG for F-18E/F, AV-8B, AH-1	UK	Ultra Electronics	13.6
Navy	Joint Protective Aircrew Ensemble	Germany	Blücher GmbH	7.00
Navy	Submarine Escape & Immersion Equipment	UK	Beaufort Air-Sea	11.60
Navy	Titanium Nitride Erosion-Resistant Coatings for Aircraft Engine Compressor Blades	Canada/Russia	MDS-PRAD joint venture	35.00
USMC	30mm APFSDS Tracer Rounds for Expeditionary Fighting Vehicle	Norway, Switzerland	NAMMO, Oerlikon Contraves	0.50
USMC	40mm Training Cartridge MK281	Germany	Nico Pyrotechnik	13.14
USMC	High Rate-of-Fire .50 Cal Machine Gun M3M	Belgium	FN Herstal	39.80
USMC	Lightweight Aluminum Roadwheels for Expeditionary Fighting Vehicle	GKN	UK	0.50
USSOCOM	7.62mm Lightweight Machine Gun	Belgium	FN Herstal	5.00
USSOCOM	Chemical Protective Gloves JB1GU	Canada	Cloutier	2.56
USSOCOM	Joint RAAWS Upgraded Ammunition – Phase I (HEAT551C, TPT141,	Sweden	Saab Bofors Dynamics	2.10

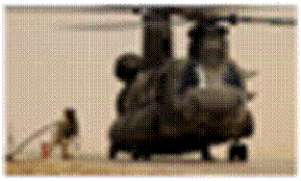
USSOCOM	Joint RAAWS Upgraded Ammunition - Phase II (HEDP502, ADM401, HE441DRS)	Sweden	Saab Bofors Dynamics	7.40
USSOCOM	MC-130H Aerial Refueling Pod System	UK	Flight Refueling, Ltd.	7.30
USSOCOM	Semi-Rigid Ammo Containers for MK48 Lightweight Machine Gun	Belgium	FN Herstal	0.35
Air Force	F-15 BOL Countermeasures Dispenser (SWE) with IR Expendables (UK)	Sweden, UK	Saab Avionics and Chemring	4.80
Air Force	Eagle Vision Deployable Ground Station	France	EADS	18.00
Air Force	Emergency Aircraft Arresting System	France	Aerazur	0.70
Air Force	F-15A/B Countermeasures (BOL)	Sweden	Saab Avionics	16.10
Air Force	Next Generation Small Loader	Australia	Static Engineering	49.00
Air Force	Retractable Arresting Cable System	France	Aerazur	0.32
Air Force	Uncooled Thermal Imager (Sentry)	Sweden	FLIR Systems	13.90
		Total Follow-On Procurements		496.63

PROJECTS COMPLETED IN FYs 2005 – 2006
(Year of project initiation as indicated)

ARMY

Engine Air Particle Separator for CH-47 – United Kingdom – 2005





The Army's Cargo Helicopters Project Management Office in Huntsville, Alabama, successfully evaluated an Engine Air Particle Separator (EAPS) developed by *Pall AeroPower Corporation of the United Kingdom* which is in service with the British Royal Air Force. The Pall unit design decreases the erosion of engine components in dusty and sandy environments by means of swirling engine inlet air at a high velocity, thereby separating particulate matter via centrifugal force. The EAPS currently used by the Army is the "long can" design requiring the unit to be moved forward on its mounting rails to open the engine cowling when performing maintenance or inspections. The British design is a "short can" that will allow maintenance to be performed without unfastening and moving the EAPS. The FCT project contract was awarded in September 2005 and test items were delivered one month later for operational testing on the CH-47D "Chinook" at the Army Aviation Test Center, Fort Rucker, Alabama, completing in December. In May 2006, the Army awarded an initial $11.5 million contract to Pall Corporation's subsidiary in New Port Richey, Florida, for the first increment of Short Can EAPS to replace the CH-47 fleet Long Can EAPS units. An estimated $7.5 million in development costs and $14.4 million in operational life-cycle and engine replacement cost savings were achieved by utilizing the FCT approach to meeting this vital Army requirement.

Laser Marksmanship Training System "Hummerbook" – Republic of Korea – 2005

The Army National Guard Training Division and the Army's Product Manager for Ground Combat Tactical Trainers in Orlando, Florida, evaluated the "Hummerbook" from *Seoul Standard Co., Ltd. of the Republic of Korea*.. Technical support for the FCT project was provided by MPRI/Beamhit, Inc. of Columbia, Maryland, the developer of the Army's Laser Marksmanship Training System (LMTS-E2). The Korean product is a ruggedized scoring device suitable for harsh environments which will environmentally enhance LMTS evolution from an indoor training system to an outdoor tactical engagement simulation system, a major leap forward for National Guard units facing challenging scenarios during mobilization and deployment training. The FCT test articles were delivered in February 2006 to MPRI/Beamhit for validation and integration into LMTS and, in April 2006, were fielded for evaluation to the Joint Forces Training Center, Camp Shelby, Mississippi; Clarks Hill South Carolina Army National Guard Training Center, Plum Branch, South Carolina; Army National Guard, Aberdeen, Maryland; and to the National Guard Training Center at Fort Indiantown Gap, Pennsylvania. The formal FCT evaluation testing was successfully completed in late FY 2006, two years ahead of the planned scoring system replacement, with Hummerbook exceeding the expected capability for outdoor environment use. Additional procurements by the National Guard Bureau training locations are being considered.

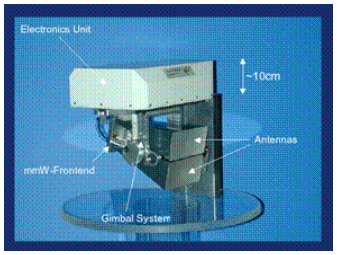
Laser Obstacle Detection System (joint with U.S. Special Operations Command) – Germany – 2002

The Army Communications and Electronics Command, Night Vision and Electronic Sensors Directorate at Fort Belvoir, Virginia, led a joint Army-U.S. Special Operations Command team in the evaluation of a Helicopter Laser Radar developed by the *European Aeronautic Defence and Space Company (EADS)-Dornier Group of Germany.* In use at the time by the German Border Patrol, "HELLAS" was considered to be suitable for integration on Army and Special Forces aircraft platforms to meet U.S. requirements for improved aircrew safety by detection and timely warning of hazards such as poles, trees, wires, and other hard-to-detect obstacles. Test article contracts were awarded to EADS-Dornier in early FY 2002, and flight tests were conducted by the Army Aviation Applied Technology Directorate at Fort Eustis, Virginia, during FY 2003. All FCT testing was completed in late FY 2003 and, although the system performed as advertised, it did not meet stringent weight requirements. In FY 2005, a down-sized version of HELLAS was examined by the primary Special Forces users, the 160th Special Operations Aviation Regiment; however, the German candidate was not able to meet the threshold system weight requirement and no procurement decisions were made. The Army officially closed out the project in September 2005.

Lightweight Smoke Generator (Visual/Infrared Liquid Obscurant) – Poland – 2004

Originally, the Army's Joint Project Manager for Obscuration, Aberdeen Proving Ground, Maryland, intended to evaluate a camouflage smoke generator developed by *PZL Rzeszow of Poland* that was reported to be significantly lighter than the U.S. Army's M56 Smoke Generating System. A promising aspect of the Polish system was its combination of fog oil and infrared obscuring particles in one solution to provide visual/infrared obscuration, in contrast with the M56 system which separately disseminates fog oil and graphite. Despite the good efforts of the U.S. Embassy in Poland, acquisition of a smoke generator test article from the manufacturer or the Polish Army for evaluation was unsuccessful. In fourth quarter FY 2004, however, test quantities of the Polish obscuring liquid were contracted for with *Unitronex Corporation, Saint Charles, Illinois,* and a field evaluation was completed at the Aberdeen Proving Ground-Edgewood Area test facilities in Maryland, using a modified M56 generator. It was determined that the Polish obscurant liquid is not a suitable replacement for the fog oil and graphite obscurants that the M56 system currently uses, and will not be procured.

Miniature Synthetic Aperature Radar (MiniSAR) – Germany – 2005



This project was intended to evaluate the " MiniSAR," developed by the *European Aeronautic Defence and Space Company (EADS-Deutschland GmbH-Defense Electronics)*, a miniaturized Synthetic Aperture Radar sensor system which produces radar images in near-photographic quality in day and night conditions. The Army's Program Manager for Robotic and Unmanned Sensors (PM-RUS) at Fort Monmouth, New Jersey, planned to conduct the test program with system integration support from AAI Corporation in Hunt Valley, Maryland, to determine the Mini SAR's suitability and operational effectiveness for use on the Army's Shadow 200 Tactical Unmanned Aerial Vehicle (TUAV). Following test program planning and analysis of the German system, the project was terminated by the Army in late FY 2005 due to the lack of a firm path to procurement and questionable Army requirement.

Regenerative Drive System – Australia – 2004

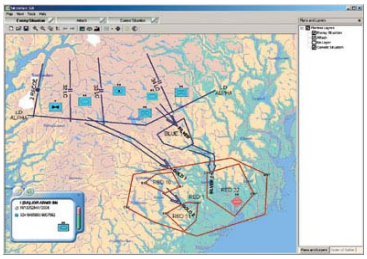
The Product Manager for Medium Tactical Vehicles, Tank Automotive and Armaments Command evaluated a hydraulic hybrid technology developed by *Permo-Drive Technologies Ltd of Australia* to capture energy lost during braking of large vehicles, such as the Army's Family of Medium Tactical Vehicles (FMTV). The Australian technology captures braking energy, stores it in a hydraulic accumulator, and releases it to enhance dash capability and fuel economy while improving braking performance and brake life. Engineering qualification, performance, and durability testing on an M1078A1Vehicle was conducted from April 2005 to June 2006 at the Churchville, Munson, and Perryman test areas of Aberdeen Test Center, Maryland. Analysis of the test data has been completed and the FCT closeout and technical reports, and procurement decision, are pending.

Small Bundle Resupply System – Canada, Republic of Korea, Netherlands – 2003

This project evaluated compact guidance and control units developed by two competing vendors: *MMist of Canada and Koable of the Republic of Korea* as alternatives to the Parafoil Aerial Delivery System – Extra Light. If successful, the project was intended to provide precise high-altitude delivery of small bundles and airborne troops for missions such as re-supply operations in urban terrain, delivery of small robots and sensors, counter-terror operations, and humanitarian support. The Air Drop/Aerial Delivery Directorate of the Army's Natick Soldier Center in Massachusetts conducted the test program at Yuma Proving Ground, Arizona, and at the Red Lake Drop Zone in Kingman, Arizona. A candidate delivery system presented by Dutch Space of the Netherlands was not selected for the FCT Program; however, a

Cooperative Research and Development Agreement (CRADA) was established to investigate the Dutch technology further. Formal testing for this FCT project was completed in FY 2006 with the Canadian system performing satisfactorily. Final close-out of the project by the Army is awaiting delivery of the modified Korean system to the Natick Soldier Center for re-analysis. Any candidate meeting requirements will be qualified for the full and open competition of the Precision Extended Glide Airdrop Systems (PEGASYS) for the appropriate weight class.

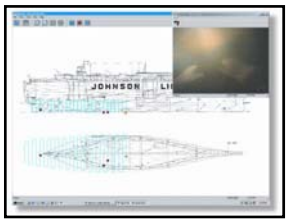
Unit of Employment Battle Command – Denmark, Netherlands – 2006



The Program Integration Office for Battle Command at Fort Leavenworth, Kansas, evaluated mature battle command system software developed by *Systematics of Denmark and Capgemini of the Netherlands*, and in use in their respective countries, for applicability as a real-time battlespace command and control tools for training combat commanders. The objective of the project was to employ the candidates at the Army's Training and Doctrine Command Battle Command Battle Laboratory as surrogate Army Battle Command Systems for Unit of Employment and exercises. The test article contract was awarded in May 2006. Testing was completed at Fort Leavenworth, Kansas, in fourth quarter FY 2006. The Danish software met the standards for use within battle lab experiments and joint/coalition projects. As a result of this FCT, a contract was awarded to Systematics for systems administration and operator training using the current system procured for the evaluation. Future contract awards to Systematics are to be to be determined. The Dutch software was not evaluated in the FCT project; however, acquisition of Capgemini test items is the subject of an agreement being discussed between the U.S. and the Netherlands.

NAVY

Diver Hull Inspection and Navigation System – Australia – 2005

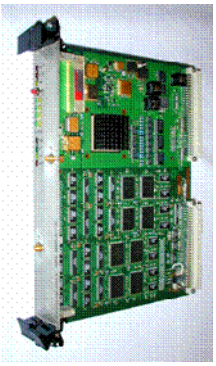


The Explosives Ordnance Disposal Program Office, at the Naval Surface Warfare Center, Panama City, Florida, evaluated an underwater survey system developed by *Advanced Technology Systems of Australia* to determine its suitability for use by U.S. Naval forces conducting Explosive Ordnance Disposal diving operations in support of Navy Force Protection, which include searches and inspections of ship hulls, moorings, and pier-side berths for planted explosives or other dangerous items. The Australian "Spot-On Ship Hull Survey System," currently in use by the Swedish Coast Guard, is open architecture, combining video streams from multiple sensors, underwater positioning data and the ship's hull schematics to accurately track and record the diver's underwater movements. Initial integration verification and performance evaluations were successfully conducted at the Australian Maritime Museum in Sydney, Australia, in August 2005 with support from the Australian Navy's Clearance Dive Team One and local police divers. Beginning in first quarter FY 2006, FCT diving exercises with the Australian system were conducted on the cargo ship "Del Monte" at the Naval Amphibious Base, Little Creek, Virginia. All FCT testing was completed in fourth quarter FY 2006 and the test data is under review.

High Frequency Adaptive Antenna Receive System Replacement – Canada – 2002

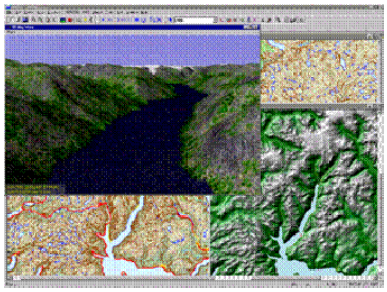
The Space and Naval Warfare Systems Center in Charleston, South Carolina, evaluated a high-frequency adaptive antenna system developed by *SED Systems, Saskatoon, Saskatchewan,* to meet a Navy requirement to improve the quality, range, and anti-jam performance of Link-11 ANDVT secure voice and HF radio communications with maritime patrol and surveillance aircraft. The project was coordinated with Commander, Naval Patrol and Reconnaissance Forces, Atlantic and Pacific Fleets. A test article contract was awarded to SED Systems in January 2002. Testing, including factory acceptance tests at the vendor's facility in Saskatoon and laboratory testing and field trials in Charleston, began in September 2002. The FCT test program was completed in FY 2004, with three systems, inclusive of the test article, being procured and placed in operation at the Navy's Tactical Support Communication Centers at Naval Air Station, Brunswick, Maine, and Naval Computer and Telecommunications Station, Jacksonville, Florida. Software-related issues in the final operational tests resulted in a decision to place future procurements on hold. No follow-on procurements are anticipated at this time.

Improved Specific Emitter Identification System – United Kingdom – 2003



The Space and Naval Warfare Systems Center, San Diego, California, evaluated National Security Agency (NSA)-compliant technology alternatives developed by *QinetiQ of the United Kingdom*, as compared to the U.S. specific emitter identification processors currently in Navy use for passive identification and fingerprinting of emitters in naval applications. Both maritime and land-based emitters were used to determine the capabilities of the British system. Test support for the project was provided by the Navy's Center for Naval Analyses, Alexandria, Virginia.
From April through June 2003, laboratory tests were completed at Applied Power Technologies Inc., Columbia, Maryland, maritime tests were accomplished by the Naval Research Laboratory, Chesapeake Bay Detachment, and land-based testing was conducted at the China Lake Electronic Combat Range in Ridgecrest, California; and environmental testing was conducted in FY 2005. The successful result of the FCT addresses the joint service need for more accurate locating and tracking information for the warfighter, as well as for supporting efforts involving merchant shipping, counter-terrorist, and counter-drug activities. In FY 2006, QinetiQ was awarded a potential maximum $6.1 million contract for up to 32 of its specific emitter ID systems. As of the end of FY 2006, two systems have been delivered. An estimated $14 million in development cost avoidance was achieved through this FCT project, with approximately four years accelerated fielding.

MARIA Mapping Application (previously named Tactical Geographic Information System-Maria) – Norway – 2001



The Space and Naval Warfare Systems Command evaluated a software-based command and control system developed by *Teleplan AS of Norway* that provides superior battle-space awareness through the rapid display of geographic imagery and positional information on friendly, neutral, and enemy units. The system provides advanced planning and decision aids, such as communication and emitter propagation analysis tools. If successful, the FCT project would have the added benefit of increasing interoperability with U.S. allies. The objective was to integrate MARIA into the Navy's Global Command and Control System-Maritime (GCCS-M) or the GCCS Integrated Imagery and Intelligence program. After two years of initial FCT evaluation, the FCT was re-structured to coincide with emerging changes to the GCCS-M requirements of Commanders U.S. Atlantic and U.S. Pacific Fleets and, in mid-FY 2004, central project execution was transferred to the Fleet. A test article contract was awarded in first quarter FY 2005 to Teleplan through its U.S. representative, *Native American Industrial Distributors, Inc.* and the test program was completed in FY 2006. Fleet Forces Command has no plan for future procurement of MARIA in view of mapping interface issues identified during testing, and the results of a cost/benefit analysis conducted to implement MARIA into an operational environment.

Mine Countermeasures (MCM) Small Unmanned Underwater Vehicle – Iceland – 2004

The Program Executive Officer for Littoral and Mine Warfare, Naval Sea Systems Command, evaluated the capabilities of a small unmanned underwater vehicle (UUV) designed for operations in the very shallow water zone (10 to 40 foot depth). The foreign candidate was the "GAVIA" developed by *Hafmynd of Rekjavik, Iceland*, which is operational with the Icelandic Marine Research Institute and the University of Iceland. GAVIA incorporates several features that are not fielded by domestic producers, but have been identified as features needed for the UUVs to successfully operate and survive in a mine countermeasures environment. This type of small underwater vehicle can be used to search coastal areas and identify hazards to naval operations in preparation for amphibious assault, force protection, and harbor security operations. Technical test support for the project was provided by the Space and Naval Warfare Systems Center in San Diego, California, and Naval Special Clearance Team One UUV Platoon in Coronado, California. A contract was awarded to Hafmynd in May 2004 for fabrication of GAVIA test units for the Navy evaluation. Due to unforeseen production delays, the Navy revised the project schedule to allow the contractor more time for in-water checkout of the assembled system. During testing in FY 2006, numerous component issues, software anomalies, and other reliability issues were reported. As a result, it was determined the system was not sufficiently mature for Fleet introduction.

Mobile Acoustic Support System (MASS) - Canada – 2004

The Space and Naval Warfare Systems Center, Charleston, South Carolina, evaluated a mobile analysis system developed by *General Dynamics-Canada* and in service with Canadian, Australian, and British forces. The goal was to meet a Navy requirement to replace obsolete equipment employed for Post Flight Analysis of sonobuoy (underwater microphone) acoustic data recorded on Maritime Patrol Reconnaissance Aircraft conducting anti-submarine warfare missions. The MASS system was designed to operate from fixed shore sites, deployed remote areas, and onboard ships. Also under evaluation in the project was a domestic in-production system presented by *BBN Technology Solutions, Cambridge, Massachusetts.* The FCT test program was completed in August 2005. Test results determined neither met Fleet requirements.

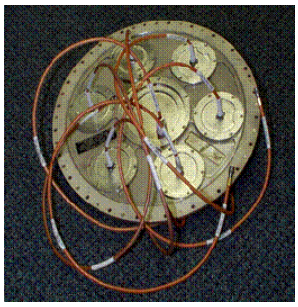
Next Generation Underwater Breathing Apparatus – Canada, United Kingdom – 2005

The Explosives Ordnance Disposal Diving Systems Office, Naval Sea Systems Command, at the Naval Surface Warfare Center in Panama City, Florida, evaluated state-of-the art diver life support equipment developed by *Carleton Life Support, Inc. of Mississauga, Ontario* (the VIPER) and *Divex, Ltd. of the United Kingdom* (Stealth EOD-M) to determine their suitability as a possible replacement for MK16 diving equipment used by U.S. Naval Forces in underwater Explosive Ordnance Disposal mine countermeasures, naval special warfare missions, amphibious assault preparations, and harbor security. The two candidate equipments were in use by numerous NATO countries and showed promise of enhancing diver safety, mission effectiveness, and interoperability with NATO and coalition partners. A domestic candidate presented by *Carleton Technologies of Orchard Park, New York,* was also evaluated with project sponsor funding. Test support for the project was provided by Explosives Ordnance Disposal Group Two. Based on the FCT test data, the U.S. solicited proposals from Divex and Carleton Technologies (domestic contractor); however, both contractors failed to meet requirements stated in the solicitation. As a result, the U.S. government is pursuing a limited sole source contract with a domestic candidate contractor for potential product improvements to the existing Navy MK-16 Mod 1 system.

Replacement Structures for Aircraft – Poland – 2003

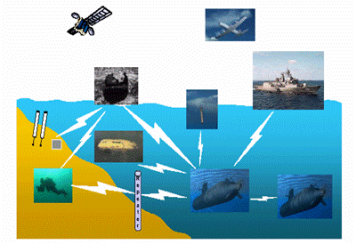
The Navy's F-14 Program Manager, Structures Division, at the Naval Air Warfare Center, Patuxent River, Maryland, qualified *PZL-Swidnik of Lublin, Poland*, as an approved source for the manufacture of aluminum honeycomb panels and sub-structures to support in-service, out-of-production aircraft. The Polish company was teamed with *Alcore, Inc. of Edgewood, Maryland*, with manufacturing support from *Pryer Machine and Tools, Tulsa, Oklahoma and Aero Fabricators, Dallas, Texas*. The immediate objective of the project was to provide a cost-effective solution to the warfighter for the replacement of flight control surfaces and sub-structures on F-14 "Tomcat" and EA-6B "Prowler" aircraft, which are no longer in production and for which parts are no longer available from the original manufacturer. Test support for the project was provided by Aurora Flight Sciences in Manassas, Virginia. Scheduling and arrangements for direct contract negotiations in Poland with PZL-Swidnik authorities were hampered by combat operations in Afghanistan and Iraq; thus, an initial project acquisition contract was not finalized until third quarter FY 2004. The FCT test results conclusively demonstrated that *PZL-Swidnik* was more than capable of establishing an assembly line and performing large-scale fabrication of the transmitter bay access panel assembly. This included a complete and comprehensive understanding of all processes and specifications unique to the F-14 requirement. Unfortunately, the project was prematurely ended due to the accelerated retirement of the F-14.

Shipboard Anti-Jam GPS Antenna – United Kingdom – 2003



The Program Executive Office C4I of the Space and Naval Warfare Systems Center, San Diego, California, evaluated the GAS-1 Global Positioning System (GPS) anti-jam antenna for Navy surface ship applications. The GAS-1 is produced by *Raytheon Systems Ltd. (Cossor), Harlow, United Kingdom*, and is mounted on large U.S. Air Force aircraft. GPS provides continuous, worldwide, precise navigation to unlimited users in all weather conditions. The encrypted military code ensures that the U.S. military and its allies have a superior navigation capability; however, the GPS signal from the satellites is of very low power and is vulnerable to jamming. The FCT project built on continuing sponsor-funded tests of the British system utilizing an Avenger class Mine Countermeasures ship (MCM) and a Landing Craft Air Cushion (LCAC) platform. Particular emphasis was placed on electromagnetic compatibility in the dense electronic environment of a Navy battle group. The FCT evaluation, including at-sea tests aboard the U.S.S. Pearl Harbor (LSD-52) and an LCAC platform, was successfully completed in FY 2004. The results supported procurements and deployment of 125 units worth approximately $5.1 million. Due to the next generation technology emerging, no additional procurements are anticipated. An estimated $1 million in development cost avoidance was achieved through the FCT approach to meeting the Navy requirement.

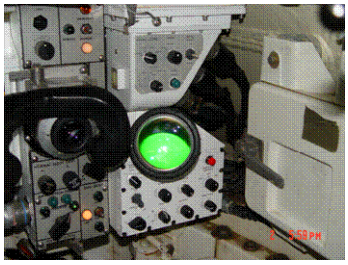
Underwater Communication & Tracking System for Submarines – Australia – 2003



The Program Executive Officer, Submarines-Combat Systems Program Office, Naval Sea Systems Command, Washington, DC, evaluated the suitability of an underwater digital communication system designed for the exchange of real-time position information data between submarines participating in open ocean exercises. Developed by *Nautronix Maripro*, the "HAIL" (Hydro-Acoustic Information Link) is a low-data-rate digital spread spectrum communications system for submarines using installed acoustic transmitter/receivers. The system had been demonstrated previously with great success in joint U.S.-Australian exercises. Technical test support and coordination for the project was provided by the Commander of Submarine Forces, U.S. Pacific Fleet, the Naval Undersea Warfare Center (NUWC) Keyport Division, Washington, and Commander, Operational Test and Evaluation Force. The Australian system was installed at the underwater instrumented Pacific Missile Range Facility-Barking Sands, Kauai, Hawaii, and testing was conducted successfully in January 2005. Currently, the Navy is reviewing integration options for inclusion of the HAIL functionality into the Navy's AN/BQQ-10A-RCI sonar system.

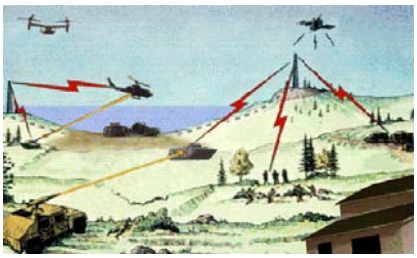
MARINE CORPS

Biocular Image Control Unit for M1A1 Main Battle Tank – United Kingdom – 2004



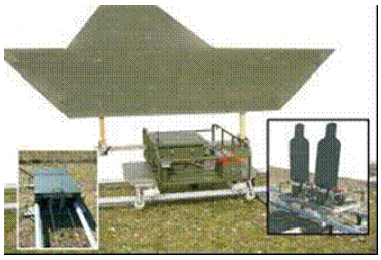
The Project Office M1A1 Tank, Marine Corps Systems Command Armor & Fire Support Systems at Quantico, Virginia, evaluated the Biocular Image Control Unit (BICU) developed by *Brimar of the UK* for application to the Marine Corps' M1A1 Firepower Enhancement Program (FEP). The BICU directly supports tank crew situational awareness by enabling 2nd - generation Forward Looking Infrared (FLIR) imagery to be displayed in the Gunner's Primary Sight monocular display as well as in the biocular display. The BICU significantly reduces gunner's fatigue and enables the crewman to utilize the best features of direct view optics and FLIR imagery to acquire and engage targets. An accelerated integration and test program was conducted at the Army Night Vision and Electronic Sensors Directorate at Fort Belvoir, Virginia; Aberdeen Test Center, Maryland; Eglin AFB, Florida; Yuma Proving Ground, Arizona; Twentynine Palms, California; and at Raytheon Corporation facilities in McKinney, Texas. In December 2004, Milestone C was achieved and the Marine Corps awarded a contract for 192 units. The current procurement total is valued at approximately $6.7 million to Brimar for full-rate production of 450 BICUs to be deployed with the Marine Corps Tank Battalions in Iraq. With this successful project, an estimated $1.5 million in development cost avoidance and anticipated $4.1 million in production cost savings were achieved.

Deployable Instrumentation for Marine Air Ground Task Force (MAGTF) Training – Sweden, Switzerland – 2003



The Program Manager, Training Systems-Ranges and Instrumentation, Marine Corps Systems Command, Orlando, Florida, evaluated mobile Range Instrumentation Systems developed by *Saab Training Systems of Sweden* and *RUAG (formerly Swiss Electronics) of Switzerland* to meet Marine Corps requirements to integrate current deployable training devices used for force-on-force training. The evaluation demonstrated the candidates' abilities to provide track reporting, engagement adjudication of simulated direct and indirect fire (including battlefield audio and visual cues), and recording of all movement and engagement criteria for use in exercise after-action reviews. Test article contracts were awarded in fourth quarter FY 2003. The FCT test program included operational field tests by Marine Corps infantry units at Marine Corps Base, Quantico, Virginia, and Camp Pendleton, California. While both systems were qualified under the evaluation, the *Saab Training Systems* candidate exhibited greater radio coverage, more accurate position verification, better interoperability with the current MILES 2000 equipment, and an easier logistics footprint. However, due to the urgent need for realistic urban warfare training, the USMC Deployable Instrumentation for MAGTF Training System does not now meet battlefield needs and will not be procured in its current form. The FCT Program is addressing this new development by way of the "Deployable Instrumented Training System for Urban Warfare" project (please see "New FCT Projects for FY 2007", later in this review).

Deployable Multi-Purpose Moving Target System – Germany – 2004

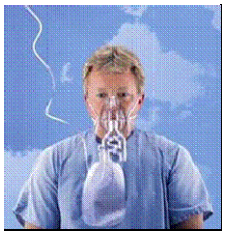


The Marine Corps Program Manager for Training Systems, Marine Corps Systems Command, Orlando, Florida, evaluated a deployable, moving, pop-up, automated, marking and targeting system developed by *Thiessen Training Systems GmbH of Germany* to enable Marines to train as they fight and enhance proficiency with anti-armor engagement tactics. Technical support for the project was provided by the Marine Corps' Warfighting Laboratory at Quantico, Virginia. The test article contract was awarded in April 2004. In fourth quarter FY 2004, two completed deployable target systems were delivered to Thiessen's U.S. facility in Chiefland, Florida, where operational testing was conducted in April 2005, including engagement testing of the German system with the Marine Corps' MILES 2000 Tactical Engagement Simulation System and the Special Effects Small Arms Marking System (SESAMS) training system. All testing was successfully completed in November 2006 and sixteen systems worth $950, 000 were procured and fielded for operational use at Camp Lejeune, North Carolina. An estimated $500,000 in development cost avoidance was achieved via this successful FCT project, with accelerated fielding of 6 months to one year.

Eye-safe Laser Rangefinder for M1A1 Tank – Germany, United Kingdom – 2003

The Marine Corps Systems Command, Quantico, Virginia, in conjunction with the Marine Corps Operational Test and Evaluation Activity at the Aberdeen Test Center, Maryland, and the Army's Night Vision and Electronic Sensors Directorate at Fort Belvoir, Virginia, evaluated eye-safe lasers developed by *Zeiss Optronic of Germany* and *Thales (formerly AVIMO) of the United Kingdom* to meet requirements of the Marine Corps' M1A1 Battle Tank Firepower Enhancement Program (FEP). The eye-safe laser is expected to increase the range performance of the FEP by 2000 meters and was tested for range, beam divergence, output energy, field of view, and other parameters used to locate distant targets. Test article contracts were awarded to both vendors in third quarter FY 2003 and, in third quarter FY 2004, laboratory testing was completed at the vendors' facilities in England and Germany. The units were integrated into the M1A1 Main Battle Tank and evaluated at Picatinny Arsenal, New Jersey. During FY 2005, developmental tests were conducted at Fort A.P. Hill, Virginia; Aberdeen Test Center, Maryland; and Yuma Proving Ground, Arizona. After successful evaluation of the *Zeiss Optronic* candidate, the Marine Corps executed a procurement contract for 450 units valued at $13.63 million. The entire fleet of M1A1 tanks will eventually be outfitted with these units. An estimated $2 million in development cost avoidance, anticipated procurement savings of $3 million, and operational and life-cycle cost savings of $500,000 were achieved from this successful FCT effort.

Highly Mobile Oxygen Supplementation System – Canada



The Combat Equipment & Support System, Nuclear, Biological, & Chemical Defense Systems, Marine Corps Systems Command at Quantico, Virginia, evaluated a lightweight battery-powered oxygen supplementation system which is fielded to Canadian Armed Forces and is in use within the Canadian health system. Developed by the *University Health Network of Toronto*, the "HMO^{2}SS" is an oxygen-breathing mask that provides increased oxygen therapy in mass casualty medical care, lasting 8 to 12 times longer than current masks. In order to increase transportation safety and ease logistics, the HMOSS provides oxygen to wounded warfighters in a combat environment without the use of oxygen tanks or large oxygen generating systems. FCT testing was performed by *Thornhill Research of Canada* and *Defense Research Development-Canada*, with the HMOSS satisfactorily meeting all test parameters. Although considered a successful project, due to a change in the Marine Corps requirement for ventilated oxygen, the HMOSS can not meet current battlefield needs and will not be procured in its current form. The FCT Program is addressing these new requirements with the initiation of the "Mobile Oxygen Ventilation and External Breathing Apparatus" project (please see "New FCT Projects in FY 2007" later in this review).

M16A2/M4 Training Bolt – Canada

The Marine Corps Program Manager for Training Systems, Marine Corps Systems Command, Orlando, Florida, successfully evaluated the M16A2/M4 training bolt manufactured by *SNC Technologies of Canada* which is designed to fire the Special Effects Small Arms Marking System (SESAMS) training cartridge. The Canadian item, which is in service with Canadian, Japanese, Swedish, and British Armed Forces, replaces the current SESAMS upper receiver for the M16A2 and M4 Service Rifles and allows Marines to fire at short range low-velocity marking ammunition for urban terrain training. Technical test support for the project was provided by the Naval Surface Warfare Center in Crane, Indiana, and operational test support by the Marine Corps' Program Manager for Training Systems at the Ordnance Test Facility, Marine Corps Base, Quantico, Virginia. The test article contract was awarded to SNC Technologies in second quarter 2005. After a successful evaluation, the Marine Corps procured 19,968 training bolt kits valued at approximately $3.72 million, avoiding $650,000 in development costs and achieving and anticipated $3 million in procurement costs.

Mounted Cooperative Target Identification System – United Kingdom – 2004

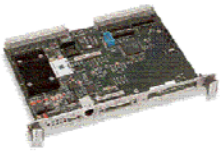
The Marine Corps Systems Command, Combat ID Project Office, Quantico, Virginia, evaluated a battlefield target identification system in production by *Thales Missile Electronics of the United Kingdom* which will provide a positive-encrypted identification of friend or unknown on the battlefield, thereby reducing incidents of fratricide. The system will be bore-sighted through the gunner's primary sight on Marine Corps M1A1 Tanks, Light Armored Vehicles, and Expeditionary Fighting Vehicles. This successful FCT will allow the Marine Corps to train and fight with positive identification capability of friends in the joint and coalition combat environments. The test article contract was awarded to Thales Missile Electronics in May 2004. Design proof testing and environmental and stress screening tests were completed at the vendor's facility in Basingstoke, England, in July and August 2004, and test articles were delivered to the Naval Surface Warfare Center in Crane, Indiana, in January 2005 to begin the test program as part of an ongoing Combat ID/Advanced Concept Technology Demonstration (ACTD) effort. After the successful technology demonstration, the Army-Marine Corps Board met in March 2006 and decided to proceed with further development of the MCTIS as a program of record.

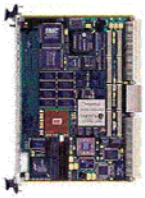
Special Effects Small Arms Marking System (SESAMS) – Canada – 2003

The Program Manager, Training Systems-Ranges and Instrumentation, Marine Corps Systems Command, Orlando, Florida, in coordination with the Marine Corps Operational Test and Evaluation Activity, and the Marine Corps Warfighting Laboratory at Quantico, Virginia, evaluated the safety and integration suitability of *SNC Technologies (Simunitions)* 5.56mm linked low-velocity training munitions and weapon conversion kit for the M249 Squad Automatic Weapon. SESAMS is a user-installed weapons modification kit that allows the individual Marine to fire low-velocity marking ammunition at short range while precluding the weapon from firing live ammunition. Technical testing was completed with favorable results at the Naval Surface Warfare Center in Crane, Indiana, to verify that the training munitions will not cause any bodily harm and to ensure that the converted M249 will not be capable of firing live ammunition. In convoy operations training exercises at Fort Carson, Colorado, members of the 1st Space Battalion remarked, ***"…it was a lot more realistic training than the MILES equipment…there is no dispute as to whether you get hit or not…there is a colored mark on your clothes, equipment, or body armor."*** SEASAMS met Marine Corps requirements and, in FY 2005, was approved for fielding. The Marine Corps has procured 1,980 M249 conversion kits and 91,000 rounds with a total estimated cost of $1.65 million. By fielding the SESAM, the Marine Corps avoided $10 million in developments costs, with procurement cost savings of $20 million anticipated, as are $10 million in life-cycle cost savings.

AIR FORCE

Guidance Components for Missiles – Canada, France, Germany, Israel, Sweden, United Kingdom – 2004





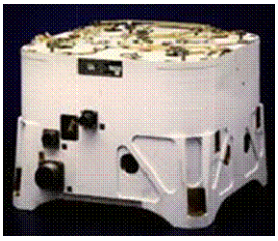
The Air Force's Rocket Systems Launch Test Program evaluated the performance of missile guidance components developed by *Curtiss Wright (formerly DY4/Force Computers) of Canada, Thales Computers of France, SBS (OR) Technologies of Germany, Aitech Defense of Israel, Saab Ericsson Space of Sweden,* and *Radstone Technology of the United Kingdom.* Domestic components developed by *Honeywell* were also evaluated. Improvements to basic guidance and control (G&C) technology and miniaturization of components have potential to enhance the performance of U.S. non-strategic missile systems. The project was conducted by the Space and Missile Systems Center Detachment 12, Air Force Space Command, assisted by the Air Force Research Laboratory at Kirtland AFB, New Mexico, with technical oversight by Northrop Grumman Corporation and test support by Orbital Sciences

Corporation in Chandler, Arizona, and L3 Coleman Aerospace. Following initial technical examination during FY 2004, the French, Israeli, and Swedish candidates were dropped from the project. Test article contracts were awarded to *Radstone Technology* and *Curtiss Wright* for delivery to Utah State University in Logan, Utah, for performance testing. Both vendors' products provided sufficient performance to potentially meet user requirements and both were referred for environment qualification testing that began in mid-2005. Further evaluation of the Canadian components, however, was put on hold in third quarter FY 2005 due to increased product and associated test costs. The evaluation of Radstone Technology's RT4 chassis with IMP1A processor card was terminated in March 2006 due to environmental and performance test failures of the candidate. No Air Force procurements are anticipated as a result of this project.

MEMS Inertial Measurement Units (IMU) – United Kingdom – 2004

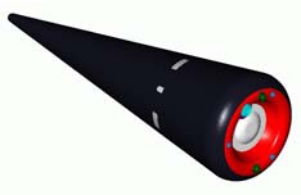
The Air Force's Rocket Systems Launch Test Program evaluated the Micro Electro-Mechanical Inertial Measurement Unit (SiIMU01/02) developed by *BAE Systems of the United Kingdom.* The British unit promises significant size, weight, and cost advantages over technologies currently employed in U.S. Intercontinental Ballistic Missiles, Reentry Vehicles, and precision weapons requiring an IMU. A domestic MEMS IMU developed by *Honeywell* was also evaluated. IMU costs are a major contributor to the high overall costs of a particular guidance system and the IMU's relative large size has driven the guidance system to be a significant part of payload mass lifted by the propulsion system, thereby reducing the available mass for the lethal portion of the payload. The project leveraged emerging global MEMS technology which has been demonstrated in areas such as telecommunications, automobiles, and biotechnology. The project was conducted by the Space and Missile Systems Center Detachment 12, Air Force Space Command, assisted by the Air Force Research Laboratory at Kirtland AFB, New Mexico. Test support was provided by Orbital Sciences Corporation in Chandler, Arizona; L3 Coleman Aerospace; Draper Laboratories, Cambridge, Massachusetts; and the 46th Test Squadron at Holloman AFB, New Mexico. The test article contract was awarded in fourth quarter FY 2004. In February 2006, Coleman Aerospace successfully completed all qualification testing of the SiIMU02 (unit D067), including vibration, shock, thermal, and acceleration tests. In April 2006, the U.S. Army awarded *BAE, teamed with Northrop Grumman of the U.S.,* a three-year contract valued at $45.7 million to begin production of a derivative of the SiIMU02 MEMS IMU qualified in this FCT project, for the Army's Advanced Precision Kill Weapon System-II (APKWS-II) Missile Program. This represents the first large-scale use of MEMS-based IMUs for the U.S. Armed Services. Through the use of the FCT Program approach, an estimated development cost avoidance of $34 million was achieved, and production cost savings of $44 million over the three-year contract are anticipated.

Missile Reserve Battery Replacement – France, Japan, Republic of Korea – 2003

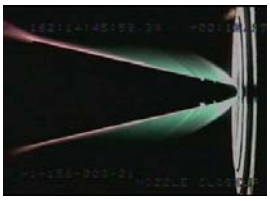


The Air Force's Rocket Systems Launch Test Program evaluated battery cells developed by *Saft Alcatel of France* and *Japan Storage Battery (JSB), Ltd. (Nippondenchi) of Japan* and *SKC of the Republic of Korea* for use in missile/booster environments. With the decline of military missile development and the downsizing of strategic forces, several U.S. battery manufacturers for these applications have discontinued production, leaving *EaglePicher of Phoenix, Arizona* as the only qualified U.S. source of batteries for missile/booster applications. The intent of the project was for EaglePicher to assemble the batteries with cells from qualified candidate sources incorporating the newer technologies. The Air Force Space and Missile System Center's Peacekeeper Reuse Program Office at Kirtland AFB, New Mexico, conducted the test program with test support by the Naval Surface Warfare Center, Crane, Indiana. Test articles were delivered to Crane in March and April 2004 and performance testing was completed in fourth quarter FY 2004 with positive results for all the candidates. The FCT evaluation demonstrated that the JSB, Saft, and SKC cells can handle the environments presented to the launch vehicles commonly used for these types of Air Force missions, and successfully introduced the space/launch vehicle communities to the viability of using Li-Ion technology. The Air Force will not directly procure the battery cells proven as part of this FCT project, but will encourage the launch vehicle industry to capitalize on the testing completed in this project, and to pursue further testing efforts to achieve flight qualification. After involvement in this FCT project, Orbital Sciences Corporation, initiated an internally-funded examination of Li-Ion batteries for use in future vehicle designs.

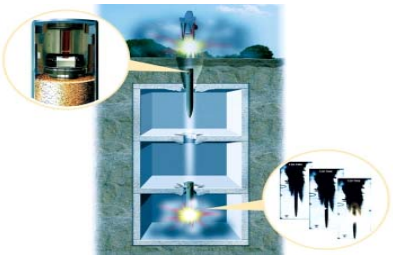
Rayon for Heatshield and Motor Nozzles – Austria, Belgium, France, Germany, United Kingdom – 2003



The Air Force's Rocket Systems Launch Test Program evaluated high-quality rayon from *Lenzing Technik of Austria, Fabelta of Belgium, Snecma Moteurs of France, Acordis of Germany,* and *Acordis of the United Kingdom* to meet requirements for use in high-temperature applications such as heat shields and rocket motor nozzles. There are no longer any domestic suppliers of aerospace-grade rayon for rocket nozzles and reentry heat shield thermal protection. The Air Force Space and Missile Center's Peacekeeper Reuse Program Office at Kirtland AFB, New Mexico conducted the test program. Cytec Industries, a U.S. company with expertise in processing rayon, was responsible for procuring the candidate fibers and overseeing production of the test samples. The FCT evaluation included arc jet testing at Arnold Engineering Development Center, Tennessee, in March 2004; mechanical properties testing on the candidate materials by SRI International in Palo Alto, California; and solid rocket motor nozzle testing by the Aerojet Corporation in Sacramento, California, on the top two candidates from the previous tests. All testing was completed in February 2005. Based on the successful FCT and a business decision by the Belgian company to eliminate its rayon production line, *Snecma C-2 and Acordis Enka* finished as the leading candidates for replacement rayon. The Reentry Vehicle Applications Systems Program Office at Hill AFB will be procuring some Snecma C2 and flying the material on a reentry vehicle aboard GT-190 scheduled for launch in March 2007.

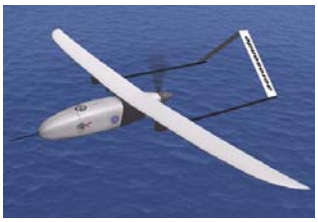


Void-Sensing Fuze – Germany – 2006



The Program Director, Cruise Missile Product Group at Tinker AFB, Oklahoma, evaluated a programmable void-sensing and layer-counting fuze currently in production by *TDW of Germany*. The fuze is for potential employment in the penetrating warhead of the Air Force's Conventional Air-launched Cruise Missile (CALCM) and/or the Navy's Tomahawk Cruise Missile in order to defeat hard and deeply-buried targets. The test articles contract was awarded in third quarter FY 2006 and FCT sled tests were successfully completed on 30 August 2006 at the Naval Air Warfare Center, China Lake, California. As a result, contracts were awarded to TDW's representative in the U.S., Kaman Aerospace, and to the Boeing Company, to repackage the German fuze for integration into the AGM-86D Block II CALCM. The expected procurement will be for 50 fuzes and modification kits for fielding in FY 2009.

Weather Scout UAV – Australia – 2005



The Weather Operations and Capabilities Directorate, U.S. Air Forces, Pacific at Hickam AFB, Hawaii, sponsored the evaluation of the employment and operational suitability of "Weather Scout," an unmanned weather-sensing air vehicle manufactured by Aerosonde Pty. of Australia, to meet U.S. Pacific Command requirements for improved tropical cyclone and target area weather reconnaissance. The FCT program contract was awarded to Aerosonde in August 2005 and initial flight tests were accomplished at Wallops Island, Virginia, in September by the Air Force Operational Test and Evaluation Command (AFOTEC), with oversight provided by the Air Force Reconnaissance Systems Wing, Wright-Patterson AFB, Ohio. Phase II flights were conducted in Guam, the Marianas, during October-November 2005. Phase III flights planned for Alaska during FY 2006, and additional testing, were held in abeyance based on preliminary determinations that the Australian air vehicle had insufficient range to reach its intended target area during storm formation. Decisions on further project execution are awaiting completion of the AFOTEC test report.

Wideband Klystron for E-3 AWACS – United Kingdom – 2000

The Air Logistics Command at Tinker AFB in Oklahoma evaluated a wide-band klystron power amplifier manufactured by *Thorn Microwave Division of the United Kingdom*. The then-current klystron power amplifier had a low mean-time-between-failure rate and was costly to repair. The British unit promised a 30-fold increase in reliability, increasing AWACS aircraft availability by 20 days. Technical support for the project was provided by Northrop Grumman, Dynamics Research Corporation, and Calabazas Creek Research in Saratoga, California. The project was approved and first funded in July 1999 with a test article contract awarded to TMD Technologies Ltd. in FY 2001. Two prototypes and two pre-production assets were introduced to limited factory qualification testing which began in FY 2004 and concluded in FY 2005. The TMD Technologies unit performed well across the E-3 AWACS bandwidth; however, additional work is required to fully satisfy Air Force specifications. The TMD effort never produced a working tube and the Air Force elected to procure another unit produced by L-3 Communications of the U.S.

U.S. SPECIAL OPERATIONS COMMAND

40mm Enhanced Grenade Launcher Module – Belgium, Germany – 2003

The U.S. Special Operations Command evaluated state-of-the-art grenade launcher modules manufactured by *FN Herstal of Belgium* and *Heckler and Koch of Germany* in a two-phased test program conducted by the Special Operating Forces Weapons Division of the Naval Surface Warfare Center in Crane, Indiana. The objective was to select a suitable launcher to replace the current M203 Grenade Launcher which is a single shot breech-loaded 40mm weapon designed especially for attachment to the M4 carbine or M16 rifle. The M203 is over 30 years old and is becoming logistically unsupportable. In October 2004, upon completion of the initial assessment of both candidates, the FN Herstal EGLM was down-selected for integration and final testing in the development of the new Special Operations Forces' Combat Assault Rifle (SCAR) (see SCAR FCT project, discussed below). Technical and operational testing of the Belgian EGLM proceeded during FYs 2005 and 2006 in conjunction with the SCAR FCT project. Low Rate Initial Production was approved in June 2006 and, initially, 196 EGLMs were contracted for. Another 6,227 will be procured during SCAR/EGLM Full Rate Production.

Advanced Family of Interfaces for Chemical-Biological Protective Clothing – Germany, Japan, Switzerland – 2004

This project evaluated promising new types of chemical protective (CP) garment closures and interfaces developed by *Dynat of Germany*, *YKK Universal Fasteners of Japan,* and *RiRi SA of Switzerland*. The emergence of Selectively Permeable Membrane and other barrier material technologies for CP garments has generated a need for enhanced methods of sealing the garment interfaces, especially at vulnerable interfaces with the wrist, ankles, zippers, and neck, as demonstrated in recent vapor and aerosol testing. The project was conducted by the Special Operations Forces' Warrior Protection Office at the Army Natick Soldier Center in Massachusetts, in conjunction with the Hazardous Materials Research Center at Battelle Memorial Institute in West Jefferson, Ohio, and the Research Triangle Institute (RTI) near Raleigh, North Carolina. In FY 2004, Kokatat, Inc. of Arcata, California, the manufacturer of the new Personnel Protection Ensemble (PPE), assessed the candidates for compatibility with the PPE design. The *Swiss RiRi* zipper was not technically ready and was dropped from the project. In late FY 2004, PPE suits with the *YKK ("FlexSeal")* and *Dynat ("TiZip")* candidates incorporated began aerosol and vapor penetration testing at RTI and Battelle, completing in March 2005. Both remaining candidates performed well in the aerosol tests. During vapor testing, due to poor performance, the *Dynat* product was eliminated. The *YKK* fastener performance was determined to be suitable to replace the standard zipper; however, the unit cost was prohibitive and it required additional labor to integrate it into the PPE. No procurement is planned; however, if fabrication and cost issues are later overcome, the *YKK "FlexSeal"* could offer an alternative for PPE development.

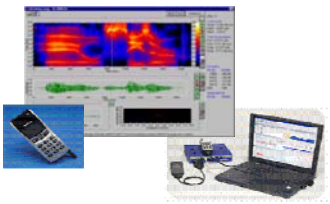
Amphibious Reconnaissance Insertion Vehicle – United Kingdom – 2006

The Naval Special Warfare Development Group (NSWDG) conducted technical and operational testing at its facilities in the Virginia Beach, Virginia, area to evaluate a high-speed amphibious vehicle developed by *Gibbs Technologies Ltd. of the United Kingdom.* The vehicle has the potential capability to insert Navy Special Warfare SEAL teams through the water from offshore, continue on land to conduct reconnaissance or direct action missions, and then return the teams through the water to the parent launch ship. The test article lease contract was awarded to Gibbs Technologies in May 2006. One month later the vendor delivered two test vehicles, two demonstration vehicles, a spare parts package, and maintenance personnel for performance tests that were conducted 10-28 June, ahead of schedule. The British vehicle met key technical performance parameters. Several areas were identified requiring modifications to improve military utility. U.S. Special Operations Command procurement plans are "on hold" since none of the vehicles tested are currently in production or available from the manufacturer for production. The British vendor is exploring licensing agreements with a number of companies to possibly produce the vehicles in the United States for both commercial and military applications.

Deployable GSM Cellular Network – Sweden (joint with Army) – 2004

This project evaluated a transportable cellular network developed by *Sony Ericsson of Sweden*, a third-generation Universal Mobile Telecommunications System (UMTS) capable of supporting up to 5,000 users and deployable worldwide as a stand-alone unit in support of mission requirements in austere environments. The project was focused on satisfying critical requirements of the Special Operations Forces Tactical Assured Connectivity and Joint Threat Warning Systems Programs, and the Army's Warfighter Information Network-Tactical (WIN-T) Program, providing the warfighter access to high-speed data communications. The Army Communications and Electronics Command at Fort Monmouth, New Jersey, conducted the test program in coordination with the U.S. Special Operations Command's Program Executive Officer for Intelligence and Information Systems at MacDill AFB, Florida. Test support was provided by the Navy's Space and Naval Warfare Systems Center in Charleston, South Carolina, and the Pennsylvania State University Applied Research Laboratory, State College. Testing at Fort Monmouth was completed in third quarter FY 2006 after being delayed by the deployment of test personnel and the test article in support of the 82nd Airborne Division and Federal and local agencies during Hurricane Katrina relief efforts. The system failed to meet size, weight and power requirements. No procurements are planned for the Swedish system, as tested. Rather, a follow-on FY 2007 FCT project has been initiated (*Lightweight Deployable UMTS Communications System)* which will evaluate and certify a down-sized Ericsson UMTS to provide the "on-the-move" capability required for Special Forces and similarly deployed conventional forces.

Global Cellular Phone System Optimization – Canada, Sweden, United Kingdom – 2003

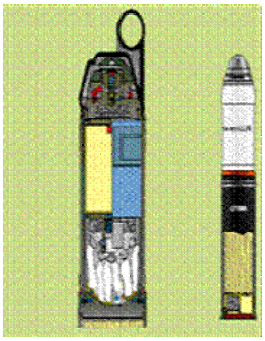


This project evaluated commercially-available mobile cellular phone systems (GSM) from *Communications Research Centre/Marconi of Canada, Sectra Communications of Sweden,* and *IOMAX of the United Kingdom* to determine if they provide increased range, improved data throughput, and reduced probability of signal detection or intercept to meet Special Forces requirements. The Joint Threat Warning Systems (JTWS) Program Office at MacDill AFB, Florida, conducted the test program with technical support from the Navy's Space and Naval Warfare Systems Center in Charleston, South Carolina, and the Pennsylvania State University Applied Research Laboratory, State College. The Swedish candidate was dropped from further evaluation in early FY 2004 when initial testing revealed it did not meet requirements. The FCT test program was successfully completed in May 2005 with the remaining candidates. No procurement decisions have yet been made by the FCT project sponsor; the *IOMAX* technology has potential for insertion via spiral development into JTWS and PROPHET and is undergoing further evaluation by other agencies.

Low Probability of Intercept Communications Intelligence Direction Finding – United Kingdom – 2004

Special Forces require a capability to quickly and reliably detect sideband, spread spectrum-broadband and other types of low probability of intercept communication signals from potential adversaries. This project evaluated commercially-available equipment that will detect these signals and provide threat warning to meet the requirements of the Joint Threat Warning System (JTWS). The JTWS Program Office at MacDill AFB, Florida, conducted the test program with technical support from the Navy's Space and Naval Warfare Systems Center in Charleston, South Carolina, and the Pennsylvania State University Applied Research Laboratory, State College. Originally, a candidate developed by ELTA Electronics of Israel was to be evaluated; however, in the course of project planning the company was deemed non-responsive to requests for test article cost quotes and, in August 2004, the Israeli candidate was dropped from the project. Arrangements were then made for delivery in January 2005 of comparable technology developed by *TRL Technology, Ltd. of the United Kingdom* for evaluation without jeopardizing the project schedule. Testing of the British technology was completed in May 2006; however, it did not meet user requirements and was determined unsuitable for integration into JTWS. The residual test article was placed in operational use at the Space and Naval Warfare Systems Center, Charleston, to take advantage of the unit's valuable signal generation capability as a training tool.

MAAWS Illumination Round – Sweden – 2001



The Army's Armament Research Development and Engineering Center at Picatinny Arsenal in New Jersey conducted the evaluation of improved illumination ammunition developed by *Saab Bofors Dynamics of Sweden*, for employment with the 84mm Carl Gustaf M3 recoilless rifle (now adopted by U.S. Special Forces as the Multi-Role Anti-Armor Anti-Personnel Weapon System - MAAWS). The Carl Gustaf M3 was previously qualified by the FCT Program for U.S. procurement, and was initially fielded with the 75th Ranger Regiment in 1991. The improved MAAWS Illumination 545C cartridge incorporates a new candle with improved burn duration and a reduced sensitivity fuze that meets U.S. safety standards. Test rounds were evaluated for safety and performance at the Aberdeen Test Center in Maryland and at the Naval Surface Warfare Centers at Crane, Indiana, and Indian Head, Maryland; blast overpressure testing was successfully completed; production qualification testing began in late FY 2004 and finished in early FY 2006 with satisfactory results. Procurements of the Illumination 545C rounds are planned during the MAAWS ammunition sustainment buy in FY 2007.

SOF (Special Operations Forces) Combat Assault Rifle (SCAR) – Belgium, Germany, Israel, Italy – 2004

The Special Operating Forces Weapons Division of the Naval Surface Warfare Center in Crane, Indiana, in conjunction with the Army Armaments Research, Developmental Engineering Center, Picatinny, New Jersey, evaluated advanced 5.56mm and 7.62mm rifles to meet requirements for a highly-reliable and modular combat rifle for Special Forces as a replacement for the aging M-4A1 carbine. The foreign candidate weapons that were considered for the project are developed by *FN Herstal of Belgium, Heckler and Koch GmbH of Germany, Israel Military Industries*, and *Beretta of Italy*. Three domestic candidates from *Knights Armament, Robinson Armament*, and *Colt's* were also considered for initial evaluation. Product sample testing and early user assessments of the candidate weapons were completed in September 2004, and the *FN Herstal* candidate was selected to proceed to final operational testing conducted during November 2005 and June 2006 at Camp Pendleton and Camp Billy Machen Navy SEAL Training Facility in Slab City, California; Naval Surface Warfare Training Facility, Niland, California; and San Clemente Island, California. As discussed earlier in this review, the *FN Herstal* Enhanced Grenade Launcher Module (EGLM), then also under FCT evaluation, was selected for integration into the SCAR FCT development. Low-Rate Initial Production of the SCAR family of weapons was approved in June 2006 for 712 SCAR-L (5.56mm), 593 SCAR-H (7.62mm), and 196 EGLM. Full-Rate Production and follow-on procurements of SCAR/EGLM is expected to reach $28.4 million. The estimated development cost avoidance as a result of this project is $2.2 million. Future production cost savings are possible, due to interest by the Marine Corps.

Tethered Balloon ISR Platform – Norway

This project evaluated a means of employing a unique intelligence, surveillance and reconnaissance (ISR) sensor communications package developed for Norwegian Forces by *Tyra Invest AS of Norway*. Known as the "ISR Balloon", the "ODIN" system was developed based upon experience during coalition military operations in Bosnia and Kosovo where, during adverse weather conditions, enemy forces were able to move freely under a "weather umbrella," thus eluding detection. The objective of the project was to improve Special Operations Forces' tactical situation awareness in the mission objective to find, fix, and destroy the enemy and simultaneously provide friendly force protection. The test program was conducted by the Joint Tactical Warning and Legacy Force Protection Systems Program Office and the Airborne Special Operations Test Directorate at Fort Bragg, North Carolina, with technical test assistance from the Space and Naval Warfare Systems Center in Charleston, South Carolina. Testing of the Norwegian system, configured for ground rather than air deployment, was successfully completed in February 2006 at Camp Roberts, California. The test article was validated and verified for follow-on testing utilizing an air-launched (SUU-76 C/B) leaflet canister as a delivery means. A new FY 2007 FCT project, *PSYOP Radio Broadcast Platform*, has been initiated to conduct this evaluation.

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CONTINUING AND NEW FY 2005 and 2006 PROJECTS

Fifty projects were continuing from previous years or were new starts in FY 2005 and FY 2006.

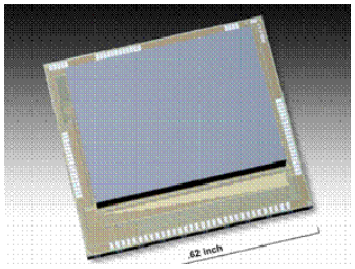
Table 4. Continuing and New Start Fiscal Year 2005 and 2006 Projects

Sponsor	Project
Army	3rd Generation Focal Plane Arrays (FPA) – 2005 105mm Preformed Fragments – 2003 120mm Mortar Propellant – 2004 155mm Ammunition – 2003 Aluminum Alloy 5059 for Armor Applications – 2006 Area Mine Clearance Systems – 2006 AT-4CS (Confined Space) Enhanced Blast Tandem Warhead – 2006 Celluloid Mortar Increment Containers – 2004 High Frequency Combat Net Radio – 2006 Individual Serviceman Non-Lethal System – 2005 Large Scale Display System – 2004 Lithium Ion Battery Cells – 2004 Noise Robust Voice Recognition System – 2006
Navy	30mm Programmable Airburst Munition - 2006 Abrasive-Resistant Skirt for Landing Craft Air Cushion (LCAC) – 2002 Composite Shroud for Landing Craft Air Cushion (LCAC) – 2005 Digital Flight Control System for EA-6B "Prowler" – 2002 High Temperature Protective Coatings for Gas Turbine Engines – 2003 Improved Lube Oil Cooler for Landing Craft Air Cushion (LCAC) – 2005 Link-16, 11B Management Integrator – 2005 Naval Active Intercept and Collision Avoidance System – 2004 Pitch-Adapting Composite Marine Propeller – 2004 Portable Undersea Training Range – 2006 Shipboard Mast-Mounted Surveillance Pod – 2005 Telemetry Buoy for Underwater Communication System – 2005
Marine Corps	40mmHigh Explosive Dual Purpose (HEDP) Improvement – 2004 40mm Low Velocity HEDP Ammunition Improvement – 2005 Emergency Battery System – 2006 Floating Smoke Pot System – 2001 Joint Assault Bridge Launcher – 2006 JSLIST Alternative Footwear Solution (Protective Boot) – 2004 JSLIST Block II Glove Upgrade - 2004 Lightweight Prime Mover for 155mm Towed Howitzer – 2004 Multipurpose Tank Blade for M1A1 Battle Tank – 2006 Multi-Spectral Camouflage Netting – 2005 NBC Integrated Footwear System (Protective Sock) – 2002 Remote Control System for Assault Breacher Vehicle – 2005
Air Force	20mm Replacement Round – 2004 Air Flotation Platform – 2006 Extended 1553 Databus – 2006 MIL-STD-1760 Umbilical and Connector – 2006 Radarsat II Commercial High Resolution SAR – 2004 Weather Analysis and Forecasting System – 2006

USSOCOM	40mm Tactical Marking Day/Night Training Cartridges – 2005 70mm Multi-Purpose Penetration Warhead –2005 84mm Multi-Target Warhead – 2005 Close Quarter Battle Pistol – 2005 Improved Crew-Served Weapon Mounts – 2006 Improved Limpet Mine – 2006 Muzzle Break Sound Suppressor for MK48 and M240 Machine Guns – 2006 Traveling Wave Tube Amplifier – 2004

ARMY

3rd Generation Focal Plane Arrays (FPA) – United Kingdom – 2006



This project is evaluating high-performance low-cost 3rd Generation Focal Plane Arrays developed by *QinetiQ* and *Selex Communications (formerly BAE System-UK)*, both of the United Kingdom. Qualification of these FPAs will support the Army's Future Combat System requirements to see first, understand first, act first, and finish decisively. QinetiQ and BAE have developed an alternative substrate for 3rd Gen FPAs which reduces the cost of today's current and future FPAs by 75% and increases the reliability by 200%, while meeting system requirements. The project is being conducted by the Army's Night Vision and Electronics Sensors Directorate at Fort Belvoir, Virginia, building on the existing effort with QinetiQ to transition from a 2nd - Generation to a 3rd - Generation FPA production line. Test article contracts were awarded to Selex Communications and QinetiQ in third quarter 2005. Following extensive laboratory evaluation and analysis of both vendors" products, in third quarter FY 2006 a "down-select" was made to the Selex Communications focal plane arrays and imagers. Test units were delivered at the end of FY 2006, and testing with the Long Range Acquisition Scout Sensor Suite (LRAS3) is in progress at Fort Belvoir.

105mm Preformed Fragments – Republic of South Africa – 2003

This project is assessing conventional 105mm field artillery ammunition developed by *Denel-Naschem of South Africa* for potential increased lethality and range compared to current U.S. 105mm ammunition. The Army's Product Manager for Combat Ammunition Systems (PM-CAS) is conducting the test program at Yuma Proving Ground, Arizona; Aberdeen Test Center in Maryland, and Picatinny Arsenal in New Jersey. The test article contract was awarded to Denel-Naschem and its U.S. partner, *General Dynamics Ordnance and Tactical Systems (GDOTS) of St. Petersburg, Florida,* in third quarter FY 2003. The results of testing to date were in accord with expectations, with lethality equal to the U.S. 155mm M107 projectile and range greater by 3-4 kilometers than the U.S. M105mm M1 projectile. Testing continues as planned and the Capabilities Production Document is waiting AROC approval. A Type Classification package is being developed, with a decision scheduled for May 2007. If the project is successful, these rounds will be procured with Army Artillery ammunition funds, beginning in FY 2008.

120mm Mortar Propellant – Switzerland – 2004

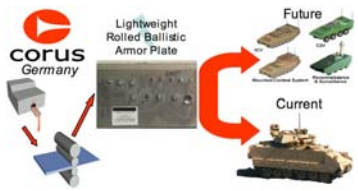
The Army's Armaments Engineering and Technology Center at Picatinny Arsenal, New Jersey, is evaluating a high-performance Extruded-Impregnated (EI) propellant for long-range mortar systems developed by *Rheinmetall/Nitrochemie Wimmis AG of Switzerland*. If the project is successful, the qualification of EI propellant will support the Army's Future Combat System requirements for increased range, elimination of the use of a hazardous/toxic stabilizer, reduction of blast overpressure, increased rate of fire, decreased gun tube wear, and increased propellant shelf-life. Arrangements for test articles were added to an existing contract with Nitrochemie in April 2004, and preliminary ballistic tests were conducted at Yuma Proving Ground, Arizona. Despite significant delays in scheduling the FCT test program at Yuma due to higher priority activities and production lot acceptance tests, evaluation of the main charge and igniter propellant was initiated in fourth quarter FY 2005 and is continuing into FY 2007.

155mm Ammunition – Republic of South Africa – 2003

This project is evaluating the "Assegai" family of 155mm field artillery projectiles developed by *Denel-Naschem of South Africa*, compared to current U.S. 155mm ammunition. If successful, the project will greatly increase the fire support provided to U.S. Army ground forces. The Army Product Manager for Combat Ammunition Systems (PEO-AMMO/PM-CAS) is conducting the test program at Yuma Proving Ground, Arizona; Aberdeen Test Center in Maryland; Dugway Proving Ground, Utah; and Picatinny Arsenal, New Jersey. The test program contract was awarded to Denel-Naschem and its U.S. partner, *General Dynamics Ordnance and Tactical Systems (GDOTS), St. Petersburg, Florida,* in third quarter FY 2003. The results of these tests to date meet expectations with improved lethality, improved screening, improved visibility, and range 3 kilometers greater than the U.S. M795 projectile fired from the same 155mm howitzers. A Capabilities Production Document has been developed and is in staffing for JROC approval. If rounds meet the range and lethality requirements of the Non-Line-of-Sight Cannon, then procurement will be supported by Future Combat System/Unit of Action.

Aluminum Alloy 5059 for Armor Applications – Germany – 2006

The Weapons and Materials Research Directorate at the Army Research Laboratory, Aberdeen, Maryland, is evaluating an improved aluminum alloy, designated AA5059, with enhanced ballistics, weldability, and corrosion resistance. Developed by *Corus of Germany*, AA5059 is of interest to the Army for armor and structural applications to existing combat systems such as improvements to the current M2 Bradley Infantry Fighting Vehicle and for the Army's Future Combat System (FCS) Manned Ground Vehicle (MGV) designs. Originally the goal of this project was to obtain a superior aluminum armor material for repair and upgrades of the cracking armor used on the M2 Bradley. The procurement potential for AA5059 has thus dramatically increased from armor repairs on Bradley Infantry Fighting Vehicles now to include the possibility for new production of AA5059 based ground armor



weapon systems. Testing is being conducted at Aberdeen Proving Ground, Maryland; the Naval Surface Warfare Center, Carderock , Maryland; and the Naval Air Systems Command, Patuxent River, Maryland.

Area Mine Clearing System – Croatia, Denmark, Norway, Sweden – 2006

The Army's Project Manager for Close Combat Systems, Countermine Division at Fort Belvoir, Virginia, is evaluating vehicle-mounted mechanical systems (flails) that are designed to clear large areas of anti-tank and anti-personnel landmines with a high degree of confidence. Originally five potential candidates were produced by DOK-ING of Croatia, A/S Hydrema of Denmark, Kvaerner Eureka of Norway, the Scandinavian Demining Group of Sweden, and Aardvark Mine Clearance, Ltd. of the United Kingdom. Early in the project, a down-select was made to the AS Hydrema's MCV 910 candidate, and Aardvark's MK IV candidate. Operational testing is scheduled for March 2007 at Fort Hood, Texas.

AT-4CS (Confined Space) Enhanced Blast Tandem Warhead – Sweden – 2006

The Project Manager for Close Combat Systems, Picatinny Arsenal, New Jersey, is evaluating an enhanced blast tandem warhead for the AT-4 CS (Confined Space) weapon produced by Saab Bofors Dynamics of Sweden. The AT-4 CS, in the DoD inventory as a result of a previously successful FCT project, is currently the only fielded shoulder-launched munition capable of being safely fired from an enclosure. The Tandem Warhead round under evaluation is designed to blast through walls with the first warhead and neutralize targets behind the wall/in the bunker with the second warhead. The FCT test plan has been finalized and test activities are scheduled to begin in second quarter FY 2007.

Celluloid Mortar Increment Containers – Austria – 2004

The Warheads, Energetics and Combat Support Armaments Center of the Army's Armaments Research, Development and Engineering Center at Picatinny Arsenal, New Jersey, is evaluating foreign celluloid mortar increment containers as a second source for the nitrocellulose-based belted-fiber Mortar Increment Containers (MIC) used to contain and protect propulsion charge systems in 60mm, 81mm and 120mm mortars. The candidate containers are manufactured by *Kaufman & Gottwald (KAGO) GmbH of Austria*, a world leader in celluloid material fabrication. Qualification of KAGO as a second source of celluloid MICs will significantly reduce U.S. production costs and improve the durability of propulsion charge systems for semi- and auto-loading capabilities required for the Army's Future Combat System. The test article contract was awarded to KAGO in April 2004 and certification of the Austrian celluloid MIC tooling and

manufacturing process was completed in first quarter FY 2005. The FCT test program will continue through FY 2007 at Yuma Proving Ground, Arizona.

High Frequency Combat Net Radio – Italy – 2006

The Space and Terrestrial Communications Directorate of the Army's Communications Electronics Command at Fort Monmouth, New Jersey, is evaluating the Selex Communications (formerly Marconi Selenia Communications) CNR2000 combat net radio with both High Frequency (HF) and Very High Frequency (VHF) band capabilities. The results of this evaluation will provide valuable information concerning communications interoperability between European Union-NATO coalition forces and U.S. military units. A test article contract was awarded to Selex Communications in third quarter FY 2006 and three CNR-2000F HF Radios were delivered for evaluation. Both laboratory and field testing are scheduled to begin in second quarter FY 2007.

Individual Serviceman Non-Lethal System – Belgium, Italy – 2005

The Army's Product Manager for Close Combat Systems at Picatinny Arsenal, New Jersey, is evaluating two foreign non-lethal weapons developed by *FN Herstal of Belgium* and *Fabrica d'Armi Pietro Beretta of Italy* to fill a jointly recognized increased need from the field for non-lethal capabilities for the individual Soldier. Both candidates promise to provide a higher rate of fire, greater effective engagement ranges and greater magazine capacity than currently fielded weapons. Coordination and test support is being provided by the Aberdeen Test Center, Maryland; the Human Effects Center of Excellence at Brooks AFB, San Antonio, Texas; and the Joint Non-Lethal Weapons Directorate at Quantico, Virginia. The FCT project is continuing; however, in January 2005 the Army issued an Urgent Material Release for 80 of the Belgian candidate weapons to the 18th Military Police Brigade deployed in Iraq. ***"In the prisons, in order to quell fights and riots, we use less-than-lethal means to stop prisoners…we have started using them here…[the FN303] is easy to shoot and appears to be really effective" – 18th MP Brigade Training NCO***.

Large Scale Display System – Republic of Korea – 2004

The Army's Product Manager for Common Hardware/Software Systems (CHS), Communications-Electronics Command at Fort Monmouth, New Jersey, is evaluating very high-resolution Flat Panel Screen Displays developed by *Samsung Electronics of the Republic of Korea* for potential to satisfy Army battlefield command and control (C2) requirements, with applications in Standard Integrated Command Posts (SICP) and PM Tactical Operations Centers (PM-TOC). Successful evaluation and fielding will allow the commander and staff to view various applications in a high-resolution environment. Testing is being conducted at the Command and

Control Directorate's (C2D) Advanced Display Laboratory at Fort Monmouth. Six panels were originally received for evaluation but, due to their weight and resolution, other display panels from the company were requested, incurring a significant delay in the project schedule. This caused some delays to the original project schedule. The substitute displays are undergoing laboratory tests and will undergo field evaluation during FY 2007 with combat units at the Army's National Training Center, Fort Irwin, California. If the project is successful, the panels will be procured and shipped to combat units in Iraq and Afghanistan.

Lithium-Ion Battery Cells – Republic of Korea, United Kingdom – 2004

The Army's Communications and Electronics Research, Development and Engineering Center, Command and Control Directorate, at Fort Monmouth, New Jersey, is evaluating the potential for Li-Ion battery cells developed by *SKC of the Republic of Korea* and *AGM Batteries, Ltd. of the United Kingdom* to satisfy Army portable electrical power requirements for a high-energy density, high-cell potential fuel source. The candidates may provide greater energy than present Li-Ion cell-based batteries and have the potential for reduced logistics burden and higher cost-effectiveness through increased mission time, greater shelf life, and greater recharging capability. Prototype battery assemblies, in the different BB configurations, began delivery in fourth quarter FY 2004, and both laboratory and field testing were initiated. Initial results show that these battery types surpass both the performance specifications and performance of the same batteries currently being procured. The project is scheduled to close-out in early FY 2007. Based upon the successful evaluation of these prototype batteries, the Army's Logistics Readiness Center will recommend to the Defense Logistics Agency procurement of batteries utilizing these improved cells.

Noise Robust Voice Recognition System – United Kingdom – 2006

The Interactive Speech Technology Program Office at the Army's Communication-Electronics Command, Fort Monmouth, New Jersey, is evaluating the "Aurix" advanced speech recognition system. Developed by *20/20 Speech Ltd. of the United Kingdom*, this system can "recognize" speech at a high level of accuracy in various noise environments, such as the intense noise produced by gunfire and/or explosions. Pending successful testing, the product will be transitioned to provide speech recognition interfaces for the individual soldier within the Army's Land Warrior/Soldier and Force XXI Battle Command Brigade and Below Programs. The technology has been received and installed on the test platforms, and the installation has been validated. The voice database has been defined, and arrangements are being made to begin test activities at the various test sites in early FY 2007.

NAVY

30mm Programmable Air Burst Munitions – Germany, Norway, Switzerland

The Program Manager for Surface Navy Minor Caliber Munitions, Naval Sea Systems Command, is evaluating 30mm programmable airburst munitions (ABM) developed by *Diehl of Germany teamed with ATK (U.S.), NAMMO of Norway,* and *RMW Schweiz of Switzerland.* Fielding of ABM will provide users of the MK46 gun system and other 30mm gun systems with the capability to engage and defeat personnel and light to medium materiel targets with more lethal and effective ammunition across the full spectrum of combat operations than currently available combat munitions. Initial live-fire test demonstrations of all candidates were conducted at Lake Hawthorne, Nevada, in March and April 2006. As a result, a down-selection was made to the *Diehl/ ATK* ammunition. A contract was awarded to the Diehl/ATK team for the production of 1,200 cartridges for use during the Navy Weapon System Explosives Safety Review Board qualification program, which is scheduled for mid-FY 2007. ABM could potentially be fielded in the following weapon systems: Marine Corps Expeditionary Fighting Vehicle, the Army's Future Combat System; and the Navy's LPD-17, Littoral Combat Ship, and Amphibious Assault Ships Replacement platforms.

Abrasive-Resistant Skirt for LCAC (Landing Craft-Air Cushion) – Sweden, United Kingdom – 2003

The Amphibious Warfare Programs Office of the Naval Sea Systems Command is evaluating hovercraft skirt materials developed by *Trelleborg of Sweden,* and *Icon Northern Rubber of the United Kingdom* to determine their capabilities to provide improvements in the LCAC skirt's resistance to abrasion without a weight or cost penalty. The test program is being conducted at the Naval Surface Warfare Center-Dahlgren Division, Coastal Systems Station in Panama City, Florida, with test support from Assault Craft Units (ACU) 4 and 5, technical and manufacturing support from Bell Avon Inc., Picayune, Mississippi; SMR Technologies of Fenwick, West Virginia; and laboratory test support from Smithers Scientific of Akron, Ohio. The test article contract was awarded in third quarter FY 2006. Based on results of Phase I testing, the Trelleborg extra-wide material has now been qualified and is officially approved as a new alternate source. While the service life of the Swedish material is no better than the baseline material, the extra-wide feature provides a significant advantage in solving the problem of seam separation, commonly experienced with the baseline material. During FY 2007, the Navy plans to continue Phase II 2 in-service testing of Swedish material skirts installed on LCAC-061 and LCAC-036.

Composite Shroud for Landing Craft, Air Cushion (LCAC) – Finland, Norway, United Kingdom – 2005

The Amphibious Warfare Program Office of the Naval Sea Systems Command is evaluating composite propeller shrouds manufactured by *FY Composites of Finland, LMG Marin of Norway,* and *Slingsby Aviation, Ltd. of the United Kingdom* as potential replacements for the current LCAC propeller shrouds, which are of a complex riveted construction, with high maintenance, material, and repair costs approaching $450,000 per shroud per year. The one domestic supplier of the over 500 different parts for the current shrouds has gone out of production and is no longer interested in providing parts to the Navy. The composite shrouds to be tested in this project will be more easily repairable and are estimated as 30% more reliable, thus reducing life cycle maintenance costs and increasing the LCAC's mission availability. The test program is being conducted by the Naval Surface Warfare Center-Dahlgren, Coastal Systems Station, in Panama City, Florida. Following analysis of the candidates, a test article contract was awarded to *FY Composites* in fourth quarter FY 2006. The first Finnish shrouds are scheduled for delivery in FY 2007, when laboratory vibration tests and data analyses will be undertaken.

Digital Flight Control System for EA-6B – United Kingdom – 2002

The Program Manager for EA-6B, Naval Air Systems Command, is evaluating a digital flight control system (DFCS), developed by *BAE Systems Avionics Ltd of the United Kingdom* for the Eurofighter and Typhoon aircraft, to replace the increasingly obsolete automatic flight control system in the Navy's EA-6B "Prowler" aircraft. The project follows successful integration of the British DFCS into the Navy's F-14 "Tomcat" aircraft as the result of a previously successful FCT undertaking. The British system holds promise to prevent losses of the DoD's only standoff electronic jamming aircraft through spurious inputs from the current analog system. The test program is being conducted at the Flight Dynamics Laboratory, Naval Air Warfare Center, Patuxent River, Maryland. In October 2004, the unrestricted Block-89A aircraft 158804, designated as the FCT project's flight test asset, landed at Patuxent River. Flightworthy prototype test articles were delivered in November and BAE's contract option with the Navy to manufacture production representative Digital Flight Control Systems for the EA-6B was exercised in December 2005. Ground and flight testing is scheduled to complete in February 2007, with the first aircraft installation scheduled for April 2007. The project is continuing with good results.

High-Temperature Protective Coating for Gas Turbine Engines – Canada, Russian Federation – 2003

The Propulsion and Power Engineering Department and the Harrier F402 Engine Team, Naval Air Systems Command, Patuxent River, Maryland, is evaluating the benefits to the operational life of gas-turbine engine hot section components achieved from application of protective coatings presented by *MDS-PRAD Technologies (Ural Works of Civil Aviation (PRAD) of Russia* and *MDS Aerospace Corporation of Canada)*, a joint venture company established at Prince Edward Island, Canada. This effort is follow-on to the successful FCT Program certification of the MDS-PRAD coating process for gas turbine compressor blades in H-53 Sea Stallion helicopter T64 engines, which is transitioning to several other naval weapon systems, including H-46 Sea Knight, P-3C Orion, and AV-8B Harrier aircraft, for operations in Enduring Freedom and Iraqi Freedom. Technical test support for the project is being provided by the Naval Engine Airfoil Center at Cherry Point, North Carolina; the Naval Research Laboratory, Washington, D.C.; Rolls Royce, the F402 engine prime; the National Aeronautics and Space Administration; and the University of Pennsylvania Applied Research Laboratory College Station. The project is awaiting test coupon shipments from PRAD in Russia that are experiencing unexplained Russian customs clearance problems. Bench level and engine durability testing is scheduled to be completed in 2007. In the meantime, applicability of the HT coatings to additional DoD engine programs is being explored.

Improved Lube Oil Cooler for Landing Craft, Air Cushion (LCAC) – Norway – 2005

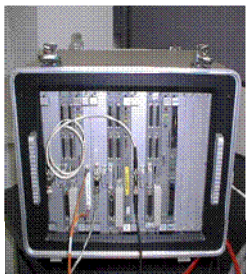
The Amphibious Warfare Program Office of the Naval Sea Systems Command is evaluating advanced coolers for the lube oil system on the engines of the Navy's LCAC hovercraft. The new coolers, manufactured by *TTC Norge AS of Norway*, are in service in hovercraft applications in Europe and have potential to reduce procurement and life cycle maintenance costs, improve wear and corrosion resistance and increase the LCAC's mission availability. The test program is being conducted by the Naval Surface Warfare Center-Dahlgren Division, Coastal Systems Station and Assault Craft Units 4 and 5 in Panama City, Florida. A test article contract was awarded to TTC Norge AS in second quarter FY 2006 and the company is in the process of manufacturing the lube oil cooler test units to the Navy's LCAC specifications. Estimated delivery for the test units is March 2007.

Link-16, 11B Management Integrator – United Kingdom – 2005

The Special Projects-Communications/Navigation Office, Maritime Surveillance Aircraft Leadership Program at the Naval Air Systems Command, Patuxent River, Maryland is evaluating an Air Defense System Integrator (ADSI) developed by *Ultra Electronics Advanced Tactical Systems (formerly Ultra Electronics Advanced Programming Concepts) of the United Kingdom*, as an add-on component that will integrate the reception, display, and transmission of messages through Link-11 and Link-16, an anti-jam, secure navigation and identification

system to which the Joint Services and NATO forces are modernizing. The Ultra Electronics integrator may prove to have the interoperability required for the Multifunctional Information Distribution System-Low Volume Terminal 1 (MIDS LVT-1) which provides Link 16 digital data communications to combat aircraft, surface combatants, and command and control host systems. The test article contract was awarded in second quarter FY 2006. FCT testing is proceeding well. A Fleet operational assessment is scheduled for the Spring of 2007.

Naval Active Intercept and Collision Avoidance – Australia – 2004



The Program Manager, Submarine Acoustic Systems, Naval Sea Systems Command, is evaluating a system developed by *Sonartech of Australia* to support U.S. submarine forces' number one priority: collision avoidance and situational awareness. Sonartech is teamed with *MIKEL, Inc., Fall River, Massachusetts,*for the project. The Australian system detects and localizes emissions from active sources such as sonar, sonobuoys, and active homing torpedoes using hydrophone sensors already installed on U.S. submarines. The system is being assessed against requirements for the AN/WLY-1 countermeasures detection and control set currently employed on SSN-688, SSN-21, and SSN-774 class submarines. Technical test support is being provided by the Naval Underwater Warfare Center, Newport, Rhode Island. In fourth quarter FY 2004, testing of government-furnished hydrophone sensors was initiated at the University of Rhode Island Acoustic Tank Facility prior to being integrated with the Australian system. Testing of the integrated systems will begin in the summer of FY 2007 at the Navy's Seneca Lake Sonar Test Facility in New York. The project is scheduled to be completed by the end of FY 2007.

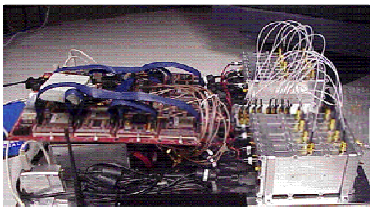
Pitch Adapting Composite Marine Propeller – Germany – 2004

The Program Manager for SSBN Submarines, in support of the Advanced SEAL Delivery Vehicle Program at the Naval Sea Systems Command, is evaluating commercial Contur-series propellers developed by *AIR Fertigung-Technologie GmbH, Rostok, Germany*, to improve submarine stealth. The propeller blades are designed to flex in a controlled manner under certain operating conditions, causing a pitch change that is claimed to improve vehicle stealth, speed, and propulsion efficiency. The pitch change also reduces cavitation damage, marine growth fouling, and permits in-water blade replacement. This advanced performance is enabled by blades constructed from carbon fibers instead of traditional metals. Technical test support is being provided by the Propulsion and Fluid Systems Division, Naval Surface Warfare Center, Carderock, Maryland. The test article contract was awarded to the German vendor in third quarter FY 2004. Hub and flex propeller fabrication began in December 2004 and was completed in second quarter FY 2005. The first series of water tunnel tests were conducted at Carderock with mixed results. During FY 2006, the Navy conducted the second phase experiments in the Carderock 36-inch water tunnel with satisfactory results. Phase II testing and analysis is continuing into FY 2007 along with propeller fabrication. The project is progressing well toward eventual incorporation of the flex propeller design into the Advanced SEAL Delivery System and potentially for other naval platforms.

Portable Undersea Training Range – Australia, France – 2006

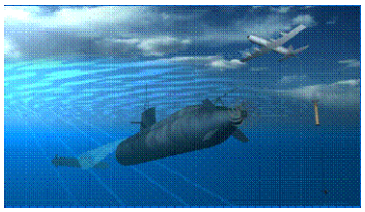
The Aviation Training Systems Office, Naval Air Systems Command, Patuxent River, Maryland, with test support from the Naval Undersea Warfare Center, Newport, Rhode Island, is evaluating two technologies which, when integrated, will provide the core of an advanced deployable undersea range for Navy Antisubmarine Warfare training in shallow littoral waters. The "Basil II" Station-Keeping Buoy produced by *ACSA of France* is used in command and control and for positioning instrumentation on similar sea ranges; the "NASPAR" transponder developed by *Nautronix of Australia* provides proven in-water protocols for ASW training. Test article contracts were awarded to both vendors in fourth quarter FY 2006. The schedule has slipped a year to align FCT efforts with the sponsor's funding and range availability. Factory acceptance tests of the French station-keeping buoy are now scheduled in third quarter FY 2007, and in first quarter FY 2008 for the Australian transponder hub. The FCT test program is planned to begin at the Navy's Pacific Missile Range Facility, Port Hueneme, California in third quarter FY 2008.

Shipboard Mast-Mounted Surveillance Pod – Australia, United Kingdom – 2005



The Advanced Technology Branch of the Navy Space and Naval Warfare Systems Center in Charleston, South Carolina, is evaluating the combined miniature beam forming and tuning technologies developed by *Sundance Digital Signal Processing, Ltd. of Australia* and *WinRadio Communications of the United Kingdom* for a Navy requirement to provide optimum surveillance performance from a mast-mounted system. Electronic beam-forming can provide suppression of "co-site noise" (interference) created at antennas in close proximity on Navy ships. The Australian beam-forming processor offers a miniature form factor which, when combined with a group of WinRadio tuners co-located with the antennas, provides better interference mitigation and signal strength. In August 2005, test articles were obtained from both vendors and testing is continuing into FY 2007 at the Navy facility in Charleston.

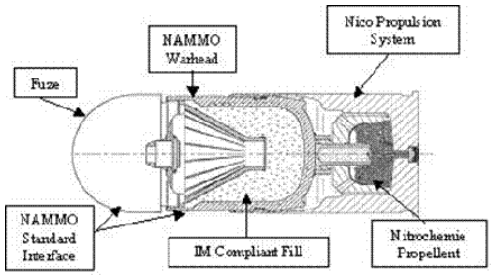
Telemetry Buoy for the Underwater Communication System – Australia – 2005



The Submarine Acoustics Systems Program Office, Program Executive Officer-Submarines at the Naval Sea Systems Command, in coordination with the Air Anti-Submarine Warfare Systems Office of the Naval Air Systems Command at Patuxent River, Maryland, is evaluating a maritime buoy developed by *Nautronix MariPro of Fremantle* that provides effective underwater communications between different Navy platforms. The Nautronix acoustic communications link uses the Australian Hydro-Acoustic Information Link (HAIL) modulation and supporting modem. The capability would provide an important component of undersea FORCENET, enabling submarines to integrate into Navy command and control networks while retaining stealth and mission profile. Technical support for the project is being provided by the Naval Undersea Warfare Center at Keyport, Washington, and ERAPSCO in Columbia City, Indiana, a domestic supplier of sonobuoys to the U.S. Navy. The project has been extensively delayed due to unforeseen test article contract difficulties, and award is not expected until first quarter FY 2007.

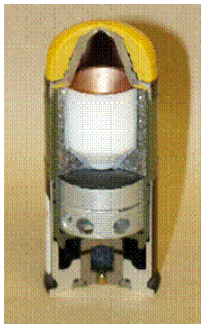
U.S. MARINE CORPS

40mm High Explosive Dual Purpose (HEDP) Improvement (joint with USSOCOM) – Germany, Norway, Switzerland – 2004



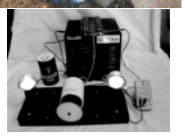
The Program Manager for Ammunition, Marine Corps Systems Command at Quantico, Virginia, is evaluating an improved propulsion propellant "after armor effect" technology and a standardized fuze interface integrated into a 40mm High Explosive Dual-Purpose cartridge for use in both the MK19 Grenade Machine Gun and MK47 Advanced Lightweight Grenade Launcher. *NAMMO of Norway* developed the warhead and standardized fuze interface, *Nico-Pyrotechnik of Germany* developed the propulsion system, and *Nitrochemie AG of Switzerland* developed the propellant for the cartridge to be evaluated. Safety and environmental tests have been completed by NAMMO at their facility in Norway. A user evaluation of the 40mm High Explosive Dual Purpose round was initiated at the end of third quarter FY 2006 and is continuing. Qualification testing is expected to be completed in time for a planned review and certification by the Navy's Weapon System Explosives Safety Review Board in early fourth quarter FY 2007.

40mm Low Velocity High Explosive Dual Purpose (HEDP) Improvement (joint with USSOCOM) – Austria, Germany– 2005



The Program Manager for Ammunition, Marine Corps Systems Command at Quantico, Virginia, is evaluating an improved propulsion system, cleaner burning propellant, a self-destruct fusing mechanism, and improved Insensitive Munitions (IM) energetic technology as integrated into an improved low-velocity 40mm High Explosive Dual-Purpose (HEDP) cartridge for use in the M79 and M203 Grenade Launchers. *Arges of Austria* and *Rheinmetaal of Germany* are the foreign manufacturer participants. A successful FCT will provide the warfighter with a more accurate and lethal HEDP cartridge for use against a broad spectrum of targets while improving shipboard safety with improvements in IM characteristics of the current rounds. Technical support for the project is being provided by the Naval Surface Warfare Center in Dahlgren, Virginia. All testing is being conducted by Rhinemetaal at its Unterluess test facility in Germany. Technical and safety and environmental tests were completed during second quarter FY 2006, and the user evaluation was completed in the third quarter. Qualification testing is scheduled to begin during third quarter FY 2007, and will be followed by review and certification by the Navy's Weapon System Explosives Safety Review Board. A procurement decision will then be made.

Emergency Battery System – Canada, Republic of Korea – 2006



The Marine Corps Systems Command (Expeditionary Power), Quantico, Virginia, is evaluating lightweight, non-rechargeable, environmentally friendly batteries developed by *MagPower Systems, Inc. of Canada* and *MEETS of the Republic of Korea*. The system addresses Marine Corps' requirement for a supplementary battery source to power small items of equipment such as radios, computers, and sensors and to minimize their battery load while assuring they can still power their electronics throughout a long mission. The test article contracts were awarded to both companies in third quarter FY 2006. Test samples were received from the Korean company and performance tests were begun in first quarter FY 2007 at the Naval Surface Warfare Center, Carderock, Maryland.

Floating Smoke Pot System – Germany – 2001

The Program Manager for Ammunition, Marine Corps Systems Command, Quantico, Virginia, is evaluating a Floating Smoke Pot System manufactured by *Diehl Munitionssysteme (formerly Comet Pyrotechnik) of Germany* to replace the current K867 floating smoke pot for training and combat on land and in the water. The current K867 floating smoke pot produces a smoke which has carcinogenic properties and a fuze that has experienced reliability problems. The German item emits infrared smoke to screen troops in low-light situations against night-vision devices. The test article contract was awarded in late FY 2001. First article acceptance tests were completed during FY 2002 at the manufacturer's facility in Goellheim, Germany. The Marine Corps required design modifications for the German technology to meet all critical performance parameters. The modifications were successfully completed by the end of FY 2004, and Phase II acceptance testing was completed by the Marine Corps in first quarter FY 2005. Insensitive munitions testing began in third quarter FY 2005 at the Naval Surface Warfare Center in Dahlgren, Virginia. The project, including data analysis, is expected to be completed in first quarter FY 2007, with acceptability decisions expected to be made at the end of second quarter FY 2007.

Joint Assault Bridge Launcher – United Kingdom – 2006

The Project Manager for Engineer Systems, Marine Corps Systems Command at Quantico, Virginia, is evaluating the BR-90 assault bridge launcher system. Developed by Alvis-Vickers, Ltd. (BAE Systems), the system will be integrated with the current Assault Vehicle-Launched Bridge (AVLB) and Marine Corps M1A1 Abrams Tank chassis to meet gap-crossing requirements for Military Load Class-70 tracked vehicles. The Marine Corps is currently using the M60 Sherman Tank chassis with the AVLB, an aging platform not designed to maneuver at current Marine Expeditionary Forces speeds on the battlefield. The test article contract was awarded in third quarter FY 2006. Integration and acceptance testing is being conducted at the Anniston Army Depot in Alabama and technical testing was initiated in first quarter FY 2007 at the Aberdeen Test Center, Maryland.

JSLIST Alternative Footwear Solution – Canada – 2004

The Marine Corps Systems Command, Combat Equipment and Support Systems, Nuclear, Biological and Chemical Systems, Stafford, Virginia, is evaluating a one-size-fits-all, small packaged chemical-biological protective boot developed by *Airboss Defense (formerly Acton International) of Canada* to meet urgent requirements of the Joint Service Lightweight Integrated Suit Technology (JSLIST) program. A successful FCT will enable improved operational suitability for the warfighter, meet urgent needs, and result in at least an estimated 25 percent production cost savings. The test program was initially carried out at Marine Corps Air Station Yuma, Arizona, by Marine Air Wing Training Squadron One with support from Marine Wing Support Squadron 371 and Combat Service Support Detachment 16. As of July 2004, the results of testing to date supported an urgent procurement for the U.S. Navy of 175,000 boots over FY 2004 and FY 2005 valued at $6.5 million. Testing of the Canadian footwear is continuing under the direction of the Program Executive Officer for Chemical and Biological Defense located at Edgewood Arsenal, Maryland. The FCT project is expected to be concluded, with technical reports submitted, in second quarter FY 2007.

JSLIST Block II Glove Upgrade – Canada – 2004

The Marine Corps Systems Command, Combat Equipment & Support Systems, Nuclear, Biological and Chemical Systems, Stafford, Virginia, is evaluating nuclear, biological, chemical (NBC) protective gloves manufactured by *Airboss Defense (formerly Acton International)* to meet the requirements for a "JB2GU" glove, a component of the Joint Service Lightweight Integrated Suit Technology (JSLIST) ensemble being developed for Army, Marine Corps, Navy and Air Force military personnel. The JB2BGU will be worn as part of the NBC protective ensemble and will allow the warfighter to perform a full range of missions in NBC environments for extended periods by increasing tactility, dexterity, and durability beyond that found in the currently fielded butyl glove. The test program was initially carried out at Marine Corps Air Station Yuma, Arizona, by Marine Air Wing Training Squadron One with support from Marine Wing Support Squadron 371 and Combat Service Support Detachment 16. Initial field durability developmental testing was completed in Yuma in March 2004. Phase II of the project, including the evaluation of chemical agents, human factors, aviation, durability, and physical properties was initiated in fourth quarter FY 2004 at Yuma, Camp Lejeune, North Carolina, and at the Natick Clothing and Textile Research Facility in Massachusetts, and was completed in first quarter FY 2005. Phase III of the JB2GU glove evaluation is scheduled to be completed in first quarter FY 2007, with technical reports submitted in second quarter FY 2007.

Lightweight Prime Mover for Lightweight 155mm Towed Howitzer – Germany, Switzerland, United Kingdom – 2004

The Program Manager for Motor Transport, Ground Transportation and Engineer Systems, Marine Corps Systems Command, Quantico, Virginia, is evaluating high mobility off-road vehicles to satisfy the requirement for a prime mover for the Marine Corps' M777 Lightweight 155 mm Medium Towed Artillery Howitzer. Currently there is no capability to effectively move the M777 around the battlefield during a vertical lift mission. The original candidate vehicles in the project are manufactured by *Krauss-Maffei-Wegman of Germany, MOWAG of Switzerland, Automotive Technik Ltd. of the United Kingdom,* and *Supacat, Ltd. of the United Kingdom (teamed with Lockheed Martin of the U.S.)* The evaluation focused on towing capability, operational suitability, and external transport via CH-53E and MV-22 Osprey. Test article contracts were awarded in second quarter FY 2005, and testing was conducted at the Nevada Automotive Test Center, in Carson City, Nevada. The Marine Corps down-selected to the *Supacat, Ltd./Lockheed Martin (U.S.)* team's vehicle as the most mature to potentially meet the requirement. Four vehicles valued at $2.2 million were purchased for Low-Rate Initial Production (LRIP) for qualification testing and flight and ammunition certification. Delivery is expected in second quarter FY 2007.

Multipurpose Tank Blade System for M1A1 Main Battle Tank – United Kingdom – 2006

The Program Manager for Tanks, Marine Corps Systems Command, Quantico, Virginia, is evaluating a crew-controlled blade system that mounts on the front of a tank, manufactured by *Pearson Engineering of the United Kingdom*. The evaluation will determine the systems suitability for use on Marine Corps M1A1 Tanks to breech buildings and walled compounds, remove roadblocks, quickly create fighting positions for infantry and mechanized forces, and impose non-explosive destruction of enemy obstacles without the use of the tank's main gun ammunition, all urgent requirements identified during Marine Expeditionary Forces operations in Iraq. The Pearson blade system is in service with British Forces. The test article contract was awarded in third quarter FY 2006, and delivery to Aberdeen Test Center, Maryland, is expected in second quarter FY 2007.

Multi-Spectral Camouflage Netting – Canada, Israel, Sweden – 2005

The NBC Programs Directorate, Marine Corps Systems Command, Quantico, Virginia, is evaluating new two-sided multi-spectral camouflage nets from *Fibrotex, Ltd. of Israel, GMA Cover Corporation of Canada*, and *Saab Barracuda LLC of Sweden.* A successful FCT will allow the Marine Corps to employ ground forces with "one net" that is capable of two different camouflage patterns. The result will be a significant reduction in purchase quantity, cost, logistical transportation, and storage requirements in addition to being able to field the full camouflage capability in a much shorter time. Test article contracts were awarded to the Israeli and Swedish companies in third quarter FY 2005 (the proposal submitted on behalf of GMA Cover Corporation was non-responsive and the Canadian candidate was dropped from the project). Field image collection testing was completed in fourth quarter FY 2005 at Fort Devens, north of Boston, Massachusetts, and at Twentynine Palms and Imperial Dunes in California. Radar field testing was conducted at Eglin AFB, Florida. During FY 2006, environmental and materials properties tests and concealment-related subtests were completed at the Natick Clothing and Textile Research Facility in Massachusetts. All FCT testing was completed in fourth quarter FY 2006. The technical test report is expected to be completed by second FY 2007, with procurement and fielding decisions scheduled for third quarter FY 2007.

NBC Integrated Footwear System (formerly NBC Multipurpose Protective Sock) – France, Germany, United Kingdom – 2002

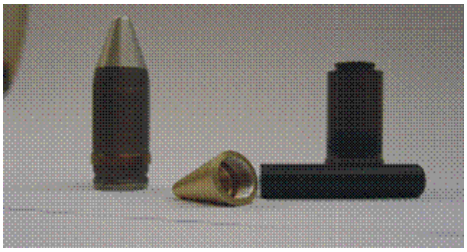
The Program Manager for Combat Equipment and Support Systems, Nuclear, Biological, and Chemical Systems, Marine Corps Systems Command, Stafford, Virginia, is evaluating candidate launderable socks developed by *Paul Boye of France, Texplorer GmbH and Helsa-Werke GmbH of Germany*, and *Purification Products, Ltd. of the United Kingdom* as integral components of the Joint Service Lightweight Integrated Suit Technology (JSLIST) ensemble. The Integrated Footwear System component of the ensemble must provide chemical/biological and friction protection to the foot when worn inside warfighter footwear. All laboratory and technical testing was completed at the Natick Clothing and Textile Research Facility in Massachusetts with assistance from Battelle Laboratories. Durability testing was conducted at Fort Benning, Georgia, by the Army's 75th Ranger Regiment. The technical test report is expected to be completed by second FY 2007.

Remote Control System for Assault Breacher Vehicle – United Kingdom – 2005

The Program Manager for Engineer Systems, Marine Corps Systems Command at Quantico, Virginia, is evaluating a Remote Control System manufactured by *Pearson Engineering of the United Kingdom* for integration into the Marine Corps' Assault Breacher Vehicle (ABV). The ABV is a cost-effective, efficient, survivable platform with Main Battle Tank speed and mobility capable of conducting in-stride breaching of minefields and complex obstacles. The Marine Corps' ABV program attained Milestone B approval in July 2003 when permission was granted to build and test three production prototypes. The FCT evaluation of the remote control system is being performed at various test locations, including Aberdeen Test Center, Maryland; Tentynine Palms, California; and Fort McCoy in Wisconsin, as part of the overall ABV System Development and Demonstration tests that began in FY 2005. Test articles were received in fourth quarter FY 2005. The FCT test program is expected to be completed in second quarter FY 2007.

AIR FORCE

20mm Replacement Round – Germany, Switzerland – 2004



The Air Force Ogden Air Logistics Center's Air-to-Surface Munitions Directorate at Hill AFB, Utah, is evaluating 20mm aircraft gun ammunition developed by *Diehl Munitionsysteme of Germany* (PELE rounds) and *Oerlikon of Switzerland* (FAP rounds) to replace current 20mm combat rounds with limited mission effectiveness and place pilots and aircraft at risk. Although the current PGU-28B ammunition meets requirements for employment ranges and target damage, use is currently suspended due to in-barrel detonation incidents that caused aircraft damage and could have resulted in pilot deaths and aircraft losses. Test support for the project is being provided by the 53rd Wing, Air Combat Command at Eglin AFB, Florida. "Quick look" testing of a limited number of rounds began at Eglin AFB in second quarter FY 2004. Comprehensive performance and safety assessments were completed on both foreign kinetic energy rounds (PELE and FAP) in first quarter FY 2005 preliminary to clearance for live fire and operational testing. Live fire tests were completed in April and August 2006 with satisfactory results. Procurement potential for the ammunition is good. Operational evaluation and production actions are planned for FY 2007.

Air Flotation Platform – Finland – 2006

The 309th Air Maintenance Group at Hill AFB, Utah, is evaluating air flotation platforms developed by *Solving of Finland* that are used to reposition aircraft and airframe structures as integral units, maintaining structural alignment during depot level maintenance operations. The platforms are currently in use by the Royal Air Force at Cottesmore AB, England, by Saab Aerospace of Sweden, and by Airbus. Currently, Air Force maintenance operations aircraft airframes are disassembled for repair and/or replacement of major structural components with no ability to move the aircraft. This requires all tooling and labor to be transported to the airframe, resulting in added wait-time, inefficient overhaul, and added in-process inventory. The test article contract was awarded to Solving in September 2006. Design requirements and maintenance building floor plan renovations suitable for the air flotation platforms is underway, with fabrication, installation, and proofing scheduled in FY 2007.

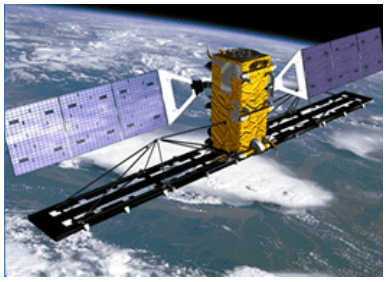
Extended 1553 Databus – Canada – 2006

The B-2 EHF Satellite Communications (SATCOM) Integration Program Office at Wright-Patterson AFB, Ohio, is evaluating extended 1553 databus performance developed by *Edgewater Computer Systems, Inc. of Canada*. The objective is to increase the throughput capability of the existing 1553 databus to perform in accordance with real-time operating principles as well as cost-effectively upgrade legacy Air Force and Department of Defense mobile warfighting support platforms using extended 1553 databus, increasing throughput required in a network-centric environment. The test article contract was awarded to Edgewater's teaming partner for this project, *Northrop Grumman*, in fourth quarter FY 2006. The test program will be conducted at the B-2 Systems Integration Laboratory, Tinker AFB, Oklahoma.

MIL-STD-1760 Umbilical and Connector – United Kingdom

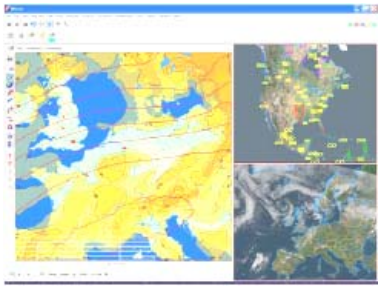
The 508th Fighter Support Group, Hill AFB, Utah, is evaluating an advanced umbilical connector developed by *EDO MBM Technology, Ltd. of the United Kingdom*. The current Air Force 1760 connecter, which transfers guidance information to weapons, is a "screw on/pop off" design which is experiencing damage upon weapon release. The British "smart bomb" umbilical uses a collar that screws onto the weapon's 1760 connector and an umbilical cable that snaps onto the collar. The umbilical snaps off of the collar when the weapon is released, preventing damage to the umbilical connector. Technical support to the project is being provided by the Air Force Research Laboratory, Kirtland AFB, New Mexico. Ground and flight testing will be completed in third quarter FY 2007.

Radarsat II Commercial High Resolution Synthetic Aperture Radar – Canada – 2004



The Air Force Electronic Systems Center at Hanscom AFB, Massachusetts, is evaluating the ability of the Canadian Radarsat II, developed by *MacDonald-Dettwiler of Canada*, to provide all-weather imaging capability at 3-meter resolution for the support of target detection, ocean surveillance, homeland defense, moving target indicators, and disaster response as an upgrade when integrated with the Air Force's Eagle Vision Deployable Satellite Imagery Receiving and Processing Station, qualified for procurement and fielded by the Air Force as the result of a previous successful FCT project. The Canadian RADARSAT II satellite is the first commercially-available high resolution Synthetic Aperture Radar imaging capability. Factory acceptance tests were successfully completed in March 2005 and planning for the integration of RADARSAT II capabilities into Eagle Vision were begun, but were slowed due to a delay in the RADARSAT II satellite launch from technical problems (eventually solved). Award of the integration contract is planned for January 2007, with a March 2007 launch.

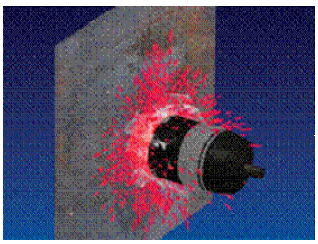
Weather Analysis and Forecasting System – Germany – 2006



The Weather, Plans and Programs Office, U.S. Air Force, Europe, Ramstein AFB, Germany, is evaluating "NinJo" weather analysis and forecasting software. The software was developed by the consortium of *Ernst Basler and Partners GmbH of Germany* for potential replacement of the U.S. Air Force-Europe Operational Weather Squadron's Horace software. NinJo allows display and handling of all types of weather data, enabling forecasters to generate significantly improved pin-point military forecasts and provide timely weather watches and warnings for U.S. European Command operations. Contracts for test hardware and software were executed in fourth quarter FY 2006 and the assessment of "Ninjo" software effectiveness will be conducted by the 21st Operational Weather Squadron. The project is expected to be completed in early FY 2007.

U.S. SPECIAL OPERATIONS COMMAND

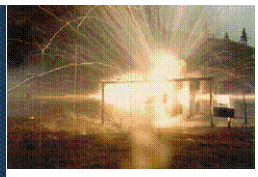
40mm Tactical Marking, Day/Night Training Cartridges – Germany – 2005



This project is evaluating two 40mm low-velocity cartridges for multi-service use: an infrared (IR) tactical marking cartridge and a 40mm day/night training cartridge. The candidates are both manufactured by *NICO Pyrotechnik of Germany* and both use unique chemi-luminescent marking technology. The 40mm tactical marking cartridges provide for accurate IR target marking to support precision fire control and air-ground combat in daylight and at night time. The 40mm day/night training cartridges allow soldiers to train using their night vision goggles. The project is being executed in two segments under U.S. Special Operations Command lead: the Naval Surface Warfare Center at Dahlgren, Virginia, is conducting qualification of the 40mm tactical marking cartridge, and the Army's

Armaments Research, Development and Engineering Center at Picatinny Arsenal, New Jersey, is tasked with upgrading the current M781 day cartridge with the German day/night training technology. The test articles contract was awarded to NICO Pyrotechnik Hanns-Jürgen Diederichs GmbH in June 2005. Initial KPP (critical performance parameters) verification tests and ballistics testing were completed at Dahlgren, Virginia, in fourth quarter 2006. Flight stability problems encountered at extended firing ranges have been corrected and re-validated by the manufacturer; delivery of re-test cartridges is expected in February 2007, and KPP verification re-tests will be held in March 2007. Qualification testing is scheduled for April-June 2007.

70mm Multi-Purpose Penetration Warhead – Norway – 2005



The Army's Armaments Research, Development and Engineering Center at Picatinny Arsenal, New Jersey, in coordination with the 160th Special Operations Aviation Regiment at Fort Campbell, Kentucky, is evaluating an improved 70mm penetration warhead developed by *NAMMO of Norway*, for use by Special Operations AH-6J aircraft. This warhead will provide Special Operations Forces with a significant new capability to defeat hardened targets such as buildings and bunkers. The NAMMO warhead is in service with Danish and Norwegian Air Forces and Apache Helicopter units of the British Army. The test article contract was awarded to NAMMO in fourth quarter FY 2006, following significant schedule slippage due to an inquiry into the original market survey and sources sought announcement in FY 2004. A re-solicitation and revisions to the project structure were necessary in FY 2005. In both instances, NAMMO was the only responsive offeror. Delivery of the Norwegian warheads is expected in the June-July 2007 timeframe. In the meantime, detailed test program planning, including alternative test sites, is continuing.

84 mm Multi-Target Warhead – Sweden – 2005

The Army's Armaments Research, Development and Engineering Center at Picatinny Arsenal, New Jersey, supported by elements of the 75th Ranger Regiment at Fort Benning, Georgia, is evaluating an 84mm Multi-Target Warhead developed by *Saab Bofors Dynamics of Sweden*, for use in the Multi-Role Anti-Armor, Anti-Personnel System (MAAWS), the primary Special Operations Forces' crew-served shoulder-fired weapon. This warhead is optimized for use in urban/built up areas and will defeat various types of structures and targets using a tandem warhead with a follow-through charge, greatly enhancing capabilities in urban environment operations. In early FY 2005, under an existing MAAWS contract, Saab Bofors Dynamics began integration of warhead, fuze, and projectile components using its High Explosive Anti-Tank (HEAT 751) projectile as the baseline. Initial enhancements focusing on satisfying U.S. Insensitive Munitions requirements were completed in fourth quarter FY 2005, and the prototype warhead was demonstrated in an operational environment. A new contract was awarded to Saab Bofors Dynamics in first quarter 2006 to complete the final phases of the project. System level tests were successfully conducted in May 2006. Qualification testing is scheduled to begin third quarter FY 2007 at Aberdeen Test Center, Maryland, and Naval Surface Warfare Center, Dahlgren, Virginia.

Close Quarter Battle Pistol – Austria, Germany, Italy, Switzerland – 2005

The objective of this project is to evaluate pistols that fire multiple caliber rounds, weigh less than 40 ounces, with improved accuracy, reliability and ergonomics, to replace the legacy SIG Sauer P226 battle pistol used by Special Operations Forces for the past 15 years. Candidates participating in the project are pistols from *Steyr-Mannlicher and Glock of Austria, Heckler and Koch of Germany, Baretta of Italy*, and *SIG Sauer of Switzerland*. The test program is being managed by the Naval Special Warfare Development Group, and will be conducted at the Naval Surface Warfare Center, Crane, Indiana, and at the Blackwater Test Facility in Moyack, North Carolina. Operational testing will be accomplished by the Marine Corps Programs Department, Fallbrook, California, at ranges at Camp Billy Machen Navy SEAL Training Facility in Slab City, California; Camp Pendleton, California; and San Clemente Island, California. Early project planning included finalizing the technical and operational test plans, issuing "draft" solicitations in September and December 2005 and March 2006 for industry comment and response, and completing documentation for Milestone "B" – technology integration and demonstration.

Improved Crew-Served Weapons Mount – Denmark, Norway – 2006

The Program Manager for Advanced Lightweight Grenade Launcher at the Naval Surface Warfare Center, Crane, Indiana, is evaluating a revolutionary "soft" mount for Special Forces' crew served weapons (automatic grenade launchers and machine guns) with three "control" points that reduce recoil and increase operator ease of use and control. Developed by *Simrod Optronics (formerly Vinghøg AS) of Norway* teamed with *Rosheld AS (formerly Roulunds Tech AS) of Denmark*, the mount promises to improve accuracy when firing on the move, resulting in less dispersion and reducing the amount of ammunition required to defeat targets. In fourth quarter FY 2006, sample mounts were received from Vinghøg/Roulunds and the planned Phase I demonstration was completed successfully. The test article contract will be awarded in early FY 2007. Once test articles are received, technical and safety testing and evaluation by the Navy's Weapons System Explosives Safety Review Board will commence at Crane, Indiana.

Improved Limpet Mine – United Kingdom – 2006

The Naval Special Warfare Command, with test support by the Naval Air Warfare Center, Indian Head, Maryland; Naval Surface Warfare Center, Carderock, Maryland; and the Army's Aberdeen Test Center, Maryland, is evaluating an improved limpet mine developed by *Royal Ordnance of the United Kingdom.* The project leverages the successes of the UK Ministry of Defense in developing improved limpet mines for underwater demolition. The evaluation will determine if the British candidate can destroy or incapacitate enemy vessels and maritime structures with a device that is 50 percent smaller, 75 percent lighter, and more capable than the legacy

Limpet Assembly Module currently in use by Special Operations Forces. Test articles were acquired at no cost in June 2006 and Phase I safety and technical verification tests were conducted at the Aberdeen Test Center as the precursor to live fire "at-sea" trials. It was determined that the candidate could be safely and effectively employed in sea trials against an actual target. "At-Sea" full scale live-firing trials were successfully completed in July 2006 onboard the ex-U.S.S. Thorn (DD-988). Due to unforeseen additional costs, planned follow-on scaled testing at Aberdeen could not be completed as scheduled. Additional funds are currently being sought, and testing will resume in FY 2007.

Muzzle Break Sound Suppressor for MK48 and M240 Machine Guns – Switzerland – 2006

The Program Office for Special Operations Forces Weapons, Naval Surface Warfare Center, Crane, Indiana, is evaluating muzzle break suppressors manufactured by *Brugger & Thomet of Switzerland.* These are made of advanced materials to suppress audio and visual signatures for the 7.62mm Belt-Fed Machine Guns (MK48 and M240). The ability of a soldier to remain concealed when firing his weapon is paramount to the safety of the shooter. An effective muzzle break sound suppressor significantly reduces the signature (visual and sound) of a weapon when it is fired and reduces the risk of detection or counter-fire from hostile forces. In third quarter FY 2006, the project sponsor evaluated industry responses to its "sources sought" announcement and down-selected to the already-fielded candidate suppressors from Switzerland. Arrangements for the procurement of test articles were made in the fourth quarter, with delivery expected in early FY 2007.

Traveling Wave Tube Amplifier – Canada, France, Germany, Israel, United Kingdom – 2004

Headquarters, U.S. Special Operations Command, with the U.S. Army Special Operations Command and Naval Special Warfare Command is conducting a competitive evaluation of alternative traveling wave tube amplifiers developed by *Communications and Power Industry of Canada, Thomson Tubes Electroniques (Thales) of France, Dornier Satellitensystemes/ND SATCOM (EADS) of Germany, ELTA Electronics of Israel*, and *E2V of the United Kingdom* for use within the Joint Threat Warning System and Deployable Multi-Channel SATCOM (Satellite Communications) Systems. Reliable satellite communications are critical to Special Forces' missions and Tri-Band Satellite terminals currently use vacuum tube technology amplifiers. Test article contracts were awarded in third quarter FY 2004 and technical testing of the candidates was conducted the Space and Naval Warfare Systems Center, Charleston, South Carolina. Operational validation testing began second quarter FY 2005 in overseas locations using Special Forces' assets. The scheduled Defense Information Systems Agency (DISA) tests, scheduled for FY 2006, did not occur due to the introduction to the project of a new candidate from the Canadian Communications and Power Industry, and availability of its test articles. The DISA tests and bench verification tests will begin in second quarter FY 2007 in Charleston.

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NEW PROJECTS SELECTED FOR FY 2007

Nineteen new start projects were selected for FCT funding in FY 2007. A listing and brief description of each project follows.

Table 5. New Projects Selected for Fiscal Year 2007

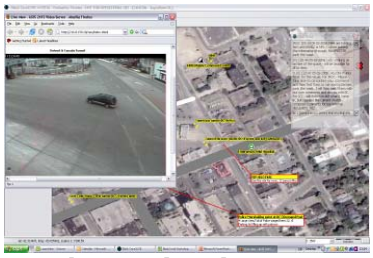
Sponsor	Project
Army	Lithium-Ion Polymer Batteries – Republic of Korea Real Time Geospatial Information Sharing – Canada Secure High-Capacity Tactical Radio System – Sweden Type II Superlattice Focal Plane Arrays and Cameras – Germany
Navy	Steel Strip Laminate Rocket Motor Case for 5-Inch Zuni Rocket – United Kingdom Tactical Paging Buoy for Submarine Communications at Speed and Depth – Canada, United Kingdom Waterjet Engine Qualification for Naval Combatants – Netherlands, Sweden
Marine Corps	Deployable Instrumented Training System for Urban Warfare – Sweden Enhanced Underwater Breathing Apparatus – Canada, Italy, United Kingdom Mobile Oxygen Ventilation and External Breathing Apparatus – Canada
Air Force	Ceramic-Aluminum Engine Coatings – Germany Helmet-Mounted Cueing System for A-10 “Warthog” – Israel Spatial Disorientation Trainer – Austria X-Band Synthetic Aperture Radar Satellite Data – Germany
U.S. Special Operations Command	Anti-Material Rifle – Croatia, Republic of South Africa Hostile Forces Tagging, Tracking and Locating – Canada, France, Italy, United Kingdom Lightweight Deployable Universal Communications Systems – Sweden MK47 Crew-Served Weapon Trainer – Norway PSYOP Radio Broadcast Platform – Norway

ARMY

Lithium-Ion Polymer Batteries – Republic of Korea

The Communications-Electronics Research, Development and Engineering Center, Fort Monmouth, New Jersey, will be evaluating advanced large Lithium-Ion polymer cells developed by *Kokam and SKC, of the Republic of Korea*, for integration into a BB-XX80 battery configuration to replace the current BA-8180 with a rechargeable battery. In addition, through integration of advanced circuitry and connectors, this battery could also directly supply equipment using XX90 type batteries (e.g., SINCGARS radios) and other associated applications.

Real Time Geospatial Information Sharing – Canada

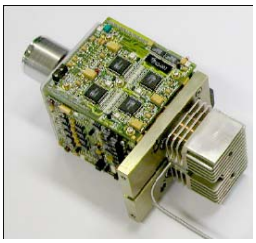


The Communications-Electronics Research, Development and Engineering Center, Fort Monmouth, New Jersey, will be evaluating software developed by *Black Coral of Ontario, Canada*, for an advanced Command and Control System, providing real time information sharing and collaboration using geospatial maps and data collation for warfighters at all echelon levels. The evaluation will validate system capabilities for searching and application to several information layers which will be combined for see-through capability.

Secure High-Capacity Tactical Radio System – Sweden

The Communications-Electronics Research, Development and Engineering Center, Fort Monmouth, New Jersey, will be evaluating a communications solution developed by *Ericsson Microwave Systems AB, of Sweden*, for securely moving information between switching nodes via Point-to-Point (PTP) and Point-to-Multipoint (PTMP) Radio Relays. The solution significantly improves upon the current fielded military system by reducing the number of required radio sets by up to 50 percent, solely through the introduction of a PTMP system. In addition, the Swedish solution is easy to set up, operate, and maintain, and is designed for simple and efficient network management.

Type II Superlattice Focal Plane Arrays and Cameras – Germany



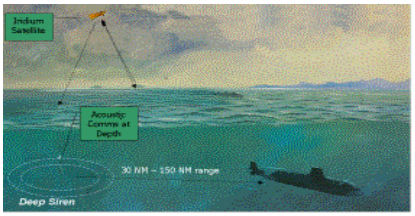
The Night Vision and Electronic Sensors Directorate, Fort Belvoir, Virginia, will be evaluating high performance and low cost Infrared Focal Plane Arrays, developed by *AEG Infrarot ModulesGmbH of Germany*, that show promise of reducing the cost of current and future Focal Plane Arrays by 80 percent, with a 30 percent decrease in system weight, while extending the distance at which the warfighter will be able to detect hostile objects by up to a factor of 5.

NAVY

Steel Strip Laminate Rocket Motor Case for 5-Inch Zuni Rocket – United Kingdom

The Naval Surface Warfare Center, Indian Head, Maryland, will be evaluating Steel Strip Laminate rocket motor case technology, developed by *Roxel Ltd. of the United Kingdom*, that promises to provide safety improvements to the Navy's Zuni 5.0-Inch Rocket System. At present, shipboard stowage and use of the Zuni requires a waiver because the current system is not Insensitive Munitions (IM) compliant. If this project is successful, the waiver will be removed and the Navy/Marine Corps will be afforded additional flexibility in using the Zuni in Close Air Support missions from their direct shipboard inventories rather than having to fly to a land-based armament point to load their weapons.

Tactical Paging Buoy for Submarine Communications at Speed and Depth – Canada, United Kingdom



The Space and Naval Warfare Systems Center, Charleston, South Carolina, will be evaluating submarine-launched expendable communications buoys, developed by *Ultra Electronics Maritime Systems of Canada* and *RRK of the United Kingdom*, which promise to provide a submarine at depth and speed with the capability to receive messages from the global Iridium Satellite Network via undersea acoustic communications. This new capability will support more agile submarine mission execution and better synchronized joint/coalition operations, and enable rapid and inexpensive fielding of the acoustic communications capability aboard U.S. submarines.

Waterjet Engine Qualification for Naval Combatants – Netherlands, Sweden

The Program Executive Officer-Ships, Naval Sea Systems Command, Washington, D.C., will be conducting full-scale shock qualifications of large waterjet engines developed by two major suppliers, *Kamewa/Rolls Royce of Sweden* and *Lipps/Wartsilla of the Netherlands*, for use on Navy combatants. The engines will be modified if necessary, in order to meet Grade A shock certification for installation on the Navy's Littoral Combat Ship (LCS), which is under construction, and for other future naval combatants.

MARINE CORPS

Deployable Instrumented Training System for Urban Warfare – Sweden

The Program Manager for Training Systems, Marine Corps Systems Command, in Orlando, Florida, will be evaluating an Urban Deployable Instrumented Training System (UDITS) developed by *Saab Training Systems AB of Sweden.* The Marine Corps' need for realistic urban warfare training evolved from lessons learned in Operations Iraqi Freedom and Enduring Freedom. UDITS supports live training exercises that move seamlessly from open terrain fighting to urban environment combat, while enhancing existing Multiple Integrated Laser Engagement System (MILES) equipment to allow for realistic simulation of direct and indirect fire effects.

Enhanced Underwater Breathing Apparatus – Canada, Italy, United Kingdom

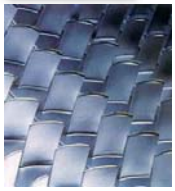
The Raids and Reconnaissance Program Office, Marine Corps Systems Command, Quantico, Virginia, will be evaluating advanced underwater breathing equipment developed by *Carleton of Canada, OMG of Italy,* and *Divex of the United Kingdom,* to meet a Marine Corps requirement to field an Enhanced Underwater Breathing Apparatus (EUBA) to conduct extended range underwater reconnaissance missions. The EUBA will increase dive duration by 33 percent and dive depth by 80 percent. Additionally, it will eliminate the risk of decompression (from up to 130 feet dive depth) and minimize the risk of diver detection caused by surface bubbles.

Mobile Oxygen Ventilation and External Breathing Apparatus – Canada

The Program Manager for CBRN-Medical, Marine Corps Systems Command, Stafford, Virginia, will be evaluating the Mobile Oxygen Ventilation & External Suction System (MOVESS), developed by *Thornhill Research, Inc. of Canada,* to meet an urgent need identified during Operation Iraqi Freedom to transport critically ill and injured post-operative patients via Marine Corps rotary wing aircraft. MOVESS is an integrated oxygen, ventilation, and suction device that will eliminate 90 percent of the logistics burden, 15 percent of the cost, and 85 percent of the weight of similar currently fielded equipment, while increasing the safety and flexibility of providing critical patient care during transportation.

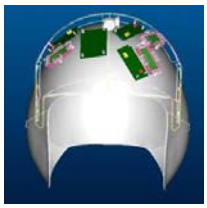
AIR FORCE

Ceramic-Aluminum Engine Coatings – Germany



The 78th Propulsion Maintenance Group, Tinker AFB, Oklahoma, will be evaluating Ceramic-Aluminum (CERAL) coatings, developed by *Gebr. M.u.M. Morant GmbH of Germany*, to provide protection from erosion and corrosion on gas turbine engines, landing gear, and surfaces of strategic components that are exposed to severe environments. Current coating materials use carcinogenic chrome, whereas CERAL 3450 is a "chrome-free" drop-in replacement that lasts twice as long (3000 hours), costs 25 percent less, and increases engine performance by providing a smoother surface.

Helmet-Mounted Cueing System for A-10 "Warthog" – Israel

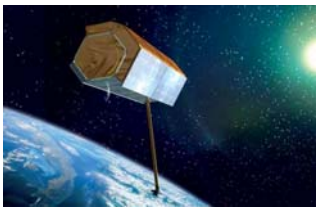


The A-10 Division of the Air Force Air National Guard Reserve Test Center, Tucson, Arizona, will be evaluating "Eyeball", an inexpensive and easily-integrated helmet mounted cueing and display system developed by *Rafael of Israel*, that allows the pilot (the primary "sensor" in the A-10 "Warthog") to slew or aim the aircraft sensors – targeting pod or weapon – to the pilot's line-of-sight, thus speeding target acquisition. Eyeball also closes the information gap between the pilot and aircraft by displaying spatially referenced cues or sensor video directly in front of the pilot's eye.

Spatial Disorientation Trainer – Austria

The Aeromedical Flying Training Branch of Air Education and Training Command, Randolph AFB, Texas, will be evaluating a Spatial Disorientation (SD) Trainer developed by *AMS Technik GmbH of Ranshofen, Austria*, which allows a pilot to simulate flight while experiencing motion-induced, visual, and "seat-of-the-pants" mis-matches. Thirty-seven percent of fatal Class A mishaps in Air Force operations have been attributed to unrecognized SD, at a cost of over $1.9 billion and loss of 82 lives. This trainer will allow pilots a chance to experience SD illusions and practice SD recoveries in a realistic simulated flight environment.

X-Band Synthetic Aperture Radar Satellite Data – Germany



The Program Manager for Eagle Vision at Hanscom AFB, Massachusetts, will be evaluating the "TerraSAR-X" satellite developed by *InfoTerra of Berlin, Germany*, to extend the all-weather imagery capabilities of current Eagle Vision systems with spatial resolution reaching 1 meter Ground Sample Distance, providing the highest resolution ever achieved from an unclassified civil or commercial satellite. Germany, with other European partners, is launching this new-

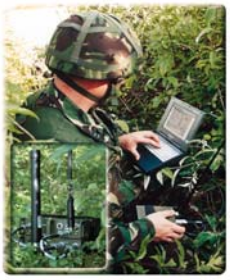
generation synthetic aperture radar satellite to provide all-weather satellite imaging and ocean surveillance.

U.S. SPECIAL OPERATIONS COMMAND

Anti-Material Rifle – Croatia, Republic of South Africa

The Naval Surface Warfare Center, Crane, Indiana, will be evaluating 20mm anti-material rifles developed by *RH-Alan of Croatia, and Denel and Truvelo Armoury, both of the Republic of South Africa* to determine their capabilities to defeat material targets such as lightly armored vehicles, power stations, communication assets, and unexploded ordnance. Phase I of the project (performance validation) will culminate with a "down-select" to a single foreign candidate which will undergo full technical testing and assessment in Phase II. Operational testing will be conducted in Phase III of the project. Planning for the test program is underway, as are arrangements for acquiring the test articles from the candidate companies.

Hostile Forces Tagging, Tracking, and Locating – Canada, France, Italy, United Kingdom



The U.S. Special Operations Command will be evaluating various tagging, tracking and locating (TTL) equipments that represent the latest in worldwide TTL technology. These ultramodern devices will provide deployed U.S. Special Operations Forces worldwide with an enhanced capability to tag, track and pin-point potentially dangerous adversaries.

Lightweight Deployable Universal Communications Systems (joint with Army) – Sweden

The U.S. Special Operations Command's Program Executive Officer for Intelligence and Information Systems, with test support from the Army Communications and Electronics Command at Fort Monmouth, New Jersey, will be evaluating the *Swedish Ericsson* "QuicLINK", a lightweight Universal Mobile Telecommunications (UMT) system. The project will focus on satisfying critical requirements of the Special Operations Forces Tactical Assured Connectivity and Joint Threat Warning Systems Programs, and the Army's Warfighter Information Network-Tactical (WIN-T) Program. The Swedish system is a downsized third-generation cellular system that can provide high data rates to personal communications devices, as well as handle a large number of simultaneous voice calls. The system can operate autonomously, or as a sub-network within current legacy networks, and will incorporate Robust Header Compression technology.

MK47 Crew-Served Weapon Trainer – Norway

The Naval Surface Warfare Center, Crane, Indiana, will be evaluating a crew-served weapons training system developed by *Simrad Optronics (former Vinghog AS) of Denmark* which allows Special Operating Forces to dry-fire the MK47 Advanced Lightweight Grenade Launcher and automatically receive feedback during mission-specific rehearsals prior to combat operations, thus improving readiness.

PSYOP Radio Broadcast Platform – Norway

The Naval Air Warfare Center, Saint Inigoes, Maryland, will be evaluating the deployment and operating capabilities of an FM Broadcast System developed by *Tyra Invest AS of Norway* using a tethered balloon concept. The system to be tested can place an FM Broadcast Transmitter at a predetermined altitude for up to five days and transmit PSYOP messages to personnel on the ground in denied areas. The system is designed to be deployed from fighter aircraft by means of a standard MK-7/20 (PDU-5B) canister and is well-suited for use under an existing cloud base or in darkness.

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APPENDIX A

PARTICIPATION IN THE FCT PROGRAM

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METRICS, MEASURES OF SUCCESS

The Foreign Comparative Testing Program assembles and "tracks" five primary metrics intended to measure the health, success, and cost effectiveness of the program. The results of this effort are presented and discussed in the following Appendices.

1. Successfully completed projects that lead to U.S. procurements (Appendices A and B)
    a. Value and quantities of procurements, including follow-on (multi-year) buys
    b. Percentage procured of those meeting sponsor requirements and providing best value
    c. Country participation, including number of projects; OSD funding provided to the sponsor for execution; percentage of overall funding comparisons; number, value and year of procurements
    d. Service and Special Operations Command participation, including number of projects conducted, completed; number of projects meeting requirements; procurements
    e. Location and identification of project management and testing activities (Appendix D)

2. Cost-benefit estimates for successful projects (Appendix D)
    - Development cost avoidance
        - How much it would have cost the U.S. to develop and field the item on its own, in the absence of the FCT Program
    - Production cost savings
        - Actual or later-expected reductions in per unit cost as a result of FCT
    - Operations and life-cycle cost savings
        - Savings expected to be achieved from longer life, less maintenance cost, or the item's efficiency
    - Reduced fielding time
        - The ability to field the qualified item to the warfighter sooner, as compared to traditional development and acquisition efforts

3. Evidence of military and other operational employment, improved operational capabilities (Appendix C)

4. Industrial teaming opportunities, including domestic partner's technology area and location (State, Congressional District) (Appendix D)

5. Licensed production in the U.S. (Appendix D)

PARTICIPATION IN THE FCT PROGRAM BY COUNTRY

The FCT Program depends for its success on the participation of our allies' and other friendly nations' defense industries and their world-class products. Table A1 lists the countries whose defense industries have participated in the FCT Program from FY 1980 through the beginning of FY 2007, along with the OSD FCT funds provided to the Services and U.S. Special Operations Command to evaluate the products from these countries. Numerous FCT projects involved equipment from two or more countries; thus, the total from column 2 will be greater than the number of total FCT projects that the FCT Program tracks. In addition, some FCT projects have resulted in the procurement of multiple items; thus, the number of items selected for procurement is greater than the number of projects shown in Table A2.

Table A1. Country Participation in the FCT Program [4]

Country	Number of FCT Projects	FCT Funds Provided ($ million) [5]	Number of FCT Items Selected for Procurement	Value of Procurements ($ million)
Australia	26	27.5	5	184.1
Austria	13	6.2	0	0.0
Belgium	18	7.9	6	74.8
Canada	74	61.9	20	277.5
Croatia	2	0.7	0	0.0
Denmark	19	15.2	7	110.1
Finland	8	4.6	1	5.0
France	77	101.3	17	636.5
Germany	115	148.5	27	1,154.3
Iceland	1	0.6	0	0.0
India	1	1.1	1	1.6
Israel	63	66.5	13	819.9
Italy	23	23.2	1	4.5
Japan	7	3.5	1	0.2
Netherlands	19	18.7	1	0.2
New Zealand	1	0.2	1	0.4
Norway	35	39.6	7	567.2
Poland	2	3.4	0	0.0
Republic of South Africa	7	9.8	3	101.5
Republic of Korea	10	4.0	0	0.0
Russian Federation	7	16.7	3	45.0
Singapore	1	0.9	0	0.0
Sweden	64	114.1	20	1,029.8
Switzerland	19	11.6	3	54.6
Taiwan	1	0.2	0	0.0
Ukraine	1	1.4	0	0.0
United Kingdom	204	337.2	60	2,852.1
Totals	818	1026.5	197	7,919.3

[4] *Table A1 includes projects conducted under the former OSD Foreign Weapons Evaluation (FWE) and NATO Comparative Testing (NCT) Programs between 1980 and 1989.*

[5] *Funds are shown in FY 2007 constant year dollars.*

DoD PARTICIPATION IN THE FCT PROGRAM

The principal objective of the FCT Program is to equip the U.S. warfighter with the world's best equipment by evaluating those mature conventional defense items and technologies produced by allied and coalition partner nations which demonstrate the potential to satisfy U.S. military requirements more quickly and economically. Table A2 lists the participation of each of the Services and the U.S. Special Operations Command in the FCT Program through the beginning of FY 2007.

Table A2. DoD Participation in the FCT Program, FY 1980 – 2006

Sponsor	Total Projects FY 1980 thru FY 2006	Projects Completed in FY 2005/2006	Total Projects Meeting Requirements FY 1980-2006	Total Projects Resulting in Procurement [6]
Army	172	8	83	57
Navy	175	10	72	51
Marine Corps	62	8	31	23
Air Force	111	7	52	35
USSOCOM [7]	47	9	28	23
Totals	567	42	266	189

From 1980 through the beginning of FY 2007, procurements resulted from about 69% of the projects that were completed successfully, met the sponsor's requirements, and provided best value. With better definition of user requirements and a clear focus on testing those items that address funded needs, the procurement rate of those items successfully completing FCT test and evaluation and meeting U.S. requirements since 1995 has risen to about 80%.

[6] *Number represents projects sponsored by the Services or Special Operations Command that resulted in procurements through October 2006.*

[7] *The first USSOCOM project was initiated in FY 1995 and was funded through the Navy's FCT Office. Beginning in FY 1997, USSOCOM directly managed its own FCT projects rather than relying on the Services to propose and receive funding from OSD for projects that related to USSOCOM requirements.*

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APPENDIX B

EQUIPMENT SELECTED FOR PROCUREMENT AS A RESULT OF THE FCT PROGRAM

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Table B1. Equipment Procured by the Army [8]

EQUIPMENT	COUNTRY	MANUFACTURER	YEAR
Engine Air Particle Separator for CH-47	United Kingdom	Pall Corporation	2006
40mm Training Cartridge MK281	Germany	Nico Pyrotechnik	2006
Individual Serviceman Non-Lethal System-FN303	Belgium	FN Herstal	2005
Fly-Away SATCOM System	Sweden	SweDish Satellite Systems	2004
AT-4CS Confined-Space Anti-Armor Weapon	Sweden	Saab Bofors Dynamics	2004
Prophet Ground Tactical-Based SIGINT-ES Architecture	United Kingdom	QinetiQ	2003
Expeditionary Airfield Light Duty Mat System "Mobi-Mat"	France	Deschamps Mobility	2003
Improved Battery Cells	Canada	Moli Energy	2003
Antenna Masts for Tactical Communications	Finland	Mast Systems	2002
Optically-Improved Standard Advanced Dewar Assembly II	France	SOFRADIR	2002
Anti-Jam GPS (GAS-1N) for Army Comanche EMD	United Kingdom	Raytheon, Ltd.	2002
Scanner Assembly for HTI B-Kit	United Kingdom	BAE Systems	2002
Afocal Assembly for HTI B-Kit	United Kingdom	BAE Systems	2002
High Mobility Engineer Excavator	Australia	Australian Defense Industries	2002
Mine Protected Clearance Vehicle (Buffalo)	South Africa	Denel-Mechem	2002
Anti-Jam GPS (Global Positioning) for Comanche EMD	United Kingdom	Raytheon Systems, Ltd.	2002
1.75/1.5-Watt Linear Drive Cooler	Germany	AEG Infrarot Modules	2001
7.62mm Short Range Training Ammunition	Canada	SNC Technologies	2001
L96/L97 Anti-Riot Grenade for LVOSS	United Kingdom	Pains-Wessex Defence	2001
Ground and Vehicle Mounting Systems for LRAS3	Germany	Sachtler GmbH	2000
Standard Advanced Dewar Assembly (SADA)-Type II	France	SOFRADIR	1999
Improved Mobile Subscriber Equipment UHF Radios	Canada, Israel	Canadian Marconi, Tadiran	1998
Powered Multi-Fuel Burner	Canada	Thermal Research	1998
Leguan Heavy Assault Bridge	Germany	MAN Technologies AG	1998
Gun Laying and Positioning System	Switzerland	Leica Heerbrugg	1998
Automatic Chemical Agent Detector Alarm Power Supply	United Kingdom	Smiths (Graseby Dynamics)	1998
Interim Vehicle-Mounted Metallic Mine Detector	South Africa	Dorbyl/RSD	1997
1-Watt Linear Drive Cooler	Germany	AEG Infrarot Modules	1997
Ultra-Lightweight Camouflage Net System	Sweden	Diab-Barracuda	1997
2kW Generator Sets for Mobile Electric Power	Canada	Mechron	1996
Automatic Chemical Agent Detector Alarm	United Kingdom	Smiths (Graseby Dynamics)	1996
Long Wavelength Infrared Focal Plane Arrays	France	SOFRADIR	1995
Muzzle Velocity System	Israel	Reshef	1994
84mm HEDP Round for Carl Gustaf RAAWS	Sweden	Saab Bofors Dynamics	1994
60mm Mortar Training Cartridges and Refurbishment Kits	Israel	Salgad/Pocal	1993
HAWK Battery Loader-Transporter Modification Kit	Germany	Thyssen Nordseewerke	1993
Improved Chemical Agent Monitor (ICAM) and Retrofit Kits	United Kingdom	Smiths (Graseby Ionics)	1993
35mm Tank Precision In-Gunbore Device HEAT Rounds	Germany	Diehl	1991
Anti-Magnetic Mine Actuating Device	Israel	Israeli Aircraft Industries	1990
Carl Gustaf M3 (RAAWS)	Sweden	Saab Bofors Dynamics	1990
Digital Signal Processor	Denmark	Weibel	1990
Fox NBC Reconnaissance Vehicle (NBCRS)	Germany	Thyssen Henschel	1990
NBCRS Lane Markers	Germany	F. Diehl	1990
NBCRS Mass Spectrometer	Germany	Bruker Franzen/Diehl	1990
NBCRS Navigation Instrument	Germany	Teldix	1990
105mm Lightweight howitzer M119	United Kingdom	Royal Ordnance	1988
105mm Tank Gun Training Ammunition	Germany	Rheinmetaal	1986
81mm Mortar Training Cartridge and Refurbishment Kit	Israel	Salgad/Pocal	1985
Improved 81mm Mortar and Ammunition	United Kingdom	Royal Ordnance	1985
120mm Mortar (Tampella)	Israel	Soltam	1985

[8] *Year of first procurement is as shown. Because more than one Service may procure an item, total numbers of the projects listed in the tables in Appendix B will not match those totals shown in Table A2.*

Chemical Agent Monitor (CAM)	United Kingdom	Smiths (Graseby Ionics)	1985
Kinetic Energy Recovery Rope	United Kingdom	Marlow Ropes, Ltd.	1985
5.56mm Plastic Training Ammunition with Bolt	Germany	Dynamic-Nobel	1984
Potable Water Tank	United Kingdom	Airborne Industries	1984
SANATOR Decontamination Unit	Norway	Karl H. Hoie/EASI	1984
4.2" Mortar Training Devices/Rounds	Germany	Nico Pyrotechnik	1983
.50 Caliber Plastic Training Ammunition with Device	Germany	Dynamit-Nobel	1983
AT-4 Anti-Armor Weapon	Sweden	Saab Bofors Dynamics	1983
Small Unit Support Vehicle	Sweden	Haaglands & Soner	1983
.22 Caliber Tank Training Ammunition	United Kingdom	EMI Eley	1982
10 Ton Truck Transporter Vehicle	Germany	MAN GHH	1981
Combat Support Boat	United Kingdom	Fairey Allday Marine	1981
M72A3 LAW Anti-Tank Weapon	Norway	Raufoss	1981
NBC Marking Set	Germany	A. Diedr Dolmeyer	1981

Table B2. Equipment Procured by the U.S. Marine Corps

EQUIPMENT	COUNTRY	MANUFACTURER	YEAR
M16A2/M4 Training Bolt	Canada	SNC Technologies	2007
JSLIST Block II Glove Upgrade	Canada	AirBoss Defence	2006
Deployable Instrumentation for MAGTF Training	Sweden	Saab Training Systems	2006
Eye-Safe Laser Rangefinder for M1A1 Tank	Germany	Zeiss Optronics	2006
Deployable Moving Target System	Germany	Thiessen Training Systems	2006
Mine Protected Clearance Vehicle "Buffalo"	South Africa	Denel-Mechem/Force Protection	2006
Skin and Open Wound Decontamination Lotion	Canada	O'Dell Engineering	2005
Special Effect Small Arms Marking System	Canada	SNC Technologies	2005
Biocular Image Control Unit for M1A1 Tank	United Kingdom	Brimar	2004
JSLIST Alternative Footwear (Protective Boots)	Canada	AirBoss Defence	2004
High Rate-of-Fire .50 Cal Machine Gun	Belgium	FN Herstal	2004
Mine Plow, Lane Marking for Assault Breacher Vehicle	United Kingdom	Pearson Engineering	2003
Communications Distribution System	Canada	Computing Devices	2003
L96/L97 Anti-Riot Grenades for LVOSS	United Kingdom	Pains Wessex Defence	2002
40mm Training Practice Cartridge MK281Mod0)	Germany	Nico Pyrotechnik	2002
Expeditionary Airfield Light Duty Mat System	France	Deschamps Mobility	2001
30mm APFSDS Tracer Rounds for USMC EFV	Germany, Norway	Mauser, Raufoss	2001
Joint Service Combat Shotgun	Italy	Benelli	2000
MTU-883 Diesel Engine for EFV	Germany	Moteren und Turbinen Union	1999
Aluminum Road Wheels for EFV	United Kingdom	GKN	1999
Digital Voice and Data System	Canada	Computing Devices	1998
NBC Analysis System	Denmark	Bruhn NewTech	1998
Minimum Operating Strip Lighting Kits	United Kingdom	Metalite Aviation Lighting	1998
Automatic Chemical Detector Alarm Power Supply	United Kingdom	Smiths (Graseby Dynamics)	1998
2KW Generator Set for Mobile Electric Power	Canada	Mechron	1997
Automatic Chemical Agent Detector Alarm (ACADA)	United Kingdom	Smiths (Graseby Dynamics)	1997
84mm Insensitive Munition HEAT Round for RAAWS	Sweden	Saab Bofors Dynamics	1996
Airtronic Light Oil Burner	Sweden/BeLux	Electrolux	1995
M72A3/A5 Light Anti-Tank Weapon	Norway	Raufoss/Talley Defense	1995
Muzzle Velocity System	Israel	Reshef	1994
HAWK Battery Loader-Transporter Modification Kit	Germany	Thyssen Nordseewerke	1993
Improved Chemical Agent Monitor (ICAM)	United Kingdom	Smiths (Graseby Dynamics)	1993
Portable Target Scoring System	United Kingdom	BDL Systems, Ltd.	1992

Anti-Magnetic Mine Actuating Devices	Israel	Israel Aircraft Industries	1990
Lightweight CB Protective Garment	United Kingdom	Compton-Webb Ltd.	1990
"Fox" NBC Reconnaissance Vehicle (NBCRS)	Germany	Thyssen Henschel	1990
NBCRS Lane Markers	Germany	F. Diehl	1990
NBCRS Mass Spectrometer	Germany	Bruker Franzen/F. Diehl	1990
NBCRS Navigation Instrument	Germany	Teldix	1990
A-6 Raster Head-Up Display	United Kingdom	GEC Avionics	1988
Chemical Agent Monitor (CAM)	United Kingdom	Smiths (Graseby Dynamics)	1985
SANATOR Decontamination Unit	Norway	Karl H. Hoie	1984

Table B3. Equipment Procured by the Navy

EQUIPMENT	COUNTRY	MANUFACTURER	YEAR
Improved Specific Emitter ID System	United Kingdom	QinetiQ	2006
Digital Flight Control System for EA-6B "Prowler"	United Kingdom	BAE Systems Avionics	2006
JSLIST Alternative Footwear (Protective Boots)	Canada	AirBoss Defence	2004
Shipboard Anti-Jam GPS Antenna	United Kingdom	Raytheon Systems, Ltd.	2004
VLF/LF Composite Bushing Replacement	Switzerland	Tyco Electronics	2003
Corona Monitoring System	OFIL, CSIR	Israel, South Africa	2003
Expeditionary Airfield Light Duty Mat	France	Deschamps Mobility	2002
Stealth Screen System	France	ACH Engineering	2002
Joint Protective Aircrew Ensemble	Germany	Blucher & Theodolf Fritsche	2002
BROACH Warhead for Joint Standoff Weapon	United Kingdom	BAE Systems	2001
Emergency Evacuation Hyperbaric Stretcher	United Kingdom	SOS, Ltd.	2001
High Pressure Pure Air Generator for F/A-18E/F	United Kingdom	Ultra Electronics	2001
Titanium Nitride Erosion-Resistant Coatings Process	Canada/Russia	MDS/PRAD	2001
Communications Faired Mast	United Kingdom	Thomson Marconi Sonar	2000
DYAD Magnetic Sweep	Australia	Australian Defense Industries	2000
HMX Explosives Compounds	Norway	Dyno Nobel	2000
Passenger Anti-Exposure Survival System	United Kingdom	Multifab Survival	2000
Submarine Escape and Immersion Ensemble	United Kingdom	Beaufort/Hale Hamilton	2000
Atmospheric Diving Suit (Newtsuit)	Canada	International Hard Suit	1999
ACADA Power Supply	United Kingdom	Smiths (Graseby Dynamics)	1998
2kW Generator Set for Mobile Electric Power	Canada	Mechron	1997
Automatic Chemical Agent Detector Alarm (ACADA)	United Kingdom	Smiths (Graseby Dynamics)	1997
Acoustic Cladding Underwater Repair System	United Kingdom	UMC International	1997
MA-31 Supersonic Sea Skimming Target Missile	Russia	Zvezda Strela	1997
84mm Insensitive Munition HEAT Round for RAAWS	Sweden	Saab Bofors Dynamics	1996
Digital Flight Control System for F-14	United Kingdom	GEC Marconi	1996
GIANT Infrared Decoy System	Germany	Buck Technologies	1996
T-45 Trainer Digital Cockpit Display	United Kingdom	Smiths Industries	1996
Long Wavelength Infrared Focal Plane Arrays	France	SOFRADIR	1995
Forward Area Degaussing Range	United Kingdom	Ultra Electronics	1995
High-Pressure Pure Air Generator for AV-8B & AH-1	United Kingdom	Ultra Electronics	1995
IFF Tracker System for EW Training	United Kingdom	Cossar	1995
M72A3/A5 Light Anti-Tank Weapon	Norway	Raufoss/Talley Defense	1995
Spray-Formed Alloy 625 Process for Submarine Piping	Sweden	AB Sandvik Steel	1995
BOL Chaff Countermeasures System	Sweden/UK	Saab Tech/Chemring	1993
Cowan Transportable Recompression Chamber	Australia	Cowan Manufacturing	1993
Impressed Current Cathodic Protection System	United Kingdom	Widney Aish	1993
Improved Chemical Agent Monitor (I-CAM)	United Kingdom	Smiths (Graseby Dynamics)	1993
EHF Traveling Wave Tubes	Germany	Siemens	1992

MK48 Torpedo Wire Guidance (Hosepipe)	United Kingdom	Marconi Underwater Systems	1992
SAM Remote-Controlled Minesweeper	Sweden	Karlskronavarvet	1991
Penguin Missile & Guidance Unit	Norway	Norsk Teknologi	1991
Infrared Imaging System	Israel	El-Op, Tadiran	1991
Aerial Target Vector Scoring	United Kingdom	Cambridge Consultants	1990
MCM-1 Tactical Displays	United Kingdom	Plessey Naval Systems	1990
Night Vision Goggles (Cats Eyes)	United Kingdom	GEC Avionics	1990
TICM FLIR with Thermal Cueing Unit	United Kingdom	GEC Avionics	1990
A-6 Raster Head-Up Display	United Kingdom	GEC Avionics	1988
ASW Acoustic Processor	Canada	Computing Devices	1988
E-2C Multifunction Control Display Unit	Canada	Marconi of Canada	1988
Maritime Decoy (Rubber Duck)	United Kingdom	Irvin Industries	1988
Versatile Exercise Mines	United Kingdom	BAeSEMA	1987
Chemical Agent Monitor (CAM)	United Kingdom	Smiths (Graseby Dynamics)	1985
SANATOR Decontamination Unit	Norway	Karl H. Hoie	1984
.50 Cal. Multipurpose Ammunition	Norway	Raufoss	1981
Combat Support Boat	United Kingdom	Fairey Allday Marine	1981
Integrated Communications System III	United Kingdom	Marconi	1980

Table B4. Equipment Procured by the U.S. Special Operations Command

EQUIPMENT	COUNTRY	MANUFACTURER	YEAR
Low Probability of Intercept COMINT Direction Finding	United Kingdom	TRL Technology	2006
SOF Combat Assault Rifle (SCAR)	Belgium	FN Herstal	2006
Advanced Lightweight Grenade Launcher Ammunition	Norway	NAMMO	2005
Wireless LAN Monitoring	New Zealand	TamoSoft	2005
Body-Worn Radar Detection Receivers	United Kingdom	QinetiQ	2005
MC-130H Aerial Refueling Pod System	United Kingdom	Flight Refueling Limited	2004
Parachute Leaflet Delivery System (WSADS)	Canada	MMist	2004
Fly-Away SATCOM (Satellite Communications)	Sweden	SweDish Satellite Systems	2003
Man-Portable Multi-Sensor System Headsets and Sensors	Denmark, France, Israel, Sweden	NextLink, Metravib, Source of Sound, FLIR Systems	2003
Chemical Protective Gloves	Canada	Cloutier	2003
7.62mm Lightweight Machine Gun MK48	Belgium	FN Herstal	2003
40mm Training Practice Cartridge MK281Mod0)	Germany	Nico Pyrotechnik	2002
Joint RAAWS Upgraded Ammunition-Phase II	Sweden	Saab Bofors Dynamics	2002
AT-4CS Confined-Space Anti-Armor Weapon	Sweden	Saab Bofors Dynamics	2002
Man-Portable Decontamination Equipment	Germany	Odenwald-Werke Rittersback	2002
Patrol Coastal Decoy System (Super Barricade)	United Kingdom	ML Aviation	2002
21mm Trainer for M72 Light Anti-Armor Weapon (LAW)	Norway	Nordic Ammunition Co.	2001
Joint RAAWS Upgraded Ammunition-Phase I	Sweden	Saab Bofors Dynamics	2001
5.56mm Lightweight Machine Gun	Belgium	FN Herstal	2000
Maritime Craft Air Deployment System II	United Kingdom	Aircraft Materials, Ltd.	1999
Gunfire Detection System-PILAR	France	Metravib	1999
Maritime Craft Air Deployment System	United Kingdom	Aircraft Materials, Ltd.	1998
Long Wavelength Infrared Focal Plane Arrays	France	SOFRADIR	1995
Carl Gustaf M3 Ranger Anti-Armor Weapon (RAAWS)	Sweden	Saab Bofors Dynamics	1994
LI-465 Fuzes for PGU-9AB Ammunition	Sweden	Saab Bofors Dynamics	1993
40mm HEI Round (PGU-37B) for AC-130 Gunship	Sweden	Saab Bofors Dynamics	1993

Table B5. Equipment Procured by the Air Force

EQUIPMENT	COUNTRY	MANUFACTURER	YEAR
MEMS Inertial Measurement Units	United Kingdom	BAE	2006
Airborne Video Recorder/Replay System	France	Enertec	2005
Eagle Vision Sensor Upgrade (SPOT5)	France	EADS (Matra Cap)	2004
Expeditionary Airfield Light Duty Mat System	France	Deschamps Mobility	2003
Retractable Arresting Cable System	France	Aérazur (Zodiac Group)	2002
Minimum Operating Strip Lighting Kit (MOSKIT)	United Kingdom	Metalite Aviation Lighting	2002
Infrared/UV Threat Stimulator	United Kingdom	Elettronica UK, Ltd.	2001
Emergency Evacuation Hyperbaric Stretcher	United Kingdom	SOS, Ltd.	2001
F-15 Countermeasures Dispenser (BOL)	Sweden	Saab Tech (formerly Celsius)	2001
Emergency Aircraft Arresting System	France	Aérazur (Zodiac Group)	2000
Next Generation Small Loader	Australia	Static Engineering with FMC	2000
Uncooled Thermal Imager	Sweden	FLIR Systems	1999
Renaissance View Satellite Data Upgrade	France, Canada	EADS, IOSAT of Canada	1999
600-Gallon Fuel Tanks for F-16	Israel	Israel Aircraft Industries	1999
Eagle Vision and Eagle Vision with LANDSAT Upgrade	France	EADS (formerly Matra CAP)	1998
Automatic Chemical Agent Detector Alarm Power Supply	United Kingdom	Smiths (Graseby Dynamics)	1998
Electronic Warfare Management System	Denmark	Terma	1997
Multi-Scanner for Aging and Surveillance	Germany	Fiedler Optoelectronik Ltd.	1997
MILSTAR Traveling Wave Tube	France	Thomson Tubes Electroniques	1997
Pressure Sensitive Paint for Wind Tunnel Applications	Russia	OPTROD, Ltd.	1996
Automatic Chemical Agent Detector Alarm (ACADA)	United Kingdom	Smiths (Graseby Dynamics)	1996
Modular Reconnaissance Pod	Denmark	Per Udsen (Terma)	1996
Long Wavelength Infrared Focal Plane Arrays	France	SOFRADIR	1995
Enhanced Electronic Warfare Scenario Generator	United Kingdom	Data Sciences	1994
Pylon Integrated Dispenser	Denmark	Per Udsen (Terma)	1993
I-800 (HAVE NAP) Warhead	Israel	Israel Military Industries	1992
SPOT Satellite Digital Imagery	France	SPOT Image Corporation	1990
ALE-40 Digital Sequencer Switch	Denmark	Terma Elektronik	1990
NBC Aircrew Protective Suit Fabric	Germany	Blucher/Celanese Corp.	1990
Millimeter Wave Communications	Japan	Nippon Electric	1989
Dielectric Measurement Equipment	France	Aérospatiale	1989
HAVE NAP Stand-Off Weapon	Israel	Rafael	1989
Munitions Ejector Release Unit	Germany	Alkan/EDO	1986
Chemical Agent Monitor	United Kingdom	Smiths (Graseby Dynamics)	1985
Rapid Runway Repair Equipment	Germany	Christiansen Diamond Products	1985
SANATOR Decontamination Unit	Norway	Karl H. Hoie/EASI	1984
DURANDAL Runway Attack Weapon	France	Matra	1983
10 Ton Truck Transporter Vehicle	Germany	MAN GHH	1981

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APPENDIX C

FCT-EVALUATED EQUIPMENT SUPPORTING MILITARY OPERATIONS AND IMPROVED CAPABILITIES

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EXAMPLES OF FCT-EVALUATED EQUIPMENT DEPLOYED IN U.S. OPERATIONS

Operation: **Iraqi Freedom**
Project: **5.56mm Lightweight Machine Gun**
Country: Belgium
Manufacturer: *FN Herstal*

Description: The MK46 Mod0 is a compact, belt-fed machine gun manufactured by FN Herstal of Belgium that significantly increases the organic firepower of U.S. Special Forces SEAL platoons without affecting tactical load bearing constraints. Substantially lighter than the 7.62mm MK43 machine gun and M249 squad automatic weapons in the inventory, the MK46 is highly reliable and remarkably flexible with improved rails for scope, laser, and light attachments. Full operational capability was obtained in July 2002 when 492 weapons were delivered to Special Forces. The weapon is being used extensively in Iraq combat operations.

Operations: **Combined Joint Task Force Horn of Africa, Iraq, Afghanistan**
Project: **High Rate-of-Fire .50 Cal Machine Gun (M3M)**
Country: Belgium
Manufacturer: *FN Herstal*

Description: The M3M replaces the obsolete .50 Cal machine guns employed by Marine Corps UH-1N and CH-53E Super Stallion helicopters, giving them 180-degrees of defensive fire from the rear and side door of the aircraft. HMH-461was the first Fleet Marine Force squadron to use the Belgian system in real-world operations, deploying to Djibouti in April 2003 for Combined Joint Task Force missions detecting, disrupting, and defending against trans-national terrorists. As of FY 2007, over $49 million worth of M3Ms have been acquired for CH-53, CH-46, and UH-1, with 161 weapons flying in Iraq, Afghanistan, and elsewhere.

Operations: **Enduring Freedom, Iraqi Freedom**
Project: **Advanced Demolition Weapons**
Country: Sweden, Germany
Manufacturer: *Saab Bofors Dynamics, Diehl Munitions GmbH*

Description: In January 2002**,** U.S. Special Operations Command completed evaluation of the Swedish AT-4CS (Confined Space 84mm shoulder-fired weapon) developed by Saab Bofors Dynamics, and the Bunkerfaust (lightweight fortification defeat weapon) developed by Diehl Munitions GmbH, for urgent deployment to Afghanistan and to Iraq, the first fielding of a confined space shoulder-fired system to U.S. Forces. Over 6,000 AT-4CS weapons have been procured.

Operations: **Bosnia, Kosovo**
Project: **Anti-Riot Grenade**
Country: United Kingdom
Manufacturer: *PW Defence, Ltd. (formerly Pains-Wessex)*
Description: Army Military Police and other selected small units on patrol duty in Bosnia and Kosovo, deployed with the Light Vehicle Obscuration System (LVOSS), were equipped with L96/97 anti-riot grenades to employ as required, as a less-than-lethal counterforce for crowd control and/or riot suppression operations.

Operations: **Kosovo, Enduring Freedom, Iraqi Freedom, Domestic Force Protection**
Project: **Automatic Chemical Agent Detector Alarm (ACADA)**
Country: United Kingdom
Manufacturer: *Smiths Detection (formerly Graseby Dynamics)*
Description: The GIDS-3 was selected as the winning candidate for the Automatic Chemical Agent Detector Alarm requirement in 1996. The sensitive detectors are emplaced for remote detection and add a nerve agent capability that the previous M43A1 detector does not possess. An advanced Power Supply for ACADA, with improved unit reliability and significant weight reduction, was qualified under FCT in FY 1998 and is being procured with each ACADA unit. ACADA is the standard detector for all Army units and is currently deployed worldwide and also is in use to protect domestic high-value installations, including the Pentagon. Over 32,000 units have been procured to date. The M22 ACADA is deployed with the following units in support of either Enduring Freedom or Iraqi Freedom: 3rd Infantry Division, Fort Stewart; 101st Airborne Division, Fort Campbell; 82nd Airborne Division, Fort Bragg; 4th Infantry Division and 1st Cavalry, Fort Hood; 10th Mountain Division, Fort Drum; and various Special Forces units.

Operations: **Enduring Freedom, Iraqi Freedom**
Project: **BOL Countermeasures Dispenser and Expendables Deployed with F-14 Tomcat**
Country: Sweden
Manufacturer: *Saab Bofors Dynamics*
The Swedish Saab Bofors Dynamics BOL Chaff Dispenser with chaff and flare expendables, qualified for procurement and installation on Navy F-14 Tomcats under the FCT Program, and was deployed in the Iraqi theater of operations with Carrier Air Wing 14 aboard the USS Carl Vinson (CVN-70). Air Wing pilots and commanders in after action reports have stated, ***"The installation of BOL Chaff is arguably one of the best survivability enhancements for the Tomcat in its history…we finally have incorporated a system on Navy Tactical Aircraft giving our aircrews a reasonable number of expendables for combat."***

Operations: **Midwest Flood Assistance (1997), Bosnia**
Project: **Combat Support Boats**
Country: United Kingdom
Manufacturer: *Fairey Allday Marine*

Description: During the serious floods in the Midwest in the late spring and summer of 1997, the U.S. Army and Army National Guard engineer units provided support to state and local officials. Combat Support Boats were used for recovery operations, transporting supplies, and assisting in the repair and construction of bridges. In Bosnia, the flood-swollen Sava River was a major obstacle to accomplishing U.S. national security objectives. Combat Support Boats were essential to rapidly assembling and maintaining the military bridge that U.S. forces used to cross the Sava River into Bosnia.

Operations: **Desert Storm, Somalia, Bosnia, Kosovo, Enduring Freedom, Iraqi Freedom**
Project: **Eagle Vision Satellite Imagery Receiving and Processing Ground Station, SPOT Satellite Digital Imagery**
Country: France, Canada
Manufacturer: *SPOT Image Corporation, EADS (formerly Matra CAP), IOSAT Corporation*

Description: SPOT satellite imagery was down-linked directly to U.S. Forces in Bosnia and is currently being used in support of Enduring Freedom and Iraqi Freedom operations. SPOT provides U.S. Air Force pilots with imagery that allows near real-time practice flyovers and provides ground commanders with valuable intelligence data in support of mission planning. Frequently, according to after-action reports during Operation Desert Storm, these were the only up-to-date images available to pilots prior to their air strike missions. Eagle Vision is also routinely used in support of exercises such as Cope Thunder and Green Flag and is currently on deployment.

Operation: **Iraqi Freedom, Enduring Freedom**
Project: **Electronic Warfare Management System AN/ALQ-213(V)**
Country: Denmark
Manufacturer: *Terma AS*

Description: The AN/ALQ-213(V) EWMS manufactured by Terma Electronik AS is an integrated and programmable electronic warfare unit which replaces individual cockpit controls with centralized control of the electronic combat suite (EC) in the F-16 Fighting Falcon and A-10 Warthog aircraft. This includes up-front presentation of all EC status, in-flight selection of chaff/IR dispense programs and full night-vision capability. The system is operational on all F-16 and A-10 aircraft, including those flying combat missions in Iraq and Afghanistan.

Operations: **Enduring Freedom, Iraqi Freedom**
Project: **Expeditionary Airfield Light Duty Mat System**
Country: France
Manufacturer: *Deschamps Mobility Systems*

Description: The 1st Marine Expeditionary Forces deployed to Afghanistan and Iraq operating areas equipped with the "Mobi-Mat" system which gave them the capability to quickly set up stabilized landing areas for medical evacuation and Forward Arming and Refueling Points for rotary-wing aircraft operations. ***"The Mobi-mats, or "triscuit pads" as we call them, were awesome in Iraq - for FARPS or even for landing pads at the hospitals…. we appreciate the help and truthfully - the lives probably saved by their use…" -- Commander MEDEVAC Company***. The mats successfully completed FCT evaluation at the Naval Air Warfare Center in Lakehurst, New Jersey, in 2002. Other units that have been equipped with "Mobi-Mat" are the Army's 10th Mountain Division, 101st Airborne Division, and the 130th Engineer Brigade-U.S. Army Europe (V Corps).

Operation: **Iraqi Freedom**
Project: **Fly-Away SATCOM (Satellite Communications) System**
Country: Sweden
Manufacturer: *SweDish*

Description: Small, lightweight satellite dishes manufactured by SweDish provide one-person operations in a turnkey satellite communications solution. Two sizes of small dishes provide secure communications (live video/audio streaming, broadband transmission and automated setup) without sacrificing the identity or location of the user. The unit in the photo is 5th Corps Headquarters during the early stages of Iraqi Freedom and the dish on the command and control vehicle is a 1.5M SweDish Drive Away System.

Operations: **Bosnia, Kosovo, Desert Storm, 1996 Summer Olympics in Atlanta, Iraqi Freedom, and with U.S. Forces in the Republic of Korea**
Project: **Fox NBC Reconnaissance Vehicle with MM-1 Mobile Mass Spectrometer**
Country: Germany
Manufacturer: *Thyssen-Henschel, Bruker-Franzen, General Dynamics Land Systems (U.S.)*

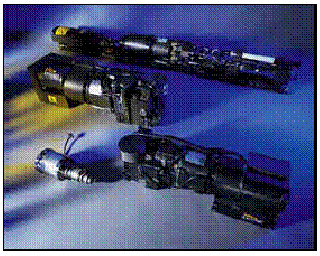
Description: The XM-93 Fox NBC Reconnaissance Vehicle is equipped with state-of-the-art sensors and mass spectrometer for detecting chemical and biological agents. The Fox vehicle is deployed whenever there is a threat of chemical-biological warfare. The vehicle performed admirably during Operation Desert Storm and was used by U.S. forces in Bosnia and Kosovo to identify areas where munitions may have leaked. The Marines Corps' Chemical Biological Incidence Response Force (CBIRF) team out of the Naval Surface Warfare Center at Indian Head, Maryland, deployed with two Foxes to the 1996 Summer Olympics in Atlanta in readiness to provide support if required. The Fox was employed by Army and Marine Corps units in the assault on Baghdad during Operation Iraqi Freedom. Several Fox systems are also deployed elsewhere in the Middle East and are with U.S. troops in the Republic of Korea.

Operations: **Joint Guardian, Enduring Freedom, Iraqi Freedom**
Project: **Ground and Vehicle Mounting System (GVMS)**
Country: Germany
Manufacturer: *Sachtler GmbH*
Description: The GVMS is a proven advanced tripod/yoke assembly which permits operation of the Army's Long Range Advanced Scout Surveillance System (LRAS3), allowing smooth pointing of the sensors in both mounted and dismounted configurations. The GVMS was deployed with units of Task Force Falcon in support of Operation Joint Guardian, the NATO-led peacekeeping operation in Kosovo; is with U.S. Special Forces in Afghanistan; as well as fielded in Iraq with the 4th Infantry Division and 1st Cavalry Division both out of Fort Hood, Texas; and with the 1st Stryker Brigade Combat Team out of Fort Lewis, Washington. Additional GVMS systems are deployed to U.S. Forces in Kuwait.

Operation: **Iraqi Freedom**
Project: **Gunfire/Counter-Sniper Detection System**
Country: France
Manufacturer: *Metravib*
Description: The Metravib "PILAR" equipment which was qualified by the U.S. Special Operations Command under the FCT Program provides acoustic detection of gunfire and pinpoints the location of its origin in azimuth, elevation, and range out to 1,200 meters. The system reduces vulnerability to sniper threats in urban terrains, temperate and tropic environments. Ground and vehicle-mounted variants are deployed with soldiers of the 101st Airborne Division in Iraq.

Operation: **Iraqi Freedom, Enduring Freedom**
Project: **Gun-Laying and Positioning System (GLPS**
Country: Switzerland
Manufacturer: *Leica Heerbrugg*
Description: GLPS significantly improves the warfighter's capability to quickly and accurately position and survey a battery of howitzers. By utilizing a global positioning system (GPS) receiver with satellite input, GLPS provides very accurate position and reduces gun-laying time by more than one-third. GLPS is currently deployed with artillery units in Iraq and Afghanistan.

Operation: **Iraqi Freedom**
Project: **High Pressure Pure Air Generator (HiPPAG)**
Country: United Kingdom
Manufacturer: *Ultra Electronics Weapons System*



Description: HiPPAG replaces the nitrogen bottles used to cool Sidewinder AIM-9M missile seekers on Marine Corps AV-8B, AH-1 and Navy F/A-18E/F and -C/D aircraft. Current flight operations with nitrogen bottles are costly and manpower-intensive to maintain, and due to capacity of the bottles, restrict the time the missile is available for self-protection/kill. HiPPAG is deployed with aviation units in Iraq, including the Navy's newest combat aircraft, the F/A-18E Super Hornet, which made its combat debut on 6 November, 2002, when aircraft from the Nimitz-class aircraft carrier *USS Abraham Lincoln* struck air-defense sites in southern Iraq. To date, over 2,000 HiPPAGs have been fielded with U.S. Forces.

Operations: **Desert Storm, Bosnia, Kosovo, Enforcement of UN Sanctions on Iraq, Enduring Freedom, Iraqi Freedom**
Project: **Improved Chemical Agent Monitor**
Country: United Kingdom
Manufacturer: *Smiths Detection (formerly Graseby Dynamics)*

Description: The Improved Chemical Agent Monitor (ICAM) is a hand-held point detector/monitor and can be used by personnel inspecting vehicles, buildings and other structures. The ICAM is the Army's standard monitor and is deployed in all theaters. U.S. inspectors on United Nations inspection teams in Iraq used the ICAM to identify areas where chemical munitions may have been produced, stored, or transported. U.S. Forces in Bosnia, Kosovo, Afghanistan and Iraq also employ the ICAM. To date, over 30,000 ICAMs have been produced and fielded with U.S. Forces.

Operation: **Iraqi Freedom**
Project: **Interim High-Mobility Engineer Excavator**
Country: Australia
Manufacturer: *Australian Defense Industries partnered with Oshkosh Trucks*

Since November 2003, high-mobility engineer excavators, manufactured by Australian Defense Industries in partnership with Oshkosh Trucks Corporation of Wisconsin, are deployed with Army units in Iraq. The production of the excavators for U.S. Forces was the result of a successful FCT evaluation in support of the Army Chief-of-Staff's Army Transformation Initiative to replace the slower Small Emplacement Excavator. The Australian equipment is C-130 deployable, all-wheel drive, diesel engine, with multiple attachment acceptability for back hoe and bucket loader, with a top speed of 70 miles per hour to stay up with forces on the move.

Operation: Iraqi Freedom
Project: **Joint Service Combat Shotgun M1014**
Country: Italy
Manufacturer: *Bennelli*
Description: This 12-gauge shotgun, the M4 Super 90 developed by Benelli Armi of Urbino, Italy, is replacing all pump-action shotguns currently in use by the Marine Corps with a common lightweight, highly reliable, semi-automatic weapon, significantly increasing individual firepower. The Marine Corps received the first 400 in November 2002 of a planned procurement of 3,997 weapons. 1st Marine Expeditionary Forces employ these weapons in Iraq, frequently as "door-busters", according to after-action reports received. The weapon is now designated the M1014.

Operation: **Desert Storm**
Project: **Lightweight Chemical/Biological Protective Garment**
Country: United Kingdom
Manufacturer: *J. Compton Sons and Webb, Ltd.*
Description: Marine infantry units deployed to Operation Desert Storm in 1991 with the British MK-V chem-bio protective garments which were, at the time, undergoing a lengthy evaluation by the Army under the FCT Program. An urgent procurement was authorized so each Marine would have, at the least in his backpack, effective self-protection against expected chemical and/or biological warfare attacks in Kuwait and Iraq.

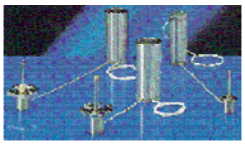
Operations: **Enduring Freedom, Iraqi Freedom**
Project: **Mine-Protected Clearance Vehicle, "Buffalo"**
Country: Republic of South Africa
Manufacturer: *Denel Mechem, partnered with Technical Solutions Group (U.S.)*
Description: After successful FCT qualification in 2002, the first two Buffalo production units were deployed to Afghanistan in support of another deployed FCT success, the Interim Vehicle-Mounted Magnetic Mine Detection (IVMMD) System. The vehicles are currently in operation in Iraq with the 612th Engineer Battalion. U.S. units also have 2 RG-31 vehicles (command cars for the IVMMD) deployed in Afghanistan and Iraq.

Operations: **Enduring Freedom, Iraqi Freedom**
Project: **Next Generation 25K Small Loaders (Halvorsen Loaders)**
Country: Australia
Manufacturer: *Static Engineering, partnered with FMC Corporation (U.S.)*
Description: Halvorsen loaders are now the standard 25,000 pound loaders for the Air Force and have been deployed with Air Force airlift units in Afghanistan and Iraq since the beginning of Operation Enduring Freedom. Introduction of the Australian advanced loader resulted from FCT evaluation of two foreign loaders in competition to meet Air Force requirements to replace the aging, unreliable loaders in the inventory.

Operations: **Desert Shield, Desert Storm**
Project: **Self-Propelled Acoustic-Magnetic Minesweeper**
Country/Mfr: Sweden
Manufacturer: *Karlskronavarvet*

Description: The Self-Propelled Acoustic-Magnetic Minesweeper, then under evaluation in the FCT Program, was deployed on an urgent basis and used by U.S. Naval Forces during and after Operations Desert Shield and Desert Storm in 1990/1991 to conduct remote minesweeping in shallow water, searching for and clearing enemy naval mines.

Operations: **Enduring Freedom, Iraqi Freedom**
Project: **Standard Advanced Dewar Assembly-Type II, and One Watt Linear Drive Coolers**
Country: France, Germany
Manufacturer: *SOFRADIR, AEG Infrarot Modules*



Description: With the deployment of the 1st Cavalry Division and the 4th Infantry Division to the Middle East, Abrams Tanks and Bradley Infantry Fighting Vehicles were inserted into the theater of operations in support of Enduring Freedom and Iraqi Freedom with an unrivaled day/night, all-weather capability to engage targets and provide situational awareness. This capability is provided by the advanced 2nd Generation FLIR systems in the platforms' sights, which have SADAs developed by SOFRADIR of France and One Watt Linear Drive Coolers developed by AEG Infrarot Modules of Germany, both successfully qualified for procurement by the Army's Horizontal Technology Insertion (HTI) Program, Night Vision and Electronics Sensors Directorate at Fort Belvoir, Virginia.

Operations: **TWA 800 Crash Recovery (1997), Pennsylvania Mine Rescue (2002)**
Project: **Transportable Recompression Chamber**
Country: Australia
Manufacturer: *Cowan*

Description: The MK 6 Transportable Recompression Chamber provides the ability to provide immediate on-site treatment of decompression sickness. Navy Underwater Construction Team Two supported deep-water recovery operations after the explosion and crash of TWA flight 800 in the Atlantic off Long Island, New York in 1997. During the operation, the recompression chamber was successfully used to treat an injured diver under emergency conditions. In July 2002, nine units were deployed to the drilling site in Somerset, Pennsylvania, as part of the operation to rescue the coal miners trapped underground at the Black Wolf Mine. ***Joseph Sbaffoni, division chief of Pennsylvania's Bureau of Deep Mine Safety said, "The miners were breathing air as if they were diving in 40 feet of water. A sudden arrival at sea-level air pressure would have given them the bends."***

EXAMPLES OF IMPROVED OPERATIONAL CAPABILITIES RESULTING FROM THE FCT PROGRAM

7.62mm Short Range Training Ammunition. The 7.62mm training cartridge developed by *SNC Technologies of Canada* is designed for use on ranges where bullets traveling beyond standard target distances pose safety problems. The Canadian round can be used safely with no damage to training sites. This ammunition has enhanced live-fire training for small unit tactics at military operation urbanized terrain sites and small arms range areas worldwide that are being reduced in size.

Airtronic Light Oil Burner for USMC Tray Ration Heating System. The TRHS is a portable system that heats tray packs during transport aboard a HMMWV to deliver hot cafeteria-style meals to Marines at multiple field locations. The TRHS uses a patented airtronic burner technology from *Bentone Electro of Luxembourg* and *Babington Enterprises of McLean, Virginia*, to deliver high-efficiency, smokeless, odorless diesel combustion for multi-fuel applications. The burner was qualified for procurement and fielded in 1995 under the FCT Program. The TRHS can feed up to 250 meals at a single site and at least 500 meals during a ration day; however, during expanded feeding operations, one TRHS could feed 1,500 people in one day. The TRHS comes with folding tables, rain cover kit, beverage containers, serving utensils, and other collateral equipment

Atmospheric Diving Suit (NewtSuit). The Navy's ADS2000, developed *by Ocean Works International Corporation (formerly International Hardsuit, Inc.) of Vancouver, British Columbia*, is a key unit of the Navy's Submarine Rescue, Diving, and Recompression System. The interior of the ADS 2000 remains at one atmosphere, allowing the pilot to operate at depths of 2000 feet (salt water). Qualified by the Navy through FCT tests at Naval Surface Warfare Center, Carderock, Maryland, and Navy Experimental Diving Unit, Panama City, Florida, the first ADS unit was delivered to the Navy in 1998.

Digital Flight Control System for F-14 Tomcat. Manufactured by then-*GEC Marconi of the United Kingdom*, this system solved the Navy's number one flight safety issue for the F-14 aircraft. The Navy had lost 35 F-14 aircraft due to unrecoverable flat spins. Since the FCT procurement, no aircraft were lost due to flat spins.

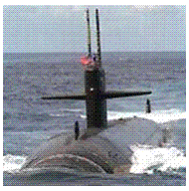
Emergency Evacuation Hyperbaric Stretcher. Developed by *SOS, Ltd., of the United Kingdom*, portable, collapsible chambers are used to transport diving personnel suffering from decompression sickness or gas embolism to a recompression treatment chamber. Initial "Hyperlite" units were fielded to the Navy's Deep Submergence Unit in San Diego, California, and Mobile Diving and Salvage Unit One in Pearl Harbor, Hawaii, significantly improving Navy diving capabilities. When fully integrated into the Navy's Submarine Rescue Diving and Recompression System, it will be a key addition to submarine rescue operations. The Air Force also tested these units under Navy lead and initially deployed one unit to Johnson Atoll in the Pacific for an emergency and to Brooks AFB, Texas, for operational aero-medical use.

Expeditionary Airfield Lighting Kits (MOSKITS). In Desert Storm, Marines saw the British lighting airfields with portable and self-contained Minimum Operating Strip Lighting Kits – MOSKITS manufactured by Metalite Aviation of the United Kingdom. The kits were successfully evaluated in 1998. Since then, Marines have deployed the kits to expeditionary airfields in Iraq and Afghanistan. In 2002-3, the Air Force also purchased the kits for these operating areas.

Modern Generator Sets for Army Mobile Electric Power. Qualification under the FCT Program, type-classification by the Army, and fielding of the 2KW Generator Sets manufactured by *Mechron Energy of Canada*, marked a historic milestone by eliminating age-old Army dependence on gasoline. The warfighter will now use JP-8 fuel in the field, an inherently safer fuel common across the Army vehicle fleet.

Multi-Role Anti-armor, Anti-personnel Weapon System and Family of Upgraded Ammunition. Manufactured by *Saab Bofors Dynamics of Sweden*, the Carl Custaf M3 84mm "MAAWS" Weapon System is a versatile, portable, and lethal shoulder-launched weapon system that fires a large suite of ammunition. The weapon is in use by the Army 75th Ranger Regiment, Special Forces SEAL Teams, and other U.S. forces as a result of FCT qualification. Upgraded MAAWS ammunition from Saab Bofors Dynamics, including HEAT, HEDP, HE, Smoke, Illumination, and ADM (Area Deterrent Munitions), conforming to U.S. insensitive munitions requirements, completed testing under the FCT Program and is fielded, significantly expanding the weapon's capabilities.

Submarine Escape and Immersion Ensemble. The Navy's qualification of the Beaufort Air-Sea Equipment, Ltd., ***MK10 Submarine Escape and Immersion Ensemble*** for backfit on U.S. submarines introduced a dramatic improvement over the Steinke Hood escape systems they are replacing, increasing the capability for safe escape from depths of 350 feet to 600 feet, while reducing the overall risk of injury to escapers from disabled submarines at all depths. ***"The design is ideal for survival at sea. This is a far more viable option than the Steinke Hood….those few moments of discomfort could be the difference between life and death for Navy submariners"- Commanding Officer, USS Key West (SSN-722)***.



Titanium-Nitride Erosion-Resistant Coating Process. By the end of Operation Desert Storm in 1991, the MH-53 Sea Stallion helicopter fleet was nearly grounded when severe sand erosion on the engine compressor blades resulted in premature engine removals. A unique turbine engine erosion-resistant coating, originally developed by the *Ural Works of Civil Aviation (PRAD) of Russia*, and developed into a joint venture with *MDS Aerospace of Canada*, was transitioned in 2002 to General Electric T64-GE-416 and 416A engines for Marine Corps CH-53 helicopters. The Marine Corps CH-46E helicopter program has approved the MDS-PRAD coating for incorporation into production T58-GE-16A ERIP engines. ***"GE's T58 and T64 engines with TiN coatings have 2-3 times the mission rates in the harshest environments around the globe," said Marc Joslow, Director of T58 and T64 Programs for General Electric Aviation.***

APPENDIX D

BENEFITS OF THE FCT PROGRAM

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REDUCED ACQUISITION COSTS AND ACCELERATED FIELDING

The successful use of a non-developmental approach to acquisition reduces new-start development costs. The gap between identifying a requirement and putting the needed equipment in the hands of our operational forces is also reduced in many cases. Table D1 shows examples of estimated development cost avoidance and accelerated fielding times as a result of successful FCT projects since 1980. Estimated production cost savings and reduced life cycle costs are also noted, where applicable.

Table D1. Examples of Development Cost Avoidance [10]

FCT Project and Sponsor	RDT&E Cost Avoidance ($M)	Production Cost Savings ($M)	Life-Cycle Cost Savings ($M)	Estimated Development Time Savings
5.56mm Lightweight Machine Gun – USSOCOM	7			-
7.62mm Lightweight Machine Gun – USSOCOM	7	1		
30mm APFSDS Tracer Rounds for EFV – USMC	23			-
105mm Lightweight Howitzer M119 – Army	279			-
Airtronic Light Oil Burner – USMC	18			4-8 years
Anti-Riot Grenades L96/L97 – Army and USMC	14			2 years
Automatic Chemical Agent Detector Alarm – Army	381	64		4 years
Digital Flight Control System for F-14 – Navy	166		50-150	5 years
Eagle Vision Sensor Upgrades (SPOT5) – Air Force	32	5	5	
Emergency Aircraft Arresting System – Air Force	12	9	6	4 years
F-15 Countermeasures Dispenser (BOL) – Air Force	57			
Fox NBC Reconnaissance System – Army	1741		100	14 years
High Mobility Engineer Excavator – Army	6			-
High Pressure Pure Air Generator (AV-8, UH-1, F/A-18E/F) – Navy	8	24	50	-
Improved Chemical Agent Monitor – Army	2	4		6 years
Joint Protective Aircrew Ensemble – Navy	9			-
Joint RAAWS Ammunition Upgrade I – HEAT, TPT – USSOCOM	23	$1,800 per HEAT round	1.0 – training costs, TPT	
Joint RAAWS Ammunition Upgrade II - HEDP, HE, ADM – USSOCOM	34	$300-$500 per round		
Less than 3Kw Generator Sets – Army	3	33	25	2 years
MC130H Aerial Refueling Pod – USSOCOM	43			1 year
Mine Protected Clearance Vehicle – Army	35	2	50K per year	-
Improved Mobile Subscriber UHF Radios – Army	7			2 years
NBC Analysis System for JWARN – USMC	9			3 years
Next Generation Small Loader – Air Force	14			2 years
Parachute Leaflet Delivery System – USSOCOM	21			
Passenger Anti-Exposure Survival Suits – Navy	3	12 over 10 yrs	30-50% less	-
Prophet Ground (Tactical-Based SIGINT) – Army	11			
Submarine Escape & Immersion Equipment – Navy	10			-

[10] *Amounts in FY 2007 constant year dollar estimates.*

INDUSTRIAL TEAMING AND PRODUCTION IN THE U.S.

The FCT Program is frequently a catalyst for teaming or other business relationships between foreign and U.S. industries. Many successful FCT projects also result in arrangements for the production in the U.S. of the qualified foreign equipment or technology. Our allies and coalition partners recognize the long-term value of such practices for competing in the U.S. defense market and the resultant strengthening of the "two-way street" in defense procurement. For the U.S., the result often means the creation of jobs and contributions to local economies. Examples include:

5.56mm Lightweight Machine Gun. The MK46 Mod 0 gun was originally designed and produced by *FN Herstal*, located in Belgium. The latest production of the weapon has been transitioned to *Fabrique Nationale Manufacturing, Inc.* in Columbia, South Carolina.

40mm Practice Cartridge (M281 Mod 0). *Nico Pyrotechnik of Germany* is partnered with *American Ordnance of Milan, Tennessee* for the production and delivery of 40mm practice ammunition as a result of a successful FY 1998 Marine Corps project.

155mm Ammunition and 105mm Pre-Formed Fragments. *Denel-Naschem of the Republic of South Africa* is partnered with *General Dynamics Ordnance and Tactical Systems of St. Petersburg, Florida*, for these two ongoing Army FCT projects.

Airtronic Light Oil Burner for Tray Ration Heating System. *Babington Enterprises Inc. of McLean, Virginia*, produces the U.S. Marine Corps' Tray Ration Heating System. *Electrolux Luxembourg, a subsidiary of Electrolux Sweden,* is licensed to manufacture and assemble the system's burner and produces it for Babington.

Anti-Riot Grenade. *Pains-Wessex (now PW Defence) of the United Kingdom* formed a partnership with *New England Ordnance of Guild, New Hampshire*, for U.S. production of the L96/L97 grenades for the Army's Light Vehicle Obscurant Smoke System (LVOSS).

Automatic Chemical Agent Detector Alarm (ACADA) and ACADA Power Supply. *Graseby Dynamics (now Smiths Detection) of the United Kingdom* and *ETG of Towson, Maryland*, teamed to produce and support early delivery of the ACADA and ACADA Power Supplies to the Army, Navy, Air Force, Marines, and National Guard.

BOL Chaff Dispenser and F-15 Countermeasures Dispenser (BOL). The Swedish and United Kingdom manufacturers of the BOL dispenser and BOL chaff, *Saab Tech* and *Chemring*, respectively, teamed with *BAE Systems North America* (formerly TRACOR) in Austin, Texas. Alloy Surfaces of Chester Township, Pennsylvania, a subsidiary of the Chemring Group, is producing expendables for the systems.

E-2C Multifunction Display Control Unit. *Marconi of Canada* teamed with the U.S. E-2C aircraft manufacturer *Northrup Grumman of Bethpage, New York*, on the CMA 882 Avionics Management System Program.

EHF Traveling Wave Tubes. As a result of the successful FCT testing of its product in 1988, *Siemens of Germany* teamed with the *Raytheon Corporation of Lexington, Massachusetts*, on the Navy's EHF submarine communications program.

Electronic Combat Integrated Pylon System. *Per Udsen*, the Danish manufacturer of the Electronic Combat Integrated Pylon System, teamed with *Northrop Grumman of Rolling Meadows, Illinois,* and *Lockheed Martin of Fort Worth, Texas.*

Forward Area Degaussing Range. *Raytheon Naval Systems (formerly Alliant Tech) of Mukilteo, Washington*, provided the acoustic portion of the United Kingdom's Forward Area Combined Degaussing and Acoustic Range.

GIANT Infrared Decoy Rounds. *Buck of Germany*, the developer of the "GIANT" Infrared Decoy Rounds used in the Navy's Super Rapid Blooming Offboard Chaff (SRBOC) shipboard countermeasures launchers, teamed with *Sippican Inc., of Marion, Massachusetts*, for the refurbishment of GIANT rounds in the U.S. inventory to increase their operational shelf life.

Heavy Assault Bridge, Leguan. The Army selected the German MAN bridging system in 1994 for Engineering and Manufacturing Development (EMD). MAN teamed with *General Dynamics Land Systems of Sterling Heights, Michigan*, for the successful FCT evaluation. The system was approved for Low Rate Initial Production in FY 1998 and dubbed the "Wolverine."

High Mobility Engineer Excavator. *Australian Defence Industries* teamed with *Oshkosh Truck Corporation, Wisconsin*, for this successful FCT evaluation sponsored by the Army. The vehicles are being produced in Wisconsin.

Improved Mobile Subscriber Equipment UHF Radios. *Canadian Marconi* partnered with *General Dynamics Communications of Taunton, Maryland*, for the phase 1 production of these radios as a result of a successful Army project managed by the Communications-Electronics Command, Fort Monmouth, New Jersey.

Joint Protective Aircrew Ensemble. *Creative Apparel Associates of Belmont, Maine*, was awarded a delivery order contract in FY 2002 to manufacture protective garments for System Development and Demonstration (SDD), including Low-Rate Initial Production amounts, using materials provided by *Blucher GmbH with Theodolf Fritsche GmbH of Germany*, which were qualified for procurement in this successful FCT project.

Laser Marksmanship Training System "Hummerbook". *Seoul Standard of the Republic of Korea* is teamed with *Beamhit, Inc., of Columbia, Maryland* for this ongoing Army FCT project.

Lightweight Antitank Weapon M72A5. *Talley Defense, Mesa, Arizona*, led the consortium that includes Raufoss as an original equipment manufacturer, along *with BAE Systems North America (formerly TRACOR) of Austin, Texas*, to produce M72A5 weapons for U.S. Forces.

Lightweight Smoke Generator. *PZL Rzeszow of Poland* is teamed with *Unitronics Corporation of Saint Charles, Illinois*, for this ongoing Army FCT project.

Man-Portable Multi-Sensor System Headsets and Sensors. *Nextlink of Denmark* and *Source of Sound of Israel* are providing headsets for the U.S. Special Operations Command Integrated Communications Helmet in association with *Television Associates of Brewster, New York*, as a result of a successful FY2001 project conducted by U.S. Special Forces.

Mine Protected Clearance Vehicle. *Denel Mechem of the Republic of South Africa* teamed with *Technical Solutions Group of Charleston, South Carolina*, for the successful FCT evaluation sponsored by the Army. The first vehicles are manufactured in Charleston.

Muzzle Velocity System. The Israeli Reshef contract was awarded to *RSL Electronics USA, Inc. of Poughkeepsie, New York. Technical Systems Inc. in Grand Rapids, Michigan*, is producing the muzzle velocity system for the Army.

Naval Active Intercept and Collision Avoidance. *Sonartech of Australia* is teamed with the undersea warfare technology company, *Mikel, Inc., of Fall River, Massachusetts* for this ongoing Navy FCT project.

Next Generation Small Loader. *FMC Corporation of Orlando, Florida*, teamed *with Static Engineering of Australia* and won the competition in this successful FCT project for the Air Force.

Powered Multifuel Burner. *International Thermal Research, Inc. of British Columbia, Canada*, teamed with *Tech Research Group in Providence, Rhode Island*, to submit their candidate for a successful FCT evaluation in meeting this Army and Marine Corps requirement**.**

Regenerative Drive System. *Permo-Drive of Australia* is teamed with *Dana Fluid Systems of Toledo, Ohio,* for this ongoing Army FCT project.

Renaissance View Satellite Data and Eagle Vision. *Northrop Grumman (ERIM International) of Ann Arbor, Michigan*, and *Matra CAP Systems (now EADS), Velizy, France,* teamed on the initial imagery project, while *IOSAT Corporation of Halifax, Nova Scotia, Canada,* joined for the upgrade to the Eagle Vision Satellite Imagery Receiving and Processing Station.

Replacement Structures for Aircraft. *PZL Swidnik of Poland* is teamed with *Alcore of Edgewood, Maryland,* for this ongoing Navy FCT project.

Skin and Open Wound Decontamination. *O'Dell Engineering of Canada* teamed with *Curtiss Laboratories of Ben Salem, Pennsylvania, and Leominster, Massachusetts*, and *E-Z-Em, Inc., of Long Island, New York*, for the evaluation and potential production of its Reactive Skin Decontamination Lotion for use on skin, open wounds, and equipment. The project was sponsored by the Marine Corps.

Underwater Communications and Tracking System for Submarines. *Nautronix of Australia* is teamed with *Lockheed Martin of Manassas, Virginia* for this ongoing Navy FCT project.

Ultra Lightweight Camouflage Net System. *Diab-Barracuda of Sweden*, now part of *Saab*, is supplying machinery, equipment, and technical assistance to *BAE Systems North America (formerly TRACOR Aerospace) of Lillington, North Carolina,* to manufacture the camouflage net system to meet Army requirements.

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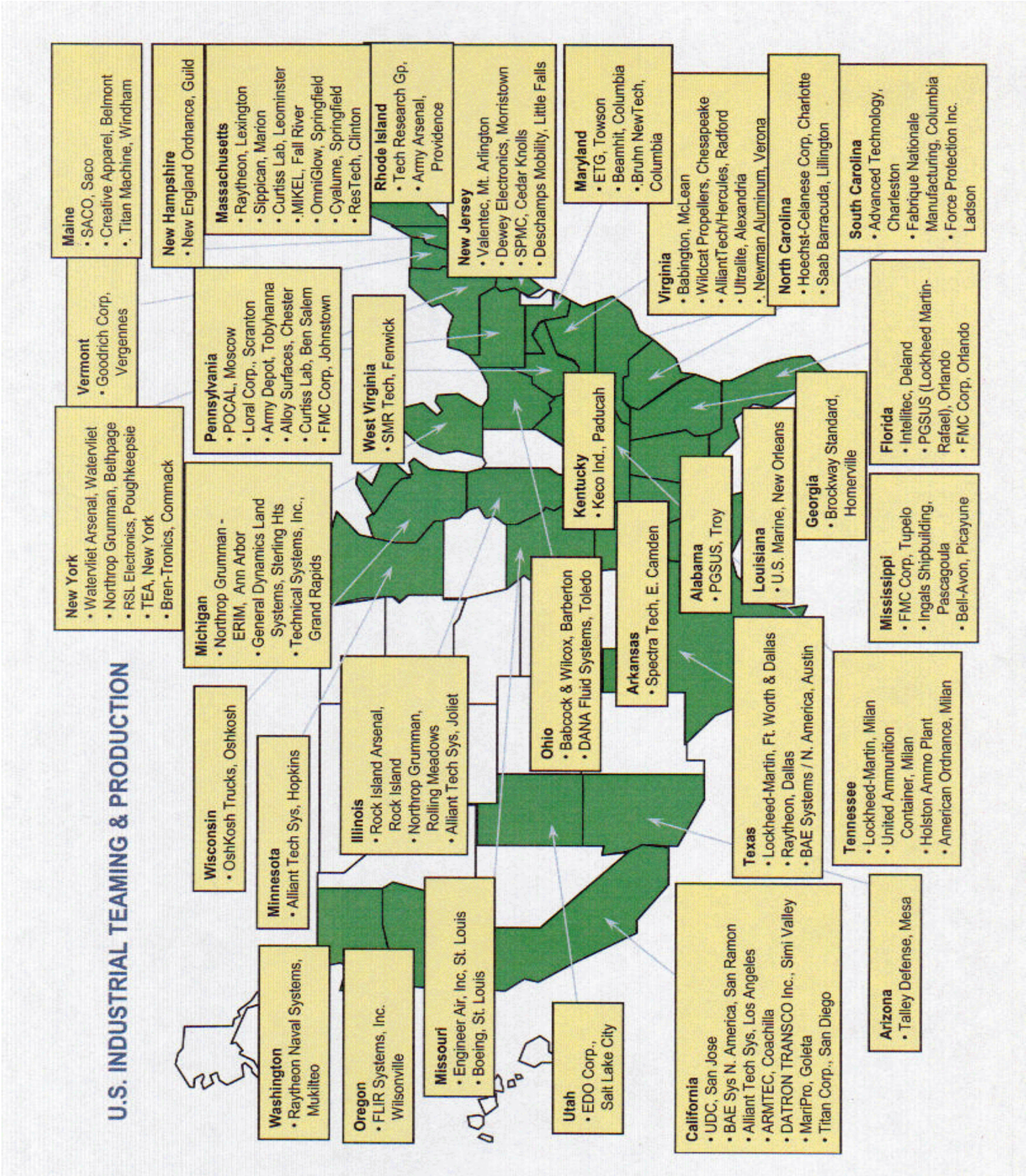

Figure D2. Industrial Teaming and Production in the U.S.

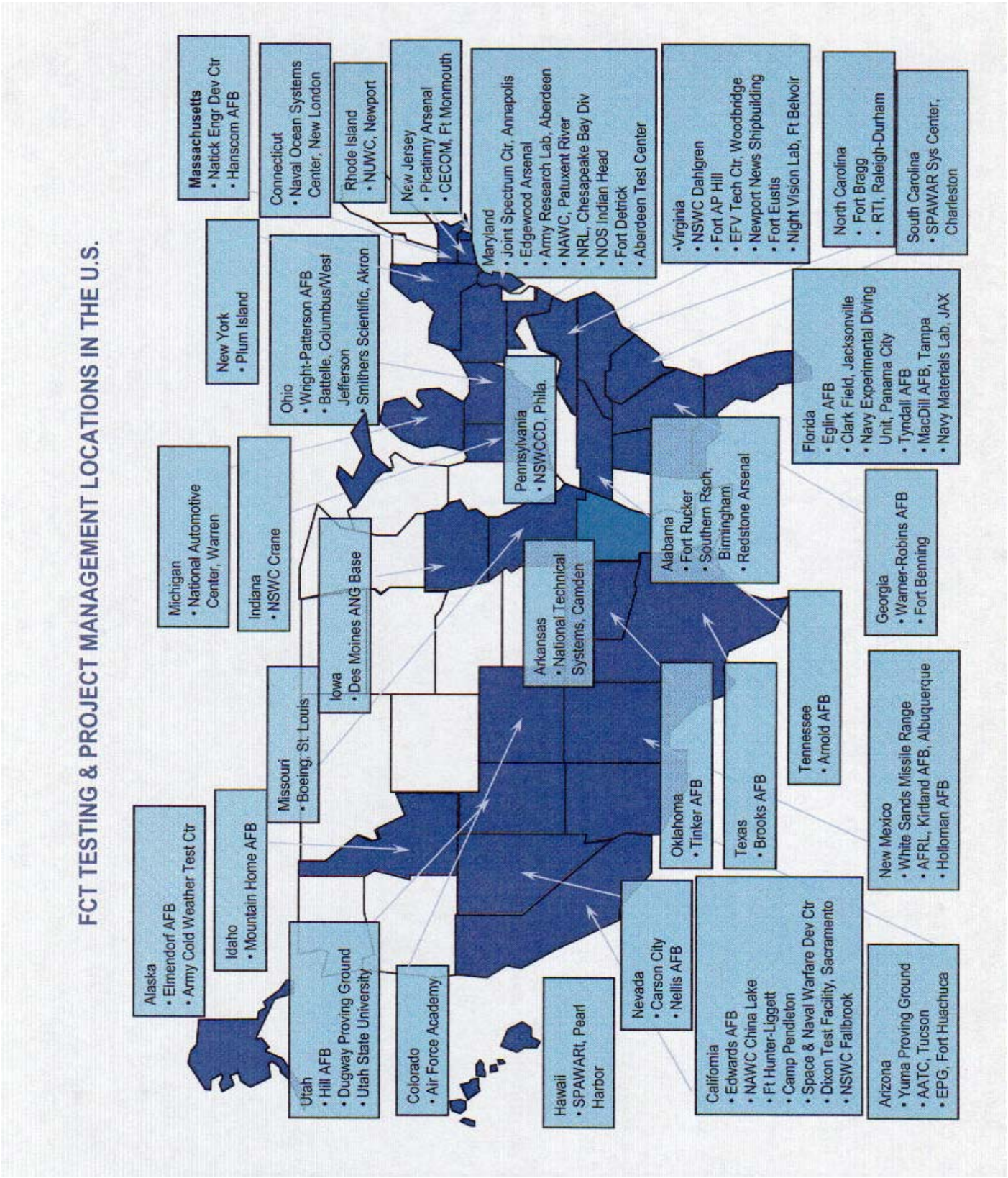

Figure D3. FCT Testing and Project Management Locations in the U.S.