Combat Identification

C.04 Advanced Air and Surface Target Identification ATD

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C.04 Advanced Air and Surface Target Identification ATD

Objectives. Develop and demonstrate advanced, long-range, high-confidence air-to-air, surface-to-air, and air-to-surface target identification (ID) capabilities for use on current and next-generation aircraft. The joint USAF–USN ATDs will leverage the investment already made in multiple S&T programs. The combat ID (CID) system resulting from this effort will incorporate multiple target recognition approaches and will result in a composite, high-confidence target ID estimate.

Payoffs. Positive hostile ID is required for weapons employment. The USAF Enhanced Recognition and Sensing LADAR (ERASER) ATD is aimed at improving the airborne identification process for air and ground targets through the use of active laser technologies. Efforts for this program will concentrate on integrating ERASER laser and signal processing technology into a testbed aircraft for flight demonstration. ERASER-supplied target ID will complement other sources of ID from the warfighter's total ID suite. ERASER will incorporate 2D laser imaging technology and CID algorithms developed for ground target ID. The USAF will also improve the air-to-ground radar imaging (AGRI) tactical radar ID capability using both synthetic aperature and high-range-resolution techniques. The Navy intends to develop a composite CID capability that draws on several sources of target information (cooperative and noncooperative). In addition to the ERASER and AGRI approaches being pursued by the Air Force, there are related automatic target recognition (ATR) programs for other sensor modes (both passive and active) that are being investigated; in particular alternative synthetic-aperture radar (SAR) ATR, specific emitter identification, precision electronic support measure, and solid-state laser vibration sensing. The USN Noncooperative Air Target Identification program will demonstrate a Doppler-based imaging process to provide air target class estimates. The USN Littoral Surveillance/Moving Target Recognition program will provide a demonstration of imaging small craft. The USN Laser CID project uses laser vibrometry, high-range-resolution 1D profiling, 2D silhouette extraction, and techniques relying on unique target reflectivity characteristics when illuminated by optimized laser sources. Exit criteria for surface target ID under this DTO are declaration probability of 85% and identification confidence probability of 98%.

Challenges. Challenges include technical issues such as data latency, all-weather performance, eye-safe laser development, tracking in radar clutter, and database development.

Milestones/Metrics.

FY2000: Airborne test of ERASER; flight demonstrate ERASER technology at militarily significant ranges. AGRI airborne data collection (SAR mode). Tower test ERASER.

FY2001: AGRI algorithm test and demonstration (SAR mode); eyesafe ERASER flight demonstration at militarily significant ranges.

FY2003: AGRI airborne data collection; complete USN Littoral Surveillance/Moving Target Recognition program.

Customer POC	Service/Agency POC	USD(A&T) POC
MAJ John DUNHAM, USA ACC/DRA	Mr. William MICELI ONR Mr. William MOORE AFRL/SN	Mr. Iftikhar JAMIL ODDR&E/AT

C.04 S&T Funding ($ millions)

PE	Project	FY00	FY01	FY02	FY03	FY04	FY05
0602232N	00000	5.0	5.0	3.0	0.8	0.0	0.0
0603203F	665A	1.2	0.5	0.0	0.0	0.0	0.0
	DTO Total	**6.2**	**5.5**	**3.0**	**0.8**	**0.0**	**0.0**

C.05 Precision Targeting Identification ACTD

Objectives. Demonstrate the standoff aspect in variant classification of aircraft and surface targets with a low probability of intercept. Precision targeting identification (PTI) combines an advanced third-generation infrared sensor together with a C^4I sensor fusion package and a target tracking and identifying laser radar (LADAR). The LADAR performs target ID by exploiting the return signal that contains the targets vibration spectrum (micro-Doppler signature).

Payoffs. The PTI ACTD will evaluate the potential to improve military capabilities to address critical military needs in three warfare mission areas: (1) joint surveillance/intelligence (positive ID of noncooperative air targets), (2) joint electronic warfare (over-the-horizon targeting (OTH–T)), and (3) battle damage assessment (BDA). Specific payoffs include (1) sensor technology packaging that can meet the needs of various transition sponsors (i.e., fighter/strike aircraft, ground combat vehicles, patrol/surveillance aircraft, and ships), (2) combat ID and precise tracking of small aircraft and ships at extended ranges, (3) real-time sensor-to-shooter updates for OTH–T and BDA, and (4) low probability of counterdetection.

Challenges. Technical objectives to be accomplished include the integrated C^4I sensor fusion package, stable laser transmitter, in-flight vibration compensation for LADAR, producibility of a low-cost common module LADAR unit for transition, and classification of aircraft and surface targets.

Milestones/Metrics.

FY2000: Achieve unit cost of less than $500,000 (targeting $370,000/unit for 270 units); improve aircraft vibration compensation to 2.0-g level.

FY2001: Classify airborne and surface targets; initiate operational database collection and upgrade target database; integrate fighter-based LADAR with UK Tornado aircraft; complete PTI evaluation program.

FY2002: Conduct fighter-based LADAR evaluation; conduct air-to-ground target detection/classification evaluation; complete operational data collection; complete military utility assessment and final report.

FY2003: Prototype pre-production LADAR system integration design with fighter aircraft; conduct interim capability support.

Customer POC	Service/Agency POC	USD(A&T) POC
CAPT Michael MATHIS, USN NAVSEA, PEO/TAD	Mr. Chyau N. SHEN NAWCAD	Lt Col Marty MEYER, USAF DUSD/AS&C
Mr. Terry MCGEE JIATFE		

C.05 S&T Funding ($ millions)

PE	Project	FY00	FY01	FY02	FY03	FY04	FY05
0603750D	P523	3.2	0.8	0.0	0.0	0.0	0.0
	DTO Total	**3.2**	**0.8**	**0.0**	**0.0**	**0.0**	**0.0**

C.05 Non-S&T Funding ($ millions)

PE	Project	FY00	FY01	FY02	FY03	FY04	FY05
0604221N	0000	2.4	1.0	0.3	0.2	0.0	0.0
MOD/UK	0000	0.3	0.5	0.0	0.0	0.0	0.0
	DTO Total	**2.7**	**1.5**	**0.3**	**0.2**	**0.0**	**0.0**

C.07 Link–16 ACTD

Objectives. Provide interoperability between the Link–16 and joint variable message format (VMF) networks. The ACTD will provide situational awareness between the networks and digital communications connectivity for air-to-ground and maritime-to-ground attack missions. (Air and maritime operations are migrating to Link–16, while ground operations are migrating to joint VMF.)

Payoffs. Disparate datalink message formats and communications media have resulted in untimely, incorrect, or incomplete delivery of crucial battlespace information due to the use of translators/gateways to make these systems communicate with one another. Currently, it is difficult to establish seamless information flow among diverse datalink units. A major goal of this ACTD is to begin standardizing C^4I messaging and data elements used to provide a seamless, flexible datalink environment. The objective is to demonstrate a joint integrated capability to pass tactical information seamlessly across Link–16 and joint VMF networks. This ACTD will be demonstrated by the military services and, potentially, some of our NATO allies. It also resulted in operational demonstrations at the Joint Interoperability Test Center (JITC) January–February 99, using (in large part) simulated message exchange, and an operational demonstration at the ASCIET 99 Exercise. The system was deployed to Northern Italy in support of Operation Allied Force in June 1999.

Challenges. The barriers include platform integration of specific, standardized C^4I messaging and data elements for messages crossing the air-to-ground and maritime-to-ground seams. Since work has been underway for several years to do waveform/frequency conversion, the technology is maturing and should be easily incorporated into this effort.

Milestones/Metrics.

FY2000: Demonstrate the first step of the Rosetta translating and forwarding technology in the Tactical Air and Missile Defense Interoperability (TAMDI) ACTD at the ASCIET 2000 exercise.

FY2001: Conclude interim capability support.

Customer POC	Service/Agency POC	USD(A&T) POC
Maj James ASHWORTH, USAF SAF/AQII	Mr. Steven DERGANC PEO/SCS	Lt Col Marty MEYER, USAF DUSD/AS&C
Maj Vernon FREDERICK, USMC AC/SC^4I		
CDR Bill MOSK, USN USACOM/J611		
Mr. Ed ROBINSON CECOM		

C.07 S&T Funding ($ millions)

PE	Project	FY00	FY01	FY02	FY03	FY04	FY05
0603750D	P523	1.3	3.8	0.0	0.0	0.0	0.0
	DTO Total	**1.3**	**3.8**	**0.0**	**0.0**	**0.0**	**0.0**

C.08 Advanced Combat Identification Capability

Objectives. Advance the combat identification (CID) materiel capabilities by building upon the S&T-derived CID architecture developed in the Joint CID ACTD. The emphasis of this DTO is on mission pairings that were not fully explored in the Joint CID ACTD. The objective is to develop solutions, verify technical performance, and quantify the combat effectiveness improvements resulting from a comprehensive rotary-wing-to-ground and ground-to-ground target identification (TI) and situational awareness (SA) technically acceptable solution to mission area needs.

Payoffs. This effort will extend the CID architecture developed during the Joint CID ACTD to include additional mission areas. The effort will develop and evaluate solutions for ground-vehicle-to-soldier ID, ID capability for fire support teams, and ID concepts for the Apache Longbow. These solutions will provide militarily acceptable probability of ID within the target acquisition range and timelines for the respective mission areas.

Challenges. Concerns include ensuring interoperability across the battlespace while minimizing the exploitability of signatures, impact to firing sequences, required action by crews, impacts to data latency/accuracy, and production cost of solutions.

Milestones/Metrics.

FY2000: Demonstrate integration of Combat Identification for Dismounted Soldiers (CIDDS) functionality with the Battlefield Combat Identification System to provide vehicle-to-soldier ID capabilities; and demonstrate an automated SINCGARS-based ID capability for fire support teams.

FY2001: Demonstrate an integrated TI and SA capability for ground-vehicle-to-ground-vehicle ID. Demonstrate a proof of concept of ID capabilities for Apache Longbow. Evaluate the different CID architectures as a function of performance (operational), cost, maturity, and interoperability.

Customer POC	Service/Agency POC	USD(A&T) POC
Mr. Chris KEARNS USAIC	Mr. Gerardo J. MELENDEZ SFAE/IEW/CI	Mr. Rob SAUNDERS SARD/TT

C.08 S&T Funding ($ millions)

PE	Project	FY00	FY01	FY02	FY03	FY04	FY05
0602120A	H15	3.3	3.5	0.0	0.0	0.0	0.0
	DTO Total	**3.3**	**3.5**	**0.0**	**0.0**	**0.0**	**0.0**

C.09 Advanced Cooperative Air Target Identification (Mode 5)

Objectives. Develop and demonstrate an advanced cooperative air target identification (ID) capability that can overcome the deficiencies of current cooperative identification technology and satisfy the friendly platform identification needs for air-to-air and surface-to-air engagements. This Navy effort will leverage existing military, air traffic control, and commercial off-the-shelf technologies to provide affordable, secure, and reliable identification of air targets in a joint or coalition environment.

Payoffs. The technology demonstration will provide the warfighter with an integrated air-to-air and surface-to-air capability to enhance combat effectiveness and reduce fratricide. The USN Mark XIIA Mode 5 Cooperative Identification System technology demonstration is aimed at improving the identification process for airborne targets over the current antiquated Mark XII Mode 4 System. The Mode 5 design addresses virtually all of the Mark XII deficiencies including a significant reduction in exploitation, deception, and operator workload while providing increased jamming resistance and data security. In addition, Mode 5 provides an increased probability of identification by providing a 7-dB processing gain and correlation improvements. Efforts for this program will concentrate on integrating the system into testbed aircraft for flight demonstration. Mode 5 friend identification will correct deficiencies in the current friend ID system and will compliment other sources of ID from the warfighter's total ID suite. Mode 5 will incorporate a new secure waveform and cryptographic computer into a high-confidence cooperative ID capability. The Mode 5 system will demonstrate a 50% improvement in surface cooperative ID systems' usable range coverage and will demonstrate the capability to overcome current deficiencies in identifying multiple friendly and closely spaced maneuvering aircraft.

Challenges. Technical issues include final design and production of a prototype cryptographic computer capable of supporting the current Mark XII Mode 4 algorithm and the new Mark XIIA Mode 5 algorithm. A crypto working group led by the National Security Agency (NSA) has developed the Mode 5 algorithm. A five-nation working group (the U.K., Germany, France, Italy, and the U.S.) developed the Mode 5 waveform over the past several years. This group documented the waveform in a draft NATO Standardization Agreement 4193 Parts V and VI that is currently in the ratification process. The waveform was designed to be compatible with current technology and should be easily incorporated through modification of existing ID Friend or Foe (IFF) equipment.

Milestones/Metrics.

FY2000: Demonstrate superior performance of the Mode 5 waveform using brassboard equipment in a limited U.S. and Allied flight demonstration. Demonstrate the ability of Mode 5 to identify friendly airborne targets flying in close formation with zero range or azimuth separation. Demonstrate 50% improvement of surface cooperative ID systems' range/coverage performance in multipath conditions.

FY2001: Deliver and integrate one surface interrogator, one airborne interrogator, five airborne transponders, and associated prototype cryptographic equipment.

FY2002: Demonstrate capability of identifying five friendly aircraft flying in close formation/crossing patterns. Demonstrate the ability of Mode 5 to identify friendly aircraft with 50% reduction from the Mode 4 the interrogation rate. Demonstrate up to 50% improvement of surface cooperative ID systems' range performance in multipath conditions. Demonstrate operator workload reduction. Demonstrate the benefits of increased data transfer capability within Mode 5 by allowing operators to obtain Mark XII data within the Mode 5 reply. Demonstrate time-authenticated automatic update and rollover of the cryptographic algorithm. Integrate prototype equipment into testbed aircraft and one surface combatant; conduct flight demonstration concurrent with planned All Services Combat Identification Evaluation Test.

Customer POC	Service/Agency POC	USD(A&T) POC
LCDR David WELCH, USN OPNAV, N42	Mr. Greg OWENS NAVAIR/PMA2133C CDR I. VELEZ, USN NAVAIR/PMA2133	Mr. Alan LAHOFF, USAF OASD (C^3I)

C.09 Non-S&T Funding ($ millions)

PE	Project	FY00	FY01	FY02	FY03	FY04	FY05
0604777N	W1253	1.4	3.2	5.1	0.0	0.0	0.0
	DTO Total	**1.4**	**3.2**	**5.1**	**0.0**	**0.0**	**0.0**