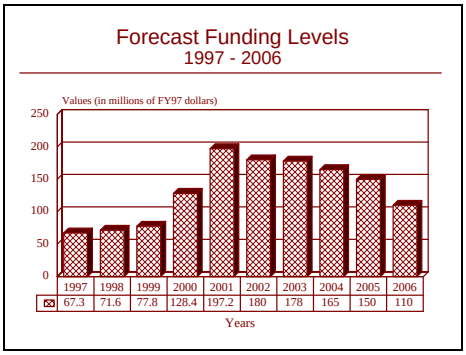
Combat Identification - Archived 4/98

Outlook

- Originally a replacement for the terminated Mk XV IFF program
- Changed to exploration of a variety of combat identification technologies
- No single system emerging as the tri-service CID approach



Orientation

Description. Next-generation reliable, cooperative and non-cooperative identification systems for military aircraft, surface ships, and ground vehicles.

Sponsor

US Navy
Space & Naval Warfare Systems Command
(SPAWAR)
Crystal Park, Building #5
Arlington, Virginia (VA) 22202
USA
Tel: +1 703 602-8954

US Navy
Naval Air Systems Command
Washington, DC 20361-2140
USA
Tel: +1 703 692-3122
(NAVAIR HQ is in the process of moving to the Naval Air Warfare Center, Patuxant River, Maryland)

US Navy
Naval Sea Systems Command (NAVSEA)
2531 Jefferson Davis Highway
Arlington, Virginia (VA) 22202
USA
Tel: +1 703 602-3381

US Navy
Naval Research Laboratory (NRL)
4555 Overlook Ave, SW
Washington, DC 20032
USA
Tel: +1 202 767-2541

US Air Force
AF Systems Command
Aeronautical Systems Center
ASC/PAM
Wright Patterson AFB, Ohio (OH) 45433-6503
USA
Tel: +1 513 255-3767

US Army
Army Communications-Electronics Command
(CECOM)
Ft. Monmouth, New Jersey (NJ) 07703-5000
USA
Tel: +1 201 532-2534

US Army
Army Communications-Electronics Command
(CECOM)
C4IEW Acquisition Center
Night Vision & Electronic Sensors Directorate
Ft. Monmouth, New Jersey (NJ) 07703-5000
USA
Tel: +1 201 532-2534

Contractors. Contractors vary with the annual program.

Status. Mk XV program terminated in 1991. Follow-on effort in combat identification ongoing.

Total Produced. Not applicable.

Price Range. Undetermined.

Application. Currently limited to US applications; release to NATO under review.

Technical Data

Design Specifications. In the aftermath of both the Mk XV termination and the Gulf War, the US Armed Services and the DoD continue to review their plans to field a follow-on identification system and to try and determine the form of such a system. The existing Mk XII IFF has been a Western IFF standard for over 30 years. The Mk XII cooperative IFF system employs an electronic question and answer (Q & A) identification format to discriminate friendly from hostile aircraft. It uses encrypted challenges transmitted by an interrogator, with replies transmitted from a transponder to identify friendly aircraft. The Mk XV was designed to be a cooperative system as well. Since a cooperative system must transmit corresponding signals, it is an "active" design that is subject to enemy exploitation and countermeasures.

Cooperative vs. Non-Cooperative IFF. The services now feel that with the advent of beyond-visual-range weapons and increased emphasis on night operations, a new IFF system should not be dependent upon the "other plane" to provide a corresponding answering response. The USAF is promoting the development of non-cooperative identification techniques to identify hostile aircraft. Non-Cooperative techniques would identify aircraft beyond visual range through the use of new sensors and processors that focus on factors such as the shape the shape of the airframe itself and unique features of the radar return, as well as its various electromagnetic, acoustical, and infrared signatures.

Such sensors must overcome atmospheric limitations, natural clutter, countermeasures, camouflage, and deception. Non-Cooperative Identification would be passive and require no interaction with the aircraft in question in order to discern its identity. It would provide the capability for long-range, passive recognition of airborne targets at ranges comparable with tactical air-to-air missiles, day or night, and in adverse weather.

A major benefit of non-cooperative technology would be an increase in situational awareness as a result of enhanced target-related information. This would provide the fighter pilot with the ability to employ weapons at their maximum engagement ranges and not be limited by visual identification or lack of positive IFF response prior to weapon release.

According to FY93 testimony, USAF officials stated that in any conflict, Rules of Engagement (ROE) would be established by a Joint Theater Commander and therefore represent the best way of conducting air operations in any particular environment. The ROE would not be established based on a single service emphasis or desire for any particular identification method. It is unlikely that a single system could be developed that would satisfy all user needs; therefore, a mix of cooperative and non-cooperative systems will most likely be required.

In future confrontations, opposing forces are all too likely to be equipped with similar aircraft, as was the case with the French and Iraqis both operating Mirage F1s during Operation Desert Storm, making reliable identification all the more critical, but also all the more complicated. Within these limitations, it remains to be seen if non-cooperative IFF would supersede or augment the traditional cooperative techniques.

Mode S. Mode S is a Federal Aviation Administration-sponsored, next-generation air traffic control system that began to be deployed in the mid-1990s. The primary objective is to improve communications between aircraft and air traffic controllers by assigning each aircraft a unique code for communicating with the airport tower. This allows air traffic controllers to immediately know which aircraft they are communicating with, and current weather data can also be exchanged. Mode S will also facilitate the hand-off of aircraft from one ATC center to another.

Existing Mk XII transponders, such as the APX-100 and the APX-101, are not compatible with this emerging new standard. To prevent limiting military flights that must operate in commercial air space, the services will need to address this capability both over the interim and in its next-generation designs. The US and NATO are replacing the older transponders with the new APX-111 CIT.

US Navy RDT&E Efforts. US Navy RDT&E efforts were initially funded under DoD program element PE#0604211N, Identification Friend or Foe (IFF) Systems. Related efforts have since been consolidated under PE#0604777N, Navigation/ID Systems. Two projects from the original PE have been brought over (W1253 Combat ID System and W0676 Improved ID Development), and two new projects added (F0253 N&E Support and X0921 GPS), although the latter two focus on the navigation function, rather than IFF technology. PE0604777N also includes an FY96 new-start, Project W2212, All Services Combat ID (ASCID) which covers

the Navy portion of a new joint service sponsored test and evaluation program.

The US Navy requires reliable and secure positive identification (ID) systems for battle management. In addition to distinguishing friend from foe for weapons delivery, the Navy must have secure, jam-resistant IFF systems for battle group air defense management and air traffic control.

Project W1253, Combat ID System, supports the Navy development of a Cooperative Aircraft Identification (CAI) system which is to be a replacement for the aging Mk III IFF and the canceled USAF Mk XV IFF. Although the Air Force terminated the Mk XV IFF development, the Navy continued to claim the requirement for a next-generation IFF system that would be developed in accordance with existing NATO STANAG. This project was tasked with recouping technologies developed from the canceled Mk XV program where possible. Activity has focused on a COEA (Cost and Operational Effectiveness Analysis) that investigated options presented at a DAB (Decision Acquisition Board) I in August 1994. Risk reduction efforts are also ongoing and scheduled to continue through FY97.

Improved ID Development, Project W0676 is focused in two areas: 1) developing non-cooperative target recognition (NCTR) and integration technologies as the basis for the rapid prototype development of a Shipboard Advanced Radar Target ID System (SARTIS) for selected ships, and 2) AUTO-ID, a sensor kinematics/ doctrine display system for aircraft carriers and selected Anti-Air Warfare (AAW) ships. A developmental version of AUTO-ID was deployed on all US Navy aircraft carriers involved in Operation Desert Storm. This system combined all information available on an aircraft target, compared it with a database of flight paths, aircraft characteristics, etc., and attempted to identify the aircraft in question.

According to Navy testimony, the system proved to be moderately successful. However, it was acknowledged to be limited; partially because of its use of the outdated Mk XII IFF as an input, and partly because it employed only a few of the various non-cooperative identification techniques under study.

The Centralized IFF (CIFF) project is a secondary effort involving deployed AUTO-ID prototypes which use IFF track, link data, and kinematics/doctrine information to better identify/display targets and integrates these features/displays in a restructured CIFF development. As a result of CIFF contract negotiations, DT and OT were compressed to complete the CDR and prepare for development testing during FY95.

Project W0676 is also developing an upgraded SLQ-20 for future integration into the CIFF multi-sensor system. The current SLQ-20 is a shipboard EW system. The program description indicates that the SLQ upgrade PDR was conducted in FY94, the CDR in FY95, and that Milestone III was passed in 2nd Quarter FY96, followed by the completion of transition to production in FY97.

All Service Combat Identification (ASCID), Project W2212, covers the Navy portion of an FY96 new-start joint service test and evaluation program, formerly the OSD-sponsored Joint Air Defense Organization- Joint Engagement Zone (JADO-JEZ) program. The program is designed to test cooperative and non-cooperative combat identification systems and tactics, as well as serving as a conduit for evaluating research and development of promising combat identification technologies.

US Air Force RDT&E Efforts. The USAF PE#0603742F, Combat Identification Technologies initiative reflects the service's preference in the development of non-cooperative identification technology. Project, 2597, Non-cooperative Identification Subsystems, is tasked with nurturing emerging non-cooperative technologies for transition to operational platforms. The US Air Force has a critical requirement to positively identify enemy, friendly, and neutral aircraft so the battlefield commander can effectively manage and control the air battle and minimize fratricide. Stringent operational requirements have been defined for a combat ID system, and in support, this program element dedicated to the development and demonstration promising new non-cooperative target identification (NCTI) technologies such as UHRR (Ultra-High Range Resolution) to meet the aforementioned requirements.

There are two major programs in development under PE#0603742F: HAVE CENTAUR and HAVE LION. Current emphasis is on HAVE CENTAUR. A third effort, HAVE DANCE, was terminated in 1992. Non-cooperative target identification/ALR-56 RWR feasibility studies are also in progress. According to FY93 testimony, the USAF projected funding outlays for non-cooperative RDT&E at just over US$100 million through FY97. The project schedule identifies HAVE CENTAUR ground-to-air and air-to-air testing continuing through FY97.

US Army RDT&E Efforts. The US Army's IFF development plan is structured to support the ground vehicle identification aspects of the Tri-Service IFF program. The US Army seeks to provide material solutions over the near term (sometimes termed Quick- Fix or Quick-Fix Plus) covering three years or less, the mid-term, and the far-term for those systems greater than seven years out. A three-phase program plan addresses quick fix solutions (BUDD Lights, DARPA Lights, thermal tape, thermal

identification device), near/mid-term solutions (second-generation infrared sensors, combat vehicle command & control system, laser retro-reflectors, technologies) and far-term solutions (Integrated Situational Awareness and Target Acquisition).

The focus of PE#0604817A, Non-Cooperative Target Recognition, effort is the design and development of signal processing techniques and equipment and system interfaces to provide four separate and distinct technology devices to help resolve battlefield fratricide incidents. This need is emphasized by the fact that the ability of modern weapon systems to detect and engage targets at longer ranges has advanced faster than the capability to positively identify them.

Project D356 Non-Cooperative Target Recognition — Electronic Support Measures (NCTR-ESM) was tasked with exploiting the inherent and unique signatures of air platforms. ESM passively identifies aircraft by recognizing their electron emissions. Target acquisition and identification devices developed by this project would locate and identify targets to permit weapons deployment at maximum range and avoid fratricide. It supports an upgrade of the Avenger weapon system which currently does not have the capability to search and locate targets outside of the FLIR field of view.

The NCTR-ESM passively collects, processes, and analyzes data for comparison in a signature library to identify an acquired aircraft. The system will be physically and electronically integrated into the Avenger weapon (Model 1) and/or Ground Based Sensor (Model 2). The identification data will be displayed on the fire control display of the Avenger weapon system and provide real-time target location and identification to the operator. Due to program re-prioritization within the Army, in FY94 the Model 2 effort was diverted to Project D482.

Project D482, Ground Combat Identification, was an FY93 new start to provide near-term solutions to fratricide problems such as those encountered during Desert Storm and to establish the foundation for embedded improvements to future weapon systems. In 1993, the Army awarded a three-year, US$16.9 million contract to the team of Magnavox and TRW Space & Electronics to produce the Battlefield Combat Identification System (BCIS). The program PDR and CDR were completed in FY94 and hardware assembly, platform integration and pre-qualification tests in FY95. Limited users tests are scheduled for FY96 and the program slated for completion in FY97.

Systems of this type are the primary focus of this project and will be used by Army combat, combat support, and combat service support units to positively identify friendly ground and air vehicles, in both ground-to-ground and air-to-ground engagement scenarios. BCIS will be capable of operating across the operational continuum. This includes high, mid, and low intensity conflicts in various regions of the world. The initial requirement is to equip ground and air vehicles in the Corps Contingency Force, with priority to those which operate forward of the Brigade.

Project D494 Non-Cooperative Target Recognition — Hostile Aircraft Identification Device Equipment (NCTR-HAIDE) focused on the development of hostile aircraft identification equipment consisting of sensors and associated processing electronics mounted on, and integrated into, air defense radars and provide positive, non-cooperative identification of modern fighter aircraft. HAIDE was initially designed for use with the HAWK weapon system, and was subsequently modified to serve as the FAADS Ground Based Sensor. The Engineering Manufacturing Development effort was scheduled to be completed in FY93; however, the EMD phase was terminated in July 1992 due to cancellation of the host NLOS and ADATS platform programs.

Variants/Upgrades

Development of the next-generation Combat Identification system is exploring a wide range of alternate concepts and technologies. There are many possibilities, as can be seen in the US Navy Naval Research Laboratory COEA of Mk XII alternatives which was completed in December 1993. Study results listed 24 initial recommendations that were later whittled down to 12. Below are some of the known approaches being taken by the services, together with available information on their status.

Airborne Target Identification Techniques with AEW Radars. This US Navy effort was announced in a *Commerce Business Daily* notice dated April 27, 1992. This announcement called for new, innovative approaches to identify non-cooperative airborne targets using airborne early warning (AEW) radar, operating at UHF through D bands. The identification techniques sought were to exploit radar performance characteristics such as high range solution, cross range from coherent Doppler, polarimetric features, radar signal modulations, and induced modulations.

C3I Hostile Target Identification. The US Air Force Rome Laboratory issued a *Commerce Business Daily* notice in October 1993 that it was seeking white papers for experiments that would increase that agency's knowledge of the capabilities required for C^3I hostile target identification. The basic goal would be to provide

enhanced aircraft identification using long-range air surveillance sensors with minimal impact on C^3I structure and sensors. The service wanted to achieve a high confidence level of aircraft identification in terms of nationality, hostile mission intent, generic target class and specific target class in order to achieve better situational awareness and weapon control. The laboratory was looking for new ways to process phenomenological and sensor signals, as well as new approaches to unexplored identification phenomenology and sensor signal processing in any sensor or identification fusion area for high confidence ID and high-payoff-to-combat operations.

FLIR ATR. Lockheed Martin has developed a FLIR-based automatic target recognition (ATR) system for air-to-ground IFF applications. The developmental system utilized ATR algorithms to match stored data that the system uses to identify the infrared image of friendly vs. threat ground vehicles. In a weapons application, the fire control system would prioritize targets and provide cues to indicate friendly and non-friendly targets. Designers have proposed the ATR capability to the Air Force as an upgrade to its existing LANTIRN systems which were designed with "space" available to add the system at some future date. They also presented it to the US Army as part of the EOSS system in development for the RAH-66 Comanche scout helicopter program.

Ground Vehicle Identification. In 1993 the Army issued a three-year, US$16.9 million contract to the team of Magnavox and TRW Space & Electronics Group for the Battlefield Combat Identification System (BCIS), which would provide a near-term ground-to-air and air-to-ground vehicle identification response. This particular approach uses a millimeter-wave query/response system that includes interrogators on weapon systems and an omnidirectional transponder on friendly platforms. Magnavox is responsible for the digital processor section (based on the stealth modem from the company's Stealth-Com Radio), while TRW developed the MMIC technology and the narrow-beam antenna for the RF section of the system. Low-rate initial production of approximately 1,600 systems was scheduled for the third quarter of FY95, with BCIS to be mounted on 18 platforms. The BCIS system was demonstrated at the Pentagon in mid-1996.

This effort will be followed by the Mid/Far-Term (1997-2005) Combat ID program. The latter will focus on exploiting technologies in the areas of advanced target ID and situational awareness that are maturing at a sufficient rate to be available in approximately five years.

Individual Combat Soldier CIE Identifier. The US Army Natick RD&E Center is developing a Soldier Clothing and Individual Equipment (CIE) identifier that will provide the individual soldier and his prepared fighting position with the ability to be recognized by friendly forces. The identifier will be worn by the soldier as an integral part of the combat ensemble. The soldier CIE is intended to be employed in defensive, offensive, ambush, blocking and other combat scenarios. The device or material will either be completely passive or a combination of passive/active (irradiation source) elements and always present as an integral part of the combatant's uniform.

The development effort is divided into two phases. Performance requirements for Phase 1 include the following: 1) The passive or passive/active device shall be detectable only through night vision devices. The active source shall not be visible to the naked eye. 2) Omni-detectable daytime and nighttime; in adverse weather; all types of terrain and environmental conditions. 3) Easily activated/deactivated. 4) Less than one ounce weight for helmet identifier, less than three ounces on uniform. 5) Fully integrated into combat uniform or helmet and simple, reliable and non-exploitable by the enemy.

Laser Radar. According to FY93 testimony before the House Appropriations Committee, the US Army was reviewing laser radar and other laser based technologies as a potential solution to the near-term combat ID requirement. At the time the Service indicated it intended to issue a contract to develop prototype hardware that could be tested and demonstrated to determine the extent of application of this technology to the Combat ID program. However, no public record of this award appears to have been made to date.

SINCGARS. ITT, the SINCGARS tactical radio prime contractor, and the former IBM Federal Systems (which subsequently became Loral, now Lockheed Martin) are working together to develop an enhanced version of SINCGARS that would provide real-time information on the identification and location of friendly forces. The SINCGARS radio is modified with an IBM-supplied processor and stored digital map data which is overlaid on military grid coordinates showing locations of friendly forces. These improvements would allow SINCGARS radios to transfer position/location and interrogation/response information into the processor for analysis. The software provides vehicle navigation data – with destination waypoints – for enactment of a preplanned mission, and features a combat interrogation/response function to identify targeted vehicles. A liquid crystal display (LCD) provides a picture of the users' operational area to allow him to visualize what vehicles and forces are in his immediate area to provide pertinent navigation information.

JEM. The Air Force has researched the potential application of jet engine modulation sensing techniques which take advantage of the ability of advanced radars to detect the Doppler shift effects generated by the rapidly

rotating compressor blades of a jet engine. The sensing mechanism is based on the fact that blade motion creates a slight frequency shift in the reflected radar signals which is characteristic (i.e. a signature) of individual types of engines. Several limitations of this approach, however, have become evident. These include the facts that: 1) the same engine can be in use on a variety of aircraft flown by several different nations, and 2) the observed frequency shift is highly variable, depending on the intercept geometry.

HRR. High-resolution radar techniques focus on generating highly detailed data describing the surface of the observed object, with the detail obtainable limited by the length (duration) of the radar pulse itself. Present-day radars can generate pulses on the order of one microsecond. This translates to a distance resolution capability of approximately 300 yards; i.e. the discernible detail is limited basically to detecting aircraft. The HRR program seeks to develop a radar capable of generating pulses of only a few nanoseconds duration, providing the ability generate identify discriminating detail of the object being irradiated. Planners are skeptical of the high developmental costs, as well as the necessity to develop an extensive library of HRR images of a large variety of aircraft seen from all angles and with different payloads.

While developing an operational HRR could be part of the JAST/JSF (Joint Advanced Strike Technology/Joint Strike Fighter) program, an operational HRR would probably not be available much before 2007. The Air Force is funding the UHRR (Ultra High Range Resolution) development program which was slated to complete initial design work in FY94.

SABER. This US Navy C^3I program has potential IFF application. SABER (Situational Awareness Beacon with Reply) was developed by the Navy in the aftermath of the Gulf War in order to provide improved target monitoring, especially in tracking "friendlies." The system makes use of GPS data to display speed and altitude data and includes an identification code for each platform of concern which is equipped with a small electronics package linking the platforms with GPS satellites. The capacity of the current demonstration system is 500 US positions which can be updated every two minutes on a joint-use SABER computer.

The Army participated in the program which was scheduled to enter system evaluation in the fall of 1995 at the Joint Air Defense Organization's Joint Engagement Zone Demonstration at Eglin Air Force Base, FL. The Navy had invested US$2.5 million by mid-1994, with the total likely to reach about US$4.5 million by the time of the Eglin demonstration.

Program Review

Background. The last major improvement in the operation of Identification Friend or Foe (IFF) systems dates back to the early 1950s, when during the Korean War, the US introduced the Mk X system which used higher frequencies than its predecessor, the Mk III. The use of the new frequencies provided better target discrimination and range performance and also meant that different challenge modes could be used. The mid-1950s saw the addition of a Selective Identification Feature (SIF) which gave the modes a 4096 code capability.

The Mk XA variant is presently in use throughout NATO. A new version appeared in the early 1960s when the US added a cryptographic capacity and new Mode IV function renaming the system the Mk XII. This variant is in use by a selected number of NATO nations.

However, since neither the Mk XA nor the Mk XII possessed a modern ECCM capability, NATO decided to begin development of a replacement, which became the Mk XV in the US and the NIS (NATO Identification System) in Europe. This began in the early '70s; but problems caused planners to terminate the effort.

Mk XV Program Termination. Despite a 1990 reversal by the DoD of the decision to cancel Mk XV development following a program review by Deputy Secretary of Defense Atwood, the USAF continued its recommendation to cancel the program in 1991. This proposal was part of a package of budget cuts the service put forward during the FY92 budget debate. In addition, the US services viewed the lessening of tensions in Europe, i.e. both the rolling back of the Communist governments among the Eastern Block and the Conventional Forces in Europe (CFE) arms reduction agreements between NATO and the Soviets, as reducing the need for the Mk XV.

Financial considerations pushed the USAF to terminate the Mk XV program. Development costs were put at over US$350 million through 1991, with a total estimated program cost of US$4.4 billion (up from a 1988 estimate of US$3.5 billion) for development and procurement of some 31,774 units (interrogators and transponders) for US aircraft. The Army and Navy followed suit with the USAF zeroing out of its Mk XV request by not requesting Mk XV-related development funding in FY91 and FY92 as they moved to terminate projects.

While much discussion has focused on the program's escalating costs, little has been said about technical or development problems that may have fueled the increases.

The Mk XV project was technically complex and relied on state-of-the-art microelectronics, including VHSIC circuits, gate arrays and GaAs-based MIMIC chips. The Mk XV IFF system was being designed as a form, fit, function (F^3), replacement for existing Mk XII hardware on US military aircraft, using existing Mk XII racks, wiring, and installation space; But it was to be vastly more powerful and capable.

While there was speculation that the packaging of the advanced electronics necessary to handle the Mk XV's capabilities may have presented size reduction and cooling problems, it appears engineers were reportedly able to overcome this obstacle. Designers conceded that the Mk XV design specifications were difficult, but that their approach did meet performance requirements and that the program was being canceled solely as part of cuts earmarked for the DoD 1992-1997 budget plan.

The Gulf War brought the problem of an inadequate target identification capability, both in the air and on the ground, to the forefront. Night air operations, combined with the use of beyond-visual-range weapons, forced coalition commanders to invoke more stringent rules of engagement for positive identification, thus putting operational limits on some Allied weapon systems. This was found necessary to compensate for the varying degrees of IFF capability (in some cases, no IFF capability) among the Coalition partners.

Traditionally, the services' needs have defined US IFF requirements. Since the end of the Gulf War, there has been heavy debate among the DoD and the services on what the new identification system should be and how best to fill requirements. The USAF favors a non-cooperative IFF as the focus of the new development program in order to give it an edge in attacking beyond-visual-range air threats, while the Navy sees a cooperative system as providing a more cost-effective identification capability. The Army is fielding a tentative IFF-like query/response system to go along with other identifiers to protect its assets.

While these debates are concerned with the ability to identify potential aircraft threats, the Gulf War experience has expanded the airborne IFF requirement to include the ability of friendly aircraft to identify ground targets. The number of "friendly fire" incidents reported during the war (including the death of 35 Coalition soldiers) brought public pressure to bear in getting the DoD to address this problem and to assign it high a priority among its combat ID plans. The Joint Chiefs of Staff appointed a special task force after the war to review air and ground identification requirements and make recommendations to meet changing needs. Since then, the debate has continued with no final accommodation being reached due to the lack of consensus as to what approach to select.

Funding

	US FUNDING							
	FY96		FY97		FY98 (Req)		FY99 (Req)	
	QTY	AMT	QTY	AMT	QTY	AMT	QTY	AMT
RDT&E								
0604777N Navigation/ID System	-	52.7	-	46.8	-	50.4	-	58.0
0603742F Combat ID Technology	-	2.8	-	4.1	-	1.4	-	6.4
0904817A Combat ID Technology	-	23.7	-	16.4	-	19.8	-	13.4
Total RDT&E		79.2	-	67.3	-	71.6	-	77.8

	FY00 (Req)		FY01 (Req)		FY03 (Req)		FY04 (Req)	
	QTY	AMT	QTY	AMT	QTY	AMT	QTY	AMT
RDT&E (estimate*)								
0607444N	-	111.4	-	180.0	-	TBD	-	TBD
0603742F	-	7.0	-	7.2	-	TBD	-	TBD
0604817A	-	10.0	-	10.0	-	TBD	-	TBD
Total RDT&E	-	128.4	-	197.2	-	TBD	-	TBD

* NOTE: Estimates based on FY98 budget request; FY03 and FY04 estimates not yet available.

(All $US are in millions.)

Recent Contracts

Contractor	Award ($ millions)	Date/Description
Cyberdynamics	0.9	Jun 1994 — UHRR signature matching studies and data (F33615-94-C-1440)
McDonnell	19.0	Apr 1995 — CPFF order for three pallet mounted Combined Interrogator/Transponder (CIT) Identification Friend or Foe flight test systems, two production representative CIT IFF flight test systems, and integration and testing required to incorporate one CIT IFF system in the F/A-18C/D aircraft. (N00019-94-G-0291)

Timetable

Feb	1989	Bendix awarded Mk XV full-scale development contract
Dec	1990	SecDef Dick Cheney canceled Mk XV development program
Feb	1991	Friendly Fire accidents highlighted shortcomings of available IFF
	FY91	Mk XV program terminated
	1991	JCS reviews IFF needs among the services
	1992	Navy becomes lead service for new IFF development, Army is lead for ground vehicle IFF
Mar	1994	US, UK, France, Germany, and Italy agreed to continue evaluation of potential candidates for meeting NATO need for a common IFF system
Oct	1994	All Service Combat ID Evaluation Team set up in DoD
Nov	1994	Scheduled deliveries of Model 1 BCIS prototypes
	FY93-97	Implementation of Mode S ATC standards
	FY97	Army hopes to begin demonstrations of advanced IFF technologies

Worldwide Distribution

These developmental efforts are currently limited to **US DoD** applications, although NATO allies are now being consulted for possible joint efforts.

Forecast Rationale

The attainment of a consensus on the specific direction to take with a Next-Generation Combat Identification system continues. But a consensus continues to be elusive, even in the face of factors such as the high casualty rate from friendly fire experienced during the Gulf War, and the friendly-fire shoot-down in 1994 of two US Army UH-60s by USAF F-15s enforcing the NATO no-fly zone over northern Iraq.

The reasons for the delays include the absence of the centralized absolute management of ID efforts and a heavy a focus on specific service requirements, sometimes to the detriment of compatibility. Inadequate funding levels have not helped either.

Selecting a long-term solution has been troublesome. A number of short-term alternatives have turned up, but these have not been fully implemented, instead acting more as demonstrations. A Navy approach based on the SABER system and its GPS capabilities offers a short-term solution but fails to provide a non-cooperative capability, which has become the "Holy Grail" of those involved in coming up with the next-generation solution. Implementation of a common cooperative identification system is further impeded by the lack of a common data-link capability for all of the services. The DoD selected Link 16 in October 1994 as the standard tactical data exchange language for all equipment operated by US forces. In 1993, the GAO recommended in a report to the House Armed Services Committee that the Army's near-term solution be compatible with whatever becomes the long-term solution, further complicating choices.

At least cooperative efforts with NATO allies have been restarted in an expansion of the original purview of the five-nation NIS development MoU. The focus has now shifted from the improvement of identification capability for combat aircraft to seeking candidate systems that would combine airborne and ground vehicle ID capabilities, as well as exploring ways to carry on bilateral and trilateral collaboration on a potential system development. The addition of the foreign elements of the equation, however, further complicates the requirements, again in areas such as data links.

Prompted by the friendly-fire shoot down of the UH-60s over Iraq in October 1994, a senior-level DoD group was set up to focus on the increasing ID complications caused by the proliferation of high-tech air defense weapons. The All Service Combat ID Evaluation Team (ASCIET) would study potential improvements to combat ID from a multi-service perspective, and also the top non-material solution to addressing combat ID shortfalls on the battlefield. The five-year effort will address areas such as improving joint service communications, interoperability, and improved integration of ID systems and system tracking data into the combat forces. ASCIET will also be responsible for performing evaluation tests of promising solutions.

An indication of the wide discrepancy of feelings which still surround the Combat ID concept can be seen in the March 1994 statement by US Army Maj. Gen. Jay Garner, in which he states, "...you probably don't need to have as robust a combat identification system as we thought we had to have two years ago." This argument was presented on the basis that plans for the wide-scale digitization of its forces have identified significant applications for reducing battlefield fratricide. The same logic was used as the rationale for reducing funding support to an annual level-of-effort of approximately US$10 million for research and development activity.

In contrast, the Office of Technology Assessment (OTA), in a study titled *Who goes there: Friend or Foe?*, stated that "reducing fratricide will require new technology and equipment. That, in turn, requires funding, which then requires allocations within a finite defense budget." The study went on to conclude that, "Technology to help prevent fratricide of land surface targets is least developed, and Congress may consider giving relatively greater weight for a few years to programs supporting these technologies."

Finding a solution will not be easy. Even with all the attention generated by the UH-60 friendly-fire incident, there still has not developed the kind of high-level interest and commitment needed to really jump-start IFF/SIF new development efforts. As it stands, a next-generation system is not likely to be implemented before the turn of the century, and all too likely, it will be closer to the 2005 time frame. It will, from all indications, be a technological departure from current IFF/SIF systems. These will remain as part of the identification scheme; but individualized service needs will become major drivers of the specific systems that are implemented.

The forecast focuses on R&D and demonstration funding only, and must be considered only an estimate due to the proliferation of efforts throughout the services. Since out-year funding figures are not yet available from the Pentagon, the FY03 and FY04 are based on trend lines and best-guess considerations of what can be expected to take place.

Ten-Year Outlook

			FORECAST FUNDING LEVELS (FY95 US $ Millions)										
			High Confidence Level				Good Confidence Level			Speculative			
Designation	Application	thru 96	97	98	99	00	01	02	03	04	05	06	Total 97-06
Combat ID	R&D DoD	424.2	67.30	71.60	77.80	128.40	197.20	180.00	178.00	165.00	150.00	110.00	1442.30