

update



Dutch Air Force CH-47 Chinook – CHASE

In this Update issue

Building on the experience from previous modular pod survivability solutions for the Apache Helicopters, Terma and RNLAf have developed a state of the art solution for the newly acquired CH-47F Chinook. See page 2.

The Apache Modular Survivability Equipment, AMASE, having added Directed Infra-Red Countermeasures (DIRCM) has now passed flight test on the Dutch Apaches. See page 4.

Terma has delivered the software and hardware for the Belgium Defence C-130H EW Update – the first prototype has been checked out successfully and the Program Production Phase has been initialized. See page 8.

Contents

New Modular Aircraft survivability Equipment for the Dutch CH-47F **Chinook Helicopters** / 2-3

Flight test of AMASE with DIRCM on Dutch Apaches / 4-5

RDAF Installs MWS on F-16s / 6-7

EW Update for **Belgium Defence C-130H** / 8-9

Integration of Airborne Survivability Equipment for Team JCA / 10

Terma has successfully finalized P-8A EW Self Protection SW development / 11

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New Modular Aircraft survivability Equipment for the Dutch CH-47F Chinook Helicopters

Building on the experience from previous modular pod survivability solutions for the Apache Helicopters, Terma and RNLAf have been able to develop a state of the art solution for the newly acquired Dutch Chinook CH-47F.

The system has been labelled the CHinook Aircraft Survivability Equipment – short CHASE.

Together with DMO, we have decided on a pod solution for integration of a new laser for diversion of missile threats, a system named Directed Infra-Red Countermeasures (DIRCM), manufactured by Northrop Grumman Corporation.

The initial flight test will be carried out July 2007 and final delivery will take place as an integrated part of Boeing's delivery of the new helicopters during 2008 and onwards. The picture on the right taken from the initial mechanical integration of the CHASE (Chinook Aircraft Survivability Equipment) pod on the CH-47D models gives a good impression of the final pod solution.



Full 4π spherical coverage

CHASE in detail:

The CHASE pods integrating each three missile sensors and one laser turret, are installed on each side of the helicopter. The pods are mounted directly on the helicopter main frame to minimize dynamic in-flight impact, which virtually can cause optical sensor distortion.

Not only does the pod solution provide a 360 deg. spherical coverage but also a mechanical integration between the missile warning sensors and the DIRCM which is of utmost importance to the overall performance of the system with respect to the level of false alarms and handover between one laser turret to another. Alternative installations of sensors on the fuselage will have to deal with airframe twist which on CH-47 can be significant during extreme manoeuvres – an effect which causes misalignment between the sensors and the DIRCM system which again results in distortion of overall performance and an increasing number of false alarms.

From an operation point of view, as for the AMASE concept, the pod solution in addition provides:

- minimum impact on aircraft modifications and thus down time for the upgrade
- easy and cost effective routes for future technical upgrades, such as active jammers

- possibilities for sharing of CHASE units across a fleet of helicopters rather than having fixed ASE (Aircraft Survivability Equipment) assets to the individual aircraft.



Illustration showing the installation of the CHASE Pod which host all of the missile warning sensors and laser infra-red countermeasures DIRCM.

To attain the required static and dynamic accuracy the CHASE pods are attached into the same helicopter main frame on both sides.



The sensors and DIRCM system will together with the ACMDS system be controlled by the ALQ-213A EW Management System installed as an integrated part of the CH-47 suite and cockpit.

ALQ-213A:

As part of the system, Terma introduces a new version of the well known ALQ-213 EW management system. The new AN/ALQ-213(V) A will combine the experience of the waste number of upgrade projects

which Terma has carried out over the past two decades. The new version will combine all functions of the existing units (EWMU, TDU, and PIBU) into one box, based on novel and sophisticated technology.

Advanced
Threat Display



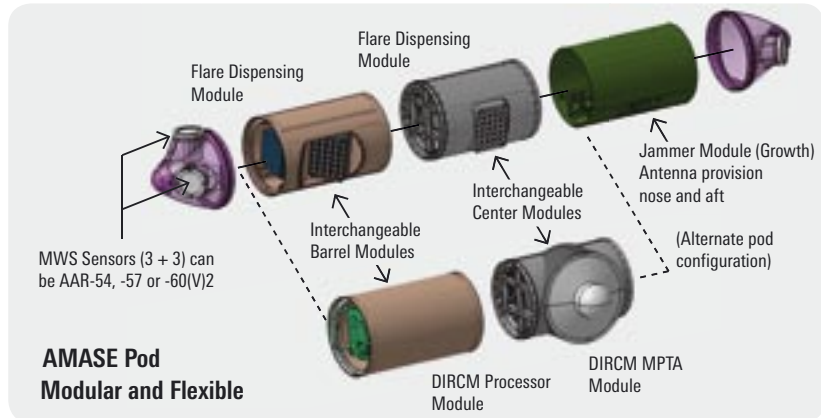
Flight test of AMASE with DIRCM on Dutch Apaches

The Apache Modular Survivability Equipment, AMASE, with laser based Directed Infra-Red Countermeasures has now passed flight test on the Dutch Apaches.

The modular AMASE pod which was installed on stub wings of the Dutch Apache helicopters back in 2004 has operated satisfactorily during operations in Iraq and Afghanistan. The AMASE originally used IR flares as countermeasures against IR guided missiles but considering the continued development with IR guided missiles the AMASE has now been upgraded to include laser based Directed Infra-Red Countermeasures (DIRCM) capability and successful flight tests were performed March 2007.

AMASE provides full 360 deg. spherical coverage

The unique features of the AMASE concept provides full 360 deg. spherical coverage of the Apache helicopters whereas this can be a problem on the fuselage installed sensor solutions. Similarly, the coverage by the DIRCM is un-obscured and ideal compared to the alternative installation behind the main rotor.



In addition to the unique coverage features of the concept, the AMASE podded solutions also provide:

- increased operation flexibility, since the pod can be easily demounted when not needed and pods can be shared over a larger number of aircraft.
- no alteration of Centre of Gravity
- minimum impact on aircraft modifications and therefore limited down time during upgrade
- easy and cost effective route for future technological upgrades, such as active RF jammers.

The modular AMASE solutions for the Dutch Apaches comprised the following elements:

- the cockpit mounted AN/ALQ-213(V) EWMS, the Tactical Data Equipment (TDE) and the Tactical Threat Display (TTD) from Terma
- the AMASE pod comprising the following subsystems:
 - AN/AAQ-24(V) DIRCM from Northrop Grumman
 - AAR-54 MWS from Northrop Grumman
 - Advanced Counter Measures System, ACMDS, from Terma

Over the past months, RNLAf, Northrop Grumman, Dutch NLR and Terma have been working closely together to enable a successful outcome of the total of 31 predetermined flight test



events carried out at the test range of Vliehors in Holland. The AAQ-24 DIRCM system performance was unprecedented with 100 % successful handoffs from the MWS to the DIRCM, 100 % handoff from turret 1 to turret 2, in engagement during fast roll rates and roll reveals, jamming through the rotor blades, engagement during rearward and lateral flight, and fast repeat engagements.

The DIRCM upgrade was based on the AN/AAQ-24 (V) Nemesis DIRCM, which is a joint cooperative program between the United Kingdom and the United States. The system uses IR laser energy to disrupt the guidance system of even the most advanced IR or "heat-seeking" missiles. Nemesis is in production and combat proven, and installed on fixed and rotary wing aircraft in the U.S., UK and other allied countries including Australia, and Denmark.

Terma and Northrop Grumman already having worked together on a number of previous programs are now jointly able to offer the AMASE pod complete including DIRCM capability.

Vliehors test range in Holland
– Operational DIRCM
validation test March 2007



Enhanced Smart Triple Ejector Rack

One multi-carriage rack for yesterday's, today's and tomorrow's weapons

The joint Terma & EDO development of the Enhanced Smart Triple Ejector Rack (ESTER) comprises a unique carrier for legacy Mk-82/-83 iron bombs, current J-class weapons including GBU-49 and JDAM, and next generation stores, such as the Small Diameter Bombs.

The basic requirement from the F-16 MLU community was a multiple carriage of J-class weapons using aircraft BRU-57 software; The Terma/EDO team decided to expand the capability of the ESTER beyond these basic requirements. Putting their team competences into action, Terma & EDO have now developed a TER-9/A upgrade which is above and beyond BRU-57.

The rack has only one hardware configuration which supports all three operation modes. These modes include:

- TER-9/A mode where the ESTER will operate identically to a TER-9/A carrying MK-82/-83 500 and 100 lbs iron bombs. The aircraft interface

is identical to TER-9/A, and the operator will not experience any changes from a TER-9/A

- BRU-57 mode where the ESTER will interface to the aircraft as a BRU-57. The aircraft only needs BRU-57 software which will support carriage of two or three J-class bombs, such as JDAM and GBU-49
- ESTER mode where all the capabilities are utilized. The rack will carry up to three ea. J-Class weapons or Small Diameter Bombs in class I or class II Universal Armament Interface as well as Launch Acceptability Region (LAR) calculations.

For improved performance and reliability the team has selected the Field Replaceable Connector System (FRCS) to replace the standard MIL type bomb interface connector on the J- and SDB class bombs.

The team has secured contracts with two customers for provision of hardware and services, and the first lot of prototypes has been delivered.

Ground tests have been conducted successfully, and the initial flight tests will be performed in the summer of 2007.

RDAF Installs MWS on F-16s

In today's asymmetrical warfare the F-16s operates from deployed operational bases, that may themselves be safe. But the corridors for take-offs and landings are often not. These corridors provide potential hiding sites for launching shoulder-borne infra-red-seeking missiles which cannot be detected by the current F-16 equipment. Therefore, to protect crew and equipment the Royal Danish Air Force has decided to install integrated Missile Warning Systems (MWS) on their F-16 aircrafts.

To survive a missile attack, several measures need to be taken in timely manner:

Missile Declaration

The missile must be declared as soon as possible but with a minimum of false alarms. This is accomplished by installing the EADS AAR-60(V)2 MILDS-F. The system is a fighter version of the MILDS system of which more than 4,000 units have been ordered. The AAR-60(V)2 is a state-of-the-art UV-based MWS which assures low false alarm rates, operational up to 45,000+ feet. The (V)2 version includes ruggedizing and repackaging to a small sensor envelope, updated software, vastly improved processing speed, and a Countermeasures Signal Processor

(CSP) being developed and manufactured by Terma. The sensors and CSP are installed in a Terma modified wing weapon pylon. Not only does this provide good coverage, it also ensures an unmatched cost-effective installation. As no aircraft modifications are needed, the pylons may also be shifted between aircraft.

Effective Countermeasures Must be Executed

The AAR-60(V)2 is integrated with the Terma AN/ALQ-213 Electronic Warfare Management System (EWMS). The EWMS receives the threat information, and based on the aircraft parameters, such as speed, altitude - and not least trial results, the EWMS selects the optimum flare dispense program. To



RDAF F-16 equipped with Enhanced Smart Triple Ejector Rack enabling it to carry up to three bombs under each wing.

facilitate countermeasures of new generation missiles, additional dispensers have been integrated in the weapon pylons. Up to four additional dispensers can be installed; which is 200 percent additional capacity compared to a pre block 40 F-16.

Situational Awareness

The pilot must obtain situational awareness and perform the required evasive manoeuvres. The flight time for a missile is typically 4 to 7 seconds. Within this timeframe, the pilot needs to detect and decoy the missile, including manoeuvring. As soon as the threat is declared the pilot receives both audio and visual information. The audio information received through a Terma-developed 3D-Audio system, provides virtual direction indication as the system generates a tone in the direction of the threat. This system enables the pilot to react intuitively to a sound without having to process visual information into a sense of direction and thereby reducing reaction time. The 3D-Audio system is integrated with the aircraft avionics and the JHMCS in a manner that aircraft and head movements are being compensated for. To enhance the pilot's situational awareness, a visual set of information is being provided on a new Advanced Threat Display (ATD). This new colour, night vision goggle-compatible display provides a total picture of the EW situation, including status for CMDS, RWR, ECM, EWMS, and obviously elevation and azimuth information of the incoming missile. The pilot has now the necessary information to initiate evasive manoeuvres which – together

The 3D-Audio system makes it easier for the pilot to focus on the specific message.



with flare dispensing – gives him maximum chances of survival of missile attack.

Aircraft Audio Management System

The 3D-Audio system is one part of the Terma Aircraft Audio Management System (AAMS). Messages such as cues, radio communication warnings and intercom, can be presented in the applicable direction. These functions makes it easier for the pilot to focus on the specific message. Audio from the actual direction enables the pilot faster to understand – up to one second – which direction is being indicated. Another part of Terma's AAMS is a high performance Active Noise Reduction (ANR) system which significantly lowers the noise level perceived by the pilot. This eliminates the need for earplugs and allows reduced volume for the intercom system. Combined factors which reduces fatigue and stress levels for the pilot.

F-16 MWS Integration Contract

Terma received the integration contract from the RDAF in late 2004, and design and manufacturing are progressing as planned. The first phase of the program focused on data collection of the F-16 physical and operational environment. These data have been used to design sensor hardware and software as well as pylon installation. The sensors have been installed with optimum coverage where a missile attack is most lethal. The first flights with the new MWSI system hardware integrated into the pylon will take place in the summer of 2007, and the remaining certification will be performed in 2008. The complete system will be operational and ready for the F-16 Mid Life Update M5 software.

EW Update for Belgian Defence C-130H

Terma has delivered the software and hardware for the Belgian Defence C-130H EW Update – the first prototype being checked out successfully and the program Production Phase has been initialized.

In early 2005, Terma was asked to provide the Terma AN/ALQ-213 EW Management System for integrating the updated EW Suite of Belgian Defence C-130H. The update included the CATS-100 Radar Warning Receiver from Thales Airborne Systems, integrated with the existing AN/AAR-44 Missile Warning System and an update of the old ALE-40 Dispenser System to the Terma Advanced Counter Measures Dispenser System (ACMDS).

The updated EW Integration was successfully presented to the customer in early 2007 and the prototype testing has been completed. Now, the program is moving into production phase.

The final result is a state of the art legacy aircraft EW Integration, involving the latest technology in EW Self Protection integration, such as threat presentation on a dedicated EW Situational Awareness display, the Automated Track Response (Terma ECAP function) and in-flight Embedded Training which gives the pilot the opportunity to train in a simulated hostile EW environment in air.

The Belgian program adds yet another C-130 Hercules country to the list of operators that rely on the ALQ-213 as the heart of their aircrafts' EW Self Protection System.

Terma's AN/ALQ-213 integrations have always been based on state-of-the-art technology and pilot-vehicle interface (PVI), where Radar Warning Receivers, Jammers, Missile Warning Receivers and dispenser systems are tied together by the AN/ALQ-213(V). The control and display capabilities of earlier

integrations were restricted to use conventional monochrome displays for Radar Warning Receiver identified threats and ALQ-213 dot-matrix text displays and panels for control.

Terma's integration programs focus on good and efficient cooperation with customers and thanks to these solid relationships, Terma has been on the leading edge of user functionality development, and has developed the AN/ALQ-213(V) together with the Tactical Data Equipment family, technology which improves situational awareness and track response processing (ECAP). This is reflected in the latest programs in the transport aircraft business.

In 2004, Terma finalized integration of the ALQ-213 as EW SPS controller into the glass cockpit of the RDAF C-130J-30. With this integration the ALQ-213 and the EW SPS installation are transparent to the pilot. All control and



Terma Airborne Systems and Terma Aerostructures supply a number of advanced electronic equipment and complex composite assemblies for the JSF.



display functions of the EW SPS are operated through the existing aircraft cockpit panels and displays.

This integration has now been in operational use for 2½ years and has proven to be very effective in combat operations. Future updates could include LAIRCM Integration taking advantage of the experiences from the Dutch Apache program which is described elsewhere in this version of Update. Integrating the LAIRCM on the C-130J, and integrating this into the Pilot Flight Displays can be done with

minimum impact to the Aircraft Avionic System, due to the flexibility offered by the ALQ-213 integration.

The AN/ALQ-213(V) EWMS was originally developed for the F-16 aircraft. In a number of updated versions, the system was later certified and selected by the U.S., Norway, the Netherlands, Belgium, Portugal, Australia, Germany, as well as other countries. More than 1,600 systems have been deployed worldwide on fighters, transport aircraft, and helicopters.

Terma AN/ALQ-213(V) EW Management System provides integration of the updated EW Suite for the Belgian Defence fleet of C-130H.

Terma Aerostructures and F-35 Joint Strike Fighter

The Joint Strike Fighter Program heavily involves the Aerostructures Business Area.

The Program establishes Terma as an international center with competencies in lightweight and composite materials for the aerospace industry. From this, Terma Aerostructures is engaged in

design and manufacture of Alternate Mission Equipment, and in the manufacture of components and assemblies for airframe and engine for the F-35.

Several Design and Manufacturing agreements for the JSF aircraft have been finalized in the System

Design & Documentation phase, and deliveries are taking place.

Recently, Terma secured contracts for production of components for the JSF engines, for production of wing pylons, and agreements for production of control surfaces, fuselage and surface components for the Joint Strike Fighter Program.

Integration of Airborne Survivability Equipment for Team JCA

Terma Airborne Systems has integrated an Airborne Survivability Equipment (ASE) suite under the US Army and US Air Force Joint Cargo Aircraft (JCA) program.

The proposed aircraft has a requirement for the most effective self protection functionality available. Terma recently finalized integration of a self protection suite of equipment into the C-295 cockpit that provides the pilot with a single dedicated

display. This single point provides the pilot with a control panel featuring automatic protection against IR and RADAR guided threats. Furthermore, the integration is well suited for successive updates as provisions for 3D Audio, Active Noise Reduction, Network Centric Warfare and other capabilities are built into the system.



The Terma suite is fully integrated with the aircraft avionics and is comprised of the AN/ALQ-213, the Tactical Data Unit and the Tactical Threat Display. This provides the JCA with the flexibility to enable the US Army and US Air Force to select different Self Protection configurations optimized for their respective mission without altering the cockpit interface.

New RSIP for AWACS Japan

Terma is awarded contracts to deliver major parts of the Radar System Improvement Program (RSIP) for the Japanese 767 AWACS fleet.

RSIP increases the AWACS aircraft's radar sensitivity, allowing it to detect and track smaller targets. It also improves the radar's existing computer with a new high-reliability multi-processor and rewrites the software to facilitate future maintenance and enhancements.

The RSIP kit, built by Terma for Northrop Grumman Electronic Systems, Baltimore, Md., under a

subcontract to Boeing, consists of a new radar computer, a radar control maintenance panel and upgrade of other electronic units.

The RSIP upgrades will improve E-767 surveillance capability by increasing the Pulse Doppler radar sensitivity and enables the aircraft to detect and track smaller targets. It also improves the radar's electronic countermeasures, human-machine interface and reliability and maintainability.

RSIP kits built by Terma have been installed on the U.S., United Kingdom, NATO and French AWACS fleets. The 767 AWACS program takes advantage

of modern manufacturing facilities and processes which ensure a high-quality Boeing defense product.

The basic 767 airplane is manufactured by Boeing Commercial Airplane Group in Everett, Wash., and then modified to accommodate the prime mission equipment.

The first derivative airframe completed production in October 1994. First flight with the rotodome installed occurred in August 1996.

Terma has successfully finalized P-8A EW Self Protection SW development



At the end of 2005, Terma was asked by Northrop Grumman Corporation (NGC) to integrate the EW Self Protection system for the US NAVY Multi-mission Maritime Aircraft (MMA), designated P-8A. After approximately a year and a half, Terma has delivered the integration software after a successful integration test.

The new U.S. Navy Submarine Hunter, the MMA, is developed by Boeing based on the well proven Boeing 737

platform, and the P-8A will replace the P-3 Orion that has been in service since 1962.

The EW Self Protection System for the P-8A is provided by Northrop Grumman Corporation, and is integrated into the Aircraft by use of the Terma AN/ALQ-213 EW Management System. On a contract given by NGC in late 2005, Terma has now finalized the development activities of the Integration SW successfully, making the EW Self Protection System ready

for the Aircraft Weapons Integration Lab Test, starting at Boeing facilities in October this year.

The EW Self Protection System on the P-8A consist of the Northrop Grumman AN/ALQ-24 Directed IR Counter Measures (DIRCM), the AN/APR-39 Radar Warning Receiver and the AN/ALE-47(V) Dispenser System – all integrated into the Aircraft Avionics System using the Terma AN/ALQ-213. This integration clearly demonstrates the AN/ALQ-213 capabilities on new aircraft, using Dual Ethernet, modern Threat Response Algorithms and Advanced Audio Cuing to enhance the capabilities of the integrated EW Self Protection System.

The AN/ALQ-213 provides the flexibility to the P-8A for future EW Self Protection System updates, with a minimum impact to the aircraft configuration.

Nimrod Enhanced Defensive Aids Suite

“New threats call for new counter-measures”: this was applicable when the RAF Nimrod MR2 got a new assignment in potential hostile environments.

In a time-compressed program, risk reduction is paramount, so within a



couple of weeks after initial mutual understanding was established, Terma took a MCP-10 to Kinloss Air Force Base for a fit check and assessment of dispense angles. This hands-on session convinced the team that the program was feasible and a trial Installation program was agreed.

Terma provided a set of ALQ-213 units and two MCP's for the program and all equipment was successfully installed

April 2007, and flight tests are planned for later 2007.

The Terma solution comprises the AN/ALQ-213 EW Management System and two ea. MCP-10. The solution provides a major improvement in performance and integration of the Nimrod EW systems as well as provisions for future upgrades of the EW suite.



Financial Highlights

USD million	2006/07	2005/06	2004/05	2003/04	2002/03
Sales	171	165	202	183	161
Profit for the year before tax	14	12	14	12	10
Equity Capital, year-end	62	57	57	53	52
Assets, total	173	151	167	189	177
Order intake	163	166	189	145	211
Order book, year-end	227	227	228	241	279
Number of full-time employees – Average for the year	965	1,014	1,034	1,010	945

We Provide Mission Customized Solutions

Terma develops and markets high-tech solutions, systems, and products for civilian and military applications.

Terma's high-tech solutions and products are developed and designed for use in extreme mission critical environments and situations, where human lives and valuable material assets are at stake.

In Denmark, Terma facilities are located at Aarhus, Copenhagen and Grenaa.

Terma's international locations include Leiden, the Netherlands; Darmstadt near Frankfurt, Germany; Washington, DC, and Warner Robins, GA, USA, and Singapore.

Terma A/S was established in 1949. For years, Terma has worked closely with defense forces, public authorities, and international organizations around the world. Through these relationships, Terma has gained in-depth knowledge of and insight into our customers' working environment and an equally deep understanding of their situations and needs.

Terma is fully owned by the Thomas B. Thrige Foundation.

Terma's business areas cover:

- Aerostructures for aircraft
- Airborne systems, including
 - Self-protection systems for aircraft
 - Audio systems solutions
 - Reconnaissance systems for fighter aircraft
 - Electronics manufacturing
- Integrated systems, including
 - Self-protection systems for naval vessels
 - Command and control systems for navy, army, and air force applications
 - Air traffic management systems
 - Public Safety & Emergency
- Radar surveillance systems
- Solutions, services, and products for space applications

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