Integrated Electronic Warfare Self-Protection Solutions for all Types of Aircraft
Terma EW Control and Integration – In a class of its own

Eight good reasons to select the Terma solution:

• Terma has over 20 years of experience as leading integrator of EW systems. Terma’s AN/ALQ-213(V) Electronic Warfare Management System is operational and combat proven on more than 2000 fighters, helicopters and transport aircraft worldwide.

• During these years, the ALQ-213 has achieved a position as the only system in the market that is independent of platform or subsystems suppliers and is able to control and integrate any combination of sensors and countermeasures systems on any type of aircraft and make these work as one system.

• Terma is the only integrator that includes the structural packaging in the total solution, typically in the form of Terma designed pods, pylons or other fixtures that allow rotation of systems within the fleet. This approach reduces the cost of aircraft modifications and allows for fewer systems overall.

• Terma provides combat proven, automatic threat response through Electronic Combat Adaptive Processing and offers multinational tested Embedded Training so pilots can truthfully say, "We train as we fight".

• Pilot-Vehicle-Interface is the most advanced in the market, with separate, full color threat display or glass cockpit integration, Three Dimensional Audio Warning of attack, Active Noise Reduction and radio channel separation.

• Terma has a proven record of developing, qualifying and delivering complete custom tailored self-protection installations within 3-6 months utilizing our fast responding organization and unique modular product portfolio.

• All EW suites are offered with advanced Mission Support tools and full organic and logistic support. Mission Support tools can be operated stand-alone or integrated with common mission programming and debriefing system tools for multi-player training.

• Terma’s EW Controller is the only solution offering commonality and common software across the aircraft fleet.
ALQ-213, the World’s Most Widely Used EW Control and Integration System

The AN/ALQ-213(V) Electronic Warfare Management System dates back to 1991, when the first version was installed in the Danish F-16 to better coordinate onboard EW self-protection systems and to reduce the pilot’s workload. Since then, it has been continually improved and upgraded, so that it has become the most versatile system of its kind today, being operational on over 2000 fighters, transport aircraft and helicopters worldwide. During those years, it has proved its value in actual combat such as Bosnia, Iraq, Afghanistan and Libya.

This versatility is achieved through a comprehensive set of system components that can be combined and programmed to meet the requirements of any type of mission or type and size of aircraft.

A unique system of its kind

Compared to similar systems, the ALQ-213 is unique in the following ways:

- It is the only system that is independently based on open architecture, and provides a firewall between the sensor system and the aircraft avionics system. This allows for addition of subsystems and sensor updates that are transparent to the aircraft, are less certification intense and less costly.
- Unlike many other systems the ALQ-213 is not locked to a specific platform or EW subsystem.
- The ALQ-213 is the only system that provides flexible integration of multiple combinations of sensors, and countermeasures systems: UV, IR, LASER, Acoustic, RF, Chaff/Flare, DIRCM, Towed Decoy, and Jammers.

ALQ-213 Components

**EW Management Unit**

The combination of EW Management Unit, EWMU and the Tactical Data Unit is the most widely used configuration. The EWMU is the cockpit control unit, which feeds data to the Threat Display, the Three-Dimensional Audio system and facilitates loading/unloading and recording of mission data through a dual PCM cartridge.

**Tactical Data Unit**

**Defensive Aids Controller**

The DAC, Defensive Aids Controller, is well suited for larger aircraft and helicopters. It combines the functionalities of the EWMU and TDU and also includes a Programmable Interference Blanker Unit, PIBU. Since the DAC is placed in the electronics bay, it requires remote control Panel RCP for cockpit control and recording, loading/unloading of mission data. A smaller version, “Mini DAC”, is under development in order to meet the requirement for smaller and medium size aircraft without the need for blanking and other kinds of expansion.

**Remote Control Panel**

**Light Aircraft Survivability Equipment**

For very light aircraft and helicopters, where weight is a special concern, a LASE controller is under development. This controller is a derivative of the Advanced Threat Display and it will be able to control a subset of threat sensors and automatically dispense countermeasures payloads.

**Advanced Threat Display**

Full color multi function display that gives the pilot complete information about the threat and the status of onboard EW systems. In glass cockpit aircraft, this information can be presented on existing displays.

**F-16**

**Other A/C**
Revolution in Cockpit Sound Quality and Pilot Situational Awareness

The quality of sound in the cockpit be it from radios, intercom, warning signals or others sources has been a much neglected area for a good many years. The following systems, developed and introduced by Terma can truthfully be described as a revolution in cockpit sound quality:

- Three-Dimensional Audio Warning which gives the pilot real time audio warnings from the exact direction of attack. The result is a considerable reduction in reaction time and enhanced situational awareness.
- Active Noise Reduction and Electrical Noise Reduction, which reduce pilot stress and fatigue considerably.
- Radio channel separation, which improves intelligibility and overall safety because important messages are not lost in simultaneous transmissions.
- Directional intercom, which improves communication, mutual understanding and awareness among crew members.

The improvement of sound quality is largely due to introduction of a digital stereo intercom system supported by an Enhanced Intercom Amplifier, EIA. The systems can be installed as stand alone or as an integral part of the AN/ALO-213(V) EW Management System on all types and sizes of aircraft.
Electronic Combat Adaptive Processing, ECAP

For the EW Management Unit, EWMU, to provide meaningful semiautomatic and automatic operation, any automation needs to match very carefully tactics applicable to the specific type aircraft. Since 2004, Terma together with EW national specialists, has been creating a decision support solution called Electronic Combat Adaptive Processing, ECAP, as part of the ALQ-213 system. In the same time frame, new EW Sensor/Countermeasures technology has also supported the need for enhanced coordination between sensors and countermeasures. Focus of the capability circles around optimized aircrew awareness of threat picture, optimized operation across the EW suite throughout all mission phases and reduced pilot workload.

Embedded Training, ET

With the new decision support and improved EW subsystems capabilities, enabling the end-users to familiarize themselves with how to operate and get the best out of the EW suite, in the context of “war”, it was clear that this could not be achieved through traditional methods. For example, in-flight engagements against real threats (airborne missiles and full weapon systems), while training, are neither practicable nor possible. Therefore, Terma can provide “full EW Subsystem Simulation” for un-installed EW subsystems and provide “Virtual Weapons Systems” against which Weapon Tactics can be trained. This capability combination is known as Embedded Training, ET. The in-cockpit experience realism and the ability to gather lesson learned experience from the in-flight instrumentation during Post Mission Training Debrief have been the lead features for full acceptance by the pilot community.

Extensive testing in different environments

ECAP and ET development has been an international project with the European F-16 users as partners, and multi-national evaluation testing has taken place at Leeuwarden, The Netherlands, Ørlandet, Norway and Edwards Air Force Base, USA. The end result is a new set of In-flight Tools that ensures that pilots will now be able to use the motto, “We train as we fight” and that in case of attacks during real conflicts, they will have the best decision support possible.

Although ECAP and ET testing was carried out within the F-16 community, results are equally applicable to other types of aircraft equipped with the ALQ-213. In fact, the capabilities have been designed with core processing and mission data strategies, which means that tailoring and re-integration to other aircraft platforms are minimized. Transfer of these capabilities onto other platform types within the ALQ-213 user community has already been initiated.

Matured Decision Support and High Fidelity Embedded Training as Part of the AN/ALQ-213(V) System

Post Mission Pilot debrief with EW

Multi-player “Big Picture” integration of Terma’s EW information (ATD and EW events) into the Common PC Debriefing System training tool.

Cockpit installation

Advanced Threat Display merges all real EW information with ECAP’s decision support information along with Embedded Training’s Virtual Threats and Simulated Subsystems
Aircraft Equipped with Terma EW Self-Protection Systems

**Fighters**
- F-16
- F-111
- A-10
- Tornado
- Harrier
- F-16 Blk 60

**Transports & other Larger A/C**
- C-160
- C-130J
- C-130H
- Nimrod
- Fokker 60
- P-8A

**Helicopters**
- Mi-24
- Cougar
- Chinook D/F
- EH-101
- Apache
- Mi-17
Installation of Sensors and Countermeasures Systems

**Helicopters**

**CH-47D/F Chinook**

Ch-47D fuselage mounted dispense magazines

**Chinook Aircraft Survivability Equipment, CHASE**

Two pods, one on each side of the fuselage, are each equipped with three UV missile warning sensors and one DIRCM unit. This provides 360 deg spherical coverage against incoming IR missiles. Mounting of sensors and DIRCM in the same pod eliminates inaccuracies caused by fuselage torque during maneuvering.

**Mi-17**

MASE Pod for Mi-17. The helicopter carries two pods, each containing three UV Missile Warning sensors and two chaff/flare magazines, plus provisions for RWR, LWS and HFI.

**AH-64D Apache**

Apache Modular Aircraft Survivability Equipment, AMASE

Each helicopter has two pods mounted on the stub wings. Each pod holds two chaff/flare magazines and three UV-based missile warning sensors providing 360 deg spherical coverage against incoming threats. Each AMASE pod can host a DIRCM unit, RWR, KWR and HFI.

**Fighters**

**F-16**

F-16 Pylon Integrated Dispensing System (PIDS+), with missile warning sensors. Each pylon contains three UV missile warning sensors and two chaff/flare magazines. Full weapons carrying capability is retained.

**Tornado**

Modular Countermeasures Pod, MCP for Tornado aircraft.

The pod contains six UV missile warning sensors and eight chaff/flare magazines.
On the C-160 Transall, sensors are installed in the fuselage. The chaff/flare capacity has been increased to a total of 36 magazines. Two underwing Modular Countermeasures Pods, MCP-10 each contains ten magazines and two ‘scab-on’ mounted units each containing four magazines. The original eight fuselage mounted magazines are retained.

**TERMA EW Systems**

**Reference List**

**Fighters**
- F-16A/B, F-16C/D
- F-16 MLU, F-16 Blk 60
- A-10 Thunderbolt
- Tornado
- Harrier
- F-111C/G

**Helicopters**
- CH-47D, CH-47F
- AS-532
- HH-60G
- EH-101
- AH-64D
- AS-550
- Mi-17, Mi-24
- NH-90

**Transports/Larger aircraft**
- C-160, Transall
- C-130H-30, C-130H, C-130J
- Fokker 27
- Fokker 60
- P-8A Poseidon
- Nimrod
- E-737AEW

**EW Subsystems Currently Controlled by ALQ-213**

- Modular Countermeasures Pod, MCP-10
- ‘Scab-on’ mounted dispense unit for the C-160. Each aircraft carries two units.

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**Modular Countermeasures Pod, MCP-10**
TERMA

Terma develops and markets high-tech solutions, systems and products for defense and non-defense applications. Our products are developed and designed for use in extreme mission-critical environments and situations, where human lives and valuable material assets are at stake.

Terma’s Business Areas cover:

- **Aerostructures**: Development and production of advanced structures for defense and non-defense aircraft and helicopters

- **Integrated Defense and Security Systems**: Network and tactical systems, airborne and naval self-protection systems and electronics manufacturing services for mission-critical defense and security applications

- **Radar Systems**: Advanced radar systems for coastal surveillance, naval surveillance, vessel traffic surveillance, perimeter surveillance and surface movement surveillance at airports

- **Space**: Mission-critical products, software, and services for space applications

Terma A/S was established in 1949, is headquartered in Denmark and maintains international subsidiaries in a number of European countries, the US and Singapore.

For many years, Terma has worked closely with the Defense, public authorities, and international organizations around the world. Extensive dialog and meaningful relationships with our business partners give us an in-depth understanding and appreciation of their strategic, functional and management needs.

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