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- Operator and Regulatory Requirements
- Protection Solution Overview
- Conclusion
At least 35 attempts recorded in the last decade. Mombasa 2002 and DHL in Iraq in 2003 caught the attention of the politicians, mainly in the US.

US Department of Homeland Security (DHS)
- US Congress tasked the DHS to develop civil protection systems against MANPADS.
- 2003 Phase 1 - Study Phase.
- 2004-2006 Phase 2 - Development of two different Directed Energy IR Counter Measure System (DIRCM adaptation to Civil use)
- 2006-2008 Phase 3 - Operational evaluation of DIRCM on aircraft within the US “Alternative solutions” reviewing 3 Flare systems.

Total US funding spent on Civil aircraft protection $M140 - $M200
Introduction

European Efforts

- **2006** - European initiative launched including most European EW companies.
- **2006** - Saab Avitronics, Chemring Countermeasures and Naturelink (Charter Company in RSA) started to initiate a proof of concept study in preparation for flights trials.
- **2008** - ‘Proclaim’ is a new European effort regarding civil countermeasures installation (similar to DHS efforts).
Introduction

VULNERABILITY OF COMMERCIAL AND SPECIAL MISSION AIRCRAFT
And unpredictability of impact point

Airbus A300 damaged by MANPADS in IRAQ
SCOPE

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The Threat

THE ASYMMETRIC ENVIRONMENT

- Totally Unpredictable
- Little or no Intelligence

- Countries with IR MANPADS
- Over 700,000 MANPADS have been produced worldwide since the 1970s

- Location of “non-state” organizations with IR MANPADS
- 150,000 MANPADS estimated in the hands of “non-state” organizations
- Prices as low as 5,000 $US

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2 Jane’s Intelligence review February 12, 2003
3 Jane’s Terrorism and Insurgency Centre, “Proliferation of MANPADS and the Threat to Civil Aviation”, August 13, 2003.
The Threat

TYPICAL RUSSIAN IR MANPADS

SA 7/ Strela 2
SA 14/ Strela 3
SA 16/ Iгла -1
SA 18/ Iгла
The Threat

ANALYSIS OF AIRCRAFT VULNERABILITY DURING MISSIONS

- “On task” phase of missions are usually conducted in “safe” airspace.

- Only “conventional” type threats (fighters and long range radar guided missiles) are considered as possible threats while “on task”, which is in turn only associated with conventional type conflicts.

- The most vulnerable phase during missions occurs during departure and approach where “asymmetric” threats could come into play – both in conventional conflicts as well as during peace time (terrorist organizations).

- Priority should therefore be given to protect this type of aircraft against the Asymmetric threat.
Aircraft rolls down the runway
Target aircraft picked; prepare missile, activate battery and spin-up missile seeker
Tracking, lock-on and pre-launch confirmation
Launch of missile
MAW detects possible missile
MAW tracks possible missile
Missile confirmed
Calculate optimum decoy timing
Dispense decoys
SCOPE

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System design requirements

- Increase platform survivability under threat
  - Multiple threat handling
  - High probability of detection
  - Provide some situational awareness and control to crew
  - Initiate effective countermeasures automatically
  - Safety during operation (operator, collateral)

- Cost-effectiveness
- Availability
- Certification (Civil Certification of EW Equipment)
Operator and Regulatory Requirements

PROTECTION SOLUTION

System certification

- EASA

- Wassenaar Arrangement

- Local CAA
Operator and Regulatory Requirements

EASA STC PROCESS

Once an application has been accepted and a certification team is established, the EASA supplemental type certification process can generally be divided into the following phases.

Phase I
Technical Familiarisation and establishment of the STC Basis

The objective of this phase is to provide technical information about the project to the Team specialists to enable the definition of and the agreement on the EASA Supplemental Type Certification Basis.

Phase II
Agreement of the Certification Programme

The objective of this phase is the definition of and the agreement on the proposed means of compliance with the Certification Basis and the identification of the Team involvement.

Phase III
Compliance determinations

The objective of this phase is the demonstration of compliance with the Certification Basis and the acceptance of the compliance demonstration.

Phase IV
Final Report/Technical Visa and issue of a STC

The objective of this phase is the establishment of a project final report/technical visa recording details of the type investigation and, based on approval of the final report by the Certification Directorate, the issue of the EASA Supplemental Type Certificate.
Operator and Regulatory Requirements

WASSENAAR ARRANGEMENT

Controls the export of dual use technology between countries. Dual use implies the uncontrolled use of certain civil technologies for military purposes and vice-versa.

Wassenaar compliance implies no restrictions on export.

Major design compliances include eg:
- Specifically designed for civil application.
- Tamper protection.
- Monitoring of platform and owner changes.

LOCAL CAA CERTIFICATION

The manufacturers normally have no intention to become involved in local certification work. The certification documentation supplied for STC and EASA certification will be sufficient to satisfy local requirements.
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Protection Solution Overview

- Threat Avoidance
- Hardening/Armour
- Signature Reduction
- Secure Flying Zones
- Procedural Measures
- Electronic Warfare Solutions
Protection Solution Overview

STUDIES INCLUDE APPROPRIATE SENSOR TECHNOLOGIES AND COUNTERMEASURES
Protection Solution Overview

SENSOR TECHNOLOGIES

- INFRA-RED (IR)
- ULTRA-VIOLET (UV)
- ELECTRO MAGNETIC (Active)
Protection Solution Overview

COUNTERMEASURE TECHNOLOGIES

- IR JAMMERS
- DIRCM
- PYROTECHNIC DECOYS
- PYROPHORIC DECOYS
Protection Solution Overview

TYPICAL SYSTEM COMPOSITION

- MISSILE APPROACH WARNER SENSOR SUITE
- COCKPIT CONTROLLER HMI
- ELECTRONIC CONTROLLER
- COUNTERMEASURE/DECOY SYSTEM
- PYROTECHNIC, ELECTROMECHANICAL, DIRCM)
Protection Solution Overview

DIRCM
- The system is operational on a limited number of military cargo/VIP aircraft.
- Requires a detection system (Sensors).
- Tests have recently been carried out in the US on board Civil wide body aircraft (Boeing 767) within the scope of US Department of Homeland Security Program.
- Need one laser turret per incoming missile to handle simultaneously fired missiles.
- Complex technology makes acquisition and operating costs high.
- Exportability might be limited.
- Aerodynamic penalties (drag).
Pyrotechnic Decoy Systems

- The most mature countermeasure system used in military applications with proven effectiveness.
- Requires a detection system (Sensors).
- Dispense pyrotechnical MTV flares by means of electrical squibs.
- Relatively high dispense speed of flare bodies.
- Flares are hazardous to operate and handle (Armament).
- Low cost systems.
- Civil certification unlikely.
Protection Solution Overview

PYROPHORIC DECOY

- Releases all the energy in the relevant IR-spectrum.
- Almost invisible to the human eye.
- Civil certification.
- Safe
  - No collateral damage on ground or in air in case of an inadvertent dispense event.
  - Requires airspeed for package to open up and disperse pyrophoric material.
  - Not classified as armament.
COUNTERMEASURE DISPENSING SYSTEM

BOA Dispenser and CIV-IR Decoys.

Dispenser characteristics:
- No recoil
- Light weight
- Internal installation
- Loading and unloading easy and safe
- Low power consumption
- Mechanical (no squibs)
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Conclusion

Several viable alternatives exist for the MANPADS protection of special mission and civil aircraft.

It is possible and viable to adapt existing technologies for such application.

The civil certification requirements are harsh and safety of flight is paramount, more so than functional requirements.

Civil certification is a long and expensive process not well understood by defence technology companies.
Conclusion
Conclusion
CONCLUSION

- CAMPS is being developed for Civilian Type Certified aircraft.

- CAMPS will be civil certified.

- CAMPS complies with the requirements of the Wassenaar arrangement.