

30th European Rotorcraft Forum
14 – 16 September 2004
Marseille - France



Self-Protection for Helicopters
Thales – France

Bernard HEPP

EW Strategic Marketing Manager

THALES SYSTEMES AEROPORTES

bernard.hepp@fr.thesesgroup.com

Aéronautique

THALES

- **Helicopter Self-protection requirements**
- THALES helicopter self-protection systems
- VIP helicopter self-protection
- Advanced self-protection concepts

HELICOPTERS GROWING IMPORTANCE



VARIED MISSIONS

VARIED FLIGHT PROFILE

- ANTI-TANK / SUPPORT / SEAD / ESCORT
- ANTI-HELOS / UAV-UCAV
- TRANSPORT / ASSAULT / SPEC.FORCES
- ANTI-SHIP / SITES PROTECTION
- URBAN WARFARE
- BATTLEFIELD RECCE / MARITIME PATROL / ESM
- TACTICAL INTELLIGENCE
- HUMAN HELP / SURVEY / MEDIVAC
- SEARCH AND RESCUE



A THREATENING ENVIRONMENT



Air to Air Missiles



**Radar Controlled
Air Defense**



IR Guided SAMs



Laser Guided Air Defense



Anti Aircraft Artillery

T30527-fr

Les informations contenues dans ce document sont la propriété exclusive du Groupe Thales. Elles ne doivent pas être divulguées sans l'accord écrit de Thales Systèmes Aérospatiaux S.A.

HELICOPTERS GROWING SELF-PROTECTION REQUIREMENT



HELOS BECOME HIGH VALUE ASSETS

LARGE RADAR CROSS SECTION

PROXIMITY / EXPOSURE TO THREATS

MORE LETHAL RADAR/IR/AAA/LASER THREATS

detection

- **RADAR WARNING : ACCURATE REAL TIME SITUATION AWARENESS**
- **MISSILE WARNING : FAST RELIABLE DEPENDABLE WARNING**
- **LASER WARNING : IMMEDIATE DETECTION & IDENTIFICATION**

action

- **DECOYING : AUTOMATIC , EFFECTIVE AGAINST ALL THREATS**
- **RF JAMMING : SMART MULTI-THREAT DIGITAL JAMMING**

NOT DETECTED → NOT TRACKED → NOT DESTROYED

HELICOPTER SELF-PROTECTION REQUIREMENT



**IMMEDIATE
ACCURATE
SITUATION
AWARENESS**



Three types of critical aspects for the equipment:

■ Installation

- Size, weight critical aspects
- platform electronic system integration

■ Operation of the equipment

- Easy to operate equipment far away from usual support bases
- Easy maintenance concept required
- Automatic, to minimize crew workload

■ Performance

- Multi-sensor (radar, laser, missile)
- Very dense EM environment
- Low to very-low altitude flight profile
- Intervisibility with radars not always ensured
- Reliable instantaneous unambiguous threat declaration

- Helicopter Self-protection requirements
- **THALES helicopter self-protection systems**
- VIP helicopter self-protection
- Advanced self-protection concepts

THALES SELF-PROTECTION ON-BOARD HELICOPTER



SA 342 Gazelle



AS 332 S Puma / AS 532 COUGAR



EC 725 Cougar



AS 565 Panther



NH 90



EC 665 Tiger



AS 555 Fennec



Lynx, MI 24, Sokol



EH 101 Merlin



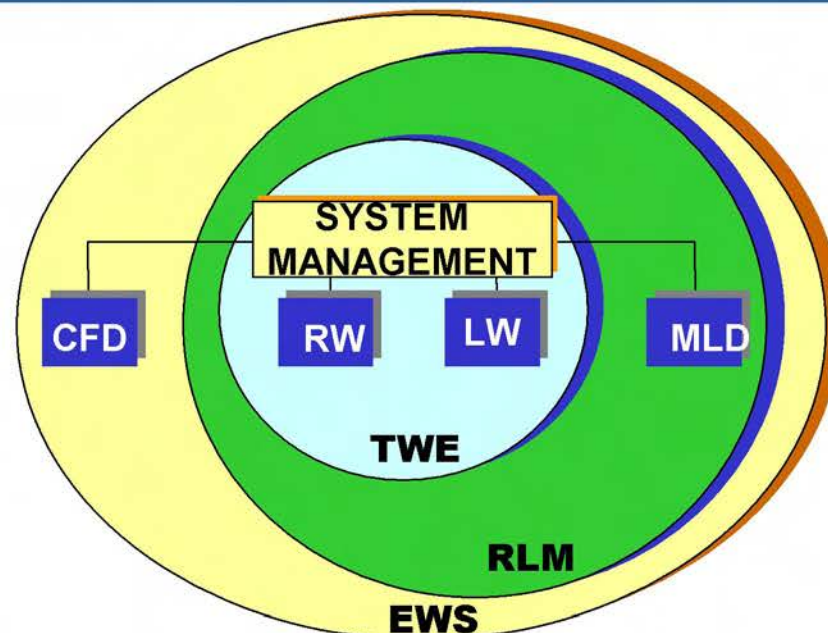
WAH 64D APACHE



T30527-fr

Les informations contenues dans ce document sont la propriété exclusive du Groupe Thales. Elles ne doivent pas être divulguées sans l'accord écrit de Thales Systèmes Aérospatiaux S.A.

MULTI-SPECTRAL EWS OPTIMISED FOR INTEGRATION ONBOARD TIGER & NH-90 HELICOPTER

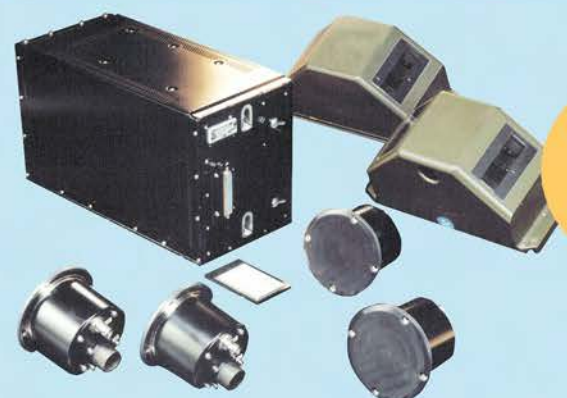


TWE
RLM
MLD
CFD
EWS

Threat Warning Equipment
Radar Laser Missile warning
Missile Launch Detector
Chaffs & Flares Dispenser System
Electronic Warfare System

TWE

- High performance wide band radar and laser warning
- EW system management
- Single processing unit
- Glass cockpit compatible design
- Standard packaging
- Integrated modular design
- Compact, low weight & easy maintenance



**EADS / THALES
EUROPEAN
COOPERATION**

COUGAR SAR SELF-PROTECTION SYSTEM



MWS-20

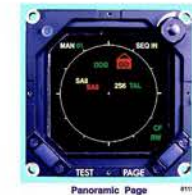
- Missile Approach Warning



SHERLOC-SF

- Instantaneous Wide Band Receiver
- System Management

VLCD Colour Display



System control



RALM01

- Laser Warning Receiver



ELIPS NG

- Chaff and Flares Dispenser



MWS-20 MISSILE WARNING SYSTEM

COMPACT



ALL WEATHER / CONDITIONS



EFFECTIVE



RELIABLE



**OPTIMIZED FOR INSTALLATION ON
BOARD HELICOPTERS AND WIDE BODY
AIRCRAFT**

**PROVIDES ACCURATE MISSILE
APPROACH WARNING DATA**



- Installed on C130, PUMA, COUGAR
- Validated in live firing conditions
- In operational use



Active Approach Missile Warning System based on Pulse Doppler RADAR principles

Detection of missile body



Detection Reliability

Measurement of missile closing
velocity



Rejection of non threatening
objects – False Alarm
reduction

Measurement of Missile Range



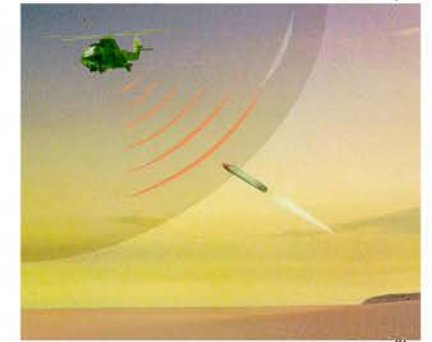
Real time estimation of Time
to Impact

Measurement of Sector Of Arrival



Optimization of counter-
measures actions
(Time and Direction)

- **Detection of incoming missiles** by coherent radar processing (Digital Fast Fourier Transform and Radar Cross Section detection)
- Continuous detection during all missile flight phases (**including post-burnout**)
- Range/velocity coherency algorithms (**low false alarm rate**)
- Fast reaction time
- Real time **estimation of Time To Impact** (TTI)
- **Optimized ECM triggering** (programmable TTI for automatic dispensing)
- **Multi-threat** (simultaneous missiles detection capability)
- No need for missile signature data
- Nominal performance above all kinds of terrain, in all weather conditions



MWS-20 is a key asset for VIP/HOS aircraft Protection combining detection effectiveness and very low false alarm rate

- Helicopter Self-protection requirements
- THALES helicopter self-protection systems
- **VIP helicopter self-protection**
- Advanced self-protection concepts

- Worldwide Increase of Terrorism
- IR SAM are cheap , easy to operate and proliferating (SA-7, SA-16, SA-18...)
- Can be operated by uncontrolled military or terrorist groups
- Vulnerability of Head Of State / VIP helicopter during low/medium altitude flight phases



Protection of HOS/VIP Platform is necessary during critical phases and requires :

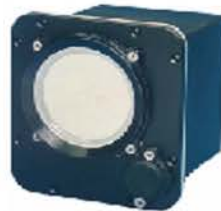
- Detection, tracking and assessment of the threats
- Triggering the most appropriate reaction at the right time
- Automatic operations
- High reliability and extremely low false alarm rate
- Proven effective safe counter-measures
- Civil aviation authorities certification

Fundamentals of HOS/VIP Protection

- 1 - Detection of **approaching** threats
- 2 - Estimation of **Time To Impact**
- 3 - Measurement of **Sector of Arrival**
- 4 - **Appropriate CM** actions triggering
- 5 - **False alarm rate optimization**

Example of WIPPS Configuration for HOS

AAR-60 MILDS
Ultraviolet
Missile Warning



ALE-47 TACDS
Threat Adaptive
Dispenser



EWCS/MFD
Electronic Warfare
Processor/Display



MWS-20
Pulsed Doppler
Radar Missile Warning

IR Decoys



MJU-7



MJU-10

MJU-51 & 53
Advanced Threat
Safe Decoys

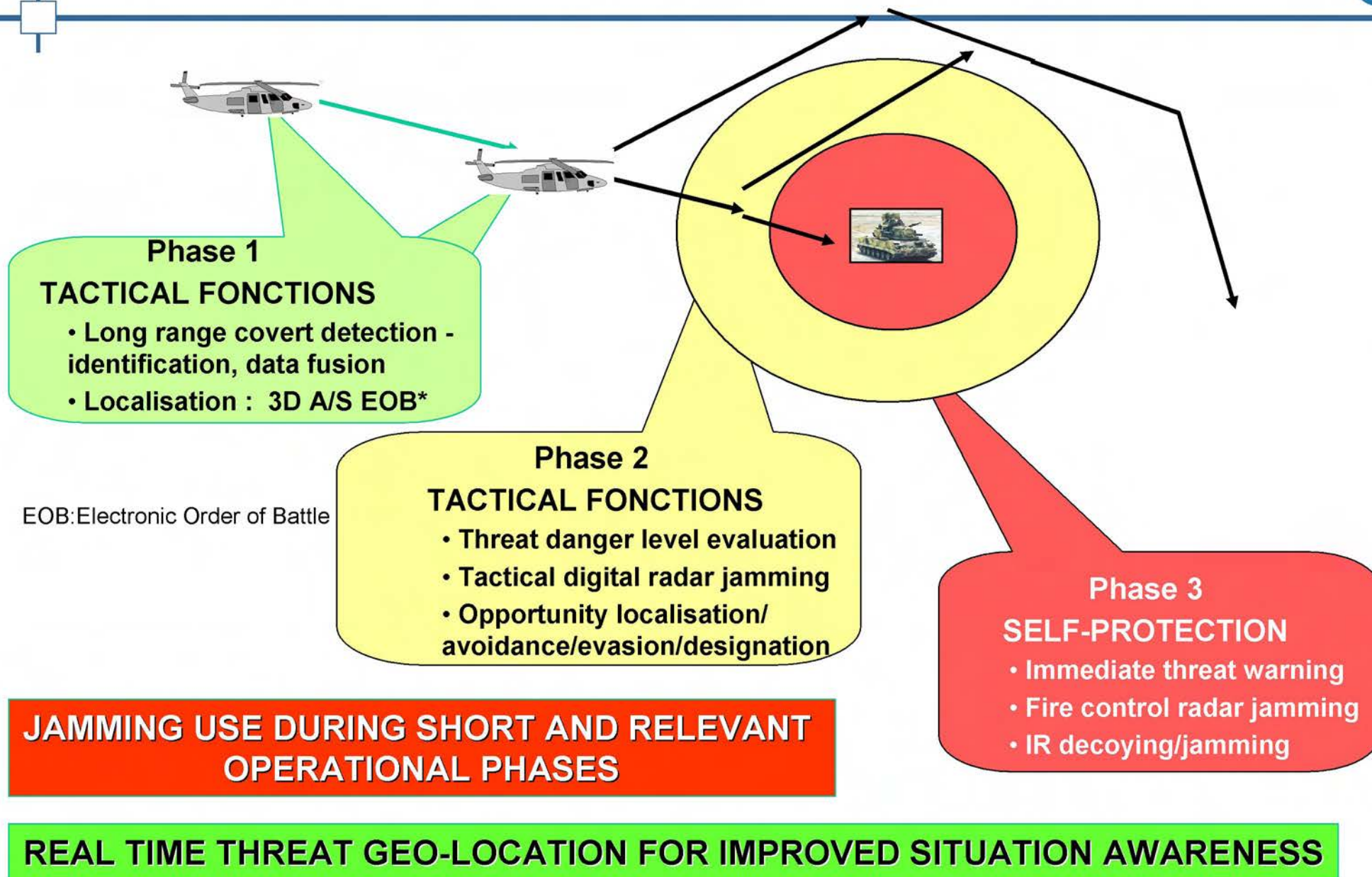
THALES





- Helicopter Self-protection requirements
- THALES helicopter self-protection systems
- VIP helicopter self-protection
- **Advanced self-protection concepts**

OPERATIONAL CONCEPT OF NEW EW FUNCTIONS



T30527-fr

Les informations contenues dans ce document sont la propriété exclusive du Groupe Thales. Elles ne doivent pas être divulguées sans l'accord écrit de Thales Systèmes Aérospatiaux S.A.

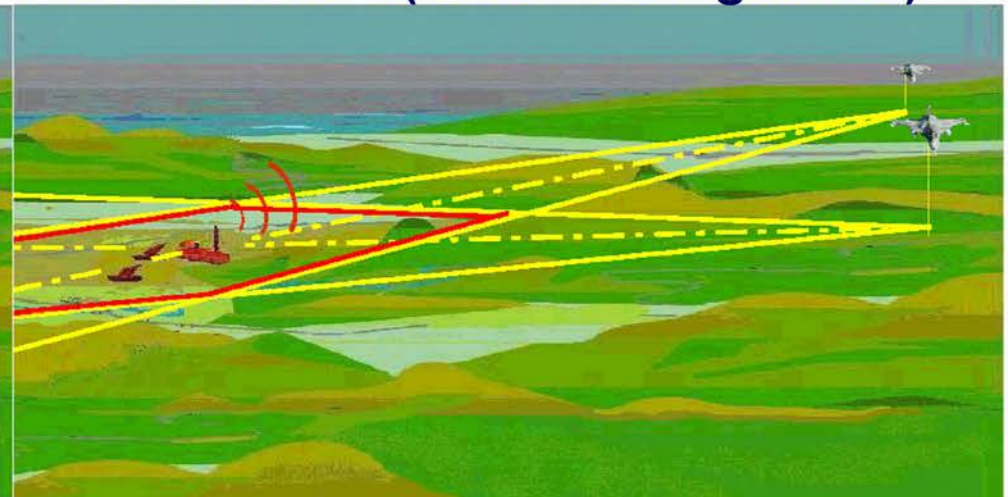


- PSEUDO RANGE (Received power level) : extremely poor accuracy
- INTERFEROMETRY & TRIANGULATION

principle



Performances (linked to angle rate)



😊 Operational

😊 Robust

😞 Not adapted for helicopters
(antenna array installation, platform velocity)

*DOA: Direction Of Arrival

PASSIVE FAST GEO-LOCATION

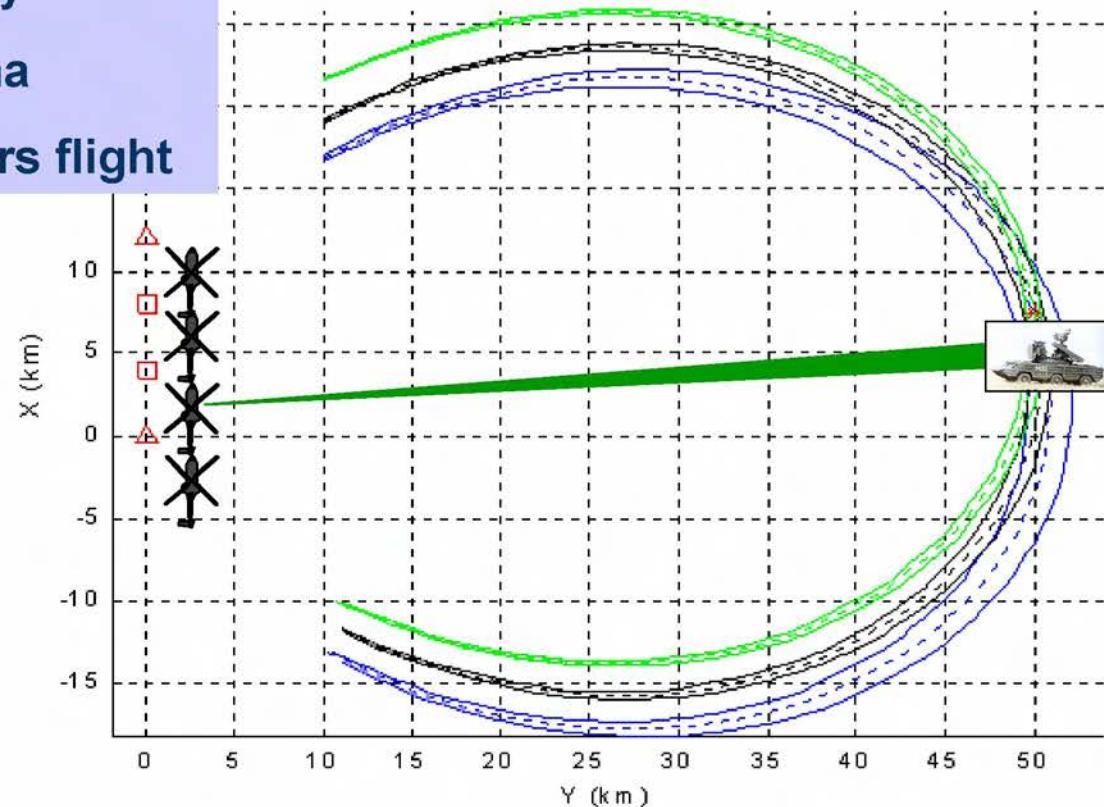
- Phase change rate interferometry
- Standard Radar Warning Antenna
- Algorithms adapted to helicopters flight

Performances class
5 % of range accuracy
within seconds

+/- 500m at 10 km
+/- 2Km at 40 km



Threat lethal range
Threat Avoidance



FASTER ACQUISITION / WEAPON DELIVERY
BETTER USE OF PROTECTION FUNCTIONS

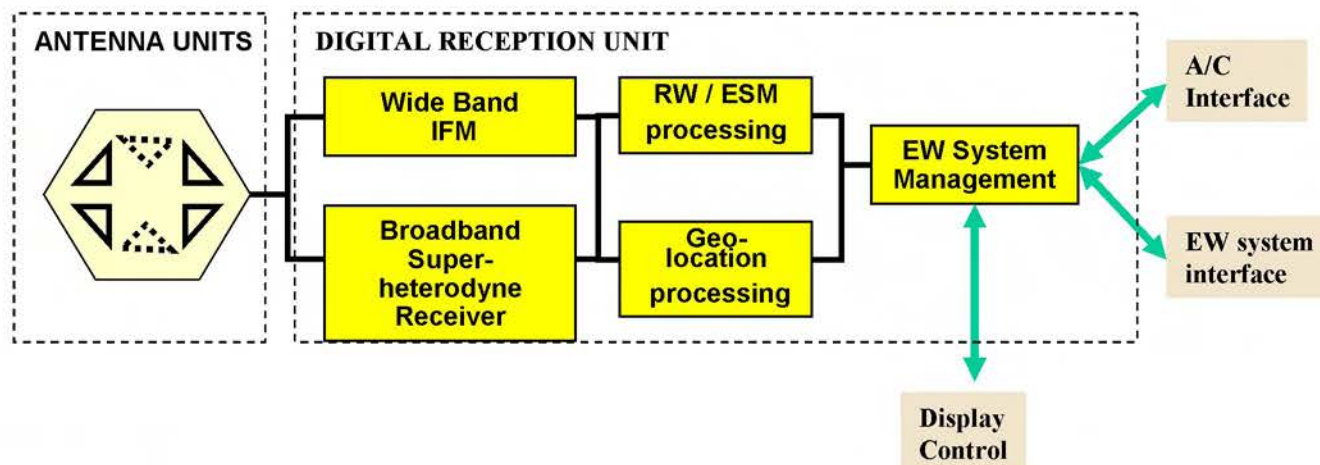
Compact Airborne Threat Surveyor (CATS) family

- Dedicated to the self-protection in all types of mission and theater
- Provides advanced situation awareness and threat geo-location for avoidance, evasion or destruction
- Broad band digital receiver for smart RF signal interception, deinterleaving and analysis
- Latest THALES EW modular family of equipment designed to be the core system of comprehensive EW defensive suites
- Modular, Small, Compact & Lightweight



T30527-fr

Les informations contenues dans ce document sont la propriété exclusive du Groupe Thales. Elles ne doivent pas être divulguées sans l'accord écrit de Thales Systèmes Aérospatiales S.A.



THALES



CATS / COFEUX NETWORK CENTRIC OPERATION AND TACTICAL SITUATION MANAGEMENT



T30527-fr

Les informations contenues dans ce document sont la propriété exclusive du Groupe Thales. Elles ne doivent pas être divulguées à l'extérieur du Groupe Thales.

