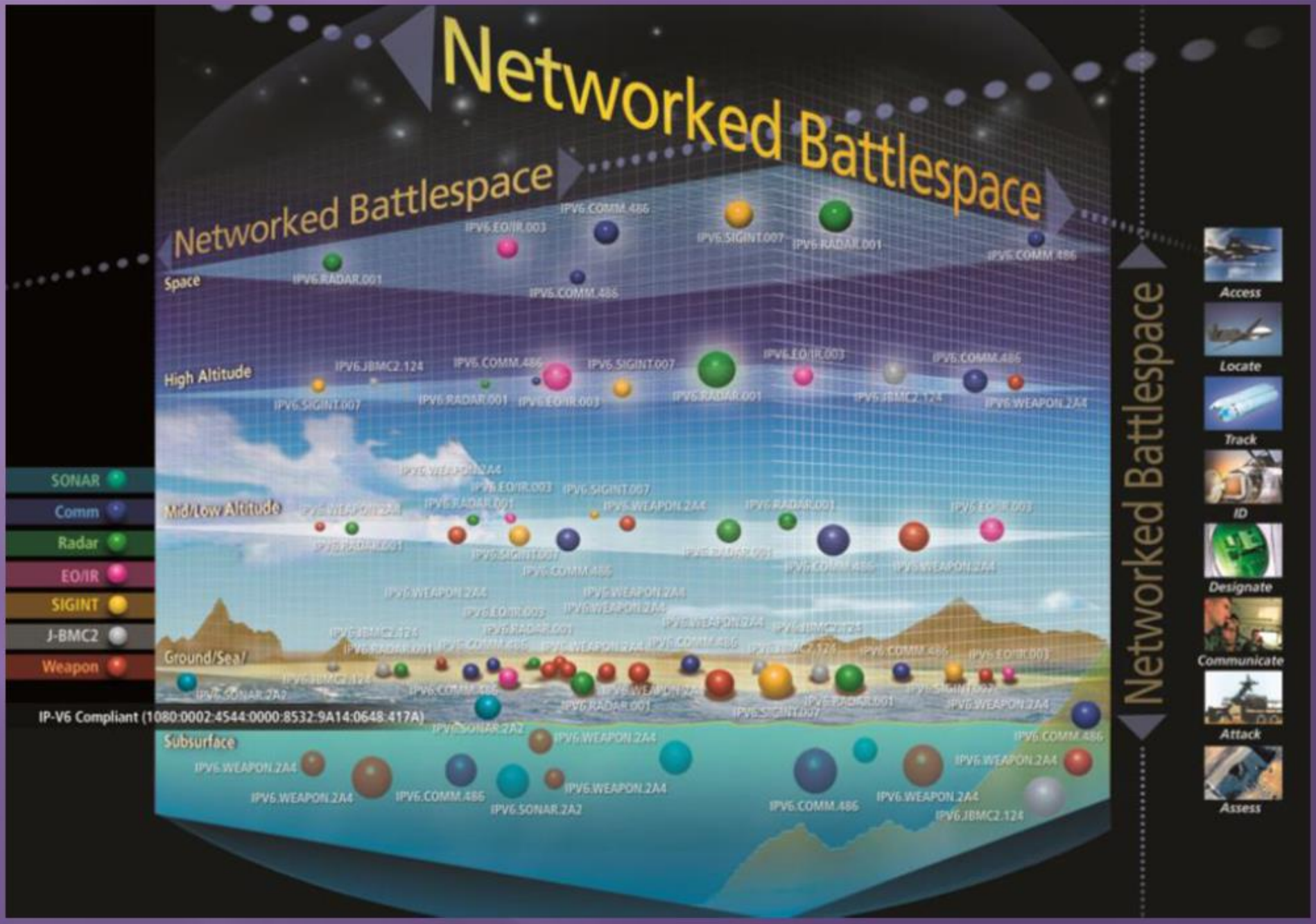

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"Optimizing Joint ISR/EW Operation Interoperability & Effectiveness with "Integrated Network - Centric & C2BM Systems"

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Alexander the Great was the First Greek General who understood the Importance of "C2", Implementing effective planning & EW Tactics according to the Battle Space Environment & Enemy capabilities……!!!!!

STRATEGIC GEOPOLITICAL ENVIRONMENT OVERVIEW

"Optimizing Joint ISR/EW Operation Interoperability & Effectiveness with "Integrated Network - Centric & C2BM Systems"

SUBJECTS

1. Introduction
2. General Concept of Operations
3. Operational Considerations & "DL" Networks Involving
4. Networked & C2BM Systems Description
5. Organizational Structure - Conclusions

"Optimizing Joint ISR/EW Operation Interoperability & Effectiveness with "Integrated Network - Centric & C2BM Systems"

1. **Introduction**
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1. Introduction

1.1 Background

- The biggest challenge facing the Joint Forces is how to effectively harness the true Potential & Power of the Contemporary Battle Space Domain.
- This creates the requirement for more sophisticated systems that can *Process, Exploit & Disseminate (PED) Information* more effectively, through Automation, taking advantage of emerging technologies to enable more dynamic, *Real Time Decision Making & C2* in the Battle Space in order to achieve superiority.
- The Joint *Intelligence, Surveillance & Reconnaissance (ISR) Information* is regarded globally as a key enabler of the ability for *Mission Planning, Direct, Control & Evaluation* all operational activities in different Battle & Peacekeeping Environment.
- For this purpose an appropriate *System Implementation* for all Communicating Assets must be developed, which will meet the *"Data Link Interoperability"* for Joint Operation requirements.

1. Introduction

1.1 Background (cont.)

It's Key factor to be determined, what means *"Interoperability" (IO) ??*

"Interoperability means synergy amongst Different Systems / Architectures & Environment with purpose to achieve High Quality share of Information over Heterogeneous Users."

This ability of Systems is driving factor for Armed Forces to define the *"Systems Requirements",* developing a ***"Concept of Operations" (CONOPS),*** in order to Interoperate effectively together, without Interference.

1. Introduction

1.2 Purpose

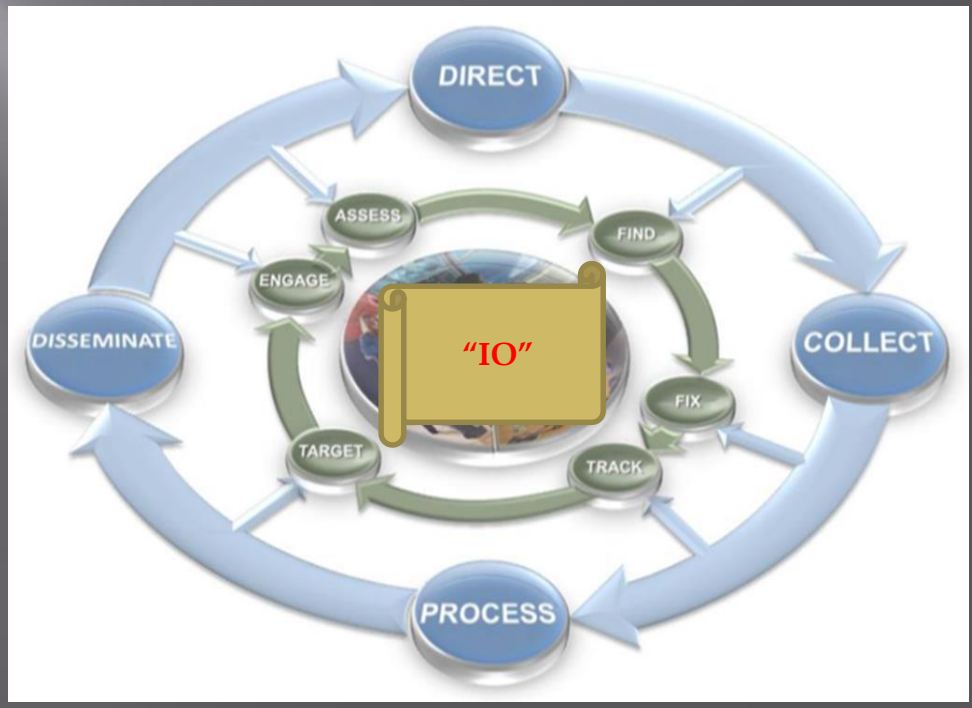
This *"CONOPS"* defines the *Armed Forces Requirements* which need to operate as an *"Integrated Network-Centric & C2BM System"* in order to optimize all Domains *Interoperability & Joint ISR/EW Operation effectiveness*, Saving Resources.

1. Introduction

1.3 Conditions & Assumptions

- DL Systems Implementation & Network development must comply with International Standards & NATO STANAGs, according to Users requirement.
- These conditions must ensure the ***"Networked & C2BM Systems"*** Compatibility & Interoperability, according to Communication - Information Standards & Security.

"Networked & C2BM Systems" must meet "PED" tasks, under the suitable operational sequence :



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2. General Concept of Operations

2.1 General Operational Requirements

The Operating Environment is becoming exceedingly more difficult along the evolution of Target Profiles, advanced Threat Capabilities, continued Innovative Weapons proliferation, increased UAV, Stealth Assets utilization as well as the Cyber-Attack risk.

- According to the above environment, the *"ISR/EW & C2BM"* Systems must coordinate and establish connection with an Interoperable & High Dense demanding *"Integrated DL network".*
- In the context of "*Joint ISR & EW/Collective ESM Operations" (CESMO),* this DL Network needs to interoperate with Multi Sensor Platforms in order to support and optimize the Data Process, Information Fusion, Target Identification, Geo-localization, Targeting Orders Dissemination, using Smart Weapons Systems for Soft & Hard Kill.

2. General Concept of Operations

2.2 Operational "DL Network" Requirements

- The *"DL Network"* must provide automated tools in combination with compatible "DL" interface implementation in order to coordinate separated ISR/EW Systems, to be fully interoperable in a *"Joint Network- Centric C2BM System"* which is effectively employed from different Sites & Service Levels.

- All *"Networked C2BM Systems"* must be *Integrated* and minimally be equipped with state of art, open architecture & scalable systems, which *Interoperable* together, *robust & resistant* in potential Enemy Electronic & Cyber Attacks.

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3. Operational Considerations & DL Networks Involving

3.1 Joint Operations

In "*Joint Operations*" all Domains Assets must have an extensive *"DL Implementation"* which interoperates as an "Integrated *Network - Centric C2BM System"* in order to support the following tasks :

- Defensive & Offensive Operations.
- Air / Maritime / Land Tasks.
- Joint ISR/EW Tasks.
- Electronic Intelligence Production - Fusion & Assessment.
- Joint Multi Link tasks (Technical Data & Operational Information Disseminate).
- Threat Assessment - Intelligence Data Base Update
- ISR/EW Systems Libraries Reprogramming.
- Missions Command & Coordination.
- Missions Assignment & Special Targeting.
- Soft Kill – Electronic Counter Measures (ECM) Operations.
- Hard Kill – Defense & Offensive Counter Air-Suppression Enemy Air Defense (SEAD), Close Air Support (CAS), Forward Air Control (FAC).

3. Operational Considerations & DL Networks Involving

3.2 Platforms Perspective Employment in Joint ISR/EW Operations.

3.2.1 Joint Command & Control (C2) Units

3.2.1.1 Airborne ISR & C2BM platforms

3.2.1.2 Navy Platforms / Units as C2 Assets

3.2.2 Non (C2) Units

3.2.2.1 Fighters

3.2.2.2 Unmanned Air Vehicle (UAV)

3.2.2.3 Ground EW Stations

3.2 Platforms Perspective Employment in Joint ISR/EW Operations.

3.2.1 Joint Command & Control (C2) Unit (JC2U)

JC2U, as "C2-node", must interoperate with all Domains Assets via an *"Integrated Network - Centric C2BM System",* providing Automated Tools for Mission Planning, Direct, Collect, Process & Assessment of Disseminated Information in order to execute effectively the following tasks :

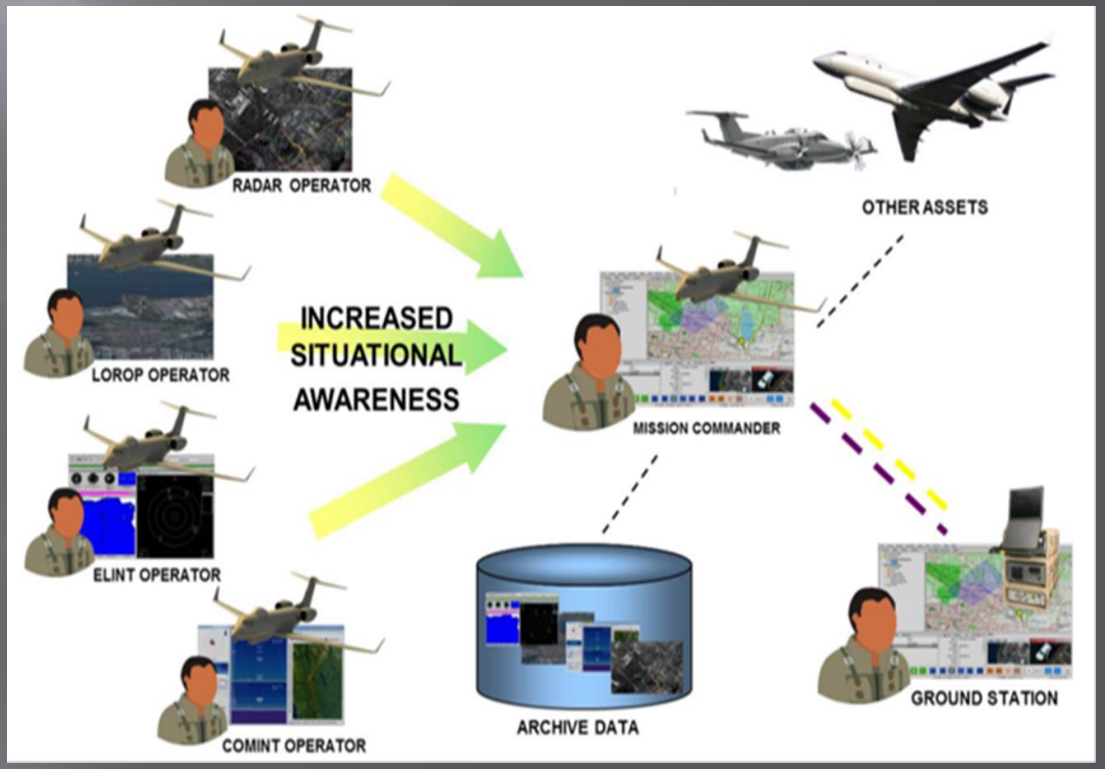
- Joint Operations Plan (JOP).
- Operations Directive (OD).
- Special Instructions issue & Disseminate.
- Threat assessment - ISR/EW DB Update & Disseminate.
- EW OPTASKS issue, Participating Assets capabilities & configuration programming.
- DL Network Design & OPTASKS Planning by JDLC, according Mission Req.
- Mission Planning - Execution - Evaluation & Report in order to support *EW/CESMO* with updated Information Intelligence via *"Integrated NATO DL Networks".*

3.2 Platforms Perspective Employment in Joint ISR/EW Operations.

3.2.1 Joint Command & Control (C2) Units (cont.)

EWCC (EW Coordination Cell) must coordinate & manage the following EW/CESMO tasks via *"Integrated DL Network"* :

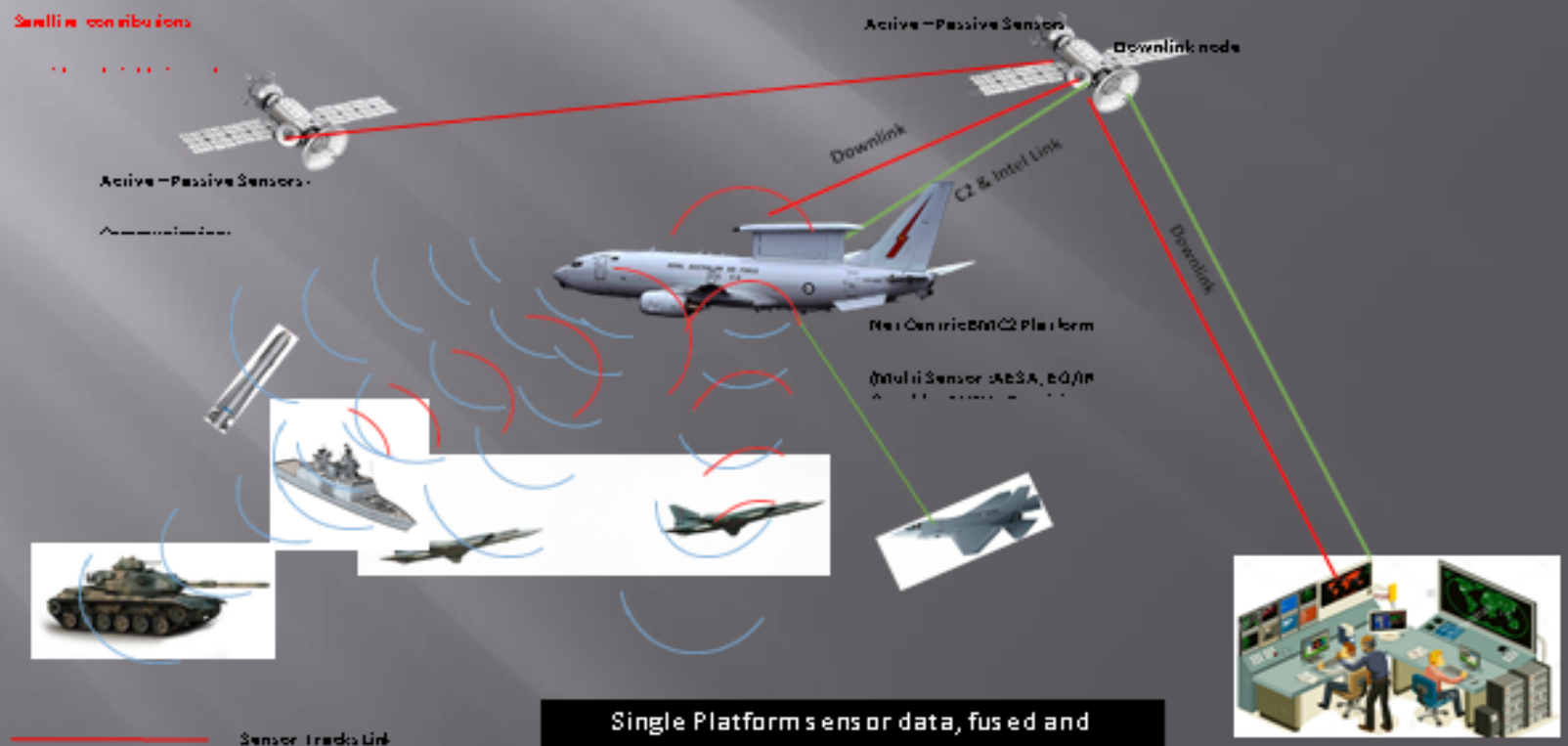
- ISR/EW/CESMO Planning & targeting.
- Special EW Tasking Instructions (SPINS).
- Common EW Data Base Update & Certificate.
- CESMO Tasking via Dedicated DL Messages implementation.
- Intelligence fusion & Identification, Threat Assessment.
- EW Data Base & Libraries Update.
- EOB Creation & Targets Engagement.



3.2 Platforms Perspective Employment in ISR/EW Operations.

3.2.1.1 Airborne ISR & C2BM platforms (as C2 Asset)

These platforms must utilize a variety of sensors, in order to enhance "SA", creating "Comprehensive Tactical Picture", is distributed over an "*Integrated DL network*" into other participants.



3.2 Platforms Perspective Employment in Joint ISR/EW Operations.

3.2.1.1 Airborne ISR & C2BM platforms (cont.)

Airborne ISR & C2BM Systems must execute the following tasking to support the Joint ISR/EW & C2BM operations :

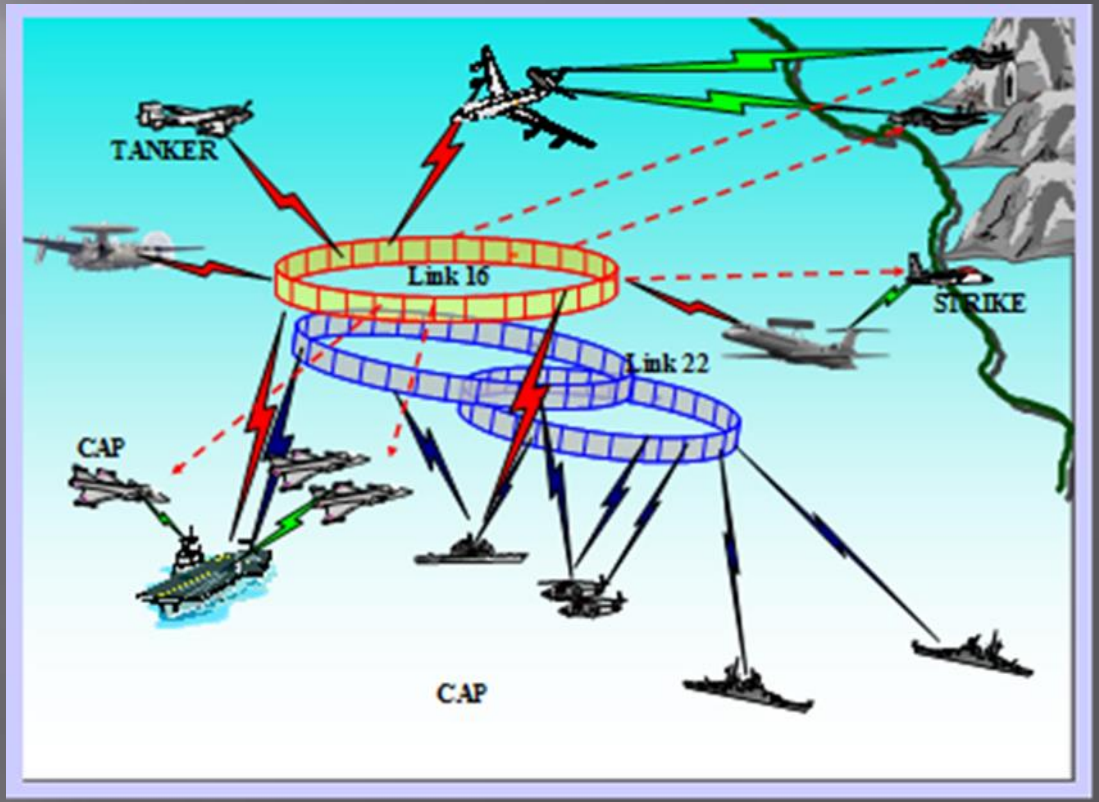
- Establish Recognized Air & Surface Picture (RSAP).
- ISR/EW & C2BM tasks, including Warning,, Identification, Classification & Threat assessment.
- ISR /EW Information Exchange via *"Integrated DL Networks"* in order to contribute to the CESMO :
  - ✓ EW Data processing, Surveillance Information Fusion, Track Association, including Triangulation & Geo-location.
  - ✓ Support the Joint ISR/EW Forces to optimize the Common Tactical Picture & EOB.
  - ✓ Contribute to Commander's ability to accomplish Mission Intelligence objectives & C2BM, Mission Assignment.

3.2 Platforms Perspective Employment in Joint ISR/EW Operations.

3.2.1.2 Navy Platforms / Units (as C2 Asset)

- Navy Platforms according to operational role in Maritime Missions must have a suitable *"DL Implementation"* which will meet the *"C2-node"* capabilities in order to effectively contribute in Joint ISR/EW operations.

- For this purpose an *"Interoperable DL Network"* must be used in order to achieve Beyond Line Of Sight (BLOS) connectivity and digital communication.

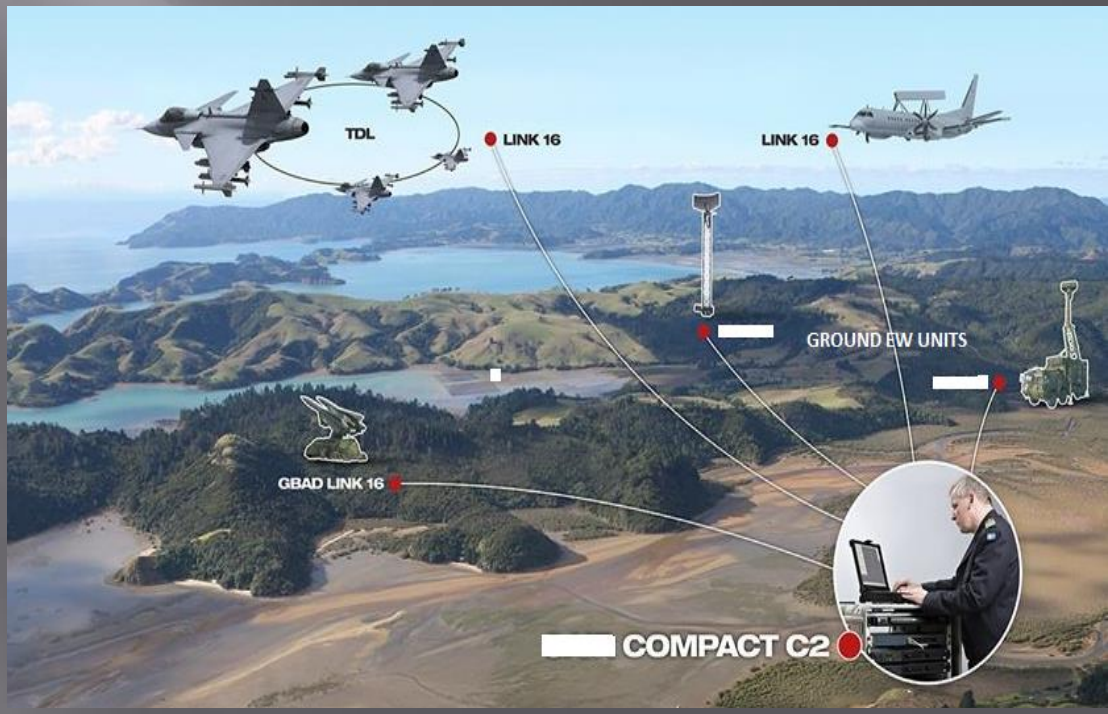


3.2 Platforms Perspective Employment in Joint ISR/EW operations.

3.2.2.1 Fighters /non C2 Unit

Modern Fighters carry out Multi Missions, such as Air Defense (DCA, Sweep), Special Missions (ISR/EW) & Offensive Operations (SEAD, CAS).
As "Non C2" Weapons Assets must use a "L16 implementation", which meets at least the following capabilities:

- To able to receive Recognized Tactical Picture.
- Exchanging Targets Information with Networked & C2BM Platforms via *"Dedicated DL messages Implementation"*.
- A *"standard message format"* must be implemented in order to carry out Air-to-Air (DCA) & Air to Ground Missions (SEAD, CAS).

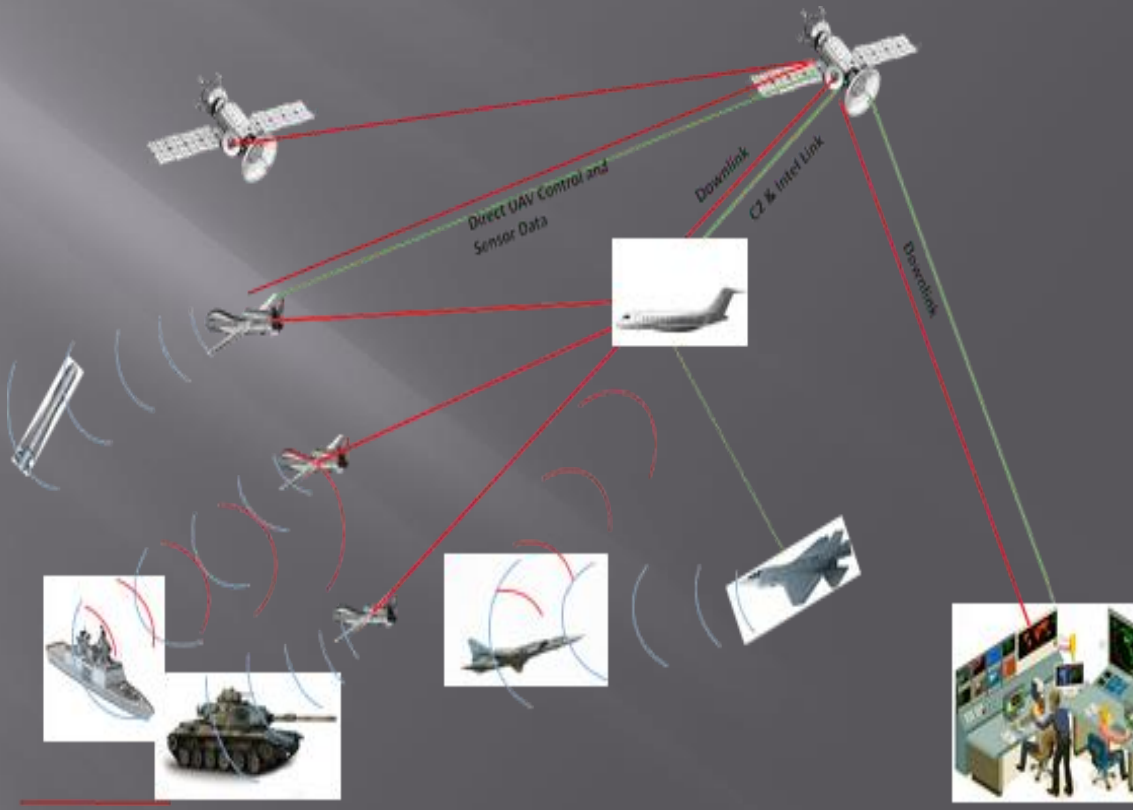


3.2 Platforms Perspective Employment in Joint ISR/EW Operations.

3.2.2.2 UAVs (Unmanned Air Vehicles)

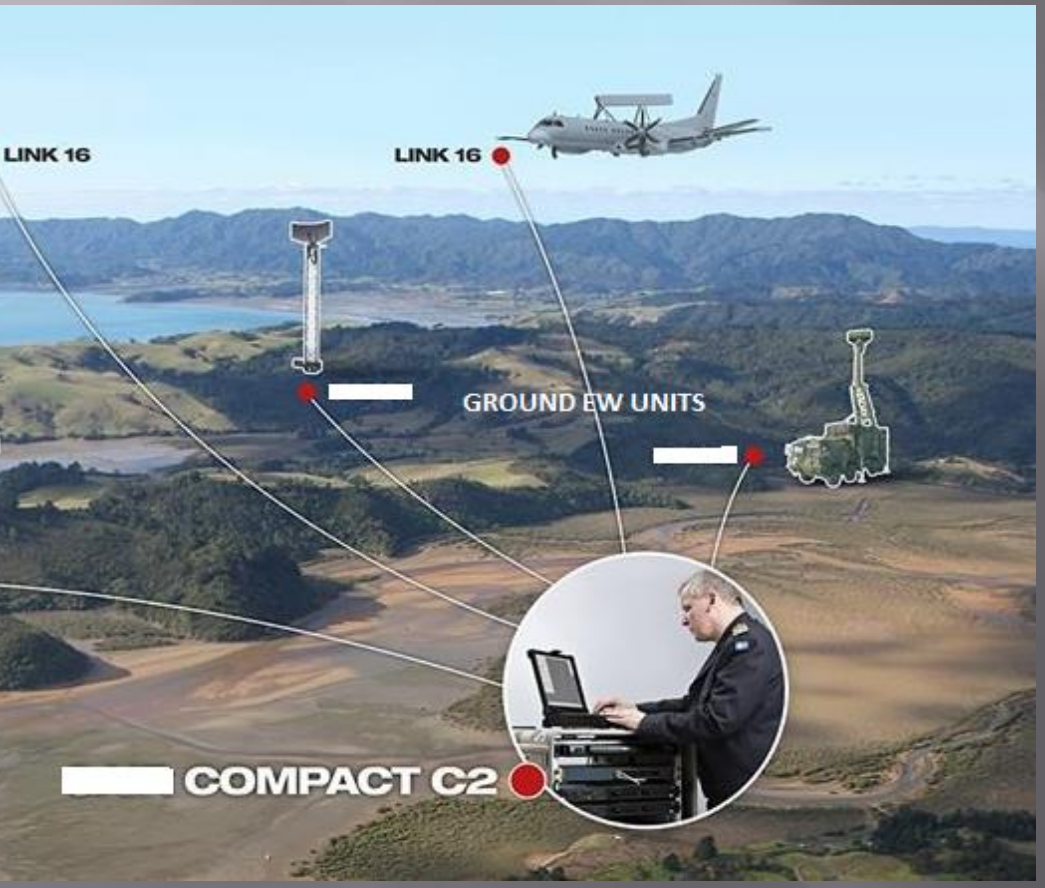
Main focus of *"DL Implementation"* on UAV, as Airborne Multi Sensor & Multi Mission platforms is to support the following tasks :

- ISR/EW Information exchange via *"Specific Messages format"* with Networked & C2BM Platforms.
- A *"standard message format"* must be implemented in order to enhance the *"Interoperability" & digital communication,* according to UAVs tasks.



3.2 Platforms Perspective Employment in Joint ISR/EW Operations.

3.2.2.3 Ground EW Stations / Non-C2 Units



GEWS, as Multi Sensor Units, must use an appropriate *"DL Implementation"* in order to support the following tasks :

- Surveillance, Collection EW data & Process &, fusion, Identification & Disseminate Information.
- ISR /EW information exchange via DL Implementation in order to contribute to the CESMO.
- Tactical Picture creation & Dissemination to ISR/EW Units.
- A *"standard message format"* must be implemented in order to enhance the *"Interoperability" & Digital Communication.*

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4. "Networked & C2BM" System Description

4.1 "DL" Systems Technical Considerations

"DLs" are "Digital Data Communication Systems" using "Standard Message Format" to transfer dedicated elements between "DL Network" participants according to the following prerequisites :

- Dedicated *"Standards & protocols"* development must ensure the Interface & Interoperability with all Domains "DL" Systems Implementation.
- *"International & NATO STANAGs"* must define the suitable format for each DL & compatible Interface for Joint "DL Networks".
- *"International DL Community"* must align the STANAGs & MIL-STD in order to Interface different "*DL Implementations",* in order to optimize the *National & International "DL Interoperability"* Requirements.

4. "Networked & C2BM" System Requirements (cont.)

4.1 "DL" Systems Technical Considerations

A *"Multi-functional Information Distribution System Implémentation"* with *"Standard DL messages"* must be implemented as the primary Interface & Information Disseminate System between all Domains.

"DL messages" must support a majority of Digital Warfare & C2 Battle Management functions, according to following Basic Implementation:

- Air/Surface & ISR/EW Tactical Picture Management & Dissemination.
- ISR/EW Technical & Tactical Information Exchange.
- Intelligence Data Fusion, Correlation, Identification & Dissemination.
- Threat Warnings management.
- Electronic Order of Battle (EOB) exchange.
- Mission Command & Mission Assignment Management & Evaluation.
- Joint ISR/EW & C2BM Tasks Disseminate.

Multifunctional Information Distribution System Implémentation

Net Architecture – Times Slots -Standard Message Format

LINK-16 NET ARCHITECTURE

TIME DIVISION MULTIPLE ACCESS (TDMA)

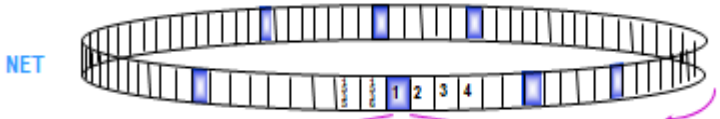
DAY (24 HRS)

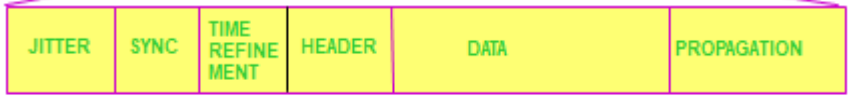
EPOCH (12.8 MIN)

FRAME (12 SEC)

TIME SLOT (7.8125 MS)

TIME SLOT STRUCTURE





JITTER IS A VARIABLE TIME DELAY BETWEEN BEGINNING OF TIME SLOT AND ACTUAL TRANMISSION OF A MESSAGE.

SYNC PREPARES RECEIVERS FOR MESSAGE RECEPTION.

TIME REFINEMENT FINE TUNES MESSAGE TIMING.

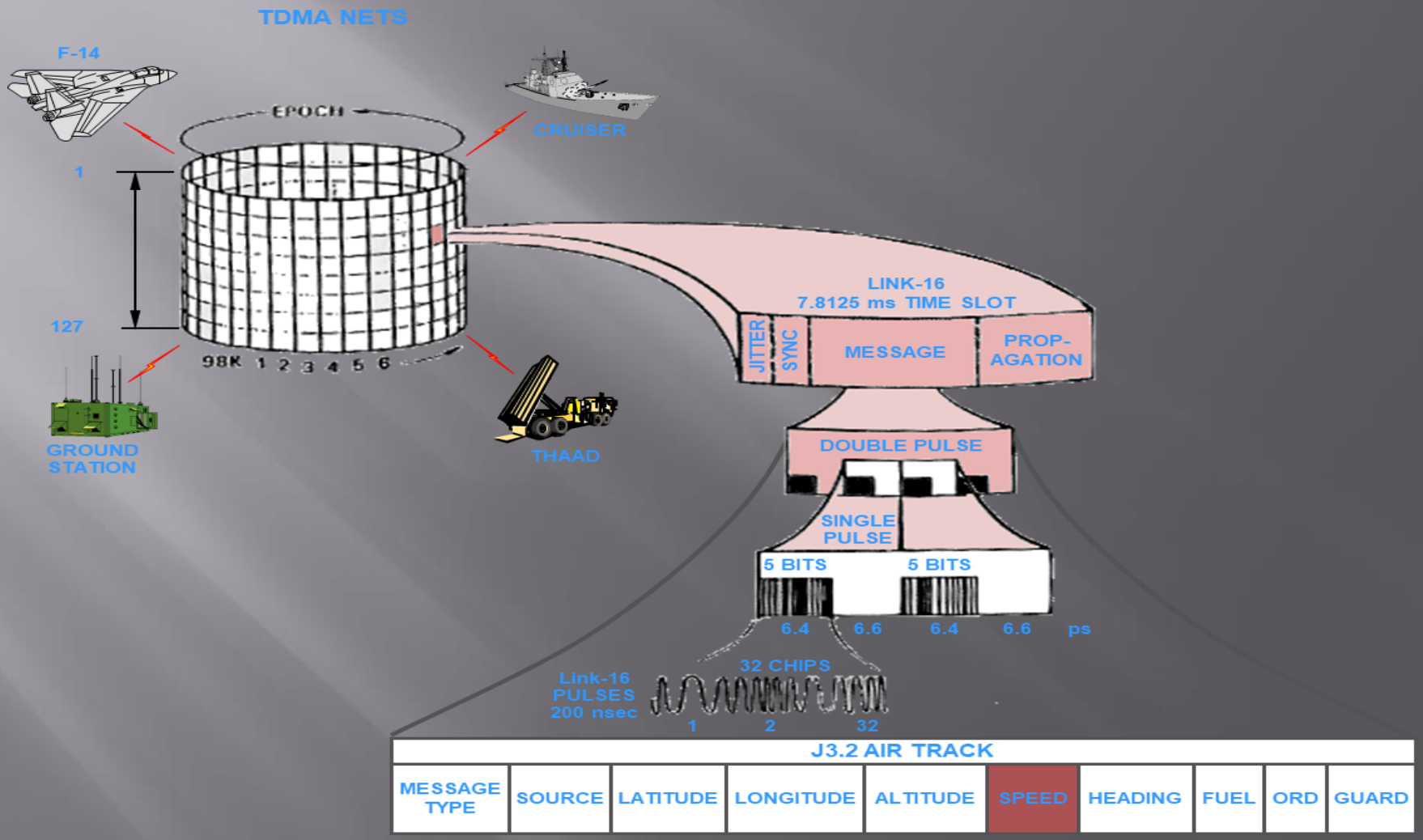
HEADER TELLS WHO ORIGINATED THE MESSAGE (SOURCE).

DATA CONTAINS ONE OR MORE MESSAGES DEPENDENT ON PACKING LEVEL.

PROPAGATION IS A TIME INTERVAL TO ALLOW THE TRANSMISSION TO PROPAGATE THROUGH THE AIR.

Multifunctional Information & Distribution System Implémentation (cont.)

Multi Net Architecture – Times Slots -Standard Message Format



4. "Networked & C2BM" System Description

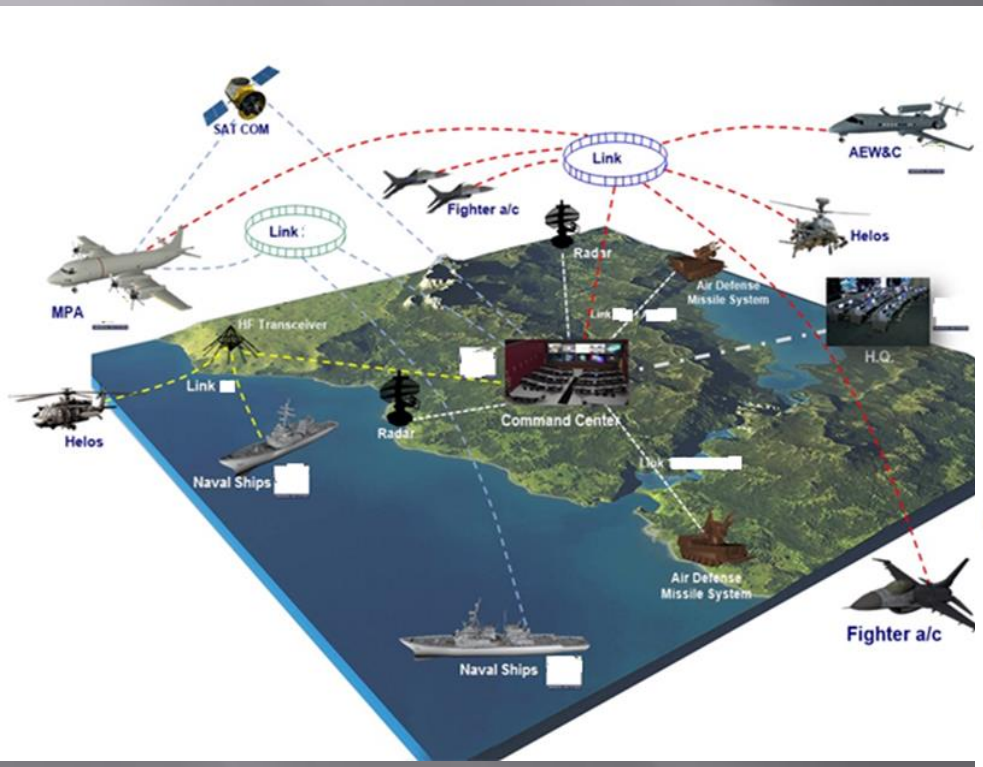
4.2 Integrated Network – Centric "C2BM" System Requirements

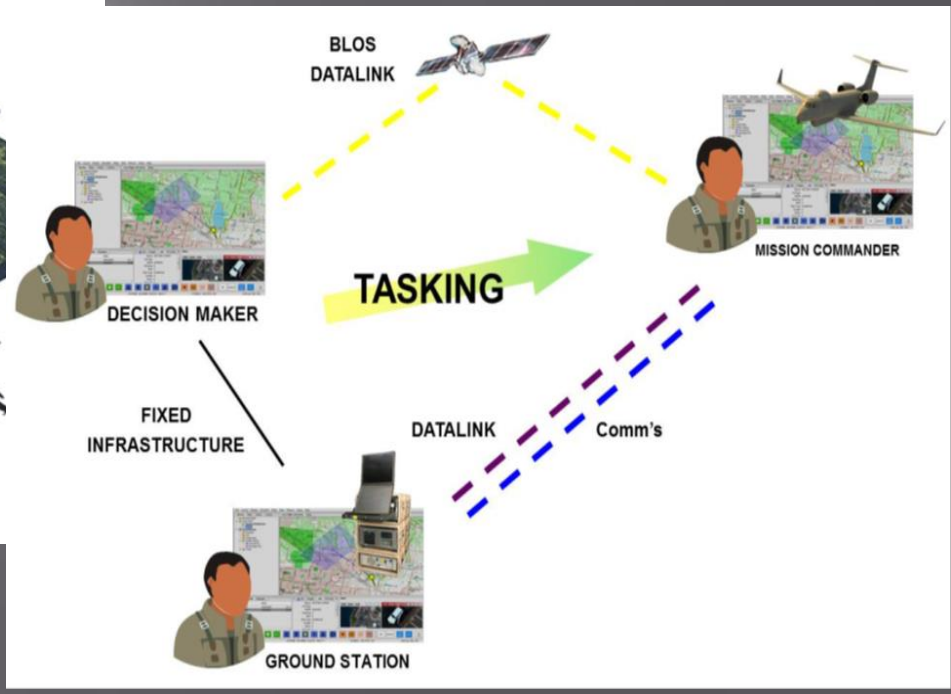
- A "Network – Centric & C2BM System Implementation" must provide "Tactical Picture" and all comprehensive mission data on the basis of a true Battle Space Environment in order to support the mission Planning - Rehearsal – Execution – Evaluation & Intelligence Report".
- *"Networked & C2BM Systems",* based upon Cloud Resources, will help to overcome Resource & Huge Data Management needs, with Security Capabilities & Resilience to Cyber Attacks.
- Powerful Computer, Interface Processors, HW & SW System integration, Reliable & Secure Data Communication Equipment are main characteristics, which ensure the *"DL Network Interoperability".*
- Real Time Information Management (Data Collection & Processing, Intelligence fusion & Dissemination) is the driving factor for an *"Integrated "Network – Centric & C2BM System".*

4. Networked & C2BM System Description

4.2 Integrated Network – Centric "C2BM" System Requirements (Cont.)

A "Network - Centric Software" with *"Integrated Architecture"* optimizes the *"DL Interoperability"* and ISR/EW Mission Planning – execution – Evaluation effectiveness.





4. Networked & C2BM System Description

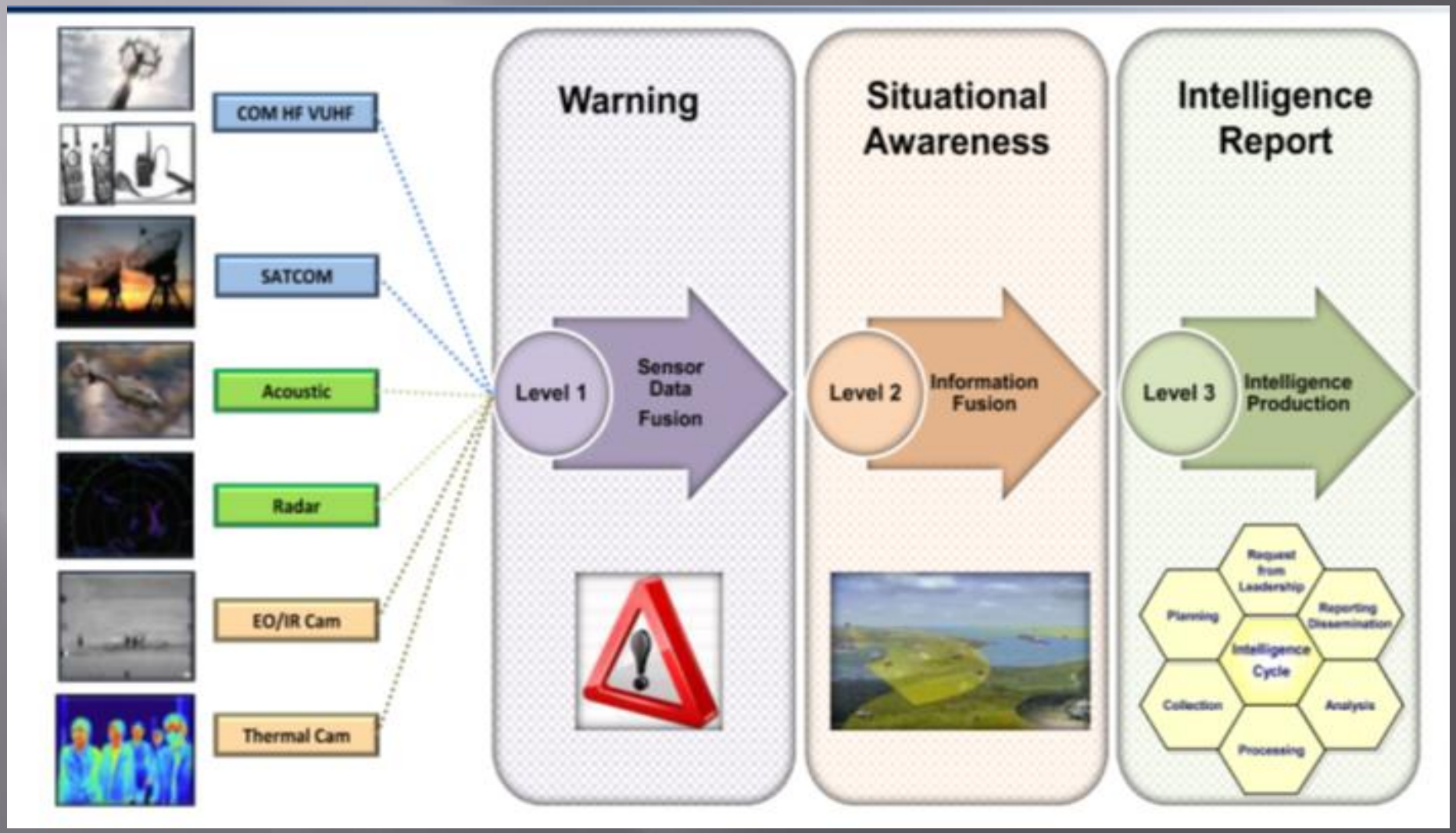
4.2 Integrated Network – Centric "C2BM" System Requirements (cont.)

- *A Man Machine Interface (MMI)* must provide Tools & Functions to Operators & Commanders in order to produce and manage the *"Comprehensive Tactical Picture".*
- Multi-Console configuration & Menu sets for managing "DL" capabilities & executing C2ISR functions.
- *Tools & Functions for Multi Sensor handling* & Full Capable of Integrating & Processing ISR /EW Sensor inputs.
- Appropriate Message Implementation & Interface for all *"DL Networks"* according to ISR/EW requirements.
- "CESMO" Support _ Information fusion & dissemination in order to contribute to Commander's ability to enhance Warning - "SA" & Intelligence Report, optimizing Joint Operation effectiveness.

4. Networked & C2BM System Description

4.2 Integrated Network – Centric "C2BM" System Requirements (cont.)

ISR/EW Task Sequence – Sensor Data Process & Information Fusion & Level Results



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5. Organizational Structure - Conclusions

- *"Network - Centric Warfare Doctrine"* must provide a great emphasis on Real Time Information Sharing via "*DL Interoperability"* in order to improve the *"Common Tactical Picture Management"*& *"enhance the Speed of Commands"*.
- Armed Forces must develop a *"Joint Organizational Structure"* with suitable Chain of command, which ensures a Joint service approach, allowing an *"Integrated DL Network"* participation in all ISR/EW Operations.
- This Organization must meet all Domains Interoperability, developing *"Integrated "Network - Centric & C2BM Systems"* Capabilities in a Joint Concept regarding to Mission Planning, Execution, Evaluation, Joint Training & Logistic Support.
- Joint C2 Units / EWCC & non C2 assets must interoperate according to Chain of Command of Joint Forces in order to *optimize the Joint ISR/EW (CESMO) effectiveness & Assets Sustainability.*

5. Organizational Structure - Conclusions (Cont.)

Joint Organizations must collaborate in the following tasks :

- Essential "Information Exchange Requirements" (IER) definition.
- Interface Standards - Protocols & STANAG update.
- New *"DL Systems Implementation"* requirements, according to "IERs".
- Technical Requirements for the "DL" implementation & *"Network - Centric Software"* solutions plan for all domains Systems according new challenges.
- Joint DL Planning Cell (JDLPC) Organization – Network planning directions & Joint DL Network Design, according to ISR/EW Operation requirements.

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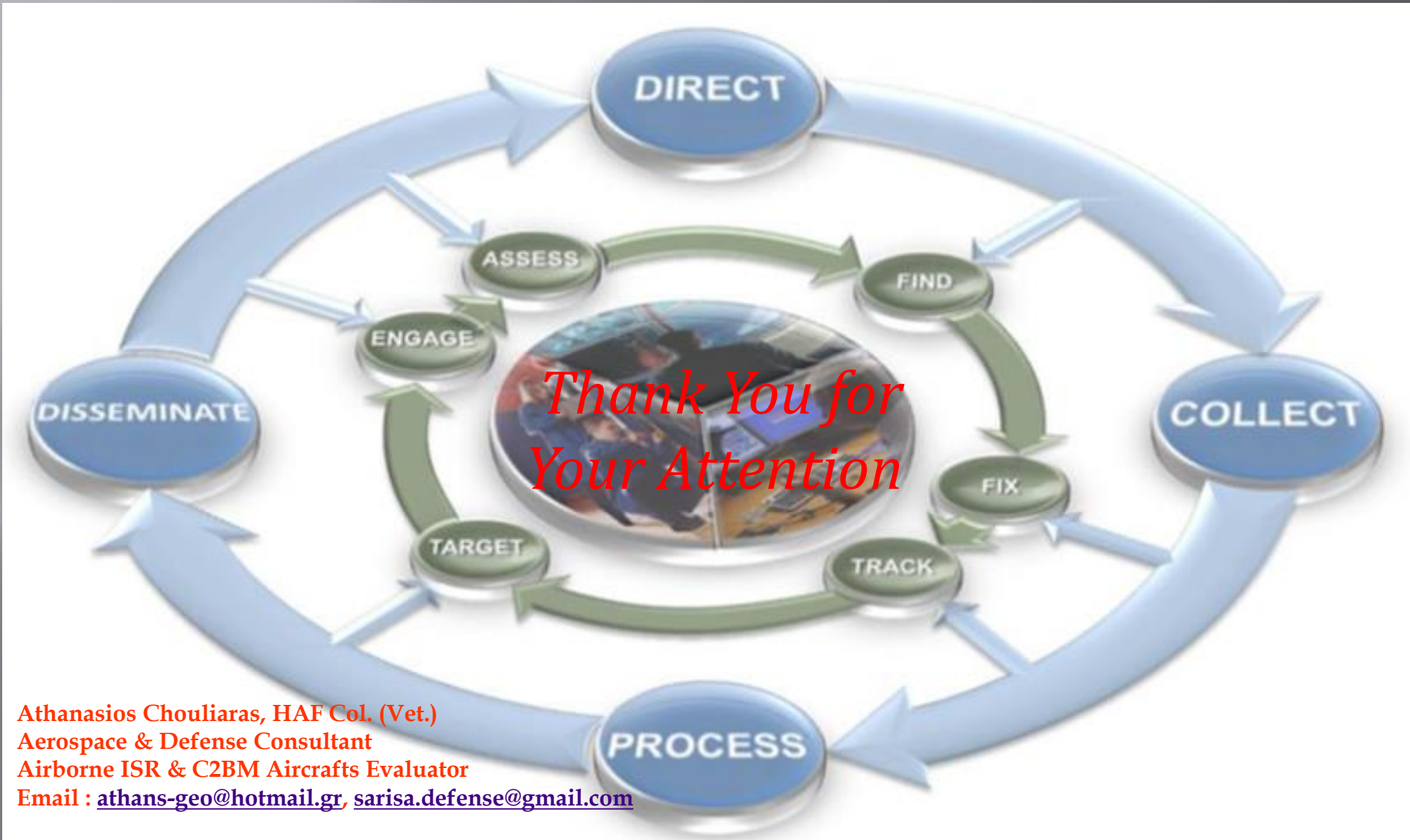

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