



National
Défense

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Canada

IFF, Combat ID and the Information Domino Effect

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Briefing Outline

- ➔ 1. IFF Mode 5
2. Combat ID
3. Information Domino Effect
4. Summary/Conclusions

Identification Friend or Foe (IFF)

**Increasing Combat Effectiveness and
Minimizing Risk of Fratricide**

IFF Mk XII
STANAG 5017

Mode 4

New Standard !



IFF Mk XIIA
STANAG 4193

Mode 5

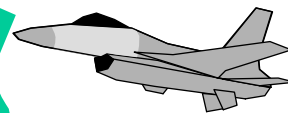
Over 30 yrs since we have last upgraded !

Basic IFF System Operation

Co-operative Target Identification (TI)

1

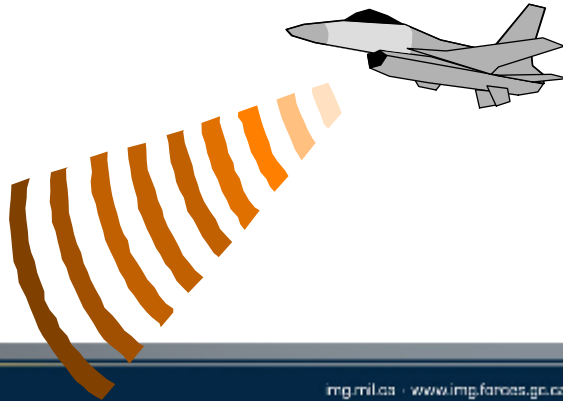
Interrogator
Asks Question
1030 Mhz



Basic IFF System Operation

2

Transponder
Reply/Answer
1090 Mhz

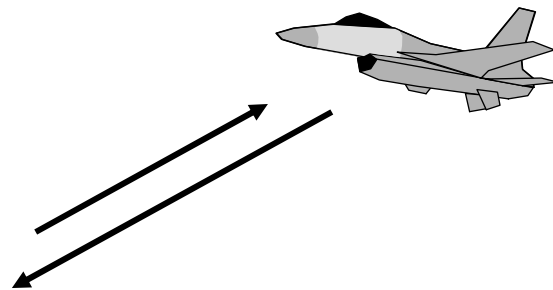


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Basic IFF System Operation

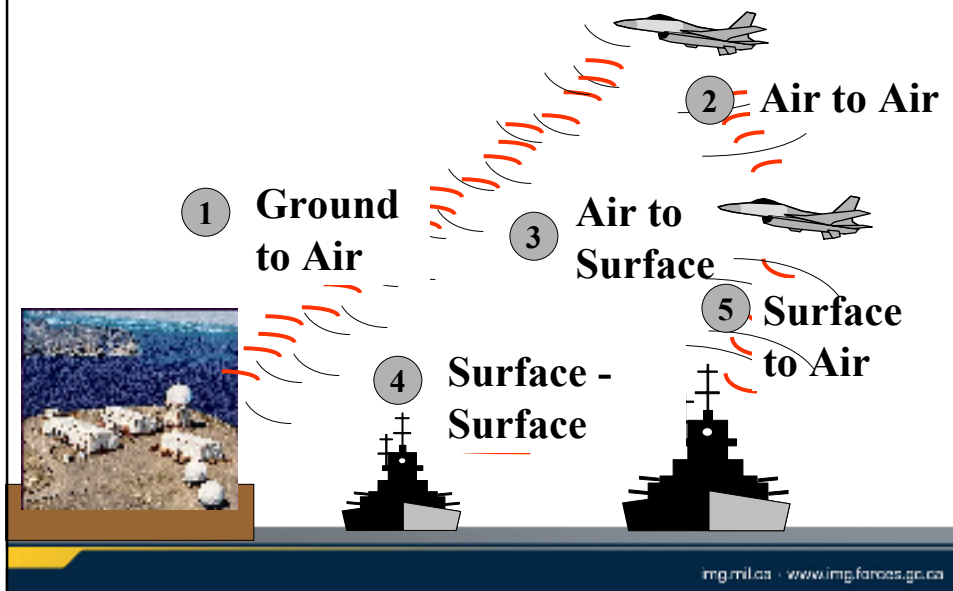
3

Receive Reply,
Process and
Report



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Scope of IFF Mode 4/5



IFF Mode 4/5 Traditionally “Not Used”

	Air	Surface	Ground
Air	Air - Air	Air - Surface	Air-Ground
Surface	Surface - Air	Surface - Surface	Surface-Ground
Ground	Ground - Air	Ground-Surface	Ground-Ground

IFF Mode 4/5 traditionally “not used”
in the
“Air-Ground” and “Ground-Ground”

IFF Feature Improvements

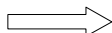
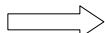
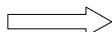
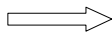
Mode 4

40 year old algorithm,
using red key with
manual switchover

Pulse Position
Modulation waveform

No Platform
Identification
Number (PIN)

Basic
Interrogation Only



Mode 5

New encryption algorithm
using black key with auto
switchover

Spread spectrum waveform
(formatted messages)

New Platform Identification
Number (PIN)

Level 1 Basic Interrogation with
Lethal Interrogation Override
Level 2 Squitter Broadcasts

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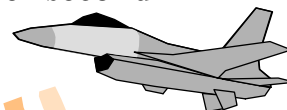
IFF Mode 5 Level 2 - Squitter

Squitter supports the new
emerging operational
paradigm...

... sharing your position
information as opposed to
giving it up only when
challenged.

Transponder
Broadcasts Message
Maybe 5 - 9 times
per second

1

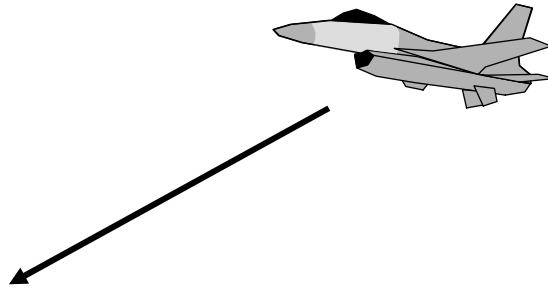


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Mode 5 Level 2 - Squitter

2

Listen, Receive,
Process and
Report



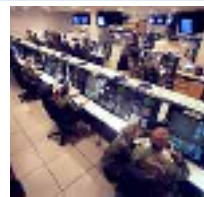
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IFF Building Blocks

1

**Command and Control
Systems**

(data fusion/weapons integration/display
functionality on a plane, ship, vehicle, etc)



2

**Sensor Systems
(Active/Passive)**

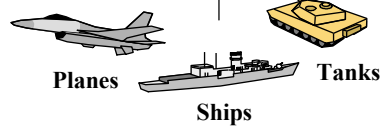
(interrogator/receiver
functionality)



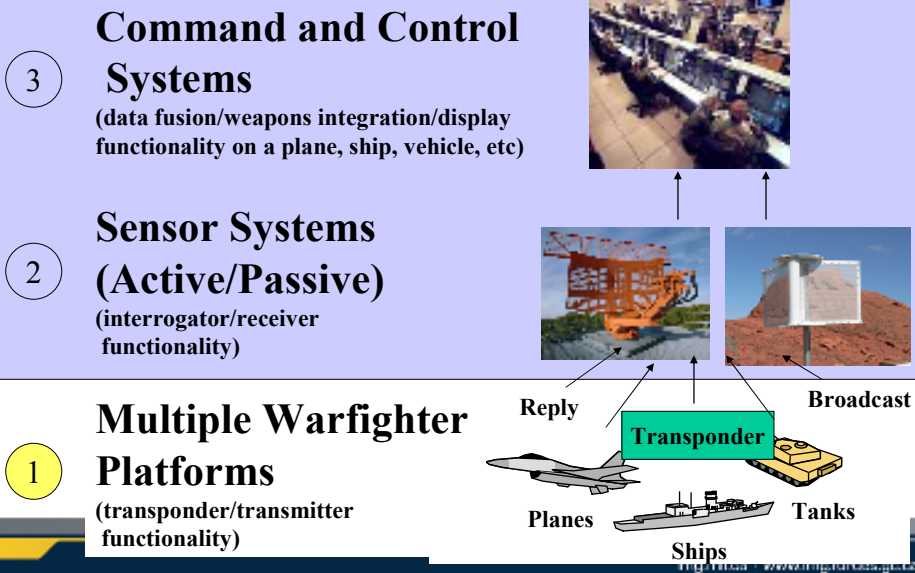
3

**Multiple Warfighter
Platforms**

(transponder/transmitter
functionality)



Platform Information



Minimum Platform Data

- 1. Platform ID (Unique ID)**
(positive ID to sort everyone out)
- 2. Position (LAT, LONG and ALT)**
(to identify where they are)
- 3. Time (Day/Hour/Second)**
(for currency of information)

Warfighter Platform Information

Platform Data Required	Mode 5 Level 1 (Interrogation)	Mode 5 Level 2 (Broadcast)
Unique Platform Identifier	Provided in reply	Provided in broadcast
Altitude	Provided in reply (100 ft baro/25 ft GPS)	Provided in broadcast (25 ft GPS)
LAT/LONG	Slant range calculated from time to reply Azimuth from antenna boresight/beamwidth	Provided in broadcast (GPS)
Day/Time	Time stamped at Interrogator	Time stamped at receiver

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Mode 5 Unique Platform Identifier

A combination of Platform Identification Number (PIN) and National Origin (NO) will provide a Mode 5 unique identifier for the transponder.

**Mode 5
Unique = PIN + NO
Identifier**

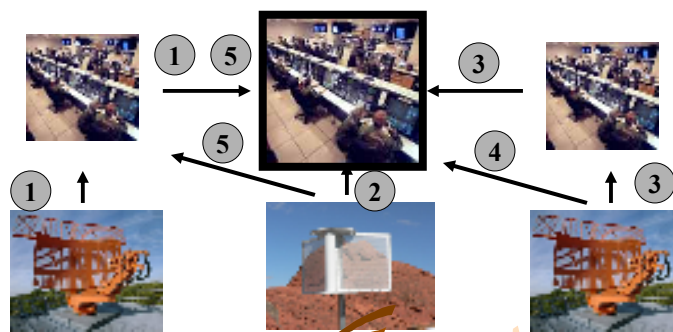
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Stove Pipe Paradigm



Each C2 system has a dedicated sensor which each detect the aircraft and identify as friendly but do not share the information.

Network Enabled Paradigm




Here we see the centre C2 system having the same aircraft platform data show up 5 different times.

Unique NO + PIN

- 1. Assists in the Elimination of Duplicate and Old Data**
- 2. Assists in Prevention of Incorrect Data Fusion**

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Briefing Outline

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-  **2. Combat ID**
- 3. Information Domino Effect**
- 4. Summary/Conclusions**

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NATO Combat ID

*As defined NC3B SC7

Mode 5 <u>Does</u> Target Identification (TI)	Mode 5 <u>Supports</u> Situation Awareness (SA)
*The process of determining the friendly, neutral, or enemy character of a detected entity.	*The knowledge and understanding of the relationship between forces and their status and intent in the battle space.
Single Entity	Multiple Entities
Perform IFF interrogation on a radar detected unknown. The unknown transponder responds as friendly.	Perform IFF continuous scan of battlespace and builds up tracks of all broadcasting and replying entities.

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Mode 5 and Combat ID

Mode 4 to Mode 5 Level 1

Interrogation

Provides Improved Target Identification

Mode 5 Level 1 to Mode 5 Level 2

Squitter Broadcast

Provides Improved Situation Awareness

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IFF Building Blocks

3 Command and Control

Systems

(data fusion/weapons integration/display functionality on a plane, ship, vehicle, etc)

C4ISR Functions

CID Activities

2 Sensor Systems (Active/Passive)

(interrogator/receiver functionality)

CID Activities

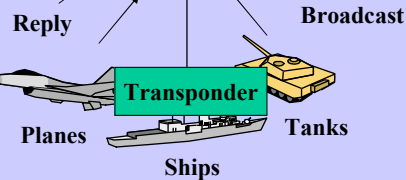
Interrogator

Receiver

1 Multiple Warfighter

Platforms

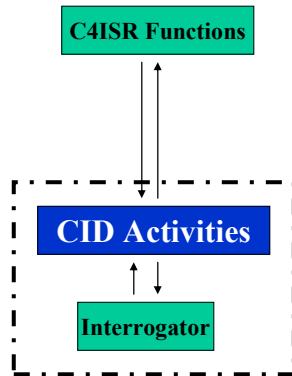
(transponder/transmitter functionality)



Product and System Impacts

**Introducing Mode 5
has the potential to impact
many products and systems
which conduct
Combat ID Activities.**

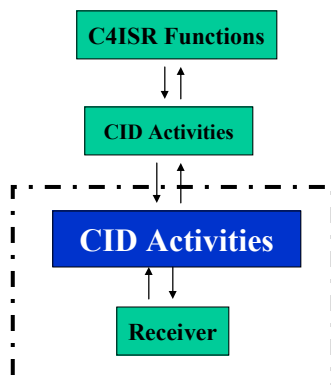
Product A: Air Defense Interrogator



- 1. Characterize and Report**
Interrogation Management
Friendly/Unknown Characterization
Detection/Tracking Management
- 2. Combine and Integrate**
- 3. Distribute and Disseminate**
Eurocontrol ASTRIX Messages

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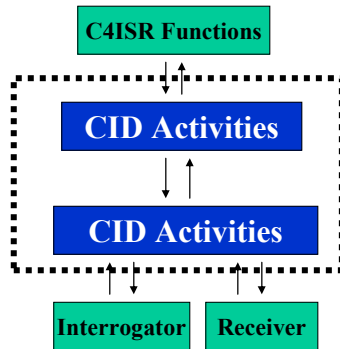
Product B: Squitter Receptor



- 1. Characterize and Report**
Squitter Management
Friendly Characterization
Detection/Tracking Management
- 2. Combine and Integrate**
- 3. Distribute and Disseminate**
NATO Friendly Force
Information (NFFI) Messages

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Product C: Combat ID Integrator



1. Characterize and Report

Friendly, Enemy, Neutral and Non-Combatant (FEEN) Characterization

2. Combine and Integrate

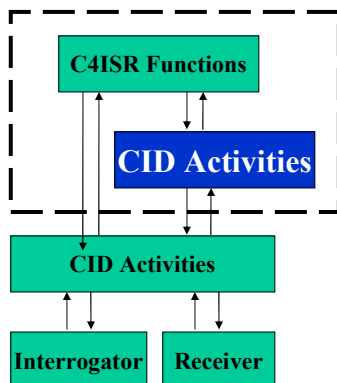
Multi Source Integration
Sector/Area Specific Processing
NATO Friendly Force Tracking (FFT)
of Ground Forces

3. Distribute and Disseminate

US DOD GCCS (OTH Gold Messages)
NATO Friendly Force Tracking (FFT)
Ground to Air Gateway (Link 16)
NFFI Messages

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Product D: Weapons Targeting System



1. Characterize and Report

2. Combine and Integrate

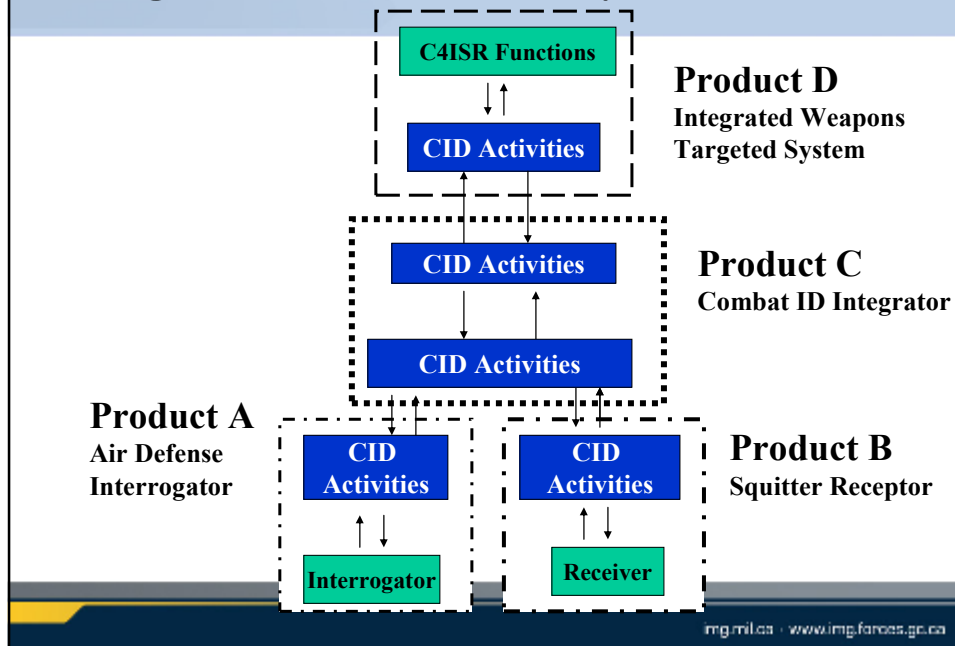
Multi Source Integration
Sector/Area Specific Processing
FEEN Tracking Management

3. Distribute and Disseminate

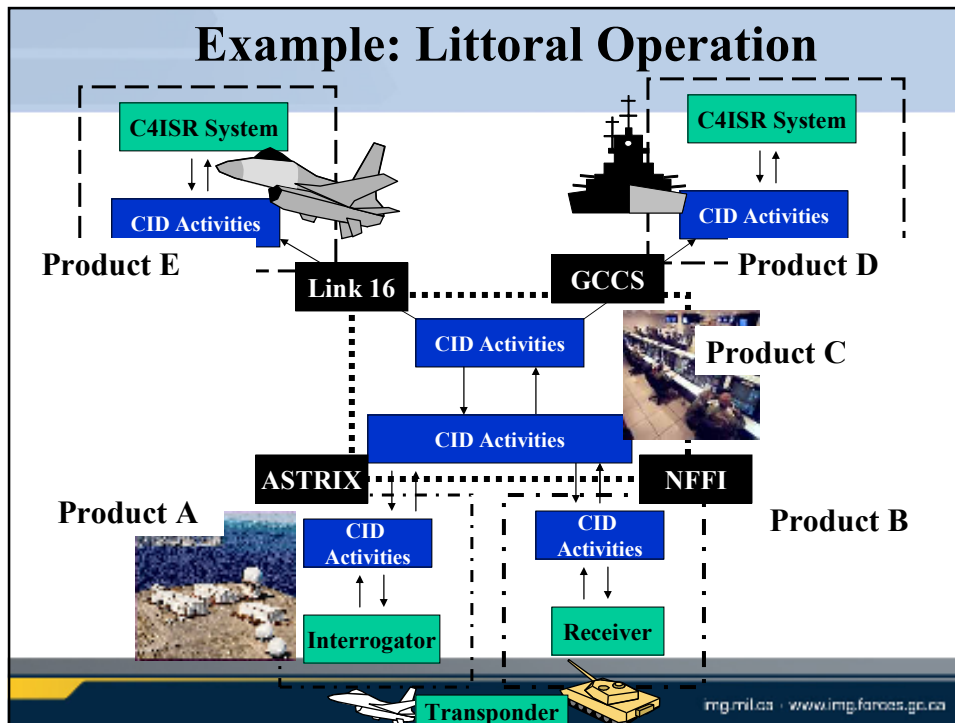
Common Operating Picture (COP)

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Integrated Products = System Solution



Example: Littoral Operation



Combat ID Standards

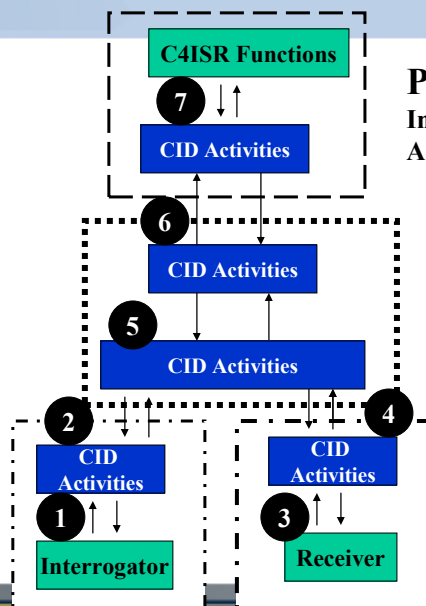
**Building a mission specific
Combat ID solution
will be aided with standards
in each of the Core Combat
ID activity areas.**

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Expose Combat ID Service Interfaces

Ease of
integration

Product A
Air Defense
Interrogator

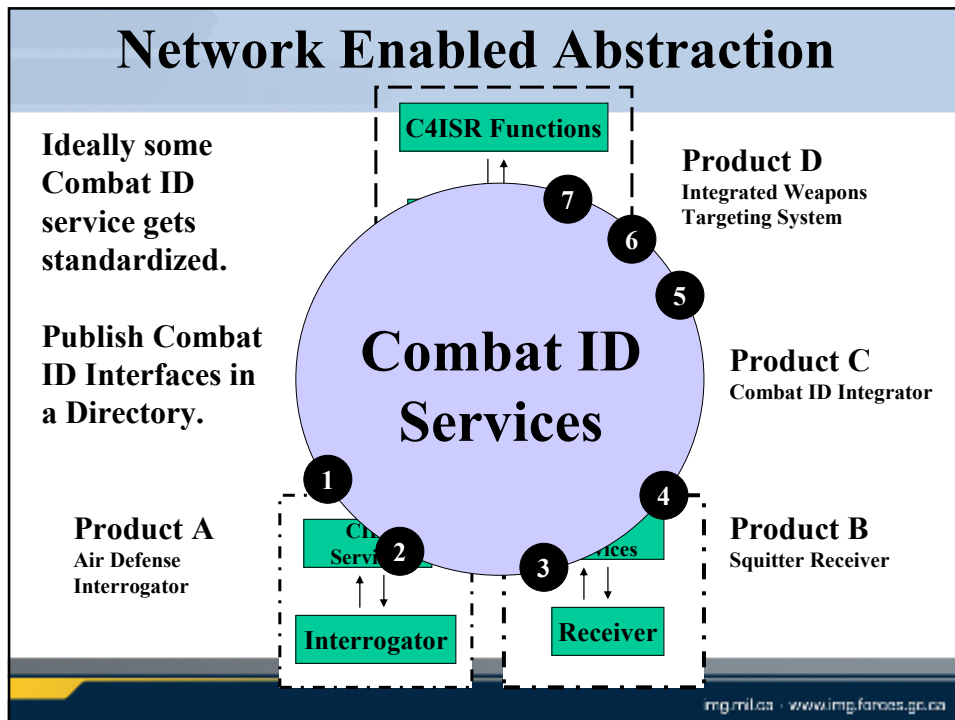


Product D
Integrated Weapons
Assignment System

Product C
Combat ID Integrator

Product B
Squitter Receptor

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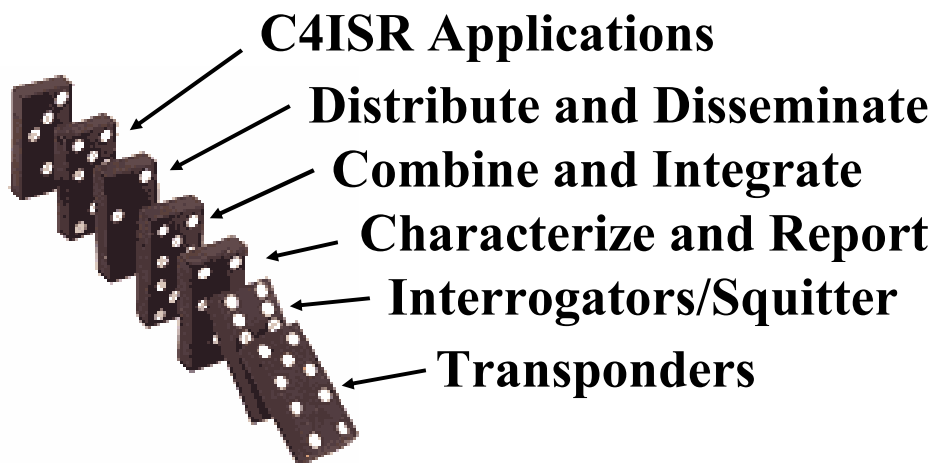


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Transition Dependencies



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Capability Transition Timelines

	2010	→			2030
Transponder	some	most	all		
Interrogator Squitter Receiver	some upgraded	more network enabled	most		
Combat ID Services	stove pipe	some open standards	more	all	
C4ISR Applications	dumb down	more new or upgraded			all

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IFF Mode 5 Goals Essential

	IOC	FOC
Your Nation ?		
NATO (MMR)		
US JFCOM		

**Setting IOC/FOC Dates Are Essential to
Keeping the Dominos Falling**

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Briefing Outline



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Summary

- 1. IFF Mode 5 delivers data for a network enabled battlespace, namely a Unique ID, Time and GeoPosition.**
- 2. The first domino falls with the delivery of Mode 5 Level 1 transponders.**
- 3. “Dumbing Down” will become the path of least resistance for existing stovepipe solutions.**

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Summary

- 4. Mode 5 Level 2 squitter transponders support the emerging paradigm of sharing your position information.**
- 5. Product integration remains a critical aspect of building out a mission centric Combat ID solution especially in a network enabled world.**
- 6. Standards are essential in aiding in a timely evolution of delivering products with updated Combat ID services.**

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Conclusion

**The IFF Mode 5 information domino
will be a long slow execution.**

**Those timelines will shorten by
developing standards in the core
Combat ID activity areas
and establishing related
IOC and FOC dates.**



Conclusion

Thanks for your attention

