



**Program Executive Office
Command, Control, Communications,
Computers and Intelligence (PEO C4I)**

**Unmanned Air Systems –
Issues and Challenges to C4I
INCOSE San Diego**

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Statement A: Approved for public release; Distribution is unlimited.

**Information Dominance
Anytime, Anywhere...**





CNO's Unifying Vision and Guiding Principles



Vision - "Pioneer, field and employ game-changing capabilities to ensure Information Dominance over adversaries and Decision Superiority for commanders, operational forces and the nation"

- First Principles Include:

- ✓ Every platform is a sensor
- ✓ Every sensor is networked
- ✓ Build a little; test a lot
- ✓ Spiral development/acquisition
- ✓ Plug-n-play sensor payloads
- ✓ Reduce afloat/airborne manning
- ✓ Transition to remoted, automated
- ✓ Collectors dynamically tasked

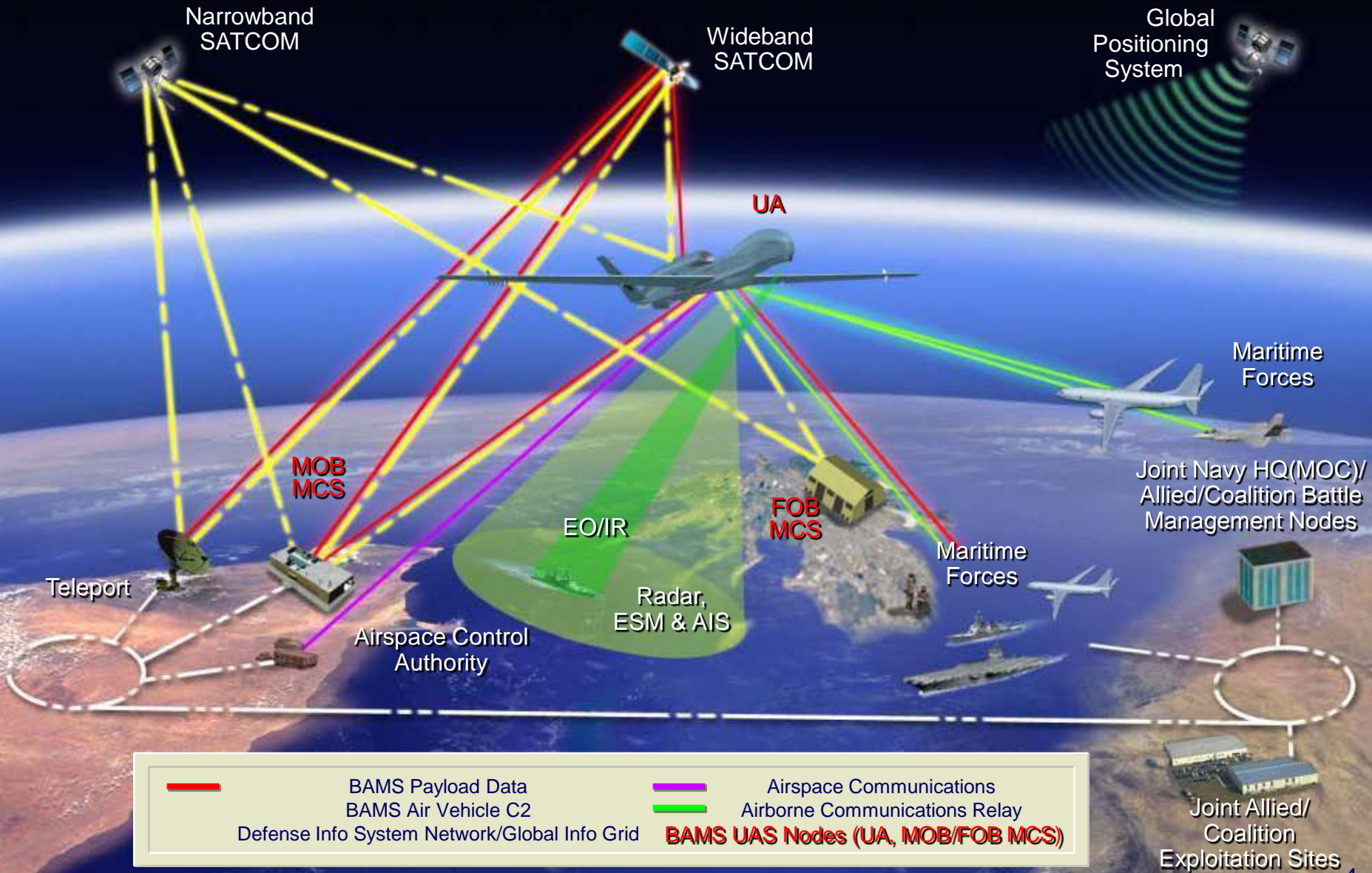
- ✓ Emphasize UAS/RPV and autonomous platforms
 - ✓ UAS's increasingly sea-based
- ✓ One operator controls multiple platforms
 - ✓ Data discoverable and accessible
 - ✓ Missions drive requirements
- ✓ Commonality in interfaces, data links and control stations
- ✓ Every shooter capable of using target data derived from any sensor

UAS Family of Systems



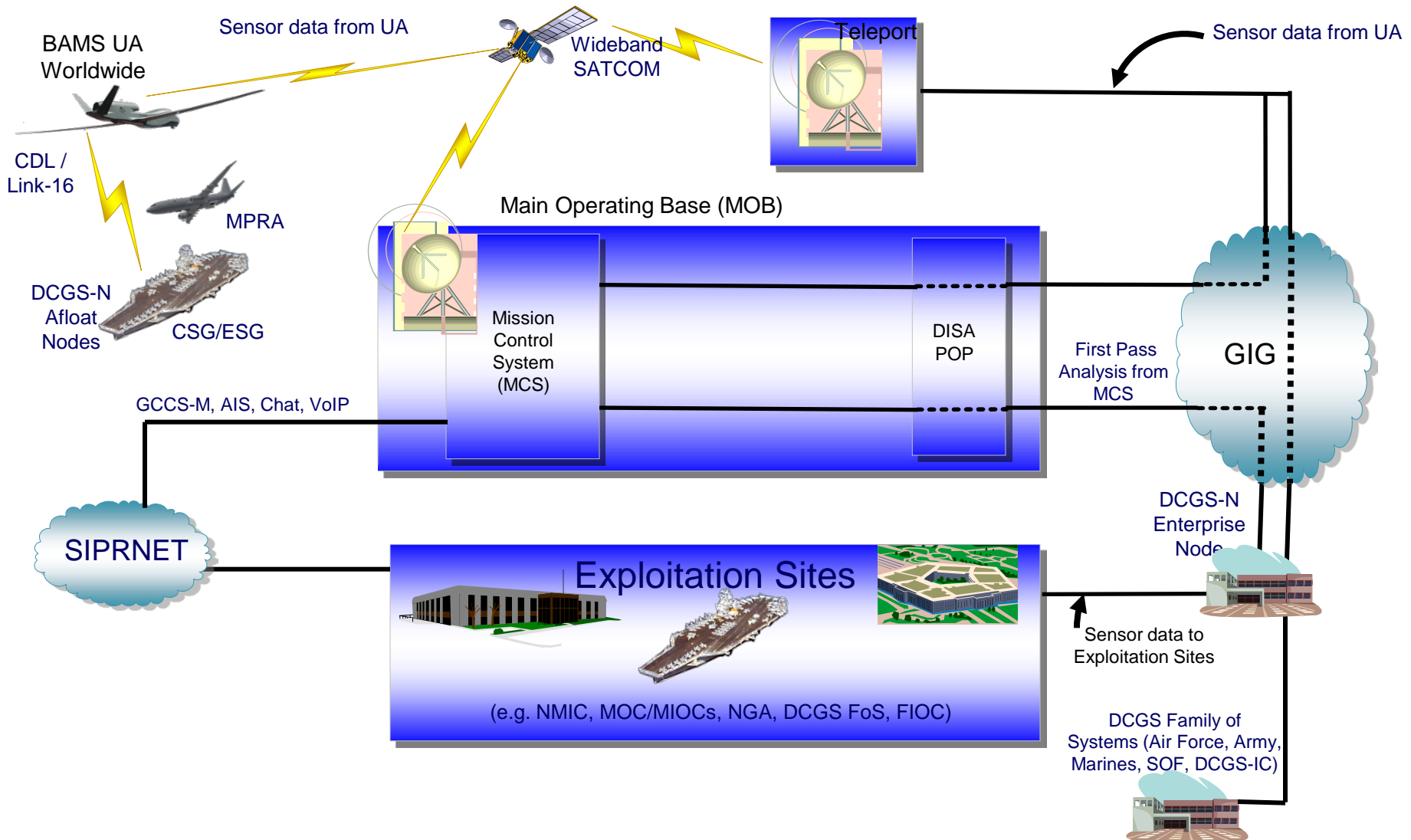


BAMS UAS OV-1





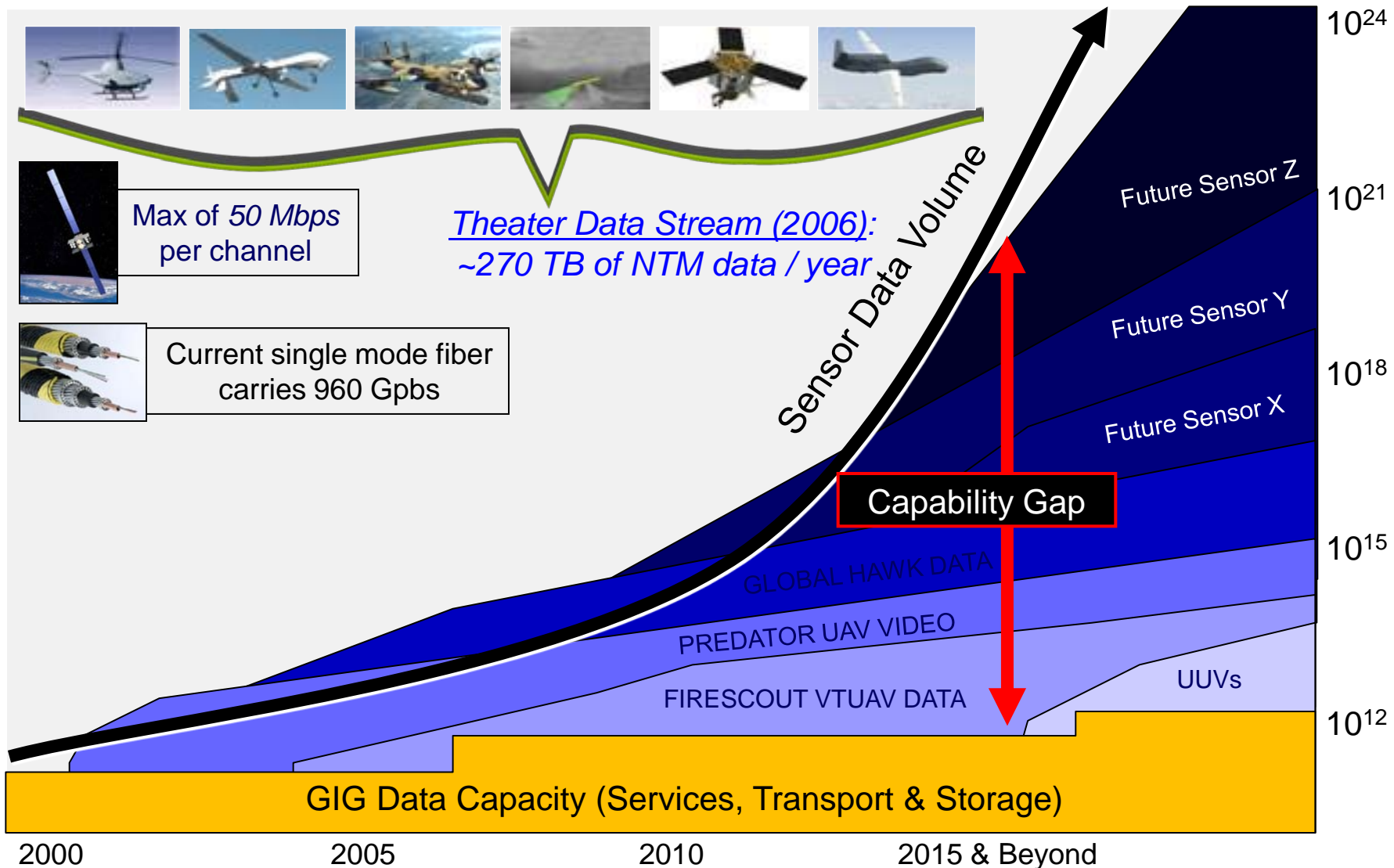
Managing the Processing, Exploitation and Dissemination (PED) of Data





Exponential Data Growth: Enabler & Challenge!

(From MIEA Study)





Navy Data Strategy Challenge

(from PEO C4I ISR Data Study - MITRE)



Data Transmission

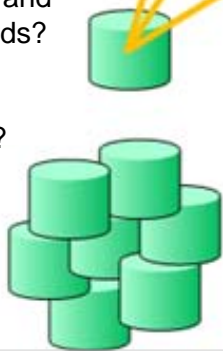
Decisions

- Send all of it?
- Compress it?
- Stream it?
- Just send a metadata synopsis?
- Adjust Quality of Service?

Enterprise/Cloud Data

Decisions

- Data center consolidation?
- Degree of distributed processing?
- “Big Data” storage and processing standards?
- Time to live?
- Data format standardization?



Systems Data Decisions

- Analyze it?
- “Mark it up” (i.e., metadata)?
- Store it? Where and for how long? Searchable?
- Distribute it? How and which systems need it?
- Which system becomes “authoritative”?
- How to aggregate different results?
- How to track provenance? Who has touched it?
- Throw it out? Why collect it and send it to begin with?

Collection Data Decisions

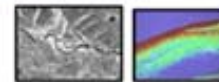
- Should we collect?
- Which sensors?
- When/where to collect?
- Where to process?
- When to transmit?
- Where to store?



SATCOM
(1-2 Mbps Up)



CDL
(240 Mbps Down)



Tactical Data Decisions

- Analyze it? Is Expertise available?
- Store it? How long? Capacity?
- Transmit it? How? Capacity?
- Throw it out?
- How to “mark it up”?

Each decision is an opportunity to improve the end-to-end mission capability and streamline the OODA* Loop



Summary



- Proliferation of UASs (and their data) pose a significant challenge to Navy C4I architectures and TTPs
- Data Strategies and ISR CONOPS are immature
- Acquisition requirements and ownership of data processing, exploitation and dissemination (PED) are unclear
 - Getting the right data to the right customer at the right time
 - Manpower - who does what and where
 - Bandwidth – how much is enough, what needs to be sent and to whom
 - Automation / Data Fusion – turning data into information
- Disciplined Systems Engineering and requirements derivation across SYSCOMs and acquisition programs is critical