Looking Ahead To NextGen Aviation
An Industry Perspective

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BAE Systems – A Global Defense Company

The U.S. accounts for nearly half of all employees, 40% of shareholders, and more than one third of revenues
NextGen Aviation and Network Enabled Operation -
The Promise Of Delivering Real Capability

Curb To Curb Scope
Net-Centric Architecture
Data And Application Access
Collaborative Flight Operations
IPv6 Enabled Network

FAA Led Interagency Collaboration

As Is

NextGen NEO

Gate To Gate Scope
Point To Point Architecture
Push To Talk Voice
Controller Centric Flight Operations
Switched Circuit Network
Largely an FAA Program

The NextGen Depends on Network Enabled Operations (NEO)
The Big NextGen Idea – Information Sharing Across Aviation Communities Of Interest

Objective - to achieve “collaborative decision making” through shared information. Accomplished through distributed information management.

From Many Ground Radars and Limited Capability A/C To Fewer Ground Radars and More Capable A/C
And ... NextGen Aviation Has Become A Global Speculation

Mission Critical Information Intensive

Multiple Access Points Security & Resilience

The Global Nature of “Cyberspace” enabled Aviation necessitates an international approach to Interoperability & Security
Implications For Advancing Aviation’s NextGen Within A Networked World

• Validating and sequencing implementation and global harmonization of modernization programs – Interoperable standards, patterns and processes

• Enterprise service oriented architecture interoperability and assurance – Run time responsive Services Oriented Architectures

•Cybersecurity in a heterogeneous network enabled mission critical environment – Achieving situational awareness and “Cyber Setback”

• Integrating cooperative and non cooperative surveillance – Operational management of trust

• The challenge of UAS operations – Autonomic meets autonomous

• Federating air surveillance and maritime domain awareness – Interoperability, security and governance at the data level
Coordination of Next Generation Implementations Will Require New Forms Of Governance

Global Aviation’s NextGen(s)

U.S. NextGen/Network Enabled Operation
- Network-Centric Infrastructure
- Avionics
- Applications and SOA
- Content Mgmt
- Air-Grnd Network Integration

SESAR/EuroControl
- Network-Centric Infrastructure
- Avionics
- Applications
- Content Mgmt
- Air-Grnd Network Integration

Indian And Asian Aviation Modernizations
- NavAid Modernization
- ATC Applications
- Network Infrastructure

Legacy Systems Transitions
- Airborne Data Networks
- Ground Based Radar Installations
- Platform IT
- Ground Networks
- Data Centers
- ATC Centers

Increasing Need For Global Harmonization
Transition Will Pace Modernization
NextGen Interoperability Needs Are Unprecedented

Usable
Available
Interoperable
Securable

From Many Ground Radars with Limited Capability A/C
To Fewer Ground Radars with More Capable A/C

DoD Infrastructure
DHS Infrastructure
FAA Infrastructure
Other “.gov” Infrastructure
DNI Sponsored ISE Infrastructure
Global Harmonization – SESAR, Indian ATC, etc
Disparate Content Sources

ATM Operational Activities

Major ATM Communities Of Interest (COI)
Air Navigation Service Provider
Aircraft
Flight Operations Center

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2006

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The Implications of Cybersecurity For NextGen Aviation Are Significant

- Conducting business in Cyberspace represents an irreversible component of modern business and society

- Military and civilian network exploitations by a variety of actors are increasing in scale and frequency

- National authorities and alliances are undertaking significant policy, programmatic and operational actions

- The security of Cyberspace has taken on international urgency as critical infrastructures continue to be successfully attacked

"Our information infrastructure — including the internet, telecommunications networks, computer systems, and embedded processors and controllers in critical industries — increasingly is being targeted for exploitation and potentially for disruption or destruction, by a growing array of state and non-state adversaries."

Cybersecurity Is Now A Run Time Proposition
Enter The
Network Centric Operations Industry Consortium

Aviation Deliverables in Review

- "Vision for A Netcentric Aviation Ecosystem " White Paper concluded formal review this week
  - Will come to EC for ratification
    - Benefits described for users in the areas of
      - Capacity
      - Safety
      - Efficiency
      - Security
      - Agility
      - Sustainability
      - Business Benefit Interdependencies

- "SESAR and NextGen Comparison" White Paper enters formal review this week
  - Summarizes, compares and contrasts Netcentric attributes for the two overarching Program concept documents that will enable the transformation of the European and United States Air Traffic Management Systems from today’s legacy paradigm into a more robust, highly automated and integrated digital environment.
  - Emphasis placed on NextGen NetCentric Infrastructure Services and Shared Situational Awareness Services and SESAR NetCentric Infrastructure Services.

Cyber Defense An Industry Perspective

Industry Perspective on "Challenges in Providing Cooperative Cyber Defence Capabilities To NATO Forces"

- Dynamic Situational Awareness
- Degraded Operations
- Cyber Defence Information Sharing

Key Areas Where Industry Is Innovating
- The Value Of The NCOIC And Its Members
- Speed And Delivery Of Value

Concluding Note
- Validating The Benefits Of NATO – Industry Collaboration
- Building Trust – A Bilateral Framework For Progress
- Potential Venues Leading To Early Successes
Balancing Cooperative & Non Cooperative Surveillance - Operational Trust Management

Sustaining An Effective Balance Requires Information Sharing

- Cooperative Surveillance
- Non-cooperative Surveillance
- Surveillance and Intelligence

- Incentivize A Basis For Sharing
  - Respect supply AND demand
  - Provide clean access audits on line
  - Trusted broker – long term archive

- Facilitate Run Time Security
  - Eliminate unneeded functionality – e.g., thin client
  - Role based security combined with digital rights mgmt
  - Focus on insider threat – rebalance toward physical security

- Strategically Insert Diversity
  - Geographical and Functional Adaptability
  - Integrate a multiplicity of suppliers in enterprise solution
  - Control key architecture components even if commodity purchased

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Operational Insight - Federating Air Surveillance & Maritime Awareness

Efforts undertaken in this plan will be designed to the maximum extent practical to be consistent with surveillance and intelligence sharing efforts already in effect or planned for the maritime and land domains. Over time, the goal is an integrated domain awareness architecture.

Air Domain Surveillance and Intelligence Integration Plan
Department of Homeland Security 26 March 2007

Part of the (Canadian) Air Force’s plan is that it “will explore new relationships with the Navy so aerospace control and maritime surveillance and control are executed jointly within Canada


We will not win the Global War on Terrorism if we cannot tell the bad guys from the good guys. We have to develop the capability to do that. A maritime NORAD is essential.

Admiral Vern Clark, Chief of Naval Operations
Signal Magazine December 2004

The asymmetric domination of the littoral is indeed the greatest challenge to the globalized state that depends on the sea and air for its lanes of communication, transport, trade and movement of people.

W. Lawrence S. Prabhakar
Securing India's Littorals in the Twenty-first Century: Issues and Challenges August 2006
We’ve Surrounded The Problem And Are Admiring It …

Interagency Air Maritime Surveillance Summit  June 5-6, 2008

General Consensus

- We need to find a way to better enable/manage Air Domain Awareness
  - Air Surveillance Capabilities
  - Information Integration (net-centric)
  - Interagency Automation (common tools)
- We need to be compatible/integrated with Maritime efforts – and those of other domains

Surveillance Summit Wrap-Up
Way-Ahead for Air Domain Awareness

ADSII-103 Recommendations

- The Network-Centric/Enabled Operations air surveillance system must be a federated interagency system
  - Common automation system and common data distribution network
    - Multi-level security authentication
    - Role-based access
    - Enable a User Defined Operational Picture
  - Establish a fully coordinated information environment across all stakeholders to support their working effectively as a cohesive unit
- Establish a lead agency or department
  - Fund, resource and charter to enable operations based on cross agency net-centric best practices and requirements guidelines
Final Thoughts –  
“The only thing we have to fear is fear itself.”