

# **Architecting Information Management: a Key Enabler for Information Superiority.**

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## **Abstract**

The National Security Space Architect (NSSA) is conducting the Mission Information Management (MIM) Architecture Study. MIM aims to develop an architecture for information management, a key tenet to information superiority, for 2015 and beyond. This paper begins with an overview of the NSSA and its functional relationships within DoD and the Intelligence Community, and gives a brief description of key MIM 1999 findings to date. The paper then describes the two closely related architecture development studies (Communications Architecture (CA) and Information Management Architecture (IMA)) being executed in 2000 and 2001, showing their definition, structure, activities and schedule.

## **1. Introduction**

The Secretary of Defense (SECDEF) and the Director of Central Intelligence (DCI) established the NSSA in the *MEMORANDUM OF UNDERSTANDING FOR NATIONAL SECURITY SPACE MANAGEMENT*, dated 31 July 1998. The NSSA replaced the DoD Office of the Space Architect, which was established on 1 October 1995. This change effectively broadened the scope of the Space Architect role to include both the DoD and the IC. In what follows we use the acronyms DoD for Department of Defense and IC for Intelligence Community.

The purpose of the National Security Space Architect is to "...develop and/or coordinate and integrate DoD and IC space system architectures for the mid- and long-term. These architectures include the entire range of DoD and IC space missions. The NSSA shall propose future space architectures and capabilities across the broad spectrum of national security mission to address validated requirements and emerging needs, and account for technology opportunities. The NSSA shall also develop transition strategies to guide mid-term program transition planning to achieve these future capabilities...."

The NSSA organization is a non-headquarters, jointly manned activity. The Space Architect is either a military officer in the grade of O-8 or a civilian equivalent in the Senior Executive Service or Senior Intelligence Service. The SECDEF selects the Space Architect with the concur-

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rence of the DCI. The Architect may not be assigned other duties (“dual-hatted”). The NSSA Vision, Mission, and Objective are shown in Figure 1.



Figure 1

The temporal and conceptual relationships of the NSSA to other planning and program activities is indicated in Figure 2.

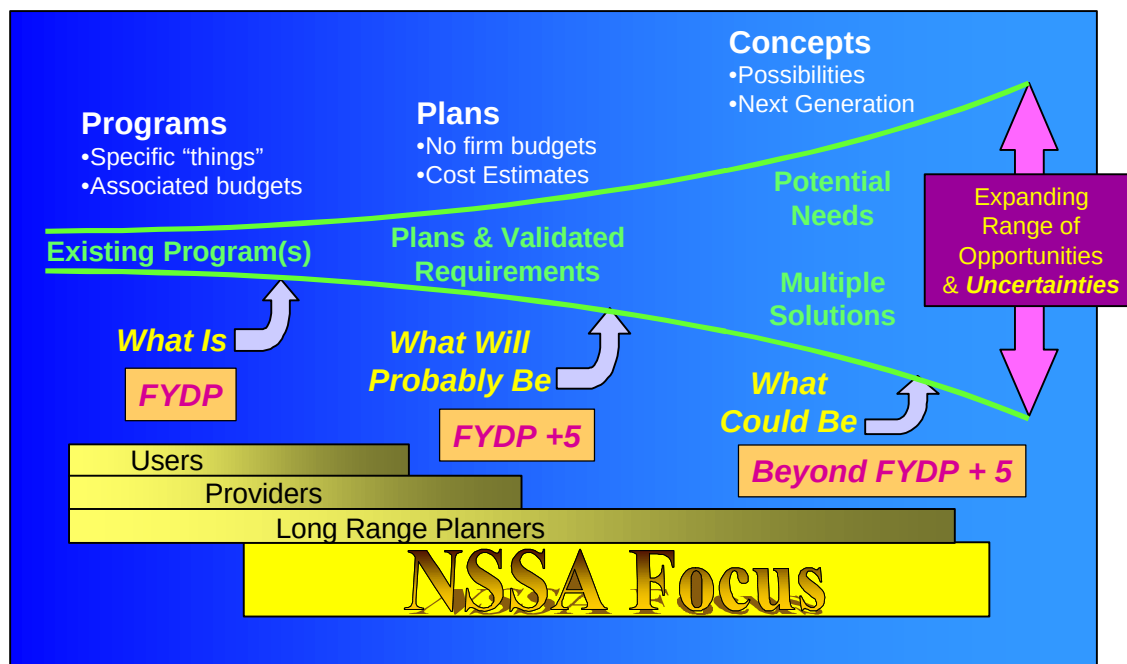


Figure 2

## 2. Mission Information Management Overview

The MIM Terms of Reference directs the NSSA to develop “architecture and investment strategy recommendations to guide technology investment, acquisition planning, and program execution for National Security mission information management capabilities in the 2010-2025 era....” It further states that MIM “comprises all aspects of providing mission-essential information to mission executing entities–DoD, Intelligence, and Civil.” This TOR was approved by the National Security Space Senior Steering Group (NSS SSG) principals (Hon. Arthur L. Money, ASD C3I, Hon. Joan A. Dempsey, DDCI CM, and Lt Gen Frank B. Campbell, JS J8) at the 7 December 1998 NSS SSG meeting. Figure 3 captures the driving rationale for the study.



Figure 3

Not surprisingly for an issue of this importance, the NSSA is not alone in addressing it. Figure 4 shows how MIM is related to two major IC and DoD efforts – the Global Information Grid and the Intelligence Community Information Systems Capability Roadmap.

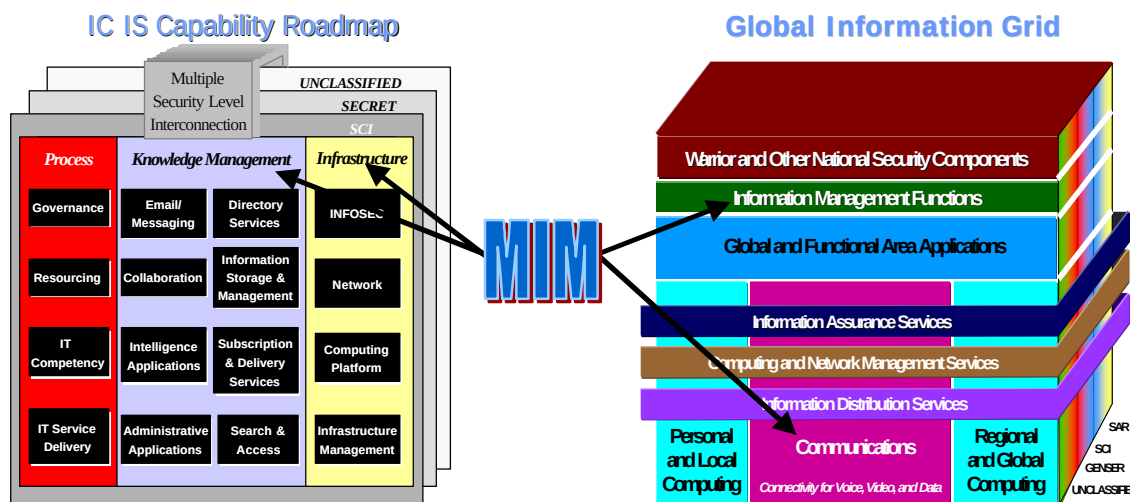


Figure 4

MIM participation is at every level: working, middle management, and executive level, via working group, review group, and senior decision maker review boards. The details of the MIM interaction with other efforts, including schedule and information exchange details, is too complex to be given here. We will give examples of these interactions in the presentation.

The NSSA is a lean organization, and has neither the fiscal and human resources, nor the intellectual capital and subject matter expertise to do this work entirely with in-house resources. Accordingly, and in full accordance with its charter, the NSSA seeks and receives stakeholder organization participation and support. Figure 5 gives a recent snapshot of that participation in the MIM study.

- Stakeholder engagement and support

- Reasonably broad
- Deep from key stakeholders

- Organizational participation to date:

|                |                         |                     |                |
|----------------|-------------------------|---------------------|----------------|
| – AC2ISRC      | – DoS / FMP / IRP       | – NAIC              | – OASD (DSC)   |
| – AFCA         | – DTSP0                 | – NASA              | – ODSCINT/Army |
| – AFCIC        | – HQ AFSPC              | – NAVSPACECOM       | – OPNAV        |
| – CIA          | – HQDA / ITAC           | – Navy N2 and N6    | – OUSD (A&T)   |
| – CMO          | – IC TELMO              | – NIMA              | – SMC / XR     |
| – CMS / ICCIO  | – ICON                  | – NRO               | – SPAWAR       |
| – CNO          | – Joint Spectrum Center | – NSA               | – USA / DAMI   |
| – DIA          | – JS / J2               | – NSSA              | – USAF / ESC   |
| – DISA         | – JS / J6               | – OASD / C3I        | – UCAO         |
| – DISC4 / Army | – MIT / Lincoln Labs    | – OASD / C3I (ISIS) | – CODA         |

Figure 5

### 3. MIM 1999 Findings and Products

Figure 6 gives an overview of the major findings and issues of the 1999 study work and the resulting products both already delivered and planned.

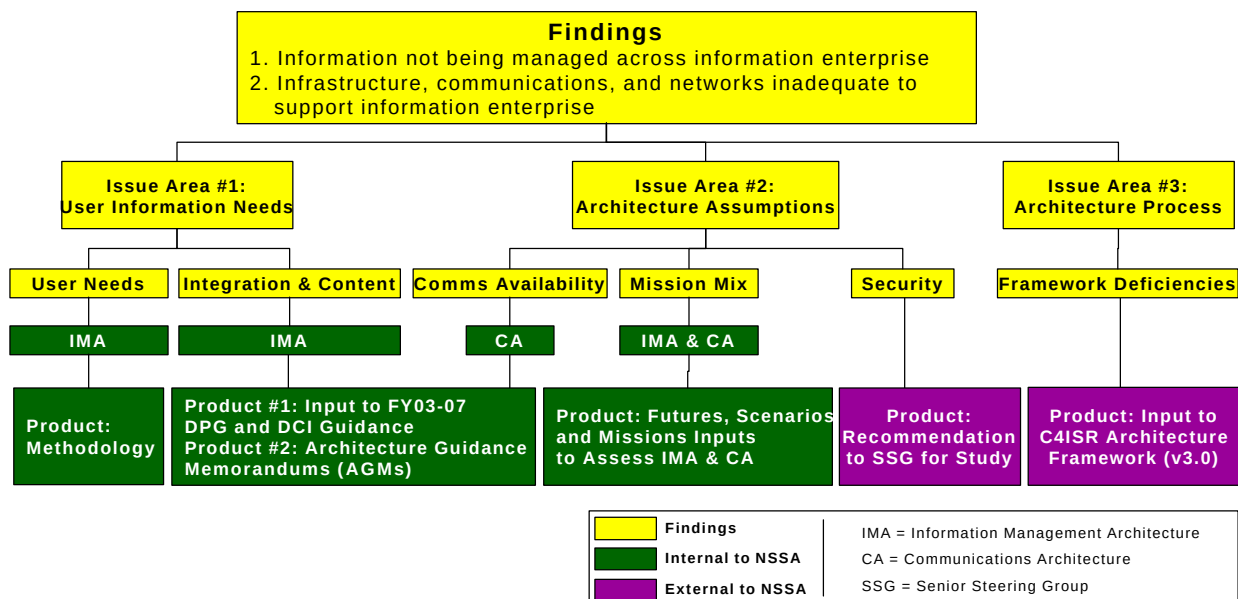


Figure 6

In the first year, MIM developed a clear understanding of the areas in which the NSSA could expect to make the most significant contributions, refined knowledge of the study-relevant future political, economic, and technical expectations, provided inputs to the FY02-07 Defense Planning Guidance and the Director of Central Intelligence Guidance, and made well-supported suggestions for improvement of the C4ISR Architecture Framework in its next version. The selected study areas, Information Management and Communications, are described in the following sections.

#### 4. Study Structure

The study team concluded that the most pressing, and highest potential payoff elements of Mission Information Management naturally fall into the two related areas of Information Management, which deals with Right Information and Right Form; and Communications, which deals with Right Place and Right Time. After stakeholder community review and agreement, the Space Architect directed that these two studies be executed.

A careful assessment of available resources and probable stakeholder support led to the conclusion that it was feasible, if slightly risky, to perform both studies at the same time. Our expectation, that while these areas are closely related, they can be studied in coordination (rather than integrated) is reflected in resource allocation and schedule.

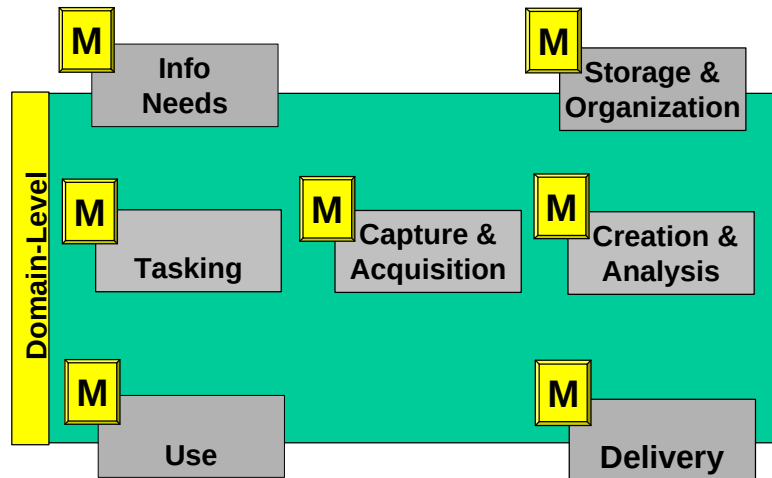
#### 5. Information Management Architecture

Of the two study areas, Information Management is less well understood, and its essential elements, structure and relationships do not enjoy established consensus. MIM believes that there is much commonality in the essential functions across the domains shown in Figure 7. The MIM reference model in Figure 8 reflects seven functions summarizing the information management cycle end-to-end (info needs, storage & organization, tasking, etc.). Close coordination and extensive research leads MIM to believe that extensibility of this model can be made to the six domains named below. While the corresponding function in each domain may (or may not) have a different name, activities which meet the definitional basis for the function are nonetheless being performed within the domain. MIM will focus on the management aspects for each of these domain functions.

| MIM<br>Reference<br>Model         | Intel                     | Weather                   | Earth Sci                 | C2                    | Log                    | Medical               |
|-----------------------------------|---------------------------|---------------------------|---------------------------|-----------------------|------------------------|-----------------------|
| <b>Info Needs</b>                 | Needs Identification      | Needs Identification      | Needs Identification      | Survey & Needs Ident. | Needs Identification   | Needs Identification  |
| <b>Storage &amp; Organization</b> | Library / Warehouse       | Library / Warehouse       | Library / Warehouse       | Library of Assessment | Depot / Warehouse      | Records / Databases   |
| <b>Tasking</b>                    | Tasking                   | Tasking                   | Tasking                   | Tasking               | Tasking                | Tasking               |
| <b>Capture &amp; Acquisition</b>  | Collect                   | Collect                   | Collect                   | Generation            | Supply                 | Collect               |
| <b>Creation &amp; Analysis</b>    | Processing & Exploitation | Processing & Exploitation | Processing & Exploitation | Control / Assessments | Maintenance / Repair   | Processing & Analysis |
| <b>Delivery</b>                   | Disseminate               | Disseminate               | Disseminate               | Disseminate           | Transport / Distribute | Deliver / Xmit        |
| <b>Use</b>                        | Use                       | Use                       | Use                       | Use                   | Use                    | Use                   |

**Figure 7**

The MIM hypothesis is that the Command and Control domain is likely to be the most different, and the study team anticipates that, and is prepared to provide to it special attention.



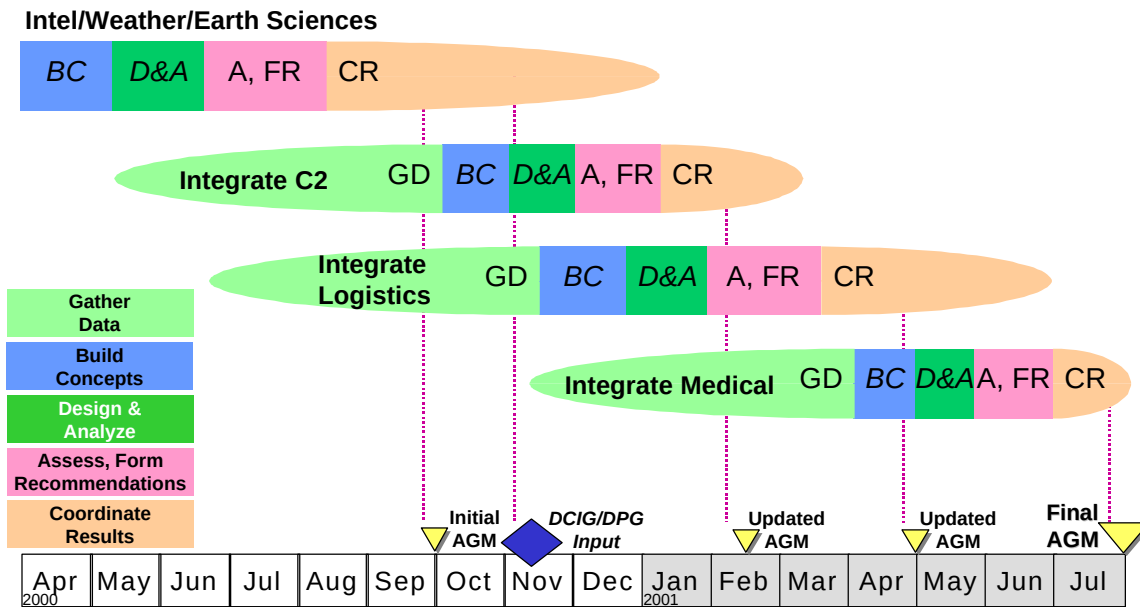
**Figure 8**

Prudence in the face of uncertainty, as well as resource availability, drove us to apply to the IM architecture study the iterative approach justified in Figure 9.

- **Incremental development, refinement, coordination**
  - Matures understanding of Information Management
  - Capitalizes on commonalities and team learning
  - Enhances understanding of metrics and their impact on the architecture
  - Uses stakeholder SME and other resources efficiently
- **Manageable and executable**
  - Small teams
    - Focused and scheduled stakeholder support
  - Scouts
    - Explore each domain
    - Cultivate key SME, centers of excellence, stakeholders
    - Recommend scoping
    - Identify and bound domain uniqueness
    - Locate data sources for 2010 baseline/cost
    - Assess community/stakeholder readiness

**Figure 9**

The resulting schedule is shown in Figure 10. As previously mentioned, it is incremental, and provides the benefits of the learning curve, that is application of expertise and lessons learned in the earliest segments to accomplishment of the later ones.



**Figure 10**

Figure 10 also shows the planned timeline and products. The AGM (Architecture Guidance Memorandum) is the document that the NSS SSG uses to direct action on the NSSA study recommendations. The DCIG (Director of Central Intelligence Guidance) and DPG (Defense Planning Guidance) elements are NSSA inputs to those documents based on the results to date of the architecture study. The Updated AGM will incorporate new results as well as changes and corrections due to more complete knowledge.

## 6. Communications Architecture

The Communications Architecture study will be conducted in a different manner. The DoDOSA

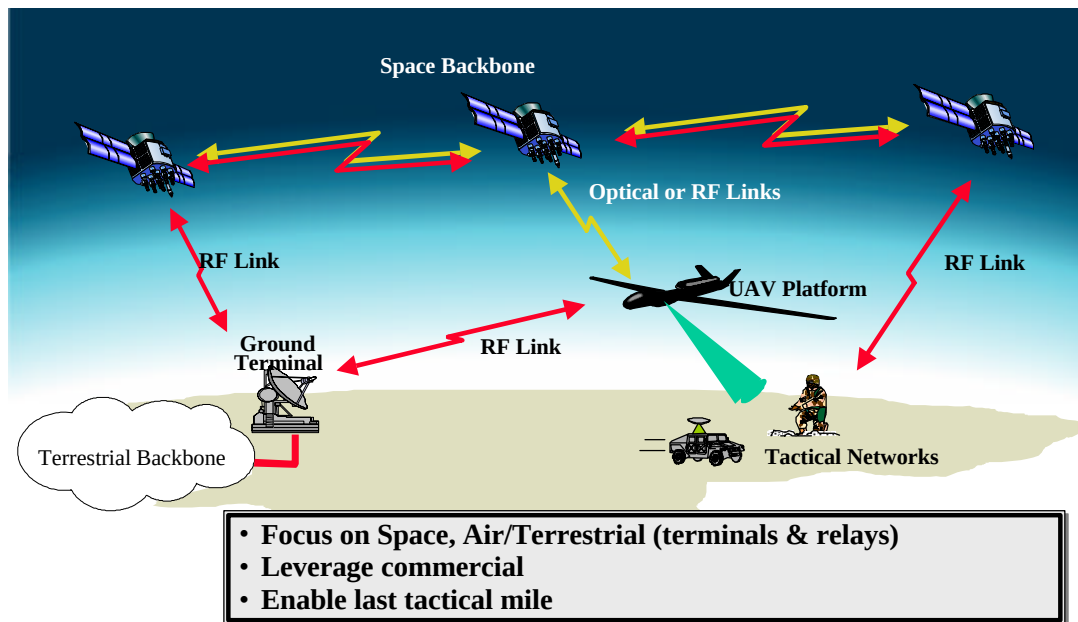
- Space Backbone
- Communications Management
- Communications to Support IM
- Interconnectivity
- C2 Connectivity
- Broadcast
- Direct Downlink Functionality
- Ships-at-Sea Communications
- In-theater Communications
- Terminal Interface

**Figure 11**

has previously done the MILSATCOM architecture study, and the NSSA retains that corporate knowledge. Many other organizations in the Intelligence, Defense, and Civil communities, also have a great deal of experience in the area. The stakeholders are well acquainted, working relationships are well established, and the study scope and methodology are well in hand. Further-



more, communications is a well-established and understood subject, unlike IM. These factors allow a more direct and traditional study structure and flow. Figure 11 gives a detailed list of architecture focus elements. Figure 12 shows the CA scope, and identifies the key focus elements.



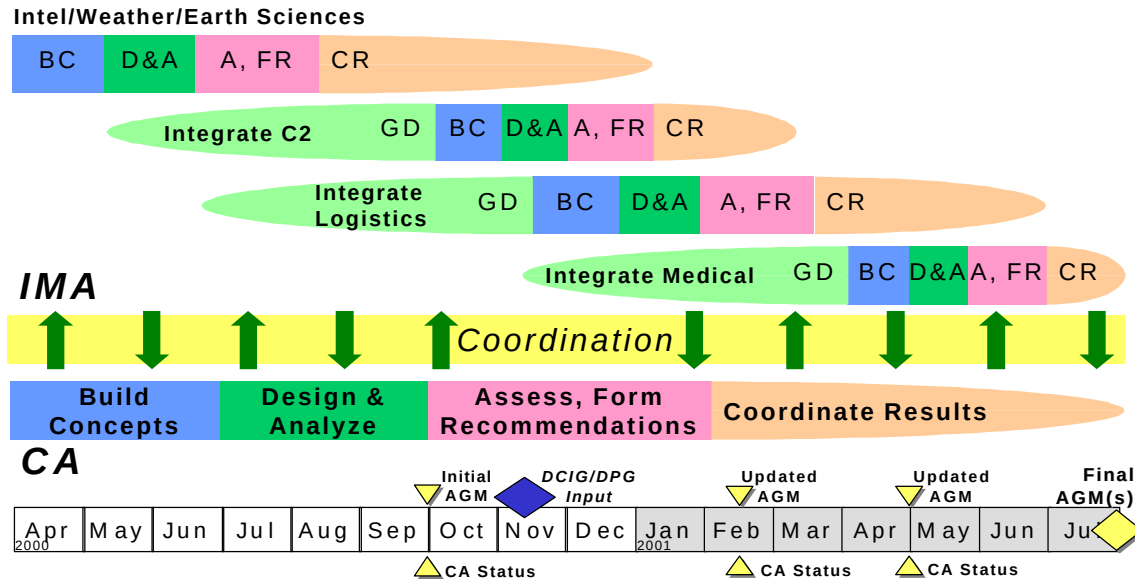
**Figure 12**

As with the IMA, the choice of approach for CA was made after careful consideration of many factors, the most important of which are shown in Figure 13.

- Successful problem definition
- Sufficient data gathered
- Established working relationships
- Stakeholder consensus on straw-man
- Efficient use of SME, stakeholder resources
- Manageable and executable

**Figure 13**

The resulting integrated schedule is shown in Figure 14. This view makes clear the relationship of the two architectures, and shows how (the vertical arrows in the coordination bar) the Architecture Development Teams (ADT) coordinate to ensure that the two studies are fully integrated and consistent.



**Figure 14**

## 7. Future Activities

Figure 15 shows the major milestones (activity and products) scheduled through mid-July 2001. A significant amount of lower-level work occurs between these periods to provide the foundation for success at these events. In Figure 15, ADT indicates an Architecture Development Team meeting, R&V is a Review and Validation group meeting, DCG is the Decision Coordination Group, and SSG is the NSS SSG previously described.

| <u>DATE</u>    | <u>ACTIVITY</u>                   |
|----------------|-----------------------------------|
| <b>2000</b>    |                                   |
| 13-15 Jun      | ADT                               |
| 11-13 Jul      | ADT                               |
| 16-17 Aug      | ADT                               |
| 31 Aug         | R&V                               |
| 28 Sep         | DCG                               |
| 5 Oct          | SSG (CA Status/IMA -Intel/W x/ES) |
| <b>2001</b>    |                                   |
| 9-11 Jan       | ADT                               |
| 25 Jan         | R&V                               |
| 5-14 Feb (TBD) | DCG                               |
| 22 Feb         | SSG (CA Status/IMA -C2)           |
| 2-10 Apr (TBD) | DCG                               |
| 26 Apr         | SSG (CA/IMA -Logistics)           |
| 2-13 Jul (TBD) | DCG                               |
| 26 Jul         | SSG (IMA -Medical)                |

**Figure 15**

The activities on this list will complete the presently planned architecture work, but will not be the end of NSSA involvement. There will be considerable, and long-term, work in supporting and facilitating the architecture implementation.

## 8. Closure

This is exciting and groundbreaking work. The NSSA is privileged to be able to serve as a key participant on the collaborative DoD and IC team working to make information superiority a reality.