ARMY AVIATION TECHNOLOGY ASSESSMENT AND TRANSITION MANAGEMENT (TATM) PROCESS GUIDE

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MEMORANDUM OF AGREEMENT

MAR 18 2004

BETWEEN
THE UNITED STATES ARMY AVIATION AND MISSILE RESEARCH, DEVELOPMENT AND ENGINEERING CENTER (AMRDEC)
AND
THE PROGRAM EXECUTIVE OFFICE, AVIATION (PEO AVN)
AND
THE UNITED STATES ARMY AVIATION AND MISSILE COMMAND (AMCOM)
AND
THE UNITED STATES ARMY AVIATION CENTER (USAAVNC)

SUBJECT: Technology Assessment and Transition Management (TATM) Process

1. BACKGROUND: The U.S. Army Program Executive Office, Aviation (PEO AVN), the U.S. Army Aviation and Missile Research, Development and Engineering Center (AMRDEC), the U.S. Army Aviation Center (USAAVNC), and the U.S. Army Aviation and Missile Command (AMCOM) have developed a Technology Assessment and Transition Management (TATM) Process for the assessment of technologies under development in the Science and Technology (S&T) community and the management of the transition of those technologies with sufficient Technology Readiness Level (TRL) onto the aviation platforms.

2. PURPOSE: This Memorandum of Agreement (MOA) expresses the undersigned Executives' intent that an Integrated Process Team (IPT) environment be implemented among the stakeholder organizations for the effective execution of the TATM Process.

3. REFERENCE: Technology Assessment and Transition Management Process Guide, Version 1.0, dated 31 October 2003

4. GOAL: Ensure that the technologies being developed for U.S. Army aviation platforms meet the demands of the war fighters and are transitioned effectively into the war fighters' hands.

5. OBJECTIVES:

a. Increase the effectiveness and efficiency of technology transition to aviation programs.

b. Reduce system and subsystem development cost, schedule and performance risk for PEO AVN programs and related S&T projects.

c. Provide PEO AVN, S&T, sustainment and user communities' common technology assessment processes and management of technology transition information.

d. Provide comprehensive assessments of supporting technology programs.

e. Provide an Integrated Tool Suite to support the TATM Process.

f. Provide broader applications of emerging technologies early Horizontal Technologies Integration.

6. RESPONSIBILITIES: This process utilizes an IPT structure that is holistically responsible for the achievement of the above stated purpose, goal, and objectives. Three levels of IPT (Executive, Integrating and Working) shall be used as described in the Management Framework in the above reference. Representatives of the PEO AVN and the AMRDEC shall co-chair the IPTs at each level, and the AMRDEC, Advanced Systems Directorate, shall provide administrative support to the process.

a. PEO AVN:

(1) Provide co-chairperson for the Executive IPT (EIPT), Integrating IPT (IIPT) and Working IPT (WIPT).

(2) Ensure continuous PEO/Project Manager (PM) participation in IPT efforts.

(3) Plan and manage the TATM Process jointly with the AMRDEC.

(4) Plan and share responsibility for funding TATM Process execution.

(a) Budget for transition funding IAW Technology Transition Agreements (TTA).

(b) Coordinate budgetary considerations with the Army's Program Objective Memorandum (POM) Process.

(c) Provide PEO AVN managed systems input to the TATM Tool Suite.

b. AMRDEC:

(1) Provide co-chairperson for the EIPT, IIPT and WIPT.

(2) Ensure continuous AMRDEC participation in IPT efforts.

(3) Plan and manage the TATM Process jointly with PEO AVN.

(4) Plan and share responsibility for funding TATM Process execution.

(5) Budget for S&T funding IAW TTAs.

(6) Coordinate budgetary considerations with the Army's POM Process.

(7) Provide AMRDEC managed technology projects input to the TATM Tool Suite.

(8) Coordinate appropriate technology developments from other S&T communities.

(9) Provide administrative support for the TATM Process to include meeting announcements, minutes and population of the TATM Tool Suite.

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c. USAAVNC:

(1) Ensure continuous USAAVNC participation in IPT efforts.

(2) Coordinate input of User (Directorate of Combat Developments (DCD) /TRADOC System Manager (TSM)) requirements into the TATM process.

(3) Develop appropriate requirement documentation to support transition IAW TTAs.

d. AMCOM:

(1) Ensure continuous AMCOM participation in IPT efforts.

(2) Coordinate sustainment requirements into the TATM process.

(3) Develop appropriate sustainment documentation to support transition IAW TTAs.

(4) Budget for sustainment funding IAW TTAs.

(5) Coordinate budgetary considerations with the Army's POM Process.

7. EFFECTIVE DATE: This agreement is effective immediately upon signature by all parties.

8. REVIEW AND CHANGE: This MOA shall be reviewed on an annual basis (preferably on or about mid August of each year to be able to adjust any necessary support funding related to this effort). The terms of this agreement are subject to change at any time by mutual consent of all parties. The original signatories or their successors shall approve proposed changes.

9. TERMINATION: Requests to terminate this MOA must be made in writing to the co-chairs. Termination will take effect 180 days after approval.

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The development of the *TATM Process Guide* could not have been completed without the dedicated efforts of many individuals from the following areas:

Program Executive Officer (PEO), Aviation and Program Managers: Cargo, Utility, Unmanned Aerial Vehicle Systems, Apache, and Aviation Systems.

Aviation and Missile Research Development and Engineering Center (AMRDEC) Advanced Science and Technology Directorate (ASTD).

Aviation and Missile Command (AMCOM) Integrated Material Management Center and G3.

The United States Army Aviation Center (USAAVNC).

Defense Acquisition University (DAU).

Science Applications International Corporation (SAIC), Applied Technology Group; Engineering and Analysis Operation.

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1
EXECUTIVE SUMMARY

1.1 OVERVIEW

This guide describes the Technology Assessment and Transition Management (TATM) Process. It provides guidance for performing assessments of emerging technologies, developing transition plans, and establishing transition agreements. It also describes the management framework and schedule for presenting these agreements to the Army technology management process. The guide also provides a description of the TATM Tool Suite developed to support the process. Several appendices to this guide provide more detailed guidance including examples and references. Technology development is considered a continuous technology discovery and development process reflecting close collaboration between the Science and Technology (S&T) community, User, Sustainer, and Program Manager (PM). It is an iterative process designed to assess the viability of technologies while simultaneously refining user requirements.

The TATM Process (Figure 1) was developed as a two-phased risk identification and management process intended for use at a Program Executive Office (PEO) level and by individual PMs. It is also intended to be used as a tool for establishing linkage and synchronization between system development programs and transitioning S&T development projects.

1.2 RELATIONSHIP TO SYSTEMS ENGINEERING PROCESS

The TATM process has a significant interface with and supports the systems engineering process. Using the American National Standards Institute/Electronic Industries Association (ANSI/EIA) 632 System Engineering Model, TATM supports technical management in the planning and assessment processes, system design, solution definition and product realization, and transition to use.

Identification of the technology project's link to specific acquisition programs and program events provides the system engineers, PMs and S&T Managers (STMs) insight into the relationships between projects and programs. It also provides information which can serve as the basis for management of projects, programs, and risks. The identification of the critical projects and capabilities provides the foundation for the selection of technical performance measures for acquisition programs or S&T projects. (For a full discussion of technical performance measurement, see the *Systems Engineering Fundamentals Guide*, Chapter 14 and Supplement 14-A on the Acquisition, Technology and Logistics (AT&L) Knowledge Sharing System (AKSS) at http://www.dau.mil/pubs/gdbks/sys_eng_fund.asp.) The road map process also supports development of a program master schedule, as well as requirements traceability. Linking S&T projects and resulting operational capabilities with either approved requirements documents

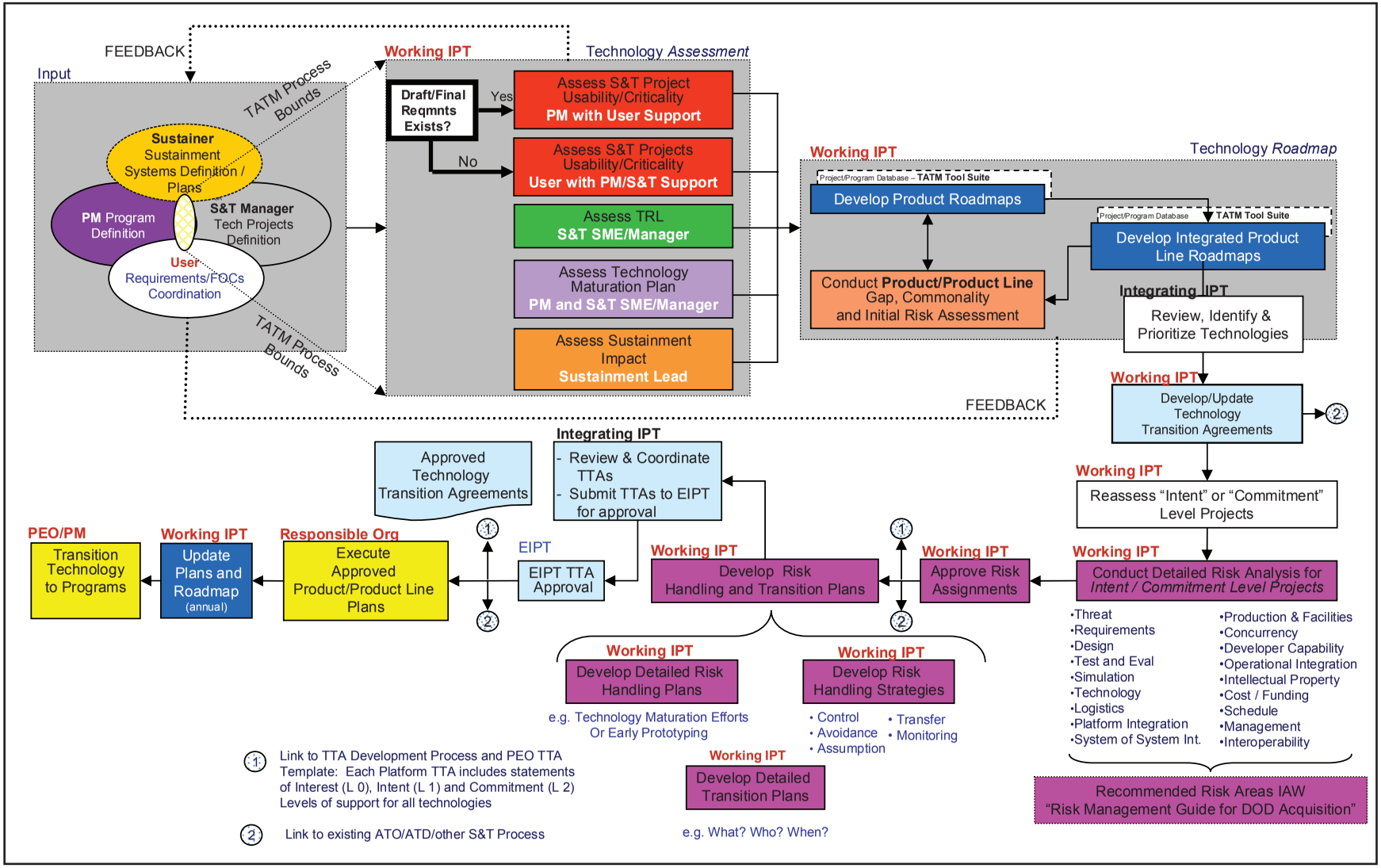

Figure 1. Technology Assessment and Transition Management (TATM) Process

(if a requirements document of some type exists) or to User defined operational capabilities (if no requirements document exists) provides traceability for improved systems engineering and supports making the transition a managed process.

The TATM Process provides information to support detailed transition planning by identifying and linking development schedules, critical events and risks for S&T development projects and system development programs. The process provides information to support detailed transition planning, transition risk management, and systems engineering planning. (For a full discussion of systems engineering planning, see the *Systems Engineering Plan (SEP) Preparation Guide* at http://www.acq.osd.mil/se/publications.htm.)

1.3 VALUE OF THE TATM PROCESS

The TATM Process provides a disciplined assessment process and supports an Integrated Product Team (IPT) in managing the transition process throughout the life cycle of a system.

The process provides a common methodology to:

- conduct technology assessments,
- develop technology transition road maps,
- link S&T projects to specific PM programs and milestones,
- conduct technical risk assessments,
- conduct non-technical risk assessments, and
- develop and implement comprehensive transition risk management programs.

This process results in the development of Technology Transition Agreements (TTAs) early in the development process to support prioritization efforts, as well as PEO and individual PM transition planning efforts. The TATM process provides synchronizing information for use by the User community in formalizing and time-phasing operational requirements and by the Sustainment community in planning for and implementing the necessary system support activities.

The process provides visibility into both S&T projects and acquisition program areas (milestones, schedules, status, and risk) to allow the acquisition community to adequately prepare for transition:

- STMs can mature the technology to the necessary level and synch the technology with acquisition program transition windows,
- PMs can prepare to integrate into their systems and programs,
- Sustainers can identify categories of support that must be addressed and develop an overall supportability strategy, and
- Warfighters can prepare to integrate into the future battlefield or operational environment.

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2
TECHNOLOGY ASSESSMENT AND TRANSITION MANAGEMENT (TATM) PROCESS

2.1 INPUTS

The TATM process begins by capturing inputs from the PM, S&T, User, and Sustainer communities through a Working IPT (WIPT) environment which facilitates communication among these stakeholders. This information provides the foundation for clear understanding of the current status of technologies and the path forward for successful technology transition.

Initially, the related elements that influence each other, and are intended to be synchronized, must be identified. For the TATM process these input elements are:

- User Requirements / Force Operating Capabilities (FOC) Coordination,
- PM Program Definition,
- S&T Project Definition, and
- Sustainment Plan Definition

Templates and samples for these input elements are included in Appendix A. For further information on the FOC process see *Training and Doctrine Command (TRADOC) Pamphlet 525-66*.

2.1.1 User Requirements/FOC Coordination

User Requirements Descriptions are identified in terms of documented requirements. Documented requirements include approved or draft requirements documents such as an Operational Requirements Document (ORD) or Capability Development Document (CDD), as well as documented or draft FOCs and both near-term and far-term Objective Force capabilities. User requirements may also include emerging needs based on advanced warfighting experiments or other user efforts resulting in lessons learned.

2.1.2 Program Manager Program Definition

PM Program Definitions include the identification of approved requirements documents, and development schedules (including key milestone dates and summaries of other critical programmatic documentation).

2.1.3 Science and Technology Project Definition

S&T Project Definitions include descriptions of the technology and the resulting operational capabilities provided, identification of which systems the technology may be applicable to and identification to which part of the PM system taxonomy the technology applies (e.g. airframe, propulsion, etc.). For each project, current maturity levels are defined using Technology Readiness Levels (TRLs) criteria. In addition, funded and scheduled technology maturation plans are defined. (NOTE: The TATM Working Group standardized on the term “program” to denote system acquisition efforts and the term “project” to denote S&T development efforts.)

2.1.4 Sustainment Plan Definition

Sustainment Plan Definitions include descriptions of the logistical impacts of the technology and the resulting costs and benefits for the life cycle operation of the systems to which the technology may be applicable. The Sustainment Plan Definition should also address the extent support considerations will influence the development and evaluation of design and operating concept, and identify the elements of support that must be addressed for the interim and objective capabilities. Individual entries provide an assessment of the positive and negative effects of integrating the technology across the integrated logistical support planning for the applicable systems.

2.2 TECHNOLOGY ASSESSMENT

Using these inputs, user requirements, acquisition programs and S&T project descriptions and sustainment plans, the WIPT conducts an initial technology assessment. The purpose is to assess:

TRL (Technology Readiness Level)	
9	Actual system proven through successful mission operations.
8	Actual system completed and qualified through test and demonstration.
7	System prototype demonstration in an operational environment.
6	System/subsystem model or prototype demonstration in a relevant environment.
5	Component and/or breadboard validation in relevant environment.
4	Component and/or breadboard validation in laboratory environment.
3	Analytical and experimental critical function and/or characteristic proof of concept.
2	Technology concept and/or application formulated.
1	Basic principles observed and reported.
From *Defense Acquisition Guidebook*, Table 10.5.2.1. TRL Descriptions.	

Figure 2. Technology Readiness Levels

- technology maturity as defined by TRLs and maturation plan
- applicability and criticality of the project from the PM and User perspectives,
- probability of successfully maturing the technology given the maturation plan, schedule and funding, and
- sustainment impact of the technology.

2.2.1 Technology Readiness Levels

TRLs are intended to define the current and future maturity level of the technology. For additional information on Technology Readiness Assessment for milestone reviews, see the *Office of the Secretary of Defense (OSD) Technology Readiness Assessment Guidebook*.

2.2.2 Applicability/Criticality

The WIPT uses two sets of criticality criteria to assess the potential impact of the specific

Level	Technical Performance
1.	**LITTLE TO NO VALUE.** Minimal or No Impact. Objective and threshold requirements still met.
2.	**CONTRIBUTING.** Acceptable with some reduction in margin. Requirement still achieved.
3.	**IMPORTANT.** Acceptable with significant reduction in margin. Requirements still achieved
4.	**ESSENTIAL.** Acceptable. No remaining Margin. Threshold requirements achieved. Program will not fail.
5.	**CRITICAL.** Unacceptable. Inability to achieve threshold requirements. Future event would cause program failure
Source:	*Risk Management Guide for DoD Acquisition* – Jun 02. As modified by the Aviation Technology Assessment and Transition Management Working Group.

Figure 3. Project Criticality Assessment Criteria

technology project on the system development program or operational capability. If a Requirements Document exists, the WIPT assesses criticality to the PM (Figure 3).

Conversely, if a Requirements Document does not exist, the WIPT defines the impact of the resulting capabilities on the warfighters documented needs or FOCs using a set of criteria developed by the user (in this case the U.S. Army Aviation Center (USAAVNC) (Figure 4)) .

Level	Operational Capability Criticality
1.	**LITTLE OR NO VALUE.** Value to currently documented Objective Force capabilities / FOCs is unclear or not supportable.
2.	**CONTRIBUTING.** Provides some support (either indirectly or partially) to achieving Objective Force capabilities / FOCs and/or contributes to maintaining legacy force capabilities through the mid-term.
3.	**IMPORTANT.** Technology is projected to provide significant margin over current warfighting capabilities and is required to support Objective Force operations.
4.	**ESSENTIAL.** A significant enabling technology which directly leads to achieving documented (TP 525-X-XX) Objective Force capabilities / FOCs. Achieving warfighting capability is at high risk without this technology.
5.	**CRITICAL.** Technology directly and significantly leads to achieving documented (TP 525-X-XX) Objective Force capabilities / FOCs. Warfighting capability will not be met without this technology.

Source: USAAVNC DCD V.2 (1 Oct 2002). As modified by the Aviation Technology Assessment and Transition Management Working Group.

Figure 4. Criticality Assessment Criteria—Resulting Capability if NO ORD/CDD exists

2.2.3 Technology Maturation Plan Assessment

The Technology Maturation Plan Assessment (TMPA) is based on: 1) current TRLs; 2) expected future TRLs; and 3) the planned, funded, and scheduled technology maturation activities. The probability of success is quantified using TMPA criteria (Figure 5).

TMPA SCORE
1. A very low degree of difficulty is anticipated in achieving planned maturity objectives for this technology, given the maturation plan, available funding level and planned schedule. Probability of Success in "Normal" R&D effort – 99%
2. A moderate degree of difficulty is anticipated in achieving planned maturity objectives for this technology, given the maturation plan, available funding level and planned schedule. Probability of Success in "Normal" R&D effort – 90%
3. A high degree of difficulty is anticipated in achieving planned maturity objectives for this technology, given the maturation plan, available funding level and planned schedule. Probability of Success in "Normal" R&D effort – 80%
4. A very high degree of difficulty is anticipated in achieving planned maturity objectives for this technology, given the maturation plan, available funding level and planned schedule. Probability of Success in "Normal" R&D effort – 50%
5. The degree of difficulty anticipated in achieving planned maturity objectives for this technology, given the maturation plan, available funding level and planned schedule is so high that a fundamental breakthrough is required. Probability of Success in "Normal" R&D effort – 20%

Source: NASA Headquarters Office of Space flight as modified by the Aviation Technology Assessment and Transition Management Working Group

Figure 5. TMPA Criteria

2.2.4 Sustainment Impact

The sustainment impact is based on the sustainer's understanding of the impact of the technology on the elements of logistical support (Figure 6). This is a qualitative assessment

based on the factors documented in the Sustainment Plan Definition (see template at Appendix A.1.4).

Level	Sustainment Impact
SPI	**SIGNIFICANT POSITIVE IMPACT (SPI)** Technology significantly improves sustainment
MPI	**MODERATE POSITIVE IMPACT (MPI)** Technology has moderate positive impact on sustainment
II	**INSUFFICIENT INFORMATION (II)** Insufficient information to evaluate
ZI	**ZERO IMPACT (ZI)** Technology has no impact on sustainment
NI	**NEGATIVE IMPACT (NI)** Technology has negative impact on sustainment
SNI	**SIGNIFICANT NEGATIVE IMPACT (SNI)** Technology has significant negative impact on sustainment

Figure 6. Sustainment Impact

2.3 TECHNOLOGY ROAD MAPS

The S&T projects are integrated into a comprehensive road map once they are identified for potential transition. The road map displays the linkages between the system being acquired and the S&T projects.

The road map graphically portrays the program's timelines and milestones. This identifies windows of opportunity to transition and insert critical S&T projects supporting the program or the warfighters' capability. The PM, working with the Technology Coordinator (TC), establishes the transition criteria (e.g.; TRL 6 required by March 2007 to transition into the program's Incremental II upgrade).

A technology should not transition for insertion into a program unless it meets or exceeds the established transition criteria. If a program does transition prior to meeting the criteria, the PM assumes additional risk for the S&T project and potential risk for the overall system acquisition program being managed.

The S&T projects are aligned on the road map and are organized in accordance with the system's hierarchy or work breakdown structure (e.g. platform, propulsion, etc.) established by the PM. The resulting road map represents a summary of the program and projects and establishes their initial relationship. In addition to identifying and portraying where an S&T project transitions into a weapon system, the road map also identifies the agency and point of contact responsible for the developing technology, the criticality and impact of the technology to the User, Sustainer and/or PM, the TRL , and any FOC the technology supports. An example of a road map is contained in Appendix A.

The road map, as an output of the TATM process, provides the User, Acquisition, S&T, and Sustainment communities an excellent visual aid in determining what and when critical technologies transition into an acquisition program. The road map also facilitates determining when funding is needed, when integration will occur with the major system, and if there are gaps between when the technology is developed and when it is needed for integration.

In order to maximize the utility of the TATM process and provide flexibility in defining the output product format, a TATM Tool Suite has been developed in parallel with the process. The TATM Tool Suite gives User, Acquisition, S&T, and Sustainment communities a single database environment for use in conducting technology assessments. A description of the TATM Tool Suite is contained in Chapter 6. For information on applying for a user account to the TATM Tool Suite, contact Judi Bhansali (Judith.Bhansali@us.army.mil) (256) 313-2783 or Brent Shelton (sheltons@saic.com) (256) 864-8375.

2.4 RISK ANALYSIS AND MANAGEMENT

Risk analysis is a two part effort involving analysis of technical and non-technical risks. At a minimum, S&T Projects for which an "Intent" level TTA, (refer to Section 3 for TTA descriptions), exists should be subjected to intensive risk management. Risk analysis is conducted both for individual projects and for portfolios (collections) of projects that are critical to the success of an acquisition program.

Projects are analyzed to predict their probability of success or failure. This risk analysis will support the risk mitigation strategy the project will use to balance transition risks and costs. Risk analysis techniques are located in Appendix C.

2.4.1 Technical Risk Analysis

Technical risk analysis is conducted for individual projects and for the portfolio of projects that are critical to the success of the acquisition program. Individual aspects of the technology development projects are reviewed to ensure that all necessary steps to minimize transition risk are included in the projects and, if not, this is addressed in the risk management activities. At the portfolio level, the cumulative risks associated with the critical projects that will impact the system acquisition program are assessed.

2.4.2 Non-Technical Risk Analysis

In addition to technical risk assessments (i.e. criticality, TMPAs, and TRLs) a "non-technical" risk assessment should also be conducted. This assessment should address those non-technical factors that the appropriate IPT determines are critical to the success of the program. Examples of elements that should be considered as potential non-technical risk areas are included in Appendix C.

2.4.3 Schedule and Commonality Analysis

Once an initial road map has been developed showing the system acquisition programs and S&T project linkages, a WIPT, consisting of the system PM, the user, the technology coordinator, and the sustainer, conducts an analysis of the road map. The initial analysis will identify schedule problems and areas of commonality.

Schedule analysis is conducted by comparing the detailed schedules of S&T Projects and target transition system programs to identify misalignment. Misalignment occurs when the S&T Project matures prior to the target system being ready to integrate it into a system development program. Misalignment also occurs when a technology project will not be mature enough to meet a system development integration window. Both situations create risk and must be managed.

Commonality analysis identifies technology projects that impact several different elements within a system acquisition program (e.g. an electronics miniaturization project critical to successful avionics and engine development efforts). Identification of those projects that are common to multiple different aspects of a system development program is an essential enabler of successful technology assessment and transition management. At higher management levels, where one individual or organization may be responsible for multiple system acquisition efforts (e.g., PEO level) those S&T projects which impact multiple system acquisition programs will be identified as horizontal technology initiatives.

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TECHNOLOGY TRANSITION AGREEMENTS AND TECHNOLOGY TRANSITION PLANNING

Technology Transition Agreements (TTAs) are used to document transition related agreements between the PM, the technology developer, the user and the sustainer. There are three levels of agreement possible within a TTA: Interest, Intent, and Commitment. While the various levels of TTAs are used during the different stages of a technology development project's life cycle, the TTAs can be tailored as necessary to meet the needs of the parties involved. An example of a TTA template can be found in Appendix A.

3.1 INTEREST TTA

In this level, the PM, user, and sustainer express an interest in the technology being developed to the technology developer. This interest is intended to represent an understanding that the technology may be applicable to the system the PM is managing, provide a near term increased operational capability and/or could potentially provide an objective force FOC.

3.2 INTENT TTA

This level reflects that the PM, user, sustainer and technology developer have concluded that the technology in development, or the capability it provides, will support an operational requirement or provide the warfighter with an advanced capability. This agreement expresses the PM's intent to transition the technology if certain defined and agreed to conditions are met and risks are managed at the time of scheduled transition. These conditions typically include the technology projects successfully meeting agreed to transition exit criteria, the user determining the operational capability the technology provides is necessary, and documenting the need, and finally, the PM expecting to secure funding to transition the technology.

3.3 COMMITMENT TTA

This level is the highest level of agreement and includes a firm commitment by the PM, user, sustainer and technology developer to transition the technology. The commitment involves committing the required resources, by all parties, to ensure the successful transition and integration of the technology into a fielded or developing system or as a separate stand-alone system. The TTA should contain clearly defined and agreed upon transition exit criteria, risk handling plans, the funding programmed in the Program Objectives Memorandum (POM), and an approved transition plan. The user should have, at a minimum, a draft document stating the need for the capability. The PM, with the support of the sustainer, should have a preliminary supportability plan.

3.4 TECHNOLOGY TRANSITION PLANNING

This guide provides a template and tools for managers of technology projects to use to transition their efforts to the acquisition process. Up front planning is a necessity to ensure the successful transition of a technology to

the acquisition process. It is important to note that early and continuous involvement of the warfighter in the S&T definition and transition planning process allows for a balanced look at the "Technology Push" coming from the Army's S&T community and the "Requirements Pull" prompted by the immediate needs of the warfighter.

There are many challenges and considerations for technology projects intended to transition to acquisition programs. A good discussion of the non-technical areas that should be addressed is contained in the *Risk Management Guide for DoD Acquisition Managers* in Appendix B of this guide. The primary challenges that are faced in preparing for the transition of a technology are:

a) Contracting Strategy—motivating the contractor(s) to provide a best-value (from an overall life cycle cost-effectiveness perspective) solution and transitioning into the acquisition program without loss of momentum.

b) Interoperability—ensuring that the new or modified system can interface with other systems on the battlefield.

c) Producibility—ensuring the technology, subsystem, or system can be produced either by the current developer or others in industry or if additional manufacturing technology development efforts are required.

d) Supportability—ensuring that the fielded systems can be cost-effectively supported with the current or planned logistics environment.

e) Test and Evaluation—early and continuous participation of the testing community and evaluators throughout the technology development and maturing process—from definition of data needs and associated military exercises to completion of the operational assessment to support the production/transition decision.

f) Affordability—assessing life cycle affordability and application of a Cost as an Independent Variable (CAIV) strategy to continuously look for ways to reduce cost.

g) Funding—choosing the proper strategy for obtaining the resources necessary for acquisition. This may include additional development activities or immediately moving into System Development and Demonstration (SDD) or production.

h) Requirements—evolving from a mission need and associated performance goals at the start of the technology development project to a formal requirements document and/or a system performance specification at the conclusion of the technology project. This requirements evolution captures the technology maturity and the knowledge and understanding gained by both the technologist and the warfighter.

i) Acquisition Program Documentation—defining and planning for the documentation required prior to the technology acquisition transition decision.

Additional details and best practices are provided by the OSD *Managers Guide to Technology Transition in an Evolutionary Environment*.

Recommendation for a technology to enter into the acquisition cycle will depend on several factors. For example, transition will depend on the military utility, as determined by the operational user, the existence of a validated requirement (if the quantity is sufficient to necessitate a validated requirement), the maturity of the technology, the ease of integration

of the technology into an existing system and the availability of funding from the Program Management Office (PMO).

Not all technology projects will be selected for transition to the formal acquisition process. The user can conclude, for example, that acquisition is not justified or the technology may be integrated as part of a more complex system and be provided as an integral part of this system vice as a separate system.

As a technology matures, and the PM's level of support moves from Interest to Intent, the stakeholders (generally the primary acquisition and user organizations, with assistance from other participants) should prepare a detailed Transition Plan (TP). The TP provides for each technology project identified for transition, a top-level description of the technology with sufficient detail that the vital objectives, approach, critical events, participants, schedule, funding, and transition objectives are understood and (by endorsement) agreed upon by all relevant parties.

There is no single solution that meets all stakeholder needs in all situations. But substantial guidance is available. The statutory and regulatory requirements for acquisition are contained in the Deparatment of Defense (DoD) 5000 series regulations. Additional challenges and considerations for technology projects are included in Appendix B.

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4
MANAGEMENT FRAMEWORK

4.1 OVERVIEW

In order to effectively implement a TATM strategy and process, an effective management framework must be put in place. This framework must support the development of individual technology transition plans as well as integrated and coordinated technology transition plans across the PEO or other activity. The PEO will forward this integrated plan to the Army level for incorporation in the overall planning process.

This management framework (Figure 7–Management Framework Overview) should include all stakeholders and allow for development of individual system TATM products, as well as the integration of these into higher-level products. This process includes individual WIPT and an Executive IPT (EIPT) to integrate the results of the individual WIPTs. (Note: The EIPT may be supported by an Integrating IPT (IIPT) serving as the action office for the EIPT.) The overall results of the WIPTs and the EIPT results should be provided to a General Officer Steering Committee (GOSC) for acceptance before being forwarded to the service process.

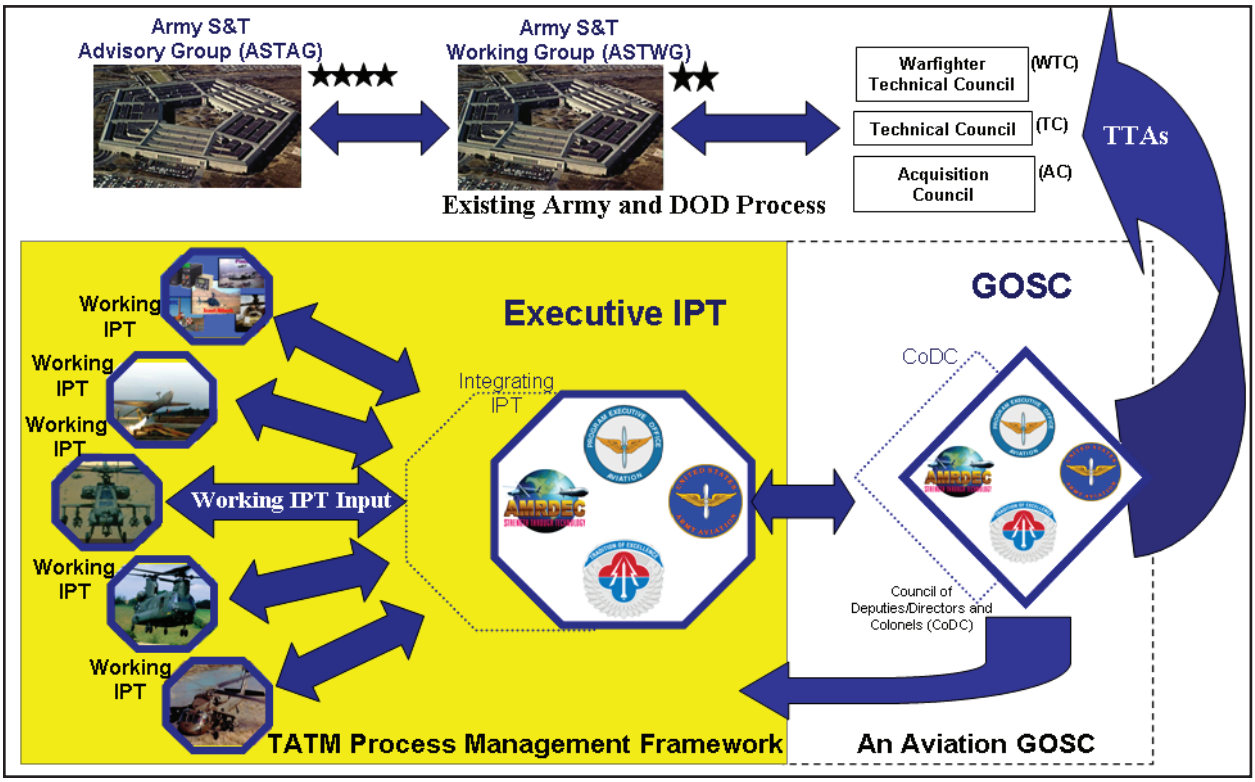

Figure 7. Management Framework Overview

4.2 WIPT

4.2.1 Objective

The objective of the WIPT is to conduct technology assessments to develop TTAs and Technology Transition Road Maps.

4.2.2 Organization

The organizational structure and membership of the WIPT (Figure 8) is at the discretion of the PM based on his/her unique program needs. WIPTs should include representatives from the:

WIPT

Organizational Structure of the WIPT at PM Discretion Based on Unique Progam Needs

- Conduct Technology Assessments, develop TTAs and Technology Transition Road Maps using TATM Process
  - — ID User Requirements (Near/Mid/Far) Applicable to PM System
  - — ID Current and Future PM Programs and/or System Improvements
  - — ID Related S&T Projects and Prioritize unfunded S&T initiatives
  - — ID Relationships Between Capabilities, S&T Projects, and PM Programs
  - — Prioritize S&T Projects for Potential Transition to PM System or Future Capabilities
  - — ID, Analyze and Quanitfy Risk
  - — Develop Mitigation Strategies for Areas Needing Risk Management
  - — ID Supportability Requirements
  - — Revise Technology Transition Agreements (TTAs)

Figure 8. WIPT

- PM Staff
- S&T Developers
- User
- Sustainer
- Resources managers and others as required to effectively identify and manage technology transition

4.2.3 Mission

The PM's WIPT should:

- Identify User requirements (near/mid/far term) applicable to the PM's system(s)
- Identify current and future PM program and/or system improvements and timelines
- Identify and prioritize S&T projects
- Identify relationships between capabilities, S&T projects and PM programs
- Prioritize S&T projects for potential transition to PM Systems or Future Capabilities
- Identify, analyze and quantify risks
- Develop mitigation strategies for areas needing risk management
- Identify supportability requirements
- Develop and revise TTAs
- Submit TTAs to PM and Associate Director, Aviation Technology for approval

4.2.4 Inputs

- Senior leadership guidance
- PM Program descriptions
- S&T project descriptions
- User Requirements descriptions
- Sustainment plans

4.2.5 Outputs

- Technology Transition Road Maps
- Technology Transition Agreements
- Risk Management Plans

4.2.6 Schedule

The WIPT should meet on a regular basis to assess the progress of the technology assessment and transition management process and to revise and update the PM related efforts as required. The WIPT should maximize use of

electronic/VTC means of communication to minimize time and resources consumed by physical Temporary Duty (TDY) travel.

4.3 IIPT

4.3.1 Objective

- Direct systems technology assessments
- Identify and prioritize technologies for transition and potential transition
- Submit system TTAs to EIPT for approval
- Identify and resolve issues; raise unresolved issues to the next level
- Approve TATM process changes

4.3.2 Organization

The management framework for the IIPT is shown in Figure 9. The IIPT should include:

- PEO Staff representative responsible for technology transition and integration
- S&T Manger responsible for all functional and project development within the S&T community supporting the PEO
- User representatives for defining requirements in the battlefield systems managed by the PEO
- Sustainer representative responsible for ensuring continued operational sustainment of the system in the field
- Others to consider include:
  - Resource managers
  - Testers
  - Industry
  - Other services and other organizations whose S&T activities will influence and affect the PEO's systems

4.3.3 Mission

The IIPT should consolidate, prioritize, and identify issues and impacts and recommend technologies for transition. This will be done by:

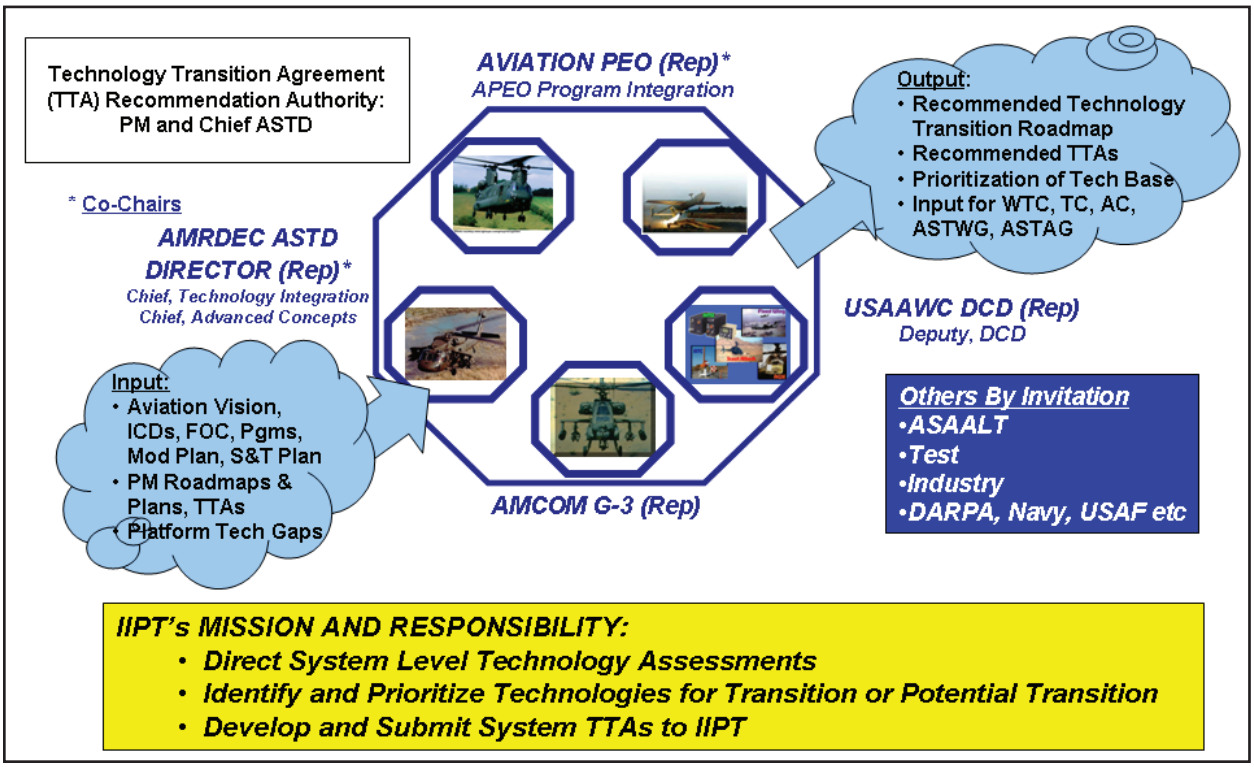

Figure 9. IIPT Management Framework

- Reviewing and revising road maps and TTAs
- Identifying resource requirements and assigning responsibilities for transition
- Providing input to the higher level service acquisition level program and S&T review bodies
- Developing consensus and providing S&T prioritization, issues and impacts, as well as system TTAs to the TATM Executive committee

4.3.4 Inputs

- Senior leadership guidance
- Inputs from the individual PM WIPTs
  - —Road maps
  - —TTAs
  - —Plans
- Vision statements
- Platform or system modernization plans
- S&T Plans

4.3.5 Outputs

- Recommended PEO level Technology Transition Road Maps
- Recommended TTAs for approval
- Recommended prioritized technology transition plans
- Issues requiring Executive Committee resolution
- Recommended input to the Planning, Programming, Budgeting, and Execution System (PPBES) inputs
- Other recommended Inputs for Service and OSD S&T Planning activities

4.3.6 Schedule

The IIPT should meet on a regular basis to review and integrate the products of the individual PM WIPTs and to prepare recommendations for the EIPT.

4.4 EIPT

4.4.1 Objective:

- Review individual PM technologies for transition, understand risks and approve TTAs
- Consolidate and prioritize technologies for transition
- Identify and recommend technologies to support service and DoD vision and strategy (if these technologies have not already been identified by the PMs)
- Resolve issues and raise unresolved issues to the next higher level for resolution

4.4.2 Organization

An example of a management framework for the EIPT is shown in Figure 10. The EIPT should include:

- Deputy PEO who provides PEO wide vision and perspective
- S&T Director responsible for all functional and project development within the represented S&T community supporting the PEO
- User representatives for defining requirements in the overall Battlefield Operating System (e.g. Aviation) whose acquisition is managed by the PEO
- Senior sustainment command representative responsible for ensuring continued overall sustainment of the field system
- Others to consider (by invitation only) include:
  - —Resource managers responsible for the PEO budgets at all levels within the DoD Financial system
  - —Testers
  - —Industry
  - —Other services and other organizations whose S&T activities will influence and affect the PEO's systems

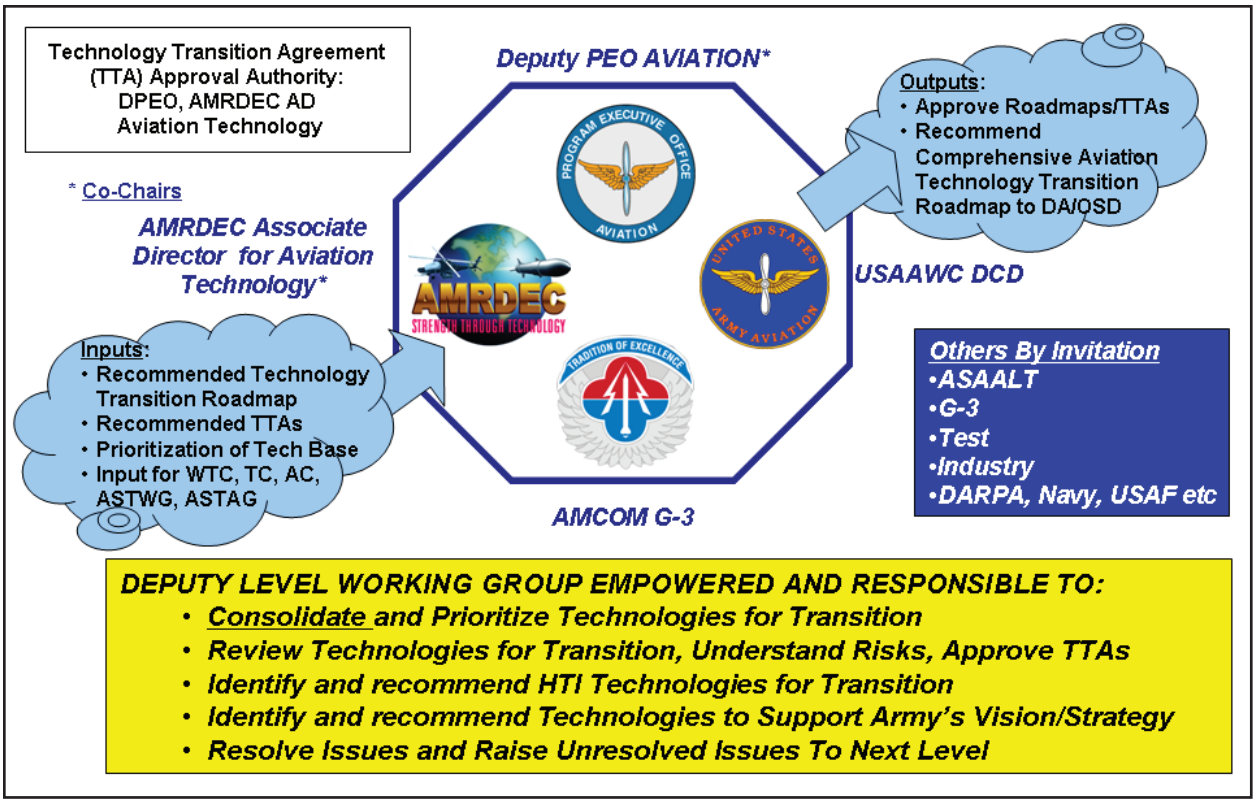

Figure 10. EIPT Management Framework

4.4.3 Mission

The IIPT should consolidate, prioritize, and identify issues and impacts and recommend technologies for transition. This will be done by:

- Review recommendations from IIPT
- Collectively review or reprioritize technologies for transition as presented by the IIPT based on:
  - —Initial Capabilities Documents (ICDs), FOCs and evolving capabilities (near/mid/far)
  - —Current and future programs supporting the Army's vision/strategy
  - —Relevant S&T Projects
- Identify and recommend Horizontal Technology Integration (HTI) technologies for transition
- Understand risks and approve TTAs
- Identify additional areas requiring risk management and assign responsibility
- Identify resources and responsibility for technologies identified to transition
- Raise unresolved issue to the next level
- Provide input for Warfighter Technical Council (WTC), Technical Council (TC), Acquisition Council (AC), Army Science and Technology Working Group (ASTWG) and Army Science and Technology Advisory Group (ASTAG), Army Materiel Command (AMC), and the GOSC.

4.4.4 Inputs

- Senior leadership guidance
- Inputs from the IIPT
  - —Recommended Technology Transition Road Maps
  - —Recommended TTAs
  - —Recommended input to Service and OSD management groups

4.4.5 Outputs

- Approved TTAs
- Approved Technology Transition Road Maps

- Other technology transition guidance for use by individual PMs and IIPT

4.4.6 Schedule

The EIPT should meet on a regular basis to review and approve the products of the IIPT and to prepare recommendations for the GOSC.

4.5 RELATIONSHIP TO SERVICE PROCESS

The TATM Process was developed to speed technology transition and reduce system and subsystem development cost, schedule, and performance risk for PEO programs and related S&T projects. It provides a common management of technology process, comprehensive assessments of supporting technology programs, an integrated tool suite that supports technology project assessment, a system for linking acquisition programs and S&T projects, and provides early identification of broader applications of emerging technology and horizontal technology applications. It will provide access to technology transition efforts, to aviation systems supported by S&T projects, and to warfighter capabilities that are met by the technologies being developed for use in the effective development of the S&T program to meet the U.S. Army Technology Objectives (ATOs).

5
ANNUAL TIMELINE

5.1 SYNCHRONIZATION STRATEGY

The TATM Process synchronization is detailed in the chart below. This annual process provides input to the Aviation Integrated Priority Lists (AIPL) (a process to prioritize Unfunded Requirements (UFRs) across the aviation community) as well as input to the TRADOC Chunk Assessment and the annual S&T review by the ASTWG and ASTAG. The TTAs and road maps will also serve as source documentation for the Aviation Transformation Strategy, which provides input to the Army Modernization Plan, as well as the Science and Technology Master Plan (STMP).

5.2 TATM ANNUAL TIMELINE

The TATM Timeline synchronizes with both Army and OSD processes and is represented in Figure 11 and Figure 12. The aviation annual execution timeline for the TATM process (to include working groups) is shown in Figure 11. This time line has been developed to integrate with the ongoing aviation synchronization efforts (Figure 12) for the bi-annual PPBES timeline.

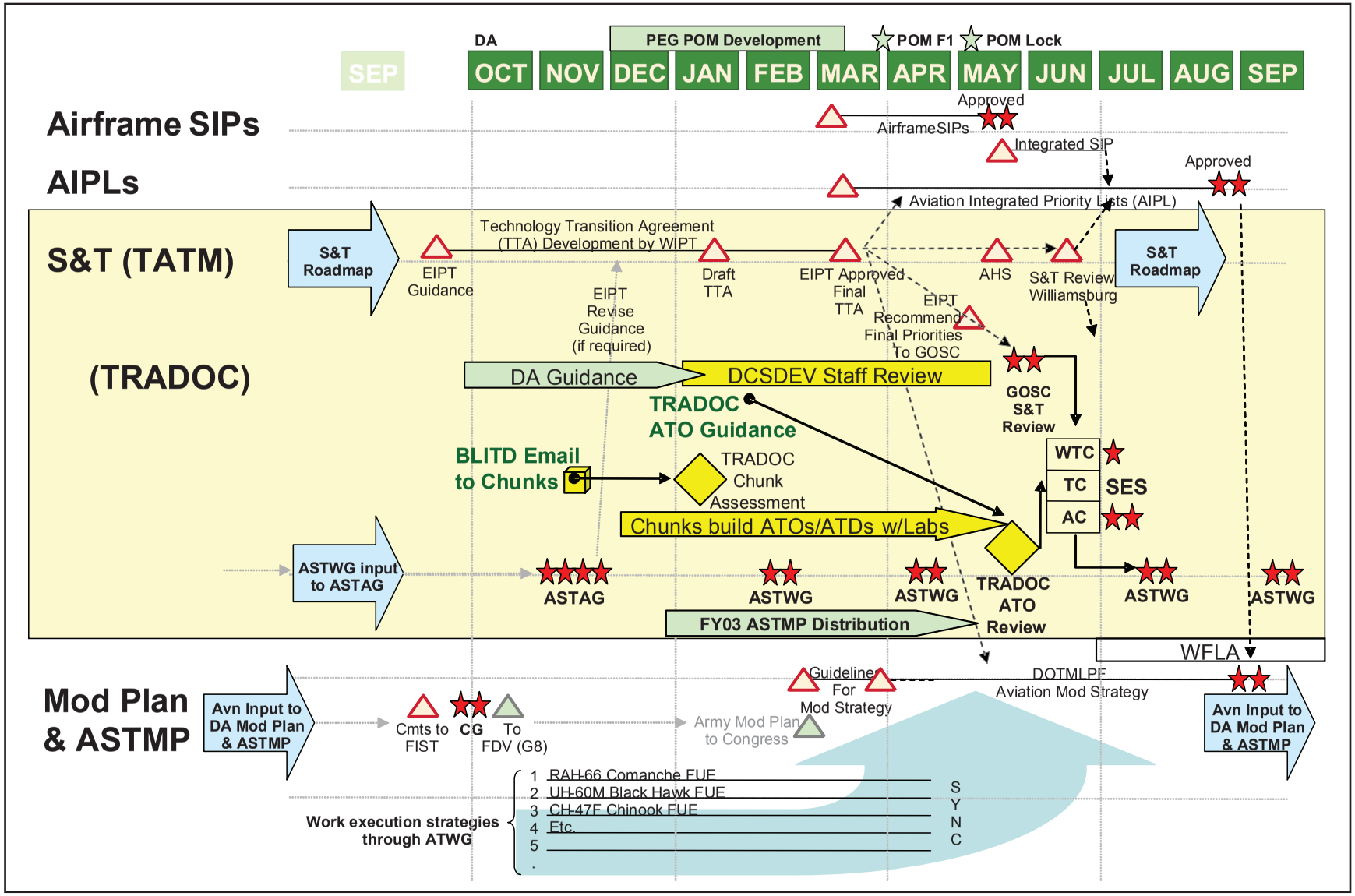

Figure 11. Aviation Synchronization Strategy

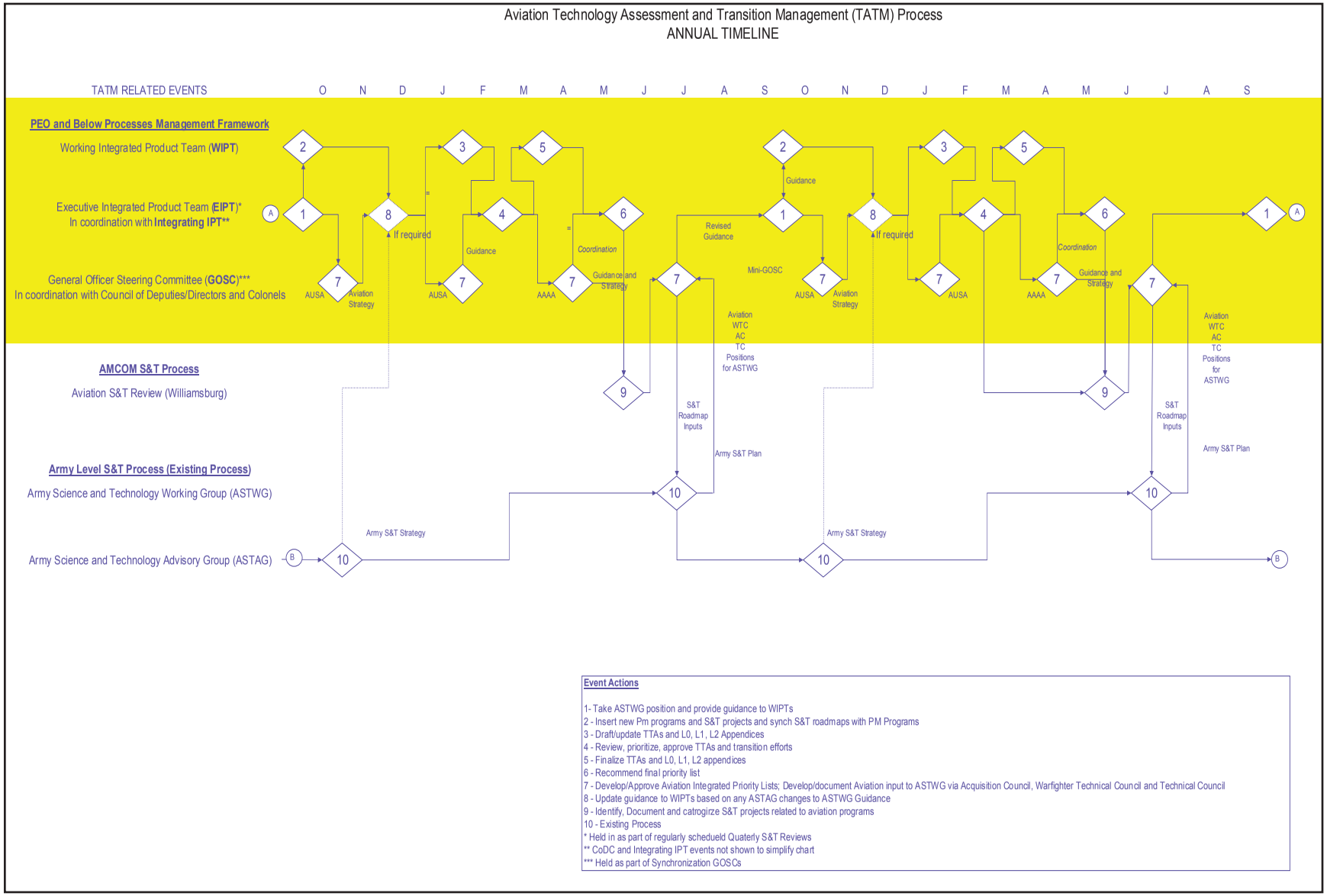

Figure 12. B-Annual Timeline

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6
TATM TOOL SUITE

6.1 DESCRIPTION

The TATM Tool Suite is the central knowledge management portal for the TATM process. It provides the Acquisition, S&T Development, User, and Sustainer communities with a common environment for conducting shared assessments of technology transition planning.

The TATM Tool Suite is a Web Enabled database product that stores the information generated from all stages of the TATM process and generates the reports needed to make the critical decisions and manage risk. It provides a Graphical User Interface (GUI) database application that will store S&T and Platform data required to support technology assessment activities and to assist in the transition of technologies to the User.

Once an S&T Project has been entered into the TATM Tool Suite, a relationship between that S&T Project and an Acquisition Program can be established. The TATM Process provides a process in which this relationship, between the S&T Project and the Acquisition Program, can mature to a TTA. The TATM Tool Suite is the knowledge management system that will track the maturing of this relationship. The TATM Tool Suite will manage the information required to support technology assessment activities and also assist in the transition of technologies to the end user.

6.2 INPUTS

The TATM Tool Suite is the data repository that aggregates information generated at all stages of the TATM Process. It provides intelligent structure and intuitive reports for making critical decisions and managing risks that are involved in transitioning S&T Projects to an Acquisition Program. This relational database of essential Acquisition Program and S&T Project information supports technology assessment activities and assists in the transition of technologies from the workbench to the end user.

Data input to the tool is controlled by user permissions. The Advanced Science and Technology Directorate (ASTD) TATM Process Points of Contact (POCs) are the control point for establishing user data entry permissions. The ASTD is responsible for entering and updating the S&T Project information (narrative, schedule, funding, etc.) using the source information from the S&T Project managers and/or other S&T databases.

The WIPT PM representative is responsible for entering and updating system/platform information to include schedules, funding, and major milestones.

The WIPT TC is responsible for entering WIPT technology criticality assessments, priorities, and risk analysis inputs. The sustainment representative provides and may input the

sustainment impacts. The user representative is responsible for providing the FOC narratives, identifying S&T Project applicability to FOCs, and supporting requirements documentation.

6.3 OUTPUTS

The TATM Tool Suite is not only a data repository. It will also generate a number of reports that will help in the transitioning of the S&T Project to the end user. These reports will also play an essential role in helping an Acquisition PM find on-going S&T Projects that are stored in the TATM Tool Suite. Examples of each of these reports are included in Appendix A.

Some reports focus on helping S&T Projects identify Acquisition Programs that align with their schedule. Other reports allow the User Community to monitor the status of S&T Projects with a focus on meeting FOCs. All reports generated by the TATM Tool Suite are customizable to individual needs.

6.3.1 Road Map Reports

One of the reports generated from the TATM Tool Suite is the "Road Map." This report is generated as a spreadsheet that combines the Acquisition Program schedule and all its related S&T Projects. These links are defined within the tool suite by assigning each S&T project to one or more Acquisition Programs. Each S&T project can also be assigned to related FOCs as defined in pull-down menu options. The Road Map allows the managers to see, at a glance, relationships between the S&T Projects and the Acquisition Program. This simplifies rapid decision making about the criticality between S&T Projects and the Acquisition Program. The road map allows management to conduct risk analysis for their Acquisition Program and mitigate potential problem areas in a timely manner.

6.3.2 S&T Reports

S&T reports are focused on allowing insight into S&T Project details (i.e., schedules, TRL, POCs, funding, etc.). This provides IPT and management teams the rationale they need to gain and retain the necessary funding for the S&T Projects. It also gives the Acquisition Program's management the ability to more effectively communicate with the S&T Project management. In this way, all affected participants can conduct detailed analysis of the S&T Project maturity, risk, schedule, and cost as an equally well-informed team.

6.3.3 Cross-Reference Matrix Reports

These reports produce a cross-reference between the Acquisition Platforms and S&T Projects in the TATM Tool Suite. They help identify HTI candidates. The reports show Acquisition Platforms as columns and S&T Projects as the rows in a spreadsheet. The maturity of the relationship between each S&T Project and Acquisition Program is shown in each cell of the spreadsheet.

6.3.4 Platform Transition Planning Reports

The purpose of the transition planning report is to quickly show stakeholders the acquisition platforms that are interested in transitioning a particular S&T Project onto their platform. This report can be broken down into individual acquisition platforms and can be directly dropped into the platform's TTA as an appendix to aid in understanding the platform's intent level for the S&T Project(s).

6.3.5 Management Reports

The reporting capability of this area is focused on gathering metrics to monitor the progress of the TATM Process and to identify potential areas of concern. The correct resources can be put in place to minimize risk as technology development progresses if potential risk is identified up front.

APPENDIX A

TEMPLATES AND SAMPLES

A.1 INPUT FORMATS

A.1.1 User Requirements/FOC Coordination

Template:

INPUT: Requirements, Force Operating Capabilities or Other
SOURCE: Provided by the User
Requirements Documents**
Future Operational Capabilities**
Other statement of expected or actual need**
Prioritization of needs—e.g., System Improvement List + more future needs as coordinated with PM
** As related to the specific project and program being assessed

A.1.2 PM Program Definition

Template:

INPUT: PM Program Description
SOURCE: Program Manager
Program name:
POC:
Schedule (high level by quarter (QTR) fiscal year (FY)):
Major Milestones (milestone decisions, major tests, Assessments, etc.):
Block Improvement dates:
Capabilities planned for each block (if appropriate):

A.1.3 S&T Project Definition

Template:

INPUT: S&T Project Description
SOURCE: S&T Project Manager
Project Name:
Executing Agency:
Brief Description:
Application (PM and Platform):
System Breakdown Structure application:
a. System Breakdown structure under development
Requirement/FOC/Capability Supported (Payoff):
Funding category (6.2, 6.3, etc.):
Funding Source/descriptor (ATO/ATD/ACTD/etc.):
POC, phone and e-mail:
Schedule with TRL levels by QTR:
Funding (funded program only) by FY:
Technology Challenges:
Technology Approach:
Issues (funding, schedule, risk and general):
Acceleration Possible? (Yes or No):
Rationale—Why can you accelerate or why not?:

A.1.4 Sustainment Plan Definition

Template:

INPUT: Requirements, Life Cycle Logistics
SOURCE: Acquirer/Sustainer Logistician
Project Name:
Acquisition Logistics POC:
Sustainment Logistics POC:
Maintenance Planning:
Supply Support:
Manpower and Personnel Requirements:
Technical Data:
Technical Support:
Technical Publications:
Software and Computer Resources Support:
Training and Training Support:
Tools/Special Test Equipment:
Support Equipment:
Depot:
Facilities:
Packaging, Handling, Storage, and Transportation:
Design Interface:
Other statements of expected impacts or needs for life cycle logistical support:

A.2 ROAD MAP EXAMPLES

A.2.1 Road Map Reports

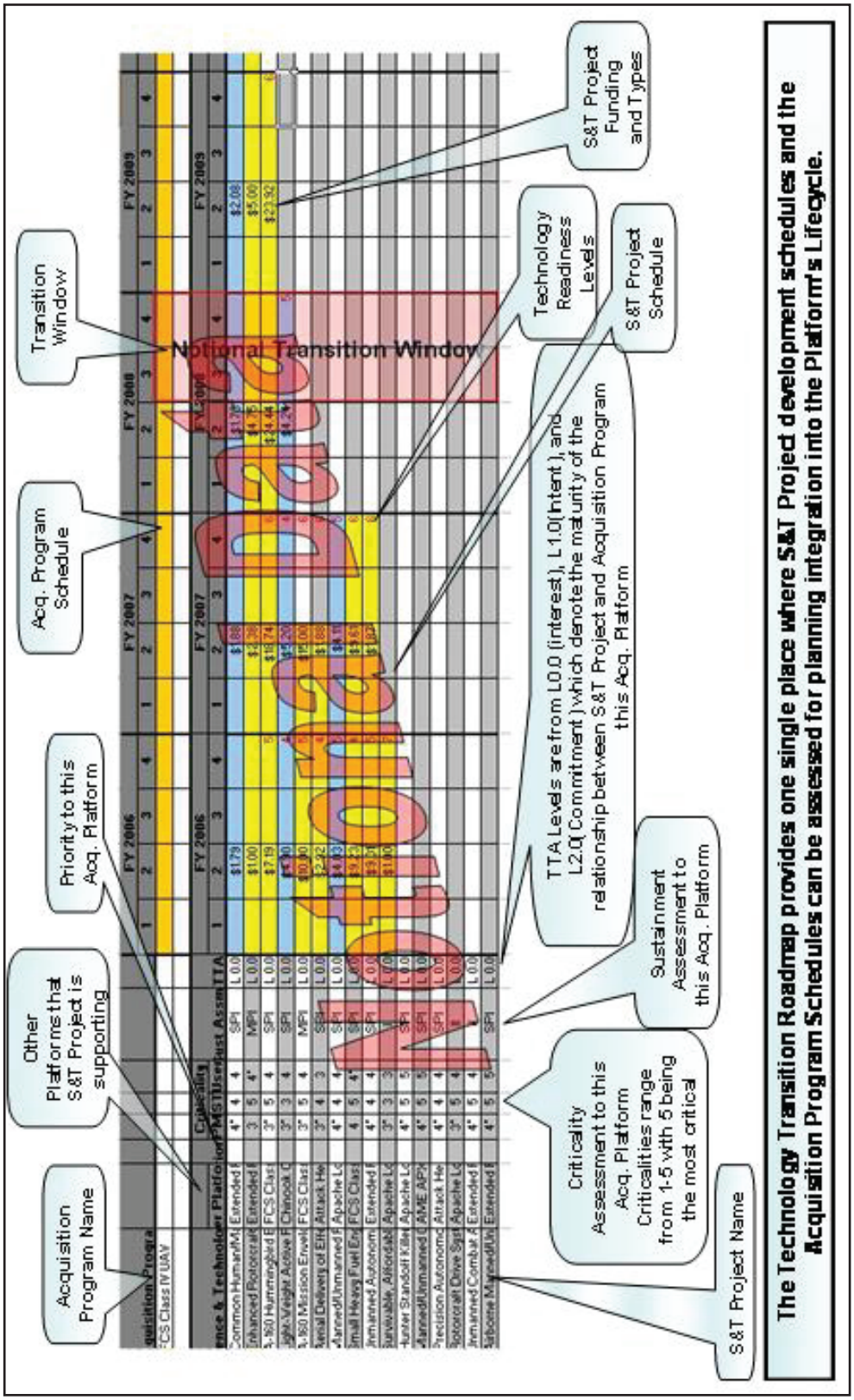


Figure 13. Technology Transition Road Map Report

A.2.2 S&T Reports

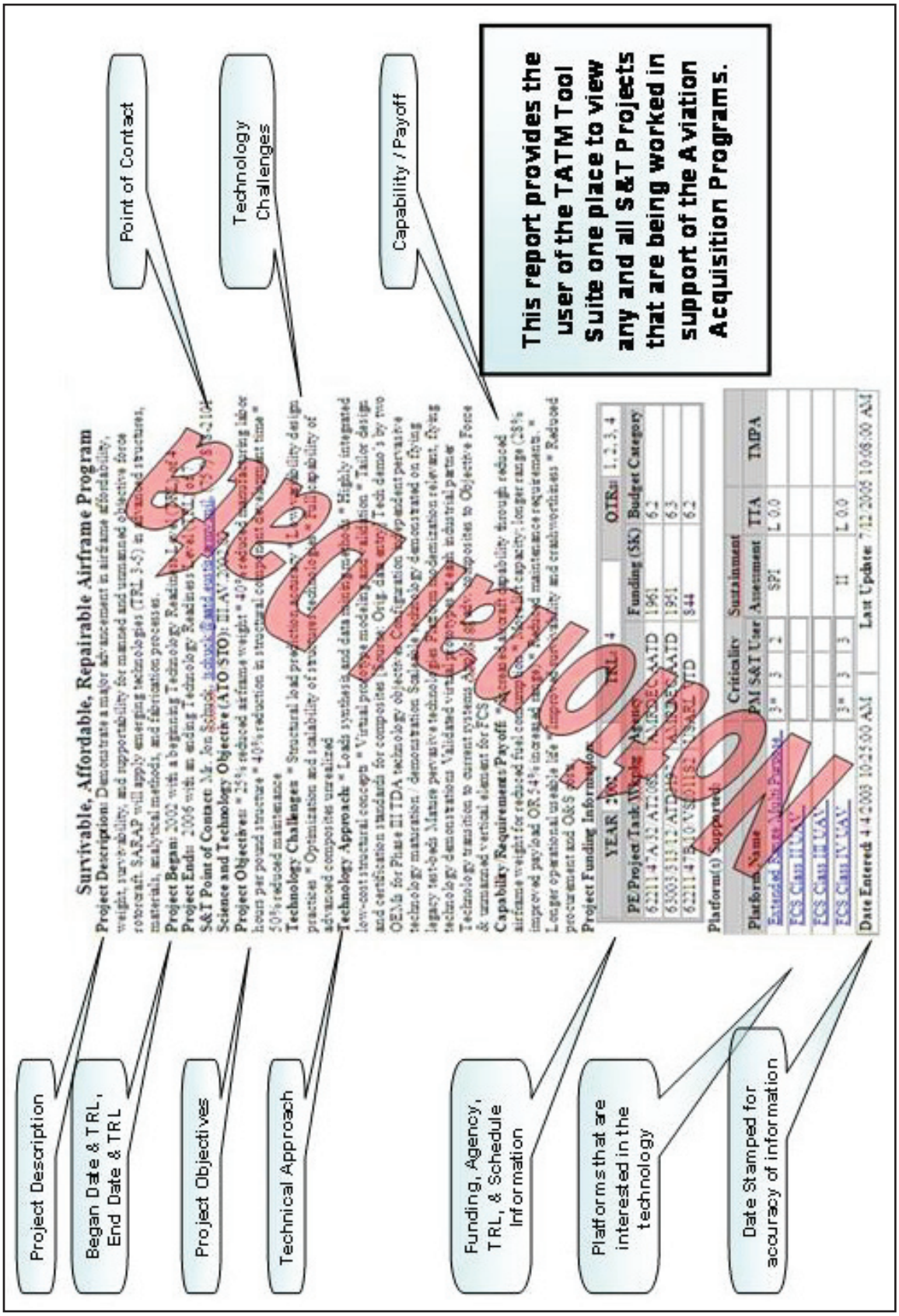


Figure 14. S&T Project Details Report

A.2.3 Cross-Reference Matrix Reports

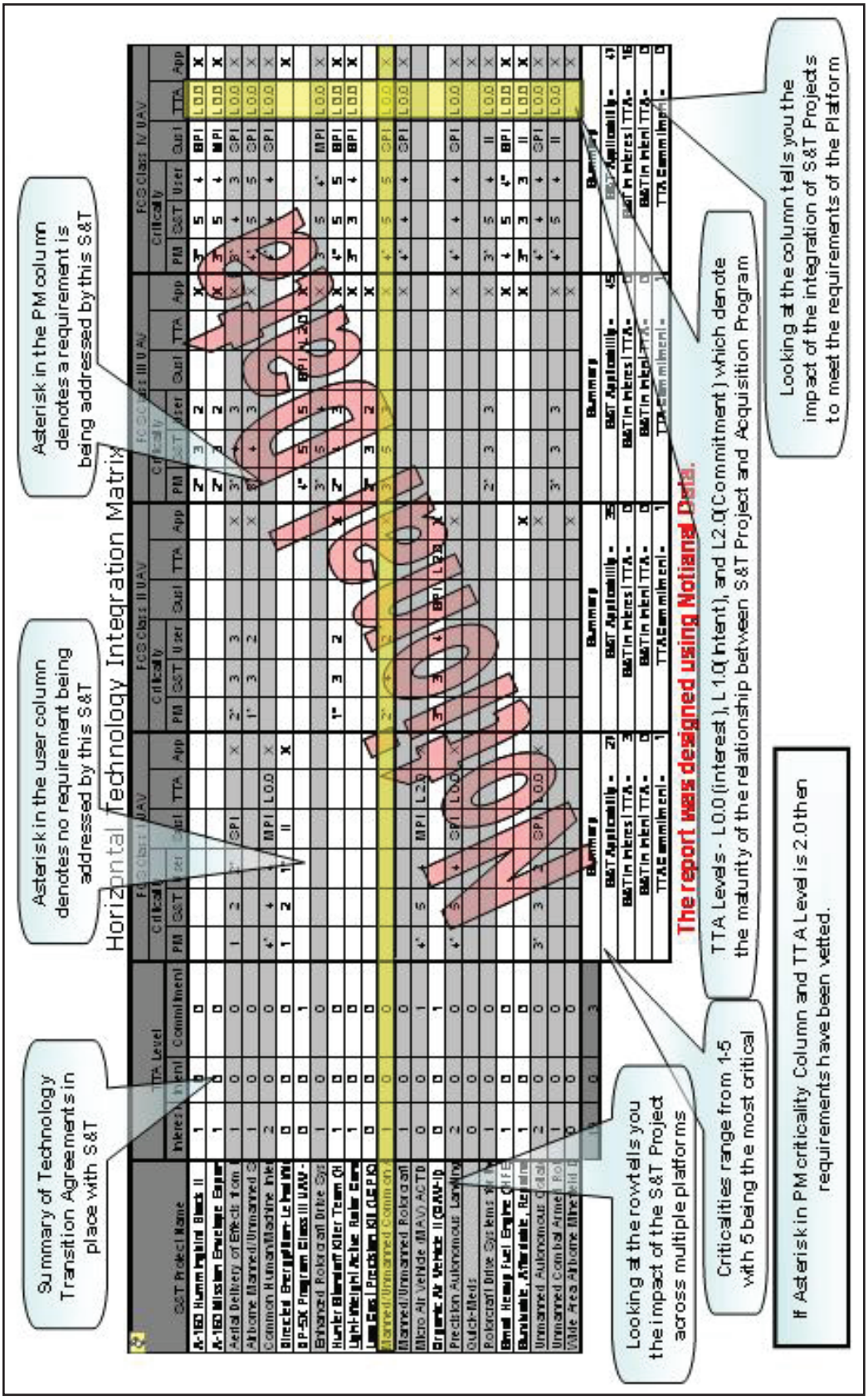
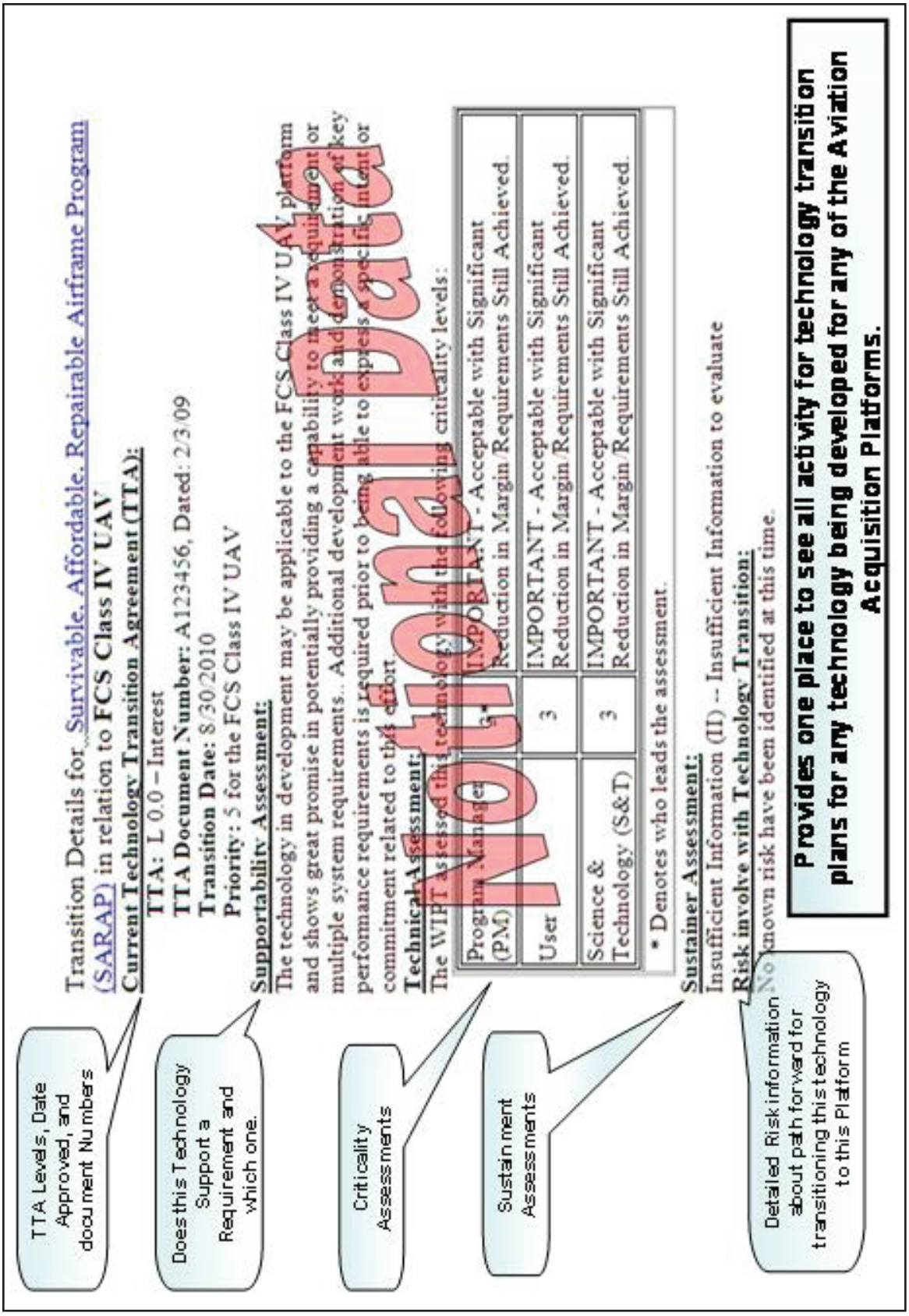


Figure 15. Horizontal Technology Integration Report

A.2.4 Platform Transition Planning Reports



A.2.5 Management Reports

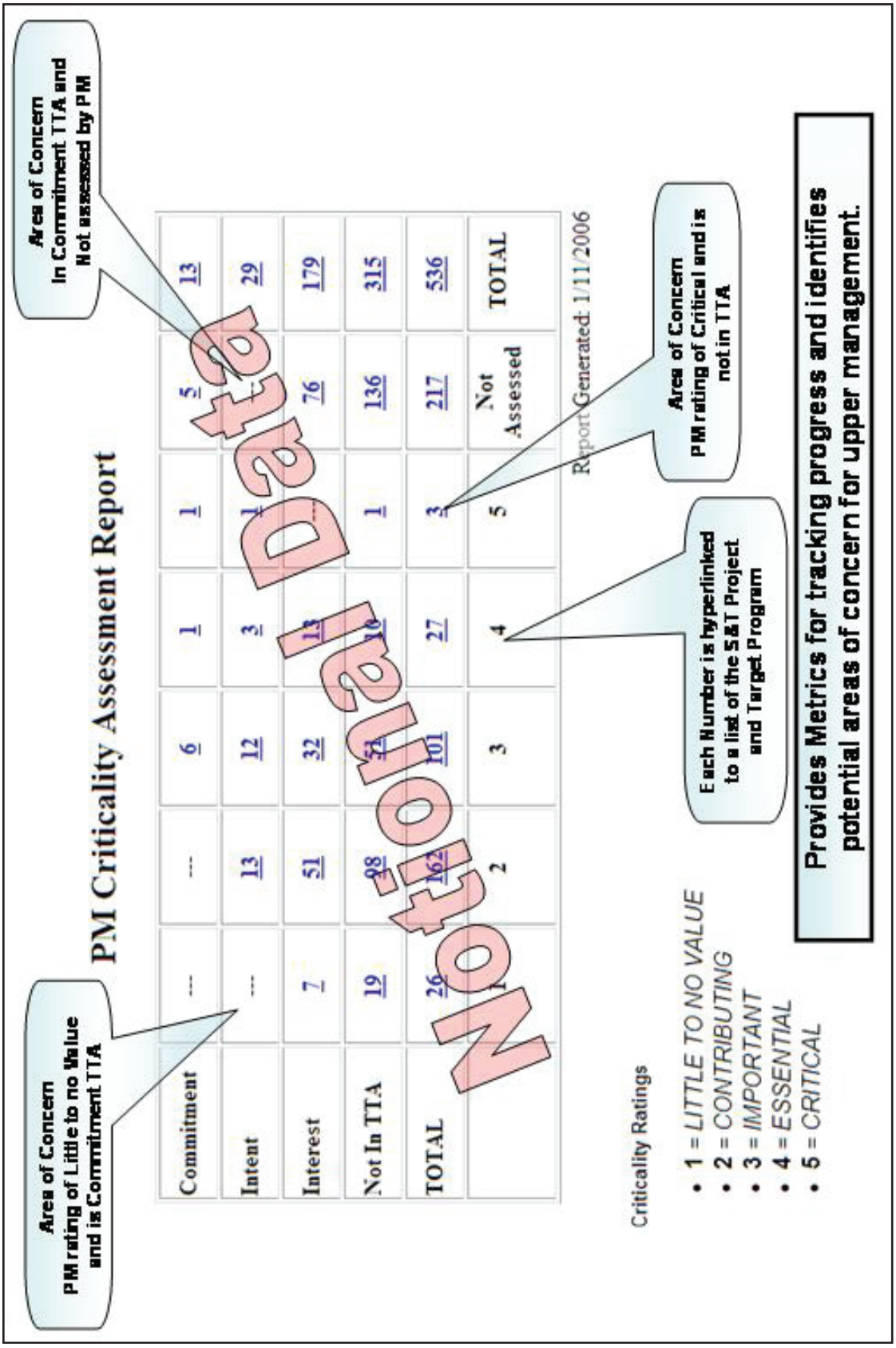


Figure 16. PM Criticality vs. TTA Level Matrix

A.3 TTA TEMPLATES

A.3.1 Elements Provided by the Program Office

Targeted Acquisition Program.

Provide a brief description of the acquisition program to receive the technology/product. Include:

- Major program objectives.
- Current phase of the acquisition life cycle.
- Projected initial operational capability date.

PM/Project Officer.

Identify personnel responsible for day-to-day program/project management:

- PM and contact information
- Project Officer and contact information

Acquisition Program Technology Need.

Identify the technology needs of the acquisition program that S&T is expected to provide. Briefly describe the benefit that the technology/product will bring to the acquisition program:

- Relate the benefit to the appropriate Requirements Document and/or Key Performance Parameters (KPPs), etc.
- Include need dates for specific capabilities (e.g. linked to block upgrades).
- Provide an estimate of the TRL for each technology/product need identified utilizing a systems approach for hardware and software as the measure of technical maturity and indication of transition readiness. Coordinate the TRL with the S&T activity.

Integration Strategy.

Describe the process for integrating the technology/product into the acquisition program. Include the following elements of acquisition strategy:

- Evolutionary acquisition, block upgrade, etc.
- Required contractor-to-contractor agreements
- Acquisition Program Element (PE) numbers funding the transition
- Annual PE funding levels committed to the transition program
- Transition FY
- Statement conveying the level of commitment: Interest, Intent, or Commitment.

For example:

Interest: "The technology in development may be applicable to the XXX system and has shows great promise in potentially providing a capability to meet the requirements of YYY or may provide WWW capability. Additional development work and demonstration of key performance requirements is required prior to being able to express a specific intent or commitment related to this effort."

Intent: "Upon successful demonstration of key performance requirements (exit criteria), PM XXX (acquisition program office) intends to integrate XXX (product S&T DEVELOPER is delivering) into XXX (acquisition program that will integrate S&T DEVELOPER deliverable) commencing in FYXX (transition year) under PE XXXXXXX Project XXXX (FYDP budget profile).

Commitment: "Upon successful demonstration of key performance requirements (exit criteria), PM XXX (acquisition program office) will integrate 6-11 XXX (product S&T DEVELOPER will deliver) into XXX (acquisition program

that will integrate S&T DEVELOPER deliverable) commencing in FYXX (transition year)." This integration effort will be funded under PE XXXXXXX, Project XXXX (Future Years Defense Program (FYDP) budget profile for this acquisition line should be included).

A.3.2 Elements Provided by the S&T Activity

Description of Technology/Product or Capability to be Delivered.

Briefly describe what the S&T activity intends to develop for transition to the acquisition program. Include capability delivery dates.

Technology Manager.

Identify the individual designated by the S&T activity to coordinate day-to-day management of the technology/product development and list contact information.

Current Status of Technology/Product.

Summarize current state of development. Identify primary areas where additional development is required and provide an estimate of current TRL. Prioritize and discuss major areas of technical risk. Identify planned mitigation activities to address technical risk (e.g., producibility, affordability, sustainability). Cost and schedule risks and mitigation activities should also be included as appropriate.

Technology Development Strategy.

Outline planned approach. Include:

- Efforts required beyond those currently underway.
- Integration plans if multiple projects are planned.
- Planned ATD or ACTD developments, if applicable.

Exit Criteria (Key Technical Measures of Readiness) for Transition.

Identify quantifiable criteria that will be used to measure whether the technology/product development effort is proceeding appropriately. Provide:

- Definitive, complete, measurable parameters to be tracked, to include performance, physical attributes.
- Conditions under which technology/product will be tested/demonstrated prior to delivery to acquisition.
- Current performance of the technology/product.
- Minimum acceptable performance threshold.
- Desired final goal/objective.
- Estimate of the transition TRL, coordinated with the program office.

Program Plan.

Show major activities/efforts planned for the technology/product development with milestones. Include both S&T and acquisition tasks/elements.

A.3.3 Elements Provided by the Requirements Organization

Requirements Officer and Capability Requirement Basis.

Identify the requirements officer and governing source of the capability requirement (for example, requirements documents), or other official reference documenting the capability need.

Requirements Development Plan.

If a formal requirements document does not exist, the appropriate FOC or Force Level

Capability should be referenced and the plan to develop a requirements document included.

A.3.4 Elements Provided by the Sustaining Organization

Targeted Acquisition Program Name.

Acquisition Logistician:

Provide brief description of acquisition program to receive technology/product include:

- Major program objectives
- Current phase of the acquisition life cycle
- Projected initial operational capability date
- Supportability Concept (identification of categories of support for the interim and objective capabilities)

Develop logistics deliverables/requirements time lines to meet programmatic goals

Life Cycle Management Center/Sustainer:
Provide consolidated input of requirements

- Identify required Sustainment personnel and contact information responsible for each of the logistics support elements.
- Relate the logistics benefits to appropriate Requirements Document and/or KPP

Acquisition Program Technology Need

Develop and provide logistics risks and deliverables/requirements time lines to meet programmatic goals

A.3.5 Distribution

Once approved, the TTA should be provided to the principle stakeholders and effected S&T project managers. The approved TTA distribution should include:

- All WIPT members
- System/platform PM/APM
- Director of ASTD
- APEO-A Program integration
- Director of Combat Developments, USA AWC
- Platform TSM, USA AWC
- AMCOM G-3
- Deputy PEO AV
- AMRDEC Associate Director for Aviation Technology
- All S&T project managers identified in the TTA

A.4 SAMPLE TRANSITION AGREEMENT

TECHNOLOGY TRANSITION AGREEMENT FOR THE SAMPLE PROGRAM

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3. Technology Transition Summary
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Figure 3 SPO Technology Transition Roadmap
Table 1 SAMPLE ECP S&T Criticality/TTA Matrix
Table 2 SAMPLE E S&T Criticality/TTA Matrix

1. Overview

1.1. Introduction

The Program Executive Office (PEO) Aviation is the Army manager for the Apache Helicopter, Cargo Helicopter, Utility Helicopter, Unmanned Aerial Vehicle Systems, and Aviation Systems acquisition programs. The PEO reports directly to the Army Acquisition Executive. Within PEO Aviation, SAMPLE systems are managed by the SAMPLE Project Office (SPO). The US Army Aviation and Missile Research, Development and Engineering Center (AMRDEC) is responsible for aspects of aviation research, from basic through applied research, to advanced development. The AMRDEC, with staff planning support provided through its Advanced Science and Technology Directorate (ASTD), pursues the generic research with application across all US Army Aviation current aircraft and future systems, subsystems, and components. Coordination between the SPO and the AMRDEC ASTD enhances technology development and its transition paths to Army SPO Systems. Additionally, the SPO can provide guidance to the AMRDEC technology programs by continuous interaction and forecasting SPO System capability and mission needs in coordination with the US Army Aviation Center Training and Doctrine Command (TRADOC) System Manager SAMPLE (TSM-S).

1.1.1. Purpose

The purpose of this Technology Transition Agreement (TTA) is to improve long-range planning by mutually identifying appropriate technologies and transition opportunities, resolving existing operational and material problems, and enhancing system performance

of the SAMPLE and potential follow-on SPO systems. The intent is to improve the technology transition process, reduce the time to integrate new technologies and field them as soon as practical.

1.1.2. Technology Assessment and Transition Management Process (TATM)

In response to a recognized need to more rapidly transition technology to aviation systems, PEO Aviation, AMRDEC, the US Army Aviation Warfighter Center (USAAWC) (representing the user), and the Aviation and Missile Command (AMCOM) (representing the sustainer), facilitated by the Defense Acquisition University, combined to develop the TATM process. These four stakeholder organizations executed a Memorandum of Agreement in March 2004 to formally implement the TATM process, with the overarching goal that technologies being developed for U.S. Army aviation platforms meet the demands of the warfighters and are transitioned efficiently and effectively into their hands. Other key objectives include: reduce system and subsystem development cost, schedule and performance risk for PEO programs and related Science and Technology (S&T) projects. The TATM effort provides a common management of technology transition process, comprehensive assessments of supporting technology programs, an integrated TATM Tool Suite that supports technology project assessment, linking system acquisition programs and S&T projects, and provides early identification of broader applications of emerging technologies and horizontal technology applications. For more information about the TATM process, refer to the TATM Process Guide, http://acc.dau.mil/docs/tatm/. The TATM process utilizes an IPT structure to accomplish these objectives. The management framework consists of three levels of IPTs, (WIPT, IIPT, & EIPT) with each level co-chaired by PEO Aviation and AMRDEC.

1.1.3. TTA Levels

The S&T projects identified as supporting the platforms covered in this document fall into three TTA levels: Interest (L 0.0), Intent (L 1.0), and Commitment (L 2.0). Those programs that have been identified as having future potential to address platform requirements or Future Operational Capability (FOC) gaps are in TTA L 0.0. The S&T project manager acknowledges that the platform Project Office (PO) has a future need and the PO endorses the S&T project, but has not identified any resources or plans to transition the technology to the platform. Those S&T projects which have been identified as being essential or critical to meeting future needs or FOC gaps and which the PM has the "intent" to plan and resource the transition of the technology to the platform are in TTA L 1.0. Once the PO has committed resources and begun the transition planning process, the S&T project advances to TTA L 2.0.

1.2. Agreement and Responsibilities

In accordance with the TATM process and guidelines the SPO, the AMRDEC, the USAAWC, and the AMCOM agree to the following as it pertains to the TATM process

and the transition of technologies to platforms managed by the SPO. Coordination between the SPO and the AMRDEC enhances technology development and its transition to the fleet. Additionally, the SPO can provide guidance to the AMRDEC technology programs by continuous interaction and forecasting program capability and mission needs in coordination with the TRADOC System Manager SAMPLE (TSM-S) and USAAWC.

1.2.1. SPO

The SPO is responsible for the safety and fleet management of the US Army's fleet. The SPO is also responsible for planning and incorporating upgrades and improvements required to maintain the SAMPLE as a viable battlefield system for the foreseeable future. The SPO shall identify a co-chair for the SPO Working-level Integrated Product Team (WIPT) who shall be the primary action officer within the SPO for this TTA and the TATM process.

Specifically, the SPO technology action officer shall:

• Include the ASTD Technology Coordinator (TC) in periodic updates of acquisition roadmap plans.

• Participate in reviews of S&T projects with potential for incorporation onto SPO platforms.

• Review candidate S&T projects, SPO Integrated Priority List (IPL) and include appropriate funding requests during the annual Aviation Integrated Priority List (AIPL) process.

• Provide the SPO Platform Roadmap.

• Co-develop TATM roadmaps semi-annually.

• Co-develop transition strategies for integration of priority technologies.

• Coordinate and staff the SPO TTA.

1.2.2. AMRDEC

The AMRDEC is responsible for aspects of aviation research, from basic, through applied research, to advanced development. The AMRDEC, with staff planning support provided through its Advanced Science Technology Directorate (ASTD), pursues the generic research and technologies with application across all US Army Aviation current aircraft and future systems, subsystems and components. The ASTD shall identify a TC who co-chairs the SPO WIPT, actively seeks technology which addresses SPO platform requirements and FOC gaps, and acts as administrator for the SPO TTA.

Specifically, the TC shall:

• Participate in reviews of S&T projects with potential for SPO incorporation.

• Include the SPO in periodic reviews of S&T projects with potential for the technology insertion.

• Provide quarterly updates and reviews of S&T project status for items that the SPO has interest, intent or commitment.

• Coordinate between the SPO and the individual S&T project managers to facilitate effectively the transition of technology.

• Co-develop SPO S&T Transition Roadmap(s) semi-annually.
• Draft and staff the SPO TTA.
• Administer the TATM Tool Suite.

1.2.3. USAAWC

The TSM for SAMPLE and USAAWC Directorate for Combat Developments (DCD) provide future operational concepts and requirements that determine enabling capabilities that technology managers strive to achieve. The USAAWC shall identify TSM and DCD representatives to the SPO WIPT who identify material requirements, FOC gaps, assess the impact of potential technologies on resolving needs, and the implications of the gaps to doctrine, organizations, leadership and training, personnel, and facilities.
Specifically, the USAAWC representative(s) shall:
• Attend meetings of the SPO WIPT.
• Identify SPO platform requirements and FOC gaps.
• Participate in developing the SPO System Improvement Plan (SIP) and the AIPL.
• Assist with TATM roadmap, updating priorities, and drafting of SPO TTA.
• Manage and revise SAMPLE capabilities documents (e.g., ICDs, CDDs, and CPDs) as necessary to keep them aligned with evolving interoperable system requirements and technology.

1.2.4. AMCOM, IMMC

The Integrated Material Management Center (IMMC) ensure that technology efforts do not have a detrimental impact on aircraft sustainment and that life-cycle management support is planned. The IMMC shall identify representatives to the SPO WIPT who identify logistics and life-cycle issues relevant to SPO platforms. Specifically, the IMMC representatives shall:
• Attend SPO WIPT meetings.
• Assess technology insertion impacts on sustainment.
• Identify logistics and sustainment issues that require a technology solution.

1.2.5. Others

The primary offices for project management of common aviation onboard and ground mission equipment, electronic survivability equipment, and flight crew equipment for Army aviation will be part of the WIPT as the need arises. Their representatives shall:
• Attend the SPO WIPT meetings as required.
• Identify appropriate R&D projects for incorporation into SPO planning.
• Provide project information and updates as required to the SPO WIPT.

1.3. SPO WIPT Points of Contact

1.3.1. NSPO

Co-Chair SPO
TATM Lead
Office-Symbol
phone
email

1.3.2. AMRDEC, ASTD

Co-Chair AMRDEC ASTD
Technology Coordinator (TC)
Office-Symbol
phone
email

1.3.3. TSM-S

User Representative
Office-Symbol
phone
email

1.3.4. AMCOM, IMMC

Sustainer Representative
Office-Symbol
phone
email

2. Platform Program Plan/Requirements

2.1. Platform Master Schedule and Roadmap.

The SAMPLE is one of Army aviation's legacy systems. The SAMPLE A began fielding in the late 19xxs with an initiation of modernization to SAMPLE B model series in the late 19xxs. The SAMPLE A average age is xx years old; the SAMPLE B average age is x years old. The average age of the fleet is now xx years. The high probability that they will be in use for another 20- 30 years makes their continuous improvement of paramount importance. The SPO is charged with SAMPLE fleet management and is extending the

fleet's service life and providing the necessary upgrades for the fleet to remain viable on the battlefields of the future. The US Army Aviation Modernization Plan provides a clear picture of the users' future needs. To achieve these goals, the SPO has developed the SAMPLE Road Map. The SAMPLE Road Map represents the vision of the SPO for the SAMPLE system over a 10-15 year period. This vision is based on the SPO perspective and understanding of potential improvements to keep the SAMPLE a viable system over its perceived lifetime. The SPO has also coordinated a User Requirements List (URL) with the TSM-S, which represents the SAMPLE user. The URL is a prioritized listing of requirements from the user's perspective. Both the SAMPLE Road Map and the SAMPLE URL are updated annually. Currently the SPO has one major program window of opportunity for potential S&T projects to transition to the SAMPLE fleet. This window of opportunity for technology transition is with the SAMPLE C. This transition window has been identified by the SPO in the Technology Insertion Roadmap as illustrated in Figure 1 and with the Program Roadmap depicted in Figure 2. Other viable technologies that mature before or after this window of opportunity will be considered for transition through the Engineering Change Proposal (ECP) process.

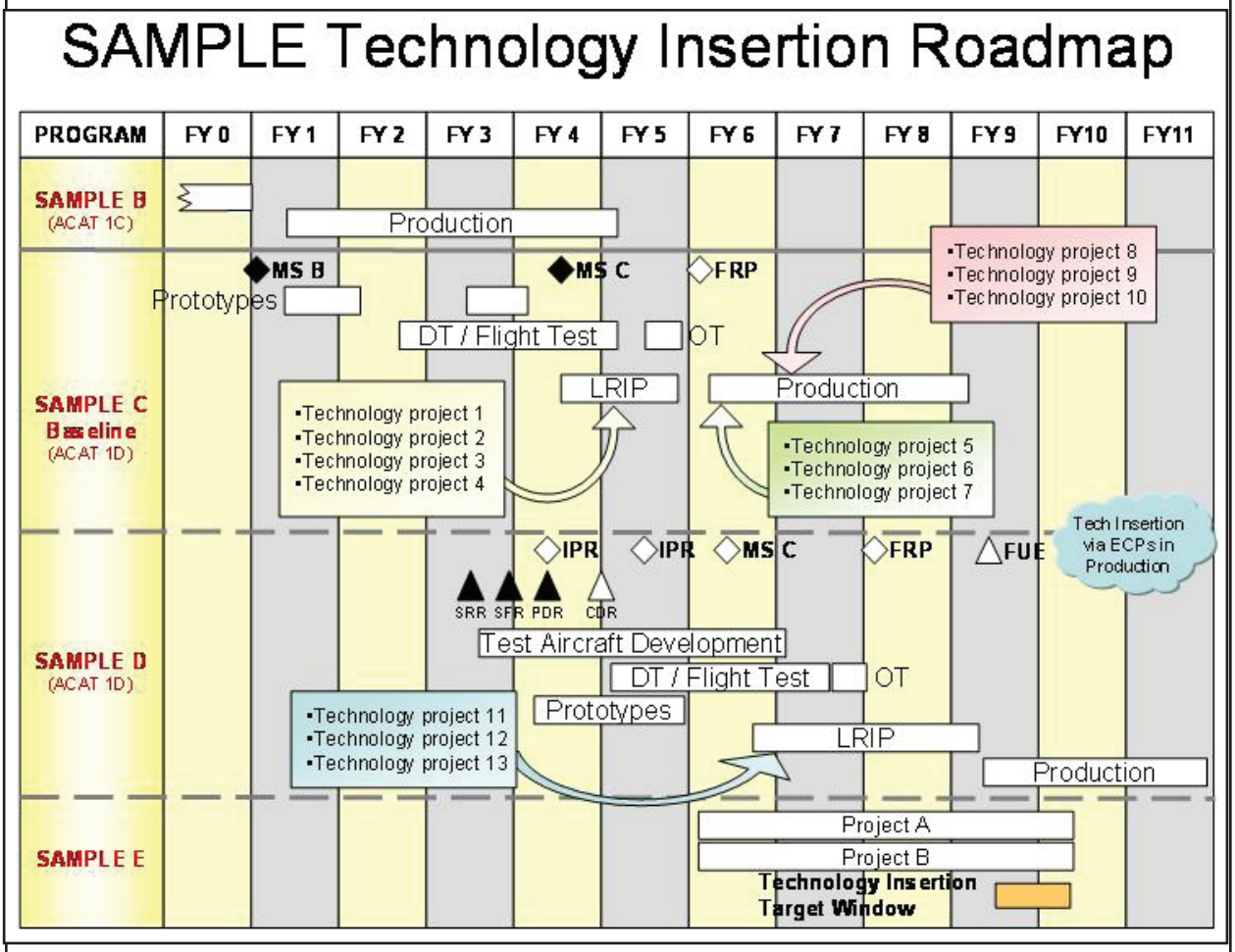

Figure 1. SPO Acquisition Strategy Schedule

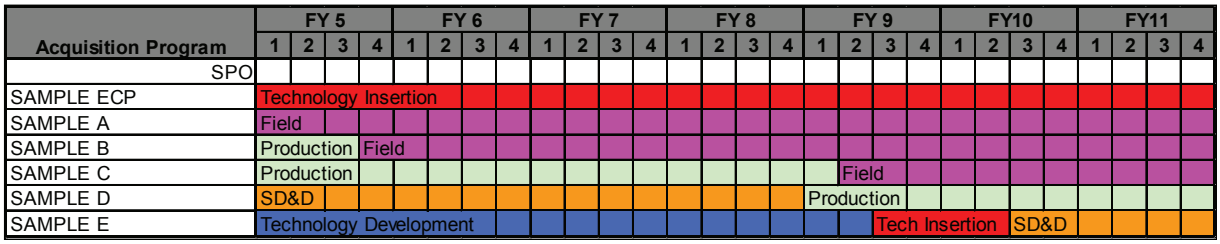

Figure 2. SPO Schedule Roadmap

2.2. User Requirements and Capability Needs Lists:

The AIPL and SIP list are maintained in the TATM data base. For more information about those lists please see URL: xxx.xxx.xxx.

3. Technology Transition Summary

3.1. Technology Transition Roadmap Overview

The SPO WIPT has identified several S&T projects for potential transition to the SAMPLE configurations through ECP initiatives and directly to the SAMPLE C prior to the SDD phase as shown in Figure 3. These technologies fall into the support categories of "interest", "intent", or "commitment".

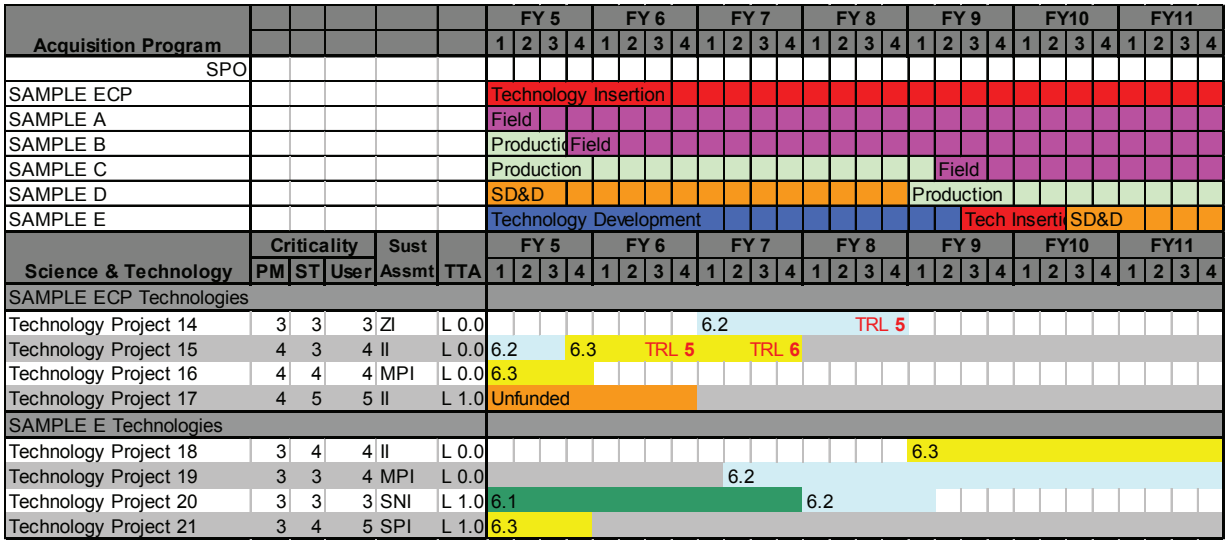

Figure 3. SPO Technology Transition Roadmap

3.2. S&T Project Development and Transition Plans

The IPT structure that is utilized by the TATM process is invoked initially at a working group level. This WIPT reviews S&T projects, identifies potential candidates, and develops the transition plans within the TATM Tool Suite for insertion into the target platform.

The TATM Tool Suite is used for managing and facilitating the TATM process and will hold critical information about the relationships between the S&T Projects and target platforms.

The transition details for all S&T Projects and their relation to the SPO Platforms can be found in the TATM Tool Suite. For more information on the individual details please contact the appropriate member of the SPO WIPT.

3.3. SAMPLE ECP Initiatives

The ECP initiative focuses on spiral development and insertion of advanced technology into existing configurations for future upgrades. Some of the key ECP initiatives will insert technologies to improve aircraft situational awareness, logistical fleet management, and interoperability. The intent will be to group similar engineering changes to minimize qualification, integration, and retrofit costs.

3.3.1. S&T Project Summary

Table 1 summarizes the S&T projects that have been identified by the SPO WIPT as potential future technologies for insertion onto a SAMPLE program through an ECP. The current levels of support to the S&T Projects are listed as "interest" (L 0.0), "intent" (L 1.0) or "commitment" (L 2.0). Details for each of the S&T projects may be found in the TATM Tool Suite.

			SAMPLE ECP				
			Criticality			Sust	
S&T Project Name	S&T POC	Agency	PM	ST	User	Assmt	TTA
Technology Project 14			3	3	3	ZI	L 0.0
Technology Project 15			4	3	4	II	L 0.0
Technology Project 16			4	4	4	MPI	L 0.0
Technology Project 17			4	5	5	II	L 1.0

Table 1. SAMPLE ECP S&T Criticality/TTA Matrix

3.4. SAMPLE C

The U.S. Army Aviation Center conducted a Doctrine, Organization, Training, Materiel, Leadership, Personnel and Facilities (DOTMLPF) determination analysis. Non-materiel alternatives were judged to be inadequate to meet capability requirements, resulting in the development of a blocked approach in the SAMPLE CDD. Subsequent Requirements Analysis and Analysis of Alternatives conducted under the oversight of AMCOM and Training and Doctrine Command (TRADOC) supported the capabilities generated in the CDD. The SPO obtained funding for executing the SAMPLE C and SAMPLE D upgrade programs in response to the requirements documented within the Milestone C-Draft CDD. SAMPLE E requirements include the entire SAMPLE D features and add greater

capabilities. To meet these requirements, new technology is required. Therefore, the Improved Subsystem Program (ISP) is the key technology for the SAMPLE E program. At this time, SAMPLE E requirements remain unfunded.

3.4.1. S&T Project Summary

Table 2 summarizes the S&T projects that have been identified by the SPO WIPT as relevant to the SAMPLE C with a level of "interest" (L 0.0), "intent" (L 1.0) and "commitment" (L 2.0). Details for each of the S&T projects may be found in the TATM Tool Suite.

			SAMPLE E				
			Criticality			Sust	
S&T Project Name	S&T POC	Agency	PM	ST	User	Assmt	TTA
Technology Project 18			3	4	4	II	L 0.0
Technology Project 19			3	3	4	MPI	L 0.0
Technology Project 20			3	3	3	SNI	L 1.0
Technology Project 21			3	4	5	SPI	L 1.0

Table 2. SAMPLE ECP S&T Criticality/TTA Matrix

4. Summary

The SPO WIPT has been chartered to identify, consolidate, and prioritize S&T Projects as relevant to the SAMPLE System Programs. This TTA establishes the process by which the relevant stakeholders can more efficiently identify and monitor those S&T projects which can enhance the warfighter's capability in the field. The SPO WIPT carries out this mission through quarterly meetings, teleconferences, and attending conferences to reduce the time to integrate new technologies and field them as soon as practical. This TTA will be reviewed and updated on an annual basis.

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APPENDIX B

TECHNOLOGY TRANSITION PLANNING

B.1 TRANSITION STRATEGY

A technology project becomes a candidate for acquisition after the technology capability and military utility of the capability is demonstrated. It is important that the transition into acquisition occurs smoothly and without undue loss of momentum. To enable this, the WIPT will identify the transition objective early in the development program via the TTA. The WIPT will develop and maintain a transition strategy as the technology matures.

The basic strategy for transition planning is fairly straight forward:

a) At the beginning of the technology project, estimate whether the nature of the objective system and the quantities procured will require entry into the formal acquisition process (versus alternate approaches such as small purchases of commercial products). If entry in the formal process is necessary, define the intended entry point (e.g., Engineering Change Proposal (ECP), major upgrade, Low-Rate Initial Production (LRIP) if new system) in the process, assuming a successful demonstration and a positive determination of high military utility by the User. Define strategies for the areas of contracting, supportability, interoperability, affordability, and requirements definition that are consistent with the intended entry point.

b) Define implementation timelines for each of the strategies. For example, those elements of the strategy that will have a direct impact on the technology projects or design of the system must be addressed, either in the initial design or in a subsequent design upgrade (e.g., Pre-Planned Product Improvement (P^3I)), that is consistent with the overall acquisition strategy.

c) For those elements that can be deferred (e.g., which do not affect the technology or design of the system), the timeframe for the deferred activity should be consistent with the anticipated acquisition decision in the target acquisition program and the follow-on acquisition process. In this step, it is important to achieve the proper balance between maintaining a streamlined technology development project (leading up to the determination of military utility) and being prepared to support the acquisition decision. The objective is not to encumber the technology development project to the point that it cannot be executed in the planned and funded timeframe, but rather to define what must be done, what can be deferred, and when the deferred activity will be completed.

d) This transition planning effort is straightforward, but not a minor effort. There is usually time between the identification of the technology for transition and the availability of the funding necessary to begin technology transition and execution of the program. This

time can be used to accomplish the detailed transition planning. Both the acquisition transition and the operational transition must be addressed. In some areas, such as maintenance, there will be interaction between the acquisition and operational transitions. Here, a note of caution is appropriate. The goal in planning the operational transition should not be to completely "normalize" the operational aspects of the system. New, revolutionary technologies are intentionally introducing significant changes in the Operational Community, and similar changes should be considered in the Acquisition Community. Considering non-traditional approaches is appropriate. For example, using contractor logistics support on a long-term basis, or at least an interim basis following initial fielding, may help significantly to reduce the burden on the technology project and expedite the schedule for achieving operational capability.

The transition goal and the associated transition strategy should be specified initially in the TTA and subsequently detailed in the Technology Transition Plan. It is critical to identify, during the planning stage, whether the technology would, if successful, transition to Development or to LRIP. Much more advance planning is required for the latter case. The transition strategy provides a readiness posture that goes beyond the technology project. The decision to proceed will be based on the assessment of military utility and relative priorities within the DoD.

B.2 OVERSIGHT OF TRANSITION PREPARATIONS

If a program enters the formal acquisition process as a major defense acquisition (ACAT 1) program, an Overarching Integrated Product Team (OIPT) structure will be put in place. For less than major programs, some form of the IPT should also be used, as determined and specified by the Milestone Decision Authority. The point at which this happens will vary, but a general rule-of-thumb is that this transition occurs when an Intent TTA is signed or, if the technology will result in a new system, when a PM is appointed.

When the transition strategy indicates that a significant level of transition preparation effort is required, a Transition IPT (TIPT) may be established soon after agreement is reached on the intent to transition the technology and this transition decision is documented in the Intent TTA. The TIPT includes representation from all of the stakeholders in the technology project to include the User, the PMO, the Developer(s), the supportability community, and others (as deemed appropriate by the PMO and the S&T Developer). The *DoD Integrated Product and Process Development Handbook* and the *DoD: Rules of the Road: A Guide for Leading Successful Integrated Product Teams* are contained in the reference section of this guide.

The purpose of the TIPT is to ensure that the necessary preparations are made during the formulation and execution of the S&T Project. These preparations would allow effective transition into the next phase, with a quality product and without a loss of momentum. A TIPT is typically supported by a number of working level IPTs with focus on preparations in the areas of acquisition, test and evaluation, supportability, and requirements. Cross functional representation is strongly encouraged to keep the preparations coordinated across the board.

Normally, the PM chairs all of the working level IPTs except the requirements IPT, which is chaired by a representative from the User Community, who will write the requirement documents. Both the structure and the membership of the working level IPTs should be tailored

for each project. It is important that working level IPTs address the preparations needed to accomplish the operational transition, as well as the acquisition transition.

As the S&T Project nears completion, meaning that useful assessments have been made, and preparations for transition are coming to a conclusion, a Commitment TTA will be developed and agreed upon. The TTA and the Transition Plan, as appropriate, will then be updated. At this time, the focus in the acquisition process shifts to the preparations for the formal milestone (or program review) that will determine the future of the program. At this juncture, the TIPT hands off oversight responsibility to an OIPT to prepare for the formal review, in accordance with the procedures defined in DoD Directive (DoDD) 5000.1, *The Defense Acquisition System*, and DoD Instruction (DoDI) 5000.2 *Operation of the Defense Acquisition System*. Note that the program should be fully funded at this point since the OIPT and Defense Acquisition Board (DAB) do not normally review activities that have not been funded by a component.

It is also advisable to conduct a major review with the PM organization that will be accepting the interim capability assets from the S&T Project. This review should occur at least six months prior to the end of the S&T Project and should address the status of preparations for operational support (i.e., manning, logistics, training, operational concepts).

B.3 TAILORING THE TRANSITION

One size does not fit all! The objective of the transition is to meet the User's need with minimum delay and cost. However, the formal acquisition process has evolved under the twin pressures of experience and the force of legislation. Entry into the acquisition process will require prudent planning on the part of the S&T PM, the Technology Coordinator and the PM's representative. Identified below are some areas that will require attention before and during the transition.

B.4 CONTRACTING STRATEGY

The initial contracting strategy for transitioning a technology project should be based on the circumstances associated with that particular project and the targeted PM's contracting efforts. The strategy should consider not only the effort to be performed during the technology development, but also the required effort by the acquisition program PM. It should also provide some flexibility in case the technology development project results do not fully support the original objective. For example, if the post-technology development project objective is to transition the technology into a major system going into LRIP, the contracting strategy should accommodate the plan to enter production (LRIP) with the technology design, but should also allow for the possibility of having to conduct further development effort after completion of the current technology development project. At the end of a technology development project, the PM and User must decide whether the capability demonstrated in the technology project has sufficient utility to justify procurement of production versions, or whether further development, or termination is appropriate. It is important that these decision criteria be established up front and documented as exit criteria in the various levels of TTAs.

The contracting strategy for the technology transition should address how the PM would procure additional units of the design demonstrated during the technology development phase, if that is the decision at its conclusion. One approach, if the development program product(s) and maturity levels support procurement, would be to obtain priced options, including Federal Acquisition Regulation (FAR) or

Defense FAR (DFAR) Supplement required terms and conditions, for production at the time competitive offers are solicited for technology development program. An obvious advantage of priced options is that the prices could be competitively obtained versus negotiating prices with the eventual development contractor on a sole source basis, if a new competition is not sensible. Another advantage of obtaining option pricing is that exercising an option significantly reduces the procurement administrative lead-time and causes less disruption to program continuity. Conditions for exercising the option should be clearly identified in the transition plan and in the technology project solicitation.

A guide for development of Statements of Works (SOW) and Statement of Objectives (SOO) is provided in Military Standard (MIL-STD)-245D *DoD Handbook for the Preparation of Statement of Work* and the Air Force's *SOW and SOO Preparation Guide*.

Obtaining priced options makes sense if the technology involved is fairly mature and the likelihood of design changes during the development is considered to be low. These factors should also help determine the contract type of the priced options. For example, if a development project involves commercial systems already in production and does not anticipate any design changes, firm fixed price options make sense. For a technology that is fairly mature but not in production and still in need of some development, cost reimbursement options may be appropriate. The contract type of priced options must consider the maturity of the technology involved to avoid placing unreasonable risks on contractors.

As an alternative to option prices, the technology developer could solicit information on integration cost for future effort to put the technology on the system being acquired or future production pricing (such as average unit production prices that are not binding on the contractor). The Transition Team would use this pricing information as part of an affordability analysis during future source selections. This approach may be more appropriate than obtaining priced options if it is likely that DoD will procure a configuration similar to that demonstrated during the technology development program but not an identical one.

For technology projects for which there is high likelihood of transition (e.g., Commitment TTA in place) the solicitation should state that future production contracts are conditioned on the contractor proposing production prices that are equal or lower to any production prices that may have been initially provided in the development competition. From the perspective of production prices benefiting from the initial technology competition, this approach is similar to obtaining option prices. Unlike option prices, this approach would still require obtaining proposals and negotiating prices. This should not be nearly as time consuming or burdensome as negotiating a typical sole source contract. Nevertheless, it will probably take more effort and time than merely exercising an option. It may be appropriate to enter an "advanced" technology development program at the conclusion of the technology project, either as a planned post-development objective or because the technology development program results indicate that further development is required. A principal question is whether the PM or S&T Developer should compete such a development program or negotiate a sole source contract with the current development contractor. It is impossible to answer this question in advance, but factors to consider include whether competition exists; the magnitude of the development effort; the number of systems that may ultimately be procured; the soundness of design of the system being developed under the technology project; whether DoD owns the design, data, and hardware from the

technology program; and cost. In any event, the Competition in Contracting Act requires justification for not conducting a competition. If the Developer determines that significant development effort is needed, decides to make significant changes to the system demonstrated during the technology development program, or desires an entirely new system; a new competition should be conducted. In these cases, any pricing obtained as part of the technology development contract would be invalid. Furthermore, it will be difficult, if not impossible, to justify a sole source contract to the original technology development contractor in these circumstances.

The DoD should communicate the long term acquisition strategy to the technology development offeror up front. For technology projects, in which there is a high probability of transition (i.e., Intent or Commitment TTAs in place) the contracting strategy alternatives, subsequent to the technology development contract should be specified in the solicitation. The possibility of continuing with the technology development contractor into production should be clearly communicated to potential offerors. Requesting option prices or production pricing information helps communicate this possibility. DoD should be as forthcoming as possible within the parameters of uncertainties that exist.

B.5 INTEROPERABILITY

To ensure that the major products produced by technology development projects consider interoperability with all necessary elements during deployment, an interoperability plan should be developed at the onset of the technology development effort. This plan should be developed for those interfaces that will be included in the development system configuration. It should define:

- Those systems with which the developmental system(s) are expected to interoperate
- The types of information to be transferred over the interfaces
- The testing approach for the interfaces (e.g., simulated or operational)
- Exiting Interface Control Documents
- The organizational responsibilities for maintaining the interfaces (e.g., the technology development project, the acquisition system targeted for transition or other some operational system)
- The degree of compliance with applicable interoperability standards, such as the Defense Technical Architecture

A technology project may or may not address all interoperability requirements of the objective system. If there is required evolution beyond the developmental configuration, that evolution should be defined, to include:

- Those systems with which the objective system is expected to interoperate
- The strategy for the evolution to the objective system interoperability
- The planned timeframe for incorporation should be shown in relationship to the overall acquisition strategy for those interfaces not included in the development configuration

The Transition Plan should reflect the interoperability strategy and the interface management and evaluation responsibilities. The execution of the interoperability plan is the responsibility of the technology development organization. The Developer should review the status of system interoperability with all interested parties periodically to discuss and review problems, and actions to ensure connectivity, compatibility, and synchronization of the effort. This should be part of the overall systems engineering effort performed during the technology development project.

B.6 OPEN SYSTEMS ARCHITECTURE

An important part of reducing the Life Cycle Cost of a system which transitions from technology development is the implementation of Open Systems architecture. A technology project normally builds non-fieldable prototypes that are based on available components (e.g., engines, black boxes, etc.); and allows the technologist and the User to assess performance of the technology and, in some cases, the military utility. However, after transition to production and/ or fielding, more capable or more cost-effective components may become available. Employing Open Systems architecture during the design of the technology project will allow the use of a greater range of components, thus resulting in a better support infrastructure and the rapid insertion of technology for product upgrades.

B.7 PRODUCIBILITY

In our environment of state-of-the-art systems development, the emphasis is largely on ensuring technological feasibility to meet performance requirements. The manufacturing process development associated with these technologies is crucial to overall program success. It must not be overlooked or delayed in implementation due to cost and schedule restraints and lack of understanding of the technology development and production relationship. For system success, the product and the process must be designed together.

Over the years, there have been multiple Directives, Instructions, guides, and papers published addressing program transition through various stages of the life cycle. Some of the most prominent include the DoD 4245.7-M "Willoughby Templates", NAVSO P-6071 "Best Practices", and GAO-02-701 "Best Practices – Capturing Design and Manufacturing Knowledge Early Improves Acquisition Outcomes." All of these embraced the common theme that technology, engineering, and process capability must come together in a disciplined environment. The TATM tool supports the use of the Engineering Manufacturing Readiness Level (EMRL) concept developed by the Missile Defense Agency (MDA).

B.8 SUPPORTABILITY

The Supportability effort required for a technology development project is dependent on many factors, but if the plan is to transition from technology development to an acquisition program (design or new), the full range of support areas (i.e., design interface, support equipment, training, initial spares, source of support, facilities, technical manuals, etc.) must ultimately be considered.

During the initial planning for the technology, support from knowledgeable logistics personnel should be obtained to identify how, and to what extent, long-term support considerations should be addressed in the program. This should include:

- To what extent the cost of establishing a support capability, and operating and support costs, can be included in a life cycle cost evaluation of competing proposals
- To what extent support considerations need to be addressed in the development and evaluation of design and operating concept, the categories of support that must be addressed for the interim and objective capabilities
- An initial supportability strategy for each of the categories

This supportability strategy should be reflected in the Transition Plan and in the major procurement for the technology as it is transitioned. For example, a strategy may include using contractor logistics support for the interim capability to significantly reduce the level of effort that must be devoted to such areas as documentation and development of training programs. As a second example, those requirements that must be addressed early in the technology development

program because they impact the design of the system (e.g. reliability, availability, built-in diagnostics, maintenance capability, operation in harsh environments) can be included within the basic contract. And activities that can, and should, be deferred until there is adequate information available (e.g. tech manuals, training programs) can be put into an option, or a contract line item, that will be initiated at a later date. It may be acceptable to delay the exercise of this option until very late in the technology program, when the likelihood of proceeding into acquisition is better understood. It may be acceptable for the option to overlap an LRIP phase if there are other means for addressing support of the interim capability.

It is particularly important to communicate the basic supportability requirements (e.g. C-130 transportable) and the supportability strategy to the offerors and to let them propose solutions. For systems that will undergo a single cycle of development and then enter into production (either as part of an existing system or a new system), it is extremely important that the selected contractor demonstrate the level of understanding of supportability necessary to meet those demands. The Request for Proposal (RFP) should require offerors to provide recommendations on the support concept, as well as the source of support (contractor or organic) based upon their assessment of cost and mission requirements. This can be used as an input for a life cycle cost comparison of alternative design concepts.

In addition to developing and assessing technology, the objectives of S&T projects efforts should be to provide for a level of definition of support requirements adequate, given the technology maturity and transition plan, to allow procurement of the support elements concurrent with the end items, if and when the system is fielded. The offeror should be asked to provide support throughout the later development phase and to define an initial support plan for the residual capability and the objective capability. The offerors also should plan to demonstrate the projected capability during the advanced development efforts using planned personnel and equipment. They should refine their recommended support approach based upon experience gained during advanced development effort and life cycle cost considerations. The government will need to assess the proposed approach in light of current policy. This not only provides insight into the support requirements of an offeror's proposal, but also provides the capability, for the government to evaluate proposals and sources of support alternatives based on life cycle costs. It is never too early, or too late, to look at ways to reduce costs. This is especially appropriate in a technology development project when the system and operating concepts are evolving and being evaluated in terms of military utility.

If the system is to enter the development phase of System Development and Demonstration at the completion of the S&T project, the supportability effort is significantly reduced and is focused primarily on the support during the project and during field operation of the interim capability.

B.9 TEST AND EVALUATION

B.9.1 Overview

The test and evaluation (T&E) activities within an S&T project provide critical inputs to three separate products that are developed during the later stages of technology development:

- The assessment of military utility performed by the User
- The operational requirements developed by the Lead Service
- The eventual Operational Assessment prepared by the Operational Test Agency (OTA)

The nature of T&E during the later stages of development and the relationship of T&E to each of these products is discussed below.

B.9.2 Assessment of Military Utility

As stated earlier, in addition to developing a new technical capability, the primary purpose of a technology development project is to allow the User to evaluate the military utility of a capability being considered in a response to a critical military need, and to do so prior to a decision by DoD to acquire that capability. This assessment of utility has two basic parts.

The first part deals with the importance of the specific mission to the success of the military operations. This aspect is vital to the subsequent funding and acquisition decisions, but does not require input from the T&E effort.

The second part of utility assessment addresses the issue of how well the capability in question responds to the stated military need (if one exits). This includes a determination of both the effectiveness of the capability in performing the mission and its suitability (i.e., availability, sustainability, reliability, maintainability, software, Integrated Logistics Support (ILS)) for operation by the User. Inputs from T&E are critical to the second part of the utility assessment.

They begin during the initial planning stages of the advanced technology development effort. At this point, the STM should consider seeking the assistance of the Developmental Testing (DT) and Operational Testing (OT) communities in developing a set of Measures of Effectiveness (MOE), Measures of Suitability (MOS), Measures of Performance (MOP), and Critical Operational Issues (COIs) that are appropriate indicators of military utility.

The STM must be involved in this activity because it is central to the success of the overall technology project; however it is important that this effort is led by the User because these measures will be central to the assessment of utility that is the responsibility of the User organization. These measures will also be important when the demonstrations or military exercises are being planned or being selected from large-scale exercises that are already planned for other purposes. That planning or selection activity needs to be driven by utility assessment considerations.

Concentrating on these measures early in the development process will ensure that the exercises, scenarios, and data collection plans will allow a "characterization" of the system that answers part two of the military assessment — "What can the system do?" and "Can it be operated and maintained by the User?". T&E personnel can also provide critical support in gaining access to test assets, developing scenarios, preparing data collection plans, and executing the demonstration.

B.9.3 Support to the Development of Operational Requirements

Technology development projects are initiated, in part, on the basis of a broad statement of need as defined by FOCs, rather than a detailed set of operational requirements.

One objective of the technology development project should be to give the User the opportunity to gain experience with a capability that represents a potential solution to the need, to develop a concept of operations to fully exploit the system capability, and to then develop a set of operational requirements that reflects the benefit of that experience. The characterization discussed in the preceding paragraph provides the User a quantitative description of the performance and suitability of the S&T configuration. From this baseline, the User can assess specific changes in the operational requirements, in terms of utility, cost, schedule, and risk; and can develop requirements documents that reflect a good understanding of the tradeoffs involved.

B.9.4 Operational Assessment

As an input to an acquisition decision to proceed into LRIP, an operational assessment is needed from the operational Testers to confirm that the system or capability in question is potentially effective and suitable. This assessment begins with the characterization of performance that has been previously discussed.

The assessment is then developed by the operational Testers in parallel, and perhaps iteratively, with the development of requirements by the User. The objective of this interactive relationship is to provide the User information on risks associated with any increases in operational requirements being considered relative to the S&T configuration.

At the same time, cost and acquisition schedule implications of these increased requirements are being provided by the Developer. This gives a complete picture of cost, schedule, and risk implications associated with such requirements and allows the User to make an informed choice between acquiring a capability quickly that is close to the S&T project performance level, or requiring a higher performance level and incurring the increased cost, schedule and/or risk.

Once the User completes these tradeoffs and prepares the requirements document, the operational Tester can issue the operational assessment against those requirements. This assessment will be provided to the acquisition decision maker as a formal part of the transition process.

B.10 AFFORDABILITY AND COST AS AN INDEPENDENT VARIABLE (CAIV)

One objective of an S&T project is to facilitate the transition of concepts using mature or emerging technologies into the operational force structure. One potential road-block to a successful transition is the lack of understanding of likely acquisition and ownership (Operation and Support (O&S)) costs. A discussion of affordability issues associated with potential acquisition and follow-on O&S costs of the objective system(s) must be part of the Transition Plan.

The purpose of Cost as an Independent Variable (CAIV) analysis is to focus on affordability issues that could potentially block successful transition. S&T Developers need to be continually aware that CAIV is a key consideration throughout procurement and may play a role in the transition to, and progress within, the acquisition process.

A key tenet of the CAIV approach for acquisition is a far stronger User role in the process through participation in setting and adjusting program goals throughout the program, particularly in the cost-performance tradeoff process. To some extent, this works hand-in-hand with the execution of an S&T project. The objectives of CAIV include:

- Setting realistic but aggressive cost objectives early in each acquisition program
- Managing risks to achieve cost, schedule and performance objectives
- Devising appropriate metrics for tracking progress in setting and achieving cost objectives
- Motivating government and industry managers to achieve program objectives
- Putting in place for fielded systems additional incentives to reduce operating and support costs.

Where applicable, these objectives should be addressed in S&T planning and/or during S&T project implementation.

B.11 FUNDING

Programmatic flexibility and speed in adjusting to change are critically important to success with an initiative as technologically intensive as an S&T project. In the current environment, technology is accelerating at a tremendous rate. Our speed and flexibility to leverage, exploit, and transition mature or emerging technologies into the operational force structure is hampered by resource and budget constraints (e.g., the inability to perform timely programming of funding during the Program Objective Memorandum (POM) process). RDT&E funding for S&T Projects are typically planned, programmed, and budgeted through the Military Departments/Agencies supplying the underlying technologies.

However, the Office of the Secretary of Defense (OSD) has identified funding to support rapid transition of technologies, these include, ACTDs, Warfighter Rapid Acquisition Program (WRAP) and other sources of funding as identified in the Manager's Guide to Technology Transition in An Evolutionary Acquisition Environment.

However, funding to support the follow-on activities (development, LRIP, full rate production, or purchase of additional quantities of commercial items) is not typically funded in OSD or the Service/Agency until the technology demonstrates the military utility of the capability being assessed. This lack of prior funding creates a significant challenge that must be addressed as part of the transition effort.

B.12 ROAD MAP

To leverage and transition mature or emerging technologies smoothly, the Lead Service will, at the appropriate time, define and establish a funding methodology for effective insertion of the S&T Project follow-on acquisition into the DoD resource allocation process. The appropriate time will depend upon the circumstances associated with the particular S&T project and the funding alternative that is selected.

Numerous programs exist to support/provide funding for follow on efforts and for risk reduction in specific areas. Programs such as Manufacturing Technology Objectives (MTO), Advanced Concept and Technology Development (ACTD) are in place within DoD and the Services. Examples of these programs and descriptions can be found in the *Managers Guide to Technology Transition in an Evolutionary Acquisition Environment* [ref XXXXXXX].

The Army has a strategy in place to fund emerging technologies, such as Advanced Technology Demonstrations (ATDs) and Advanced Warfighting Experiments (AWEs).

B.13 REQUIREMENTS

The Lead Service User will coordinate the development of the appropriate requirements documentation with Key Performance Parameters (KPPs). In the Transition Plan an organization to execute the proposed follow-on acquisition will be defined. The Transition Plan should include the development and the demonstration of a system performance specification concurrently with the development of the requirements documents. A system performance specification, based on the requirements, will be developed to serve as the functional configuration baseline for initiation of the follow-on efforts.

One approach to defining requirements is to transition the technology to an Advanced Concept Technology Demonstration (ACTD) Program. ACTDs are normally initiated based on broad descriptions of a User need, for which mature or nearly mature technology offers a potentially effective response. ACTD provides

the User with a fieldable prototype for use in assessing the military utility of the capability and in refining the operational requirements for the capability.

A useful approach to requirements development is to begin with an initial draft that reflects the ACTD configuration and to flag areas where excursions need to be assessed, and then incorporate changes as understanding and experience evolve during the ACTD. This focuses attention on areas of greatest interest. During the exercises, the User then has an opportunity to review and assess each of the flagged areas to determine the value of increasing or decreasing their requirements.

During advanced S&T projects, the Developer should gain significant insights into the design of the system and is, therefore, in a good position to provide information on the cost and schedule implications of developing a new system or, in coordination with the PM and the prime contractor, modifying an existing system design to include the new capability necessary to meet the User's requirements. Additionally, in coordination with the Sustainer, the Developer can help provide insight into supportability concerns and issues related to the new capability.

This experience gained by the User, Acquirer, Developer, Sustainer and Tester create a unique opportunity to work together in an IPT-like relationship to fully define the requirements and technology in terms of operational benefit, impact on unit and life cycle cost (as discussed in the CAIV section), impact on delivery dates for fielding of the system, and the risk of entry into the intended point in the acquisition process. The User can then make better decisions on the operational requirements because they are based on a much better understanding of the implications than is normally available.

At the same time the requirements document is completed, an Acquisition Strategy and an Operational Assessment can be completed, based on the same set of requirements.

Crucial to the success of this approach is close interaction among the User, Acquisition, S&T and Sustainment organizations during the Requirements Documents development.

B.14 ACQUISITION PROGRAM DOCUMENTATION

One of the major objectives of current acquisition policy is to minimize the volume of mandatory guidance, particularly with respect to documentation for acquisition programs. The DoDD 5000.1 and DoDI 5000.2 contain mandatory and recommended documentation requirements that are applicable to major defense acquisition (ACAT 1 and other) programs.

These documentation requirements are driven largely by legislation, but the Milestone Decision Authority has flexibility to tailor those driven by DoD regulations. If a program is less than a Category 1 program, the Milestone Decision Authority has total flexibility to tailor documentation requirements. The information required to be generated by the PM for a program leading to LRIP is in development based on reviewed direction contained in the DoDD 5000.1 and will be available on the DAU Acquisition, Technology and Logistics (AT&L) Knowledge Sharing System (AKSS). The AKSS provides a reference that serves as a starting point for tailoring information through the IPT process.

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APPENDIX C

RISK MANAGEMENT

After the PM and User have established at least an "Intent" level transition agreement for an S&T Project, the Working IPT will develop detailed risk analysis. The risk areas that are assessed are the ones addressed in Section 2.4 and are adopted from the DoD Risk Management Guide. They include elements in the "Willoughby templates" (as implemented in the Risk Management Guide).

A Working IPT (WIPT) will analyze the technology and identify any non-technical or technical risks. The WIPT will include, as a minimum, representatives from the PM office, S&T office, User Community, and the Sustainment Community. The WIPT will determine if the risks are manageable or if they are too high to warrant transitioning the technology.

If the risks are manageable, an Executive Level IPT (Deputy Level IPT e.g. Deputy PEO as member) will review the associated risks and Technology Transition Agreements will be updated and signed. Risk management plans will then be developed by the respective WIPT members. Quantitative assessment criteria for these non-technical areas are currently in development.

9.1 RISK MANAGEMENT PLAN

A Risk Management Plan (RMP) presents the process for implementing the comprehensive and proactive management of risk as part of the overall management of a program. Risk management is a program management tool to handle events that might adversely impact the program, thereby increasing the likelihood of success. This tool will:

- Serve as a basis for identifying alternatives to achieve cost, schedule, and performance goals
- Assist in making decisions on budget and funding priorities
- Provide risk information for Milestone decisions
- Allow monitoring the health of the program as it proceeds

A RMP should describe methods for assessing (identifying and analyzing), prioritizing, and monitoring risk drivers; developing risk-handling approaches, and applying adequate resources to handle risk. It assigns specific responsibilities for these functions, and prescribes the documenting, monitoring, and reporting processes to be followed.

The RMP should be updated as necessary, particularly on the following occasions: (1) whenever the acquisition strategy changes, or there is a major change in program emphasis; (2) in preparation for major decision points; (3) in preparation for, and immediately following, technical audits and reviews; (4) concurrent with the review and update of other program plans; (5) in preparation for a Program Objective Memorandum (POM) submission; (6) after a significant unplanned technical event (such as a critical material substitution or a catastrophic

test failure); and (7) after any kind of funding turbulence (such as a "tax," or a less-than-budgeted apportionment, or the identification of a substantial cost growth).

Department of Defense Directive (DoDD) 5000.1 requires that "PMs shall reduce technology risk, demonstrate technologies in a relevant environment, and identify technology alternatives, prior to program initiation. They shall reduce integration risk and demonstrate product design prior to the design readiness review. They shall reduce manufacturing risk and demonstrate producibility prior to full-rate production." Further, the Defense Acquisition Guidebook states that "The program manager should establish a risk management process… to be integrated and continuously applied throughout the program, including the design process."

Although there is no Directive requirement for a formal plan, PMs have found RMPs indispensable. Formulating and implementing the comprehensive and proactive risk management process required by these regulations is seldom possible without a coherent, documented plan.

Templates and samples for Risk Management Plans are available in the Risk Planning section of the Acquisition Community Connection at http://acc.dau.mil.

9.2 TECHNOLOGY ASSESSMENT—NON-TECHNICAL RISK SCORING AND ANALYSIS

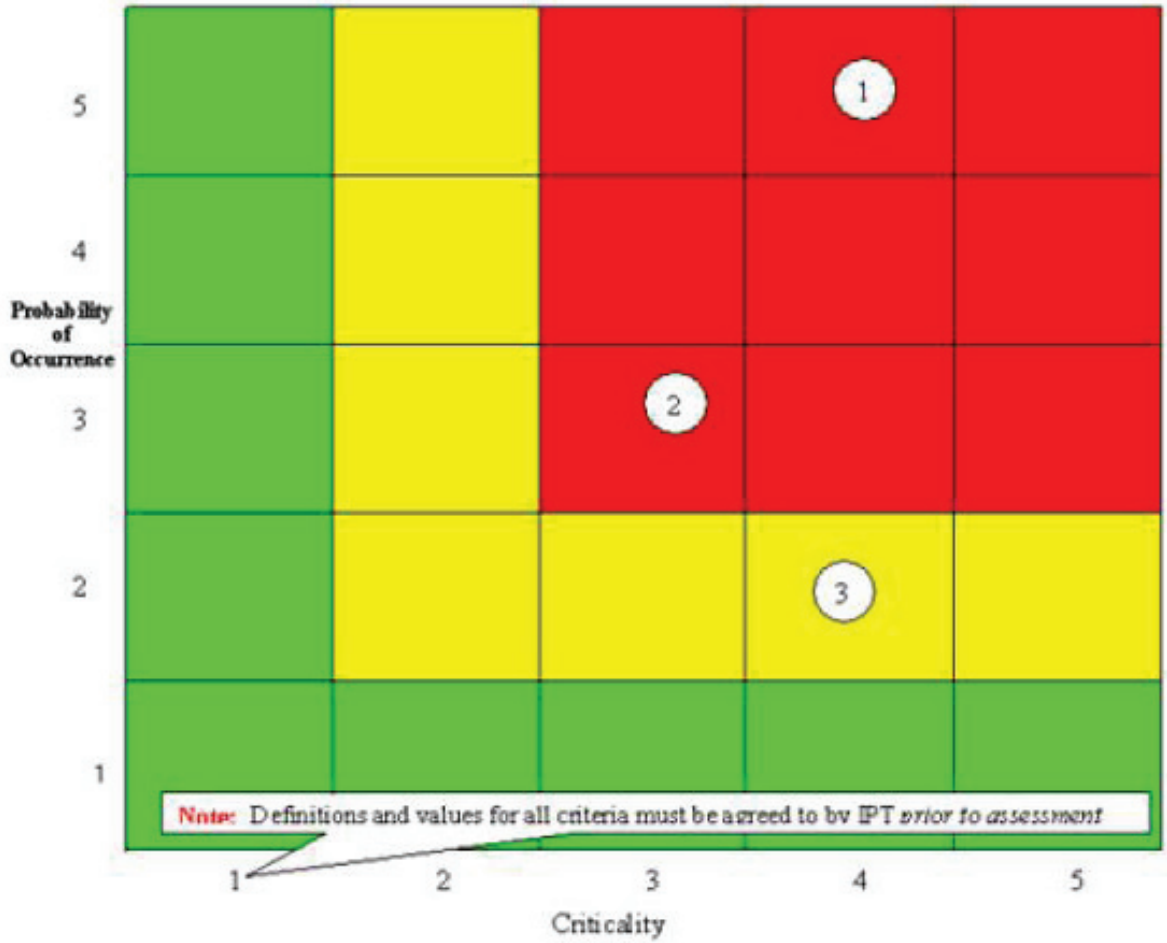
In addition to technical assessments (i.e. criticality, TMPA and TRL) the WIPT will conduct a "non-technical" risk assessment. This assessment addresses those non-technical factors that the WIPT determines are critical to the success of the program. Other sources for other risk areas for consideration include:

- DoD 4245.7 Transition from Development to Production
- Addressing Affordability in Defense S&T
- Technology Transition for Affordability – A Guide for S&T Program Managers

Until such time as quantified criteria exist for all of the "non-technical" risk elements the Program WIPT should develop an assessment criteria of its own for each non-technical risk element that the IPT identifies as critical to the program being supported.

Ultimately the results of this non-technical risk assessment should be integrated together and presented to the IPT for review and planning. One potential format for presenting these results is shown below. The PM's Working IPT should adopt the format that is best suited to their needs and reporting requirements.

Figure 3: Notional Example Of Scoring And Portraying Non-Technical Risks



Risk Number

1. **Production Process Not Proven**
   a. Criticality Rationale: Lack of proven production process can cause potential program cost overrun and schedule delays exceeding 15% of Acquisition Program Baseline
   b. Probability of Occurrence Rationale: Technology requires new and innovative production process in which neither the contractor nor the Government has any experience and no funding has been budgeted for production prove out.
2. **System Level Modeling and Simulation Not Verified, Validated or Accredited for Intended Purpose**
   a. Criticality Rationale: Lack of system level simulation will result in requirement for additional live tests which will cause potential program cost overrun and schedule delays exceeding 5% of APB
   b. Probability of Occurrence Rationale: Simulation for this unique system does not exist however, a similar system simulation has been developed by another service
3. **Required Operating Environment not fully described**
   a. Criticality Rationale: Operational Environment definition drives system functional design parameters
   b. Probability of Occurrence Rationale: User has active and aggressive program to define environment however, transformation initiatives may impact and change environment definition

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APPENDIX D

CHANGE RECOMMENDATIONS

Recommendations for changes to this guide may be submitted on the following form.

Mail or Fax to:

PEO Aviation
SFAE-AV (Attn: APEO, Program Integration)
Building 5681, Room 213
Redstone Arsenal, AL 35898

FAX number (256) 313-4963 (DSN 897-)

TATM Change Form

Phone Number

E-mail address

Recommended change

Page and Paragraph number

Comment or explanation for change

Suggested Change

APPENDIX E

WEB RESOURCES

Federal	
Federal Acquisition Regulation (FAR) <http://www.arnet.gov/far/>	Printable and searchable versions of the current FAR
General Services Administration (GSA) <http://www.gsa.gov/>	
Federal Acquisition Institute (FAI) <http://www.fai.gov/>	
AcqNet <http://www.acqnet.gov/>	Federal Acquisition "Virtual Library" FAR Federal Business Opportunities
ASSIST – Acquisition Streamlining and Standardization Information System <http://assist.daps.dla.mil/online/start/>	ASSIST is the official source of DoD specifications and standards. Includes current and historical military and federal specifications and standards.
OSD ACQWeb <http://www.acq.osd.mil/>	Office of the Under Secretary of Defense for Acquisition and Technology (OUSD(A&T)
Defense Procurement and Acquisition Policy <http://www.acq.osd.mil/dpap/>	Acquisition Initiatives
AT&L Knowledge Sharing System <http://akss.dau.mil/jsp/default.jsp	One-stop shop for policy, documents, glossaries, guides, sites, and tools for the DoD acquisition, technology, and logistics workforce (formerly known as Defense Acquisition Deskbook)

Defense Acquisition University (DAU)
<http://www.dau.mil/>

DAU – *System Engineering Fundamentals*
<http://www.dau.mil/pubs/gdbks/sys_eng_fund.asp>

DAU – *Glossary: Defense Acquisition Acronyms and Terms*
<http://www.dau.mil/pubs/glossary/preface.asp>

DAU – *Risk Management Guide for DoD Acquisition*
<http://www.dau.mil/pubs/gdbks/risk_management.asp>.

DAU Acquisition Community Connection
<http://acc.dau.mil/>

Defense Contract Management Agency (DCMA)
<http://www.dcma.mil/>

Defense Procurement and Acquisition Policy (DPAP)
<http://www.acq.osd.mil/dpap/>

Defense Technical Information Center (DTIC)
<http://www.dtic.mil/>

HOV-LANE Virtual Library for Acquisition News and Electronic Information
<http://www.dtic.mil/hovlane/>

Navy
Department of the Navy (DON) Acquisition Reform Office
<http://www.ar.navy.mil/index.cfm>

DON Long Range Acquisition Estimates (LRAE)
<http://www.hq.navy.mil/RDA/Related Links.asp>

Deputy Assistant Secretary of the Navy (DASN) for Acquisition Management (Acq)
<http://www.acquisition.navy.mil/>

Naval Air Systems Command (NAVAIR) Acquisition Guide
<http://www.ntsc.navy.mil/Resources/Library/Acqguide/Acqguide.htm>

Paperless Acquisition Office of the Navy
<http://www.peoarbs.navy.mil/>

DON Acquisition One Source
<http://www.abm.rda.hq.navy.mil/>

Army
Acquisition and Contracting Policy Site—Army Materiel Command (AMC)
<http://www.amc.army.mil/amc/rda/rda-ap/aqnsite.html>

Acquisition Logistics Web Links
<http://www.almc.army.mil/hsv/logistics.htm>

Army Acquisition and Procurement
<https://webportal.saalt.army.mil/>

Army Aviation and Missile Command (AMCOM) Acquisition Center
<https://www.proc.redstone.army.mil/acquisition/>

U.S. Army Acquisition Support Center
<http://asc.rdaisa.army.mil/>

Army Single Face to Industry (ASFI) Acquisition Business Management (ABM)
<https://acquisition.army.mil/>

Air Force
Air Force Acquisition
<http://www.safaq.hq.af.mil/>

FARSite (Federal Acquisition Regulation Site) <http://farsite.hill.af.mil/>	One stop location for most of the Federal Acquisition Regulations and Supplements, Including National Aeronautics and Space Administration (NASA), Department of Energy (DoE), Army, Navy and Air Force and its command supplements

APPENDIX F

POINTS OF CONTACT

Program Executive Officer, Aviation (PEO-A), Redstone Arsenal, AL
Deputy PEO for Concurrent Engineering
256-313-4976
256-313-4962
256-313-4964

Aviation and Missile Research, Development, and Engineering (AMRDEC), Redstone Arsenal, AL
Chief, Technology Integration Division
256-313-1955
256-313-2783

Aviation and Missile Life Cycle Management Command (AMCOM), Redstone Arsenal, AL
AMCOM G3
(256) 955-6701

U.S. Army Aviation Center (USAAVNC), Fort Rucker, AL
USAAVNC FIST
334-255-3994
334-255-2703

Defense Acquisition University (DAU) South Region, Huntsville, AL
Associate Dean for Outreach
256-722-1014

Science Applications International Corporation (SAIC), Huntsville, AL
TATM Tool Suite Developers
Manager, Aviation and Unmanned Systems
864-8375

APPENDIX G

ACRONYMS

AAAA	Army Aviation Association of America
AC	Acquisition Council
ACAT	Acquisition Category
ACTD	Advanced Concept Technology Demonstration
AD	Associate Director
AHS	American Helicopter Society
AIPL	Aviation Integrated Priority Lists
AKSS	Acquisition, Technology and Logistics (AT&L) Knowledge Sharing System
AMCOM	Aviation and Missile Command
AMC	Army Materiel Command
AMRDEC	Aviation and Missile Research Development and Engineering Center
ANSI	American National Standards Institute
ASAALT	Assistant Secretary Army Acquisition Logistics and Technology
ASTAG	Army Science and Technology Advisory Group
ASTD	Advanced Science and Technology Directorate
ASTMP	Army Science and Technology Master Plan
ASTWG	Army Science and Technology Working Group
ATD	Advanced Technology Demonstration
AT&L	Acquisition, Technology and Logistics
ATO	Army Technology Objective (Formerly STO – Science and Technology Objective)
AUSA	Association of the U.S. Army
CAIV	Cost as an Independent Variable
CDD	Capability Development Document
CG	Commanding General
CoDC	Council of Deputies/Directors and Colonels
COI	Critical Operational Issues
DA	Department of the Army
DARPA	Defense Advanced Research Projects Agency
DAB	Defense Acquisition Board
DAU	Defense Acquisition University
DCD	Directorate of Combat Developments
DCSDEV	Deputy Chief of Staff for Development (Training and Doctrine Command)
DCSS	Deputy Commander for System Support
DDRE	Director of Defense Research and Engineering
DFAR	Defense Federal Acquisition Regulation

DoD	Department of Defense
DoDD	Department of Defense Directive
DoDI	Department of Defense Instruction
DOTMLPF	doctrine, organization, training, materiel, leadership and education, personnel and facilities
DPEO	Deputy Program Executive Officer
DT	Developmental Testing
ECP	Engineering Change Proposal
EIA	Electronic Industries Association
EIPT	Executive Integrated Product Team
EMRL	Engineering Manufacturing Readiness Levels
FAR	Federal Acquisition Regulation
FCS	Future Combat Systems
FDV	DAMO-FDV (G-8) Department of the Army Military Operations – Force Development, Aviation
FIST	Futures Integration and Synchronization Team
FNC	Future Naval Capability
FOC	Force Operating Capabilities
FUE	First Unit Equipped
FY	Fiscal Year
FYDP	Future Years Defense Program
G-3	Operations Staff Office
G-8	Resource Management Staff Office
GOSC	General Officer Steering Committee
GUI	Graphical User Interface
HTI	Horizontal Technology Integration
IAW	In Accordance With
ICD	Initial Capabilities Documents
II	Insuffidient Information
IIPT	Integrating Integrated Product Team
ILS	Integrated Logistics Support
IPT	Integrated Product Team
KPP	Key Performance Parameters
LRIP	Low-Rate Initial Production
MDA	Missile Defense Agency
MI	Moderate Positive Impact
MIL-STD	Military Standard
MOA	Memorandum of Agreement
MOE	Measures of Effectiveness
MOP	Measures of Performance
MOS	Measures of Suitability
MPI	Moderate Positive Impact
NASA	National Aeronautics and Space Administration
NI	Negative Impact
O&S	Operations and Support

OIPT	Overarching Integrated Product Team
ORD	Operational Requirements Document
OSD	Office of the Secretary of Defense
OT	Operational Testing
OTA	Operational Test Agency
P3I	Pre-Planned Product Improvement
PE	Program Element
PEG	Program Evaluation Group
PEO	Program Executive Office(r)
PEO-A	Program Executive Officer, Aviation (PEO AVN)
PM	Program Manager
PMO	Program Management Office
POC	Points of Contact
POM	Program Objectives Memorandum
PPBES	Programming, Planning, Budgeting and Execution System
QTR	Quarter
R&D	Research and Development
S&T	Science and Technology
SDD	System Development and Demonstration
SDP	Software Development Plan
SEP	Systems Engineering Plan
SES	Senior Executive Service
SIP	System Improvement Program
SME	Subject Matter Expert???
SNI	Significant Negative Impact
SOO	Statement of Objective
SOW	Statement of Work
SPI	Significant Positive Impact
STM	Science and Technology Manager
STMP	Science and Technology Master Plan
T&E	Test and Evaluation
TATM	Technology Assessment and Transition Management
TC	Technology Coordinator
TC	Technical Council
TDY	Temporary Duty
TIPT	Transitional Integrated Product Team
TMPA	Technology Maturation Plan Assessment
TP	Transition Plan
TP	TRADOC Pamphlet
TRADOC	Training and Doctrine Command
TRL	Technology Readiness Level
TSM	TRADOC System Manager
TTA	Technology Transition Agreement
UFR	Unfunded Requirements
WIPT	Working-level Integrated Product Team

WTC	Warfighter Technical Council
ZI	Zero Impact