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Scientific/Research and Development

**ADVANCED TECHNOLOGY
DEMONSTRATION TECHNOLOGY
TRANSITION PLANNING**

COMPLIANCE WITH THIS PUBLICATION IS MANDATORY

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This instruction implements AFD 61-1, *Management of Science and Technology*, and AFI 61-101, *Planning for the Applied Technology Council Process*. It establishes the ancillary process for Air Force's formal technology transition process, the Applied Technology Councils. The focus is on up front planning to provide the user with technology/capability options to satisfy needs at an acceptable risk, to meet the development insertion schedule, to determine the acquisition strategy, and to provide documentation concerning required transition funding. The myriad of other Air Force technology transition efforts may find this content useful. This instruction does not address technology transfer and disclosure processes necessary to protect technology information dissemination to unauthorized parties. It does not apply to the Air National Guard or US Air Force Reserve units and members.

SUMMARY OF REVISIONS

This revision updates the instruction to include the activities of Air Force Research Laboratory (AFRL), the Applied Technology Council (ATC), and the planning documentation of Enterprises and Major Commands/Agencies. A glossary of terms and supporting information is in [Attachment 1](#).

1. Policy.

1.1. The primary mission of AFRL is to develop and mature technology options for insertion into Air Force weapon and support systems including AFMC center infrastructure. The focus of technology transition via the ATC process is to provide a range of technology/capability options, each with well-understood benefits and risks, which the recipient can exploit in a subsequent system, support, or infrastructure application. Transition via the ATC process begins with discussion with the initial and/or final recipient about the content of any proposed, candidate ATD. The specific tasks are determined during engineering validation and cited in the transition planning documentation. Transition is completed when the technology is incorporated in a system application. A notional timeline is in [Attachment 2](#).

1.2. Enterprises will establish and/or employ a process for engineering validation that may be fulfilled by an active integrated product team. The process will maximize payoffs from AFRL technology developments and incorporate a systems engineering approach and supporting methodology.

1.3. AFRL and the initial recipient will ensure each ATD effort is covered by complete transition planning documentation prior to the second ATC after the commissioning ATC. An initial, abbreviated document should be generated by AFRL and the initial recipient and signed prior to commissioning. AFRL will also ensure each ATD addresses a need generated in response to a MAJCOM deficiency or some other documented requirement. For AFMC needs, AFRL will ensure needs are addressed as documented by any of the three AFMC Enterprises.

1.3.1. A detailed plan is advisable and will be required between an AFRL directorate and the initial and/or final recipient of the technology unless the initial recipient has not been specifically identified or is industry as is the usual case for the Space ATDs. The ATD integrated product team will initiate and pursue development, coordination, and implementation of any required, detailed technology transition document and will incorporate the elements shown in [Attachment 3](#). A tri-panel chart may be used when a detailed plan is not possible, [Attachment 4](#). The content of any tri-panel chart shall be coordinated with the initial and final recipient, shown at the ATC and considered a signed technology transition document when the decision memorandum is signed.

1.3.2. Technology transition plans should be signed by the ranking members of the ATD integrated product team with the assertion that they are signing an agreement between AFRL and the initial and final technology recipients documenting the specific tasks must be successfully completed prior to technology acceptance at the time of signature. Since the technology transition plan should be a living document, it is expected that changes will be negotiated and an amendment/revision signed.

2. Organizational Responsibilities.

2.1. AFRL will:

2.1.1. Serve as the HQ AFMC OPR for the overall technology transition process to assure the command T2 objectives are met.

2.1.2. Maintain a record of TTPs, completed technology transitions, and procedures.

2.1.3. Support an annual review of ongoing TTPs and support revisions and staff new signatures.

2.1.4. Support the reviews of ongoing ATD tri-panel charts.

2.1.5. Serve as the AFMC headquarters OPR for technology transition policy and guidance

2.1.6. Develop and maintain command-level metrics for technology transition.

2.1.7. Participate fully in the ATC process.

2.1.8. Develop, perform, and update investment strategy sheets, S&T key performance parameters (KPP) ([Attachment 5](#)) and S&T cost, schedule, and technical risk ([Attachment 6](#)) for all ATDs in the format described in the appendices to this AFMCI in conjunction with the integrated product team. The initial KPPs and S&T risk assessments will be available for Enterprise coordination prior to the commissioning ATC.

2.1.9. Participate in reviewing the tri-panel chart prior to every ATC and work to highlight tri-panel chart revisions during the ATC.

2.1.10. Maintain an Internet accessible database for ATDs, Program Baseline documents, and ATC items.

2.1.11. Ensure technical efforts cited for transition complete the critical set of specific tasks in the tri-panel charts.

2.1.12. Work with the appropriate Enterprise to expedite the engineering validation process.

2.1.13. Establish and fully participate in the ATD integrated product teams throughout the transition process.

2.2. AFMC Enterprises will:

2.2.1. Be responsible for any needed development of transitioned technology beyond 6.3 with the exception of 7.8 funding.

2.2.2. Ensure Enterprise OPRs participate in the ATC process and integrated product teams to identify potential concepts for technology exploitation, fully participate in developing any required, detailed TTP, implementation of the TTP(s) and to assess operational implications of new and evolving technology with MAJCOM/Agency users.

2.2.3. Have in place an engineering validation process that may be fulfilled by active participation on integrated product teams.

2.2.4. Designate a ATC OPR who will:

2.2.4.1. Develop the tri-panel chart, see 1.5, in conjunction with AFRL and the final technology recipient.

2.2.4.2. Ensure specific tasks, conditions, and criteria in the tri-panel chart are sufficient to transition a technology to the intended technology recipient.

2.2.4.3. Certify that the technology is validated for system application when the stated tri-panel criteria have been met.

2.2.4.4. Participate in reviewing the tri-panel chart prior to every ATC and work to highlight tri-panel chart revisions during the ATC.

2.2.4.5. Coordinate the insertion of transitioned technology into system, support, or infrastructure applications.

2.2.4.6. Complete auditable cost estimates for transition costs prior to the commissioning ATC in conjunction with the integrated product team.

2.2.5. Use the T2 process for transition of laboratory technology developed in other than 6.3 funded ATDs.

2.2.6. Plan and obtain MAJCOM coordination for the funding of technology insertion.

2.2.7. Develop an executable acquisition, fielding, and sustainment plan.

2.2.8. Support an annual review of ongoing TTPs and support revisions and staff new initial recipient and/or final recipient signatures.

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Vice Commander, Air Force Research Laboratory

Attachment 1**GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION*****Terms***

ATD—Advanced Technology Demonstration

ATD Candidate—Any Air Force Science and Technology (S&T) technology program with the objective of demonstrating an integrated set of technologies that will enable (a) superior warfighting capabilities and (b) be ready to transition before the end of the Future Years Defense Program (FYDP). Successful completion of an ATD program would sufficiently mature the technology(ies) for transition into an advanced system development or a fielded system upgrade.

ATD Categories—The ATC categorizes all candidate ATD programs. These categories are:

- Category 1 - MAJCOM/Agency supports and has programmed required funding for transition (6.4 and beyond) within the Future Year Defense Program
- Category 2A - MAJCOM/Agency supports and is committed to identify transition funding in the next programming cycle
- Category 2B - MAJCOM/Agency supports but is not currently able to program for Transition
- Category 3 - MAJCOM/Agency does not support

ATD—Any Candidate ATD commissioned by the ATC and given a category of 1, 2A, or 2B.

Graduated ATD—Any ATD which has reached the end of the coordinated, planned AFRL program, i.e., accomplished the final Technology Availability Delivery.

Technology Transition (T2)—In general, T2 is the transition of technology from the sponsoring AFRL directorate (technology developer) to a technology recipient (see paragraph 1.3 below). Transition ultimately is successful upon incorporation of technology into a system. T2 is considered as occurring through the following two steps:

Technology Demonstration—Technology demonstration, usually at the system/subsystem model or prototype demonstration in a relevant environment level, is the successful completion of the AFRL portion of the terms and conditions of a technology transition plan (see paragraph 1.5 below).

Technology Application—Technology application involves any required further development of the technology (e.g., in a system detailed design program) and the actions associated with specification, development, and acquisition of systems incorporating the technology.

Technology Recipient—Enterprises, consisting of the Product and Logistics Centers, are the usual initial recipients of the technology/capability developed and demonstrated by the laboratory. Industry is the usual technology/capability integrator since the primary means of inserting new and evolving technology into systems is through contractors who propose to employ the technology/capability in system developments.

Initial Recipient—The activity that assumes program management responsibility for the technology/capability from AFRL.

Final Recipient—The MAJCOM/Agency that uses the technology/capability.

Engineering Validation—The Enterprises, along with AFRL and other stakeholders, will determine the S&T Key Performance Parameters (KPPs) ([Attachment 5](#)) and provide input to the S&T cost, schedule, and technical risk as shown in [Attachment 6](#). The S&T KPP and S&T Risk charts will be used to develop the AFRL portion of the tri-panel chart, 1.5.1, and/or the detailed technology transition plan, 1.5.2. The resulting product is a validation of the proposed technology performance parameters, exit criteria, associated system risk, and Technology Readiness Level.

Technology Transition Plan (TTP)—An agreement between AFRL and the initial and final technology recipients documenting the specific tasks that must be successfully completed prior to technology acceptance including an executable acquisition, fielding, and sustainment plan. Current TTPs, using the 13 March 1995 AFMC Instruction 61-102, are considered valid until any revision is required. Revised TTPs will use the process described in this paragraph. There can be more than one level of TTP as described below.

Tri-Panel Chart—A detailed plan may not be possible when the initial recipient has not been specifically identified or is industry as is the usual case for the Space ATDs. The final technology recipient, the Enterprise, and AFRL will agree to the content of a tri-panel chart, see example in [Attachment 4](#), in conjunction with ATC pre-briefs. The coordinated chart will be shown during the ATC and considered a signed TTP when the decision memorandum is signed. The ATD integrated product team will provide the first draft of the tri-panel chart for review during the ATC pre-briefs.

Detailed TTP—A detailed plan is advisable and will be required between an AFRL directorate and the initial and/or final recipient of the technology unless the conditions of paragraph [1.5.1](#). are met. The ATD integrated product team will initiate and pursue development, coordination, and implementation of any required, detailed TTP. Elements of a detailed plan are in [Attachment 4](#). The ATD Program Baseline document should be a viable source for many of the items contained within a detailed TTP.

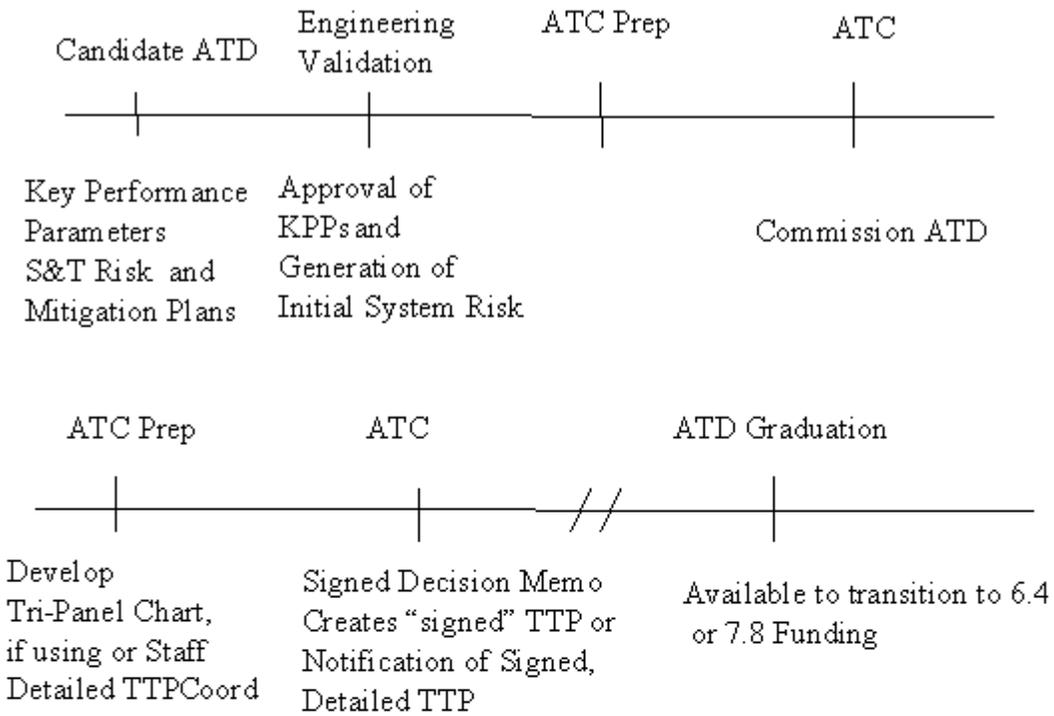
ATD Program Baseline Reviews—A cost, schedule, and performance review conducted by AFRL HQ on ATD programs.

Technology Readiness Levels (TRLs)—Technical maturity levels are measured along a scale of one to nine, starting with paper studies of the basic concept, proceeding with laboratory demonstrations, and ending with a technology that has been proven on the intended product. The sufficiently mature technology, see [1.1.1.](#), is usually considered to be a System/Subsystem Model or Prototype Demonstration in a Relevant Environment. The initial technology recipient and AFRL may negotiate a higher risk transition with the integrated product team.

Integrated Product Team—Each ATD shall have an integrated product team consisting of AFRL, initial technology recipient, and the final recipient, as a minimum

Attachment 2

NOTIONAL TIME LINE



Attachment 3

DETAILED TECHNOLOGY TRANSITION PLAN ELEMENTS

The detailed TTP documents the commitment of the requirements/resource sponsor, AFRL (developer and provider of the technology/capability), and acquisition program sponsor (intended receiver of the technology or capability development) to develop, deliver, and integrate a technology/capability into an acquisition program. The following elements should be considered for inclusion in the TTP. Not every one of these elements is appropriate for every agreement, but each element should be considered for inclusion.

Agreements, to be effective, must be reviewed periodically with each of the key partners, the requirements/resource sponsor, S&T management, and the program office management representatives participating. These reviews should address technical progress and future directions.

Elements to be provided by the Program Office (Initial Recipient):

- a. **Target Acquisition Program.** Provide a brief description of the acquisition program to receive the technology/capability. Include:
 - 1) Major program objectives.
 - 2) Current phase of the acquisition life cycle.
 - 3) Projected initial operational capability date.
- b. **Program Manager/Project Officer.** Identify personnel responsible for day-to-day program/project management:
 - 1) Program Manager and contact information.
 - 2) Project Officer and contact information.
- c. **Deficiency.** Identify the MAJCOM need, deficiency, or capability gap/shortfall that the S&T program is expected to address. Briefly describe the benefit that the technology/capability will bring to the acquisition program:
 - 1) Relate the benefit to the Initial Capabilities Document (ICD), Capability Development Document (CDD), Key Performance Parameters (KPP), etc.
 - 2) Include need dates for specific technologies/capabilities.
 - 3) Provide an estimate of the TRL for each technology/capability 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.
- d. **Integration Strategy.** Describe the process for integrating the technology/capability into the acquisition program. Include the following elements of acquisition strategy:
 - 1) Evolutionary acquisition, block upgrade, etc.

- 2) Required contractor-to-contractor agreements.
- 3) Acquisition Program Element (PE) numbers funding the transition.
- 4) Annual PE funding levels committed to the transition program.
- 5) Transition FY.
- 6) Statement conveying the level of commitment that could be the ATD category or shown as a complete ATC fishbone chart. For example:

i. Commitment: “Upon successful demonstration of key performance requirements (exit criteria), PMW XXX (acquisition program office) **will integrate** XXX (technology/capability AFRL will deliver into XXX (acquisition program that will integrate AFRL technology/capability) commencing in FYXX (transition year).” This integration **effort will be funded** under PE XXXXXXXX, Project XXXX (FYDP budget profile for this acquisition line should be included).

ii. Intent. “Upon successful demonstration of key performance requirements (exit criteria), PMW XXX (acquisition program office) intends to integrate XXX (technology/capability AFRL is delivering) into XXX (acquisition program that will integrate AFRL technology/capability) commencing in FYXX (transition year) under PE XXXXXXXX Project XXXXX (FYDP budget profile).

Elements to be provided by AFRL:

a. **Description of Technology/Capability to be Delivered.** Briefly describe what the AFRL intends to develop for transition to the acquisition program Include technology availability dates.

b. **Description of What Technology/Capability Will Not Be Delivered.** Describe what performance characteristics/capabilities will not be provided by AFRL. Identify what characteristics and missions the technology/capability will not provide and transition to the acquisition program.

(**Note:** Any changes in capability or performance must be agreed to by both AFRL and the funding organization and an updated Technology Development and Transition Plan must be signed and dated by ranking representatives of AFRL and the funding organization.)

c. **Technology Manager.** Identify the individual designated by AFRL to coordinate day-to-day management of the technology/capability and list contact information.

d. **Current Status of Technology/Capability.**

1) Status Summary. Summarize the current state of development. Identify:

- a. Primary areas where additional development is required.
- b. Estimate of current TRL

2) **Risk Analysis.** Prioritize and discuss major areas of technical risk. Identify planned Mitigation activities to address technical risk (e.g. Producibility, affordability, sustainability).

e. **Technology Development Strategy.** Outline planned approach. Include:

- 1) Efforts required beyond those currently underway.

- 2) Integration plans if multiple projects are planned.
- 3) Planned ATD or ACTD developments, if applicable.

f. **Exit criteria (key technical measures of readiness) for Transition.** Identify quantifiable criteria that will be used to measure whether the technology/capability development effort is proceeding appropriately. Provide:

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

g. **Program Plan.** Show major activities/efforts planned for the technology/capability development with milestones. Include both AFRL and acquisition tasks/elements.

h. **Data Documentation Deliverables.** Identify what types of data will be furnished to the initial and/or final technology/capability recipients such as: handbooks, databases, engineering validation output, etc.

Elements to be provided by MAJCOM/Agency (Final Recipient):

Both of these elements may be captured in the ATC fishbone chart.

- a. **Capability Requirement Basis.** Identify the governing source of the capability requirement: the ICD, CDD, Need, Deficiency, Capability Gap/Shortfall, or other official reference documenting the capability need.
- b. **Resource Sponsor/Requirements Officer.** Identify the resource sponsor and requirements officer responsible for resourcing and establishing requirements for the capability. Include contact information.

Signatures and dates. Technology transition plans should be signed by the ranking members of the ATD integrated product team with the assertion that they are signing an agreement between AFRL and the initial and final technology recipients documenting the specific tasks that must be successfully completed prior to technology acceptance at the time of signature. Since the technology transition plan should be a living document, it is expected that changes will be negotiated and an amendment/revision signed.

Attachment 4

TRI-PANEL CHART



ATD Transition Plan



<u>AFRL</u> (Exit Criteria & Tech Availability)	<u>Enterprise</u> (Developmental Criteria)	<u>MAJCOM</u> (Implementation Requirements)
<p><i>Hardware:</i></p> <p><i>Data: Final Report</i></p> <p><i>Software:</i></p>	<p><i>Test Req:</i></p> <p><i>Funding:</i></p> <p><i>Schedule:</i></p>	<p><i>Implementation Req:</i></p>

Attachment 5

KEY PERFORMANCE PARAMETERS



**Key Performance Parameters
Per Technology or Delivery**



Parameter/ Weight (0-1)	Req't Threshold	Req't Objective	Expected Value	How to Demo	Current Status	How Demo'd	POF

The Weight is the relative importance of the individual parameter versus the other parameters. If all parameters are equally important, the weight of all of the parameters is 1.0.

The Threshold is the minimum the customer needs for this measurable parameter.

The Objective is the maximum the customer could possibly use for this measurable parameter.

The Expected Value is the best AFRL believes is achievable for this measurable parameter.

How to Demonstrate is bench measurement, flight test, by analysis, etc.

POF is probability of failure, a measure of risk of not meeting requirement threshold for a given parameter.

It is a qualitative assessment, in percentage by the integrated product team, expressed from 0-1. (A 40% chance of failure, or not meeting threshold, is 0.4.)

Attachment 6

S&T RISK



S&T Risk
Per technology or Delivery



	COST	SCHEDULE	PERFORMANCE
RISK			
RISK FACTORS			
MITIGATION PLAN			

Risk is shown as low, medium, or high for each technology/capability or delivery, i.e., spiral development.