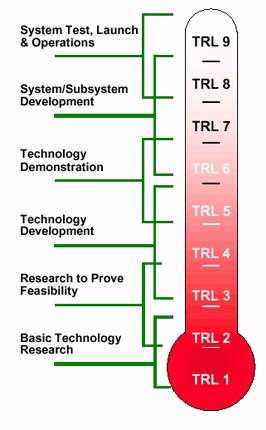
**Technology Readiness Assessment**

**1. FUNDAMENTALS OF TRAs**

**1.1. Introduction to TRAs**

The objective of this lesson is for each student to comprehend the TRA architecture.

**1.1.1. TRA Definition**

A Technology Readiness Assessment (TRA) is a formal, systematic, metric-based process and accompanying report that assesses the maturity of technologies called Critical Technology Elements (CTEs) to be used in systems. It is conducted by an Independent Review Team (IRT) consisting of subject matter experts (SMEs).

**1.1.2. TRA Purpose**

 2005 Government  
 Accountability   
 Office (GAO) Review\*

* For mature technology programs, research, development, test, and evaluation (RDT&E) costs increased 9% and unit production cost increased <1%.
* For immature technology programs, RDT&E costs increased 41% and unit production cost increased 21%.

\*Defense Acquisitions: Assessments of Selected Major Weapon Programs, GAO-05-301, March 2005

The purpose of TRA is to perform an independent, objective assessment of technology maturity during each phase of the acquisition lifecycle and to assess the technical risk associated with a project.  
  
Technologically immature development efforts often lead to cost overruns, schedule slippages, and performance problems, which are associated with the quality triangle elements.

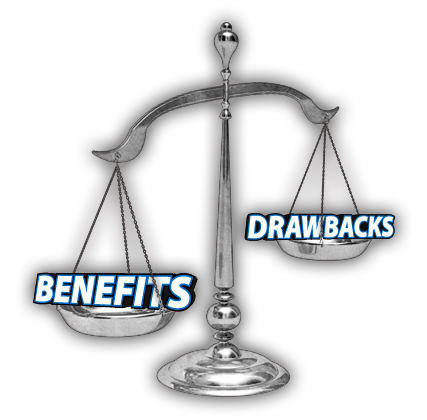
**1.1.3. TRA Benefits**



There are many benefits that the AF realizes by conducting TRAs.  
They include:

* Better business management
* Better technology capabilities
* Integration of mature technologies into acquisition programs
* Fewer schedule slippages
* Less cost overruns

**1.1.4. TRA Drawbacks**



TRA Drawback include:

* TRAs are a one-dimensional measurement that only assess individual CTEs, not the way the CTEs integrate with each other, or within systems.
* TRAs don’t consider outside integration influences like system readiness levels and different points of view.

Minimize TRA drawbacks through conscious and deliberate consideration of:

* The way CTEs integrate with each other
* The way CTEs integrate with other readiness levels during the TRA process

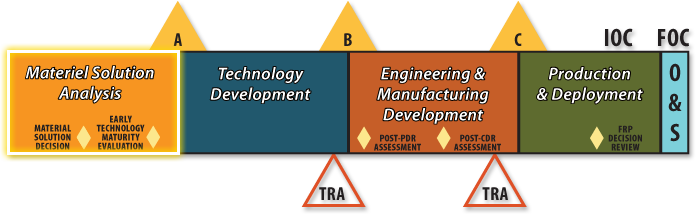
**1.1.5. Technology Maturity Definition**

Technology maturity is a measure of the degree to which proposed CTEs meet program objectives. It is a principal element to consider when determining program risk.

Technology maturity is measured in two environments:

* Relevant environment
* Operational environment

**1.1.6. MSA Phase of Technology Maturity**

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MSA Phase stands for Materiel Solution Analysis Phase.  
  
MSA Phase functions include:

* Potential materiel solutions are assessed.
* Phase-specific entry criteria for Milestone A are satisfied.
* A Pre-MSA list of potential CTEs is compiled.
* An approved initial capabilities document (ICD) is required for phase entry.
* An Analysis of Alternatives (AoA) is performed.
* Early Systems Engineering activities are conducted.
* An Early Evaluation of Technological Maturity is conducted.

Entrance into this phase depends on an approved Initial Capabilities Document. In this phase, an Analysis of Alternatives is conducted to identify potential materiel need solutions, based on a cost-benefit analysis.

Early Systems Engineering activities, such as the proposed Engineering Analysis of Potential System Solutions, are conducted. These materiel solutions then undergo an Early Evaluation of Technological Maturity, provided sufficient technical information exists to support such an evaluation.

This evaluation will identify candidate Critical Technologies or Critical Technology Areas for each of the potential materiel solutions.



**1.1.7. Characteristics of TRA Steps**

***Step 1 – Initiate TRA***

To initiate the TRA process, the Program Management Office (PMO) contacts the Deputy Assistant Secretary of the Air Force / Science, Technology, and Engineering Executive (SAF / AQR) Service Acquisition Executive / Defense Acquisition Executive (SAE / DAE programs).

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SAF / AQR then identifies Acquisitions Engineering and Technical Management Division (AQRE) and Acquisitions Science and Technology Division (AQRT) action officers. SAF / AQRE is the Engineering and Technical Management Division. They are the owners of the TRA process. SAF / AQRT is the Science and Technology Division. They provide technology expertise.

***Step 2 – Plan TRA***The PMO and SAF / AQR work together to develop the TRA plan. Commonly this is done through a teleconference. Participants may include PMO, SAF / AQR, SAF Capability Directorate, and SAF / ACE, among others. The outcome of the teleconference is a plan, consisting of:

* Program description and acquisition strategy
* Technologies under consideration
* Planned TRA schedule
* Funding considerations for temporary duty (TDY), labor, etc.
* Proposed IRP participants

***Step 3 - Identify IRP***After the TRA plan is in place, the PMO assembles a list of the candidate IRP members and provides resumes of those candidates to SAF / AQR. The PMO considers the following criteria for the team:

* IRP Lead must be an experienced technical leader, outside of the Program Executive Office (PEO) chain of command.
* IRP members must have knowledge of program’s technologies and are independent of program’s technology development.
* IRP members can come from the following sources: Center Engineers, Air Force Research Laboratory AFRL, Federally Funded Research and Development Centers, Advisory and Assistance Services, and other Services.

SAF / AQR modifies the list as necessary and approves IRP lead and members, then coordinates IRP membership with Deputy Under Secretary of Defense for Science and Technology for the DAE programs.

***Step 4 - Train IRP***Training the IRP is a responsibility shared by the AQR and PMO. AQR provides TRA process information, while the PMO provides a program description to include a potential list of technologies.

As a rule, it is best to have IRP convene at the PMO for briefings. This provides a good opportunity for the IRP to request artifacts (e.g. Work Breakdown Structure (WBS), Capabilities Development Document (CDD), trade studies, etc.) from PMO to initiate the assessment.

***Step 5 – Develop Candidate CTE List***PMO identifies a candidate CTE list to include:

* Superset list of technologies by reviewing the WBS, system architecture, etc. This process should be thorough, disciplined, and inclusive. Any questionable technology should be identified as a possible CTE. For these questionable technologies, the information required to resolve their status should be also documented. The PM, the government program office staff, and the system contractors—the people best informed about the system—should lead the first step.
* Subset list of critical technologies by using the methodology defined in Appendix B of the TRA Deskbook, Section B.3.1. The development of this list is the responsibility of an Independent Review Team (IRT) of subject matter experts (SMEs) convened by the Component Science and Technology (S&T) Executive. In this step, the IRT, in conjunction with the program office, resolves any issues generated in the development of the initial CTE list. The IRT can also make additions and deletions to the initial list. The Director, Research Directorate (DRD) should also review the candidate list and provide necessary changes. Additions to the list may include any technologies that warrant the rigor of the formal TRA process.

The PMO then submits the candidate list of CTEs to the IRP and AQR.

***Step 6 - Finalize CTE List***IRP reviews the candidate CTE list then recommends to AQR the final CTE list to be assessed.

SAF / AQR modifies the list as necessary and approves the final CTE list, then coordinates CTEs with Deputy Under Secretary of Defense for Science and Technology [DUSD(S&T)] for DAE programs.

***Step 7 - Collect Data***

Next, the PMO collects and provides data for the IRP to use in assessing CTE maturity. The data should include detailed results from test or demonstrations. The burden of proof is on the PMO to provide evidence that a CTE has been successfully demonstrated.

The PMO must provide documentation to the IRP well in advance of the formal assessment to support a timely review.

***Step 8 - Perform Assessment***The IRP performs the assessment by reviewing data / artifacts to determine a TRL for each CTE, then documents their rationale and overall conclusion. IRP may consult SMEs to augment the their existing skill set

The IRP prepares their score in a closed door session with attendance limited to IRP members and SAF / AQR points of contact (POCs). A copy of each team member's score sheets is provided to the IRP Lead and to SAF / AQR.

During the scoring, the IRP Lead strives for TRL consensus, which is dependent upon completeness of artifacts and IRP discussion. A lack of consensus may necessitate AQR intervention.

The IRP provides opportunity for PMO feedback on any CTEs requiring TMPs. PMO provides the facility for IRP assessment and verifies facility and attendees are cleared to handle classification level of data presented / discussed.

***Step 9 - Document TRA***

IRP documents its assessment in accordance with TRA Deskbook Section 3.

The IRP Lead submits the assessment to the PMO with a copy to AQR. The PMO then builds the TRA final document around the IRP’s assessment using the template in Section 4 of the TRA Deskbook.

The PMO (CE / Tech Director) and IRP Lead sign TRA final document.

***Step 10 - Staff TRA***

The PMO submits the TRA final document to SAF / AQR no later than 6 weeks prior to the Milestone. SAF / AQR then performs a peer review on the TRA final document. The IRP Lead and PMO representative shall be available to brief the TRA assessment to SAF / AQR and DUSD(S&T) (for DAE programs).

Finally, the SAF / AQR endorses the TRA via memo and forwards to Assistant Secretary of the Air Force (Acquisition) (SAF / AQ) with an info copy to DUSD(S&T) (for DAE programs).