***BY ORDER OF THE COMMANDER***
***AIR FORCE RESEARCH LABORATORY***
***(AFRL)***

***AIR FORCE RESEARCH LABORATORY***
***INSTRUCTION 61-108***

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***Scientific/Research and Development***

# *MANAGEMENT AND CONTROL OF TECHNOLOGY DEVELOPMENT FOR AFRL*

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This is to be used in conjunction with Air Force Instruction (AFI) 61-101, *Management of Science and Technology*; Air Force Material Command Instruction (AFMCI) 62-202, *Criteria for Critical Engineering Positions and 63-1201, Implementing Operational Safety Suitability and Effectiveness (OSS&E) and Life Cycle Systems Engineering.* This instruction applies across the entire Air Force Research Laboratory (AFRL) Research and Development (R&D) portfolio encompassing all programs in Basic Research, Applied Research, Advanced Technology Development, and Prototype and Experimentation. All existing references to Department of the Air Force (DAF) publications and forms are applicable to all DAF entities including the DAF and the United States Space Force (USSF), unless specifically excluded. This publication remains applicable to AFRL organizations aligned under USSF. This publication may be supplemented at any organizational level, but all direct Supplements must be routed to the Office of Primary Responsibility (OPR) of this publication for coordination prior to certification and approval. Refer recommended changes and questions about this publication to the OPR using the AF Form 847, *Recommendation for Change of Publication*; route AF Form 847 through the appropriate functional chain of command. The authority to waive requirements in this publication resides with the AFRL Vice Commander (CV). Submit requests for waivers through the chain of command to the Publication OPR for non-tiered compliance items. Ensure that all records created as a result of processes prescribed in this publication are maintained IAW Air Force Manual (AFI) 33-322, *Records Management and Information Governance Program*, and disposed of IAW the Air Force Records Information Management System (AFRIMS) Records Disposition Schedule (RDS).

**1. Overview.** This instruction establishes the structure and procedures for development, management and review of R&D programs for the AFRL enterprise. Specifically, this document defines differences in AFRL program types and outlines appropriate management and oversight procedures based on program total cost, external visibility and other factors. This document details specific program management and oversight functions to ensure the establishment, monitoring and annual review of program progress through standard cost, schedule, and performance management methods. This document also identifies a suite of digital applications designed to support the Research and Development Program Manager (R&D PM) and other Program Managers (PMs) in adherence to this guidance. Lastly, this outlines a set of AFRL tailored Systems Engineering (SE) approaches to support SE principals in planning and executing R&D efforts. This instruction is intended to provide general guidance to the PM, R&D PM, Mission Organization (Msn Org)/Directorate Chief Engineer or Systems Engineer. Msn Orgs and Directorates have discretion in defining internal processes and procedures for complying with this instruction.

1.1. **Application.** This document establishes policy, responsibilities, and procedures for the management of AFRL Programs. This instruction applies to all R&D related programs or efforts managed or executed by AFRL personnel and applies to all efforts on which AFRL has lead responsibility, whether internally or externally funded.

**2. Roles & Responsibilities.** The following are the roles and responsibilities of key participants in the development, approval, and reporting of AFRL Programs.

2.1. **AFRL/CC.**

2.1.1. Ensures existence of policy and guidance for the implementation and application of the AFRL program management process.

2.1.2. Serves as the DAF Technology Executive Officer (TEO).

2.1.3. Designates R&D-1 Programs (See Section 6 for R&D program types).

2.1.4. Chairs Enterprise level Program Management Reviews (PMRs) for R&D-1 Programs unless it has been delegated.

2.1.5. Approves baselines for R&D-1 Programs not delegated to a Msn Org Director.

2.1.6. Approves baselines for select R&D-1 Programs.

2.1.7. Issues AFRL S&T logistics and property accountability guidance.

2.2. **Director of Engineering (DOE) .**

2.2.1. This instruction constitutes AFRL/CC appointment of the AFRL Director of Engineering (DoE) as the AFRL Technical Engineering Authority (TEA) in accordance with (IAW) AFMCI 63-1201.

2.2.2. Serves as AFRL Center Senior Functional (CSF) for Engineering and Technical Management (ETM).

2.3. **AFRL Engineering & Technical Management Directorate (AFRL/EN).**

2.3.1. Acts in the capacity as the Center Senior Functional (CSF) for Program Management.

2.3.2. Ensures that the AFRL Systems Engineering and Program Management (SEPM) Group promotes R&D program management within AFRL.

2.3.3. Serves as approval authority for the designation of R&D Programs as R&D-1, and ensures that the approved program type for an R&D program is reflected in the Enterprise Planning and Programming (EP2) Application (App) and the R&D Master List (R&DML) report and the PMR template

2.3.4. Maintains the list of R&D-1 programs retained by AFRL/CC as the Technical Approval Authority (TAA) and those delegated to the Msn Org Directors.

2.3.5. Schedules and assists in preparations of PMRs and other program reviews as directed by AFRL/CC.

2.3.6. Assists R&D PMs in developing R&D Program baselines and PMR presentations.

2.3.7. Participates in all R&D-1 PMRs, and R&D-2 program PMRs as available.

2.3.8. Reviews and coordinates on baseline documents for R&D-1 programs.

2.3.9. Reviews selected R&D-1 programs and provides reports to AFRL/CC.

2.3.10. Develops, integrates and coordinates on R&D Management processes and program data requirements with XP, FM, DP, PK, SB, DS, and RC as they relate to the Science and Technology (S&T) Information Technology Collaboration Hub (STiTCH) applications suite.

2.4. **AFRL Plans and Programs Directorate (AFRL/XP).**

2.4.1. Maintains configuration control over technology transition definitions and metrics.

2.4.2. Develops, integrates and coordinates on R&D Management processes and program data requirements with EN, FM, DP, PK, SB, DS, and RC as they relate to the STiTCH applications suite.

2.5. **Msn Org/Directorate Director.**

2.5.1. Ensures divisions, branches, and R&D PMs/PMs implement this instruction.

2.5.2. Supports the Chief Engineer's role as the R&D Program Management focal point for the Msn Org/Directorate.

2.5.3. Ensures PMRs are conducted at least annually for delegated R&D-1 Programs and for R&D-2 and 3 programs within the organization.

2.5.4. Recommends Programs to be designated as R&D-1.

2.5.5. Designates R&D-2 and R&D-3 Programs for the Msn Org.

2.5.6. Serves as TAA for delegated R&D-1 Programs.

2.5.7. Names R&D PMs for R&D-1 and 2 programs within their organization.

2.5.8. Ensures R&D PMs are named for all R&D-3 programs within their organization.

2.5.9. Designates TAAs for all R&D-2 programs within the organization.

2.5.10. Delegates or delegates responsibility for naming TAAs for the R&D-3 programs within the organization.

2.5.11. Oversees the implementation of Digital Enterprise R&D Management Suite (DEMS) and its STiTCH Apps as part of their internal business and R&D management processes.

2.5.11.1. Ensures allocation of appropriate resources per approved R&D program baseline in accordance with documented AFRL priorities.

2.5.12. Serves as Portfolio Manager by approving and maintaining a control process for the resources allocated to the Msn Org's/Directorate's portfolio of Programs.

2.6. **Msn Org/Directorate Chief Engineer.**

2.6.1. Serves as the Msn Org/Directorate Senior Engineering and Program Management focal point and member of the AFRL SEPM Group.

2.6.2. Approves tailored SE processes for programs within their Msn Org/Directorate.

2.6.3. Trains and supports SE and program management practices in accordance with this instruction.

2.6.4. Reviews and coordinates on all program baselines and PMRs, per TAA request, for Programs within their Msn Org/Directorate.

2.6.5. Participates in PMRs and other reviews as available.

2.7. **AFRL Systems Engineering and Program Management (SEPM) Group.**

2.7.1. Develops, promotes, and updates policy, processes, tools and training for the S&E and PM workforce across the AFRL enterprise to include SE, airworthiness, OSS&E, and Mission Assurance.

2.7.2. Reviews this instruction and the AFRL SEPM Group roles and responsibilities defined in AFRLI 61-207 and prepares updates as necessary.

2.7.3. Reviews each tailored Msn Org/Directorate SE instruction for continuity and consistency with overall AFRL SE policy and recommends alterations as needed.

2.7.4. Maintains an awareness of government, commercial industry, and academic SE and PM best practices, procedures, and tools and makes them available for use across AFRL.

2.7.5. Liaises with the AFMC Engineering and PM Directorates on issues of mutual concern.

2.8. **Msn Org/Directorate Branch Chiefs and Division Chiefs.**

2.8.1. Ensures R&D PMs/PMs follow this instruction in the creation, development, execution and closure of assigned Programs.

2.8.2. Support allocation of sufficient resources to meet program objectives.

2.9. **R&D PMs and Other PMs.**

2.9.1. The individual, regardless job series (civilian) or Air Force Specialty Code (military), named to be the single person responsible for managing the cost, schedule and performance of a program as defined by the baseline.

2.9.2. Creates, advocates and manages assigned programs through collaboration with the appropriate stakeholders.

2.9.3. Makes decisions, in conjunction with the research team, necessary to meet the cost, schedule, and performance objectives of the program while balancing programmatic and technical risks.

2.9.4. Identifies a multi-functional program team, as required for the planning and execution of assigned programs. Works with organizational leadership to include all necessary members, including functional representation from finance, engineering, contracting, logistics and others as needed.

2.9.5. Creates and maintains an approved program baseline that is current for the program.

2.9.6. Makes informed decisions utilizing risk management and cost/schedule evaluation methods.

2.9.7. Works collaboratively with stakeholders to execute tailored SE processes and transitions technology.

2.9.8. Invites customers as appropriate and in coordination with leadership, to the PMRs and appropriate program reviews.

2.9.9. Recommends cost, schedule, and performance baseline changes in accordance with Section 12 of this Instruction.

2.9.10. Prepares and presents to the TAA (or delegated official) PMRs to convey Program status relative to the baseline on at least an annual basis.

2.10. **Msn Org/Directorate Senior Planner.**

2.10.1. Ensures all Msn Org and Directorate programs (except as prohibited by other factors such as classification are created, populated and maintained in the EP2 app.

**3. Digital Enterprise R&D Management Suite (DEMS).** AFRL utilizes a suite of systems and applications to enable digitization and integration of the planning, programming, budgeting and execution data across the enterprise. DEMS consists of a diverse set of applications, including AFRL-developed and Department of Defense (DoD)-provided business process systems, which have been designed to work cooperatively as AFRL's enterprise business system. DEMS enables digitization and integration of AFRL's core business practices to promote timely and accurate decision making. Constituent apps within DEMS may contain additional embedded instructional guidance which is to be considered supplemental to this Instruction and treated with the same authority. Higher-level instruction, guidance or policy that conflicts with this instruction will take precedent.

3.1. **S&T Information Technology Collaboration Hub (STiTCH) R&D Management Apps (STiTCH M-suite).** AFRL's STiTCH Applications (Apps) suite, maintained by AFRL/RC, is being deployed to enable digitization and integration of planning, programming, budgeting, and execution data across the AFRL R&D enterprise. Four of the STiTCH apps most applicable to R&D Management and this instruction include the EP2 app, the PM app, the Work Unit (WU) app, and the Grants app. STiTCH apps enable timely planning, programming, budgeting, and execution of core and external funds received by AFRL. STiTCH apps ensure the management of technical work in support of Department of the Air Force priorities. These apps have been developed in conjunction with this instruction such that comprehensive use of these apps constitutes compliance with this guidance. A pictorial representation of the STiTCH application suite is included as **Figure 1** These STiTCH apps are described in greater detail in the following sections:

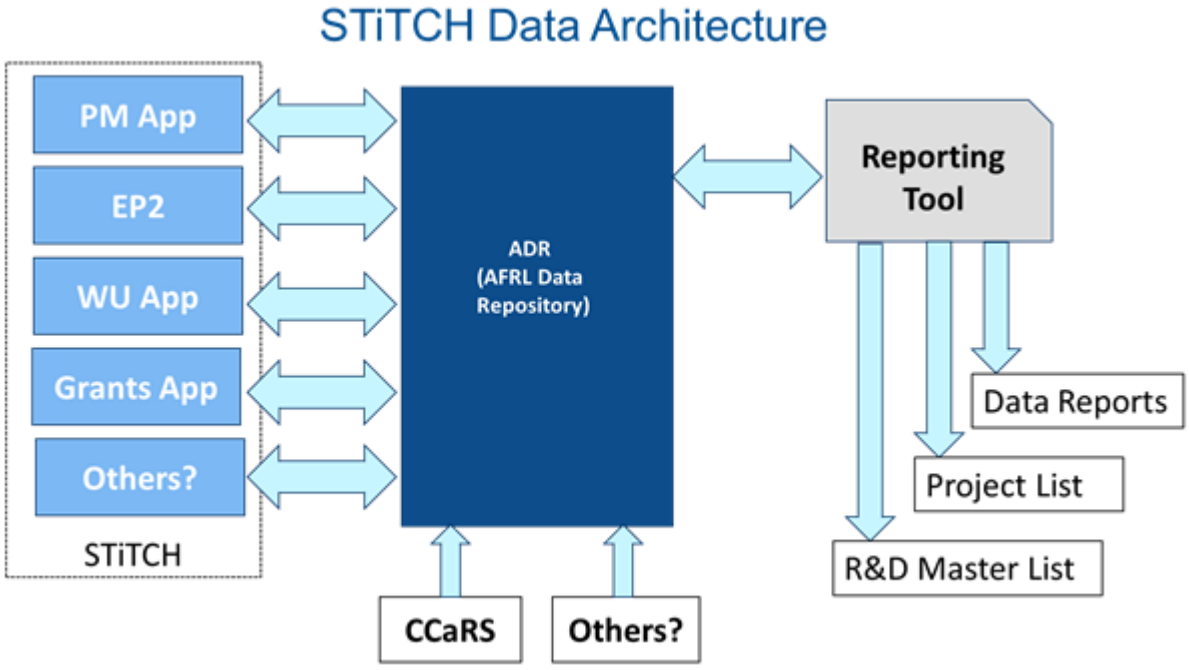
3.1.1. The EP2 app allows planners to create, develop, manage and understand AFRL's programs at the enterprise level, and captures processes & data use for the executing the Planning, Programming, Budgeting and Execution (PPBE) process. The business utility includes "Touch data once" for enterprise data capture and the elimination of paper based AFRL data calls. EP2 interfaces with other apps including the PM and Grants Apps and Comprehensive Cost and Requirement System (CCaRS) to ensure consistency of data across the AFRL business processes.

3.1.2. The PM app is an AFRL-tailored program management app that provides a robust set of cost, schedule, performance, and risk-management tools. This app exchanges program and financial data with EP2 and receives data from the CCaRS to ensure consistency of data across business processes and to reduce multiple cross app data entries. This app provides a digital baseline and PMR approval processes and the reduction (or elimination) of AFRL data calls.

3.1.3. The WU App captures the metadata for the AFRL research efforts, employs workflows to automate business processes, tracks compliancy, reports data to external applications (e.g. Unified Research & Engineering Database (URED)) to improve the effectiveness of our workforce.

3.1.4. The Grants App is a business system that supports numerous Air Force Office of Scientific Research (AFOSR) business processes. The primary purpose of the Grants App is to facilitate award and management of research and non-research grants and contracts to academia and industry across the United States and the world.

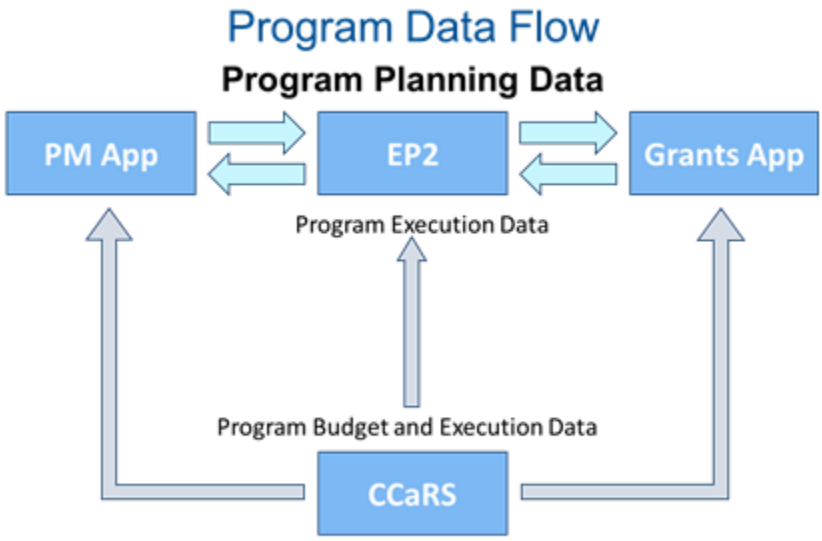
**Figure 1. STiTCH Data Architecture.**




**4. Externally operated Digital Business Applications for R&D Management.** DEMS includes apps provided by DoD, DAF, and other government organizations that are used to support specific AFRL business processes including financial execution, contract management and other programming, planning and execution R&D management activities. Examples of externally operated systems that may be utilized within DEMS include but are not limited to: CCaRS [a module of Project Management Resource Tools (PMRT)], ConData, Program and Budget Enterprise System (PBES), Manpower Programming and Execution System (MPES), Defense Technical Information Center (DTIC), URED repository, and other authoritative systems as required. AFRL does not hold primary authority for the use of these apps so additional embedded or higher-level guidance may exist and should be consulted as appropriate.

4.1. DEMS is designed to integrate the planning, programming, budgeting, execution and management processes across different individual apps to enable Enterprise-wide execution of the AFRL mission. These apps form the basis of AFRL's digital approach for comprehensive planning, programming, budgeting, and execution of the DAF's R&D mission and are an important part of the DAF's digital transformation efforts. **Figure 2** details the data flow between EP2, the PM app, the Grants app and CCaRS illustrating how these apps are integrated to support management of AFRL's R&D portfolio. Given the challenges of planning, programming and managing increasingly complex and collaborative programs, AFRL personnel are strongly encouraged to use the STiTCH application suite for the accomplishment of their work. Additional policy and guidance will detail the application and use of these apps.

**Figure 2. Program Data Flow.**




**5. Programs.** AFRL defines programs as endeavors undertaken and managed to create products, services, or results. A program is the highest level of the AFRL Work Breakdown Structure (WBS) and is where programming of funds occurs. Programs are planned and executed with AFRL appropriated funding and/or with money from external organizations. There are three categories of AFRL Programs: R&D Programs, R&D Support Programs, and Organizational Support Programs (see Sections 6-9). AFRL's DEMS utilizes programs as the highest level of organization in the financial planning and programming process. As such, all activities executed within AFRL will connect to a specific program, with a unique identifier, and will be recorded and maintained within the EP2 app. The PM app will utilize programs, established in EP2, as the highest-level organizational construct for the execution and management of resources.

**6. R&D Programs.** These are a specific category of programs within the AFRL taxonomy and are used to conduct the research and technology development work. These form the basis for our planning and management structure and are defined as a subset of all AFRL programs in order to characterize our technology efforts into discretely defined endeavors with clear outcomes or objectives for effective planning and management. R&D programs utilize a managed process that measures progression of program performance objectives through established PM and SE tools. R&D programs are defined as.

6.1. A finite endeavor involving expenditure of manpower and/or funding focused on technology maturation and delivery of scientific and/or technology products to increase future warfighter capability. R&D programs utilize a managed process that measures progression of program performance objectives through established PM and SE tools. R&D programs have defined performance objectives, a schedule, cost estimate and established exit criteria.

6.1.1. **AFRL R&D Program Life Cycle.** The goal of an AFRL R&D program is to systematically execute approved program resources to progress the development and transition of identified technical products. As such the lifecycle of programs in AFRL are defined in seven phases. These phases are defined as: Ideation, Pre-planning, Budgeting, Pre-execution, Execution, Retirement and Program End. AFRL's DEMS utilizes this acquisition construct to monitor the progression of an R&D program through its lifecycle so all AFRL R&D programs will have a specific phase designation identified within the EP2, PM, and Grants apps. Additional information on these lifecycles and for utilizing these phases to aid in the program management process, are provided in **Attachment 2**.

6.2. **Technical Approval Authority (TAA).** The TAA is responsible for program oversight. The TAA approves program baselines, baseline changes and serves as the chair for Program Management Reviews (PMRs).

6.3. **Research and Development Master List (R&DML).** All AFRL R&D Programs shall be defined by type on a single, authoritative R&DML. The R&DML will be assembled from the authoritative data source in the AFRL STiTCH Apps. R&DML Programs are programs that are in the Pre-Execution and Execution phases or have funding allocated to them across the Program Objective Memorandum (POM) years in a President's Budget (PB) position submitted to Congress.

6.4. **R&D Program Types.** All AFRL R&D programs shall be designated by one of the three program types for purposes of tracking and defining reporting and oversight responsibilities and authorities. These three types, R&D-1, R&D-2 and R&D-3 will be used to designate approval and reporting authority for all AFRL R&D efforts. AFRL portfolios as defined in **Attachment 1**, are not to be treated as R&D programs and will not be categorized as an R&D program. All work within AFRL portfolios will be part of identified programs. **Table 1** contains the description and decision authority for R&D-1 through R&D-3 programs.

6.4.1. **R&D-1 and 2 Programs.** These program types have clearly defined and measurable objectives with products intended for transition in support of DoD capability development. Specific criteria for R&D-1 and R&D-2 programs are defined in **Table 1** R&D-1 and R&D-2 programs are among AFRL's largest investments and often focus on specific customer needs through formal or informal transition planning. As such these higher-visibility programs often necessitate greater AFRL-level engagement and may be identified by AFRL/CC for direct oversight. Other than being identified as such, R&D-1 programs do not differ from R&D-2 programs in management processes, PMR frequency and other aspects. If a program meets the criteria in **Table 1** for an R&D-1 or 2 program and if it is believed the program should be designated differently, the Msn Org Chief Engineer should submit a request with the justification to AFRL/EN for a categorization decision.

6.4.1.1. The AFRL/CC is the TAA for all R&D-1 programs unless indicated through delegation. AFRL/EN will maintain a list of programs for which AFRL/CC will retain TAA designation and will identify the responsible organization for delegated R&D-1 programs. This list will be updated periodically, and notification of the TAA delegation will be made to the responsible Msn Orgs. The TAA for R&D-2 are the Msn Org Directors identified as the lead organization unless otherwise indicated. The Msn Org Director may further delegate TAA responsibility as appropriate. Msn Orgs have broad discretion in exercising TAA delegation but must maintain consistency with this instruction.

**Table 1. Description and Technical Approval Authority (TAA) for R&D Programs.**

| R&D Type | Reason for R&D Type Designation | TAA |
|---|---|---|
| R&D-1 | • Vanguard Programs<br>• Special Interest Programs[1]<br>• TEO designation | TEO or designee |
| R&D-2 | • Does not meet criteria for R&D-1 and;<br>• Has definable deliverable(s) with a set of transitionable capabilities to the warfighter and >$50M Total Program Required Cost[2] (unburdened)<br>OR<br>• TEO or Mission Organization Director designation | Msn Org Director or designee |
| R&D-3 | • All other R&D Programs | Mission Organization Director or designee |

[1]Considerations for special interest programs should include factors such as external visibility and interest, political implications, significant outside funding, Joint Emergent Operational Needs (JEONs), Joint Urgent Operational Needs (JUONs), Urgent Operational Needs (UONs) and programs with total required values (unburdened) of >$200 million total for all types and sources of funding.

[2]Total Program Required Cost is the total estimated cost of the program for all monetary types, including all external money, across the total life of the program.

6.4.2. **R&D-3 Programs.** R&D-3 programs constitute most of the technical activities executed within AFRL. In comparison to R&D-1 and R&D-2 programs, R&D-3 program structures and approaches are more varied because of broad differences in technological maturity, total investment and acquisition methodology. As such, Msn Orgs have discretion in the organization and execution of these program types. The TAA for R&D-3 programs is may be designated by the Msn Org Director or delegated to the Division or Branch level.

6.4.3. Like R&D-1 and R&D-2 programs, R&D-3 programs may focus on clearly defined transitionable products. However, R&D-3 programs may also be used to organize related technical projects wherein the products derived from these tasks may include knowledge products and others that may not transition out of the laboratory or result in the conclusion of the research area. To ensure that all R&D program technical objectives are current and appropriately align with DAF priorities, all AFRL programs, including R&D-3, should be limited in duration and will not exceed 5 years without approval by the program's TAA.

**7. R&D Support Programs.** Like R&D programs, R&D support programs are technical activities contributing directly to AFRL's research and development mission. However, R&D support programs are enduring activities intended to support or grow the general technical capability of AFRL. These programs support more than one R&D program and are therefore budgeted separately from any specific R&D program. R&D support programs types include:

7.1. **Research /Test Labs (Facilities/Infrastructure, Materials, etc.** ).

7.2. Modeling, Simulation and Analysis (MS&A) activities (if managed separately from a R&D Program).

7.3. Research/Test Lab Hardware Acquisition/Upgrade and Maintenance (costs not managed as part of an R&D Program).

7.4. Research/Test Lab Software Acquisition/Upgrade and Maintenance (costs not managed as part of an R&D program).

7.5. Other technical activities intended to directly support AFRL's R&D programs, grants or other technical activities.

**8. Organizational Support Programs.** These programs are budgetary activities or organizational constructs that provide support to organize, train and equip AFRL's Msn Orgs and Functional Directorates. Organization Support Programs include all activities, set-asides or overhead necessary to carry out the AFRL mission but are not accounted for in R&D technical or R&D support programs. Organizational Support Programs are organized by the following program types: DAF Assessments (SBIR/STTR, FLEX-4, MDAP); HQ Assessments (HQ BOE and Corporate Requirements); Other Government Costs (OGC) (All Travel, All Misc/GPC Supplies, All Training and Work Force Development, ADPE, Fuel); Facilities/Infrastructure – Non Lab Specific (Msn Org civ pay and non-OGC operations costs of FOG, Divisions, Branches, etc.); A&AS – Non R&DML Program; Base Operating Support (BOS) – Rome and Maui; Msn Org Directed Projects (CC/Director, Chief Scientist, etc.); Other Msn Org Civ Pay (Msn Org civ pay with no direct link to a specific function (i.e. Leadership, Div Chiefs, Branch Chiefs, etc.)); Special Civ Pay (Civ pay for classified reimbursable positions); Civ Pay (Execution year only program used by FM). These programs are included within EP2 and are used to supply appropriate budget detail to support annual POM submissions and data-calls.

**9. Managing R&D Programs.** The R&D PM is responsible for managing R&D Programs from inception through closure which includes the creation and maintenance of the program baseline and any additional data required by the Msn Org, Directorate, the TAA or other organizational processes or procedures.

**10. Management of the R&DML.** Individual endeavors, projects, sub-efforts or elements, funded with Budget Authority-3 Advanced Technology Development (6.3 for DAF) or expending outside (non-AFRL core) funding that meet the criteria for R&D-1 or 2 programs shall be identified as separate programs and will be tracked and managed as such.

10.1. AFRL/EN will review and update the R&D program type alignment annually in consultation with the SEPM Group. As part of this process, Msn Orgs and Directorates may recommend programs to be designated as R&D-1 based on various factors that may include total program cost, external visibility, cross-Msn Org involvement or other factors necessitating AFRL/CC oversight. Once established, AFRL/EN and AFRL/XPO will review the R&DML through AFRL's Group/Board/Council governance process whose members include representatives of all HQ Functionals and Msn Orgs. Once approved by the Council, the R&DML will be maintained by the Msn Orgs and Directorates in the STiTCH suite of applications.

10.1.1. Changes to the program type, including additions or deletions of any R&D programs, require a request be submitted through AFRL/EN, to **afrl.en.workflow@us.af.mil** and a response confirming the change must be received prior to making those changes in the apps. These changes will be collected and presented for informational purposes through the AFRL governance process on a periodic basis. Program content will be controlled through the program baseline process.

**11. R&D Program Baselines.** R&D Program Baselines document the program's technical objectives, resource requirements, cost, schedule, and performance parameters that must be met in order to accomplish the program's goals. A baseline approved by the TAA is required for all R&D programs in the execution phase. The initial baseline is approved prior to the program beginning the execution phase. The initial baseline will normally be reviewed and approved as part of the Initial PMR, which provides the authorization to begin execution of the allocated and authorized funding. Additional information on baselines is available in **Attachment 3**.

11.1. **R&D Program Baseline Content.** The baseline shall be maintained, coordinated, and approved either in the PM App, or if not included in the PM App, as a separate document made available for review in conjunction with PMRs. Standard criteria for programmatic baselines differ depending on program type. The minimum criteria by program type is detailed in **Table 2** AFRL/EN maintains a program baseline template. Additional baseline criteria may be required based on organization policy and Msn Orgs have discretion in development of specific program baseline templates.

**Table 2. Baseline Requirements by Program Type.**

| Baseline Requirements by Program Type | | | | |
|---|---|---|---|---|
| Section | Requirement | R&D-1 | R&D-2 | R&D-3 |
| **Program Scope** | Program Overview | X | X | X |
| | Desired Operational Capability | X | X | |
| | Program Objectives | X | X | X |
| | Description of Products | X | X | X[a] |
| | Product Key Performance Parameters (KPPs) and/or Technical Performance Measures (TPMs) and/or Measures of Performance (MOPs) | X | X | X[b] |
| | Technical Performance Breach Criteria | X | X | X |
| **Program Schedule** | Level I WBS and associated Schedule | X | X | X |
| | Level II WBS and associated Schedule | X | X | X |
| | Description of Major Program Milestones | X | X | X |
| | Schedule Breach Criteria | X | X | X |
| **Program Cost** | Program Cost Estimate | X | X | X |
| | Allocated Budget by WBS | X | X | X |
| | Required Resources (Personnel and Facilities) | X | X | X |
| | Cost Breach Criteria | X | X | X |

**[a] At least one product shall be identified.**
**[b] MOPs/KPPs and/or TPMs for enduring efforts may be qualitative in nature but must provide a clear description of the program end-state.**

11.2. **Re-baselining a Program.** During program execution, events or circumstances may arise causing a program to deviate from its approved baseline. Some of these events or circumstances are minor and do not significantly affect a program's technical objectives, cost, schedule, risk or overall performance. Other events or circumstances can be significant and require a modification to the approved baseline. This modification is called a program re-baseline and is required when any of the program breach criteria as defined in the approved baseline are exceeded.

11.2.1. **Circumstances for Re-baselining a Program.** AFRL R&D Program Baselines establish the re-baseline criteria as part of the approved baseline or use the default criteria. If the baseline does not specify this criteria, then the following default criteria will apply: any product delivery date changes by 6 months or more, 15% or greater cost change, any change to a KPP, MOP or TPM. The following criteria will trigger a rebaseline.

11.2.1.1. As a result of a major program restructure that changes the program parameters beyond the established breach criteria. Examples: externally directed budget increase or budget reduction/rephrasing, changes in KPPs/TPMs/MOPs, etc.

11.2.1.2. As a result of a program deviation (breach), which is defined as a current estimate for a KPP/TPM/MOP, a Schedule Milestone, or Cost Estimate that exceeds the established breach criterial for the threshold values.

11.2.1.3. At the TAA's discretion if a fact of life program change is so significant that managing to the existing baseline is not practical.

11.2.1.4. If at least one of the re-baseline criterion is met.

11.2.2. **The Re-baseline Process.** If one or more re-baseline criteria are met, the R&D PM shall notify the TAA and those who coordinated on the previously approved baseline that a PMR must be conducted to review the circumstances and the course of action needed as well as determining if a program re-baseline is required. This notification and scheduling action for this PMR must be done within 30 days of the discovery of the breach with the goal of conducting the PMR as soon as possible.

11.2.2.1. During the PMR, the R&D PM shall identify the circumstances that resulted in meeting one or more re-baseline criteria, provide recommendations for addressing issues with the program, and recommend the changes that will be required to the baseline as a result of those circumstances.

11.2.2.2. The TAA will decide on the appropriate course of action for the program. Possible COAs include, but are not limited to, temporarily stopping execution of the program or cancelling the program. The PMR must document the course of action selected.

**12. Program Management Reviews (PMRs).** In order to ensure program objectives and technical measures remain current and achievable within defined cost and schedule parameters, all programs are required to be reviewed annually by the program's TAA.

12.1. **PMR Content.** The required content for R&D-1 PMRs is contained in the template maintained by AFRL/EN. This template establishes minimum mandatory PMR content and provides additional content that may be included by the R&D PM as appropriate to address specific PMR requirements. The PM app incorporates best available PMR guidance and full use of the app constitutes compliance with this instruction.

12.1.1. PMR content for R&D-2 and R&D-3 programs is subject to the TAA's discretion, however, minimum acceptable content must include:

12.1.1.1. A review of the program's technical objectives and program deliverables including any technical products, major program milestones, activities requiring airworthiness certification and other details as determined significant by the delegated TAA.

12.1.1.2. An assessment of the R&D PM's program cost and schedule to ensure adequacy of resources to achieve the program's objectives.

12.1.1.3. A review of the program's financial execution history to ensure expedient execution of appropriated resources.

12.1.1.4. An assessment of the program's technical progression toward the program objectives to include consideration of technical performance measures, achievement of significant milestones and other factors as appropriate.

12.1.1.5. An evaluation of the program's risk management process as appropriate.

12.2. **Types of PMRs.** There are four different types of PMRs associated with R&D programs – Initial, Periodic, Re-baseline, and Close-out – each of which is described below. R&D-1 and R&D-2 Programs must complete the initial, periodic, and close-out PMRs. Re-baseline PMRs shall be conducted as necessary. For R&D-3 programs, each responsible organization may define the process, although the review should include all minimum PMR criteria referenced in this instruction.

12.2.1. **Initial PMR.** An initial PMR is conducted after the detailed planning is complete and a baseline is drafted. The desired outcome of the initial PMR is to review and approve the program planning and the baseline. Baseline requirements are defined in **Table 2** Approval of the initial PMR and allocation for execution of appropriated funding signifies the end of the Pre-Execution phase and the start of the Execution phase and is the formal authority to proceed with program execution including obligation of funds, awarding of contracts, agreements, and other such activities.

12.2.2. **Periodic PMR.** The purpose of the periodic PMR is to review the R&D Program against the Program Baseline. These are conducted after the initial PMR and are required at least annually for all R&D Programs. The desired outcome is a decision on continuing the program as planned, to continue the program with a modified plan and baseline, or to cancel the program.

12.2.3. **Re-baseline PMR.** The re-baseline PMR is conducted to review the circumstances leading up to, and the COAs proposed to recover from, a program baseline breach. The desired outcome of this PMR is to make decisions on the future of the program. If a decision is made to continue the program with a revised baseline, then a review of the new baseline content for purposes of approval (similar to an initial PMR) is required. The content for this type of PMR should be tailored to the individual circumstances for each occurrence but must, at a minimum, address the breach(es) which triggered the re-baseline activity.

12.2.4. **Close-Out PMR.** A close-out PMR for all programs must be conducted to review the final state of the program. As appropriate, the program's Key Stakeholders should be included in the final PMR to ensure the elements of any established Memorandums of Understanding (MOUs) or Memorandums of Agreement (MOAs) have been addressed, technology transition procedures are being addressed, and lessons learned have been captured. The desired outcome is for the TAA to make a final determination to proceed with close-out activities for the program.

**13. Technology Transition Strategy and the Technology Transition Plan (TTP).** All R&D-1 and R&D-2 Programs are required to have a documented transition strategy to define a plan for the deliverable(s). This may be documented in various ways, including formal TTPs, MOUs/MOAs, Expectation Management Agreements, or other documentation between AFRL and the receiving organization. This guidance does not direct a specific format, document or structure for the transition plan and mission organizations have discretion on the how program transition planning is conducted and documented. R&D-1 and R&D-2 programs are required to have transition customers identified and a draft transition strategy document prior to entering the execution phase.

13.1. **Transition Strategy Content.** Unless governed by other authority requiring a formal TTP, the transition strategy must contain, at a minimum, the following information:

13.1.1. Description of deliverables to include appropriate technical parameters, KPPs and/or TPMs and or MOPs

13.1.2. Transition customer(s).

13.1.3. Schedule

13.1.4. Cost estimate of funding needed for transition activities

13.1.5. Acquisition strategy (for transition activities)

13.1.6. Additional information as needed, to include a description of a digital data package, airworthiness exhibits, or anything the customer may need/request to support future activities

13.1.7. Signature page including R&D PM, TAA and appropriate transition partners

**14. Data Management Plans (DMPs).** DMPs are required for all WUs per DoDI 3200.12, DoD Scientific and Technical Information Program (STIP), Incorporating Change 3, Effective 17 December 2018. To ensure consistency with this Instruction, all programs must have a DMP that summarizes the data management approach for the program and any associated WUs. Program-level DMPs must include anticipated data products produced during program execution and shall describe the program's approach for transmission, storage, management and disposal of these data. Because many aspects of DMPs may be common to programs within a technical area, Msn Orgs/Directorates are encouraged to establish a standard DMP framework that may be tailored by identification of program-specific data products and/or differences in the program and/or WU's data management approach. DMPs should be attached as a document to the PM app and entered into the WU/Grants app. If not attached in the Apps, they must be available for review during the annual PMRs. Msn Orgs/Directorates have broad latitude in implementation of these plans.

14.1. Each DMP must contain the following elements:

14.1.1. The types of data, software, and other materials to be produced.

14.1.2. How the data will be acquired.

14.1.3. Time and location of data acquisition, if scientifically pertinent.

14.1.4. How the data will be processed.

14.1.5. The file formats and the naming conventions that will be used.

14.1.6. A description of the quality assurance and quality control measures during collection, analysis, and processing.

14.1.7. A description of dataset origin when existing data resources are used.

14.1.8. A description of the standards to be used for data and metadata format and content.

14.1.9. Appropriate timeframe for preservation.

14.1.10. The plan may consider the balance between the relative value of data preservation and other factors such as the associated cost and administrative burden. The plan will provide a justification for such decisions.

14.1.11. A statement that the data cannot be made available to the public when there are national security or controlled unclassified information concerns (e.g., "This data cannot be cleared for public release in accordance with the requirements in DoD Directive 5230.09.")

**15. System Engineering Process.** Each Msn Org/Directorate must document their tailored application of the SE process in a Msn Org specific Operating Instruction (OI) or supplement to this instruction. Each Msn Org or Directorate Director is granted authority to waive this requirement for any Budget Authority (BA)-1 Basic Research (6.1 for Air Force) and any Small Business Innovation Research (SBIR)/Small Business Technology Transfer (STTR) programs performed in the Msn Org/Directorate.

15.1. **AFRL SEPM Group.** The AFRL SEPM Group is the AFRL corporate body responsible for improving and strengthening the culture, discipline, and consistency of applying SE processes in AFRL. The SEPM Group is chaired by the AFRL Director of Engineering (DoE), and comprised of the Msn Org Chief Engineers and deputies including a representative from AFOSR, others as designated by the chair and an appointed secretariat.

**16. Training and Certification:** Individuals assigned to an acquisition coded position as designated in the manpower system of record shall meet the requirements for that position as defined under The Defense Acquisition Workforce Improvement Act (DAWIA) and the Back-to-Basics (BtB) guidance and policies for DoD and DAF. In addition, all non-bargaining unit personnel who manage an AFRL program or project, or who supervise someone who manages an AFRL program or project, and other R&D workforce individuals that play a substantive role in the acquisition of R&D technical products, are highly recommended to complete LAB-202, *Science and Technology Program Management Course*, between 6 months and one year after the assumption of these duties in order to "get up to speed" quicker. Note: Completion of LAB 202 is required for these individuals within three years. All other individuals assigned to AFRL are also highly encouraged to take this course. If individuals assigned to AFRL have previous program management training and/or experience to satisfy the intent of this course, a waiver to this requirement can be requested through AFRL/EN.

**17. Financial Management.** Managing financial execution of R&D programs or projects is a critical part of the R&D PM's job. The DoD financial rules and regulations are complex and R&D PMs must work closely with appropriate AFRL finance team members to assure the fiduciary requirements can be planned and executed successfully.

17.1. **Cost Estimates.** R&D-1 and R&D-2 programs will generate cost estimates in accordance with methodology and documentation guidance from General Accounting Office (GAO) Cost Estimating Guide, AFI 65-502, Inflation, and the AFRL Financial Management Cost Estimating Standard Operating Procedure (FZC01) AFRL Cost Estimating Process Guide. R&D-3 programs will generate cost/program estimates based upon Msn Org FM recommendation. At a minimum, R&D-3 programs must have a PM generated program estimate. All PM generated estimates should be coordinated with the organization FM personnel.

17.1.1. Estimates are required for the Program Baseline and annually to support the PMR. An annual cost estimate, or update to an existing estimate, is used to inform the planning and budgeting process and will be compared to the Baseline Cost Estimate to assess the cost health of the program. Note that the foundation of a sound and credible cost estimate is a well-defined program. An annual estimate that exceeds the cost threshold as defined in the program baseline is a baseline breach. All estimates for R&D-1 and R&D-2 programs will be submitted to AFRL/FZC annually to update the S&T cost library and improve cost estimating capabilities.

17.2. **Coordination.** Estimates for R&D-1 programs will be conducted in conjunction with FZC. For R&D-2 programs, estimates are the responsibility of the lead Msn Org. with roles coordinated between AFRL/FZC and the AFRL Financial Management Organizational Senior Functional (AFRL FM OSF). For R&D-2 and R&D-3 program estimates, assistance from AFRL/FZC is encouraged but will be dependent upon other activities, priorities, and agreements with AFRL FM OSFs.

17.3. **Waivers.** The waiver process is maintained by AFRL/FZC. Cost estimate waivers shall follow the guidance in the Cost Estimating SOP (FZC01) and require AFRL/FZC approval.

17.4. **Earned Value Management (EVM).** EVM is a key integrating process in the management and oversight of programs. While implementation of formal EVM is not required for S&T funded programs, it should be considered for all contract efforts exceeding $20M, based on a risk assessment and discussion of the value EVM may bring to the technical effort. If formal EVM is not used, other means for evaluating and tracking contract progress and the Estimate at Completion (EAC) should be considered in consultation with the financial and contracts team members. It should be noted that a tailored version of the Integrated Program Management Data and Analysis Report Data Item Description (DiD) can and should be used to collect cost and/or schedule data regardless of whether formal EVM is used.

17.4.1. **EVM Requirements.** Where formal EVM is used, the R&D PM ensures that:

17.4.1.1. The solicitation and contract contains the appropriate Contract Data Requirements List (CDRL) items.

17.4.1.2. EVM analysis is required as part of the Periodic PMRs for R&D-1 and R&D-2 programs.

17.5. **Cost Reporting.** Standardized data collection procedures and formats are essential for credible cost estimates for current and future programs. R&D PMs shall incorporate Cost and Software Data Reporting (CSDR) on all R&D-1 and 2 programs regardless of contract type valued at more than $20M and on high-risk or high-technical-interest contracts valued at over $10M. The R&D PM will work with AFRL/FZC or the lead AFRL FM OSF to determine the appropriate CSDR requirements.

17.6. **Financial Management Reviews.** Monthly Financial Management Reviews between the R&D PM and AFRL/FZA or FM staff within the Msn Org are required for R&D-1 and R&D-2 programs. These reviews will include cost health metrics, EVM analysis when required, EAC analysis and current year execution analysis. The template is maintained by AFRL/FZA and the FM Staff within the lead Msn Org.

**18. Ending Programs.** An AFRL Program or R&D Program can come to a conclusion for two reasons, completion or cancellation. Completion is successfully meeting the program's objectives by the prescribed end date. Cancellation is the inability to achieve the program's objectives due to significant issues with cost, schedule, and/or performance, or as the result of a re-baseline PMR decision to terminate the program, or the need to terminate a program due to funding shortfalls or the lack of customer support for the technologies being developed.

18.1. **Closure Requirements.** Several steps are required to be taken to bring a program to conclusion. These include the following:

18.1.1. **Closure Decision.** Approval of the final PMR is the formal authority to end the execution phase and initiate and complete closeout activities.

18.1.2. **Work Units.** If a contract was an element of the program, the R&D PM and Work Unit Manager will work through the Contracting Office to verify that all contractual commitments have been met, all contract deliverables have been received and accepted, and records were prepared for retirement. The R&D PM will support the Work Unit Manager and Contracting Officer during close-out of the contract in accordance with appropriate procedures.

18.1.3. **Property Management.** The R&D PM will ensure that any equipment or material and technical data received or produced as a result of the program is properly inventoried, stored, or disposed of, and the results captured in the Accountable Property System of Records, as appropriate (reference Air Force Instruction 23-119, *Exchange, Sale, or Temporary Custody of Non-excess Personal Property*, most current version available).

HEATHER L. PRINGLE,
Major General, USAF
Commander

## Attachment 1

## GLOSSARY OF REFERENCES, FORMS, AND SUPPORTING INFORMATION

***References***

DODI 5000.02T, *Operation of Defense Acquisition System, Incorporating Change 10*, December 31, 2020.

DoDI 3200.12, *DoD Scientific and Technical Information Program (STIP), Incorporating Change 3, Effective 17 December 2018.*

AFI 61-101, *Management of Science and Technology*, 13 March 2013.

AFI 23-119, *Exchange, Sale, or Temporary Custody of Non-excess Personal Property,* 5 June 2001.

AFI 33-322, *Records Management and Information Governance Program,* 28 July 2021

AFMCI 62-202, *Criteria for Critical Engineering Positions,* 27Ootober 2016

AFMCI 63-1201, *Implementing Operational Safety Suitability and Effectiveness (OSS&E) and Live Cycle System Engineering (*LCSE), 12 September 2018, with Guidance Memorandum, 21 July 2021.

AFRLI 23-141, *AFRL Equipment and Other Laboratory Asset Management,* dated 02 September 2021.

Department of Defense Risk, *Issue and Opportunity Guide for Defense Acquisition Programs,* January 2017.

MIL-STD-881E, *Work Breakdown Structures for Defense Material Items*, 6 Oct 2020.

***Prescribed Forms***

None

***Adopted Forms***

AF Form 847 *Recommendation for Change of Publication*

***Abbreviations and Acronyms***

**A&AS**—Advisory and Assistance Services

**AFI**—Air Force Instruction

**AFMCI**—Air Force Material Command Instruction

**AFOSR**—Air Force Office of Scientific Research

**AFRL**—Air Force Research Laboratory

**AFRIMS**—Air Force Records Information Management System

**App**—Application

**ASP**—Acquisition Strategy Panel

**BA**—Budget Authority

**BtB**—Back to Basics

**BPAC**—Budget Program Activity Code

**CAP**—Contractor Acquired Property

**CCaRS**—Comprehensive Cost and Requirement System

**CDRL**—Contract Data Requirements List

**CSFR**—Contract Funds Status Report

**COA**—Course of Action

**CSF**—Center Senior Functional

**CRADA**—Cooperative Research and Development Agreement

**CSDR**—Cost and Software Data Reporting

**CTC**—Core Technical Competency

**DEMS**—Digital Enterprise R&D Management Suite

**DiD**—Data Item Description

**DMP**—Data Management Plan

**DoD**—Department of Defense

**DoE**—Director of Engineering

**DTIC**—Defense Technical Information Center

**EAC**—Estimate at Completion

**EP2**—Enterprise Planning and Programming

**ETM**—Engineering and Technical Management

**EVM**—Earned Value Management

**FY**—Fiscal Year

**FYDP**—Future Years Defense Program

**GAO**—General Accounting Office

**GFP**—Government Furnished Property

**GFE**—Government Furnished Equipment

**JEON**—Joint Emergent Operational Need

**JUON**—Joint Urgent Operational Need

**KPP**—Key Performance Parameter

**MOA**—Memorandum of Agreement

**MOU**—Memorandum of Understanding

**Msn Org**—Mission Organization

**OI**—Operating Instruction

**OPR**—Office of Primary Responsibility

**OSF**—Organization Senior Functional

**OSS&E**—Operational Safety, Suitability, and Effectiveness

**MOP**—Measure of Performance

**MPES**—Manpower Programming and Execution System

**MS&A**—Modeling, Simulation and Analysis

**PBES**—Program and Budget Enterprise System

**PE**—Program Element

**POM**—Program Objective Memorandum

**PB**—President's Budget

**PM**—Program Management

**PMR**—Program Management Review

**PMRT**—Program Management Resource Tools

**PPBE**—Planning, Programming, Budgeting, and Execution

**R&D**—Research and Development

**R&DML**—Research and Development Master List

**R&D PM**—Research and Development Program Manager

**RDS**—Records Disposition System

**SBIR**—Small Business Innovative Research

**SE**—Systems Engineering

**SEPM**—Systems Engineering and Program Management

**S&T**—Science and Technology

**S&TPL**—Science and Technology Protection Lead

**STITCH**—S&T Information Technology Collaboration Hub

**STTR**—Small Business Technology Transfer

**T&E**—Test and Evaluation

**TAA**—Technical Approval Authority

**TEA**—Technical Engineering Authority

**TEO**—Technology Executive Officer

**TPM**—Technical Performance Measure

**TTP**—Technology Transition Plan

**UON**—Urgent Operational Need

**URED**—Unified Research & Engineering Database

**USSF**—United States Space Force

**WBS**—Work Breakdown Structure

**WU**—Work Unit

***Terms***

**Attribute**—A tag (structured data element) applied to a WBS Element for characterizing the relationship of the element to an analytical portfolio or construct.

**Core Technical Competency (CTC)**—CTCs represent the technical foundation that is difficult to duplicate and allows AFRL to provide unique technical leadership. They span basic research, applied research, and advanced technology development encompassing the people, information, facilities, equipment, and programs allowing AFRL to solve critical AF and national security problems.

**Deliverable**—Hardware, software, or data that is produced by a WBS Element and made available to the Government. Deliverables include all items, including products and those items that may not have a residual value except for historical and/or archival purposes. For example a deliverable that is not a product may include a Cost Funds Status Report (CSFR).

**Flex—4** - Funding Laboratory Enhancements Across 4 Categories - A Congressionally directed program to fund AFRL for the four categories of innovative R&D, rapid transition of technologies, workforce development, and laboratory revitalizations/recapitalization in support of AFRL missions. FLEX-4 is budgeted in the POM as an Organizational Support: DAF Assessment Program for each S&T Program Element. In execution, depending on the specific effort, the funding is allocated to R&D Programs, R&D Support Programs or Organizational Support Programs.

**Grant**—A legal instrument which, consistent with 31 U.S.C. 6304, is used to enter into a relationship:

**(a)** -—Of which the principal purpose is to transfer a thing of value to the recipient to carry out a public purpose of support or stimulation authorized by a law of the United States, rather than to acquire property or services for the Department of Defense's direct benefit or use.

**(b)** -—In which substantial involvement is not expected between the Department of Defense and the recipient when carrying out the activity contemplated by the grant.

**Key Performance Parameters (KPPs)**—A critical subset of performance parameters representing those technical capabilities and characteristics so significant that failure to meet the defined minimum value of performance (the threshold) can be cause for the program or project to be reassessed or terminated. KPPS are expressed with tolerances, with thresholds and objectives. They represent the critical performance requirements or objectives and collectively characterize overall performance in summary form.

**Measures of Performance (MOPs)**—The measures that characterize physical or functional attributes relating to the system or product operation, measured, modeled or estimated by specific testing or simulated conditions. MOPs measure attributes considered important to assess whether the system or product meets defined requirements or objectives.

**Mission Organization**—Those organizations in AFRL that are executing the scientific and medical mission of AFRL. These include AFOSR, AFRL/RD, RI, RQ, RV, RG, RS, RW, RX, RY, STO and the 711 HPW, and any new organization established to execute scientific and medical technology missions.

**Portfolios**—AFRL defines portfolios as collections of programs, projects, or other efforts grouped together by a common theme such as by Msn Org for management and control or by a common technology for purposes of achieving strategic objectives. Portfolios are not directly used as a planning or programming construct within the STiTCH applications suite. However, portfolios are recognized as an important tool for the categorization and organization of R&D activities within the AFRL enterprise. As such, the STiTCH applications allow Msn Orgs to organize Programs internal to the Msn Orgs and across the Enterprise in order to effectively plan and execute resources to meet AFRL priorities. There are two types of portfolios in AFRL:

**Managed Portfolio**—One or more programs that are grouped together for management of resources. These are usually aligned by Msn Org based on the org's strategic direction and are used for planning and allocating budget and manpower to the various programs and projects for which they are responsible. In managed portfolios, all programs and projects belong to a single portfolio and a single portfolio manager is responsible for the content of the portfolio.

**Portfolio management**—Is fundamentally different from program and project management. Program and project management are about planning, execution and delivery, about managing programs effectively. In contrast, portfolio management focuses on the selection of the right programs at the right time by selecting and managing programs and projects as a portfolio of investments.

**Championed Portfolio**—A collection of programs, projects and/or work elements that are grouped together for purposes of organization or analysis. These are usually grouped to focus on cross-cutting strategic technologies, such as autonomy. The programs, projects and work elements can come from multiple Managed Portfolios. In an analysis portfolio, the portfolio manager is more of a monitor. These managers do not have direct control over the allocation of resources, but normally act to advise and advocate for changes within the managed portfolios.

**Product**—A deliverable that has been identified as a primary outcome from the program. A product may be hardware, software or knowledge (report, data, etc.) that is likely to have value to a successor activity or end-user and is intended to be transferred to a recipient for application or use. A product will generally have program-defined metrics or criteria which may be used to monitor success.

**Projects**—Projects are finite endeavors undertaken and managed to create products, services, or results within a program. Projects are lower level WBS elements and must be subordinate to a program at Level-I. Projects create specifically defined deliverables and may be used for purposes of allocating organizational or management roles and responsibilities within a program. Within the AFRL's taxonomy for planning and programming, projects will only exist at level-II of the WBS.

**Resources**—People, funding, products, equipment and facilities

**Core Resource**—Funding appropriated by Congress for an AFRL managed and executed Program Element (PE) or Budget Program Activity Code (BPAC), AFRL Personnel, AFRL-owned facilities and equipment.

**External Resource**—Funding received by AFRL that is not appropriated by Congress for an AFRL managed PE and/or BPAC for execution on an AFRL program, Non-AFRL personnel, products, facilities and equipment.

**Research and Development Program Manager (R&D PM)**—The individual names as the single individual, regardless of job series (civilian) or Air Force Specialty Code (military) empowered to make the decisions necessary to meet the cost, schedule, and performance objectives of the program while balancing programmatic and technical risks.

**Technical Performance Measures (TPMs)**—TPMs measure attributes of a system or elements or a system to determine how well it is satisfying, or expected to satisfy, a technical requirement or objective. TPMs are typically developed directly from MOPs to characterize physical or functional attributes relating to evaluation of the technical requirements or objectives. These measures are used to assess interim technical progress, compliance to requirements or objectives or technical risks.

**Technology Transition**—The process of inserting critical technology into military systems, or advancing the realm of the possible, to provide effective weapons and support systems needed by the warfighter to carry out their assigned missions. In the context of AFRL products, the term refers to the formal transfer of technology solutions or demonstration of new militarily relevant capabilities to an end-user, their supporting life-cycle management organization, and/or industrial partners for use in a fielded systems. Details of a technology transition are typically documented in a Technology Transition Agreement or Technology Transition Plan.

**Work Breakdown Structure (WBS)**—The WBS is a hierarchical breakdown of the work to be done in a program. The WBS is used both to organize the planning and programming portfolios across the AFRL Enterprise and within programs as a deliverable-oriented hierarchical decomposition of the work to be executed by the team to accomplish the program's objectives and create the identified deliverables. The WBS defines the building blocks of the program's structure by breaking the programs into smaller, more manageable work elements. Additional information and guidance on WBS is available in **Attachment 4**.

**WBS Elements**—The WBS elements are entries that can be made at any level below level-I of the WBS. These elements are subordinate to either a program, project or other WBS elements. They are created to define hierarchical levels and to organize and manage distinct work efforts and deliverables. Additional information on WBS is included in **Attachment 4**.

**Work Units (WUs)**—WUs are separate, single performer-level tasks or awards (Contracts, grants, task orders, in-house efforts) associated with one or more WBS element(s). They have finite duration, are reviewed, and are managed by cost, schedule, performance, and risk. WUs satisfy the ASD(R&E) URED requirements and the research results reporting requirement to DTIC. WUs are not part of the hierarchical structure of a program. A Program WBS element can be associated with a single WU while a WU can be associated with multiple Programs and/or Projects/WBS elements.

## Attachment 2

## THE AFRL PROGRAM LIFE CYCLE

**Figure A2.1. The AFRL Program Life Cycle.**

This attachment is intended to describe, and to provide guidance on the effective use of, AFRL's life cycle approach for planning, programming and execution of R&D programs. The purpose of this construct is to provide AFRL's R&D management workforce a consistent structure to guide conceptualization, organization, programming and execution of R&D programs. R&D requirements may come from a variety of sources and are often varied in developmental timelines. As such, this acquisition construct is intended to serve as general guidance and one or more of these phases may be skipped as necessary to deliver timely R&D solutions. While these phases are generally sequential, there is a degree of parallelism that normally occurs. This may occur, for example when long-lead activities such as acquisition planning occur in concert with budgeting and planning processes. And while these phases are defined at the program level, it should be noted that this approach may be helpful during a significant program rebaseline, especially in cases where the scope is being expanded to add new products and/or results.

**A2.1. Ideation Phase**. The Ideation Phase is the initial stage in the R&D acquisition lifecycle wherein conceptual R&D solutions are identified, matured and preliminarily refined based on limited or best-available information. The primary objective of this phase is to establish the customer need, technical feasibility and acquisition readiness of the concept to determine if an R&D program is appropriate and reasonable. During Ideation, alternative solutions and acquisition strategies should be assessed and documented. Whenever practical, a defined, quantitative process employing Modeling, Simulation & Analysis (MS&A) should be utilized to establish the concept's technical approach, feasibility, risk, and military utility. At this phase, the program's transition strategy should be considered. For R&D efforts, transitions may be internal to AFRL, through a 3rd-party or to an acquisition office.

Recommended outcomes from Ideation include:

a. A basic description of the program to include:

i. Program goal and technical objectives

ii. A statement of customer need

iii. Identification of delivered technical product(s)

iv. Preliminary cost estimate and program period of performance

v. Any constraints, assumptions and scope limitations (e.g. what won't be accomplished)

b. Documentation of an analysis of alternatives to include alternative technical solutions and/or approaches to meet best-available user need

c. Initial MS&A documenting a determination of technical feasibility; acceptable development or acquisition risk; military utility or other assessments as appropriate

The use of a plan to document these outcomes is highly recommended. The plan will serve as a constant guide throughout the program to help maintain focus on the primary program intent and objectives.

**A2.2. Pre-Planning Phase**. The primary objective of this phase is to develop the basic program plan and acquisition structure necessary to obtain budgeting approval for the effort. During this phase, the program solution is refined consistent with available detail and the steps necessary to meet the objective are planned. It is imperative to identify and include the appropriate parties early in the process, including representation from the financial, contracting, and logistics communities, along with the technical experts and others as needed. Development of all program factors including a program-level the WBS, level III program schedule, preliminary risk assessment (reference DoD Risk, Issue and Opportunity Guide) and cost-estimate will likely occur. During this phase, the program's transition strategy should be primarily defined. AFRL programs can vary broadly in approach, objective, and complexity.. As such, AFRL Msn Org program development, prioritization, and approval processes may vary based on organizational needs.

Recommended outcomes from the Pre-planning Phase include:

a. Initial program plan to include:

i. Products with corresponding Technical Performance Measures

ii. Detailed WBS and associated cost estimate

iii. Draft exit criteria

iv. Preliminary risk management plan including identification and quantification of major program risks and initial risk mitigation strategy

v. Preliminary transition strategy. Create/Update the Program Plan. Obtain and document program plan approvals by the program's TAA and program manager. This should serve as the decision authority to proceed with further planning efforts to mature the program with the anticipation that budget will be approved. Specific details identifying each program's TAA and their respective role in process approval is described in subsequent sections of this instruction.

**A2.3. Budgeting Phase:** During this program phase, program budget recommendations are prepared based on Msn Org priorities. Msn Org recommendations are consolidated and prioritized by AFRL/XP consistent with AFRL/CC's guidance. These consolidated recommendations serve as the basis for AFRL's POM and establish initial program budget estimates. Budget estimates are provided to Msn Org program managers and senior planners to support refinement of selected programs. While this phase is primarily focused on program buy-plan and POM development and refinement, for the next Fiscal Year (FY) and the Future

Years Defense Program (FYDP) POM years, early or long-lead acquisition planning may be appropriate. Establishing or modifying contracts or other acquisition instruments can be among the longest-lead considerations. During this phase, R&D PMs may mature the acquisition strategy that will serve to identify any program contractual requirements. Program security factors may also be considered as part of this phase. R&D PMs are encouraged to consult their Science and Technology Protection Leads (S&TPLs) to assess applicability of any classification guides or S&T protection plans as part of this process and should take appropriate measures to ensure adequate protections.

Recommended outcomes from this phase include:

a. POM program recommendations

b. Approved program budget documentation

**A2.4. Pre-Execution Phase**. During Pre-Execution, Msn Org Program Representatives develop detailed program plans. Because aspects of the program acquisition process may require significant preparation time, Pre-Execution may be initiated once Msn Org leadership has identified the program as buy-plan or POM priority and may proceed in parallel with the other Lifecycle Phases.
While program plans may vary based on numerous factors, R&D PM's should perform a comprehensive program planning process to consider potential contractual requirements, air worthiness, test or facility certifications, the need for Government Furnished Property (GFP), security constraints, RF Spectrum approvals or other factors that may hamper timely program initiation or execution. This phase may conclude when the Program Manager has matured the program plan such that the cost, schedule and performance baseline has been approved by the program's designated TAA and an initial PMR has been conducted. Any additional documents needed for the program, such as System Engineering Plans, Test Plans, Execution Plans, Spend Plans, Risk Management Plans, Cybersecutity, Configuration Plans etc. should be prepared as necessary. If GFP is required during execution, the R&D PM must engage the Logistics Support Analyst in the Directorate and ensure the GFP is properly managed and tracked in accordance with AFRLI 23-141.

Recommended outcomes from this phase include:

a. Mature program plan which may include the following:

i. Program cost, schedule and performance baseline:

ii. Acquisition strategy documentation (ASP)

iii. MS&A, Test and Evaluation (T&E) and/or facility requirements.

iv. Exit criteria

v. Data Management Plan

vi. Program security and S&T Protection plans

vii. Additional documentation/plans as needed

**A2.5. Execution Phase**. Execution begins after the Program's cost, schedule and performance baseline has been approved by the designated TAA, upon successful completion of the initial PMR and receipt of funding for execution. It is during this phase that technical products are developed through in-house or extramural activities that are generally conducted by or associated with contracts or other assistance instruments. As such, early planning, often in prior life cycle phases, are crucial to ensure that contracts, MOAs, Cooperative Research and Development Agreements (CRADAs), or other instruments are available for timely acquisition.

During this phase, it is important to establish and maintain program configuration control and communicate with program stakeholders as needed. Progress is continuously monitored and appropriate adjustments are made and recorded as variances from the original plan. Primary activities conducted in this phase include oversight and reporting of the work as defined by the program baseline. Significant deviations from the cost or schedule baseline may necessitate a rebaseline. Rebaseline criteria may vary between programs but general guidance is provided in subsequent sections of this instruction.

R&D PMs are encouraged to monitor progress through regular technical exchanges, formal Design Reviews, or through technical reports or data submittals.

A defined Risk Management process, wherein risks are identified, quantified and mitigated through a systematic approach, is essential to successful program execution. Risk Management is detailed extensively in the DoD Risk, Issue and Opportunity Guide and R&D PMs are encouraged to consult these as appropriate. Risk Management should initiate during Ideation then is matured and updated as the program progresses.

Successful management of the program's financial progress is essential to ensure successful execution. R&D PMs should regularly consult with appropriate financial and planning functionals to ensure that (a) sufficient funds have been approved to meet the program's execution requirements; (b) that these funds have been expediently obligated onto available contracts and (c) all R&D efforts are expending consistent with the approved program baseline. R&D PMs should monitor their activities weekly to assess that approved funds are obligated to meet the execution needs of the activity. Forward financing, defined as the practice of obligating more funds than required to meet the execution requirements of the activity, should be minimized to ensure resources are available to pursue new technical requirements.

Recommended outcomes from this phase may include:

a. Technical reports, program review presentations, and/or other technical deliverables

b. Financial execution documents, reports and presentations

c. Completed documentation not completed at the end of the Pre-Execution Phase

d. Program deliverables, products, and results

**A2.6. Retirement Phase**. This phase is the shutdown of the program after the product has been completed and delivered to its intended user/destination or when an effort is determined as no longer viable from a research results perspective. During this phase the program documentation will be finalized and completed and any residual hardware such as GFP/Government Furnished Equipment (GFE)/Contractor Acquired Property (CAP) must be dispositioned. R&D PMs are encouraged to coordinate with their work unit managers on specific requirements and timelines for activity close-out.

**A2.7. Program End Phase.** This is the final administrative close-out of the program. All reporting is completed, all tech data is stored/archived per the Data Management Plan and no additional resources (direct or indirect) are expended against the effort. A program can end in one of two possible states: Completed or Cancelled.

- Completed: The program came to a natural conclusion within the program's current baseline,
- Cancelled: The program is stopped prior to completion of the program's baseline.

## Attachment 3

## BASELINES

**A3.1.** The program baseline serves as a fundamental agreement between the program's TAA and the R&D PM that documents, at a minimum, the program's cost, schedule and performance or scope. Approval of the program's baseline by both parties assures the understanding and interaction of cost, schedule, and performance or scope. The baseline also provides a clearly defined reference point for measuring a program's progress. By tracking, monitoring and measuring the program's performance against its baseline, the R&D PM, management and other stakeholders will be alerted to potential problems, such as cost growth, schedule slip, or performance shortfalls, permitting early and responsive decisions on the program's future. Specific details on the content of the cost, schedule and performance baseline sections are described below.

**A3.2.** The cost is the estimated value required to complete the program within acceptable risk, as defined by the other two parameters -- schedule and performance. Cost is not the same as budget. The budget is the amount of money available to a program. However, cost is the amount of money a program will need to achieve its desired objectives as determined by its identified schedule and performance or scope. The cost is estimated using one or more cost estimating methodologies. If the budget is less than the cost, this deficiency should either be tracked as a program risk or a change in the program's schedule and/or scope must be implemented. If the change to these factors exceeds one or more of the established breach criteria, a program re-baseline may be required.

**A3.3.** The schedule must include the start date, end date, deliveries of all products and any major interim milestones. The schedule should provide as much detail as necessary to convey how major tasks align with established program objectives while still allowing for PM flexibility in non-critical path tasks. This section of the program baseline should also include a list of major milestones with expected completion date and a description of the milestone's relation to the program objective(s).

**A3.4.** The performance section should permit a complete understanding of the program's scope and a description of major deliverables. In this section, a clear end-state should be defined that effectively answers the question of "how do you know when you are done?" Some description of the technical performance should be included. KPPs can be used and/or possibly TPMs and/or MOPs if KPPs are not feasible for the particular product. However, it is recognized that direct measures may not be appropriate for certain fundamental research activities wherein technical publications are the major output. In these cases, some means of quantifying the end-state of the program should be included as part of scope definition.

**A3.5.** While a program baseline must contain the three minimum elements of cost, schedule and performance supplemental detail pertinent to the planning and execution of the program may be included based on organizational preference. When including time-sensitive elements such as transition or risk management elements, regular review of the baseline is encouraged to ensure that these data remain current.

**A3.6.** The program's products should be expressed as either threshold or objective values that represent the acceptable limits for the performance parameters that must be achieved to meet program goals. A threshold represents a minimum acceptable value. Failure to attain program thresholds may degrade product performance, delay the program, or make the program too costly. The failure to attain program thresholds; therefore, places the overall affordability of the program and/or the product into question. The objective value is an increment above the threshold that represents a desired goal associated with an attribute beyond which any gain in utility does not warrant additional expenditure. An objective can be the same as the threshold when a measurable increment above the threshold is not significant or useful.

A3.6.1. The area between the threshold and objective represents the R&D PM's trade space, where they have authority to trade cost, schedule and performance to complete the program. If a program's TPMs and/or KPPs and or MOPs cannot be met within this trade space, a baseline breach has occurred. In this instance, the PM should consult the TAA to determine whether the program is still viable. If yes, a re-baseline should be conducted.

## Attachment 4

## WORK BREAKDOWN STRUCTURE (WBS)

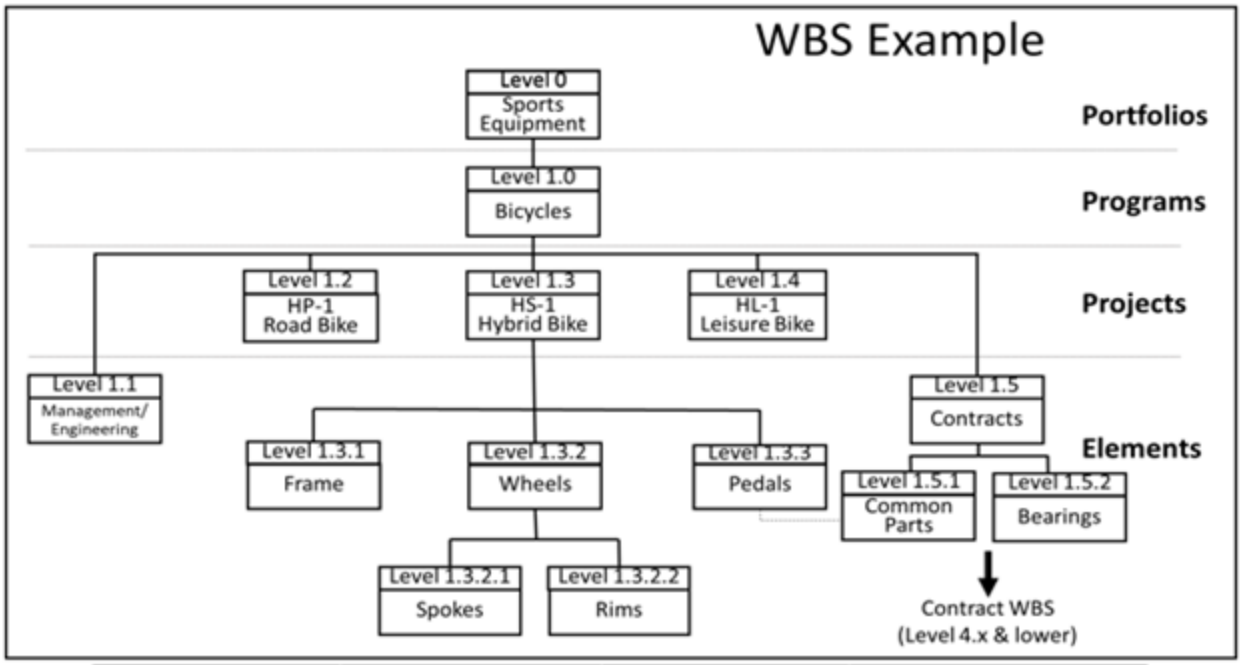
**A4.1.** The goal of a WBS is to establish a hierarchical decomposition of the total scope of work to be carried out in a program to accomplish the objectives and create the required products and deliverables. The WBS is not a plan nor a schedule; however, the WBS provides a common framework for the natural development of the overall planning and control of a program and is the basis for dividing work into definable increments. The program WBS should be developed in draft at the start of a program and be completed by the end of the Budgeting phase.

**A4.2.** As defined in this instruction, the level-I of the WBS is defined as the program. Level-II may be either projects or elements. And, Level-III and lower are WBS elements. Each descending level of the WBS represents an increasing detailed definition of the program work.

**A4.3.** A project (WBS Level-II) is financially aligned to a CCaRS record which documents the approved funding allocated to the program for execution. R&D PMs must allocate budget at the WBS Level-II or below to maintain consistency with this CCaRS data structure and to provide appropriate fidelity on program funding requirements.

**A4.4.** WBS elements, represent lower levels of work effort within a program and are used to further define, organize and allocate the program's approach to achieving its objectives. For most of the AFRL programs, a WBS to level-3 or level-4 should be sufficient for managing the program. Contract-defined WBSs, if included in the program structure, may further expand on the WBS. In certain cases, it may be expedient to manage project-level WBSs as separate activities. While this is permitted by this instruction, a program-level WBS must be maintained for all PMRs and Baseline approval processes. A notional WBS referencing portfolio, program, project and element levels is presented as **Figure A4.1**.

**Figure A4.1. WBS Example.**




| WBS# | Name | Level | AFRL Type |
|---|---|---|---|
| 0 | Sports Equip | Level 0 | Portfolio |
| 1 | Bicycles | Level 1 | Program |
| 1.1 | Mgmt/Eng | Level 2 | Element |
| 1.2 | Road Bike | Level 2 | Project |
| 1.3 | Hybrid Bike | Level 2 | Project |
| 1.3.1 | Frame | Level 3 | Element |
| 1.3.2 | Wheels | Level 3 | Element |
| 1.3.2.1 | Spokes | Level 4 | Element |
| 1.3.2.2 | Rims | Level 4 | Element |
| 1.3.3 | Pedals | Level 3 | Element |
| 1.4 | Leisure Bike | Level 2 | Project |
| 1.5 | Contracts | Level 2 | Element |
| 1.5.1 | Common Parts | Level 3 | Element |
| 1.5.2 | Bearings | Level 3 | Element |

The differences between projects and elements in some cases can be subtle. Projects are normally product focused while elements may represent support or other work efforts. Projects always have subordinate elements while an element may be the lowest level of the WBS with nothing subordinate. Elements may also be at a higher level of the WBS and used to group subordinate elements to provide a summation of work efforts. In the above example, Element 1.1, Management/Engineering, is a service supporting the entire program. Element 1.5, Contracting, is a summary of all the work done using contractor vendors and is the summary element for multiple elements of contract work.

A4.4.1. The benefits of a good WBS includes the following:

A4.4.1.1. Clearly articulates the work required to fulfill the program's approach to deliver its technical products.

A4.4.2. Depicts the relationship of the elements to the overall program plan and to other program planning elements.

A4.4.2.1. Provides the basis for cost and schedule estimating.

A4.4.2.2. Enables effective planning and assignment of management and reporting responsibilities.

A4.4.2.3. Provides commonality for program cost, schedule, technical performance and risk management and reporting.

A4.4.2.4. Provides a framework to assist technical management efforts, providing insight into risks associated with system element.

**A4.5.** A WBS can be expressed to any level of detail. For effective management of complex programs, it may require the WBS definition to go to lower levels. The depth of the WBS should be balanced such that the level is sufficient to provide clear monitoring of work progress but does not drive excessive documentation.

A4.5.1. When developing a program WBS the following guidelines should be used:

A4.5.1.1. The WBS should maintain a product focus.

A4.5.1.2. The WBS should encompass the entire scope of work and account for all deliverables.

A4.5.1.3. Each project or element should represent the sum of all the work of its subordinate elements.

A4.5.1.4. Each project or element should belong to only one element at the next higher level.

A4.5.1.5. Each element represents a discrete work effort that can be specifically defined.

A4.5.1.6. Each project or element should have a unique identifier.

A4.5.1.7. The lowest level does not have to be the same for each branch.

A4.5.1.8. The lowest level should not be so detailed it creates an administrative burden to manage.

**A4.6.** MIL-STD-881E or the latest version available provides a good reference on the WBS and the use of WBS for DoD and is also widely used as a general reference in program/project management outside of DOD. This reference includes illustrated representative examples of WBS structures for common DoD systems. R&D PMs are encouraged to use this as a guide in the development of WBSs for AFRL programs.