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NAVAL AIR SYSTEMS COMMAND
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IN REPLY REFER TO

NAVAIRINST 4355.19C
AIR-4.0/5.0/6.0
APR 10 2006

NAVAIR INSTRUCTION 4355.19C

From: Commander, Naval Air Systems Command

Subj: SYSTEMS ENGINEERING TECHNICAL REVIEW PROCESS

Ref: (a) DoD Directive 5000.1, 12 May 2003
(b) DoD Instruction 5000.2, 12 May 2003
(c) Under Secretary of Defense (Acquisition, Technology, and Logistics) Memorandum of 20 Feb 2004, Policy for Systems Engineering in DoD (NOTAL)
(d) Defense Acquisition Guidebook, 8 Oct 2004
(e) Naval Systems Engineering Guide, Oct 2004
(f) NAVSO P-3690, September 2001 (NOTAL)
(g) NAVAIRINST 5000.21A, Program/Project Risk Management, 2 Nov 2005
(h) NAVAIRINST 3960.2C, 9 May 1994
(i) NAVAIRINST 4200.36C, 2 Jun 2004

Encl: (1) Systems Engineering Technical Review Process Handbook
(2) Systems Engineering Technical Review Timing

1. Purpose. To establish policy, outline the process, and assign responsibilities for the planning and conduct of Systems Engineering Technical Reviews (SETRs) of Naval Air Systems Command (NAVAIR) programs.

2. Cancellation. This instruction supersedes and cancels NAVAIRINST 4355.19B.

3. Scope. This instruction applies to all of NAVAIR Research and Engineering (AIR-4.0), Test and Evaluation (AIR-5.0) and Logistics (AIR-6.0) personnel supporting all NAVAIR and all Aviation Program Executive Officer (PEO) programs involved with the design, development, test and evaluation, acquisition, in-service support, and disposal of naval aviation weapon systems and equipment.

4. Discussion

a. References (a) through (c) provide policies and principles applicable to all Department of Defense (DoD)

acquisition programs. Among other things, these references require that acquisition programs be managed by application of systems engineering that optimizes total system performance and minimizes total ownership costs. Additionally, cost realism and knowledge-based risk management are mandated. Specifically, knowledge about key aspects of a system shall be demonstrated by the time decisions are to be made. Technology risk shall be reduced and technologies shall have been demonstrated in a relevant environment, with alternatives identified, prior to program initiation. Integration risk shall be reduced and product design demonstrated prior to Design Readiness Review. Manufacturing risk shall be reduced and producibility demonstrated prior to full-rate production. Reference (d) is a comprehensive guide to be used for best practices, lessons learned, and expectations. It is accessible at http://akss.dau.mil/dag/TOC_GuideBook.asp.

b. SETRs are an integral part of the systems engineering process and life cycle management, and are consistent with existing and emerging commercial/industrial standards. These reviews are not the place for problem solving, but to verify that problem solving has been accomplished. Reference (e) provides systems engineering processes for use in support of the acquisition of NAVAIR systems. As a part of the overall systems engineering process, SETRs enable an independent assessment of emerging designs against plans, processes and key knowledge points in the development process. An integrated team consisting of Integrated Product Team (IPT) members and independent competency subject matter experts conducts these reviews. Engineering rigor, interdisciplinary communications, and competency insight are applied to the maturing design in the assessment of requirements traceability, product metrics, and decision rationale. These SETRs bring to bear additional knowledge to the program design/development process in an effort to ensure program success. Overarching objectives of these reviews are a well-managed engineering effort leading to a satisfactory Technical Evaluation (TECHEVAL), which will meet all of the required technical and programmatic specifications. This, in turn, will ensure a satisfactory Operational Evaluation (OPEVAL), and the fielding of a suitable and effective system for the Warfighter.

c. Reference (a) also requires that Program Managers (PMs) develop and implement performance-based logistics (PBL)

strategies that optimize total system availability while minimizing costs and logistics footprint. Reference (f), "Acquisition Logistics for the Rest of Us", dated September 2001, states as fundamental principles that logistics planning is part of the systems engineering process, cannot be accomplished independently, and that reliability and maintainability engineering are cornerstones of a successful logistics program.

d. The SETR process is also the logical setting to review logistics, test and evaluation and engineering initiatives. These initiatives include, but are not limited to, the Joint Service Specification Guide (JSSG), the Technology Readiness Assessment (TRA), "Section 804" software acquisition initiative, and the Joint Technical Architecture (JTA). The JSSG is a DoD initiative that provides guidance in the form of tailorable templates utilized in the preparation of aviation performance specifications. TRA is an Office of Naval Research (ONR) initiative, based on National Aeronautics and Space Administration (NASA) technology planning, which consistently assesses the maturity of critical technologies. Section 804 of the National Defense Authorization Act for Fiscal Year 2003 mandates improvement of the DoD's software acquisition processes. The JTA is a DoD initiative to assist the achievement of full spectrum dominance and joint military interoperability. Enclosure (1) provides guidance with respect to reviewing TRA and JTA initiatives.

5. Policy

a. Assistant Program Managers for Systems and Engineering (APMSEs), Assistant Program Managers for Test and Evaluation (APMT&Es) and Assistant Program Managers for Logistics (APMLs), as part of Program Teams, shall ensure that planning for SETRs is fully integrated with the overall program plans for all PEO and NAVAIR managed acquisition programs in Acquisition Categories (ACAT) I through IV. Programs already in progress should comply, to the maximum extent possible, within the constraints of their existing budget and contract(s). This SETR planning shall be coordinated with the Program Manager, Air (PMA), the cognizant Assistant Program Executive Officer (APEO) for Research, Development, Test and Evaluation (APEO(RDT&E)), and the cognizant APEO for Logistics (APEO(L)). The SETRs should form the technical basis for establishing:

(1) program definition (cost, schedule, and performance);

(2) an independent NAVAIR cost estimate of the program; and

(3) program milestone reviews.

The SETRs may also be applied to Abbreviated Acquisition Programs (AAPs), and other non-ACAT programs as determined and tailored by the cognizant PEO and/or Program/Project Manager. Programs already in progress should comply, to the maximum extent possible, within the constraints of their existing budget and contract(s). Joint and other external organization programs should incorporate these policies, as applicable.

b. SETRs provide the PMA with an integrated technical (e.g., logistics, engineering, T&E, in-service support) baseline approval, and confidence that the technical baseline is mature enough for the next stage of development. This is accomplished via a multi-discipline, engineering assessment of the program's progress towards demonstrating and confirming completion of required accomplishments and their exit criteria as defined in program planning. These SETRs include an overall technical assessment of cost, schedule, and performance risk, which forms the basis for an independent NAVAIR cost estimate. End products of these SETRs include approval of the technical baseline, risk assessments and mitigation options, Request for Action (RFA) forms, and minutes.

c. Program APMSEs shall ensure naval aviation acquisition programs include a Systems Engineering Plan (SEP) as program documentation. Reference (c) establishes systems engineering policy, and mandates a SEP for all programs. This memorandum will be included in the next revision to reference (b). An extract from reference (c) states, "All programs responding to a capabilities or requirements document, regardless of acquisition category, shall apply a robust systems engineering (SE) approach that balances total system performance and total ownership costs within the family-of-systems, systems-of-systems context. Programs shall develop an SEP for Milestone Decision Authority (MDA) approval in conjunction with each Milestone review, and integrated with the Acquisition Strategy. This plan shall

describe the program's overall technical approach, including processes, resources, metrics, and applicable performance incentives. It shall also detail the timing, conduct, and success criteria of technical reviews."

d. Reference (e) is a valuable tool in preparing the SEP, which should define the overall plan for SETRs and the systems engineering processes to be employed by the program. The following SETRs should be conducted, as applicable, on all ACAT programs:

(1) Initial Technical Review (ITR);

(2) Alternative Systems Review (ASR);

(3) System Requirements Review (SRR);

(4) Technology Readiness Assessment (TRA);

(5) System Functional Review (SFR);

(6) Preliminary Design Review (PDR);

(7) Critical Design Review (CDR);

(8) Test Readiness Review (TRR);

(9) Flight Readiness Review (FRR) (for airborne systems);

(10) System Verification Review/Production Readiness Review (SVR/PRR);

(11) Physical Configuration Audit (PCA); and

(12) In-Service Review (ISR)

At a minimum, SRRs, PDRs, CDRs and SVRs should be conducted on all non-ACAT acquisition programs.

e. SETRs may be tailored to suit individual program scope and complexity. Tailoring or elimination of reviews should be coordinated with the APEOs for Engineering, Test and Evaluation, and Logistics, and documented in the Program's SEP. Programs

need not conduct SETRs that do not apply given the structure of the program, i.e., where in the acquisition cycle the program will enter. This tailoring may be updated as part of setting the review agenda and participants, in conjunction with the program APMSE, APMT&E, APML, APEO(RDT&E), and APEO(L). Functional and/or subject matter experts, together with government and contractor IPT membership, will participate in these SETRs. Customer representatives and other stakeholders are invited to provide the Warfighters perspective with a clear linkage to their requirements. Certain reviews may be performed incrementally by configuration item. Enclosure (1) describes the objective of each SETR, and provides additional information concerning implementation of this instruction, and guidelines for compliance. A stand-alone Risk Assessment Checklist is available for each of the reviews at http://www.navair.navy.mil/kms/41G/. These checklists are living documents, and are intended to be updated based on user experiences. Reference (g) establishes policy and assigns responsibilities for a standardized Risk Management process across NAVAIR programs.

f. The cognizant APMSE, with APML and APMT&E assistance, shall ensure that SETRs are conducted in accordance with the Program SEP and enclosure (1). The SETRs are structured to assess a program's progress towards demonstrating and confirming completion of required accomplishments and their readiness to proceed to the next key milestone. These reviews should be event driven and conducted when the system's design/development is ready for review. As a product develops, it passes through a series of SETRs of increasing detail. SETRs are structured to be an approval of the technical baseline, and confidence that the technical baseline is mature enough for the next stage of development. Each SETR must have defined entry and exit criteria tied to the required level of design/development maturity and applied across all requirements and technical disciplines. These reviews are confirmation of a process. New issues should not come up at SETRs. If significant new issues do emerge, the review is being held prematurely, with an inherent increase in program risk. Enclosure (2) aligns the chronology of these SETRs in relation to acquisition program events (milestones). The Program SEP should detail the specific SETR chronology for the program. This is especially important for evolutionary acquisition strategies, using spiral development processes, or multi-component programs.

g. In addition to SETRs, programs conduct Integrated Baseline Reviews (IBRs) and Operational Test Readiness Reviews (OTRRs) in accordance with references (d) and (h) respectively. AIR-4.0 personnel do not normally chair these reviews, but they do provide technical elements and support as detailed in enclosure (1). The Program SEP should provide for the technical elements of the IBR and OTRR. Enclosure (2) depicts SETR timing, as well as that for IBR and OTRR, in the acquisition cycle.

h. Acquisition program plans and contracts should provide for the conduct of these SETRs as part of the acquisition planning process, in accordance with reference (i). Careful consideration should be given before using individual SETRs as a basis for progress or performance-based contract payments. However, payments for successful conduct of SETRs as part of the established award fee criteria may be considered. SETRs are complete when all RFA forms have been addressed, assessed, the status agreed upon, and an updated Risk Assessment as described in enclosure (1) and the Risk Assessment Checklists. Unless specifically provided for in the contract(s), successful completion of SETRs does not affect the requirements, terms, and conditions set forth in the program's contract(s). SETRs should not be used to:

(1) constitute government approval of the design;

(2) change the responsibility as set forth in the contract(s);

(3) change or affect ownership of the design; or

(4) relieve the contractor from meeting specification requirements as set forth in the contract(s).

i. At any given SETR, the chairperson leads the review. The SETR itself is conducted and approved by the extended IPT (program IPT together with convened subject matter experts and other competency representatives). Systems Engineering Technical Review approval, as it relates to this instruction, is defined as:

(1) approval of the RFAs generated during the SETR;

(2) approval of the technical baseline;

(3) confidence that the technical baseline is mature enough for the next stage of development; and

(4) promulgation of the assessment of risk generated during the SETR. Completion of SETRs occurs after all RFA forms have been addressed, assessed, and the status agreed upon.

6. Action. The following responsibilities are assigned relative to the planning, conduct, and reporting of SETRs:

a. Systems Engineering (AIR-4.1) shall nominate qualified SETR Chairpersons and coordinate the designation of the SETR Chairperson(s) from the appropriate competency. Specific guidance concerning Chairs and Co-chairs is addressed in enclosure (1). The designated Chairperson, with the assistance of the APMSE, APMT&E and APML, shall assemble and convene the Technical Review Board (TRB) for the system under review. The TRB analyzes the material presented to develop a technical assessment of the system under review, determine disposition of RFAs in an executive session, and issue minutes of the SETR.

b. Research and Engineering Department Heads (AIR-4.x) shall provide Cost Team (AIR-4.2) representatives and other subject matter experts, as required, to update independent cost and technical assessments as part of each SETR.

c. Integrated Systems Evaluation Experimentation and Test Division Heads/Squadron Commanding Officers (AIR-5.1) shall provide subject matter experts, as required, to make technical assessments as part of each SETR.

d. Program APMSEs, with APMT&E and APML assistance, shall support the PMA:

(1) to ensure program acquisition plans and strategies provide for the conduct of SETRs, and that those reviews are considered in the milestone decision-making process. This planning shall be coordinated with the PMA, the cognizant APEO(L), and the cognizant APEO(RDT&E).

(2) to ensure each program has a SEP, and that SETRs are addressed in that plan, as well as in the contract(s).

(3) to ensure the program contract(s) Statements of Work (SOWs), Contract Deliverable Requirements Lists (CDRLs), and master schedule include provisions for these identified SETRs, and the required documentation and data to support each review.

e. Program APMSEs, with APMT&E and APML assistance, shall:

(1) ensure the performing activity provides the supporting data and stakeholder participation in the SETRs;

(2) develop, coordinate, and execute, in cooperation with the performing activity, individual SETR arrangements;

(3) ensure the preparation of appropriate material is coordinated across the IPTs; and

(4) organize and supervise the documentation of RFAs in support of the TRB Chairperson.

7. Review. Systems Engineering (AIR-4.1), Test and Evaluation (AIR-5.1) and Logistics Management Integration (AIR-6.6) shall coordinate the review of this instruction annually, and implement updates and changes as appropriate.

W. B. MASSENBURG

Distribution:
SNDL: FKA1A (Deputy Commanders, Assistant Commanders, Comptroller, Command Special Assistants, Program Managers, Level 1 Leaders, Level 2 Leaders); A1J1A; A1J1B; A1J1C; FKR

Copy to: SNDL: FKA1A, AIR-7.5; AIR-7.1.1.2; AIR-4.1; AIR-09F; FKR6A; AD-7.2.5

All public-releasable NAVAIR directives are available on the Internet at http://directives.navair.navy.mil/.

Systems Engineering Technical Review Process Handbook

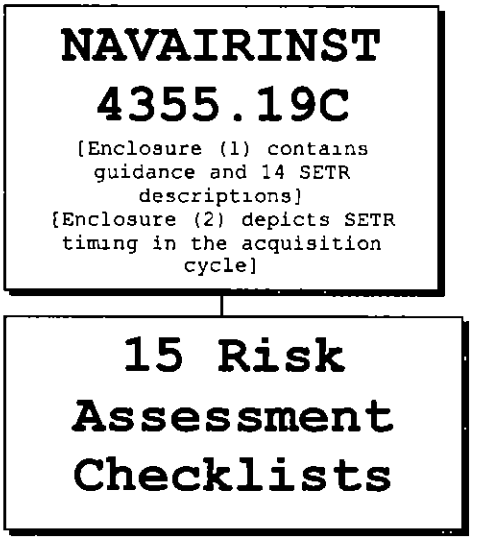
Table of Contents - Enclosure (1)

Use of this Handbook and Risk Assessment Checklists

This enclosure and associated Risk Assessment Checklists are utilized to facilitate the implementation of NAVAIRINST 4355.19C. In addition to this introductory segment, this enclosure is composed of 14 individual Modules. These Modules describe the purpose, timing, entry criteria, planning, conduct, exit criteria, and completion of each SETR. The SETR Modules are provided for guidance, and should not be modified.

A Program Risk Assessment Checklist is also provided for each SETR. These checklists should be utilized in conjunction with the program SEP while executing the program. The checklists are an effective tool for use during preparation for each SETR. The checklists should be used as a guide during preparation for SETRs, as a tool during SETRs, and during special audits and reviews (such as Non-Advocate Reviews, Green/Red Teams, etc.). The Risk assessment Checklists are living documents, intended to be updated based on user experiences. AIR-4.1G is the SETR document point of contact, and up to date reference materials are available on the AIR-4.1G website http://www.navair.navy.mil/kms/41G/. Logistics information is available at http://logistics.navair.navy.mil/ and lessons learned information is available at the Knowledge Management Exchange website https://kmx.navair.navy.mil.

Relationship of SETR Documents



SETR Scheduling

- **Timing of review:** SETR should be accomplished no later than 2 months before the program milestone/event it supports
  - Subsystem reviews precede system level SETR
  - Subsystem review process may take months or years
  - To minimize cost, the review facility chosen should be adequate to meet the needs of the working group members

- **As early as possible, but NLT 3 months before SETR** [earlier start for more complex programs]
  - APMSE/APML/APMT&E/APEO review checklist for applicability of each question and add new questions as appropriate
  - APMSE/APML/APMT&E/APEO identify relevant Competencies required for participation in the TRB, and solicit Competency leadership to nominate TRB candidates
  - APMSE request AIR-4.1 to name TRB Chair
  - APMSE/APML/APMT&E create repository of relevant program data for TRB use (standard "Entry Criteria" for each SETR)
  - AIR-4.1 designates the TRB chairperson

- **NLT 2 months before SETR**
  - Level II Competency Leaders identify TRB members
  - TRB Chairperson approves tech review checklist and schedule
  - TRB Chairperson approves TRB membership
  - APMSE leads planning meeting with APML, APMT&E, TRB, Chairperson, and contractor(s)

- **NLT 1 month before the SETR**
  - APMSE or Chairperson designee in-briefs all TRB members
  - TRB members review data repository
  - TRB members interact with IPT counterpart
  - Notify Subject Matter Experts of their participation

- **The SETR meeting**
  - Includes all TRB members (and other stakeholders), often held at contractor's facility, and typically 2-3 days duration (for large programs)
  - Each TRB member responsible for comprehensively evaluating his or her area of expertise
  - For overall program assessment at end of review, TRB Chairperson may ask TRB members to provide inputs

independently, or to meet as group to discuss findings and provide single integrated input

- **As soon as possible, but NLT 1 month after SETR**
  - Chairperson, APMSE, APML, and APMT&E review RFAs, summary assessment, and findings
  - Chairperson presents finding and assessment to PMA, and signs out memo
  - APMSE and IPT begin acting on RFAs
  - SETRs are considered complete when all draft RFAs are signed off, and an acceptable level of program risk is ascertained

Additional References

- NAVAIR Using Software Metrics & Measurements for Earned Value Handbook - AIR-4.2

- NAVAIR Software Metrics Program Handbook - AIR-4.5

Getting on Contract - Suggested Contract Language

A recurring issue that Programs conducting SETRs face is what contractual or legal significance attaches to a Contractor's successful completion of a required technical review. Often times the question will arise whether the Government's approval of a particular technical review results in the Government henceforth waiving its rights to enforce the performance terms and conditions of the contract in the event the Contractor is ultimately unsuccessful in completing this contract.

This is a very complex question to be sure, and the precise answer will necessarily turn on the particular facts and circumstances of individual programs. That is not to say, however, that some certainty cannot be introduced into the process. At the outset, it is important that the contracting parties reach agreement as to the fundamental purpose of the SETRs. As this instruction makes clear, that purpose is to evaluate, at particular points in time, the progress of a system's design/development towards meeting the "end-game" which is ensuring that the contractual specification/performance requirements are met. As this iterative process progresses, the SETRs become increasingly detailed, and as such become more sharply focused on the "end-game." At some point along the review continuum, the Government arguably will have "bought-off" on the Contractor's design thereby either expressly or tacitly agreeing that the design will or does meet the "end-game" objective. After this point in time, it is important to note that while it might be said that the Government has "assumed responsibility" for the design, the Government does not necessarily also assume the burden for any subsequent technical failures. Again, that is a very complex question the resolution of which will depend on an assessment of the particular facts and circumstances to determine the cause of the failure.

In order to place some boundaries on the responsibilities of the contracting parties, you are strongly encouraged to incorporate the following clause into your awarded contracts. Please note that this clause is current as of the date of this instruction, but may be refined over time via updates to the AIR-2.0 official clausebook. Accordingly, you are advised to check with your Procuring Contracting Officer (PCO) to ensure the most current version of the clause is utilized.

Use: Use in Section H for contract subject to the requirements of NAVAIRINST 4355.19C, Systems Engineering Technical Review Process.

H-X SIGNIFICANCE OF SYSTEMS ENGINEERING TECHNICAL REVIEWS REQUIRED UNDER THIS CONTRACT

The effort to be performed under this contract includes a series of technical reviews as outlined in [**insert the complete title, date, and contract attachment number for the SOO, SOW, Spec or other applicable reference**]. The parties agree that the fundamental purpose of these systems engineering technical reviews (SETRs) is to review the design/development to date of the [**insert program name**] system and in so doing to assess the progress to date towards meeting the technical and/or performance requirements set forth in this contract. As such, each review will be tailored to ensure that the emerging design/development of the [**insert program name**] system is ready to enter the next phase towards completion of this contract. The parties further agree that Government approval of any particular technical review does not eliminate nor modify the Contractor's responsibility to perform in accordance with the terms and conditions of this contract. In that regard, unless expressly directed in writing by the Procuring Contracting Officer, the Contractor is free to adopt or reject any recommendations or advice offered by the Government during the conduct of any of the required SETRs. Moreover, in the event the Contractor is expressly directed in writing by the Contracting Officer to implement a change(s) to the design/development of the [**insert program name**] system, this clause shall remain in full force and effect unless the Contractor provides written notice to the Contracting Officer requesting relief from the requirements of this clause. Such written request shall provide detailed rationale to support and justify the Contractor's request for relief. In addition, such written request shall be made not later than 5 days after being directed in writing by the Contracting Officer to implement said change and the Contractor waives any and all entitlements to relief from the requirements of this clause by failing to make a timely written request to the Contracting Officer.

Request For Action (RFA) Procedures

1. RFA Form. The RFA form, or its equivalent, will be used to document a situation where a technical approach does not appear to meet the specification requirement or where a change must be made even though the design appears to meet the specification requirement. The RFA process will consist of the originator's identification of a problem, level of urgency, recommended action, the IPT response, and Executive Session disposition. The form may also be used to document a Request for Information (RFI) or to reflect meeting minutes or actions. NAVAIR 4355/4 (01/99) will be included as part of the technical review report. A sample format is provided on page 10 of this enclosure.

2. RFA Initiator. The upper portion of each RFA shall be completed by the person identifying the action and may be supplemented by additional sheets as required. It is the responsibility of the person identifying an action to complete the first portion in sufficient detail to clearly document the design issue. Specific entries are as follows:

a. Type. Indicate type of review.

b. Assignment. Indicate the intended use of the form.

c. Subject/Title. Enter a meaningful short title for the item discussed.

d. Subsystem Panel. Indicate the technical review data package or panel session where the problem was identified.

e. Request No. This number is assigned by the TRB Recorder for tracking purposes.

f. Referenced Document. List paragraph reference to design specification, SOW, or its applicable requirement document.

g. Specific Problem or Concern. Enter an explanation of the problem. Define a problem in clear, concise terms that can be understood and answered. Relate the problem to either a specification requirement either not met or a technical specification change required.

h. Recommended Action. Self-explanatory.

i. Recommend Category. Assign category according to the following definitions:

(1) Category I. Within the scope of the current contract. When approved by the Executive Session, action will be initiated as specified on the RFA format to meet the estimated completion date. The RFA constitutes authority to proceed, and no further direction is required.

(2) Category II. Not within the scope of the current contract. When approved by the Executive Session, and when directed by the Navy contracting officer, the contractor will prepare either a cost and schedule impact statement or a formal proposal, as indicated, and submit to NAVAIR.

(3) Category III. Rejected. By agreement of the technical review board or at the Executive Session, no further action will be undertaken.

j. Recommend Urgency/Date. Assign the urgency according to the following definitions, and a recommended completion date:

(1) Level 1. Indicates the existence of a hazardous condition such as safety of flight or personnel hazard.

(2) Level 2. Indicates the existence of condition(s) requiring attention, which could affect mission performance.

(3) Level 3. Indicates desired, but not mandatory, design improvements or changes, which would improve mission or aircraft performance.

k. Initiator's Name/IPT, Activity/Code/Phone, and Date. Self-explanatory.

3. IPT Response. The IPT personnel to document the response to the problem or concern may use the middle portion of the RFA. Specific entries as follows:

a. Proposed Action. The appropriate IPT person shall add pertinent facts regarding the RFA to include comments on discrepancies, recommended actions, alternate recommended actions, and impact.

b. Proposed Schedule. Provided the best available estimate of the schedule for accomplishment of the recommended action.

c. Recommended Category/Urgency/Date. Enter per category/urgency level definitions given previously, and the recommended completion date.

d. Engineer's Name, Function/Department/Phone, and Date. Enter the information for the IPT member assigned to prepare the response and the date of the response.

4. Executive Session. Following the IPT response with the proposed action and categories, RFAs will be referred to the Executive Session for resolution of any differences between NAVAIR and contractor positions. The final Executive Session decision, assigned category, urgency level, and the scheduled completion date will be recorded. An assessment of the impact of this decision upon the program will also be indicated. The program and contractor representative signatures, followed by the TRB Chairperson's signature, are entered as a concluding event after the disposition of the RFA has been determined.

REQUEST FOR ACTION FORM

RFA INITIATOR	TYPE: ☐SRR ☐PDR ☐CDR ☐Other:		ASSIGNMENT: ☐RFA ☐RFI ☐Minutes/Action
	SUBJECT/TITLE:	SUBSYSTEM PANEL:	REQUEST NO:
	REFERENCED DOC:		
	SPECIFIC PROBLEM OR CONCERN:		
	RECOMMENDED ACTION:		
	RECOMMENDED CATEGORY:		RECOMMENDED URGENCY/DATE:
	INITIATOR'S NAME: IPT:	ACTIVITY/CODE/PHONE:	DATE:
IPT RESPONSE	PROPOSED ACTION:		
	PROPOSED SCHEDULE:		
	RECOMMENDED CATEGORY:		RECOMMENDED URGENCY/DATE:
	ENGINEER'S NAME:	FUNCTION/DEPT/PHONE:	DATE:
EXECUTIVE SESSION	EXECUTIVE REVIEW AND DECISION:		
	ASSIGNED CATEGORY:		ASSIGNED URGENCY/DATE:
	IMPACT:		
	PROGRAM REPRESENTATIVE: DATE:		CONTRACTOR REPRESENTATIVE: DATE:
	TRB Chairperson:		DATE:

NAVAIR 4355/4 (1/99)

Essential Systems Engineering Technical Reviews

Initial Technical Review (ITR)

1. **ITR Purpose** - The ITR is a multi-disciplined technical review to support a Program's initial POM (Program Objective Memorandum) submission. This review is intended to ensure that a Program's technical baseline is of sufficient rigor to support a valid (acceptable cost risk) cost estimate and enable an independent assessment of that estimate by cost, technical and program management subject matter experts. The ITR assesses the envisioned requirements and conceptual approach of a proposed Program and verifies that the requisite research, development, test, engineering, logistic, and programmatic bases for the program reflect the complete spectrum of technical challenges and risks. Additionally, the ITR ensures that historical and prospective drivers of Weapon System costs have been quantified to the maximum extent and that the range of uncertainty in these parameters have been captured and reflected in the Program cost estimates.

Large acquisition programs are required to define program and system parameters in accordance with the Cost Analysis Requirements Description (CARD) as described in DoD 5000.4M. The basic CARD technical and programmatic guidance, tailored to suit the scope and complexity of the program, should be followed to ensure that all pertinent technical cost drivers are addressed. The term CARD-like document will be used in this SETR instruction to describe the minimum technical description required to achieve the objectives of the ITR. The success of the ITR will also depend on independent subject matter expert review of each of the identified cost drivers. It is critical that subject matter experts be drawn from the correct technical competencies that specialize in each of the areas addressed in the CARD-like document, and that the document must be completed and provided to the cost analyst 60 days before the desired review completion date. AIR-4.2 (Cost Analysis) ensures (via independent assessment) that the cost drivers detailed in the CARD-like document have been used properly in the development of the Program cost estimate. Completion of this review should provide:

a. A complete CARD-like document detailing system overview, risk, system operational concept (see AIR-4.2 Technical and Programmatic Checklist, Appendix 2).

b. An assessment of the technical and cost risks of the proposed Program.

c. An independent NAVAIR assessment of the Program's cost estimate.

2. ITR Timing - The ITR should be conducted to support formal Program cost estimate submission, that is prior to POM submission or Program Review (PR) updates in the fall timeframe. The ITR should be held well in advance of the actual cost estimate submission to allow time for issue resolution and proper executive level concurrence on process and results. While the ITR may first be accomplished well in advance of Program initiation (Milestone B) or even prior to a Initial Capabilities Document (ICD - formerly Mission Needs Statement (MNS)) or Capability Development Document (CDD - formerly Operational Requirements Document (ORD)), the ITR may be repeated as necessary to support POM or PR cycles, major changes in scope, breach of Acquisition Program Baseline Agreement, or following ICD or CDD approvals.

3. ITR Entry Criteria

a. A preliminary agenda has been coordinated by the APMSE 30 days (nominally) prior to the ITR.

b. A Program CARD-like document has been prepared by the IPT and made available to all ITR participants 45-60 days prior to the review.

c. Documented assumptions that relate to the CARD-like document. These assumptions will be critical to understanding the CARD-like document and its relevance to understanding costs.

d. The AIR-4.2 preliminary cost estimates for the Program.

4. ITR Planning

a. TRB Chairperson - Planning for a technical review should start with a request for a TRB Chairperson, nominally 45 days

prior to conduct of the review. Typically the PMA, assigned IPT leader, or assigned APMSE requests a TRB chairperson be appointed/coordinated by AIR-4.1. Prior to this request, the assigned APMSE should have coordinated chairperson requirements with the cognizant APEO(RDT&E). Chairperson assignments should be reflective of program scope and risk. With the concurrence of AIR-4.0, the ITR TRB Chairperson may be assigned from AIR-4.2. The role of the chairperson includes:

(1) Determination of TRB membership,

(2) Development of the final review elements,

(3) Oversight of the technical review and RFA process, and

(4) Issuance of the Technical Review Summary Report

b. Technical Review Elements - The APMSE and the assigned Chairperson shall coordinate with the cognizant APEO(RDT&E) in the development of a preliminary agenda for the planned review. A sample review is shown below in **paragraph 5.a**. This agenda should be made available to the review participants 30 days prior to conduct of the review.

c. Technical Review Participants

(1) TRB (typical composition):

(a) TRB Chairperson;

(b) PM representative;

(c) APMSE should:

1. Ensure the performing activity provides the supporting data and participation in the required review,

2. Develop, coordinate, and execute, in cooperation with the performing activity, individual review arrangements,

3. Ensure the preparation of requirements performance material is coordinated across IPTs,

4. Conduct the review for the TRB, and

5. Organize and supervise the documentation of RFAs in support of the TRB Chairperson.

(d) APML should ensure all relevant supportability requirements are addressed;

(e) APMT&E should ensure all Test and Evaluation requirements are addressed;

(f) Cost Team (AIR-4.2) representatives (should include Lead for the Cost Estimate effort as well as a Senior AIR-4.2 Competency representative). With the concurrence of AIR-4.0, the ITR TRB Chairperson may be assigned from AIR-4.2;

(g) Recorder is responsible for collating RFAs for submission to the TRB. The recorder should have the Technical Review Summary Report prepared for distribution by the Chairperson;

(h) Resource Sponsor (Requirements Officer); and

(i) User representatives, if appropriate.

(2) Technical Competency representatives as required to brief CARD-like document inputs.

(3) Non-advocate subject matter experts, as required, to review and validate CARD-like document technical and programmatic descriptions.

d. ITR Location - The facility chosen should be adequate to ensure complete participation by all cognizant competencies and organizations. Selection of the location should consider minimizing participant travel and associated costs.

5. Conduct of ITR Review - All TRB participants are to assess the materials at the review, document concerns by means of RFAs, and submit RFAs to the TRB Recorder.

a. ITR Review Elements

(1) Introduction/agenda/administrative

(a) Purpose of review

(b) RFA procedures overview

(c) Program overview

(2) Follow ITR Program Risk Assessment Checklist (one of four - aircraft; propulsion; avionics; or missile/weapon)

b. ITR Products

(1) Technical Review Summary Report, with the following attachments:

(a) List of attendees, to include; name, functional area represented, NAVAIR code, phone number, and email address,

(b) Completed RFA forms

(c) Meeting minutes

(d) Independent assessment as to the technical suitability of the CARD-like document to support the estimate of Program costs and an independent assessment of the Program's Cost Estimate.

(2) An updated, approved CARD-like document.

6. ITR Completion/Exit Criteria

a. The ITR is considered complete when all draft RFAs are signed off, and the CARD-like document has been updated, reviewed, and approved.

b. Typical ITR Exit Criteria include:

(1) Does the CARD-like document capture the key program, cost drivers development costs (all aspects of hardware, test, human integration, and software), production costs, operation

and support costs? Is the CARD-like document complete and thorough?

(2) Are the underlying assumptions used in developing the CARD-like document technically and programmatically sound and complete?

(3) Have the appropriate technical and programmatic competencies been involved in the CARD-like document development, and have the proper subject matter experts been involved in its review?

(4) Are the risks known and manageable within the cost estimate?

(5) Is the program, as captured in the CARD-like document, executable?

(6) Have all applicable, completed ITR Risk Assessment Checklists and any Lessons Learned been entered into AIR-4.1's Knowledge Management Exchange (KMX) system accessible at https://www.kmsonline.net/kms/ in accordance with the KMX/LL Process Document NASCO0672-KMX-PROC-001?

Alternative Systems Review (ASR)

1. **ASR Purpose** - The ASR is a multi-disciplined product and process assessment to ensure that the resulting set of requirements agrees with the customers needs and expectations, to ensure that the system concepts align with the external environment (systems, information networks, and infrastructure), and to ensure the system under review can proceed into the Technology Development (formerly Component Advanced Development (CAD)) work effort) phase. ASR should be completed prior to Milestone A. Generally this review assesses the alternative systems that have been evaluated during Concept Refinement (formerly Exploration), and ensures that the preferred system is cost effective, affordable, operationally effective, and suitable, and can be developed to provide a timely solution to a need at an acceptable level of risk. Of critical importance to this review is the understanding of available system concepts to meet the requirements from the Initial Capabilities Document (ICD - formerly MNS) or the Capability Development Document (CDD - formerly ORD), as well as the affordability/operational effectiveness/technologies/adaptability to the evolving external environment/risk inherent in each alternative concept. Depending on the overall acquisition strategy, one or more preferred system solutions may be carried forward into the Technology Development phase. By reviewing alternative system concepts, the ASR also helps ensure that sufficient effort has been given to conducting trade studies that consider and incorporate alternative system designs that may more effectively and efficiently meet the defined requirements. Acceptable level of risk is key to a successful review.

Completion of this review should provide:

a. An agreement on the preferred system concept(s) to take forward into Technology Development.

b. Software architectural constraints/drivers to address Defense Information Infrastructure/Common Operating Environment (DII/COE) and system interoperability requirements.

c. An assessment of the full system software concept to include conceptual definition of the complete deliverable/non-deliverable software, scope and risk, e.g. operational software elements, software engineering environment, test software,

maintenance software, simulation/stimulation software, training software, in-service support software, etc.

d. A comprehensive rationale for preferred system concept solution, which includes an Analysis of Alternatives evaluating relative cost/schedule/performance (hardware, human, software)/process integration/technology risks.

e. A comprehensive assessment on the relative risks associated with including Commercial Off-The Shelf (COTS) or Non-Developmental Items (NDI) as opposed to a new design, with emphasis on host platform environmental design, diagnostic information integration, dependence on other government programs and maintenance concept compatibility.

f. A comprehensive risk assessment for the Technology Development phase.

g. Trade studies/technical demonstrations for concept risk reduction.

h. Joint requirements for the purposes of compatibility, interoperability, and integration.

i. Refine threshold and objectives initially stated as broad measures of effectiveness.

j. A comprehensive plan for the Technology Development phase (hardware and software) that addresses critical components to be developed and demonstrated, their cost, and critical path drivers.

k. Initial planning for the System Development and Demonstration phase.

l. Draft system requirements document if one does not already exist. (This is the highest-level document that includes key relationships among subsystems to be created by the project to represent the customer/user requirements). This systems requirement document should include a system level description of all software elements required by the preferred system concept.

The review may be tailored in accordance with the technical scope and risk of the system. Under no circumstances should the review be tailored completely out of the development plan. Details of any tailoring should be described in the SEP, or should occur as part of the APMSE or systems engineer coordination of the review elements with the AIR-4.1 cognizant authority APEO(RDT&E).

2. ASR Timing - The ASR is typically conducted at the conclusion of the Concept Refinement phase, before Milestone A, following completion of Technology Development planning, and prior to the Technology Development phase. The ASR should not be scheduled at a particular number of months after contract award; rather, ASR should occur relative to the completion of Concept Refinement as described above.

3. ASR Entry Criteria

a. A preliminary agenda has been coordinated (nominally) 30 days prior to the ASR.

b. ASR technical products listed below for both hardware and software system elements have been made available to the cognizant ASR participants prior to the review:

(1) Analysis of Alternatives,

(2) Preferred System Concept(s),

(3) Analyses results and definition,

(4) Risk assessment and associated risk management/mitigation plan that includes the evolving external environment,

(5) System requirements document including interoperability and system distributed services requirements,

(6) Updated cost and schedule data, and

(7) Technology Development Plan

4. ASR Planning

a. TRB Chairperson - Planning for a technical review should start with a request for a TRB Chairperson, nominally 45 days prior to conduct of the review. Typically the PMA, assigned IPT leader, or assigned APMSE requests a TRB chairperson be appointed by AIR-4.1. Prior to this request, the assigned APMSE should have coordinated chairperson requirements with the cognizant APEO(RDT&E). Chairperson assignments should be reflective of program scope and risk. The role of the chairperson includes:

(1) Determination of TRB membership,

(2) Development of the final review elements,

(3) Oversight of the technical review and RFA process, and

(4) Issuance of the Technical Review Summary Report

b. Technical Review Elements - The APMSE and the assigned Chairperson shall coordinate with the cognizant APEO(RDT&E) in the development of a preliminary agenda for the planned review. A sample review agenda is shown below in **paragraph 5.a.** This agenda should be made available to the IPT 30 days prior to conduct of the review.

c. Technical Review Participants

(1) TRB (typical composition):

(a) TRB Chairperson;

(b) PM representatives (industry and Government);

(c) APMSE should:

1. Ensure the performing activity provides the supporting data and participation in the required review,

2. Develop, coordinate, and execute, in cooperation with the performing activity, individual review arrangements,

3. Ensure the preparation of requirements performance material is coordinated across IPTs, and

4. Organize and supervise the documentation of RFAs in support of the TRB Chairperson.

(d) APML should ensure all relevant supportability requirements are addressed;

(e) APMT&E should ensure all Test and Evaluation (T&E) requirements are met;

(f) Battlespace Systems Engineer for systems that have an information exchange requirement;

(g) Cost Team (AIR-4.2) representative;

(h) Counsel, if required;

(i) Contracting Officer;

(j) Recorder is responsible for collating RFAs for submission to the TRB and recording the minutes of the ASR. The recorder should have the Technical Review Summary Report prepared for distribution by the Chairperson;

(k) Resource Sponsor (Requirements Officer); and

(l) User representatives, if appropriate.

(2) Subject Matter Experts (SMEs) as required to address system concepts and enabling technologies. These SMEs represent their NAVAIR competencies in the adjudication of RFAs, to include cost and schedule impacts. SMEs should be notified at least 30 days prior to the scheduled review date. Any software metrics from NAVAIRINST 5234.5A and those provided to the Program Office to manage the software concept development are provided to the software SME at least 10 working days prior to the review.

(3) IPT briefers in accordance with the ASR agenda

d. ASR Location - The facility chosen should be adequate to ensure complete participation by all cognizant competencies and organizations. The ASR is typically conducted at a contractor or government provided facility, as mutually agreed upon, or specified in the contract. The facility must be able to support a meeting at the appropriate classification level to ensure effective information exchange and to address maturity of the system to enter system technology development. Selection of the location should consider minimizing participant travel and associated costs.

5. **Conduct of ASR Review** - All TRB participants are to assess the materials at the review, document concerns by means of RFAs, and submit RFAs to the TRB Recorder.

a. ASR Review Elements

(1) Introduction/agenda/administrative

(a) Purpose of review

(b) RFA procedures overview

(c) Risk Assessment procedures overview

(d) Program overview

(e) External Environment (System of Systems) overview

(2) Review of ITR RFAs, if applicable

(3) Risks

(4) Program schedule

(5) Metrics

(6) Summary of Preferred Concept

(a) Traceability of resulting requirements to customer's needs and expectations

(b) Assessment of the alternative systems

(c) Description of the preferred concept

(d) Cost, operational suitability, and schedule for preferred concept

(7) Follow ASR Program Risk Assessment Checklist structure

(8) Recommendation to proceed into requirements development

(9) Review of RFAs

b. ASR Products

(1) Technical Review Summary Report, with the following attachments:

(a) List of attendees, to include: name, functional area represented, NAVAIR code, phone number, and email address,

(b) Completed RFA forms

(c) Meeting minutes

(d) Recommendation to PMA as to the technical readiness of the program to enter requirements development.

(2) Updated Risk Assessment, including risks and recommended mitigations

6. ASR Completion/Exit Criteria

a. The ASR is considered complete when all draft RFAs are signed off, and an acceptable level of program risk is ascertained.

b. Typical ASR Exit Criteria include:

(1) Understanding of the evolving external environment to adequately address the risks

(2) Is/Are the preferred system solutions(s) sufficiently detailed and understood to enable entry into Technology Development with low technical risk?

(3) Is the system software scope and complexity sufficiently understood and addressed in the Technology Development plan to enable low software technical risk?

(4) Are the risks known and manageable for Technology Development?

(5) Were the proper NAVAIR competencies represented at the review?

(6) Can the preferred system concept(s), as disclosed, satisfy the ICD/CDD?

(7) Is the program schedule executable (technical/cost risks)? Within what margin and probability of estimate?

(8) Is the program properly staffed? Do the supporting competencies agree?

(9) Is the programs Technology Development work effort executable with the existing budget?

(10) Is the estimated software cost consistent with preferred concept approved at the ASR?

(11) Has the system technical baseline been captured in a preliminary system specification that is consistent with technology maturity and the proposed program cost and schedule?

(12) Have all applicable, completed ASR Risk Assessment Checklists and any Lessons Learned been entered into AIR-4.1's Knowledge Management Exchange (KMX) system accessible at https://www.kmsonline.net/kms/ in accordance with the KMX/LL Process Document NASCO0672-KMX-PROC-001?

System Requirements Review (SRR)

1. **SRR Purpose** - The SRR is a multi-disciplined product and process assessment to ensure that the system under review can proceed into the System Development and Demonstration (SDD) phase, and that all system and performance requirements derived from the CDD are defined, aligned with the external environment (systems and infrastructure), and consistent with cost (program budget), schedule (program schedule), risk, and other system constraints. Generally this review assesses the system requirements as captured in the system specification, and ensures that the system requirements are consistent with the preferred system solution as well as available technologies resulting from the Technology Development (formerly CAD) phase. Of critical importance to this review is the understanding of program technical risk inherent in the system specification and SDD phase program plan. Acceptable level of risk is key to a successful review.

The systems requirements are evaluated to determine whether they are fully defined and consistent with the mature system solution, and whether traceability of systems requirements to the CDD is maintained. A successful review is predicated on the IPT's determination that the system requirements, preferred system concept, available technology, and program resources (funding, schedule, staffing, and processes) form a satisfactory basis for proceeding into the SDD phase.

The review may be tailored in accordance with the technical scope and risk of the system. Under no circumstances should the review be tailored completely out of the development plan. Details of any tailoring should be described in the SEP, or should occur as part of the APMSE or systems engineer coordination of the review elements with the AIR-4.1 cognizant authority APEO(RDT&E).

Notwithstanding successful completion of the SRR, the contractor remains responsible for the system design/performance requirements within the terms of the contract.

Completion of this review should provide:

a. An approved system specification,

b. A preliminary allocation of system requirements to hardware, human, and software subsystems,

c. Identification of all software components (tactical, support, deliverable, non-deliverable, etc.),

d. Confidence that the requirements have been reflected in the software estimated cost to complete,

e. A comprehensive risk assessment for SDD,

f. An approved SDD SEP that addresses cost and critical path drivers, and

g. An approved Acquisition Logistics Support Plan (ALSP) with updates applicable to this phase.

2. SRR Timing - The SRR is typically conducted near the conclusion of the Technology Development phase, following full Concept Refinement definition, completion of Technology Development definition, and prior to MS-B (program initiation). In the competitive environment, with multiple contractors competing, SRRs may be conducted with all contractors. An additional SRR may be conducted as an initial technical review of the SDD phase, for the purposes of establishing the technical baseline and approach. The SRR should not be scheduled at a particular number of months after contract award; rather, SRR should occur relative to the maturity of the system technical baseline as described above.

3. SRR Entry Criteria

a. If applicable, an ASR has been successfully completed.

b. A preliminary agenda has been coordinated (nominally) 30 days prior to the SRR.

c. SRR technical products listed below for both hardware and software system elements have been made available to the cognizant SRR participants prior to the review:

(1) System specification, to include a description of interoperability and/or distributed services requirements,

(2) System architecture (hardware, software, human, material as necessary) complete with details regarding partitioning rationale and approach to architecture development,

(3) System software functionality description,

(4) System/Subsystem Design Specification (SSDD),

(5) CARD,

(6) Preferred system solution definition,

(7) Updated risk assessment,

(8) SEP,

(9) Updated cost and schedule data,

(10) Updated logistics documentation (ALSP, LRFS, Preliminary Maintenance Plan, etc.),

(11) Updated Human Systems Integration (HSI) related documentation,

(12) Software Development Plan (SDP) is complete. May be a standard organizational or company document tailored to the program.

(13) Integrated system architecture and supporting views.

4. SRR Planning

a. TRB Chairperson - Planning for a technical review should start with a request for a TRB Chairperson, nominally 45 days prior to conduct of the review. Typically the PMA, assigned IPT leader, or assigned APMSE requests a TRB chairperson be appointed by AIR-4.1. Prior to this request, the assigned APMSE should have coordinated chairperson requirements with the cognizant APEO(RDT&E). Chairperson assignments should be reflective of program scope and risk. The role of the chairperson includes:

(1) Determination of TRB membership,

(2) Development of the final review elements,

(3) Oversight of the technical review and RFA process, and

(4) Issuance of the Technical Review Summary Report

b. Technical Review Elements - The APMSE and the assigned Chairperson shall coordinate with the cognizant APEO(RDT&E) in the development of a preliminary agenda for the planned review. A sample review is shown below in **paragraph 5.a**. This agenda should be made available to the IPT 30 days prior to conduct of the review.

c. Technical Review Participants

(1) TRB (typical composition):

(a) TRB Chairperson;

(b) PM representatives (industry and Government);

(c) APMSE should:

1. Ensure the performing activity provides the supporting data and participation in the required review,

2. Develop, coordinate, and execute, in cooperation with the performing activity, individual review arrangements,

3. Ensure the preparation of SRR material is coordinated across IPTs, and

4. Organize and supervise the documentation of RFAs in support of the TRB Chairperson.

(d) APML should ensure all relevant supportability requirements are addressed;

(e) APMT&E should ensure all T&E requirements are addressed;

(f) A Battlespace Systems Engineer, for those systems that have an interoperability requirement;

(g) Cost Team (AIR-4.2) representative;

(h) Counsel, if required;

(i) Contracting Officer;

(j) Recorder is responsible for collating RFAs for submission to the TRB and recording the minutes of the SRR. The recorder should have the Technical Review Summary Report prepared for distribution by the Chairperson;

(k) Resource Sponsor (Requirements Officer); and

(l) User representatives, if appropriate.

(2) Lead for the Software Support Activity.

(3) SMEs as required to address system concepts and enabling technologies. These SMEs represent their NAVAIR competencies in the adjudication of RFAs, to include cost and schedule impacts. SMEs should be notified at least 30 days prior to the scheduled review date. Software metrics to date in accordance with NAVAIRINST 5234.5A and those provided to the Program Office to manage the software program are provided to the software SME at least 10 working days prior to the review.

(4) Developmental and Operational Testers

(5) IPT briefers in accordance with the SRR agenda.

d. SRR Location - The facility chosen should be adequate to ensure complete participation by all cognizant competencies and organizations. The SRR is typically conducted at a contractor or government provided facility, as mutually agreed upon, or specified in the contract. The facility must be able to support a meeting at the appropriate classification level to ensure effective information exchange and to address maturity of the system to enter system functional requirements development.

Selection of the location should consider minimizing participant travel and associated costs.

5. **Conduct of SRR Review** - All TRB participants are to assess the materials at the review, document concerns by means of RFAs, and submit RFAs to the TRB Recorder.

a. SRR Review Elements

(1) Introduction/agenda/administrative

(a) Purpose of review

(b) RFA procedures overview

(c) Risk Assessment procedures overview

(d) Program overview

(e) Family of Systems/System of Systems overview

(2) Review of ASR RFAs

(3) Risks

(4) Program schedule

(5) Metrics

(6) Summary of system requirements

(7) Traceability to CDD or ORD

(a) Tools used to maintain the requirements

(b) Requirements management/change process

(8) Follow SRR Program Risk Assessment Checklist structure

(9) Recommendation to proceed into system functional requirements development

(10) Review of RFAs

b. SRR Products

(1) Technical Review Summary Report, with the following attachments:

(a) List of attendees, to include: name, functional area represented, NAVAIR code, phone number, and email address

(b) Completed RFA forms

(c) Meeting minutes

(d) Recommendation to PMA as to the technical readiness of the program to enter system functional requirements development.

(2) Updated Risk Assessment, including risks and mitigation options

6. SRR Completion/Exit Criteria

a. The SRR is considered complete when all draft RFAs are signed off, and an acceptable level of program risk is ascertained.

b. Typical Exit Criteria include:

(1) Were the proper NAVAIR competencies represented at the review?

(2) Can the system requirements, as disclosed, satisfy the CDD?

(3) Are the system requirements sufficiently detailed and understood to enable system functional definition and functional decomposition?

(4) Is there an approved system specification?

(5) Is the architecture adequately structured to support both explicit and implied system attributes? Does the architectural development process provide adequate opportunity

for analysis and early detection/resolution of top-level design issues?

(6) Are the Family of Systems (FoS)/System of Systems (SoS) requirements properly allocated and approved?

(7) Are adequate processes and metrics in place for the program to succeed?

(8) Have Human Integration requirements been reviewed and included, where needed, in the overall system design?

(9) Are the risks known and manageable for design and development?

(10) Is the program schedule executable (technical/cost risks)?

(11) Is the program properly staffed?

(12) Is the program executable within the existing budget?

(13) Is the software estimated cost to complete consistent with the requirements approved at the SRR?

(14) Does the updated cost estimate fit with in the existing budget?

(15) Is the preliminary CARD consistent with the approved system specification?

(16) Is the software functionality in the system specification consistent with the software sizing estimates and the resource-loaded schedule?

(17) Did the Technology Development phase sufficiently reduce development risks?

(18) Have all applicable, completed SRR Risk Assessment Checklists and any Lessons Learned been entered into AIR-4.1's Knowledge Management Exchange (KMX) system accessible at https://www.kmsonline.net/kms/ in accordance with the KMX/LL Process Document NASCO0672-KMX-PROC-001?

Technology Readiness Assessment (TRA)

1. **TRA Purpose** - The TRA is a regulatory information requirement per DoD Instruction 5000.2. The TRA is a systematic metrics-based process that assesses the maturity of Critical Technology Elements (CTEs) and is a requirement for all acquisition programs. The TRA may be conducted concurrent with other technical reviews, specifically SRR, CDR, SVR, and/or PRR. If a platform/system depends on specific technologies to meet system operational threshold requirements in development, production, and operation, and if the technology or its application is either new or novel, then that technology is considered a CTE. The TRA should not be considered a risk assessment but viewed as a valuable tool for assessing program risk and adequacy of technology maturation planning. The TRA will score the current readiness level of selected system elements, using defined Technology Readiness Levels (TRLs), highlighting critical technologies and other potential technology risk areas requiring PMA attention. The TRA essentially "draws a line in the sand" on the day of the event for making an assessment of technology readiness for critical technologies integrated at some elemental level. If the system does not meet pre-defined TRL scores then a CTE maturation plan is identified to explain in detail how these levels will be reached prior to the next milestone decision date or agreed relevant decision point.

Completion of the TRA should provide:

a. A comprehensive review, using an established program Work Breakdown Structure (WBS) as an outline, of the entire platform or system. This review, using a conceptual or established baseline design configuration, identifies program CTEs,

b. An objective scoring of the level of technological maturity for each CTE by an Expert Assessment Panel (EAP),

c. Maturation plans identified for achieving an acceptable maturity roadmap for CTEs prior to critical milestone decision dates

2. **TRA Timing** - TRA is required by DoD prior to both Milestone B and Milestone C decision dates. TRA is also recommended, but not DoD required, as entry criteria for CDR. The TRA process

has proven to require between 8 to 10 months prior to the decision date to complete for ACAT 1D or 1AM programs (Notification/Go-Ahead to DoD Approval) Variation in schedule may be influenced by:

a. Number of Offerors

b. Number of supplier alternatives carried prior to prime down select

(1) Sole-Source Vs Competitive

(2) Contract vehicle in place or not to facilitate capture of technology information

(3) Availability of funding

(a) Includes one to 2 month window of opportunity for DoD Integrated Technology Architecture (ITA), if required, prior to Milestone date (ACAT 1D or 1AM only)

(b) ACAT II and ACAT 1C programs can be streamlined to 5 to 7 months (given only Deputy Assistant Secretary of the Navy for Research, Development, and Acquisition (DASN(RDA)) Milestone Decision Authority (MDA) review required)

(c) ACAT III and IV programs require approximately 5 months or less (given only PEO MDA review required)

3. TRA Entry Criteria

a. Signed ORD or CCD,

b. PMA funding identified for the TRA,

c. Chairman designated and Office of Naval Research (ONR) TRA Coordinator (TRAC) identified,

d. Program Indoctrination and TRA Kick-Off,

e. Signed TRA Plan authored by Chairman, concurred with by TRAC, and acknowledged by PMA,

f. If applicable, an ASR and/or SRR have been successfully completed,

g. TRA CTEs identified using WBS disciplined reconciliation process,

h. Contractual vehicle in place to fund the contractors for the TRA preparation and execution, if prime contractor known,

i. Draft Read-Ahead material provided to Chairman 10 weeks before TRA event (allows 2 weeks review for comment and 4 additional weeks for final draft preparation and release to EAP),

j. Final Read-Ahead material provided to Chairman and EAP 4 weeks before TRA event (tailored as appropriate to accommodate program schedule).

4. TRA Planning

a. TRB Chairperson - As the Navy's Science and Technology Executive, the Chief of Naval Research (CNR) is responsible for ensuring the integrity of the TRA and for providing a recommendation to ASN(RD&A). The TRA Chairman, designated by AIR-4.0, is responsible for TRA coordination, planning, conducting, documenting, and reporting on results. In order to maximize TRA effectiveness and facilitate a CNR recommendation, the Chairman will work closely with the appointed ONR TRAC.

Upon determination that a TRA is required, the PMA contacts AIR-4.0 with a request for a candidate Chairman. The Chairman is selected after review of credentials and mutual agreement is achieved among the PMA, PEO, and AIR-4.0. The Chairman cannot be a member of the program IPT, in most cases is a recognized competency technical expert, and a leader capable of coordinating and conducting a comprehensive assessment of the assigned program. The Chairman is designated by AIR-4.0 via official correspondence.

After designation as the TRA Chairman, the Chairman contacts ONR to announce the need to perform a TRA for the program assigned. The applicable ONR Science and Technology (S&T) Department assigns a TRAC. The TRAC provides collaboration and counsel to the Chairman on the content of the TRA Plan, the

actual event, and the development of the final report. The TRAC participates as a member of the TRA independent panel, and acts as a certifying agent for CNR, ensuring the integrity of the TRA is maintained.

In order to effectively coordinate and track significant actions and milestones necessary to successfully execute a TRA and meet the program's critical path for obtaining a CNR endorsement in support of applicable Milestone (B or C), the Chairman must build an executable schedule and obtain concurrence from both the PMA and TRAC. The Program Objectives and Milestones (POAM) schedule is a key tool used by the Chairman to keep aware of TRA progress and establish priority for TRA tasks within the program. It is highly recommended that the program office integrate the TRA POAM into the program integrated master schedule for appropriate visibility and planning.

b. TRA Preparation - Identification of Critical Technologies Technology Development Strategy (TDS) is a statutory requirement that must be updated at each milestone. The TDS should be a stand-alone document requirement, preferably for Milestone B, but at a minimum for Milestone C. Many programs are getting past milestone B by adding a few lines in the Acquisition Strategy. By Milestone C, programs are unaware of how to proceed and seem to miss the intent of the document. Given the importance and visibility of the TDS, it would be prudent to maintain configuration control of a separate document for tracking and PMA awareness. The TDS discusses, among other things, how the program will be divided into technology spirals and development increments. The TDS applies to both multiple and single spiral acquisition strategies.

A WBS of systems, subsystems, and components is used to establish the system CTEs to be scored by a TRA EAP. The process starts with both the contractor(s) and the Government IPT separately reviewing the WBS structures they control and individually identifying branches of the WBS that may contain CTE candidates. In the event that no contractor award has been established, the responsibility for identifying CTEs fully rests with the program office. Those WBS branches that clearly do not contain a candidate CTE are terminated with justification documented. The WBS is peeled down low enough in all cases to identify with confidence the core CTEs. Some cases may result

in only a component CTE where others may identify a sub-system, or both. The combined contractor and government IPT collaborates and reconciles a draft aggregate list for passage to the Chairman. The Chairman reviews the list and determines whether IPT is on track and properly interpreting the definitions of a CTE. Once it is determined that a good draft is worthy of formal review, the IPT formally presents the proposed CTE list to the Chairman and TRAC for further reconciliation and approval. If after reconciliation it is determined that no CTEs exist for the program in question, the chairman will draft a letter to CNR documenting the results with a request that a formal TRA scoring event not be required. On the other hand, if after reconciliation it is determined CTEs do indeed exist, then a formal TRA is pursued.

The DoD defines an element as a critical technology (i.e., CTE) if: a) a system being acquired depends on specific technologies to meet system operational requirements in development, production, and operation; and b) the technology or its application is either new or novel. In order to help apply these definitions when funneling down the WBS and determining potential candidate CTEs, one of the following considerations must be true to be a CTE in addition to directly impacting an operational threshold requirement:

(1) Is the technology new or novel? Or modified?

(2) Has the technology been repackaged such that a new relevant and more stressing environment is realized?

(3) Is the technology expected to operate in an environment and/or achieve a performance expectation beyond its original design intention or demonstrated capability?

In order to further help determine a candidate CTE and provide a snapshot on the level of technology maturation involved to date, the following information should be considered and provided to the EAP for each CTE candidate:

(1) Is the technology a common/standard design or iteration of an existing design?

(2) Is an Engineering Development Model (EDM) built, functional, and verified to meet derived and systems level operational performance?

(3) Has the technology been tested in a laboratory or flight test environment?

(4) To what level has the technology been qualified, such as Environmental System Screening (ESS), Highly Accelerated Life Testing (HALT)

(5) Has the technology been flight certified, etc., or is it fully or partially in production?

(6) Is the technology (at all elemental levels) production representative?

It is important to ensure that the definition of a critical technology is delineated clearly from that of standard engineering practice. It is expected that during SDD technical challenges will arise typical to engineering development. When determining CTEs, especially at the stage approaching Milestone C, it is important to separate typical engineering challenges associated with integration into a platform with that which might be a technology limitation (i.e., CTE). If dollars, time, and/or resources can be applied to resolve the problem, within the constraints of the official program of record, then the issue at hand is likely a typical SDD challenge and not a potential CTE. Care should also be taken when considering CTEs when legacy or heritage equipment is concerned. If a legacy technology is repackaged into a new relevant environment, such as a new form factor, or if a product family roll occurs where the next iteration of a family of products is to be used, the technology may qualify as a CTE. If repackaging constitutes a relevant environment that is known to be less harsh and therefore non-influential on the technology, an argument may exist that the technology is not a CTE.

Manufacturing, Supportability, and Test and Evaluation (T&E) should also be considered to ensure no new or modified process steps or tooling required qualifies as a CTE.

Software Engineering Environment (SEE) automated tools, firmware devices, and hardware necessary to perform software

development will be assessed using DOD TRL definitions. If any item qualifies as a limiting technology, such that proposed software development rates are impacted adversely, or an item is considered new and implementing a non-standard approach. Automated tools to consider may include but not be limited to computer-aided software engineering (CASE) tools, editors, compilers, assemblers, linkers, loaders, operating system, debuggers, simulators, emulators, and test tools.

Computer software identified as dealing with new or novel air system, weapon system, sub-system, automatic test equipment, trainer, and/or mission planning applications, as well as new or novel algorithms or application of algorithms necessary to meet operational performance requirements will be assessed using the NAVAIR configuration controlled software TRLs. Potential examples include: command and control, communications, target detection and tracking, automatic target recognition, navigation, flight control, fuel control, resource management, fusion, etc.

c. TRA Read-Ahead Documentation - In order to best prepare the assessment panel, a read-ahead package should be provided to each panel member several weeks prior to the TRA event. The read-ahead package contains a copy of the actual briefings, as close to final form as possible, TRA Score Sheets, and any additional data that can provide maximum insight and preparation for the TRA event. A draft read-ahead will be provided to the Chairman several weeks before the IPT generates the final read-ahead for the panel in order to ensure the proper format for the briefings is understood and timely feedback for modifications can be given. On the days of the TRA event, a voter's notebook will be given to each panel member by the IPT that contains updated presentation briefings, a new section that lists technology maturation events that have occurred since the final read-ahead was provided to the panel, and new TRA Score Sheets.

d. Technical Review Participants - The EAP is comprised of three groups: a Government program team (25%), an industry program team (25%), and an independent team (50%) of SMEs. The EAP consists initially of all primary discipline areas considered necessary for a comprehensive review and reconciliation of potential CTEs. The independent membership (50% or more of the EAP) can consist of SMEs from NAVAIR, ONR, national laboratories, other services, and academia depending on

Chairman and TRAC concurrence of necessary coverage and need for specialized experts. After reconciliation of CTEs and leading into the TRA event, the EAP will diminish in size as a function of CTE relevancy. The size of the TRA EAP is also influenced by the size, uniqueness, and nature of the program or its systems.

e. TRA Location - If the program has an awarded prime contractor, then the TRA is typically conducted at the contractor's facility. The facility should be adequate to ensure complete participation by all members of the EAP. The added benefit to holding the TRA at the contractor's facility is to allow for the opportunity for laboratory tours or system demonstrations if deemed important by the IPT. If no awarded contract exists or if the PMA deems it not practical for the contractor to host the TRA, then the TRA should be hosted by the PMA at a government site with appropriate capacity, resources, and safeguards provided.

5. Conduct of TRA Review

a. TRA Event - The assessment procedures are specifically designed to have a rigid presentation structure in order to meet the needs of the TRA in a timely and to-the-point fashion. The TRA format prevents the presenter and assessment panel from unintentionally slipping into a critical design or risk management review, of which the TRA is not.

The TRA begins with a short program introduction, between 1 to 2 hours maximum, which sets the foundation for the following technology assessment briefs. The introduction provides a platform/weapon system overview which then logically flows into the subsystem and component elements to be assessed. The format for the presentation and recommended presenter is as follows:

(1) Platform/weapon system overview (1-2 Hours), which includes:

(a) Description of the Concept of Operations (CONOPS) - PMA or Contractor

(b) Walk through the program master schedule, identify significant milestones, items on the critical path and status progress - Joint PMA/Contractor

(c) Description of the operational performance requirements, highlighting Key Performance Parameters (KPPs), in general and those that will be directly influenced by the technologies to be assessed - Contractor

(d) Identification of platform/system challenges associated with the technologies to be assessed - Contractor

(e) Show a program technology maturation roadmap and highlight those maturation events that have been accomplished and those yet to occur - Contractor

(f) Show an overall platform/weapon system architecture that highlights the technology system/subsystem elements that will be assessed - Contractor

The TRA agenda allows each subsystem/technology presenter 60 minutes to convince the EAP as to the status of the technology maturity. Immediately following the presentation, a total of 20 minutes is recommended for potential questions and official scoring by the panel members. The presenter should not suggest a TRL for his subsystem/technology but must provide the sound evidence that will allow the panel to make an informed decision. Each presenter is timed and is coached for remaining time throughout his presentation. Given the discipline involved, each presenter is forced to stay on track, be objective, and provide only relevant data for the TRA. Each presenter is expected to present the following data:

(1) Introduction to the subsystem/technology, which includes:

(a) A technical description of the subsystem/technology, to include physical architecture, highlighting CTEs (components and/or packaging), explaining why other technologies within subsystem are non-critical, and differentiating subsystem and elements from that of potentially similar designs (i.e., highlight any uniqueness)

(b) A description of the subsystem's/technology's intended function within the design

1. Discuss the significance or importance of the critical technologies relative to the subsystem technology

2. Discuss the significance or importance of the subsystem/technology relative to the system overall design (important to appreciate system level impact)

3. Discuss the traceability of the subsystem technology relative to the applicable operational requirements and state whether impact to a KPP (important to appreciate linkage to operational requirements)

(c) Show a schedule, clearly identifying critical path events, for the design and integration of the subsystem/technology; including expectation/deliveries from suppliers, if relevant to the TRA

(d) Show where the technology resides in the overall system architecture as presented in the initial System Overall brief

(e) Show a block diagram of the Hardware/Software elements

(f) Show a current risk square for the subsystem element

(g) Show a roadmap of on-going and planned maturation activities how/when these events can influence the master design schedule (This is the only point where the presenter should note future maturation events)

(2) Status of subsystem/technology (Extremely important since substantiates TRL score), which includes:

(a) Itemize factoids and accomplishments that directly reflect maturation of the subsystem/technology (use TRL rating factors as a guideline)

1. Accomplishments should be presented using TRL rating factors as a guideline

2. State quantitative facts where possible in order to temper and legitimize significance of the technology maturation accomplishments

3. Describe the measurement environment and methodology used

4. Identify who witnessed the subsystem/technology maturation accomplishments

(b) Show tangible evidence of subsystem/technology maturation accomplishments (e.g., hardware, pictures, displays, etc.). Clearly state what is and is not represented by the evidence

(c) Identify documented tangible evidence of accomplishments (e.g., technical papers, reports, etc.). Clearly state what is and is not represented by the evidence

(d) Discuss any relevant subsystem/technology maturation leveraged from other programs. Clearly state any differences between this program and the leveraged program to appreciate significance of maturation events

(e) If it is clear that significant maturation events fall short or have not been accomplished by the date of the TRA, identify these items upfront so the panel membership can avoid asking the obvious questions

(3) Panel Member Questions (10 Minutes)

(4) Panel Members Score the Technology (10 Minutes)

If possible, the IPT should provide invitations to panel members to witness any relevant demonstrations planned to occur prior to the TRA scoring event. Demonstrations/tours can be planned specifically for the panel members, on a not-to-interfere basis with the TRA event, at the discretion of the IPT, but are not directed in any way as a requirement of the TRA. Upon completion of the TRA event, panel members will have up to 24 hours to change their score, if desired, and within that period it is possible a tour or demonstration could be offered.

The rating panel(s) use(s) the TRA Score Sheet template to document their technology readiness level determination and make narrative comments on their assessment.

The TRA Process Risk Assessment Checklist is intended to provide a listing of the key tasks required to be accomplished in the execution of the TRA process.

b. TRA Products - A final report will be prepared documenting the findings of the assessment panel. The final report will be prepared by the chairman considering the template guide identified in the OSD TRA Deskbook, dated October 2003, and will include the following information: a narrative report on the data and findings of the assessment, an executive level briefing on the assessment process and results, and copies of the assessment data. A preliminary hot wash (i.e., highlights brief) of the scores obtained from the panel will be provided at the conclusion of the TRA event. The chairman will also provide a recommended endorsement cover letter for CNR to sign based on the TRA results.

6. TRA Completion/Exit Criteria - After the final report is written, it is submitted by the chairman to CNR via the TRAC, as well as a copy provided to the PMA. Upon CNR approval of the report, CNR provides the chairman the original signed endorsement cover letter and forwards a copy of the report and letter to DASN(RDA). For ACAT 1D or 1AM programs, DASN(RDA) forwards a recommendation to Deputy Director for Research and Engineering (DDR&E) for Deputy Under Secretary of Defense for Science and Technology (DUSD(S&T)) final approval. If deemed necessary, the DDR&E can conduct an Independent Technical Assessment (ITA) in addition to, and totally separate from, the TRA. Thirty days are required for CNR staffing and signature - 30 to 60 days are recommended for DASN(RDA) and DUSD(S&T) staffing and approval. Typically 1 to 2 months should be reserved for an ITA prior to the milestone as a precaution.

System Functional Review (SFR)

1. **SFR Purpose** - The SFR is a multi-disciplined product and process assessment to ensure that the system under review can proceed into preliminary design, and that all system requirements and functional performance requirements derived from the CDD (formerly ORD) are defined, aligned with the external environment (systems and infrastructure) and consistent with cost (program budget), schedule (program schedule), risk, and other system constraints. Generally this review assesses the system functional requirements as captured in system specifications (functional baseline), and ensures that all required system performance is fully decomposed and defined in the functional baseline. System performance may be decomposed and traced to lower level subsystem functionality that may define hardware and software requirements. SFR determines whether the systems functional definition is fully decomposed to its lower level, and that the IPT is prepared to start preliminary design.

The system's lower level performance requirements are evaluated to determine whether they are fully defined and consistent with the mature system concept, and whether traceability of lower-level systems requirements to top-level system performance and the CDD is maintained. A successful review is predicated on the IPT's determination that the system performance requirements, lower level performance requirements and plans for design and development form a satisfactory basis for proceeding into preliminary design.

The review may be tailored in accordance with the technical scope and risk of the system. Under no circumstances should the review be tailored completely out of the development plan. Details of any tailoring should be described in the SEP, or should occur as part of the APMSE or systems engineer coordination of the review elements with the AIR-4.1 cognizant authority (APEO(RDT&E)). The SFR has importance as the last review that ensures that the system is credible and feasible before more technical design work commences. Notwithstanding successful completion of the SFR, the contractor remains responsible for the system design/performance requirements within the terms of the contract.

Completion of this review should provide:

a. An established system functional baseline,

b. An updated risk assessment for the SDD phase,

c. An updated CARD (or CARD-like document) based on the system functional baseline,

d. An updated program development schedule including system and software critical path drivers, and

e. An approved ALSP with updates applicable to this phase.

2. **SFR Timing** - The SFR is typically conducted early in the System Development and Demonstration phase, following full system functional definition, completion of preliminary functional baseline documentation, and prior to preliminary design activity. The SFR should not be scheduled at a particular number of months after contract award; rather, SFR should occur relative to the maturity of the system technical baseline as described above.

3. **SFR Entry Criteria**

a. A SRR has been successfully completed.

b. A preliminary agenda has been coordinated (nominally) 30 days prior to the SFR.

c. SFR technical products listed below for both hardware and software system elements have been made available to the cognizant SFR participants prior to the review:

(1) Updated system specification, to include a description of interoperability and/or distributed services requirements,

(2) Preliminary functional baseline (with supporting trade-off analyses and data),

(3) Preliminary system software functional requirements,

(4) CARD changes, if any,

(5) SEP changes, if any,

(6) Updated risk assessment,

(7) Updated logistics documentation (ALSP, Logistics Requirements and Funding Summary (LRFS), Preliminary Maintenance Plan, etc.),

(8) Based on system complexity, updated HSI plan,

(9) Is the Software Test Plan (STP) complete and ready to be placed under configuration management?

(10) Are the Software Requirements Document(s) (SRD) complete and ready to be placed under configuration management?

(11) Are the Interface Requirements Specification(s) (IRS) complete and ready to be placed under configuration management?

(12) Are the software requirements and interface requirements to be implemented in each incremental software build and/or released identified?

(13) Integrated system architecture and supporting views.

4. SFR Planning

a. TRB Chairperson - Planning for a technical review should start with a request for a TRB Chairperson, nominally 45 days prior to conduct of the review. Typically the PMA, assigned IPT leader, or assigned APMSE requests a TRB chairperson be appointed by AIR-4.1. Prior to this request, the assigned APMSE should have coordinated chairperson requirements with the cognizant APEO(RDT&E). Chairperson assignments should be reflective of program scope and risk. The role of the chairperson includes:

(1) Determination of TRB membership,

(2) Development of the final review elements,

(3) Oversight of the technical review and RFA process, and

(4) Issuance of the Technical Review Summary Report

b. Technical Review Elements - The APMSE and the assigned Chairperson shall coordinate with the cognizant APEO(RDT&E) in the development of a preliminary agenda for the planned review. A sample review is shown below in paragraph **5.a.** This agenda should be made available to the IPT 30 days prior to conduct of the review.

c. Technical Review Participants

(1) TRB (typical composition):

(a) TRB Chairperson;

(b) PM representatives (industry and Government);

(c) APMSE should:

1. Ensure the performing activity provides the supporting data and participation in the required review,

2. Develop, coordinate, and execute, in cooperation with the performing activity, individual review arrangements,

3. Ensure the preparation of requirements performance material is coordinated across IPTs,

4. Conduct the review for the TRB, and

5. Organize and supervise the documentation of RFAs in support of the TRB Chairperson.

(d) APML should ensure all relevant supportability requirements are addressed;

(e) APMT&E should ensure all T&E requirements are addressed;

(f) If a flight clearance will be required, notify AIR-4.0P of the review;

(g) A Battlespace Systems Engineer, for those systems that have interoperability requirements;

(h) Cost Team (AIR-4.2) representative;

(i) Counsel, if required;

(j) Contracting Officer;

(k) Recorder is responsible for collating RFAs for submission to the TRB. The recorder should have the Technical Review Summary Report prepared for distribution by the Chairperson;

(l) Resource Sponsor (Requirements Officer); and

(m) User representatives, if appropriate

(2) SMEs as required to address system concepts and enabling technologies. These SMEs represent their NAVAIR competencies in the adjudication of RFAs, to include cost and schedule impacts. SMEs should be notified at least 30 days prior to the scheduled review date.

(3) IPT briefers in accordance with the SFR agenda.

d. SFR Location - The facility chosen should be adequate to ensure complete participation by all cognizant competencies and organizations. The SFR is typically conducted at a contractor or Government provided facility, as mutually agreed upon, or specified in the contract. Selection of the location should consider minimizing participant travel and associated costs.

5. Conduct of SFR Review - All TRB participants are to assess the materials at the review, document concerns by means of RFAs, and submit RFAs to the TRB Recorder.

a. SFR Review Elements

(1) Introduction/agenda/administrative

(a) Purpose of review

(b) RFA procedures overview

(c) Risk Assessment procedures overview

(d) Program overview

(e) FOS, SOS overview.

(2) Follow SFR Program Risk Assessment Checklist structure

b. SFR Products

(1) Technical Review Summary Report, with the following attachments:

(a) List of attendees, to include: name, functional area represented, NAVAIR code, phone number, and email address,

(b) Completed RFA forms,

(c) Meeting minutes,

(d) Recommendation to PMA as to the technical readiness of the program to enter the next phase of development.

(2) Updated Risk Assessment, including risks and mitigation options

6. SFR Completion/Exit Criteria

a. The SFR is considered complete when all draft RFAs are signed off, and an acceptable level of program risk is ascertained.

b. Typical Exit Criteria include:

(1) Can the system functional requirements, as disclosed, satisfy the CDD?

(2) Are the system functional requirements sufficiently detailed and understood to enable system design to proceed?

(3) Are adequate processes and metrics in place for the program to succeed?

(4) Are the risks known and manageable for design and development?

(5) Is the program schedule executable (technical/cost risks)?

(6) Is the program properly staffed?

(7) Is the program with the approved functional baseline executable within the existing budget?

(8) Is the updated CARD consistent with the approved functional baseline?

(9) Does the updated cost estimate fit within the existing budget?

(10) Has the system Functional Baseline been established to enable preliminary design to proceed with proper Configuration Management (CM)?

(11) Have all appropriate documents been updated and put under CM control?

(12) Is the software functionality in the approved functional baseline consistent with the updated software metrics and resource loaded schedule?

(13) Have all applicable, completed SFR Risk Assessment Checklists and any Lessons Learned been entered into AIR-4.1's Knowledge Management Exchange (KMX) system accessible at https://www.kmsonline.net/kms/ in accordance with the KMX/LL Process Document NASCO0672-KMX-PROC-001?

Preliminary Design Review (PDR)

1. **PDR Purpose** - The PDR is a multi-disciplined product and process assessment to ensure that the system under review can proceed into detailed design, and can meet the stated performance requirements within cost (program budget), schedule (program schedule), risk, and other system constraints. Generally this review assesses the system preliminary design as captured in performance specifications for each configuration item in the system (allocated baseline), and ensures that each function in the functional baseline has been allocated to one or more system configuration items, or System of Systems (SoS)/Family of Systems (FoS) items as appropriate. Configuration items may consist of hardware and software elements, and include items such as airframe, avionics, weapons, crew systems, engines, trainers/training, etc.

For complex systems, and SoS, a PDR may be conducted for each subsystem or configuration item. These incremental reviews would lead up to an overall system PDR. When incremental reviews have been conducted, the emphasis of the overall system PDR should be on configuration item functional and physical interface design, as well as overall system design requirements. PDR determines whether the hardware, human and software preliminary designs are complete, and the IPT is prepared to start detailed design and test procedure development.

The subsystem requirements are evaluated to determine whether they correctly and completely implement all system requirements allocated to the subsystem, and whether traceability of subsystem requirements to system design is maintained. At this review the IPT should also review the results of peer reviews on requirements and preliminary design documentation. A successful review is predicated on the IPT's determination that the subsystem requirements, subsystem preliminary design, results of peer reviews, and plans for development and testing form a satisfactory basis for proceeding into detailed design and test procedure development.

The review may be tailored in accordance with the technical scope and risk of the system. Under no circumstances should the review be tailored completely out of the development plan. Details of any tailoring should be described in the SEP, or

should occur as part of the APMSE or systems engineer coordination of the review elements with the AIR-4.1 cognizant authority (APEO(RDT&E)). Notwithstanding successful completion of the PDR, the contractor remains responsible for the system design/performance requirements within the terms of the contract.

Completion of this review should provide:

a. An established system allocated baseline,

b. An updated risk assessment for SDD,

c. An updated CARD based on the system allocated baseline,

d. Confidence that the preliminary design has been reflected in the software estimated cost to complete,

e. An updated program schedule including system and software critical path drivers, and

f. An approved ALSP with updates applicable to this phase.

2. **PDR Timing** - The PDR is typically conducted during the System Integration work effort of the System Development and Demonstration phase, following preliminary design, completion of preliminary allocated baseline documentation, and prior to detailed design activity. The PDR should not be scheduled at a particular number of months after contract award; rather, PDR should occur relative to the maturity of the system technical baseline as described above.

3. **PDR Entry Criteria**

a. A SFR has been successfully completed, and all SFR RFAs have been responded to.

b. A preliminary agenda has been coordinated (nominally) 30 days prior to the PDR.

c. PDR technical products for each system hardware (H/W) and software (S/W) configuration item have been made available to the cognizant PDR participants prior to the review:

(1) updated system specification, to include a description of interoperability and/or distributed services requirements

(2) preliminary subsystem design specifications for each configuration item (H/W and S/W), with supporting tradeoff analyses and data, as required. The preliminary software design specification must include a completed definition of the software architecture, and a preliminary database design description is applicable

(3) Confidence that the preliminary design has been reflected in the software estimated cost to complete,

(4) updated risk assessment

(5) SEP changes, if any

(6) CARD changes, if any

(7) updated logistics documentation (ALSP, LRFS, Preliminary Maintenance Plan, etc.)

(8) updated HSI related documentation

(9) Updated integrated system architecture and supporting views

(10) Is the ISP in the J-6 Joint C4I Program Assessment Tool - Empowered (JCPAT-E)?

4. PDR Planning

a. TRB Chairperson - Planning for a technical review should start with a request for a TRB Chairperson, nominally 45 days prior to conduct of the review. Typically the PMA, assigned IPT leader, or assigned APMSE requests a TRB chairperson be appointed by AIR-4.1. Prior to this request, the assigned APMSE should have coordinated chairperson requirements with the cognizant APEO(RDT&E). Chairperson assignments should be reflective of program scope and risk. The role of the chairperson includes:

(1) Determination of TRB membership,

(2) Development of the final review elements,

(3) Oversight of the technical review and RFA process, and

(4) Issuance of the Technical Review Summary Report

b. Technical Review Elements - The APMSE and the assigned Chairperson shall coordinate with the cognizant APEO(RDT&E) in the development of a preliminary agenda for the planned review. A sample review agenda is shown below in paragraph **5.a.** This should be made available to the IPT 30 days prior to conduct of the review.

c. Technical Review Participants

(1) TRB (typical composition):

(a) TRB Chairperson;

(b) PM representatives (industry and Government);

(c) APMSE should:

1. Ensure the performing activity provides the supporting data and participation in the required review,

2. Develop, coordinate, and execute, in cooperation with the performing activity, individual review arrangements,

3. Ensure the preparation of PDR material is coordinated across IPTs, and

4. Organize and supervise the documentation of RFAs in support of the TRB Chairperson.

(d) APML should ensure all relevant supportability requirements are addressed;

(e) APMT&E should ensure that all T&E requirements are addressed;

(f) If a flight clearance will be required, notify AIR-4.0P of the review;

(g) A Battlespace Systems Engineer, for those systems that have an interoperability requirement;

(h) Cost Team (AIR-4.2) representative;

(i) Counsel, if required;

(j) Contracting Officer;

(k) Recorder is responsible for collating RFAs for submission to the TRB and recording the minutes of the PDR. The recorder should have the Technical Review Summary Report prepared for distribution by the Chairperson;

(l) Resource Sponsor (Requirements Officer);

(m) Joint Interoperability Test Command (JITC) representatives;

(n) User representatives; and

(o) Lead for the Software Support Activity.

(2) SMEs as required to address system concepts and enabling technologies. These SMEs represent their NAVAIR competencies in the adjudication of RFAs, to include cost and schedule impacts. SMEs should be notified at least 30 days prior to the scheduled review date. Software metrics to date in accordance with NAVAIRINST 5234.5A and those provided to the Program Office to manage the software program are provided to the software SME at least 10 working days prior to the review. These need to include Empowered Performance Monitors for any planned Flight Clearance actions, if applicable. These assignments should be coordinated with AIR-4.0P and with the individual engineers Level 4 Competency Manager.

(3) Developmental and Operational testers, and

(4) IPT briefers in accordance with the PDR agenda

d. PDR Location - The facility chosen should be adequate to ensure complete participation by all cognizant competencies and organizations. The PDR is typically conducted at a contractor or government provided facility, as mutually agreed upon, or specified in the contract. The facility must be able to support a meeting at the appropriate classification level to ensure effective information exchange and to address maturity of the system to enter critical design development. Selection of the location should consider minimizing participant travel and associated costs.

5. **Conduct of PDR Review** - All TRB participants are to assess the materials at the review, document concerns by means of RFAs, and submit RFAs to the TRB Recorder.

a. PDR Review Elements

(1) Introduction/agenda/administrative

(a) Purpose of review

(b) RFA procedures overview

(c) Risk Assessment procedures overview

(d) Program overview

(e) System of Systems/Family of Systems overview

(2) Review of SFR RFAs

(3) Status on the risks

(4) Updates to the program schedule

(5) Metrics

(6) Summary of preliminary design

(a) Traceability of requirements to preliminary design

(b) Tools used to develop and maintain the preliminary design

(c) Design management/change process

(7) Follow PDR Program Risk Assessment Checklist structure

(8) Recommendation to proceed into critical design

(9) Review of RFAs

b. PDR Products

(1) Technical Review Summary Report, with the following attachments:

(a) List of attendees, to include: name, functional area represented, NAVAIR code, phone number, and email address,

(b) Completed RFA forms

(c) Meeting minutes

(d) Recommendation to PMA as to the technical readiness of the program to enter critical design development.

(2) Updated Risk Assessment, including risks and mitigation options

6. PDR Completion/Exit Criteria

a. The PDR is considered complete when all draft RFAs are signed off, and an acceptable level of program risk is ascertained.

b. Typical Exit Criteria include:

(1) Were the proper NAVAIR competencies represented at the review?

(2) Does the status of the technical effort and design indicate OPEVAL success (operationally suitable and effective)?

(3)Can the preliminary design, as disclosed, satisfy the CDD?

(4) Has the system allocated baseline been established and documented to enable detailed design to proceed with proper configuration management?

(5) Are adequate processes and metrics in place for the program to succeed?

(6) Have Human Integration design factors been reviewed and included, where needed, in the overall system design?

(7) Are the risks known and manageable for developmental test/operational test (DT/OT)?

(8) Is the program schedule executable (technical/cost risks)?

(9) Is the program properly staffed?

(10) Is the program executable with the existing budget and with the approved system allocated baseline?

(11) Is the software estimated cost to complete consistent with the preliminary design approved at the PDR?

(12) Does the updated cost estimate fit within the existing budget?

(13) Is the preliminary design producible within the production budget?

(14) Is the updated CARD consistent with the approved allocated baseline?

(15) Is the software functionality in the approved allocated baseline consistent with the updated software metrics and resource-loaded schedule?

(16) Verification that the integrated architecture System and Technical Views support, and are consistent with, the appropriate Operational architecture, the CPD, the Information Support Plan (ISP) and Net-Ready Key Performance Parameter (NR-KPP).

(17) Verification that system data has been entered/updated in the FORCEnet Implementation Baseline (FIBL).

(18) Have all applicable, completed PDR Risk Assessment Checklists and any Lessons Learned been entered into AIR-4.1's Knowledge Management Exchange (KMX) system accessible at https://www.kmsonline.net/kms/ in accordance with the KMX/LL Process Document NASCO0672-KMX-PROC-001?

Critical Design Review (CDR)

1. **CDR Purpose** - The CDR is a multi-disciplined product and process assessment to ensure that the system under review can proceed into system fabrication, demonstration, and test, and can meet the stated performance requirements within cost (program budget), schedule (program schedule), risk, and other system constraints. Generally this review assesses the system final design as captured in product specifications for each configuration item in the system (product baseline), and ensures that each product in the product baseline has been captured in the detailed design documentation. Product specifications for hardware enable the fabrication of configuration items, and may include production drawings. Product specifications for software (e.g., Software Design Documents) enable coding of a Computer Software Configuration Item (CSCI). Configuration items may consist of hardware and software elements, and include items such as airframe, avionics, weapons, crew systems, engines, trainers/training, etc.

For complex systems, a CDR may be conducted for each subsystem or configuration item. These incremental reviews would lead up to an overall system CDR. When incremental reviews have been conducted, the emphasis of the overall system CDR should be on configuration item functional and physical interface detail design, as well as overall system detail design requirements. CDR determines whether the hardware, human and software final detail designs are complete, and the IPT is prepared to start system fabrication, demonstration and test.

The subsystem detailed designs are evaluated to determine whether they correctly and completely implement all system requirements allocated to the subsystem, and whether the traceability of final subsystem requirements to final system detail design is maintained. At this review the IPT shall also review the results of peer reviews on requirements and final detail design documentation, and ensure that latest estimates of cost (development, production, and support) are consistent with the detail design. A successful review is predicated on the IPT's determination that the subsystem requirements, subsystem detail design, results of peer reviews, and plans for testing form a satisfactory basis for proceeding into system fabrication, demonstration and test. The CDR should occur at the point in the design where the "build-to" baseline has been

achieved, allowing production, and coding of software deliverables to proceed.

The review may be tailored in accordance with the technical scope and risk of the system. Under no circumstances should the review be tailored completely out of the development plan. Details of any tailoring should be described in the SEP, or should occur as part of the APMSE or systems engineer coordination of the review elements with the AIR-4.1 cognizant authority (APEO(RDT&E)).

Completion of this review should provide:

a. An established system product baseline,

b. Confidence that the critical design has been reflected in the software estimated cost to complete,

c. An updated risk assessment for SDD,

d. An updated CARD (or CARD-like document) based on the system product baseline,

e. An updated program development schedule including fabrication, test, and software coding critical path drivers, and

f. An approved ALSP with updates applicable to this phase.

Notwithstanding successful completion of the CDR, the contractor remains responsible for the system design/performance requirements within the terms of the contract.

2. **CDR Timing** - The CDR is typically conducted during the SDD phase, at the transition point from System Integration to System Demonstration. CDR generally occurs after completion of final design efforts and product baseline documentation, and prior to system fabrication and testing. The CDR should not be scheduled at a particular number of months after contract award; rather, CDR should occur relative to the maturity of the system technical baseline as described above. A benchmark for requisite system maturity for CDR would be when nominally 80% of the design drawings have been released from engineering to manufacturing.

3. CDR Entry Criteria

a. A PDR has been successfully completed, and all PDR RFAs have been responded to.

b. All PDR exit criteria key issues have been satisfied, if applicable.

c. TRA, as applicable

d. A preliminary agenda has been coordinated (nominally) 30 days prior to the CDR.

e. CDR technical products (hardware and software elements of the product baseline to be reviewed and approved at the CDR) have been made available to the cognizant CDR participants prior to the review:

(1) Updates to the systems specification and functional specification,

(2) Product specifications for each hardware and software configuration item, along with supporting trade-off analyses and data,

(3) Current risk assessment

(4) SEP changes (if any)

(5) CARD changes (if any)

(6) Updated HSI document

(7) Updated logistics documentation (ALSP, LRFS, Preliminary Maintenance Plan, etc.)

(8) Updated HSI related documentation

(9) Is the Software Design Document complete and ready to be placed under configuration management?

(10) Is the Software Interface Design Document complete and ready to be placed under CM?

(11) Are the preliminary Test Procedures for Software Integration and Systems testing available for review?

(12) Are the integrated architecture System and Technical Views supporting and consistent with the Operational architecture and the CPD and NR-KPP?

(13) Has the data in the FIBL been updated?

4. CDR Planning

a. TRB Chairperson - Planning for a technical review should start with a request for a TRB Chairperson, nominally 45 days prior to conduct of the review. Typically the PMA, assigned IPT leader, or assigned APMSE requests a TRB chairperson be appointed by AIR-4.1. Prior to this request, the assigned APMSE should have coordinated chairperson requirements with the cognizant APEO(RDT&E). Chairperson assignments should be reflective of program scope and risk. The role of the chairperson includes:

(1) Determination of TRB membership,

(2) Development of the final review elements,

(3) Oversight of the technical review and RFA process, and

(4) Issuance of the Technical Review Summary Report

b. Technical Review Elements - The APMSE and the assigned Chairperson shall coordinate with the cognizant APEO(RDT&E) in the development of a preliminary agenda for the planned review. A sample review agenda is shown below in **paragraph 5.a.** This agenda should be made available to the IPT 30 days prior to conduct of the review.

c. Technical Review Participants

(1) TRB (typical composition):

(a) TRB Chairperson;

(b) PM representatives (industry and Government);

(c) APMSE should:

1. Ensure the performing activity provides the supporting data and participation in the required review,

2. Develop, coordinate, and execute, in cooperation with the performing activity, individual review arrangements,

3. Ensure the preparation of CDR material is coordinated across IPTs, and

4. Organize and supervise the documentation of RFAs in support of the TRB Chairperson.

(d) APML should ensure all relevant supportability requirements are addressed;

(e) APMT&E should ensure all T&E requirements are addressed;

(f) If a flight clearance will be required, notify AIR-4.0P of the review;

(g) Battlespace Systems Engineer should ensure all interoperability requirements are addressed;

(h) Cost Team (AIR-4.2) representative;

(i) Counsel, if required;

(j) Contracting Officer;

(k) Recorder is responsible for collating RFAs for submission to the TRB and recording the minutes of the CDR. The recorder should have the Technical Review Summary Report prepared for distribution by the Chairperson;

(l) Resource Sponsor (Requirements Officer);

(m) User representatives;

(n) Lead for the Software Support Activity; and

(o) JITC representatives.

(2) SMEs as required to address system concepts and enabling technologies. These SMEs represent their NAVAIR competencies in the adjudication of RFAs, to include cost and schedule impacts. These need to include Empowered Performance Monitors for any planned Flight Clearance actions, if applicable. These assignments should be coordinated with AIR-4.0P and with the individual engineers Level 4 Competency Manager. SMEs should be notified at least 30 days prior to the scheduled review date. Software metrics to date in accordance with NAVAIRINST 5234.5A and those provided to the Program Office to manage the software program are provided to the software SME at least 10 working days prior to the review.

(3) Developmental and Operational testers.

(4) IPT briefers in accordance with the CDR agenda.

d. CDR Location - The facility chosen should be adequate to ensure complete participation by all cognizant competencies and organizations. The CDR is typically conducted at a contractor or government provided facility, as mutually agreed upon, or specified in the contract. The facility must be able to support a meeting at the appropriate classification level to ensure effective information exchange and to address maturity of the system to enter system test. Selection of the location should consider minimizing participant travel and associated costs.

5. Conduct of CDR Review - All TRB participants are to assess the materials at the review, document concerns by means of RFAs, and submit RFAs to the TRB Recorder.

a. CDR Review Elements

(1) Introduction/agenda/administrative

(a) Purpose of review

(b) RFA procedures overview

(c) Risk Assessment procedures overview

(d) Program overview

(e) FOS/SOS overview

(2) Review of PDR RFAs

(3) Status on the risks

(4) Updates to the program schedule

(5) Metrics

(6) Summary of critical design

(a) Traceability of requirements to critical design

(b) Tools used to develop and maintain the critical design

(c) Design management/change process

(7) Follow CDR Program Risk Assessment Checklist structure

(8) Recommendation to proceed into system test

(9) Review of RFAs

b. CDR Products

(1) Technical Review Summary Report, with the following attachments:

(a) List of attendees, to include: name, functional area represented, NAVAIR code, phone number, and email address,

(b) Completed RFA forms

(c) Meeting minutes

(d) Recommendation to PMA as to the technical readiness of the program to enter the next phase of development.

(2) Updated Risk Assessment, including risks and mitigation options. It should specifically address OPEVAL and transition to production risks.

6. CDR Completion/Exit Criteria

a. The CDR is considered complete when all draft RFAs are signed off, and an acceptable level of program risk is ascertained.

b. Typical Exit Criteria include:

(1) Were the proper NAVAIR competencies represented at the review?

(2) Does the status of the technical effort and design indicate OPEVAL success (operationally suitable and effective)?

(3) Does the detailed design, as disclosed, satisfy the CDD, and CPD, if available?

(4) Has the system product baseline been established and documented to enable hardware fabrication and software coding to proceed with proper configuration management?

(5) Has the detailed design satisfied Human Systems Engineering requirements?

(6) Are adequate processes and metrics in place for the program to succeed?

(7) Are the risks known and manageable?

(8) Is the program schedule executable (technical/cost risks)?

(9) Is the program properly staffed?

(10) Is the program executable with the existing budget and the approved product baseline?

(11) Is the software estimated cost to complete consistent with the critical design approved at the CDR?

(12) Is the detailed design producible within the production budget?

(13) Is the updated CARD consistent with the approved product baseline?

(14) Are Critical Safety Items and Critical Application Items identified?

(15) Does the updated cost estimate fit within the existing budget?

(16) Is the software functionality in the approved product baseline consistent with the updated software metrics and resource-loaded schedule?

(17) Are you compliant with your program's approved FORCEnet category FIBL?

(18) Have all applicable, completed CDR Risk Assessment Checklists and any Lessons Learned been entered into AIR-4.1's Knowledge Management Exchange (KMX) system accessible at https://www.kmsonline.net/kms/ in accordance with the KMX/LL Process Document NASCO0672-KMX-PROC-001?

Test Readiness Review (TRR)

1. **TRR Purpose** - The TRR is a multi-disciplined product and process assessment to ensure that the subsystem, system, or systems of systems under review is ready to proceed into formal test. The TRR assesses prior unit level and system integration testing adequacy, test planning, test objectives, test methods and procedures, scope of tests, and determines if required test resources have been properly identified and coordinated to support planned tests. The TRR verifies the traceability of planned tests to program requirements. The TRR determines the completeness of test procedures and their compliance with test plans and descriptions. The TRR assesses the system under review for development maturity, cost/schedule effectiveness, and risk to determine readiness to proceed to formal testing. The TRR assesses the impact of known anomalies to ascertain if there is a high degree of confidence that the system will pass the tests. The TRR must be planned, managed, and followed up to be an effective system analysis and control tool.

T&E is an integral part of the systems engineering process (critical element of system analysis and control; part of the verification loop). As such, just as the Systems Engineering process permeates the entire life cycle of an acquisition program so too does T&E. T&E is an important tool to identify and control risk. Although this template principally addresses the TRR specified in the DoD 5000 series instructions to support a readiness for a system to proceed into system level DT, the TRR process is equally applicable to all tests in all phases of an acquisition program. A TRR can be used to determine if maturity of a software product or integrated set of software products is of a sufficient level to proceed into any type of testing. PM's and their respective T&E IPT's should tailor the requirements specified herein to the specific acquisition phase, the specific planned tests, and the identified risk level of their respective programs. The level of specific risk and risk level will vary as a system proceeds from component level, to system level, to systems of systems level testing. A robust test program will greatly enhance the PM's ability to identify and manage risk, and catch problems earlier in the development cycle. The degree of review a given set of tests should receive is directly related to the risk level associated with performing the planned tests and the importance of the test results to

overall program success. Early component level test may not require the same level of review as the final system or system of system level tests. However, any test plans and products need to undergo a Peer Review to determine the applicability, effectiveness, and completeness of any testing. Sound judgement based on an appreciation of the risk level and the potential impact of the tests to program success should be important factors in deciding at what level and how formal a TRR should be for a specific test or series of tests.

Readiness to convene a TRR is predicated on the Program/ IPT's determination that preliminary testing, functional testing, and pre-qualification testing results form a satisfactory basis for proceeding with a TRR and initiation of formal system level DT. Additionally, readiness relies on the knowledge of the vulnerabilities and limitations through detection and reporting of anomalies in order to assess the level of risk to enter a test phase.

The TRR may be tailored in accordance with the technical scope and risk of the system under test. Under no circumstances should the review be tailored completely out of the development plan. As a minimum, the testers must understand capabilities added to, or corrected in the software, testing to date, vulnerabilities and limitations of the system under test, and ability of the system under test to successfully pass the proposed testing. Details of any tailoring should be described in the SEP, or should occur as part of the Program/IPT's APMSE or systems engineer coordination of the review elements with the AIR-4.1 cognizant authority (APEO(RDT&E)).

In general terms the template provides guidance to ensure that test events are carefully planned and properly resourced. No matter what stage of the acquisition or whether you are planning a component test, a system test, or a system of systems test, the basic tenets of this guidance should apply. The TRR should provide answers to the following:

a. Why are we testing? What is the purpose of the planned test? Does the planned test verify a requirement that is directly traceable back to a system specification or other program requirement?

b. What are we testing (subsystem, system, system of systems, other)? Is the configuration of the system under test sufficiently mature, defined, and representative to accomplish planned test objectives and or support defined program objectives? What vulnerabilities and limitations does it have?

c. Do the software metrics reflect a maturity level consistent with entering system level testing?

d. Are we ready to begin testing? Have all planned preliminary, informal, functional, unit level, subsystem, system, and qualification tests been conducted, and are the results satisfactory? What anomalies exist against the system under test and is the level of risk of testing with known anomalies acceptable?

e. Do the testers know what functional capability is provided in order to design their tests? Are the developers aware of what will be tested and what the pass/fail criteria will be used? Are the developers confident the system will pass the testing? Are the testers confident the system will pass testing?

f. What are the expected results and how will deviations from those test results affect the program?

g. Is the planned test properly resourced (people, test article or articles, facilities, data systems, support equipment, logistics, etc.)? Will the facilities and test assets be available to support the test period? Have test certification/approvals been obtained?

h. What are the risks associated with the tests and how are they being mitigated?

i. What is the fall back plan should a technical issue/potential showstopper arise during testing?

2. **TRR Timing** - The TRR is typically conducted during the System Demonstration work effort of the System Development and Demonstration phase. Like other technical reviews, the TRR should be event driven and should not be scheduled at a particular number of months after contract award; but rather, should occur relative to the readiness/maturity of the system

under test to begin the subsystem, system, or systems of systems level DT required to support the overall program T&E and Risk management plans. The TRR may be used for earlier testing to ensure readiness/maturity to enter any test phase.

3. TRR Entry Criteria

a. Configuration of system under test has been defined and agreed to. All software in the system under test have been placed under configuration management or have been defined in accordance with an agreed to plan and a Version Description Document has been made available to TRR participants (minimum of 7 working days prior to the review). All software in the system under test is frozen.

b. All applicable functional, unit level, subsystem, system integration, and qualification testing has been conducted successfully.

c. Test Requirements have been documented and are fully traceable to system, engineering, operational or program requirements. The APMSE, APMT&E and appropriate engineering competencies certify this test requirements definition.

d. All TRR specific materials such as test plans, test cases, and procedures have been available to all participants prior to conducting the review (minimum of 7 working days).

e. All test certifications or flight approvals, if required, have been obtained or will be completed prior to the beginning of the testing.

f. All known system discrepancies have been identified and dispositioned in accordance with an agreed to plan.

g. All previous design review exit criteria and key issues have been satisfied in accordance with an agreed to plan.

h. All required test resources (people, facilities, test articles, test instrumentation) have been identified and are available to support required tests.

i. Roles and responsibilities of all test participants are defined and agreed to.

j. An agenda has been developed and sent to all participants (minimum of 10 working days prior to the review).

4. TRR Planning

a. TRB Chairperson - Planning for a TRR should start with a request for a TRB Chairperson, nominally 45 days prior to conduct of the review. Typically the PMA, assigned IPT leader, or assigned APMSE requests a TRB chairperson be appointed by AIR-4.1. For a TRR it is appropriate to include a senior T&E competency representative (AIR-5.1) to serve as a co-chairperson of a TRR. Prior to this request, the assigned APMSE should have coordinated chairperson requirements with the cognizant APEO(RDT&E). Chairperson assignments should be reflective of program scope and risk. The role of the chairperson includes:

(1) Determination of TRB membership,

(2) Development of the final review elements,

(3) Oversight of the technical review and RFA process, and

(4) Issuance of the Technical Review Summary Report.

b. Technical Review Elements - The APMSE and the assigned Chairperson shall coordinate with the cognizant APEO(RDT&E) in the development of a preliminary agenda for the planned review. A sample review agenda is shown below in **paragraph 5.a.** This agenda should be made available to the IPT 30 days prior to conduct of the review. It is also advisable to provide a read ahead brief (no more than 10 slides) to the IPT and chairperson(s) 10 days prior to the conduct of the review. This action also serves as a good reminder as to date/time of the event.

c. Technical Review Participants

(1) TRB (typical composition):

(a) TRB Chairperson/Co-chairperson;

(b) PM representatives (industry and Government);

(c) APMSE should:

1. Ensure the performing activity provides the supporting data and participation in the required review,

2. Develop, coordinate, and execute, in cooperation with the performing activity, individual review arrangements,

3. Ensure the preparation of TRR material is coordinated across IPTs, and

4. Organize and supervise the documentation of RFAs in support of the TRB Chairperson.

(d) APML should ensure all relevant supportability requirements are addressed;

(e) APMT&E should ensure T&E requirements are addressed;

(f) Counsel, if required;

(g) Contracting Officer;

(h) Recorder is responsible for collating RFAs for submission to the TRB, and recording the minutes of the TRR. The recorder should have the Technical Review Summary Report prepared for distribution by the Chairperson;

(i) Resource Sponsor (Requirements Officer);

(j) User representatives, if appropriate; and

(k) Lead for the software support agency.

(2) SMEs as required to address system concepts and enabling technologies. These SMEs represent their NAVAIR competencies in the adjudication of RFAs. (A TRR must have an appropriate AIR-5.1 representative for the system under test). SMEs should be notified at least 30 days prior to the scheduled review date.

(3) IPT briefers in accordance with the TRR Agenda.

d. TRR Location - The facility chosen should be adequate to ensure complete participation by all cognizant competencies and organizations. The TRR is typically conducted at a contractor or government provided facility, as mutually agreed upon, or specified in the contract. The facility must be able to support a meeting at the appropriate classification level to ensure effective information exchange and to address maturity of the system under test through discussions on anomalies, limitations, and vulnerabilities. Selection of the location should consider minimizing participant travel and associated costs.

5. **Conduct of TRR Review** - All TRB participants are to assess the materials at the review, document concerns by means of RFAs, and submit RFAs to the TRB Recorder.

a. TRR Review Elements

(1) Introduction/agenda/administrative

(a) Purpose of review

(b) RFA procedures overview

(c) Risk Assessment procedures overview

(d) Program overview, and how planned tests support the overall program

(2) Status on the risks

(3) Updates to the program schedule

(4) Metrics

(5) Test Program Overview, including the test schedule

(6) Test Program Staffing

(a) Organization structure/chart

(b) Key Government/contractor interfaces

(7) Preliminary/Informal test results

(a) Identify any preliminary testing that has already been conducted,

(b) Identify any outstanding discrepancies as a result of any preliminary/informal testing previously conducted

(8) Test Requirements

(a) Required test resources (personnel, facilities, test environment, and test assets)

(b) Final reporting process/format defined

(c) Fall back plan for technical issues and showstoppers

(9) Follow TRR Program Risk Assessment Checklist structure

(10) Recommendation on Readiness to Commence Testing

(11) Review of RFAs

b. TRR Products

(1) Technical Review Summary Report, with the following attachments:

(a) List of attendees, to include: name, functional area represented, NAVAIR code, phone number, and email address,

(b) Completed RFA forms

(c) Meeting minutes

(d) Recommendation to PMA as to the technical readiness of the program to enter into the planned tests.

(2) Updated Risk Assessment, including identification of risks, recommended mitigation strategy, and assessment of residual risk.

(3) Lists of anomalies, limitations, and vulnerabilities.

6. TRR Completion/Exit Criteria

a. The TRR is considered complete when TRB members agree that:

(1) All draft RFA forms have been addressed, assessed, and agreed upon, and

(2) An acceptable level of program risk is ascertained.

b. Were the proper NAVAIR competencies represented at the review? If applicable, were all of the required flight clearance performance monitors involved, and do they concur with the planned tests, expected results?

c. Typical Exit Criteria include:

(1) Test requirements are traceable, documented and approved. Adequate test plans based on these traceable requirements are completed and approved for the system under test.

(2) Adequate identification and coordination of required test resources is completed

(3) Previous component, subsystem, system test results form a satisfactory basis for proceeding into planned tests.

(4) Risk level identified and accepted by Program/ Competency leadership as required.

(5) Testers have a high degree of confidence that the system under test will pass the testing successfully and agree that the anomalies, limitations, and vulnerabilities will not impact this.

(6) The developers are aware of the testers' plans and have a high degree of confidence that the system under test will pass the testing successfully.

(7) Have all applicable, completed TRR Risk Assessment Checklists and any Lessons Learned been entered into AIR-4.1's Knowledge Management Exchange (KMX) system accessible at

https://www.kmsonline.net/kms/ in accordance with the KMX/LL Process Document NASCO0672-KMX-PROC-001?

7. **TRR Customers** - The primary customers of the TRR decision are the applicable Program Manager/IPT, the Integrated Systems Evaluation, Experimentation & Test Department (AIR-5.1), and the affected Research and Engineering Department.

Flight Readiness Review (FRR)

1. **FRR Purpose** - The FRR is a multi-disciplined product and process assessment to ensure that the system under review can proceed into flight test with NAVAIR airworthiness standards met, objectives clearly stated, flight test data requirements clearly identified and an acceptable risk management plan defined and approved. Generally, this review ensures that proper coordination has occurred between engineering and flight test and that all applicable disciplines understand and concur with the scope of effort that has been identified and how this effort will be executed to derive the data necessary (to satisfy airworthiness and test and evaluation requirements) to ensure the weapon system evaluated is ready to proceed to flight test. As such, this review shall include appropriate level of detail for each configuration expected to be evaluated within the flight test effort, and specified in both the flight test plan and the flight clearance. The configuration may consist of hardware and software elements and include items such as airframe, avionics, weapons, crew systems, engines, trainers/training (supporting flight test), etc. It is important that software be evaluated in the laboratory to ensure that software is safe to fly and test objectives can be met. The CDR should have established the system product baseline. The FRR shall include detailed entry and exit criteria.

A FRR shall be conducted prior to the first flight of any new air vehicle. For complex systems/configurations, a FRR shall be conducted with an assessment of each subsystem or configuration item prior to flight. A FRR may also be required prior to the first flight of any major modification/upgrade to an existing air vehicle to include:

a. Any major change to configuration (such as new engine(s))

b. Significant changes to hydraulic/electrical systems

c. New wing

d. Major flight control and/or flight control computer/software upgrade

e. Change to number of propellers/rotors

f. Change in material selection for rotors or other flight critical components

g. Change in utilization and/or mission (such as strike-fighter to electronic warfare; ASW to tanker; conventional landing to short take off and landing; etc.)

h. Changes in system limitations to existing air vehicles (such as significant expansion of flight envelope in terms of altitude, airspeed, load factor, etc.)

i. Software changes that affect safety of flight, weapons release or delivery, self-protection, and situational awareness. Excluded are library changes only.

j. Changes in architectural partitions (system or software) which affect safety, security or other flight worthiness-related attributes.

The recommendation of whether or not to convene a FRR for a given major modification/upgrade to an existing air vehicle shall be determined by the APMSE in conjunction with the Chief Flight Test Engineer/Squadron Chief Engineer (or AIR-5.1G/senior individual in the T&E Chain of Command). The recommendation will then be presented to AIR-4.0/5.1 Competency leadership (minimum of AIR-4.0P/4.1/5.1) for their concurrence. A FRR is typically not required for on-going developmental testing changes/modification such as:

a. Minor software changes (software changes that can be fully tested in the laboratory and do not affect safety of flight)

b. Envelope expansions to an envelope previously reviewed in a flight clearance pre-planning meeting and Executive Review Board (ERB)

c. Minor changes to weapons/stores (does not affect release or delivery)

d. Minor changes to weight and balance

e. Wing dressings (such as vortex generators, fences, porous wing fold fairing covers, etc.).

During this review, the FRR Chairperson shall also review the results of peer reviews, laboratory testing, Independent Review Teams (IRTs), Grey Head inputs, etc., on requirements and final detail design documentation. A successful review is predicated on the Chairperson's determination that the subsystem requirements, subsystem detail design, results of peer/IRTs/Grey Head reviews, laboratory testing, and plans for risk mitigation form a satisfactory basis for proceeding into Flight Test.

Tailoring of the review is permissible in accordance with the technical scope and risk of the system under review. Only the APMSE, in conjunction with the APEO(RDT&E), can provide the approval for the review to be tailored completely out of the development plan. Details of any tailoring should be described in the SEP, or should occur through coordination by the APMSE with the AIR-4.1 leadership and FRR Chairperson.

Notwithstanding successful completion of the FRR, the contractor remains responsible for the system design/performance requirements within the terms of the contract.

2. **FRR Timing** - The FRR is typically conducted during the SDD phase, after completion of the CDR and TRR, and prior to convening an ERB. The ERB is a separate and distinct process (NAVAIRINST 3960.4B or subsequent) from the FRR, and is primarily focused on the test planning for the flight test program. A Pre-FRR should be held NLT 90 days prior to first flight of the aviation system and should follow the same format as the FRR, but without the Chairperson. The Pre-FRR should be convened by the APMSE with the purpose of identifying critical issues/risks that need resolution prior to the FRR. The Pre-FRR should be more detailed technically, with the FRR presenting only those technical details necessary to clarify/reinforce top issues/concerns for the FRR Chairperson. The exit criteria for the Pre-FRR are that the project is ready to conduct the FRR and seek approval from the FRR Chairperson to proceed to flight test. The FRR shall be held NLT 30 days prior to first flight. Scheduling of FRR should be contingent upon ensuring that entry criteria will be met by the beginning of the FRR, that a reasonable expectation of meeting the exit criteria exists, that the team believes they can receive go-ahead from the Chairperson

of the FRR, that the first flight event is coordinated closely with the applicable PMA(s) and that it is consistent with their milestone events. These expectations should be verified at the Pre-FRR.

3. **FRR Entry Criteria** - The following are the minimum entry criteria that should be addressed before each FRR. The APMSE may desire to tailor these, and may do so with the approval of the Chairperson.

a. The CDR has been successfully completed, if applicable.

b. All CDR action items have been responded to, if applicable.

c. All CDR exit criteria key issues have been satisfied, if applicable.

d. CDR technical products (all elements of the product baseline to be reviewed and approved at the FRR, including final specifications, analyses and data) have been made available to the cognizant FRR participants prior to the review. This shall include open and closed action items from the CRR and any subsequent technical review.

e. Final detail hardware and software designs have been implemented in all configuration items and have been placed under configuration management control. All integrated system testing will be completed by the FRR.

f. A flight clearance pre-planning meeting has been convened and an Engineering Data Requirements Agreement Plan (EDRAP) has been signed between the APMSE/IPT (or other applicable Senior Engineer) and AIR-4.x engineering.

g. Applicable PMs have been briefed to ensure FRR is consistent with program objectives (cost, schedule and performance) and priorities are understood.

h. A flight clearance has been issued (or a defined flight clearance process, with plans to get an initial flight clearance at FRR exists).

i. Critical flight test support efforts have been identified and are under review and/or completed. These items may include, but not limited to, the following:

(1) Instrumentation identified and installed on aircraft

(2) Critical ground tests (e.g., static tests, subsystems tests, EMI/EMC SOFT, etc.) completed or planned to be completed prior to flight

(3) Critical flight simulation is completed

(4) Training for aircrews and maintenance personnel (as required)

(5) Training for the flight test team (to include such items as: subsystems ground school; first flight mission profile training; telemetry room training; mission rehearsal, knock it off criteria review; in-flight emergency handling, etc.)

(6) Aircraft support is identified/accounted for (such as spares/repairs, etc.)

(7) Flight control system (and changes) are defined

(8) Ground maintenance procedures are defined

(9) Base operations and procedures have been reviewed and issues identified

(10) Risk assessment/mitigation plans has been provided (refer to NAVAIR Instruction 5000.21A)

(11) An envelope expansion plan is identified (if applicable)

(12) A flight manual, preliminary flight manual, or contractor support manual (as appropriate) is available to support flight test

(13) Mishap planning/reporting

(14) The aircraft configuration has been identified with appropriate definition in the form of an Aircraft Configuration Control Board or Modification package (as required)

(15) Platform diagnostics data recording and data reduction functions and programs are operational

(16) Software media and loading instructions (technical data package) are completed

j. A preliminary agenda has been coordinated (nominally) 30 days prior to the FRR.

4. FRR Planning - Planning for the FRR requires designation of the Chairperson by AIR-4.0 (Chair defaults to AIR-4.1 unless specifically directed otherwise by senior leadership), and completion of all meeting planning requirements as noted below. It is the responsibility of the APMSE to coordinate all actions except the designation of the Chairperson.

a. FRR Chairperson - The Chairmanship of the FRR normally rests with the Head, Systems Engineering Department (AIR-4.1), or their designated representative. The FRR may be chaired or co-chaired by AIR-5.1 (typically the Test Wing Commander). Chairperson assignments should be reflective of program scope and risk. The roles/responsibilities of the chairperson includes:

(1) Concurrence with proposed FRR participants

(2) Approval of the FRR agenda

(3) Maintaining focus/direction of the FRR

(4) Oversight/Approval of the technical review and RFA process

(5) Conduct the review for the FRR TRB

(6) Ensuring Competency Report Card issues are understood and briefed to appropriate levels

(7) Ensuring Risk Assessment is understood and briefed to appropriate levels

(8) Provides approval to proceed to flight test, unless otherwise directed by AIR-4.0 or senior leadership

b. FRR APMSE - The APMSE (or designated IPT Leader) is responsible for the conduct of the FRR. The roles/responsibilities of the APMSE are:

(1) Convene a Pre-FRR (as appropriate) to ensure path to a successful FRR is identified

(2) Develop a Draft FRR agenda for Chairperson approval

(3) Identify FRR participants and brief the Chairperson

(4) Ensure a Pre-Planning flight clearance meeting has been completed and critical data to support flight clearance has been identified

(5) Ensure flight clearance Performance Monitors have access to critical data, CDR results and risk assessments

(6) Ensure the performing activity provides the supporting data to FRR TRB members and has participated in the required design reviews

(7) Ensure the preparation of design and FRR material is coordinated across IPTs

(8) Organize and supervise the documentation of RFAs in support of the FRR Chairperson

(9) Coordinate RFA responses with action assignees

(10) Forward RFA actions with responses and recommended action (remain open/defer/closed) to the Chairperson for final resolution

(11) Ensure an independent technical risk assessment has been completed and integrated into the process

(12) Provide email notification to the Chairperson, AIR-4.1/4.1A, AIR-5.1/5.1A and AIR-4.0P that the FRR RFAs/actions have been closed in accordance with the Chairperson's guidance,

that the FRR is officially closed and that the air vehicle/system is sufficiently mature to proceed to flight test

c. FRR Participants - The FRR participants are responsible for ensuring critical technical information and risks are conveyed in a clear and concise manner to the FRR Chairperson. In addition to the Chairperson and the APMSE, the composition of a typical FRR should include:

(1) NAVAIR Airworthiness Officer (AIR-4.0P)- acts as an advisor to the Chairperson and provides a recommendation to the Chairperson on the readiness of the air vehicle to proceed with the airworthiness/flight clearance review/approval process,

(2) PM/technical representatives (industry and Government),

(3) Chief Test Engineer/Chief Test Pilot/appropriate members of the flight test engineering team,

(4) Lead instrumentation engineer/technician,

(5) APML should ensure all relevant supportability issues are addressed,

(6) APMT&E should ensure all T&E requirements are addressed,

(7) Recorder is responsible for collating RFAs originated at the FRR. The recorder should have the FRR Report prepared for distribution by the APMSE after approval by the Chairperson,

(8) System Safety (AIR-4.1.6) provides a detailed Risk Assessment,

(9) System and/or Program Security provides readiness risk for security procedures,

(10) SMEs from appropriate competencies/disciplines may provide briefings or other inputs to support the FRR review process. SMEs as required to address salient review items, and medium/high risk areas. These SMEs represent their NAVAIR competencies in the adjudication of RFAs. SMEs should be notified at least 30 days prior to the scheduled review date.

(11) Performance Monitors (to include Empowered Performance Monitors for any planned Flight Clearance actions, if applicable, who will be used as part of the airworthiness review process. These Performance Monitors should be coordinated with AIR-4.0P (and with the individual engineers Level 4 Competency Manager) by the APMSE to ensure they are on the AIR-4.0P approved Performance Monitor list for the subject air vehicle.

(12) Operational Testers (as appropriate), and

(13) IPT briefers in accordance with the FRR agenda.

d. FRR Location - The facility chosen should be adequate to ensure complete participation by all cognizant competencies and organizations. The FRR is typically conducted at a contractor or Government provided facility, as mutually agreed upon, or specified in the contract. Selection of the location should consider minimizing participant travel and associated costs.

e. Competency Report Card - Each relevant competency must complete preparation of a "Report Card" for the subcategory tasks within their engineering disciplines prior to first flight. The respective competency managers shall agree with the contents of these Report Cards prior to presentation. Each task will be assigned a color code of "red", "yellow", or "green". A summary briefing slide for each individual competency will be prepared that includes the overall Report Card grade for that engineering discipline, also as a "red", "yellow" or "green". The APMSE shall use these summary slides to determine the IPT briefers during the FRR. All competencies with a Report Card summary grade of "red" shall provide a brief at the FRR. Summary grades of "yellow" or "green" are required to present at the FRR only at the discretion of the APMSE (or their senior). The criteria definitions are as follows:

(1) **Green** - Tasks complete, ready to proceed

(2) **Yellow -** Some/all tasks incomplete but scheduled to be completed prior to first flight

(3) **Red** - Tasks not scheduled to be completed in time to support first flight. This could result in either postponement

of first flight and/or reduction in scope of effort until satisfactory completion

5. **Conduct of FRR Review** - All FRR participants are to assess the materials at the review, document concerns by means of RFAs (and/or verbally), and submit RFAs to the FRR Recorder, as appropriate. All risks must be understood and documented. All IPT briefers shall present a Report Card, and all "Red" and "Yellow" grades must be understood with mitigation plans briefed.

a. **FRR Presentations** - All presenters shall present pertinent data to support a summary slide. All presenters shall use the same format for their summary slides. Where possible, presentations should reflect the joint position of the IPT and Industry counterpart. These summary slides shall contain the following information:

(1) Competency/Engineering Discipline

(2) Issues(s)

(3) Impact(s)/Risk(s)

(4) Mitigation Plan(s)

(5) Report Card Grade

b. **FRR Review Elements** - The following are recommended review elements. The APMSE shall develop an agenda and seek approval from the Chairperson prior to releasing the meeting invitations.

(1) Introduction/agenda/administrative/purpose of review

(a) RFA procedures overview

(b) Program, schedule and technical overview

(c) System Safety/Risk Assessment review

(d) System and/or Program Security Risk assessment review

(2) New systems and modifications since CDR (if applicable)

(3) Review of the RFAs from the CDR

(4) Status on the risks

(5) Updates to the program schedule

(6) Metrics

(7) Airworthiness - Plan for flight clearance

(8) Recommendation on readiness to conduct flight test

(9) Review of the RFAs from the FRR

c. FRR Products

(1) FRR Summary Report, with the following attachments:

(a) List of attendees, to include; name, functional area represented, organizational code, phone number, and email address

(b) Completed RFA forms

(c) Meeting minutes

(d) Competency Report Cards

(e) Updated Technical Risk Assessment, including risks and recommended mitigations

(f) Recommendation to AIR-4.0/5.1/PMA as to the technical readiness of the program to commence flight test

(2) A completed IPT/Competency Report Card broken down by critical engineering disciplines (these disciplines are those defined as critical path to obtaining an airworthiness approval and flight clearance) and each reporting that they are either "Red", "Yellow" or "Green" to go to flight test.

6. **FRR Completion/Exit Criteria** - The FRR is complete when all RFAs are signed off, an acceptable level of program risk is ascertained, the APMSE has notified (via email) the appropriate leadership that these actions are closed with a recommendation to proceed to flight test, and the Chairperson has issued a concurrence. The exit criteria should include the following but may be tailored by the APMSE with the prior (to commencement of the FRR) approval of the Chairperson. Exit Criteria should include:

a. Does the status of the technical effort and design indicate aircraft and test team are ready to proceed to flight test?

b. Are the hardware and software defined and in accordance with an approved configuration? Are they under configuration management control?

c. Are the Flight Test Plans and Flight Test Procedures approved? Is the flight clearance approved?

d. Are adequate processes and metrics in place for the program to succeed?

e. Are the risks known and manageable for CT/DT/OT?

f. Is the flight test program schedule executable (technical/cost risks)?

g. Are all of the system requirements traceable to the test procedures?

h. Is the program properly resourced?

i. Are all modifications and assemblies completed and approved?

j. Are qualification testing and system level testing related to safety of flight complete?

k. Are qualification testing and system level testing related to security complete?

l. Does the engineering analysis support aircraft readiness for flight test?

m. Are all flight test planning and inspection procedures been completed and approved?

n. Have all the flight restrictions and limitations been identified, documented, and tied to appropriate flight test configuration?

o. Have all inspections been completed and any discrepancies been corrected?

p. Are all Inter- and Intra- system Interfaces between hardware and software compatible?

q. Are the support and maintenance personnel (Government and contractor) trained and ready to go?

r. Are all Go/No Go criteria identified?

s. Have all independent/Gray Head teams given an approval (where applicable)?

t. Is the aircraft ready for flight test within acceptable risk parameters and applicable approving authorities?

u. Does hardware and software design meet established requirements?

v. Are all logistics support elements in place or adequately planned?

w. Does the aircraft configuration match the approved design? Does the configuration identification match the configuration identified in the flight clearance?

x. Is the proposed maintenance concept compatible with the platform hardware and software configurations?

y. Have all applicable, completed FRR Risk Assessment Checklists and any Lessons Learned been entered into AIR-4.1's Knowledge Management Exchange (KMX) system accessible at

https://www.kmsonline.net/kms/ in accordance with the KMX/LL Process Document NASCO0672-KMX-PROC-001?

7. **FRR Customers** - The primary customers of the FRR decision are AIR-5.1, AIR-4.1, the PM/IPT, and AIR-4.0P.

System Verification Review/Production Readiness Review (SVR/PRR)

1. **SVR/PRR Purpose** - The SVR is a multi-disciplined product and process assessment to ensure that the system under review can proceed into Low Rate Initial Production (LRIP) and Full Rate Production (FRP) within cost (program budget), schedule (program schedule), risk, and other system constraints. (A Functional Configuration Audit (FCA) may be conducted concurrent with SVR, if desired). Generally this review is an audit trail from the CDR, and assesses that the system final product, as evidenced in its production configuration, meets the functional requirements as derived from the Capability Production Document (CPD - formerly ORD) to the Functional, Allocated, and Product Baselines. The SVR establishes and verifies final product performance.

The PRR is an examination of a program to determine if the design is ready for production and the producer has accomplished adequate production planning without incurring unacceptable risks that will breach thresholds of schedule, performance, cost, or other established criteria. The full, production-configured system is evaluated to determine that it correctly and completely implements all system requirements, and whether the traceability of final system requirements to the final production system is maintained. At this review the IPT shall also review the readiness of the manufacturing processes, the Quality System, and the production planning, i.e., facilities, tooling and test equipment capacity, personnel development and certification, process documentation, inventory management, supplier management, etc. A successful review is predicated on the IPT's determination that the system requirements are fully met in the final production configuration, and that production capability form a satisfactory basis for proceeding into LRIP and FRP.

The PRR(s) should be conducted on the prime contractor and on major subcontractors, as applicable. The PRR should be conducted in an iterative manner concurrent with other major program reviews, such as SFR, PDR, and CDR, during the SDD phase. These periodic production readiness assessments should be conducted during the System Demonstration work effort to identify and mitigate risks as the design progresses, with a

final PRR conducted at the completion of System Development and Demonstration phase.

A follow-on tailored PRR may also be appropriate in the production phase for the prime contractor and major subcontractors for:

a. Changes from the System Development and Demonstration phase and during the production phase of the design, materials and manufacturing processes

b. Production start-up after a significant shutdown period

c. Production start-up with a new contractor

d. Relocation of a manufacturing site

The review may be tailored in accordance with the technical scope and risk of the system. Under no circumstance should the review be tailored completely out of the development plan. Tailoring should occur as part of the APMSE or systems engineer coordination of the review agenda with the AIR-4.1 cognizant authority (APEO(RDT&E)).

Notwithstanding successful completion of the PRR, the contractor remains responsible for the system design/performance requirements within the terms of the contract.

2. **SVR/PRR Timing** - The final PRR is typically conducted at the conclusion of the System Development and Demonstration phase and at the start of the Production and Deployment Phase to assess the manufacturing and quality risk as the program proceeds into LRIP and FRP. As stated above, the PRR should be conducted in an iterative manner concurrent with other major program reviews, such as SFR, PDR, and CDR, during the System Development and Demonstration phase. These periodic production readiness assessments should be conducted during the System Demonstration work effort to identify and mitigate risks as the design progresses, with a final PRR conducted at the completion of System Development and Demonstration phase.

3. **Entry Criteria For System Development and Demonstration Phase Final PRR** - The entry criteria discussed below are applicable to the final phase PRR. It should be tailored for application to a specific program. The PM may decide for

programmatic reasons to proceed with the PRR prior to completing all of the Entry Criteria listed below. This PM decision should be based on a risk assessment, identification of risks, and their acceptance. In this case, a delta PRR may be applicable depending upon the extent of changes resulting from late completion of the Entry Criteria.

a. A preliminary agenda has been coordinated (nominally) 30 days prior to the PRR.

b. PRR technical products have been made available to the cognizant PRR participants prior to the review:

(1) Results of the PRRs conducted at the major suppliers,

(2) Transition to Production and/or Manufacturing Plan,

(3) Change control process has been established and the customer has approved the production configuration baseline,

(4) Manufacturing/Producibility and Quality requirements have been addressed during the design/development phase, and

(5) Current risk assessment

c. A CDR milestone event has been successfully completed, if applicable.

d. All CDR action items have been responded to, if applicable.

e. All CDR exit criteria key issues have been satisfied, if applicable.

f. All system performance specification qualification test requirements have been successfully completed, if applicable.

4. SVR/PRR Planning

a. Production Readiness Review Chairperson - Planning for a PRR should start with a request for a PRR Chairperson, nominally 45 days prior to conduct of the review. Typically the PMA, assigned IPT leader, or assigned APMSE requests a PRR

chairperson be appointed by AIR-4.1. Prior to this request, the assigned APMSE should have coordinated chairperson requirements with the cognizant APEO(RDT&E). Chairperson assignments should be reflective of program scope and risk. The role of the chairperson includes:

(1) Determination of PRR membership,

(2) Development of the final review elements,

(3) Oversight of the PRR and RFA process, and

(4) Issuance of the PRR Summary Report

b. Production Readiness Review Elements - The APMSE and the assigned Chairperson shall coordinate with the cognizant APEO(RDT&E) in the development of a preliminary agenda for the planned review. The following areas should be addressed in the PRR:

(1) Program Management

(2) Engineering/Product Design

(3) Production Engineering and Planning

(4) Materials and Purchased Parts

(5) Industrial Resources

(6) Quality Assurance

(7) Logistics

(8) Software Management

A more detailed listing the PRR elements can be found in the PRR Risk Assessment Checklist.

c. Technical Review Participants

(1) PRR Board (typical composition):

(a) TRB Chairperson;

(b) PM representatives (industry and Government);

(c) APMSE should:

1. Ensure the performing activity provides the supporting data and participation in the required review,

2. Develop, coordinate, and execute, in cooperation with the performing activity, individual review arrangements,

3. Ensure the preparation of CDR material is coordinated across IPTs, and

4. Organize and supervise the documentation of RFAs in support of the TRB Chairperson.

(d) APML should ensure all relevant supportability requirements are addressed;

(e) APMT&E should ensure all T&E requirements are addressed;

(f) Cost Team (AIR-4.2) representative, if required;

(g) Counsel, if required;

(h) Contracting Officer, if required; and

(i) Recorder is responsible for collating RFAs for submission to the TRB. The recorder should have the Technical Review Summary Report prepared for distribution by the Chairperson.

(2) SMEs as required to address system concepts and enabling technologies. These SMEs represent their NAVAIR competencies in the adjudication of RFAs, to include cost and schedule impacts. SMEs should be notified at least 30 days prior to the scheduled review date.

d. SVR/PRR Location - The facility chosen should be adequate to ensure participation by all cognizant competencies and organizations. The PRR is typically conducted at a contractor

or government provided facility, as mutually agreed upon, or specified in the contract. Selection of the location should consider minimizing participant travel and associated costs.

5. **Conduct of SVR/PRR Review** - All PRR participants are to assess the materials at the review, document concerns by means of RFAs, and submit RFAs to the PRR Recorder.

a. PRR Review Elements

(1) Introduction/agenda/administrative

(a) Purpose of review

(b) RFA procedures overview

(c) Risk Assessment procedures overview

(d) Program overview

(2) Follow SVR/PRR (as appropriate) Program Risk Assessment Checklist structure

b. PRR Products

(1) Production Readiness Review Summary Report, with the following attachments:

(a) List of attendees, to include: name, functional area represented, NAVAIR code, phone number, and email address,

(b) Completed RFA forms

(c) Meeting minutes

(d) Recommendation to PMA as to the readiness of the program to enter the next phase of production.

(2) Updated Risk Assessment, including risks and mitigation options. It should specifically address OPEVAL and transition to production risks.

6. SVR/PRR Completion/Exit Criteria

a. The PRR is considered complete when all draft RFAs are signed off, and an acceptable level of program risk is ascertained.

b. The program manager will approve entering LRIP or FRP based upon acceptable PRR results and manageable program risk.

c. Typical Exit Criteria include:

(1) Has the system product baseline been established and documented to enable hardware fabrication and software coding to proceed with proper configuration management?

(2) Are adequate processes and metrics in place for the program to succeed?

(3) Are the risks known and manageable?

(4) Is the program schedule executable (technical/cost risks)?

(5) Is the program properly staffed?

(6) Is the detailed design producible within the production budget?

(7) Have all applicable, completed SVR/PRR Risk Assessment Checklists and any Lessons Learned been entered into AIR-4.1's Knowledge Management Exchange (KMX) system accessible at https://www.kmsonline.net/kms/ in accordance with the KMX/LL Process Document NASC00672-KMX-PROC-001?

Physical Configuration Audit (PCA)

1. **PCA Purpose** - The purpose of a PCA is to examine the actual configuration of an item being produced in order to verify that the related design documentation matches the item as specified in the contract. In addition to the standard practice of assuring product verification, the PCA confirms that the manufacturing processes, quality control system, measurement and test equipment, and training are adequately planned, followed, and controlled. It is also used to validate many of the supporting processes used by the contractor in the production of the item and to verify other elements of the item that may have been impacted/redesigned after completion of the System Verification Review. A PCA is normally conducted when the government plans to control the detail design of the item it is acquiring via the Technical Data Package (TDP). When the Government does not plan to exercise such control or purchase the item's TDP (e.g., performance based procurement) the contractor must still conduct an internal PCA in order to define the starting point for controlling the detail design of the item and to establish a product baseline.

2. **PCA Timing** - Prior to final acceptance (DD Form 250) of the deliverable item(s). The schedule must be compatible with availability of items being reviewed as well as applicable information, personnel, etc. Supporting CDRL/DD Form 1423 or equivalent must also be scheduled to correspond with planned timing.

3. **PCA Entry Criteria** - A new production contract or an Engineering Change Proposal (ECP) may call for the development of a new item and incorporation of the new item into a system via a modification program. The expected configuration, performance and TDP of the new item will have to be verified by the conduct of a PCA. It is normal that the first units of an item in the Production and Deployment, and Operations and Support Phases be subjected to a PCA. Depending on whether the acquisition strategy was based on a detail design or performance design specification could influence whether the PCA is to be conducted by the contractor or government.

The following is entry criteria for the PCA. It should be tailored for application to a specific program. The PM may decide for programmatic reasons to proceed with the PCA prior to

completing all of the Entry Criteria listed below. This PM decision should be based on a risk assessment, identification of risks and their acceptance.

a. A preliminary agenda has been coordinated (nominally) 30 days prior to the PCA.

b. PCA technical products have been made available to the cognizant PCA participants prior to the review:

(1) Results of the PCAs conducted at the major suppliers,

(2) Manufacturing Plan,

(3) Quality control plan, and

(4) Current risk assessment

c. A PRR milestone event has been successfully completed, if applicable.

d. All PRR action items have been responded to, if applicable.

e. All PRR exit criteria key issues have been satisfied, if applicable.

4. PCA Planning - PCA requirements should be included in the SOW tasking. A specific plan (whether done incrementally or in whole) should be targeted at least 60 days prior to the planned review, and based upon availability of the item and its associated documentation. The review should be planned well in advance of the production delivery schedule so as to allow sufficient time for correcting any deficiencies found during the PCA that could compromise the contract delivery schedule. A PCA applicable to software items may be delayed until after integration testing.

a. PCA Chairperson - The Government and contractor program managers or designees co-chair what is often referred to as the PCA Executive Panel. Chairperson assignments should be reflective of program scope and risk. The role of the chairperson includes:

(1) Determination of PCA membership,

(2) Development of the final review elements,

(3) Oversight of the PCA and RFA process, and

(4) Issuance of the PCA Summary Report

b. PCA Elements - A representative number of drawings and associated manufacturing instructions for each item shall be reviewed to determine their accuracy in accordance to the final product configuration/design. Unless otherwise directed by the Government co-chairperson, inspection of the drawings and the associated manufacturing instruction may be accomplished on a valid sampling basis. The purpose of the PCA is to insure that the manufacturing instructions (and/or Computer Aided Manufacturing (CAM) data) accurately reflect all design details contained in the drawings (and/or CAD presentations). Since the hardware is built in accordance with the manufacturing instructions (and/or CAM data), any discrepancies between the manufacturing instruction (and/or CAM data) and the design details and changes in the drawings (and/or CAD representation) will be reflected in the hardware. The following areas should be addressed in the PCA:

(1) Quality Control System

(2) Control of Purchases

(3) Shipping

(4) Software

(5) Training

(6) Measurement and Test Equipment

(7) Non-Conforming Material

(8) Manufacturing

A more detailed list of the PCA elements can be found in the PCA Risk Assessment Checklist.

c. PCA Participants - Personnel needs are based on the type and complexity of the item(s) being reviewed. Experts in engineering design, configuration management, computer-aided design/manufacturing, production, assembly and acceptance test processes are normally required. SMEs should be notified at least 30 days prior to the scheduled review date. Defense Contract Management Agency (DCMA) plant representatives should also be tasked to review and certify engineering release, configuration control and in house product verification processes.

d. PCA Location - Unless otherwise specified, the PCA is generally performed at the prime or sub contractor's facility where the item to be reviewed is manufactured or where the test/verification data is located.

5. PCA Conduct of Review/Review Process - All PCA participants are to assess the materials at the review, document concerns by means of RFAs, and submit RFAs.

a. PCA Review Elements

(1) Introduction/agenda/administrative

(a) Purpose of review

(b) RFA procedures overview

(c) Risk Assessment procedures overview

(d) Program overview

(2) Follow PCA Program Risk Assessment Checklist structure

b. PCA Products:

(1) PCA Summary Report including approved issue/problem write-ups and assigned actions,

(2) Approved Product Baseline and TDP (formal PCA close out),

(3) Updated Risk Assessment, including risks and mitigation options.

6. PCA Completion/Exit Criteria

a. The PCA is considered complete when all draft RFAs are signed off, and an acceptable level of program risk is ascertained.

b. The design and manufacturing documentation matches the item as specified in the contract.

c. Results approved by the PCA Executive Panel or Co-Chairs.

d. Have all applicable, completed PCA Risk Assessment Checklists and any Lessons Learned been entered into AIR-4.1's Knowledge Management Exchange (KMX) system accessible at https://www.kmsonline.net/kms/ in accordance with the KMX/LL Process Document NASCO0672-KMX-PROC-001?

In-Service Review (ISR)

1. **ISR Purpose** - The ISR is a multi-disciplined product and process assessment to ensure that the system under review is operationally employed with well-understood, and managed risk. This review is intended to characterize in-service technical and operational health of the deployed system by providing an assessment of risk, readiness, technical status, and trends in a measurable form that will substantiate in-service support budget priorities. The ISR objectives are met through the consistent application of sound programmatic, systems engineering and logistics management plans, processes, and sub-tier in-service stakeholder reviews, such as System Safety Working Group (SSWG), Integrated Logistics Management Team (ILSMT), etc., and the effective use of available government and commercial data sources. In-Service safety and readiness issues are grouped by priority to form an integrated picture of in-service health, operational system risk, system readiness, and future in-service support requirements.

Completion of this review should provide:

a. An overall System Hazard Risk Assessment

b. An operational readiness assessment in terms of system problems (hardware, software, and production discrepancies)

c. Status of current system problem (discrepancy) report inflow, resolution rate, and trends and updated metrics as required for prioritizing budget requirements.

Successful completion of this review should provide the PM, the APMSE, the APML, the assigned Fleet Support Team (FST), and other stakeholders with the integrated information they need to establish priorities, and to develop execution and out year budget requirements.

2. **ISR Timing** - The ISR is typically conducted prior to, and in support of, the initiation of the following FY Operation and Maintenance, Navy (O&M,N) requirements determination process. Since the O&M,N requirements data calls typically occur in early second quarter timeframe of any given FY, the ISR should be conducted in the prior months.

3. ISR Entry Criteria

a. A preliminary agenda has been coordinated (nominally) 30 days prior to the ISR.

b. ISR technical products for the operational system have been made available to the appropriate ISR participants prior to the review:

(1) Program Risk Assessment

(a) System Safety Hazard Risk Assessment

(b) Programmatic Risk Assessment

(2) Current In-Service Hazards

(a) Safety Assessment Reports (SARs) status

(b) Active Mishap Reports

(c) Active Hazard Reports (HAZREPs)

(d) Active safety Engineering Investigations (EIs)

(e) Active bulletin Technical Directives (TDs)

(f) Original Equipment Manufacturer (OEM) Reports

1. Service Bulletins

2. Alerts

(g) Federal Aviation Administration (FAA)

1. Airworthiness Directives (ADs)

2. Rule Changes

(h) Other Service Hazards

(3) Aging Aircraft Status

(a) Fatigue Life

(b) Wiring

(c) Obsolescence and Supportability

(4) NAMDRP Status

(a) Routine EIs

(b) Hazard Material Reports (HMRs)

(c) Technical Publication Deficiency Reports (TPDRs)

(d) Production Quality Deficiency Reports (PQDRs)

(5) Configuration Management (CM) Status

(a) Technical Directive Status Accounting (TDSA) Status

(b) ECPs Status

(6) Software Management Status

(a) Software Trouble Reports (STRs) Status

(b) FORCEnet compliance

(c) Other

(7) Operational Advisory Group (OAG) Priorities Status

(a) PMA actions relative to Top 10 OAG Priorities

(8) Operational Requirements Status and Assessment

(a) Fielded Systems

1. Number of Systems

2. Permanent Sites

3. Unclassified Deployed Sites

(b) New Mission Capability

(c) Interoperability

(d) CNS/ATM

(e) Logistics Footprint Assessment (Baseline/Annual Review)

(f) Other

(9) System Readiness and Maintenance Program Status

(a) Naval Aviation Readiness Integrated Improvement Program (NAVRIIP)

1. Cross Functional Team 1 (Readiness) Status

2. Cross Functional Team 2 (Providers) Status

3. Cross Functional Team 3 (Planning & Programming) Status

4. Cost Wise Readiness Status

(b) Reliability Centered Maintenance (RCM) and Integrated Maintenance Program (IMP)

1. Airframe Management Board (A/FMB) Status

2. Status Comparison of RCM/IMP plans to baselines

3. Adequacy of staffing to sustain RCM and IMP efforts

(10) ILSMT Status

(a) LS Element Issues & Priorities

(b) PMA actions relative to ILSMT priorities

(11) Program O&M,N budget requirements tied to system metrics and prioritized in accordance with NAVAIR requirements

determination priority categories, including the delta between requirements and funding.

(a) Current Execution Year

(b) Pending Execution Year

(c) Future Years Defense Program (FYDP)

(12) Program Aircraft Procurement, Navy (AP,N) budget requirements for fielded aircraft tied to system metrics and prioritized, including the delta between requirements and funding.

(a) Current Execution Year

(b) Pending Execution Year

(c) Future Years Defense Program (FYDP)

(13) Program Staffing Status

(a) Organization structure/chart supporting program management, technical and logistics requirements

(b) Key government/contractor interfaces

(c) Planned versus actual resource curve

(14) Open Action Items from previous reviews

4. ISR Planning

a. In-Service Review Board Chairperson - Planning for an ISR should start with a request for a TRB Chairperson, nominally 45 days prior to conducting the review. The APMSE assigned to conduct the review requests a TRB Chairperson be appointed by AIR-4.1. Prior to this request, the assigned APMSE should have coordinated chairperson requirements with the appropriate AIR-4.1 APEO(RDT&E). TRB Chairperson assignments should be reflective of program scope and risk.

b. ISR Elements - The APMSE, APML, and the assigned Chairperson shall coordinate with the appropriate AIR-4.1

APEO(RDT&E) in the development of a preliminary agenda for the planned review. This agenda should be made available to the ISR participants 30 days prior to conducting the review. Review elements are shown below in paragraph **6.a.**

c. ISR Participants

(1) In-Service Review Board (required membership):

(a) In-Service Review Board Chairperson

(b) Government PM

(c) Industry PM (as applicable)

(d) APMSE

(e) APML

(f) FST Leader

(g) Resource Sponsor (OPNAV)

(h) Requirements Officer, as applicable

(2) User representatives

(3) SMEs as determined by the APMSE, APML, and TRB Chairperson

(4) Counsel, if required

(5) Contracting Officer, if required

(6) Support personnel as required by the ISR agenda - at a minimum to include the ISR Recorder

d. ISR Roles and Responsibilities

(1) TRB Chairperson role includes:

(a) Determination of TRB membership

(b) Development of the final review elements

(c) Oversight of the ISR, RFA process, and Issuance of the ISR Summary Report

(2) APMSE role to conduct the review includes:

(a) Ensuring that the engineering activities provide the supporting data and participate in the required review

(b) Develop, coordinate, and execute, in cooperation with the performing activity, individual review arrangements

(c) Ensuring that the preparation of requirements performance material is coordinated across IPTs

(d) Conducting the review for the TRB Chairperson

(e) Organizing and supervising the documentation of RFAs in support of the TRB Chairperson

(3) APML role includes:

(a) Providing ILSMT and NAVRIIP pertinent data

(b) Ensure all relevant supportability requirements are addressed

(c) Ensure logistics activities provide the supporting data

(d) Participate in the required review

(4) ISR Recorder is responsible for collating RFAs for submission to the TRB. The recorder should have the ISR Summary Report prepared for distribution by the Chairperson.

5. **ISR Location** - The facility chosen should be adequate to ensure complete participation by all appropriate competencies and organizations. The ISR is typically conducted at a contractor or Government provided facility, as mutually agreed upon, or specified in the contract. Selection of the location should consider minimizing participant travel and associated costs.

6. **Conduct of ISR Review** - All ISR participants are to assess the materials at the review, document concerns by means of RFAs, and submit RFAs to the ISR Recorder.

a. ISR Review Elements

(1) Introduction/agenda/administrative

(a) Purpose of review

(b) RFA procedures overview

(c) Risk Assessment procedures overview

(2) Program Overview

(a) Production Overview, Status,

(b) Fielded Status

(c) Modification Program Status

(d) Engineering and Logistics Overview

(e) Program Staffing Status

(f) Budget Overview

(3) Program Risk Assessment

(a) Operational System Hazard Risk Index (HRI) status

(b) Risk items and mitigation options

(c) Cost and schedule impacts of risk and/or mitigation options

(4) In-Service Management Metrics

(a) Safety Program Status

(b) Aging Aircraft Status

(c) Naval Aviation Maintenance Discrepancy Reporting Program (NAMDRP) Status

(d) Configuration Management Program Status

(e) Software Program Status

(f) OAG Status

(g) Readiness and Maintenance Status

(h) ILSMT Status

(i) Funding Status

(j) ISR Action Items Status

(5) Process Review (Provide Status of following to ensure plans and processes are current)

(a) Program Management Plan

(b) Operational Requirements Management Plan

(c) System Safety Management Plan

(d) Risk Management Plan

(e) Configuration Management Plan

(f) NAVRIIP Plan

(g) Reliability Centered Maintenance and Integrated Maintenance Program Plans

b. ISR Products

(1) In Service Review Summary Report, with the following attachments:

(a) List of attendees, to include: name, functional area represented, NAVAIR code, phone number, and email address,

(b) Completed RFA forms

(c) Meeting minutes

(d) Assessment of the technical health (system operational risk and system readiness) of the program to the PMA.

(e) Assessment of program O&M,N budget requirements tied to system metrics and prioritized in accordance with NAVAIR requirements determination priority categories, including the delta between requirements and funding.

(2) Updated Operational System Hazard Risk Assessment, including risks and mitigation options

(3) ISR Summary report due within 20 days of review.

7. ISR Completion/Exit Criteria

a. The ISR is considered complete when all draft RFAs are signed off, and program operational risk, and relation of this risk to O&M,N budgets is ascertained.

b. Typical ISR Exit Criteria includes:

(1) System problems have been categorized to support the O&M,N requirements determination process

(2) Required budgets (in terms of work years) have been established to address all system problems in all priority categories

(3) Required staffing (in terms of skills) have been established to address all system problems in all priority categories

(4) Current levels of System Operational Risk and System Readiness have been quantified and related to current O&M,N and Aircraft Procurement, Navy (AP,N) budgets

(5) Future levels of System Operational Risk and System Readiness have been quantified and related to future year O&M,N and AP,N budgets

(6) Have all applicable, completed ISR Risk Assessment Checklists and any Lessons Learned been entered into AIR-4.1's Knowledge Management Exchange (KMX) system accessible at https://www.kmsonline.net/kms/ in accordance with the KMX/LL Process Document NASCO0672-KMX-PROC-001?

Integrated Baseline Review (IBR)

1. **IBR Purpose** - The IBR is employed by PMs throughout the life of projects where Earned Value Management (EVM) is required. The process is composed of four steps: (1) the PMs' assessment of their understanding of the risks, (2) preparation for an IBR, (3) execution of the IBR, and (4) the management process (the source of on-going mutual understanding). The key step in the process is execution of the IBR. The IBR establishes a mutual understanding of the project Performance Management Baseline (PMB) and provides for an agreement on a plan of action to evaluate risks inherent in the PMB and the management processes that operate during project execution.

Completion of the review should result in the assessment of risk within the PMB and the degree to which the following have been established:

a. Technical scope of work is fully included and is consistent with authorizing documents. This should include full system focus, and in-depth integration, and software considerations.

b. Project schedule key milestones are identified and supporting schedules reflect a logical flow to accomplish the work

c. Resources (budgets, facilities, personnel, skills, etc.) are available and are adequate for the assigned tasks

d. Tasks are planned and can be measured objectively relative to the technical progress

e. Rationales underlying the PMB are reasonable

f. Management processes support successful execution of the project

2. **IBR Timing** - The on-site portion of the IBR is normally conducted within 6 months of contract award. After this initial IBR, PMs are encouraged to utilize the management process to maintain their understanding of risks. However, changes to PMB over the life of a program are expected, and PMs must determine whether to perform an additional IBR or continue to rely on the

management process to provide the necessary information relating to risk. Changes in PMB risks may result from contract award, authorization to proceed, contract modification, funding, replanning scope/schedule, new PM, acquisition plan, and higher-level authority direction.

3. **IBR Entry Criteria** - Since the purpose of the IBR is to assess the PMB, the baseline must be established by the performing organization (contractor or Government) and should reflect the entire scope of work documented at the appropriate level of detail before the formal IBR can be conducted. The Program Teams must be familiar with the project scope of work, e.g., SOW or statement of objectives (SOO), before the start of IBR. There needs to be an understanding of management processes including management of subcontractors.

4. **IBR Planning** - Preparation is the process step that establishes a foundation for a successful IBR. A plan should be developed for conducting an IBR consistent with the PMs expectations and program dynamics. Program dynamics that have an impact on PMB planning include changes in funding, scope of work, acquisition plan, subcontracting, key personnel, and any pending higher authority decisions.

Preparation for the IBR focuses on those risks that may impact the project PMB. Risks include technical, schedule, cost, resource, or management processes. The Risk Management Plan (RMP) is essential for identifying, analyzing, handling, monitoring, and documenting project risks. The RMP provides the basis for iterative assessment and management of risk.

a. **Program Managers** - PMs are responsible for the Baseline Review Process and for the following:

(1) Planning and executing the IBR.

(2) Providing an adequate number of qualified technical personnel to serve as the principal IBR team members, supplemented by members with applicable support skills (e.g., EVM specialists, subcontract managers, business managers, and finance managers).

(3) Documenting, in the RMP, risk issues identified during an IBR.

(4) Reviewing progress on the actions until issues are resolved.

b. IBR Team Participants - PMs should select individuals for the IBR team who are experienced with the programmatic and technical disciplines under review. When appropriate, subcontractor personnel should be included on the team. Areas of discipline that should be included on the team are program management, business management, subcontract management, and technical management (e.g., system engineering, software engineering, manufacturing, integration and test engineering, and integrated logistics support). The size and composition of the team should reflect the PMs objectives, expectations, and risk assumptions.

c. Cost Department - While the PM is responsible for conducting the IBR, AIR-4.2 is the IBR SME for the Command, and provides for the facilitation of the review. Additionally, AIR-4.2 provides training (in conjunction with the contractor or team site personnel where possible) for the review, and team members for the assessment.

d. IBR Agenda - The IBR Team Handbook will assist the team members with how the review should be conducted. Included in this handbook will be a description of the effort, layout of the team assignments, review agenda, discussion guidelines, travel arrangement details, sample documentation, sample discussion questions, risk evaluation criteria, and a glossary of terminology.

e. IBR Training - Training is essential to ensure that the IBR team can identify and adequately assess the project risk. The PMs should conduct joint training in which all members of the IBR team participate. The training provides enough information so the team can mutually understand the cost, schedule, technical, and management processes used on the project.

The essential elements of training include the following:

(1) PMs Expectations

(2) IBR objectives

(3) Risk identification and documentation

(4) Management Processes

(5) Baseline maintenance

(6) Risk management

(7) Business processes (including EVM)

(8) Project Management Aspects

(a) SOW/SOO

(b) Work breakdown structure dictionary/matrix

(c) Work authorization document

(d) Control account plans

(e) Terms and acronyms

(f) Funding

(g) Budget and schedule baselines

(h) Subcontractor management

(i) Management reserve

f. IBR Location - The facility chosen should be adequate to ensure complete participation by all cognizant competencies and organizations. The IBR is typically conducted at a contractor or government facility to ensure availability of documentation, or as mutually agreed or specified in the contract. Selection of the location should consider minimizing participant travel and associated costs.

5. **Conduct of IBR Review** - The IBR objectives are to confirm that the PMB captures the entire technical scope of work. Work is scheduled to meet project objectives, risks are identified, proper amount and mix of resources have been assigned to accomplish all requirements, and management processes are implemented in order to ensure PMs have an understanding of risk

items. The key events during the IBR are the control account manager discussions. These discussions focus on key risk areas and management processes. To be effective, the discussion group must remain small and focused, and be composed of knowledgeable participants who have participated in the preparation and training.

a. Risk Areas - Examining the PMB and planning processes determine risk. These risk areas generally can be grouped as technical, schedule, cost, resources, or management processes. It is important that any real or perceived risks identified in the planning stage be dealt with during preparation for the IBR. The following are examples of risk areas:

(1) Technical risk - The ability of the project's technical plan to achieve the objectives of the scope of work. This includes the effects of available technology, software development capability, human systems design options, design maturity, etc.

(2) Schedule risk - The adequacy of the time allocated for performing the defined tasks to achieve successfully the project schedule objectives. This includes the effects on the schedule of the interdependency of scheduled activities to achieve project milestones and supports the PMs ability, when necessary, to identify critical path.

(3) Cost risk - The ability of the PMB to execute successfully the project cost objectives recognizing the relationships of budget, resources, funding, schedule, and scope of work. This includes the effects of assumptions used, for both estimates and resource allocation, on budgets for work items.

(4) Resource risk - The availability of personnel and facilities required for performing the defined tasks to execute the program successfully.

(5) Management processes risk - The degree to which the management processes provide effective integrated cost/schedule/technical planning and baseline change control. This includes the ability of the processes to establish and maintain valid, accurate, and timely performance data, including that from subcontractors, for early visibility into risk.

b. Management Processes - Risks may change with contract modifications, funding higher-level authority direction, or a new PM raising the question "Is another IBR necessary?" However, the objective is to ensure that the management processes are used to provide the PMs an ongoing source of understanding on the project baseline maintenance, risk management, and business processes used by the project. Management processes necessary to support the Baseline Review Process include the following: changes, replanning, scope/schedule changes, changes to the acquisition plan, and

(1) Risk Management Process - The risk management process documents and classifies risks associated with the PMB. Action items from the IBR need to be documented in the RMP. These action items should be classified as to their probability of occurrence, consequences, handling, and identification of the individuals responsible for mitigation of risk. This process must accommodate all changes in project risks including those resulting from changes in the PMB.

(2) Baseline Maintenance Process - This process maintains a PMB that represents the plan for accomplishing the remaining work. This process must accommodate changes to the PMB caused by contract modification, funding changes, replanning scope/schedule changes, changes to the acquisition plan, higher level authority direction, etc.

(3) Business Processes - Other business processes, such as scheduling, estimate to complete, earned value methodology, and managerial analysis, support the management of the project. Inappropriate or inadequate use of these processes may add risks to the project.

6. IBR Completion/Exit Criteria - After completing IBR discussions, a review summary and a closure plan need to be documented. The PMs should agree on a plan of action and who is responsible for each risk item identified. Items identified, as action items, require PM attention and should be included in the Risk Management Plan. Items identified as watch items represent concerns that may require future attention and inclusion in the RMP if they become action items. Once the IBR is completed, the emphasis shifts to the management processes as the source of ongoing mutual understanding of the project risks.

7. **IBR Point of Contact** - For additional information/details on IBRs or EVM, contact AIR-4.2.3 at (301) 342-2394.

Operational Test Readiness Review (OTRR)

1. **OTRR Purpose** - The OTRR is a multi-disciplined product and process assessment to ensure that the system under review can proceed into Operational Test and Evaluation (OT&E) with a high probability the system will successfully complete operational testing. Successful performance during Operational Evaluation (OPEVAL) generally indicates the system being tested is suitable and effective for Fleet introduction. The decision to enter production may be based on this successful determination. Of critical importance to this review is the understanding of available system performance to meet the CPD (formerly ORD).

Notwithstanding successful completion of the OTRR, the contractor remains responsible for the system design/performance requirements within the terms of the contract.

2. **OTRR Guidelines**

a. NAVAIRINST 3960.2C further defines the requirements of SECNAVINST 5000.2C which establishes the minimum criteria required for certification of readiness to commence operational evaluation (OPEVAL) and follow-on operational test and evaluation (FOT&E). The policy and procedures defined in NAVAIRINST 3960.2C shall be followed for the conduct of OTRRs.

b. Operational requirements defined in the CPD must match the requirements tested to in the Test and Evaluation Master Plan (TEMP).

(1) System requirements and the time phasing of them must be traceable from the CPD to the system specification, and the TEMP.

(2) Spiral development, if incorporated, must be supported by the CPD as well as other acquisition related documentation.

c. Commander, Operational Test and Evaluation Force (COMOPTEVFOR) must accredit Modeling and Simulation (M&S) before utilization during OPEVAL.

d. Information Assurance must be maintained. If applicable, a Program Protection Plan must be in place and/or security certification and accreditation policy must be adhered to.

e. Interoperability capabilities, including ship interfaces, must be assured.

f. Definition and classification of severity of software deficiencies should be similar to hardware deficiencies. Software metrics, which demonstrate maturity/stability of the software are to be provided to the software SME at least 10 working days prior to the review.

g. Systems containing high Mean Time Between Failure (MTBF) components pose special problems during reliability determination. Ensure there is agreement with COMOPTEVFOR that this will not impact resolution of Critical Operational Issues.

3 OTRR Completion/Exit Criteria

a. The OTRR is considered complete when all requirements for Navy Certification of Readiness for OT are complete. SECNAVINST 5000.2C provides the following list of criteria for certification of readiness that applies to all OT&E for all DON programs. The program manager with the concurrence of the Operational Test Agency (OTA) may tailor criteria listed below in sub items 2 through 20 that, at a minimum, implement DoD criteria required in reference (b), enclosure 5, paragraph E5.6. The MDA may add criteria as necessary to determine readiness for OT.

(1) The TEMP is current and approved. Testing prior to Milestone B shall have an approved TES as described in this enclosure, paragraph 5.3.1.

(2) DT&E results indicate DT objectives and performance thresholds identified in the TEMP have been satisfied or are projected to meet system maturity for the ICD/CDD/CPD, as appropriate.

(3) All significant areas of risk have been identified and corrected or mitigation plans are in place.

(4) DT&E data and reports have been provided to the OTA not less than 30 days prior to the commencement of OT, unless otherwise agreed to by the OTA.

(5) Entrance criteria for OT identified in the TEMP have been satisfied.

(6) System operating, maintenance, and training documents have been provided to the OTA 30 days prior to the OTRR, unless otherwise agreed to by the OTA.

(7) Logistic support, including spares, repair parts, and support/ground support equipment is available as documented. Discuss any logistics support which will be used during OT&E, but will not be used with the system when fielded (e.g., contractor provided depot level maintenance).

(8) The OT&E manning of the system is adequate in numbers, rates, ratings, and experience level to simulate normal operating conditions.

(9) Training has been completed and is representative of that planned for fleet units.

(10) All resources required to execute OT including instrumentation, simulators, targets, expendables, and funding have been identified and are available.

(11) Models, simulators, and targets have been accredited for intended use.

(12) The system provided for OT&E, including software, is production representative. Differences between the system provided for test and production configuration shall be addressed at the OTRR.

(13) Threat information (e.g., threat system characteristics and performance, electronic countermeasures, force levels, scenarios, and tactics), to include security classification, required for OT&E is available to satisfy OTA test planning.

(14) The system is safe to use as planned in the concept of employment. Any restrictions to safe employment are stated.

The environmental, safety, and occupational health (ESOH) program requirements have been satisfied. The system complies with Navy/Marine Corps environmental, safety, and occupational health/hazardous waste requirements, where applicable. Environmental, safety, and occupational health/hazardous waste reviews and reports have been provided to COMOPTEVFOR or Director, Marine Corps Operational Test and Evaluation Activity (MCOTEA). When an energetic is employed in the system, Weapon System Explosive Safety Review Board (WSESRB) criteria for conduct of test have been met.

(15) All software is sufficiently mature and stable for fleet introduction. All software Trouble Reports are documented with appropriate impact analyses. There are no outstanding Trouble Reports that:

(a) Prevent the accomplishment of an essential capability,

(b) Jeopardize safety, security, or other requirements designated "critical",

(c) Adversely affect the accomplishment of an essential capability and no work-around solution is known, or

(d) Adversely affect technical, cost, or schedule risks to the project or to life-cycle support of the system, and no work-around solution is known.

(16) For software qualification testing (SQT), a Statement of Functionality that describes the software capability has been provided to COMOPTEVFOR and CNO (N091). For programs to be tested by MCOTEA, the SQT Statement of Functionality has been provided to Director, MCOTEA, and Marine Corps Tactical Systems Support Activity (MCTSSA).

(17) For aircraft programs, there are no unresolved NAVAIR deficiencies that affect:

(a) Airworthiness,

(b) Capability to accomplish the primary or secondary mission(s),

(c) Safety of the aircrew/operator/maintainer,

(d) Integrity of the system or an essential subsystem,

(e) Effectiveness of the operator or an essential subsystem.

(18) For programs with interoperability requirements (e.g., information exchange requirements in ICD/CDD/CPDs), appropriate authority has approved the ISP and JITC concurs that program interoperability demonstrated in development has progressed sufficiently for the phase of OT to be conducted.

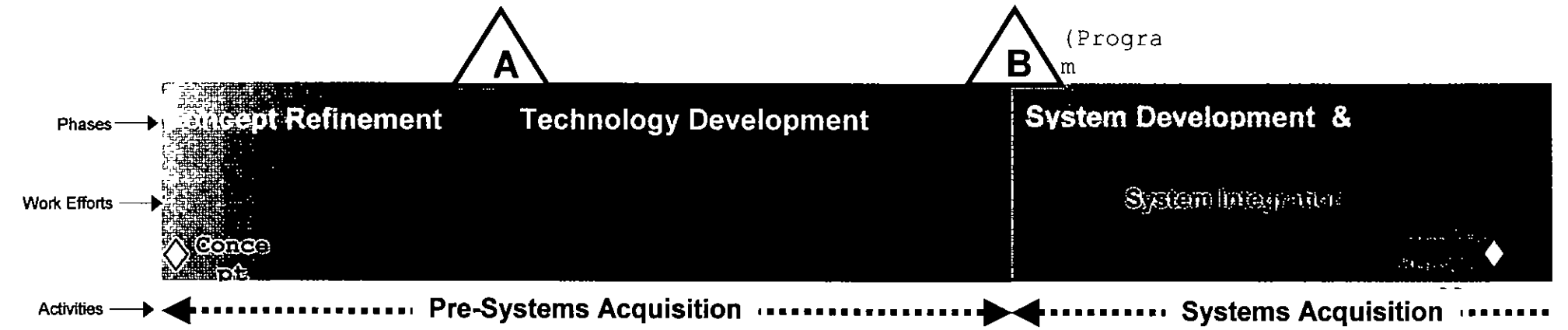
(19) Approval of spectrum certification compliance and spectrum supportability has been obtained.

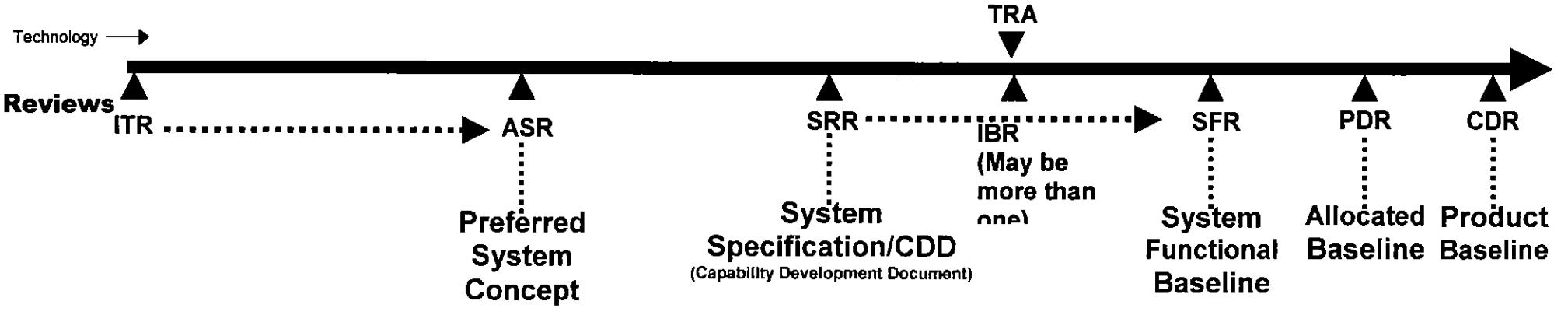
(20) For IT systems, including National Security Strategy (NSS), the system has been assigned a MAC and Confidentiality Level. System certification accreditation documents, including the SSAA and the Authority to Operate (ATO) or Interim Authority to Operate (IATO), have been provided to the OTA.

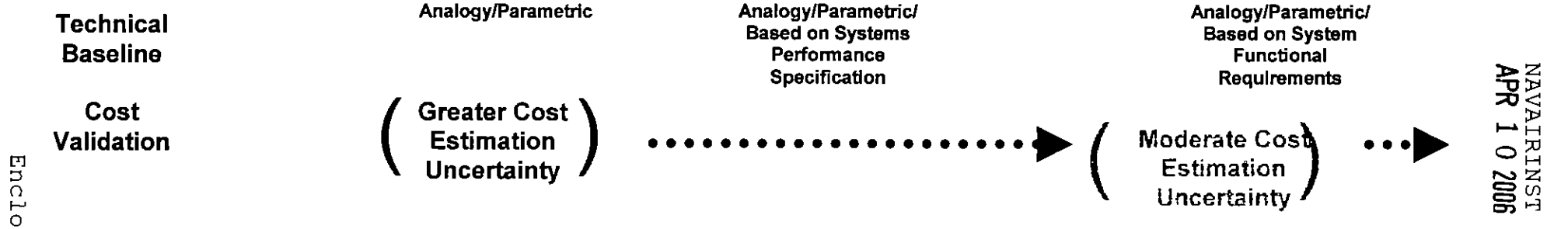
b. For programs employing software, there are no unresolved priority 1 or 2 software problem reports (SPR), and all priority 3 problems are documented with appropriate impact analyses.

c. Have all applicable, completed OTRR Risk Assessment Checklists and any Lessons Learned been entered into AIR-4.1's Knowledge Management Exchange (KMX) system accessible at https://www.kmsonline.net/kms/ in accordance with the KMX/LL Process Document NASCO0672-KMX-PROC-001?

Systems Engineering



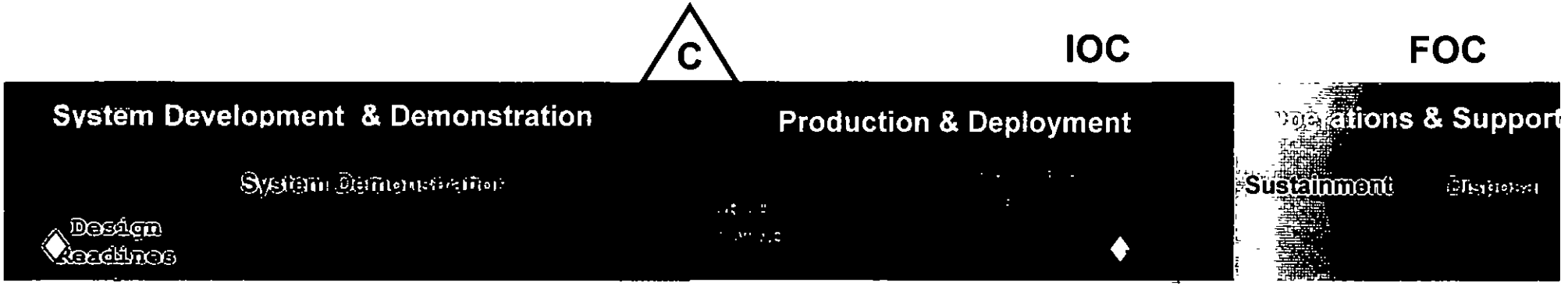


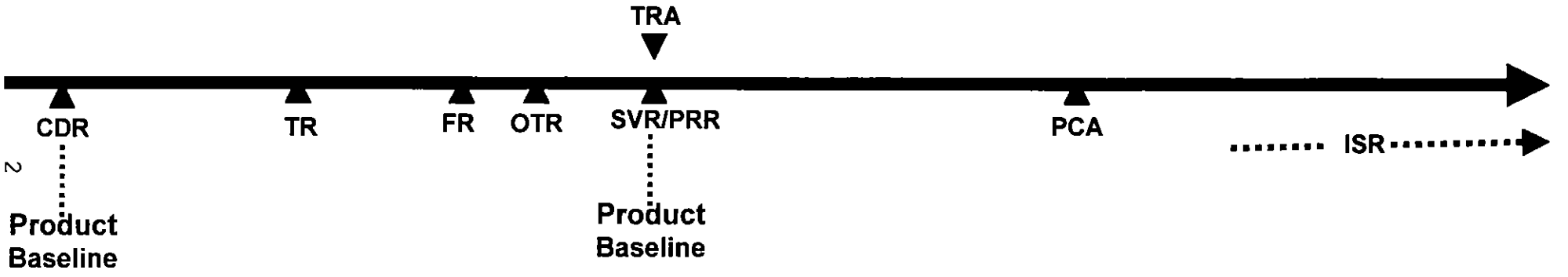


Enclosure (2)

NAVAIRINST 4355.19C
APR 1 0 2006

Technical Review Timing





Analogy/Parametric/ extrapolation of Actual Preliminary Design Packages

Refined Cost Estimate Based on Detailed Design Drawings

Engineering Extrapolation of Actual Design Package

(Less Cost Estimation Uncertainty)

ITR-Initial Technical Review
ASR-Alternative System Review
SRR-System Requirements Review

PDR - Preliminary Design Review
CDR - Critical Design Review
TRR -Test Readiness Review

SVR-System Verification Review
PRR-Production Readiness Review
PCA-Physical Configuration Audit