BY ORDER OF THE COMMANDER
AIR FORCE MATERIEL COMMAND

AFMC INSTRUCTION 21-126

30 NOVEMBER 2000

Maintenance

TEMPORARY 2 (T-2) MODIFICATION OF AEROSPACE VEHICLES

COMPLIANCE WITH THIS PUBLICATION IS MANDATORY

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OPR: HQ AFMC/DOM
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Supersedes AFMCI 21-126, 11 Apr 97

Certified by: HQ AFMC/DOM
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Pages: 24
Distribution: F

This instruction establishes Air Force Materiel Command (AFMC) policy, implements the intent of Air Force Instruction (AFI) 21-101, *Maintenance Management of Aircraft,* AFI 63-1101, *Modification Management,* and Air Force Policy Directive (AFPD) 63-1, *Acquisition Syste*m. The weapons system Single Manager (SM) is the modification approval authority for all aerospace vehicles under their control. This instruction specifically prescribes procedures for managing, controlling, documenting, and processing Temporary 2 (T-2) modifications of aerospace vehicles. This instruction applies to all T-2 modifications accomplished by AFMC to any assigned, possessed, loaned or leased aerospace vehicles. This instruction also applies when AFMC has liability for damage or responsibility for configuration control to the aerospace vehicle. This instruction does not apply to space launch boosters, upper stages, orbital stages, satellites and their subordinate and interfacing subsystems, components, and support equipment, or Federal Aviation Administration (FAA) certified, commercial derivative aircraft prior to issuance of the DD Form 250, **Material Inspection and Receiving Repor**t, unless invoked by the SM and HQ AFMC.

SUMMARY OF REVISIONS

This instruction has been revised to include recent changes to Air Force modification policy and configuration control measures. The new policy has a major effect on the applicability of the instruction. The system SM is the decision authority for all modifications unless delegated to an AFMC test center or laboratory.

1. Temporary 2 (T-2) Modifications Defined. T-2 modifications are configuration changes that support research and development; design changes to existing T-2 modifications; and Developmental Test and Evaluation programs or inservice testing of systems or equipment. The T-2 modifications are temporary hardware or software changes or alterations to aerospace vehicles (aircraft, guided weapons, drones, Remotely Piloted Vehicles (RPV), Unmanned Aerial Vehicle (UAV), and missiles other than strategic),

airborne support equipment, external and internal stores, subsystems, components, or support equipment which is governed by Technical Orders (T.O.) that interface with an aerospace vehicle. These temporary changes or alterations may be installed only for the duration of the flight test unless an extension is approved by the delegated Modification Engineering Authority (MEA) (reference paragraph 12.2). Carriage of uncertified aircraft/stores combinations for other than certifying the store, is considered a T-2 modification. The AFI 63-104, *The Seek Eagle Program*, governs formal certification of external and internal stores through the U.S. Air Force aircraft/stores certification program, and issuance of flight clearances for Initial Operational Test and Evaluation (IOT&E) purposes.

2. Functional Manager for T-2 Modifications. HQ AFMC/DOM is the functional manager for the T-2 modification instruction. The Instrumentation Division, 412 TW/TSI, Air Force Flight Test Center (AFFTC), Edwards AFB, California, is the Center of Expertise for T-2 modification procedures. HQ AFMC/DOM performs staff surveillance over the AFMC T-2 modification process and performs staff assistance visits.

3. Acronyms and Terms Explained. Acronyms and terms are explained in attachment 1.

4. Uncertified External and Internal Stores (General).

4.1. Although clearance of stores is part of the T-2 modification process, it involves highly specialized engineering disciplines and experience generally not available within modification activities. As a result, the Air Force has set up a separate stores compatibility activity at the Air Force SEEK EAGLE Office (AFSEO), Eglin AFB, Florida. While each MEA is responsible for the successful conclusion of a T-2 modification, the MEA will contact the AFSEO to issue a flight clearance for all uncertified stores on all aircraft. For aircraft not assigned to a System Program Office (SPO), the modification activity will request a flight clearance for stores carried on those aircraft.

4.2. To be able to recommend a flight clearance, the stores compatibility activity often must conduct extensive analyses and tests, some of which may involve contracts. The modification activity or applicable store design activity is responsible for providing any necessary engineering data (physical, aerodynamic, structural, aerothermal, and electromagnetic) on the store and for providing funds to support compatibility studies and tests. To minimize program delays, stores compatibility efforts should be initiated early, usually well before the T-2 modification action itself is initiated.

4.3. The compatibility activity, after completing analyses and tests, can issue flight clearances to the modification activity. After MEA approval, the clearances will become part of the modification documentation. If a change is needed on a cleared store, aircraft configuration, or flight envelope, the modification activity will contact the issuing office for aircraft compatibility to determine if additional clearance is warranted.

5. Modification Classification. All T-2 modifications, to include hardware/software, will be classified as either major or minor.

5.1. Major modifications involve a high degree of technical uncertainty. Modifications will be classified as Major if the modification affects one or more of the critical areas of structure, propulsion subsystems, avionics systems, software, aerodynamics, stability and control, etc. A modification may also be classified as Major if available technical data or analytical techniques are insufficient to provide an adequate basis for sound engineering design of the modification, and sufficient testing has not

been accomplished to resolve the technical uncertainties. When determining classification, it is recommended that the MEA's technical staff review the proposed modification. All other modifications are classified as minor.

5.2. The MEA is the classification approval authority (see paragraph 7.1.).

5.3. The proposed T-2 modification should be reviewed to ensure technical data and/or analytical techniques are adequate to provide a basis for sound engineering and for resolution of technical uncertainties. If the MEA has any questions as to the technical uncertainty for a particular modification, they should contact the responsible program SM.

6. Independent Modification Review (IMR).

6.1. All major T-2 aircraft modifications require an Independent Modification Review (IMR) by the responsible program SM. The comprehensiveness and extent of the IMR will be negotiated and agreed upon by responsible program SM and the MEA prior to approval of the preliminary modification package. Minor modifications and de-modifications do not require an IMR. The IMR is a technical review of the modification from an airworthiness point of view. It will include a detailed review of the modification's engineering (including software changes), impacted air vehicle characteristics, systems and flight safety, drawings, analyses, test plans, data, changes to related flight manuals, operating and maintenance instructions, and the demodification plan with its associated analyses and drawings. This detailed review will concentrate on those areas of the modification that are the basis for declaring the modification major.

6.2. The classification of the modification as either major or minor must be made as early as possible so the IMR requirements will be fulfilled. If the modification is classified as major, the responsible program SM will be contacted before formalizing any program schedules so all IMR required documentation can be identified.

6.3. As a part of the IMR, the responsible program SM and the MEA may take part in the preliminary design review (PDR) and critical design review (CDR), the Physical Configuration Inspection (PCI), and the review of all test results before the MEA approval of the flight release. The responsible program SM will recommend airworthiness approval or disapproval to the MEA.

7. Approval Authority.

7.1. Modification Engineering Authority.

7.1.1. The MEA leader functions as the modification approval authority for all aerospace vehicles under their control.

7.1.1.1. The authority to approve minor modifications, including engineering and safety of flight approval, to aerospace vehicles is the responsibility of the SM unless delegated to the test centers and laboratory. For Government Furnished Property (GFP), unaccepted, leased, or loaned aerospace vehicles, authority to approve minor modifications, including engineering and safety of flight approval will be negotiated and approved by the SM.

7.1.1.2. No more than five systems may be modified on a temporary basis without approval of either the SM or MEA.

7.1.1.3. Approval or disapproval recommendations for major modifications to aerospace vehicles are assigned to the responsible program SM. The SM will make the recommendation

for GFP, unaccepted, leased, or loaned aerospace vehicles. Engineering approval for T-2 major modifications is the responsibility of the MEA.

7.1.2. For GFP aircraft assigned and/or possessed by a contractor (EB coded), the SM functions as the MEA authority. When the GFP aircraft are to be flight tested by an AFMC test organization, the test organization must take part in the CCB. The test organization will participate in other reviews as requested by the MEA authority.

7.1.3. For unaccepted aerospace vehicles, the MEA authority will be the SM responsible for the program. If the aerospace vehicle is to be flown at an AFMC test facility, the AFMC test organization will be a member of the MEA.

7.1.4. For leased or loaned aerospace vehicles (XY coded), the lease or loan agreement will specify which government agency, such as the FAA, SM or MEA has modification approval.

7.1.5. For non-AFMC aerospace vehicles not under lease or loan agreement, the MEA will be specified in the Memorandum of Agreement (MOA). Normally, this authority is delegated to the AFMC test centers and laboratory having CCB and Modification Engineering Authority (MEA) for the modification. This approval will be coordinated with the appropriate SM.

7.1.6. Send a copy of the AFMC Form 244, **T-2 Modification Configuration Control Board Directive**, to the weapons system SM when requested.

7.2. MEA Leader Responsibilities.

7.2.1. Approves/disapproves all modifications and demodifications.

7.2.2. Approves/disapproves the preliminary modification design and releases it for final design, fabrication, and installation.

7.2.3. Reviews all modification contracts and documents.

7.2.4. Determines if the technical approach to the modification will achieve the desired results within acceptable safety criteria.

7.2.5. Approves PDR and CDR for contracted T-2 modifications and design reviews for T-2 modifications conducted in-house.

7.2.6. Directs the development of local procedures to make sure that appropriate review and approval of subsequent changes to the design are assessed for their cost, schedule, safety, technical, and operational performance impacts.

7.2.7. Identifies areas of concern to the IMR in the case of major modifications.

7.2.8. Reviews and makes final safety of flight determination. The SM may delegate safety of flight determination IAW AFPD 62-6, *USAF Aircraft Airworthiness Certification*. Normally, this is the delegated MEA leader.

7.2.9. Recommends assignment of status prefix symbol “N” (special test permanent) according to Air Force Joint Instruction (AFJI) 16-401, *Designating and Naming Defense Military Aerospace Vehicles*.

7.2.10. Identifies aircraft flight test requirements for safety of flight determination as the result of modifications to aerospace vehicles.

7.2.11. Approves tailoring of waivers to military standards and specifications that will be used to document and accomplish the modification.

7.2.12. Sends an information copy of the T-2 modification package to the appropriate AFMC item manager or weapons system SM when requested.

7.2.13. Possesses PCI authority.

7.2.14. Reviews results of laboratory, ground, or safety of flight tests.

7.2.15. Issues temporary and final flight releases.

7.2.16. Addresses the following areas during revalidation:

7.2.16.1. Necessity of modification for current or future use.

7.2.16.2. Estimated demodification costs, if demodification is necessary.

7.2.16.3. Increased Programmed Depot Maintenance (PDM) cost as the result of revalidated modifications.

7.3. CCB Concept.

7.3.1. Engineering approval involves identifying and authorizing the specific changes to be made to the hardware and software. The hardware, software, and requirements they authorize must represent the configuration baselines. The purpose of the CCB is to control these baselines. They are documented in the form of weapon system specifications, drawings, software code listings, etc. The primary purpose of the CCB is to disposition proposed modification packages, waivers and deviations against these baselines The CCB functions as an advisory body to the CCB chairperson and meets at the discretion of the chairperson. The weapons system Single Manager (SM) has the CCB responsibility for their respective weapons systems. The CCB chairperson is the modification process approval authority and may approve deviations to normal procedures to accomplish modifications.

7.3.2. Configuration Control Board Delegation. The (SM) may delegate CCB and MEA to AFMC Test Centers and laboratory for the purpose of accomplishing T-2 modifications on test center- or laboratory-assigned and possessed aerospace vehicles. The CCB authority may not be delegated to other activities for the purposes of accomplishing T-2 modifications.

7.3.3. Major Modifications. All major T-2 modifications will be coordinated with the weapons system SM.

7.3.4. For additional CCB guidance, see MIL-HDBK-61, *Configuration Management Guidance* and AFMC Pamphlet 63-104, *IWSM Configuration Management Implementation Guide.*

7.4. CCB Membership. The CCB will be established with the following minimum membership to advise the chairperson in the discharge of responsibilities:

7.4.1. Safety.

7.4.2. Maintenance/logistics.

7.4.3. Engineering.

7.4.4. Operations.

7.4.5. Quality assurance/control.

7.4.6. Responsible Test Organization (RTO) (if CCB authority is not the RTO).

7.4.7. Responsible program SM (for major modifications).

7.4.8. Contracting. (When the modification effort requires contracting or involves a lease or loan agreement, identify contracting as part of the CCB membership.)

7.4.9. Configuration management.

7.4.10. Others as identified by the CCB Authority.

8. Procedures and Control. Guidelines for a typical implementation of this instruction are provided within this section. This instruction may be supplemented according to paragraph 17 to suit local requirements and capabilities.

8.1. Modification Phases. The modification process will be accomplished in the following phases: identification of modification requirements, preparation of the preliminary modification package, preliminary modification approval, modification design, CCB approval, modification, safety of flight determination, and demodification.

8.1.1. Identification of Modification Requirements.

8.1.1.1. Initial Identification. Early identification of a T-2 aircraft modification requirement is vital. As soon as a program with modification requirements is initiated, the organization that has modification management responsibility will be contacted by the Program Manager (PM). This contact will be made before preparing the modification request to ensure smooth transition into the modification process. (For more information, see T-2 Modification Lessons Learned, Attachment 2.)

8.1.1.2. Formal Identification. As soon as funding and schedule parameters allow, a modification request will be sent to the MEA by the PM. The AFMC test centers, organizations, and laboratory will use locally established funding processes.

8.1.2. Preparation of the Preliminary Modification Package.

8.1.2.1. Before initiating detailed design, a preliminary modification package will be prepared by the PM or his representative for MEA review and approval. The designated modification organization, with the assistance of the RTO and the organization initiating the modification, will prepare the package that will contain as a minimum the following:

8.1.2.1.1. An initial AFMC Form 244.

8.1.2.1.2. Preliminary hazard analyses.

8.1.2.1.3. Justification and HQ AFMC program directives (where applicable).

8.1.2.1.4. Preliminary design information, profile, and support engineering data, as available.

8.1.2.2. For major modifications, the responsible modification organization will send a copy of the package to the responsible SM (if applicable) before MEA review and coordination.

8.1.3. Preliminary Modification Approval.

8.1.3.1. Preliminary modification approval is authority to proceed with detailed modification design, at which time the functional baseline for the modification is defined. MEA is approval

authority.

8.1.4. Modification Design.

8.1.4.1. The final design must include all information necessary to fabricate, install, functionally check out, and verify safety of flight determination of the modification. The design must be accomplished with considerations for demodification. Approval from the SM is required whenever standard T.O. repair procedures are insufficient to restore the test article to the pre-modified configuration.

8.1.4.2. If the modification is major and with contracted engineering design, then the AFMC organization awarding the contract will conduct a PDR and a CDR. When aircraft with contracted modifications are to be flight tested by an AFMC test organization, that test organization must take part in the PDR and CDR. The test organization will participate in other reviews as requested by the MEA. If the modification is minor and with contracted engineering design, a PDR is desirable and CDR is required.

8.1.4.3. For those modifications with in-house design, a design review will be established.

8.1.4.4. A PDR will normally address the following areas:

8.1.4.4.1. Preliminary design data, including preliminary drawings, diagrams, and sketches.

8.1.4.4.2. System safety.

8.1.4.4.3. Preliminary analyses and tests.

8.1.4.4.4. Mass properties.

8.1.4.4.5. External stores compatibility.

8.1.4.4.6. Power requirements, subsystems compatibility, and electrical loads analysis.

8.1.4.4.7. Electromagnetic compatibility.

8.1.4.4.8. Operating restrictions.

8.1.4.4.9. Changes to performance, stability, and control.

8.1.4.4.10. Preliminary flight test plan for safety of flight determination.

8.1.4.4.11. Group B safety of flight determination.

8.1.4.4.12. Demodification plan.

8.1.4.4.13. Schedule.

8.1.4.4.14. Thermal design and constraints.

8.1.4.4.15. Human factors.

8.1.4.4.16. Corrosion control.

8.1.4.4.17. Interface requirements.

8.1.4.5. A CDR will normally address changes to scope, features and capabilities from those presented at the PDR. The CDR will also identify design and operating requirements or specifications not satisfied by the proposed design. In addition, the following areas should also be

included.

8.1.4.5.1. Final design data, including detailed design drawings and diagrams.

8.1.4.5.2. System safety.

8.1.4.5.3. Final analyses and tests.

8.1.4.5.4. Detailed mass properties.

8.1.4.5.5. External stores compatibility.

8.1.4.5.6. Detailed power requirements, subsystems compatibility, and electrical loads analysis.

8.1.4.5.7. Updated electromagnetic compatibility.

8.1.4.5.8. Strength summary and operating restrictions.

8.1.4.5.9. Changes to performance, stability, and control.

8.1.4.5.10. Flight test program for safety of flight determination.

8.1.4.5.11. Operation, maintenance, and inspection instructions.

8.1.4.5.12. Project equipment list.

8.1.4.5.13. Drawing list.

8.1.4.5.14. Lists of engineering analyses, tests, and reports.

8.1.4.5.15. Flight test plan.

8.1.4.5.16. Updated demodification plan.

8.1.4.5.17. Thermal design and constraints.

8.1.4.5.18. Human factors.

8.1.4.5.19. Corrosion control.

8.1.4.5.20. Interface requirements.

8.1.4.5.21. Software detailed design.

8.1.4.6. The CDR or the final in-house design review establishes the design baseline of the modification.

8.1.5. CCB Approval.

8.1.5.1. CCB approval is authority to proceed with the modification installation and is accomplished through the signing of the CCB directive by the CCB chairperson. CCB approval establishes the configuration baseline for the modification; however, change is a normal part of the modification process, and it is important that local procedures clearly define CCB involvement in design baseline changes. The changes must not affect critical flight systems, such as, flight controls or cockpit instruments, nor can the function of the software go beyond the functional range envisioned when the original T-2 modification was approved. Any alteration to design that meets the major modification criteria will cause the entire modification to be classified as major. If that occurs, major modification procedures apply.

8.1.6. Modification.

8.1.6.1. Normally, fabrication begins after the CDR for contracted modifications or after an internal design review for in-house modifications. Installation may only occur after CCB approval.

8.1.6.2. The responsible MEA will make sure a PCI is conducted when modification installation, design baseline changes, or demodifications are accomplished. The PCI is required before issuance of a flight release.

8.1.6.3. After the PCI, the responsible CCB authority ensures final documentation matches the current aircraft configuration.

8.1.7. Safety Determination. The MEA is responsible for ensuring design safety and safety of flight determination. The CCB approves the requirements for laboratory, ground, and flight tests.

8.1.8. Demodification. When flight testing is completed, the demodification plan (paragraph 12), certified during the MEA review and approval process (or as later amended), will be implemented, except as noted in paragraph 14.

8.2. Documentation Requirements. The T-2 modifications will be documented in a modification file that will be maintained by the organization possessing configuration control responsibility for the aerospace vehicles. For contracted T-2 modifications, the responsible organization will make sure that the modification is properly documented according to this instruction by using appropriate tasking in the Statement Of Work (SOW) and identifying the necessary data in the Contract Data Requirements List (CDRL). Portions of the file may be decentralized (e.g., drawings; Modification Flight Manuals; operation, maintenance, and inspection instructions; etc.); however, references to location of decentralized documents will be maintained in the modification file. A complete modification package will be provided to the gaining organization when an aircraft is transferred. When an aircraft is temporarily assigned to support test programs at other locations, a MOA between the affected organizations will address the transfer of T-2 modification packages. The modification file will contain, as applicable, the following:

8.2.1. Table of Contents for the entire modification package.

8.2.2. AFMC Form 244.

8.2.3. AFMC Form 272, **Physical Configuration Inspection *(PCI)* Report**.

8.2.4. AFMC Form 273, **Final Release for Flight Certificate**.

8.2.5. AFMC Form, 243, **Temporary Release for Flight Certificate**.

8.2.6. Preliminary hazards analysis.

8.2.7. Weight and balance data.

8.2.8. Inventory and disposition of equipment removed to facilitate the modification.

8.2.9. Stress and loads analysis.

8.2.10. Aerodynamic analysis.

8.2.11. Hydraulic load analysis.

8.2.12. Pneumatic load analysis.

8.2.13. Flutter analysis.

8.2.14. Ejection/jettison analysis.

8.2.15. Life support analysis.

8.2.16. Uncertified stores flight clearance.

8.2.17. Component safe for flight determination.

8.2.18. Electrical loads analysis.

8.2.19. Ground support equipment analysis.

8.2.20. T-2 modification wire list.

8.2.21. On-board calibration procedures.

8.2.22. T-2 modification acceptance test plan.

8.2.23. System maintenance concept.

8.2.24. Group B components maintenance and calibration procedures.

8.2.25. Periodic inspection and maintenance requirements.

8.2.26. Ground crew preflight procedures.

8.2.27. Ground crew operation checklist.

8.2.28. Aircrew operation checklist.

8.2.29. Modification flight manuals.

8.2.30. Ground crew postflight procedures.

8.2.31. Flight test plan.

8.2.32. Aircraft modification worksheets.

8.2.33. T-2 modification drawings list.

8.2.34. T-2 modification drawings.

8.2.35. Photographic records of T-2 modification installation.

8.2.36. Orange-bordered AFTO Form 781As, **Maintenance Discrepancy and Work Document**.

8.2.37. Design review meeting minutes.

8.2.38. CCB meeting minutes.

8.2.39. Orange-bordered AFTO Form 95, **Significant Historical Data**.

8.2.40. Waivers and deviations.

8.2.41. ASC/EN coordination for major modifications.

8.2.42. Man-hours and cost documentation.

9. Post Modification Acceptance (PMA). PMA will normally be completed prior to the PCI and before issuance of a flight release. The PMA consists of a ground-based checkout of the modification (when possible) to verify the following:

9.1. System operation.

9.2. Completion of electromagnetic interference and electromagnetic compatibility tests of the modification.

9.3. Modification satisfies the users' requirements as specified in the Program Introduction (PI) Document, Engineering Change Proposal (ECP), or AFMC Form 244.

9.4. Adequacy of the operation, maintenance, inspection instructions, and associated workcards. The PMA requirements will be recorded on an orange-bordered AFTO Form 781A, or a locally approved form, and discrepancies will be reported to the CCB. The PMA findings will be considered before release for flight test or issuance of flight releases.

10. Physical Configuration Inspection (PCI). A PCI will be conducted for each modification, design baseline change, or demodification before it is released for operation. The PCI is a detailed inspection of the modification to make sure that the installation was done as prescribed by the approved modification package. It requires, as a minimum, an inspection of hardware and documentation to include engineering drawings, approved changes, maintenance instructions, workcards, and weight and balance mass properties. The PCI may be done in phases or when the work is completed, depending upon the magnitude of work. When a PCI is completed, the organization performing the inspection will certify as to its accomplishment. All discrepancies observed during a PCI will be recorded on an orange-bordered AFTO Form 781A and reported to the cognizant CCB. The PCI findings will be considered before the release for flight test or issuance of the final safety of flight determination. The PCIs will be documented on an AFMC Form 272.

11. Safety Requirements. As a minimum, T-2 aircraft modifications will incorporate the following requirements:

11.1. Group B Safety of Flight Determination. The government PM, initiating government organization, or the government organization providing the equipment will determine the safety of flight of the Group B components and identify associated hazards and limitations. The component's determination will be documented using the AFMC Form 3, **Component Safety of Flight Certificate.** Final determination of safety of flight will rest with the T-2 MEA lead.

11.2. System Safety. The engineering design must include safety program requirements. These requirements will be determined by tailoring the current version of Military Standard (MIL-STD)-882D, *System Safety Program Requirements*, to the complexity of the modification and the degree of risk created by the modification. The SOWs will specify those safety program tasks required for the modification or equipment (Group B) development. Make sure the appropriate tasking is included for both modification and demodification when use of known or potentially hazardous agents are being considered.

11.3. Safety Review Board (SRB). The MEA will make sure a SRB, or equivalent review, is conducted to provide formal safety reviews of ground and flight-test plans associated with the modification (reference AFI 91-202 AFMCS1, *The US Air Force Mishap Prevention Program*). The SRB will include representatives from safety, engineering, operations, project personnel, maintenance, and other disciplines as appropriate, including the SM for major modifications

12. Demodification Plan.

12.1. This plan details the procedures necessary for return of the test vehicle to its premodification configuration. The demodification plan must be as complete as possible and should address such items as funding, disposition of removed Group A and Group B assets, location of basic aircraft equipment removed to accommodate the modification, and other areas which may not have been resolved during the modification. A demodification plan will contain enough detail to allow the MEA to approve the concept. The organization funding the modification is responsible for funding the demodification unless specific arrangements are formalized for other disposition.

12.2. The demodification plan must be reviewed, and approved by the MEA, as necessary, before the actual demodification. The demodification must be done after flight test is completed, unless the CCB determines that all or portions of the modification should be preserved to support known future test requirements or general support test programs (see paragraph 14 for revalidation).

12.3. The IMR procedures do not apply to demodification unless specifically requested by the MEA.

12.4. The demodification plan will include estimates of man-hours and cost required to return the modified aerospace vehicle or support equipment to its premodified configuration.

13. Flight Releases.

13.1. Final Flight Releases. The responsible MEA will issue an AFMC Form 273 for the aircraft after a PCI and positive safety of flight determination has been accomplished.

13.2. Temporary Flight Releases. When a final flight release cannot be issued (e.g., an incomplete modification/demodification not affecting flight safety or a program requirement), then an AFMC Form 243 of up to 180 days may be issued by the responsible MEA. Subsequent temporary flight releases may be issued, as deemed necessary, by the responsible MEA lead. Temporary flight releases cannot be utilized to retain residual T-2 modifications after flight testing is completed. (See paragraph 12.2.)

13.3. Major Modification Flight Releases. The responsible program SM will provide recommendations for release or nonrelease to the MEA.

14. Modification Revalidation.

14.1. The CCB authority may elect to retain all or portions of the modification through revalidation. Revalidation must be accomplished at least annually or at the completion of each test program.

14.1.1. To preserve some portion of the modification to be used on another program.

14.1.2. If portions of the modification cannot be removed without extensive damage and repair to the aerospace vehicle or system.

14.2. Revalidations can be made to either of the following:

14.2.1. An existing modification program.

14.2.2. A general test support program.

14.3. For revalidation due to paragraph 14.1.2, the CCB authority will gain a one-time concurrence from the SM prior to authorizing the revalidation. The CCB will ensure that analyses, tests, and installation necessary to qualify the residual modification comply with the current design criteria for per-

manent modifications. In the event that the SM does not concur, the test article will be fully demodified and the organization funding the modification will be responsible for funding the demodification.

14.4. Revalidation will be reviewed and approved by the responsible CCB authority who ensures adequate management and technical controls exist to document the residual configuration. The responsible program SM (if applicable) will advise the CCB on the affected areas of a major modification.

15. Contracted Modifications and Lease or Loan Agreements.

15.1. All organizations utilizing contractual support to accomplish T-2 modifications will comply with this instruction.

15.1.1. Purchase Request must be coordinated through the organization having test vehicle modification management responsibility during the modification installation to ensure the appropriate T-2 modification design standards and data are included. Instrumentation installed by contractors to support Test and Evaluation (T&E) is considered a T-2 modification regardless whether the aircraft has been accepted or unaccepted without a design baseline.

15.2. If a lease or loan agreement does not specifically require complete demodification upon lease or loan termination, or if the aerospace vehicle is to be returned in a modified configuration, a complete T-2 modification package will accompany the aerospace vehicle.

15.3. The responsible program SM will coordinate on all contracts, lease, and loan agreements involving aircraft requiring modification installation, flight test, or demodification and for which the government has assumed the risk of loss, damage, or destruction. This includes aircraft that have not undergone final acceptance by the government and aircraft provided as government furnished property. The documentation of the responsible program Single Managers coordination must comply with AFMCFARS 5345.310-91, *Maintenance and Flight Operations of Aerospace Vehicles and Related Support Equipment.*

16. Funding Reimbursement. Modification and demodification costs of an aerospace vehicle will be reimbursed by the requesting activity using locally established funding processes or processes similar to AFMCI 65-602, *Uniform Reimbursement and Pricing Procedures*. When modifications are done for organizations outside of AFMC, the agreements will call for reimbursement similar to the procedures in AFMCI 65-602.

17. Local Supplements. AFMC field activities may prepare locally approved supplements and forms, as required, to detail procedures. The local supplements must be coordinated through HQ AFMC/DOM prior to approval. Send one copy of the approved supplements and forms to HQ AFMC/DOM for informational purposes.

18. List of Prescribed Forms. AFMC Form 3, AFMC Form 243, AFMC Form 244, AFMC Form 272, and AFMC Form 273.

WILBURT D. PEARSON, Brig General, USAF
Director of Operations

Attachment 1

GLOSSARY OF REFERENCES, ABBREVIATIONS, ACRONYMS AND TERMS

References

AFI 21-101, *Maintenance Management of Aircraft*

AFI 63-104, *The Seek Eagle Program*

AFI 63-1101, *Modification Management*

AFI 91-202 AFMCS1, *The US Air Force Mishap Prevention Program*

AFJI 16-401, *Designating and Naming Defense Military Aerospace Vehicles*

AFMCFARS 5345.310-91, *Maintenance and Flight Operations of Aerospace Vehicles and Related Support Equipment*

AFMCI 65-602, *Uniform Reimbursement and Pricing Procedures*

AFMC Pamphlet 63-104, *IWSM Configuration Management Implementation Guide*

AFPD 62-6, *USAF Aircraft Airworthiness Certification*

AFPD 63-1, *Acquisition System*

MIL-HDBK-61, *Configuration Management Guidance*

MIL-STD-882D, *System Safety Program Requirements*

Abbreviations and Acronyms

AFFTC—Air Force Flight Test Center (Edwards AFB CA)

AFI—Air Force Instruction

AFJI—Air Force Joint Instruction

AFMC—Air Force Materiel Command

AFMCFARS—Air Force Materiel Command Federal Acquisition Regulation Supplement

AFMCI—Air Force Materiel Command Instruction

AFPD—Air Force Policy Directive

AFSEO—Air Force SEEK EAGLE Office (Eglin AFB FL)

AFTO—Air Force Technical Order

ASC/EN—Aeronautical Systems Center, Deputy for Engineering (WPAFB OH)

CCB—Configuration Control Board

CDR—Critical Design Review

CDRL—Contract Data Requirements List

ECP—Engineering Change Proposal

FAA—Federal Aviation Administration

FAR—Federal Acquisition Regulation

GFE—Government Furnished Equipment

GFP—Government Furnished Property

HQ AFMC—Headquarters Air Force Materiel Command

HQ AFMC/DOM—HQ AFMC Director of Operations Maintenance Division

HQ USAF—Headquarters United States Air Force

IAW—In Accordance With

IMR—Independent Modification Review

IOT&E—Initial Operational Test and Evaluation

MEA—Modification Engineering Authority

MIL-STD—Military Standard

MOA—Memorandum of Agreement

PCI—Physical Configuration Inspection

PDM—Programmed Depot Maintenance

PDR—Preliminary Design Review

PHA—Preliminary Hazard Analysis

PI—Program Introduction Document

PM—Program Manager

PMA—Post Modification Acceptance

RPV—Remotely Piloted Vehicle

RTO—Responsible Test Organization

SC—Statement of Capability

SM—Single Manager

SOW—Statement of Work

SPO—System Program Office

SRB—Safety Review Board

T&E—Test and Evaluation

T-2—Temporary 2

T.O.—Technical Order

UAV—Unmanned Aerial Vehicle

Terms

AFMC Test-Bed Aircraft—An aerospace vehicle that is assigned to AFMC for the purpose of providing long-term general test-bed capability in support of research and development testing, as well as operational testing and evaluation. This definition does not apply to an aerospace vehicle assigned to AFMC from another MAJCOM for a limited test period; that is, in support of a specific program for a specified duration.

Component Safety of Flight Certificate, AFMC Form 3—Verification that sufficient engineering or flight tests have been done to ensure safe flight of an aerospace vehicle or component within a specified envelope. This determination must also address the crashworthiness of the article.

Certification of Stores—The determination of a specific store or aircraft compatibility and the formal publication of all information necessary for appropriate employment of the store in the applicable technical and flight operations manuals.

Configuration Control Board (CCB)—A board composed of representatives from program or project functional areas; such as, safety, maintenance and logistics, engineering, operations, quality assurance and control, RTO, ASC/EN (major modifications), contracting, configuration management, and using or supporting organizations. The board recommends approval or disapproval of proposed modifications to the CCB chairperson. The chairperson makes the final decision on all modifications, design baseline changes, revalidation's, and demodifications unless otherwise directed by command policy. The CCB issues a directive to implement its decision (AFMC Form 244).

Contract Data Requirements List (CDRL)—The Contract Data Requirements List, DD Form 1423, is the standard format for identifying potential data requirements in a solicitation and deliverable data requirements in a contract. The CDRL is used to define data requirements, delivery requirements, approval criteria, references to tasking documents, and distribution statements. The compilation of specific CDRLs are exhibits to the contract. The CDRLs are specified as contract line items. With the exception of data specifically required by Federal Acquisition Regulation (FAR) or Defense Federal Acquisition Regulation (DFARS), the CDRL is the contractual instrument used to establish data requirements.

Critical Design Review (CDR)—A formal technical review of the detailed design of a modification. It will be conducted before fabrication or production design release so the detail design solutions satisfy performance requirements set by the PDR. Incremental reviews may be conducted instead of a single CDR.

Design Baseline—The baseline established by either the CDR (for contracted modifications) or the final in-house design review. This baseline delineates the necessary design interface requirements between the aerospace vehicle and the modification components (Group A and Group B).

Demodification—Removal of a modification (Group A and Group B components) related to a specific program/project.

EB-Coded Aircraft—Contractor test/test support: Aerospace vehicles provided to contractors as GFP in support of a prime Air Force contract. These aerospace vehicles will be utilized for complete system evaluation, testing to improve the capabilities of the designated aerospace vehicles, support of specific test programs, or production support. This code is for use as possession reporting identifiers only.

Final Flight Release—An AFMC Form 273 is issued to formally release an aerospace vehicle for mission use based upon sufficient engineering and flight tests to ensure safe flight within a specified

envelope. Final flight release implies completion of the modification installation and documentation or demodification process.

Flight Clearance—An authorization for flight after appropriate engineering analyses have been made that an aircraft and store combination precludes an unacceptable risk for a specific, limited purpose of a munition or other external store. The flight clearance attests to the physical, mechanical, electrical, and aerodynamic compatibility of the aircraft-store configuration. The flight clearance will specify flight limits for the loading configuration desired and tolerances on store physical properties to include weight, center of gravity, moments of inertia, and employment.

Functional Baseline Configuration—The initial configuration of the modification as approved by the CCB. This configuration reflects the functional requirements associated with the modification as described in the program directive, PI, ECP, or other modification program requirement documents.

Group A—The items to be installed as part of a modification to support, secure, interconnect, or accommodate the Group B components. In general, anything that cannot be readily removed, provides support, or provisions for equipment installation is considered Group A. Examples of Group A items are: electrical wiring, power junction boxes, brackets, oxygen lines, signal wiring, interconnect cabling, waveguide, racks, beams, longerons, skins, spars, stringers, intercostals, plates, seats, mounts, trays/ slides, fairings, lighting, and other structural support equipment for Group B items.

Group B—The equipment installed as part of a modification which is readily removable. Examples of Group B items: computers, printers, controllers, digital recorders, digital formatters, avionics encoders, antennas, radomes, and, in general, “black boxes.”

Independent Modification Review (IMR)—A detailed technical review of major modifications by ASC/EN personnel and the weapons system SM of the modification engineering data, impacted air vehicle characteristics, drawings, analyses, test plans, and changes to related flight manuals and operating and maintenance instructions required to ensure safe operation. Personnel having no prior involvement in the modification will accomplish this review.

Initial Operational Test and Evaluation (IOT&E)—The first phase of operational test and evaluation conducted on preproduction items, prototypes, or pilot production items and normally completed prior to the first major production decision. It is conducted to provide a valid estimate of a system's operational effectiveness and operational suitability prior to the first major production decision.

Memorandum Of Agreement (MOA)—A document signed by authorized representatives of organizations which are working together such as a program office and a test and evaluation activity. The agreement establishes the organizational relationships and agreements.

Modification Engineering Authority (MEA)—The engineering activity responsible for the safe integration of the T-2 modification into the aerospace vehicle.

Physical Configuration Inspection (PCI)—A detailed inspection of the modification to ensure the modification has been installed as prescribed in the modification package.

Post Modification Acceptance (PMA)—A power up, ground test, and functional checkout of the equipment/ modification to the maximum extent possible. During this system checkout, operation, maintenance, and inspection instructions will be evaluated for adequacy, and electromagnetic interference/electromagnetic compatibility test will be accomplished as required.

Preliminary Design Review (PDR)—A formal technical review of the basic approach for a modification design. It will be held after the preliminary design efforts are done, but before start of the detailed design.

Preliminary Hazard Analysis (PHA)—An analysis of hazardous conditions as an initial risk assessment of a concept or system identifying safety critical areas, evaluating hazards, and identifying the safety design criteria to be used.

Preliminary Hazard List—A list, identified in block 15 of the AFMC Form 244, which identifies potential hazards associated with the modification.

Program Introduction (PI) Document—The PI document officially introduces the test program to the support agencies. The PI is a long-range planning document submitted by a potential user to the support agency immediately upon identification of the scope and duration of program activity. The potential user should submit the PI using best available information, enabling the support agency to initiate resource and technical planning. This information, while sometimes fragmentary and incomplete, is of substantial value to the support organization in determining the scope of the program. For minor or short lead-time programs, the PI is designed to eliminate further documentation except for conduct of specific tests. The PI is submitted by a user to a range or test center to officially identify test support requirements. It should be initiated early enough to interface with test activity, fiscal, and planning cycles. The individual test activity should be consulted for assistance in preparation. When appropriate, the using command should assist in preparing the PI.

Program Manager (PM)—The designated individual assigned by an organization (i.e., the organization making the modification request in support of a project flight test) to oversee the project accomplishment.

Remotely Piloted Vehicle (RPV)—An aerospace vehicle that is remotely controlled. NOTE: For this instruction, an RPV is not considered a store and does not include guided bombs or missiles.

Responsible Test Organization (RTO)—The organization responsible for accomplishing the test program.

Revalidation—A method by which all, or portions, of a T-2 modification are retained after the project is completed. Documentation records are annotated to reflect the residual configuration as part of another modification program or a general test support program.

Safety-for-Flight/Safety Of Flight—The property of a particular air system configuration to safely attain, sustain, and terminate flight within prescribed and accepted limits for injury/death to personnel and damage to equipment, property, and/or environment. The intent of safety-for-flight clearance is to show that appropriate risk management has been completed and the level of risk (hazards to system, personnel, property, equipment, and environment) has been appropriately identified and accepted by the managing activity prior to first flight of the air system. Component safety of flight is documented on AFMC Form 3.

Safety Review Board (SRB)—A board convened to review the project flight test plan and the safety of flight determination flight test plan (if applicable) to make sure all hazards have been identified and considered.

Single Manager (SM)—The designated individual assigned the responsibility and delegated the authority for the centralized management of a particular system or program.

Software—A set of computer programs, procedures, and possible associated documentation concerned with the operation of a data processing system (compilers, library routines, manuals).

Statement of Capability (SC)—The SC is an activity's formal response to a request for test support listing capability and cost which, when signed, is a formal commitment of resources.

Stores—Any item suspended from a standard weapons station or in the bomb bays of an aerospace vehicle (e.g., bombs mounted on pylons, electronic countermeasure pods, missiles, external fuel tanks, and instrumentation pods and their suspension equipment).

System Program Office (SPO)—The organization comprising technical, business, management, and administrative personnel. The office may be augmented with additional personnel from participating organizations.

Temporary Flight Release—AFMC Form 243 issued for no more than 180 days for an aerospace vehicle, due to incomplete installation or documentation of a T-2 modification.

Unaccepted Aerospace Vehicle—Aerospace vehicles being procured on an Air Force contract that are past final assembly, yet have not been accepted as completed per contract requirements, nor has a DD Form 250 been signed to accept the vehicle.

Uncertified Store—The particular aircraft-store configuration is not authorized in Section 5 of the Flight Manual (-1 TO) or wherever aircraft-store limitations are depicted for the aircraft.

Unmanned Aerial Vehicle (UAV)—An unmanned aerospace vehicle with autonomous guidance and control capability. NOTE: For this instruction, a UAV is not considered a store and does not include guided bombs or missiles.

XY Coded Acft—Lease, Loan Aerospace vehicles or trainers on lease to commercial agencies or loaned to other governmental agencies for accomplishment of test or other projects. This code is for use as possession reporting identifiers only.

Attachment 2

T-2 MODIFICATION LESSONS LEARNED

The following lessons learned have been identified to assist program managers involved in T-2 modifications in developing effective T-2 modification program plans. The listing provides questions that are presented in chronological sequence, which provides the user with an outline that follows the modification process. Since this listing is not necessarily exhaustive, the individual initiating the T-2 modification is encouraged to contact the activity performing the T-2 modification to learn more about local lessons learned.

A2.1. Initial Contact With RTO.

A2.1.1. Has the planning PI been accomplished? Not using a PI for planning normally results in higher cost due to confusion as to the job content.

A2.1.2. Has the test approach been agreed upon? A vague test approach often results in high cost due to out-of-scope changes for reconfiguration and additional instrumentation.

A2.1.3. Has aircraft availability and suitability been addressed? Aircraft that are not operationally suitable or supportable, especially at off-site locations, have increased program costs in the past.

A2.1.4. Have certification requirements been established and coordinated?

A2.1.5. Have the requirements for utilization of existing DoD ranges, facilities, or other resources to support the T-2 modification been addressed (e.g., waivers, etc.)?

A2.2. Group B.

A2.2.1. Has Group B safety of flight determination been addressed? Rejection due to lack of analyses after design have, in the past, greatly increased program costs and stretched out modification schedules. Non-flight qualified hardware must be identified early in the program to ensure correct installation during the modification.

A2.2.2. Has AFSC DH l-X, Design Handbook, been used to design Group B components? In the past, non-use of this design handbook has resulted in high recertification and documentation costs.

A2.2.3. Have deliverable Group B components and data been addressed as items for delivery to the government under the Group B CDRL?

A2.2.4. If Group B cannot be delivered in time for use during modification, have arrangements been made for high fidelity (accurate size and mounting dimensions, electrical, waveguide, and cooling interfaces) Group B mockups? Failure of the mockup to accurately reflect Group B configuration has resulted in Group A rework with impact on program cost and schedule.

A2.2.5. Have spare components been identified and allowances made for procurement?

A2.2.6. Have arrangements been made for the contractor to supply peculiar system equipment and components to the modification facility?

A2.2.7. Have substitutions for long-lead items been addressed?

A2.2.8. Have the modification schedule and the Group B component delivery schedule been integrated?

A2.2.9. Has contractor peculiar instrumentation been identified? Lack of identification usually results in increased costs due to out-of-scope changes.

A2.2.10. Has the organization with aerospace vehicle T-2 modification CCB authority coordinated on all Group B contractual documents prior to contract award?

A2.3. Modification Planning.

A2.3.1. Have the modification requirements been clearly defined and conveyed to the activity performing the modification design? Failure to clearly define and convey the design requirements, coupled with requirement changes, are a significant source of rework. This will result in increases to modification program cost and schedule.

A2.3.2. Has complete funding for the modification been identified by source and fiscal year?

A2.3.3. Has demodification funding been identified by source and fiscal year?

A2.3.4. Is the modification a major modification? If so, has consideration been given to independent modification review, ASC/EN requirements, SM coordination, documentation, and contractor support for the modification?

A2.3.5. Has a decision been made to design the modification in-house or through a contractor?

A2.3.6. Has aircraft assignment by tail number been done?

A2.3.7. Is the flight testing of the modification considered hazardous? If so, has HQ AFMC/DOM been notified?

A2.3.8. Have modification marking, master power switch installation and polyvinyl chloride (PVC) wiring (described in MIL-STD-27733) been identified?

A2.3.9. Does the present modification schedule have any conflicts between Group B delivery, aircraft modification, and requirement for use of the vehicle for flight test? Have modification, post modification, maintenance interface, and checkout schedules been developed?

A2.3.10. Has the CCB authority been determined?

A2.3.11. Has the system safety preliminary hazard analysis been performed? Use of this technique often finds system deficiencies.

A2.3.12. Have the safety of flight determination flight test requirements been defined (pace, chase, photographic requirements, required test results, test technique, and schedule)?

A2.3.13. Have the responsibilities for Government Furnished Equipment (GFE) instrumentation been outlined (supply, format, calibration, and data reduction)?

A2.3.14. Has support GFE, such as, special aerospace ground equipment, including suitable substitutes and spares, been identified?

A2.3.15. Has an off-site support or range agreement been coordinated (special ramp and hangar facilities, safety zones, and power requirements)?

A2.3.16. Has an environmental assessment been done?

A2.3.17. Have radio and telemetry frequencies been coordinated with appropriate agencies?

A2.3.18. Have other support requirements, such as special construction, rehabilitation, new range facilities, or special use simulators, been identified?

A2.3.19. Have flight performance and operational systems impacts been carefully considered?

A2.3.20. Are there any known requirements for military specifications? Many military specifications have been deleted; therefore, a waiver may be required to invoke a military specification.

A2.3.21. Are there any known requirements for waiver of military specifications?

A2.3.22. Has consideration been given to Programmed Depot Maintenance impacts coming due during the modification installation duration? This issue can result in schedule and cost impacts if the modification Group B equipment must be removed and reinstalled to support aircraft maintenance. These costs are normally borne by the organization requesting the modification.

A2.3.23. Have fabrication and assembly processes been identified and their capabilities assessed and/or have constraints related to fabrication and assembly processes been communicated to the activity performing the design? Failure to consider manufacturing process capabilities during the design process often results in expensive rework of designs and/or manufacturing.

A2.4. Modification Phase.

A2.4.1. Have firm Group B delivery schedules been set up and have these schedules been checked for impact on the overall modification timetable?

A2.4.2. Have long-lead time items been delivered or reasonable substitutes found or has a delivery schedule been agreed to that does not affect the modifications?

A2.4.3. Has design data for the modification been approved?

A2.4.4. Have mockups been delivered if it was agreed that the Group B items would not be available for the modification, fabrication, and installation phase?

A2.4.5. Have quality assurance inspections been scheduled and done (in progress, blind area close-out, final, and functional)?

A2.4.6. Has the detailed fabrication and installation plan been coordinated?

A2.4.7. Has on-site contractor support been obtained?

A2.4.8. Have Base support agreements at test operating locations been completed?

A2.4.9. Have maintenance support agreements at operating locations been completed?

A2.4.10. Have special maintenance support equipment been delivered and have special maintenance agreements been formalized?

A2.4.11. Have disposition instructions (storage, shipment, turn-in) been developed and implemented for basic aircraft equipment removed to accommodate the modification? Do these instructions address reinstallation requirements at demodification?

A2.4.12. Have control measures, such as, caution and warning notes identified in the PHA and failure mode, effects, and criticality analysis that affect operations and maintenance, been incorporated in modification flight manuals and maintenance instructions?

A2.4.13. Have incapable fabrication and assembly processes been improved, new processes developed and/or design robustness improved to ensure all such processes are capable?

A2.5. Demodification.

A2.5.1. Has a demodification schedule and funding profile been coordinated?

A2.5.2. Have requirements for functional check flights after completion of the demodification been identified?

A2.5.3. Has a disposition of the removed Group A and Group B components been coordinated?

A2.5.4. Has the possibility of revalidation been considered versus demodification?

A2.5.5. Have follow-on test requirements been identified?

A2.5.6. Has the impact of the demodification on other test programs been identified?

A2.5.7. Has a return agreement to other major commands (assumes aircraft not from AFMC inventory) been completed?

A2.5.8. Have transfer inspection requirements been identified?

A2.5.9. Has a requirement for revalidation of flight and technical manuals been addressed?

A2.5.10. Have residual special maintenance requirements been addressed?

A2.5.11. Has recertification of basic aircraft systems been addressed if those systems were affected by the modification?

A2.5.12. If the demodification requires the reinstallation of standard aircraft equipment (-21 equipment such as a gun), has reprocurement of the aircraft equipment been considered?