

**BY ORDER OF THE COMMANDER
EDWARDS AIR FORCE BASE**

**EDWARDS AIR FORCE BASE
INSTRUCTION 99-101**



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Test and Evaluation

412 TW TEST PLANS

COMPLIANCE WITH THIS INSTRUCTION IS MANDATORY

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This Edwards Air Force Base Instruction (EDWARDSAFBI) implements Air Force Instruction (AFI) 99-103, Capabilities-Based Test and Evaluation, by establishing the responsibilities and local procedures for the development, review, and approval of test plans for the 412th Test Wing (412 TW). The ultimate goal is to develop technically robust test plans which provide relevant, high-confidence planning to decision-makers. It applies to all test plans where 412 TW resources will be used or at risk, even when the 412 TW has no technical analysis and reporting responsibility. This instruction does not require tiers at or below the Wing level. Waiver authority for this instruction is the 412th Test Wing Commander. This instruction addresses development, review, and approval of test plans from a technical point of view. Test safety planning and review is covered by the Air Force Test Center Instruction (AFTCI) 91-202, *AFTC Test Safety Review Process*. Technical reporting is covered by EDWARDSAFBI 99-103, *412 TW Technical Report Program*. Ensure that all records created as a result of processes prescribed in this publication are maintained in accordance with (IAW) Air Force Manual (AFMAN) 33-363, *Management of Records*, and disposed of IAW Air Force Records Information Management System (AFRIMS) Records Disposition Schedule (RDS). There are no prescribed forms for the processes described in this instruction. Refer recommended changes and questions about this publication to the Office of Primary Responsibility (OPR) using the AF Form 847, *Recommendation for Change of Publication*; route AF Form 847 from the field through the appropriate functional's chain of command. The use of the name or mark of any specific manufacturer, commercial product, commodity, or service in this publication does not imply endorsement by the Air Force.

SUMMARY OF CHANGES

This document has been substantially revised and must be completely reviewed. Major changes include revisions to reflect changes to processes. The primary changes include adding text aligning with AFTCI 91-202 for use of combined test and safety review boards and inclusion of AFTC guidance for defensible test and evaluation. Guidance on how to conduct technical review boards was removed. References to other instructions were updated and appendices 3 through 8 were removed.

1. Policy

- 1.1. Test plans are required for all tests where 412 TW resources will be used or are at risk.
- 1.2. All test plans involving 412 TW resources will receive an independent technical review. Test plans for tests conducted by the 412 TW and for which the 412 TW has technical analysis and reporting responsibilities must include the content outlined in this instruction. When the 412 TW is a participating test organization (PTO) or does not have technical analysis and reporting responsibilities, test plans must contain sufficient content and detail for the technical review authority (TRA) to determine the tests are an appropriate use of 412 TW resources and whether there are any significant technical risks.
- 1.3. Changes to existing test plans must also be reviewed.
- 1.4. An independent safety review of all test plans is required to identify potential hazards, determine risk mitigations, and assess residual risk in accordance with AFTCI 91-202 for all tests using 412 TW assets. This is usually accomplished by the Safety Review Board (SRB). The document package containing the test and safety plan is referred to here and in AFTCI 91-202 as the “test package”. Both technical and safety reviews (up to and including approval) must be completed before testing begins.

2. Responsibilities.

- 2.1. Senior Leadership (412 TW Authorities).
 - 2.1.1. Coordinate, approve, and review test packages.
 - 2.1.2. Assign a 412 TW test unit as a liaison to assist non-412 TW organizations seeking approval to test at the 412 TW.
- 2.2. 412 TW Technical Director (412 TW/CT).
 - 2.2.1. Set policy for the test plan development, review, and approval process.
 - 2.2.2. As the Office of Primary Responsibility (OPR) for technical reviews, ensure that all test plans involving 412 TW resources receive an independent technical review. The Technical Director (412 TW/CT) may keep technical review authority or may designate a Test Wing engineering group, engineering squadron or equivalent as the TRA. Test Pilot School (TPS) student Test Management Project (TMP) test plans are automatically assigned TPS/CT as TRA unless TPS/CT determines that a higher level of TRA is required.
 - 2.2.2.1. The TRA should have expertise in all the test areas to allow adequate review of the test plan or shall request assistance from the appropriate 412 TW organizations.

2.2.2.2. The TRA will ensure an independent technical review is accomplished in accordance with AFI 99-103 and this instruction.

2.3. Technical Reviewers (Test experts from 412 TW engineering, operations, and maintenance/logistics organizations).

2.3.1. Support the 412 TW test plan technical review process IAW this instruction.

2.4. Combined Test Force (CTF) Commanders (or equivalent).

2.4.1. Support the 412 TW test plan technical review process. The CTF test conductors and project pilots will support technical reviews of the projects to which they are assigned. When requested, CTF project pilots and other personnel are required to provide independent reviews of other test programs or activities.

2.5. CTF Chief Engineer (or equivalent).

2.5.1. Train, guide, and direct test teams to ensure satisfactory test plan development.

2.5.2. Request expert technical assistance from the appropriate engineering offices within the 412th Test Wing as early as possible during test plan development to ensure the best possible test plan.

2.5.3. Ensure 412 TW engineering personnel prepare detailed test plans or make thorough and timely test plan inputs through test team meetings (or other means) to the entities who are preparing test plans so that the resulting plans comply with this instruction.

2.5.4. Ensure test plans are prepared in compliance with this instruction and are of sufficient quality before they are submitted for technical review. Ensure test plans are submitted for technical reviews in time to allow comprehensive technical and safety reviews and to meet program requirements and schedules.

2.5.5. Ensure completion of technical review action items and incorporation of recommended test plan changes. When exceptions exist (described in section 3.4.1.3.), document the rationale for the exceptions and incorporate this document into the test package as described in section 3.4.2.

2.5.6. Ensure proper test plan distribution after approval.

2.5.7. Identify a Project Test Lead as the test team point of contact and focal point for ensuring that requirements of this instruction are met prior to and during all phases of test.

2.6. Test Expert Organizations (412 TENG, 412 EWG, 771 TS, 772 TS, 773 TS, 775 TS, 412 MXLS, USAF TPS).

2.6.1. Provide expertise to aid in test planning, develop analysis capabilities, support technical reviews, and train testers in all aspects of the process described in this instruction.

3. Procedures.

3.1. Overall Process. Detailed test plan development involves three general steps: planning tests, technical reviews of test plans, and submitting test plans for approval. Attachment 2

shows the overall process for detailed test plan development. The test team is responsible for planning the test and drafting the test plan document. When the Chief Engineer deems the plan is ready for independent review, he/she submits it with a request for review to 412 TW/CT. The independent technical review is conducted by 412 TW/CT or his/her delegate. After the review is completed, recommendations and action items are provided to the test team. The test team provides the updated version of the plan along with their responses to recommendations and action items to the technical review authority (TRA). The TRA generates a technical review memorandum (TRM) to document the status of the test plan and any residual technical risk. Final approval of the test plan occurs when the test package is approved IAW AFTCI 91-202. The following paragraphs amplify significant parts of the process.

3.2. Developing the Test Plan. The CTF Chief Engineer will ensure that a test plan is prepared to meet the objectives mutually agreed to by the 412 TW, the system program office or other customer and participating agencies.

3.2.1. Test teams will note deviations from published technical orders or flight manuals in the test plan and incorporate safety planning as required during the risk assessment process IAW AFTCI 91-202.

3.2.2. Test plans come in a variety of formats and styles. Regardless of format, the test plan must contain: objectives, instrumentation requirements, data analysis plan, test techniques, test points, limitations, and management information. Test plans document why tests will be accomplished (the objectives), how tests will be accomplished (the test techniques and test points), what data will be acquired (the instrumentation requirements), how data will be used to answer the objectives (the data analysis plan), why the test may not be fully successful (limitations as applicable), and when and what type of report is needed (management information). A test can be a ground or flight activity to gather specific information, answer a customer's question, or provide information not wholly covered by an approved instruction/training manual.

3.2.3. Data Analysis Plan. Regardless of format, the data analysis plan must clearly indicate: measures of performance (MOPs) defined in terms that can be measured, required parameters, collection methods, initial quality check methods, algorithms and tools to be applied, tool validation methods, analysis methods (explain why the method was selected), completion criteria, evaluation criteria stated in terms of the MOPs (if applicable), and evaluation products.

3.2.4. Use of scientific test and analysis techniques (STAT) or statistical methods. There is no single STAT approach that fits every situation, and not all tests require the use of STAT. However, test teams will include in the test plan, or equivalent document, a statement regarding whether or not STAT is used. When STAT is used, the statement will highlight the applicability to the test as well as any limitations of the methods to be used. When STAT is not used, the statement will include the reason.

3.2.4.1. Test teams shall work with statisticians from the 812 TSS and their technical experts to incorporate scientific test and analysis techniques (STAT), or statistical methods, when planning tests. STAT are the scientific and statistical methods and processes used to enable the development of efficient, rigorous test strategies that will

yield defensible results. If statistical analysis is not planned, justification must be provided in the test plan or an equivalent document.

3.2.4.2. In addition to the data analysis plan content described above, the body of the test plan or the data analysis plan will include the following, as applicable: statistical power and confidence (or other statistical measures of merit) for measures of performance (MOPs), the test conditions believed to influence system performance (including which conditions will be measured and recorded, which conditions will be varied, and which conditions will be held constant), and the number of test points (including justification of selected test point, what algorithm was used to place points in the test space and the criteria for maximizing information obtained from the test).

3.3. Review of the Plan. In order to ensure proper and adequate preparation and planning, a thorough technical review is required of test plans and associated data analysis plans. Reporting requirements, the report schedule, and the data analysis plan will be reviewed in addition to other elements of the test plan as part of the technical review process.

3.3.1. When a test project is ready for independent review, the chief engineer will send a request for technical review to the 412 TW/CT. The chief engineer will ensure that the following items are submitted to the reviewers as part of or alongside the test plan: the data analysis plan, the reporting requirements, and the analysis/report schedule.

3.3.2. The 412 TW/CT may keep TRA at the Wing level or may designate an engineering group or squadron as the TRA. If the TRA does not have sufficient expertise in the appropriate areas, they shall request assistance from 412 TW operations, engineering, maintenance, and/or logistics organizations. All of these organizations will support the technical reviews as requested by the TRA. The intent of a technical review is to establish a group of experienced personnel not intimately associated with the project to provide an independent technical assessment and executive review of the plan.

3.3.3. The TRA shall conduct a technical review. In accordance with AFI 99-103, “as a minimum, technical reviews will assess test requirements, techniques, approaches, and objectives” and “will ensure that environmental analyses have been completed as required by AFI 32-7061, *The Environmental Impact Analyses Process*, and are referenced in the test plan.”

3.3.3.1. Technical review boards (TRBs) are the normal method of accomplishing a technical review. This is especially true when: there are multiple engineering disciplines involved; the test, analysis, or system under test are especially complex; envelope expansion or other elevated risk testing is involved; and/or new test or analysis methods will be applied. The 412 TW/CT will approve when the review method will be anything other than a TRB.

3.3.3.1.1. The test team may request a combined TRB/SRB in lieu of separate technical and safety reviews to minimize impact to resources and shorten the timeline. Teams shall contact the TRA and the Test Safety office for final determination on this course of action. Teams will ensure that the test plan is sufficiently mature for safety review prior to the combined TRB/SRB (ref AFTCI 91-202). In cases where a combined TRB/SRB is elected, teams will work with both the TRA and the Test Safety Office (SET) to schedule the meeting.

3.3.3.1.2. The TRA will ensure that the board is made up of experienced personnel to include at least one or more independent representative(s) from engineering (412 TENG and/or 412 EWG). Additionally, the TRA will ensure the board includes an experienced, independent operations representative unless the proposed test methodology is sufficiently innocuous or independent of operator involvement that an operations representative is deemed unnecessary. The TRA will also ensure the TRB board includes a member of the 812 TSS Statistical Consulting Flight when appropriate. The TRB members will be chosen on the basis of their experience in the areas addressed in the test plan. The expertise should not be limited to that dictated by the test program objectives, but should be broad enough for these individuals to critically review all aspects of the planned test. Ideally, the operations and engineering personnel on the TRB should be the same as those who will participate in the safety review process. Therefore, the chief engineer shall inform the TRA of any personnel already identified as safety reviewers. The TRA may select those personnel or others who would best fit the technical review requirements. The chief engineer, operations, and engineering personnel responsible for conducting and supporting the test program will participate in the review as consultants. Appropriate customer and contractor representatives may also be invited.

3.3.3.1.3. The Project Test Lead shall coordinate with the TRA to determine the date for the TRB. The test team shall ensure the complete test plan with data analysis plan is distributed to all participants at least five working days before the TRB meeting.

3.3.3.1.4. All required TRB members will meet in one location. When this is not possible, at a minimum, the TRB chair, members, and key test team personnel will meet in one location with other parties available via video conference or telephone conference call.

3.3.3.1.5. Action items and recommendations will be identified throughout the TRB. All changes to the test plan, other than strictly editorial, must be discussed and agreed upon by the TRB members during the TRB meeting or during the action item closure phase.

3.3.3.1.6. The TRB chair will draft a summary document of the TRB. The draft TRB summary document will cover significant discussion topics and include the action items and recommendations. The test team will provide updates to the TRB members as they address the action items and recommendations. The TRB chair and members will assess the test team responses and update the TRB summary document to reflect the appropriate status of the action items. The TRB summary, including a list of attendees, will accompany the test plan during final coordination and approval as an attachment to the TRM.

3.3.3.2. When an alternative to the TRB meeting is approved by 412 TW/CT, the TRA shall ensure that a thorough independent review is accomplished and any feedback is provided to the responsible test team. When a TRB meeting is not convened, the test team will support the detailed technical review process by

maintaining communication with the TRA and providing responses to reviewer questions and requests as soon as possible.

3.4. Finishing and Submitting Test Plan for Approval.

3.4.1. Technical Review Memorandum. Following the technical review, the TRA will generate a technical review memorandum (TRM) to the CTF chief engineer summarizing the technical review. When the 412 TW is the executing test organization (ETO), the TRM will indicate whether a test plan is considered technically adequate to meet the stated objectives, whether there are any significant technical risks, and shall include a statement regarding the level to which STAT has been applied. When the 412 TW is a PTO or does not have technical analysis and reporting responsibilities, the TRM will indicate whether a test plan is a reasonable use of 412 TW resources and whether there are any significant technical risks. The TRA will provide a copy of the TRM to the 412 TW/CT.

3.4.1.1. The TRA will use the TRM to document: who conducted the review; the current technical status and risks of the test plan; any additional recommendations and/or open action items; whether the test team considered the statistical relevance of their approach in the test design; and the test reporting plans. In the TRM, the TRA should classify test plan status as follows: adequate to meet the test objectives; adequate to meet the test objectives after recommended changes are incorporated; appropriate use of 412 TW resources (used only where the 412 TW has no technical responsibility); inadequate to meet the test objectives; or inappropriate use of 412 TW resources. If either of the last two situations exists, the TRA must notify the 412 TW/CT as soon as possible.

3.4.1.2. When a TRB meeting is held, the TRM attachments will, at a minimum, include the TRB summary document with action items and attendance list. The action items will be given along with the test team responses and closure status as judged by the TRA.

3.4.1.3. The test team will modify the test plan to incorporate the appropriate recommendations from the technical review. If there are recommendations or action items which are not addressed in a test plan revision, the exceptions will be noted in the TRM. The test team will provide reasons for the exceptions to the TRA so that they can be incorporated in the TRM. In the case of exceptions to recommendations or action items, the TRA will notify the 412 TW/CT when providing the copy of the TRM so that increased technical risk can be noted and addressed.

3.4.2. Package Preparation. Following the issuance of the TRM, the CTF chief engineer will ensure that the test team prepares a package that includes the test plan, signature page, TRM, and, if any exceptions exist, a memorandum for record explaining reasons for exceptions to the recommendations or action items. These documents will be included in test package as specified in AFTCI 91-202.

3.5. Test Plan Approval. The test plan will be approved as part of the test package IAW AFTCI 91-202.

3.6. Distribution of the Test Plan. The chief engineer shall ensure distribution of the approved test plan to: Defense Technical Information Center (DTIC), the Edwards AFB

Technical Research Library, the AFTC History Office (HO), the TRA, and to organizations requiring the plan for participation or support. Test Pilot School student TMP test plans are part of the instructional process and thus will not be distributed to DTIC, AFTC/HO, or the Edwards AFB Technical Research Library. These plans will be archived, if required, within TPS and are considered TPS internal-use documents.

4. Test Plan Changes. The CTF chief engineer shall ensure that the test team documents test plan changes and the reasons for it. For both minor and major changes, the office responsible for the original technical review (the original TRA) shall be provided a copy of the modified test plan and the change documentation. The CTF chief engineer shall consult with the TRA to determine whether a change is minor or major. All test package changes, whether to the test plan or safety package, are documented IAW AFTCI 91-202.

4.1. **Minor Changes.** Minor changes include: changing flight conditions of test points as long as they remain close to existing points and within the envelope of test points approved in the original plan; adding test points within the envelope of test points and technical scope approved in the original plan; and deleting test points if preliminary results validated by a technical expert show they are unnecessary and are not part of a safety build-up. Other than the previously mentioned consultation review to determine change category, a minor change does not require a new technical review. The CTF chief engineer must generate a memorandum amendment documenting the change, the reasons for the change, consultation with the TRA, and the determination that changes are minor. The format and coordination/approval process for the memorandum amendment shall comply with AFTCI 91-202. The test team shall provide a copy of the memorandum amendment to the TRA and add the memorandum amendment to the test package when it is approved.

4.2. **Major Revisions.** A major revision is defined to be any substantive change to test objectives, technical approach or test methodology, or changes to test procedures or test scope. For a major change, the technical review and approval process are identical to that for the original test plan. Based on the change documentation provided by the chief engineer, the TRA will determine whether a TRB meeting is required. In determining the need for a TRB meeting, the TRA will consider the extent of the changes, results of testing to date, predicted results of proposed testing, and other pertinent details. Whether a serial technical review is accomplished or a TRB meeting is held, the TRA will document the results of the technical review in a TRM, as mentioned in paragraph 3.4.1. The TRM must be included in the test package when it is amended in accordance with AFTCI 91-202.

4.3. **Change/Revision Approval and Distribution.** The test package amendment will be approved IAW AFTCI 91-202. The CTF chief engineer shall ensure distribution of the approved test plan to organizations requiring the plan for participation or support.

5. Closure. As indicated in AFTCI 91-202, the closure amendment is the final step in the overall safety review process. At the time the closure amendment is generated, the final version of the test plan will be archived in DTIC and the Edwards AFB Technical Research Library.

CARL E. SCHAEFER, Brigadier General, USAF
Commander

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

AFI 99-103, *Capabilities-Based Test and Evaluation*, 16 October 2013

AFMCI 99-103, *Test Management*, 22 November 2004

AFTCI 91-202, *Air Force Test Center Test Safety Review Policy*, 12 April 2016

EDWARDSAFBI 99-103, *412 TW Technical Report Program*, 29 August 2013

AFMAN 33-363, *Management of Records*, 1 March 2008

AFI 32-7061, *The Environmental Impact Analysis Process*, 12 March 2003, certified current 28 March 2014

Adopted Forms

AF Form 847, Recommendation for Change of Publication

Abbreviations and Acronyms

AFB— Air Force Base

AFTC— Air Force Test Center

AFTCI— Air Force Test Center Instruction

AFI— Air Force Instruction

AFMAN— Air Force Manual

AFMC— Air Force Materiel Command

AFMCI— Air Force Materiel Command Instruction

AFPD— Air Force Policy Directive

AFRIMS— Air Force Records Information Management System

CTF— Combined Test Force

DoD— Department of Defense

DoDI— Department of Defense Instruction

DTIC— Defense Technical Information Center

EDWARDSAFBI— Edwards Air Force Base Instruction

ETO —Executing Test Organization

IAW— In Accordance With

MOP— Measure of Performance

OPR —Office of Primary Responsibility

PTO— Participating Test Organization

RDS— Records Disposition Schedule

SET— Test Safety Office

SRB— Safety Review Board

STAT— Scientific Test and Analysis Techniques

THA— Test Hazard Analysis

TMP— Test Management Project

TPS— Test Pilot School

TRA— Technical Review Authority

TRB— Technical Review Board

TRM— Technical Review Memorandum

TW— Test Wing

Attachment 2

412 TW TEST PLAN PROCESS OVERVIEW

Figure A2.1. 412TW Test Plan Process Overview.

