412TW-TIH-20-01

TEST PLAN AUTHOR'S GUIDE

Office of the Technical Director

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VERSION 00

TECHNICAL INFORMATION HANDBOOK

412TH TEST WING
EDWARDS AIR FORCE BASE, CALIFORNIA
AIR FORCE MATERIEL COMMAND
UNITED STATES AIR FORCE

This technical information handbook (412TW-TIH-20-01, *Test Plan Author's Guide*) replaces AFFTC-TIH-93-01, *Air Force Flight Test Center Test Plan Preparation Guide* (Reference 1). This handbook was submitted by the Engineering Directorate, 412th Test Wing, Edwards AFB, California 93524-6843.

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This handbook provides guidelines promoting commonality and consistency across 412th Test Wing (412 TW) test plans. This handbook is a companion to the 412 TW Test Plan Template. First time authors should read this handbook before attempting to use the template, as this handbook contains basic test plan development philosophy and clarifying information. The template contains critical content guidance for every section and element in the test plan.

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TABLE OF CONTENTS

INTRODUCTION

This handbook provides guidelines promoting commonality and consistency across 412th Test Wing (412 TW) test plans. This handbook is a companion to the 412 TW Test Plan Template. First-time authors should read this handbook before attempting to use the template, as this handbook contains basic test plan development philosophy and clarifying information. The template contains critical content guidance for every section and element in the test plan. An example of the template is included in Appendix A; for the most current MS Word version, consult your Technical Editor.

This handbook is intended to provide overall guidance and not line-by-line instruction, allowing test plan authors and test teams the flexibility to tailor test plans to specific test programs. Engineering squadron-specific guidance and consultations with technical experts and the chief engineer should provide additional detail to complement this handbook. Although this guide and template are intended to promote consistency, variations may be desired in formatting or section organization (e.g., developmental test (DT)/operational test (OT) combined test plans or joint service test plans). Additionally, test teams may choose from a variety of mediums (e.g., documents, slide presentations). In those cases, this guide should still be consulted to ensure the inclusion of necessary content.

Authors assemble and use test plans to communicate the technical details and logistics required to execute and report results of flight, ground, and laboratory tests of air vehicles, subsystems, and components. Likewise, test plans provide context to 412 TW leadership, program office (PO) and test support personnel, and other testers, giving the reader a better understanding of the test objectives and methodologies for the system under test (SUT). Test teams should also keep in mind that approved test plans serve as archival documents for the capture of test and evaluation enterprise knowledge for future test efforts.

This handbook is not intended to cover the entire test preparation and execution process. For those details, see EdwardsAFBI 99-101, *412 TW Test Plans* (Reference 2), EdwardsAFBI 99-105, *Test Control and Conduct* (Reference 3) and AFTCI 91-202, *AFTC Test Safety Review Policy* (Reference 4).

This handbook does not include guidance for test plan classification markings, which is covered by DoDM 5200.01, Volume 2, *DoD Information Security Program: Marking of Classified Information* (Reference 5). If a portion of test plan content is expected to be classified, test teams should consider whether to classify the entire test plan or to place all classified content in an appendix published under separate cover, leaving the bulk of the test plan unclassified.

KEY CONCEPTS FOR SUCCESSFUL TEST PLAN WRITING

1. **Test Engineer Preparation is Critical** – Authors should understand the technical details of how the system is designed to work and the associated requirements for verifying the design. This preparation is essential for a test design that balances test support requirements, program risk, and defensible data that answer the right questions. By clearly and concisely detailing program requirements and methodologies in a well-organized test plan, the test team provides enough detail for another experienced test team to pick it up and execute the test.
2. **Get Involved Early** – Authors should get involved in the system development program early to help identify potential problems as soon as possible in order to save time and trouble in the long run. The earlier that testers get involved, the more impact they can provide for how best to plan testing the system, including: appropriate documentation, DT and OT involvement, determining test strategy, and early acquisition of long-lead-time assets. Test plan writing will go faster and smoother, avoiding interruptions and requiring fewer revisions.

3. **Leverage Prior Experience Wisely** – Test teams are rarely doing the first-ever test of its kind and are discouraged from reinventing the wheel. Lessons learned over multiple programs can aid in choosing the best test approach; experienced personnel should provide guidance to new authors to avoid repeating past mistakes. However, test teams are strongly cautioned against simply copying and pasting content from previous test packages, as even minor differences in the SUT or previous test methodology may not be appropriate for the current test effort.
4. **Clearly Understand Customer Requirements** – Test requirements are derived from warfighter needs. Test scope, test objectives, and final deliverables must capture customer requirements with an agreed upon level of technical rigor, requiring coordination with all stakeholders (i.e., any organization including contractors/vendors that produce, consume, analyze, and/or report the test data). Often, initial customer requirements and expectations must be clarified to achieve an effective document. Example customer requirement sources include: Capabilities Development Document (CDD), Capability Productions Document, and Operations Requirement Document (ORD). Additionally, requirements may be generated by the test team and coordinated with the customer, such as system regression objectives and military utility assessments.
5. **Consider Both New and Legacy Capabilities** – New capabilities tend to grab the attention of the stakeholders and require in-depth scrutiny. However, sometimes the system changes that add new capabilities can impact previously existing (also known as legacy) capabilities. Test teams should understand the potential interactions among systems, and test the critical legacy capabilities (regression testing) that are most likely to be affected.
6. **Include and Maintain Traceability** – The test plan is critical to defining the test methodology and data requirements that support the conclusions and recommendations addressing customer requirements. System requirements drive test objectives from which measures of performance (MOPs) can be developed. Testing generates data that are analyzed to derive conclusions and recommendations, which then answer test objectives and inform system requirements (Figure 1).

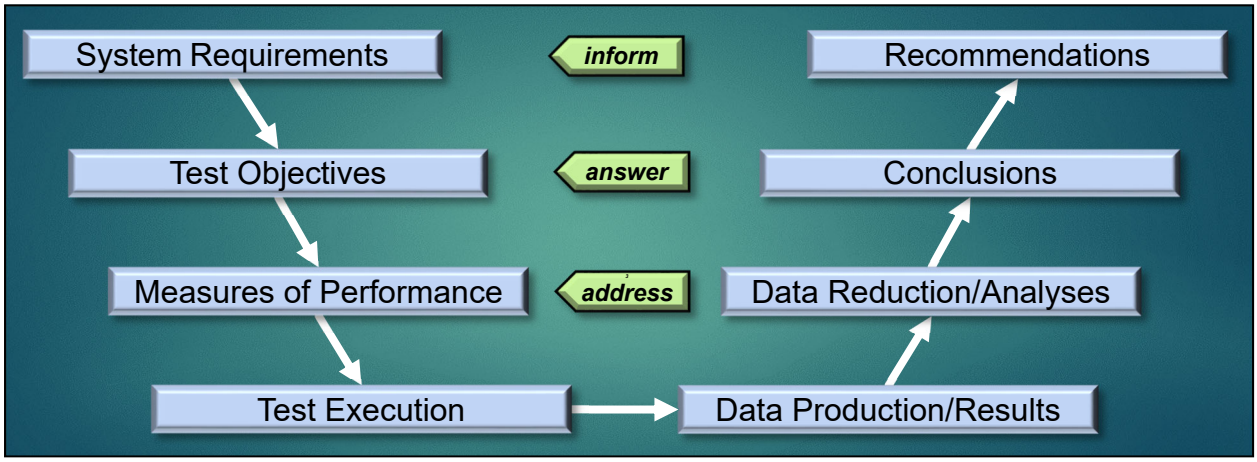


Figure 1 Requirements Traceability[1]

7. **Anticipate Final Deliverable(s)** – Well-written test plans serve as the foundation for successful test reports and are key to streamlining the test reporting process. Conceptualizing how test results will be presented can sharpen the test plan by identifying inconsistencies and revealing areas requiring more (or less) emphasis.

[1] Abbreviations, acronyms, and symbols in all figures and tables are defined in Appendix B.

8. **Distinguish between Technical and Safety Requirements** – Test teams should distinguish between technical requirements and safety requirements to maintain a clear understanding of the reasons behind those requirements. Separating requirements ensures test teams prioritize safety over data during execution. These distinctions allow teams to properly provision a specific mission in the event individual items become unavailable. For example, if a safety-of-flight (SOF) parameter became unavailable during a mission, the aircraft would return to base, but if a required for data (RFD) parameter applicable to only one planned test point became unavailable, the mission might continue to execute other lines of test. A combined test force (CTF) unit test safety officer (UTSO) can assist in determining which information is appropriate for the test plan vs. the safety plan.

TEST PLAN CONTENT

Test plans consist of three major components: Front Matter, Main Body, and Appendices.

FRONT MATTER

Outside Front Cover:

As an official U.S. Government publication, the test plan and particularly its outside front cover should reflect the professionalism of the 412th Test Wing and the USAF. The outside front cover contains standardized information, including:

- **Document Number** – 412TW-TP-##-##; the number is assigned by the 412th Test Wing via the technical editor and the Technical Publications Office.
- **Title –** The title should be brief and descriptive of the test project. Including specifics in the title may be helpful in managing reader expectations, as well as quickly differentiating multiple test projects under a single program. For example, *SR-71 Block 40 Radar Performance Baseline Flight Test Plan* is a more informative title than *SR-71 Radar Test Plan*. Additionally, descriptive titles make documents easier to locate. If at all possible, keep the test plan title unclassified, regardless of the document's classification.
- **Distribution Statement –** All test plans must have a distribution statement that has been selected by the test team and customer. The distribution statement will be IAW DoDD 5230.24, *Distribution Statements on Technical Documents* (Reference 6), as implemented by AFI 61-201, *Management of Scientific and Technical Information (STINFO)* (Reference 7). The determination date (month and year) of the distribution statement can refer to the statement of capability (SOC) date for the relevant test program, or another program date determined by the controlling authority. Technical editors may be consulted regarding squadron/CTF preferences. The controlling authority may vary, but is usually the PO. Further guidance may be found by searching 'distribution statements' at the Defense Technical Information Center (DTIC) website (Reference 8).
- **Document control marking** – All documents requiring control markings, such as controlled unclassified information (CUI) must follow current markup guidelines. The Test Plan Template will reflect the most recent guidance, and the technical editor will help ensure the markup is complete and correctly formatted.

Signature Page (Inside Front Cover):

The purpose of the signature page is to document who wrote the test plan and approved its publication. Major contributors must be able to support the key points of the document and will acknowledge their concurrence by signing the signature page.

The primary author and major contributors should be listed on the left side. The approval authority signatures on the right side are listed in EdwardsAFBI 99-101 (Reference 2).

Standard Form 298:

The Standard Form 298 is required (per DoDM 3200.14, Volume 1, *Principles and Operational Parameters of the DoD Scientific and Technical Information Program (STIP): General Processes* [Reference 9]) for all documents delivered to DTIC, except those classified higher than collateral secret. The test plan template will indicate which fields are required and their proper format.

Qualified Requestors and Export Control Statements:

The qualified requestors and export control statements (standard and/or program specific) are required for documents not cleared for public release. The format and wording for these statements are governed by AFI 61-201 (Reference 7).

Table of Contents:

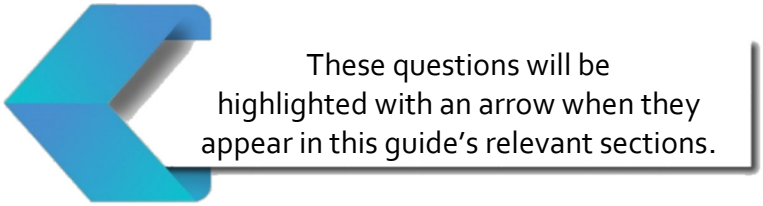
The table of contents is included in the test plan template.

MAIN BODY

The main body of the test plan contains all of the elements that logically answer the following questions:

- **Section 1: Introduction**

WHO are the customers?
WHO will conduct the tests?
WHEN will the tests be conducted?
WHAT is the overall test objective?
WHY are the tests being conducted?
WHAT will be tested?
WHERE will the tests be conducted?



- **Section 2: Test and Evaluation**

WHAT are the objectives of the tests?
WHAT could interfere with meeting test objectives?
WHAT is being measured and how? MOPs?
WHEN is testing finished?
WHAT are the evaluation criteria for each MOP?
WHAT is the test approach?
WHAT are the most realistic test outcomes?
HOW will the data be analyzed?
WHAT data products will be reported?

- **Section 3: Test Conduct**

WHEN is the team ready to test?
HOW exactly will the tests be conducted?

- **Section 4: Test Reporting**

HOW will test results be reported?

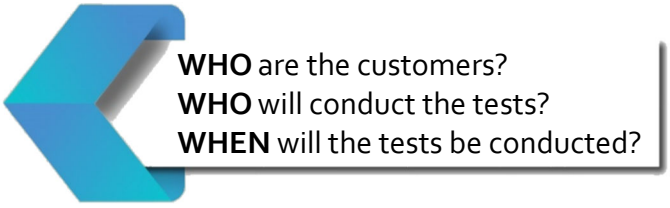
Section Numbering:

Test plan sections may be indicated with numbered or non-numbered headers. Consistency should be maintained either way. If numbering is used, the format used in this guide is recommended; if non-numbered headers are used, the overall structure and formatting should align with planned reports of results.

1.0 INTRODUCTION

The Introduction section provides an overview of the test project and includes test scope, background, resources, and test objectives.

1.1 Overview

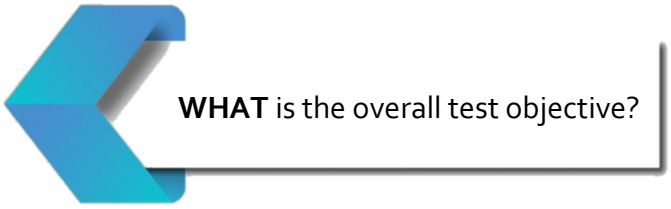


This section contains standardized content for easy readability. Generally, a single paragraph is used to convey the basic programmatic context of the test plan. The following elements should be included:

- Standardized introduction sentence.
- The overall test objective.
- The customer(s).
- Test organization(s), as appropriate. More information on these organizational definitions is found in AFI 99-103, *Capabilities-Based Test and Evaluation* (Reference 10):
  - Lead developmental test organization.
  - Executing test organization.
  - Participating test organization(s).
  - Operational test organization(s).
- Test stakeholders
- Test location(s).
- Approximate test date(s). (Test teams should avoid using concrete dates, given the dynamics of program scheduling.)
- Test scope (number of planned ground/flight test hours, test points, or other applicable metric[s]).

Specific wording guidance is included in the test plan template.

Overall Test Objective Guidance:



Test projects contain a single overall test objective, which may be further divided into two or more general test objectives (GTOs), such as by mission areas (by discipline) or by scope. For small-scope or single-discipline test programs, GTOs may be omitted. Specific test objectives (STOs) are detailed objectives that describe the focus areas of the overall test objective or a GTO. Example subdivisions of an overall test objective are shown in Figure 2.

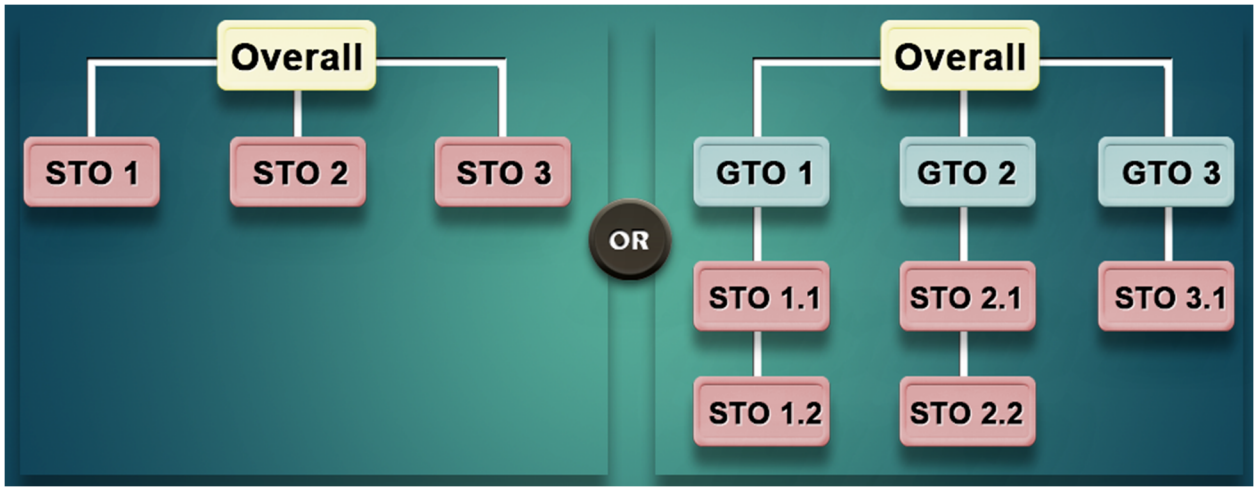


Figure 2 Test Objective Hierarchy Examples

The overall test objective should communicate the purpose of the test clearly and concisely. Although GTOs and STOs may make use of uniquely defined test objective verbs (see 2.1 General and Specific Test Objectives) to further communicate test goals, the overall test objective should be written in plain language without use of the uniquely defined verbs. The following three statements provide the framework for the overall test objective.

Test the system in the specified areas to:

1. Provide ratings and/or a recommendation.
2. Show its characteristics, performance, or functionality.
3. Collect information in support of analysis efforts.

EXAMPLES

Test the integration of the synthetic aperture radar (SAR) map radar mode with the F-16 Block 99 rehosted software in support of a recommendation whether to proceed to operational testing.

☆ ☆ ☆

Test the F-16 Block 99 rehosted SAR map radar mode performance.

☆ ☆ ☆

Collect F-16 Block 99 rehosted SAR map radar resolution data for the customer in support of further development.

These statements maintain flexibility in addressing the variety of tests conducted by the 412 TW, including providing recommendations without ratings. Test plan authors should adjust the wording to provide the appropriate test project details.

Regression Testing:

Regression testing compares the current system operation with a baseline, or previous system functionality. As developments or additions are made to previously tested or fielded systems such as subsequent software blocks, both new and legacy capabilities and/or performance will generally be tested. Regression testing assesses the impacts of the new system integration on legacy functionality. The scope of regression testing is generally based on design considerations (such as system safety and mission), previous deficiencies, customer requirements, and engineering judgment. When planning regression

testing, teams should assume no measurable/detected change in performance exists until proven otherwise. If a major portion of testing will include regression, the overall test objective should reflect that.

Test teams should also consider how the changed system integrates with other systems. Systems that interact with or may be affected by the changed system should be considered adjacent systems, and should be identified and included in regression testing as funding, schedule, and test program priorities allow. Adjacent systems that have safety implications or are necessary for mission completion are generally considered to be higher priority for regression testing. For instance, if a change is made to the high angle-of-attack logic in a flight control system, the main out-of-control-recovery logic paths in the flight control software would typically be regression tested, as those paths are adjacent to the change and have safety implications. In another example, a change to an aircraft's GPS/inertial navigation system might warrant regression tests of weapons cueing because software errors could result in incorrect cueing angles being passed to a weapon.

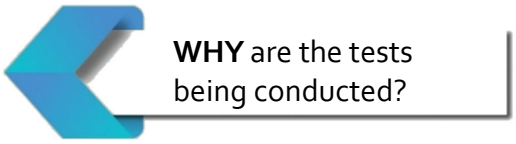
Modeling and Simulation:

Test programs may include a significant modeling and/or simulation (M&S) component to be used in lieu of some real-world testing or to inform the test strategy. If testing uses M&S assets as either a significant portion of the system under test or as a significant portion of the testing environment (e.g., Joint Simulation Environment [JSE] or Digital Integrated Air Defense System [DIADS]), the test objectives and MOPs should include the M&S information.

Military Utility Assessment:

Test teams should consider the system value to the warfighter, commonly called a military utility assessment, which can provide a critical early look to subsequent OT and decision makers regarding how the system will perform in operationally representative scenarios. The specific approach to military utility testing should be based on the method of system use by the operational end user, as well as the priority of the system to eventual operational usage. The usability, workload, and functionality of the system are all potential considerations, as are mission planning and ground support systems. The military utility assessment often requires coordination with system operators (usually aircrew). Any discoveries that affect the military utility of the system will be included in any final report(s) of results, and noting this in the test plan can help maintain focus on warfighter impact throughout testing. If a major portion of testing will include a military utility assessment, the overall test objective should be written accordingly.

1.2 Background



The Background section should provide a summary of relevant program history leading up to the test, to include: why this test is being accomplished, any previous related test efforts and significant results, and problems found during operational use. These details should explain how this particular test fits into the broader scope of the platform/test program/enterprise. The technical maturity of the SUT, to include any test entrance criteria (e.g., M&S) performed to prepare for this test, may be explained. The Background section may also introduce technical concepts important in understanding aspects or methodologies used later in the test plan. Discussion of these concepts should be kept at a high level in this section, with more detailed descriptions placed in an appendix as necessary.

1.3 Test Item Description

The test item description should provide enough details to understand the SUT, including any relevant information that impacts test design. If the SUT is part of a larger system on the aircraft, this section should focus on the parts of the system that are new or test-unique, and should differentiate the SUT from all of the supporting equipment. Functional control diagrams (with an outline around the SUT) help make the distinction clear. If the SUT is intangible, such as an algorithm, the description should focus on the algorithm rather than the hardware supporting that algorithm. Identification of the host system or aircraft (not test unique) should be captured in 1.4.3 Test System/Aircraft. If M&S resources are used as the system under test, they should be described in this section. Assumptions and/or system modifications made to facilitate the simulation, along with why/how that simulator is an appropriate test venue, should also be included. Generally, the Test Item Description section should not exceed two pages; lengthier descriptions should be provided in an appendix and summarized in this section.

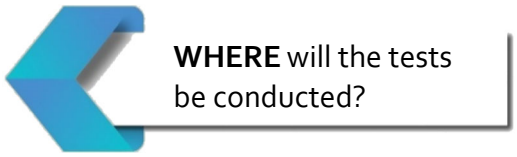
1.4 Test Resource Requirements

The resource requirements for the test program should be identified in this section. Teams should list the resources, elaborating on any whose purpose is not obvious. This can include a wide variety of needs, ranging from special test equipment and analysis tools to outside range or technical support, such as system integration laboratories (SILs), hardware-in-the-loop (HITL) facilities, installed system test facility (ISTF), etc. Common resource requirements sections include but are not limited to the following elements.

1.4.1 Modeling and Simulation Resources

This section states which M&S resources will be used during the test, including their maturity or known accuracy. The resources can be contractor or government owned, and are often used to predict test results, establish system maturity, provide understanding of system behavior, augment or serve as the primary venue for test results, and train personnel.

1.4.2 Test Facilities, Ranges, and Resources



This section outlines the contractor- or government-owned test ranges, airspaces, airfields, facilities and their associated resources. Table 1 provides examples of test facilities, ranges, and resources, and their types and descriptions. Engineering squadrons may provide additional information.

1.4.3 Test System/Aircraft

If the aircraft is the SUT, this section may be deleted, as the information is already in the Test Item Description section.

This section states the test aircraft and associated test configuration requirements. Aircraft configurations may include software, hardware, and/or stores. Any flight certification requirements that allow the SUT to be installed and operated on the host system should be included (e.g., Temporary 2 [T-2] aircraft and any applicable modifications, military flight releases, contractor aircraft/engine operating limitations, contractor-owned/contractor-operated contracts, or PO configuration control boards).

Table 1 Examples of Test Facilities, Ranges, and Resources

Type	Description	Example Facility/Range(s)	Example Resources
Virtual Environment	Facilities with computer models of the system under test, friendly/non-friendly players, scenarios, combat environment, and threat systems used to replace or supplement on-aircraft test	• DIADS, EAFB • Integrated Facility for Avionics Systems Testing (IFAST), EAFB • JSE, EAFB	• Threat laydowns • Scenario laydowns
Measurement Facilities	Facilities with capabilities to establish known quantities of the SUT (e.g., mass properties).	• Metrology Facilities • Stores Weight and Inertial System Facility	• Scales • Other measurement equipment (especially if brought from off-site)
SILs/ HITL Facilities	Facilities designed to integrate aggregations of hardware and software in a laboratory environment.	• Integrated Defense Avionics Lab (IDAL) • Handling Qualities Simulator (HQS)	• Special Test Equipment (STE) • Line-Replaceable Units (LRUs)
ISTFs	Facilities designed to evaluate integrated systems in installed configurations to test specific functions of complete, full-scale weapons systems.	• Benefield Anechoic Facility (BAF), EAFB • McKinley Climatic Laboratory, Eglin AFB, Florida	• Surrogate signal sources • Threat simulators • Avionic simulators
Open-Air	Facilities that provide the ability to evaluate the systems under natural environment operating conditions.	• Point Mugu Sea Range (PMSR), California • Precision Impact Range Area (PIRA), EAFB • White Sands Test Center (WSTC), New Mexico	• Inter-range links • Threats/threat simulators • Airspace (R-2508, etc.)
Other Resources	Additional facilities and equipment required for the test.	• Ridley Mission Control Center (RMCC), EAFB • Hangar 1600, EAFB	• Control room • Telemetry • Tracking radars • Hangars or ramps • Drop Pit • Trucks and cranes

1.4.4 Instrumentation and Parameter Requirements

This section states the instrumentation required on the SUT, onboard the test/support aircraft, and on the range(s). It also defines the recorded data parameters (also known as test measurands) produced by those instrumentation systems. Some data parameters are available via a data bus (often in MIL-STD-1553B format) and some are available via special instrumentation (often known as orange wire). The parameter list should address both data bus and orange wire parameters. Lengthy parameter lists should be provided in an appendix.

The recorded parameters required for test data collection are called RFD parameters and typically will be verified as operable before each test mission. Usually, RFD parameters need not be telemetered and monitored in real time unless they are also safety-of-test (SOT) or SOF parameters. Generally, the failure of any non-SOT/SOF RFD parameter would cause a pause until the responsible engineer or test team can determine whether testing may proceed without the parameter.

The SOT/SOF parameters are those essential for ensuring the safety of a test or flight. The SOT parameters must be monitored in real time against established limits during the execution of test points. The SOF parameters must be monitored during the entire flight including between test points. Generally, the test/flight will not proceed if any SOT/SOF parameters are unavailable. If the SOT/SOF parameters are listed here or in an appendix, they may be referenced by the safety plan, rather than repeated.

1.4.5 Support Vehicles/Aircraft

This section briefly states support vehicle and/or aircraft requirements. If appropriate, documents containing detailed support vehicle/aircraft descriptions may be listed as references. The focus should be on the technical requirements needed to accomplish the test objectives, such as aircraft with a desired radar cross section. Safety requirements such as safety chase should be identified in the safety plan.

1.5 Safety Considerations

All of the safety requirements should be clearly stated in the safety plan. Safety considerations that also affect the technical approach, such as resource requirements or specific process/execution considerations, may be noted here.

1.6 Security Requirements

This section should inform the reader which security measures (general, operations, communications, and competition sensitivity) will be required before, during, and after the test. Guidance is included in the test plan template.

1.7 Key Stakeholder Contact Info

The purpose of this section is to provide the contact information of the personnel and/or offices with responsibilities essential to test execution. This section is not meant to be a comprehensive list of all test team participants.

1.8 Test Environment Requirements

This section should describe requirements pertaining to locations, times of day, weather, etc., required for testing, including any technical limits.

1.9 Environmental Impact Assessment

Federal and state environmental laws regarding air pollution, noise pollution, waste disposal, disturbing the ground in drop zones, fuel spills, wildlife, etc., must be followed when planning a test. For tests conducted at or by the 412 TW, the test team will coordinate with the 412 TW Environmental Management Office at the beginning of the test project to produce an approved environmental checklist, usually as an appendix. This checklist and a statement about the assessment must be included in the test plan, regardless of whether or not environmental impacts are expected. The 412 TW Environmental Management Office may be contacted at: (661) 277-1401 or 412TW.CEV.EIAP@us.af.mil.

2.0 TEST AND EVALUATION

The Test and Evaluation section is the technical core of the test plan. Authors may add paragraphs or subsections at the beginning of Section 2 to provide readers with contextual information regarding definition of test terms, test phases, technical build-up approach, the role of M&S in meeting test objectives, etc.

Use of Statistical Methods:

Test teams should consider the use of statistical analyses when developing the overall test approach in Section 2. Such methods are of greatest value when outcomes are uncertain and resources are severely constrained. The important components of a statistical test include: the estimated noise (uncertainty) expected in the data, the desired signal (effect) the test is designed to detect, and the desired level of precision (e.g., confidence and power). These statistical components serve to guard against system mischaracterization and/or inaccurate system ratings, and are typically displayed in a table and/or graph to inform decision makers. Authors should utilize statisticians local to the CTF and/or from the Statistics Home Office to help identify whether statistics are appropriate, and, if so, to help formulate correct tests and prepare required deliverables. A statement regarding the use of statistics should be included in an external document if the use of statistics is not referenced in the test plan (see Section 3.2 of EdwardsAFBI 99-101 [Reference 2]).

Use of Previous Test Approaches:

If the test is assessing the next iteration in a series of system developments (such as subsequent software blocks), authors should consider using previous test approaches to help design the current test. Consistency is important to assess system performance over time. If the team is not confident in previous test approaches, comparing the SUT with past performance may not be appropriate. Authors should take precautions to review the technical report (TR) and lessons learned, especially if the test did not gather the intended data or if the previous results were less than satisfactory.

Regression Testing:

Regression testing should focus on identifying impacts to capabilities, rather than repeating a complete system evaluation as though it were a new capability. Regression test results should be evaluated as improved, unchanged, or degraded from the baseline. The content of regression testing requires critical thinking to remain relevant and within the cost/schedule program scope. Regression testing should be targeted at legacy capabilities that are most operationally relevant, critical to safety, and most closely associated with the new capabilities, to include determining where the new software/hardware will interact with the legacy capabilities. The regression test approach should be specifically coordinated with relevant 412 TW technical experts and system operators (usually aircrew), and should consider the following:

- Extent of the intended changes (e.g., adding a new symbol to a display vs. rehosting an entire operational flight program in a new coding language).
- Likelihood that unintended effects might occur elsewhere in the larger system (e.g., changing a datalink system resulted in degradation in the air collision avoidance cues).
- Criticality of the modified capability (e.g., a seldom-used radio mode vs. flight control software).
- System complexity.
- Amount of overall system change since a capability was last tested.
- Programmatics (e.g., time/funding available, tolerance of technical risk).

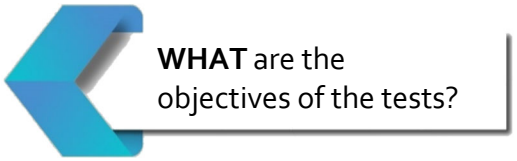
Modeling and Simulation:

Modeling and simulation may be used in lieu of full ground and/or flight testing in certain situations; for example, if a real-world asset is not available to be tested against, or a very large set of test points is required to fully vet a system, a simulation may be appropriate.

Consideration should be given to how best to use M&S test assets, as well as how best to ensure that the tests have real-world applicability. During test planning, the use of M&S assets should be examined with the relevant discipline and platform technical experts. When planning how to test a system using M&S, the following should be considered:

- Which test points are best suited to simulation, and why
- Model validation, verification, and accreditation
- Whether similar testing has previously been done using simulation

2.1 General and Specific Test Objectives



The GTOs and STOs should be short definitive statements beginning with an action verb (Table 2) followed by the object or qualifying phrases. The action verbs are intended to be single-word summaries of the scope and intent of the test; consistent use of verbs across the 412 TW helps guide discussion and common understanding among test teams. Table 2 is intended as a guide for most cases, but is not prescriptive; alternate phrasing may be appropriate, provided the team agrees on the scope and intent of the test.

The STOs should have traceability to requirements (or previous results for regression testing) to the maximum extent possible. Although military utility testing typically is not traceable to a specific requirement, DoDI 5200.02T, Enclosure 4, *Operation of the Defense Acquisition System* (Reference 11), directs that DT&E include stressing the system in an operationally relevant environment, as well as identifying capabilities, limitations, and deficiencies, meaning that assessing military utility is a function of DT&E, even if not directly tied to a contractor- or program-provided requirement. Depending on the planned scope of regression and military utility assessment, teams may write dedicated GTOs/STOs or MOPs, or the information may be captured in already existing GTOs/STOs/MOPs.

EXAMPLES

GTO 1: Evaluate aircraft aero-performance with AIM-9X installed.
STO 1.1: Evaluate up-and-away aero-performance.

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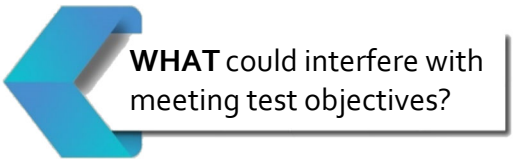
GTO 2: Demonstrate the functionality of the communications system.
STO 2.1: Demonstrate the command and control link availability and latency.

Table 2 412 TW Test Objective Verbs

Qualities	Verbs			
	Collect	Demonstrate	Determine or Characterize	Evaluate
Definition	To gather data for an external organization.	To show system functionality or performance.	To measure or ascertain system attributes.	To assess system effectiveness or capability.
Scope of Test and Evaluation	No 412 TW analysis or evaluation is performed.	Implies limited testing. May involve technology demonstrators, verification of fixes, or regression.	Involves establishing a system performance baseline. Comparison against a specification/standard may be appropriate.	Implies robust testing. System performance is usually tied to effectiveness and military utility.
Probable Test Outcomes	N/A	Generally well understood. System functionality or performance is typically binary; works as expected or does not.	Generally less well understood; test results are typically not binary.	Generally well understood, and test results are typically not binary.
Use of Rating Scales		Rating scales may or may not be used, based on system maturity and extent of testing. Qualitative assessment may be used to describe test results.	May use the 412 TW Rating Scale to access test objectives and overall rating. May use discipline-specific rating scales to establish system attributes.	Uses the 412 TW Rating Scale to access test objectives and overall rating. May use discipline-specific rating to support the overall rating.
Emphasis on Military Utility		Results may include some emphasis on military utility, but general focus is on system functionality or performance.	Results may include some emphasis on military utility, but general focus is on system attributes.	Results should include a strong emphasis on military utility when appropriate.

Note: Discipline-specific rating scales may include the Cooper-Harper Rating Scale, 412 TW Revised Bedford Workload Scale, and general purpose scales.

2.2 Potential Impacts to Completion Criteria



This section describes any test-unique factors that could realistically interfere with meeting test objectives.

EXAMPLES

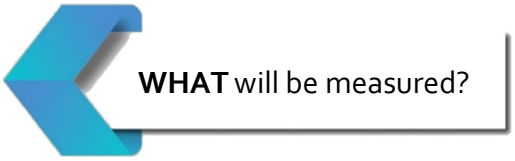
System Under Test – The F-16 T/N 123 requires a small amount of trim to fly straight, but it is the only F-16 available for the test. This factor is unlikely to prevent the test objectives from being met; however, it constitutes a technical risk.

Test Instrumentation – The instrumentation system is only capable of recording 10 samples per second, which is less than the 15-Hz frequency requested for parameter X. This instrumentation capability may be a factor in the evaluation, but should be sufficient to meet the test objective.

Test Resources – In order to obtain a circular error probable of 90 percent (CEP90), 36 bomb drops are required. However, financial limitations and range availability limit the number of bomb drops to 12. These factors still allow test objectives to be met, but reduced sample size diminishes the precision and/or confidence in system ratings or system characterization.

Test Facilities – A representation of the next generation threat system is not available. This test objective was requested by the PO for programmatic reasons, but will not be accomplished.

2.3 Measures of Performance



This section defines and explains the measurable system-specific design and/or performance characteristics. The MOPs may be either quantitative or qualitative, but they must be measurable and should not be confused with test objective statements or methodology. Each MOP name is a noun or noun phrase. A concise one- or two-sentence definition of the MOP immediately follows.

When determining whether to include a specific military utility or regression MOP, test teams should consider the duration of the test program; creating military utility or regression MOPs ensure continuity from planning through reporting, given personnel turnover and/or PO pressures.

Statistical analysis should be considered independently for each MOP. When variation in observed performance measures is possible (i.e., probable MOP outcomes are not binary), statistical methods should be used to ensure test conclusions are defensible. Statistical intervals may be used to account for the uncertainty in the data. Teams should use the lower and upper bounds of the interval to formulate appropriate evaluation criteria and/or system characterization depending on test objectives.

Some MOPs may share common aspects (such as evaluation criteria or methodology). In those cases, authors may choose to create an introductory section prior to the MOPs that details those shared aspects such that they are not repeated for each MOP, or address multiple MOPs in a table (e.g., one MOP per column, with merged cells as appropriate). Authors should avoid repeating the same statement multiple times throughout the Test and Evaluation section.

EXAMPLES

MOP 1.1 – Specific Range

Specific range is a performance metric used to measure normalized fuel efficiency, typically expressed as the distance traveled (nautical air miles) per unit (pound) of fuel.

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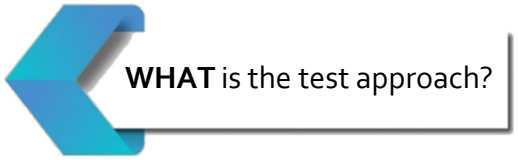
MOP 2.1 – Link Availability

Percentage of time that the configured command and control link is in Ready/Ready status.

2.3.1 Test Methodology



The test methodology section is a MOP-specific description of the test approach outlining how the team will use the SUT and support resources to gather the required data.

This section should list any test maneuver, condition, or state used to execute the test. If methodologies are brief (less than a page), the test point matrix and test procedures/maneuvers may be discussed here; longer lists should be placed in appendices. Often two appendices will be used: a Test Point Matrix and a Test Procedure/Maneuver Description appendix. Authors should maintain traceability between MOP test points and conditions. Authors should avoid including test cards in the test plan; however, there should be sufficient information in this section to develop flight cards and help establish the general order of the test cards. Table 3 provides distinguishing elements between content appropriate to the Test Methodology section versus the test cards.

Table 3 Test Methodology vs. Test Cards

Element	Test Methodology	Test Cards
Typical Location	Test Plan Section 2	Separate from Test Plan
Level of Detail	Summary and Rationale	Specific Actions
Focus	Test approach; translates the test strategy outlined by the test objectives into test techniques and procedures. Users of this product are technical reviewers and the test team. Provides enough information to start writing test cards and help establish the general order of the test cards. Examples: the number and type(s) of maneuver(s).	Executable steps; combines information from multiple sources (test methodology, test plan appendices, tech orders, regulatory guidance, and system descriptions). Users of this product are engineers and operators during execution. Examples: HOTAS actions, button pushes, stick movements.

EXAMPLES

Three speed-power test points will be flown at each test condition (see Appendix X for detailed methodology and Appendix Y for list of test conditions).

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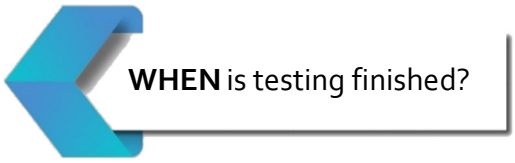
For each flight test point:
1. Establish a Ready/Ready command and control link from the ground segment.
2. Monitor Ready/Ready status for a minimum of 30 minutes. The link need not be in control. The 30 minutes need not be continuous.

2.3.2 Test Completion Criteria



Test completion criteria specify how much data (quantity and quality) are required to complete the analysis for each MOP. Test completion criteria can be as simple as a finite number of test points executed, the number of hours of operation, or achieving some minimum level of operation. If a particular level of statistical rigor is required, the appropriate number of data samples should be discussed. Explain in this section why the criteria were selected (e.g., statistics, safety, etc.). Usually, deficient system performance does not affect test completion criteria; the test is still considered complete if identified completion criteria are met.

EXAMPLES

Testing will be complete when test points XX.001 through XX.012, as defined in Appendix X, are correctly executed and required data have been collected.

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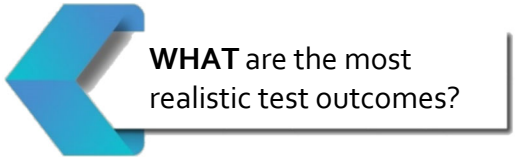
Testing will be complete when the link under test is established and observed for at least 30 minutes with required data collected. Experience has shown that link instability is likely to manifest within 30 minutes.

2.3.3 Expected Test Results



The section is intended to encourage the test team to explain possible test outcomes from a technical standpoint. For example, test teams should explain if the probable outcomes are not well understood, the results are not binary, or the system is expected to be borderline or worse. When possible, test teams should cite the basis for expected test results (e.g., lab results or modeling and simulation predictions).

Understanding the expected system behavior not only allows test teams to identify when the system is not operating correctly, but also allows the team to understand the impacts of unexpected test results and whether it is appropriate in a technical sense to continue testing.

The safety plan has a similar section that is reserved for test results with safety planning implications; the safety plan is the basis for determining whether an unexpected test event (UTE) has occurred. Generally, when test results are different from what is written in the test plan, the test team should investigate but does not necessarily have to declare a UTE. Refer to AFTCI 91-202 (Reference 4) for more information.

EXAMPLES

Based on results from aero-performance modeling and simulation with AIM-9X installed, specific range is expected to decrease by less than 10 percent at all subsonic flight conditions, with decreases up to 14 percent at supersonic flight conditions.

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Based on preliminary lab testing, link availability is expected to be good as defined by the evaluation criteria.

2.3.4 Data Requirements

This section is intended to identify the MOP-specific test data required to conduct data analysis. Data may include surveys, video, or other products as well as traditional telemetered or recorded data (expected file type[s] should be included). Traceability between data requirements and specific MOPs can reduce confusion during test execution; should parameters become inoperative, test teams need to know which test points remain executable. The data parameter list supports both instrumentation and control room personnel in obtaining the correct recorded and telemetered data (see Appendices section).

EXAMPLES

Data parameters EG001, EG003, and EG007 (as defined in Appendix X) are required for this MOP.

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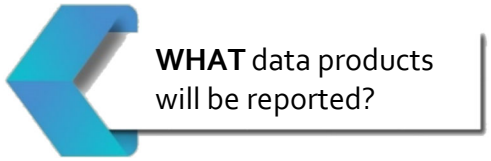
The following are required:

- Pilot, engineer, and test team notes
- Ground segment logs
- Pilot flight display video recordings

2.3.5 Data Analysis and Final Data Products



This section explains how test data will be processed, analyzed, and presented. If the processing and analysis are expected to be simple, provide analysis methods (e.g., equations, algorithms, etc.) in this section. Otherwise, data analysis tools and methods should be summarized and the final data products listed. In consultation with technical experts, detailed information should be included in a data analysis plan (DAP), either as a test plan appendix or a standalone document. If a new data analysis technique is planned, it should be mentioned here but described in a DAP.

The final data products are the tables, charts, plots, or other figures that will be used to support conclusions and recommendations in the technical report. Although specific examples of data products are not required in the test plan, the types of final data products produced should be determined by the test team and coordinated with the technical expert(s).

EXAMPLES

Aero-performance data from the test points will be provided to the contractor in order to produce updated flight manual charts. A description of test results will be provided in a final technical report. Plots and/or tables summarizing a specific range will be provided in a technical report data package; specification limits will be depicted where appropriate. Maneuver time history plots will be provided in the data package.

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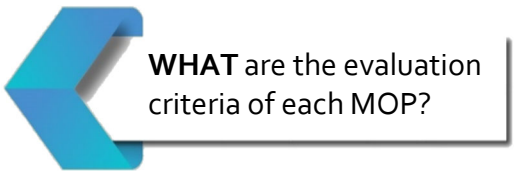
Link availability will be calculated as a percentage of time a link is in Ready/Ready status over time a link connection is attempted. The link is available when command and control is established. Intentional drops of the link are not scored against the link. Recorded drops of less than 1.5 seconds will be treated as data anomalies and will not be scored against the command and control link.

2.3.6 Evaluation Criteria



Evaluation criteria are used to assess each MOP against standards of system performance and/or functionality. The sources of any specifications to be used for comparison or reference (e.g., the Interface Control Document [ICD], MIL-STD, or CDD) should be cited. If there is no specification or baseline for comparing data, the rationale to be used for determining the evaluation criteria should be explained. Evaluation criteria are not required for data collection test objectives, and may not be appropriate for other test objectives, particularly in the case of technology demonstrations (see Table 2).

Evaluation criteria are usually stated as a single sentence or in a table listing performance attributes under certain conditions. Each MOP must be addressed; however, if multiple MOPs share evaluation criteria, a cross-reference is provided. As shown in the 412 TW Rating Scale (see the Appendices section), descriptors (e.g., good, borderline, or deficient) apply to MOPs, whereas ratings (satisfactory, marginal, and unsatisfactory) are applied to test objectives. When more than one observation is in a sample, point estimates are used to summarize system performance and should be accompanied by statistical bounds to

account for uncertainty in the data. Evaluation criteria are compared to the lower and upper bounds to determine the appropriate descriptor.

For regression testing, test teams should compare test results with legacy performance/functionality; if systems are unchanged, they are expected to continue to function as in the previous iteration (not necessarily as originally designed). Thus, regression test results should be evaluated as improved, unchanged, or degraded from the baseline. Although the evaluation criteria pertaining to military utility assessments may be qualitative (i.e., operator comments and aircrew experience are critical data to this assessment), descriptors may still be assigned IAW the 412 TW Rating Scale (e.g., good, borderline, or deficient).

EXAMPLES

Test results will be considered good if the specific range is less than 10 percent less than clean aircraft values. Test results will be considered borderline if the specific range is at least 10 and less than 15 percent less than clean aircraft values. Degradation in specific range of 15 percent or greater will be considered deficient.

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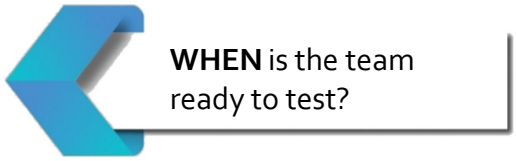
Test results will be considered good if availability of the flight critical links is 95 percent or greater and non-flight critical links are 90 percent or greater; deficient otherwise.

3.0 TEST CONDUCT

This section describes test-unique aspects beyond the requirements in USAF instructions, such as EdwardsAFBI 99-105 (Reference 3). This section should be closely coordinated with aircrew and test operations personnel. The Test Conduct section may include, but is not limited to, the following sections:

3.1 Readiness Reviews



Each organization and/or program may choose to hold reviews prior to testing to ensure test preparation is complete. The purpose of a test readiness review (TRR), or similar meetings such as a flight TRR (FTRR), launch readiness review (LRR), etc., is to gather readiness-to-test status on all the aspects of the test program, answer any interorganizational questions, and outline the final action items that must be completed. The TRRs may be held locally at the CTF level or at the PO level, but they share a common purpose. The TRRs conducted at the CTF level are led by the test team after the test package (i.e., both the test and safety plan) has been approved and ideally several weeks before testing begins.

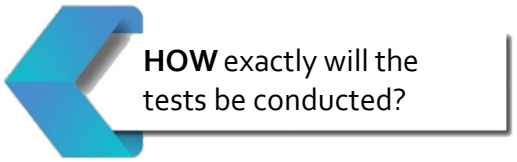
This optional section describes elements applicable to the TRR, to include:

- A timeline of the TRR relative to test events
- Required attendees
- Readiness to test
- Program-unique aspects
- Stakeholder concurrence to proceed if required

3.2 Pretest Briefing(s)

This section is intended to describe the test-unique aspects of pretest briefings, to include personnel required to attend and topics to be discussed. Some organizations or programs require a day-prior brief (T-1), whereas some only require a day-of preflight brief (T-0). These briefings are narrower in scope compared to readiness reviews and focus on the individual missions. Additional briefing items may be required by the safety plan. Further guidance may be found in the test plan template and 412 OG O.I. 11-5, *Briefing/Debriefing and Flight Briefing Room Requirements* (Reference 12).

3.3 Test Execution



This section may include test procedures and setup unique to the test program. For simple tests, this section can include detailed test setup and step-by-step execution procedures. For complex tests, test setup and execution procedures should be captured in an appendix to the test plan with references in this section.

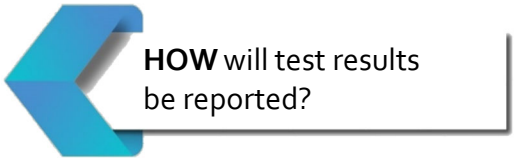
3.4 Posttest Briefing

This section is intended to describe the test-unique aspects of posttest briefings, to include personnel required to attend and topics to be discussed. Additional guidance may be found in the test plan template and 412 OG O.I. 11-5 (Reference 12).

3.5 Posttest Data Procedures

This section is intended to describe how data acquired during the test will be managed, requested, and distributed. This includes a short explanation of the system on which data will be stored, the process of how posttest data will be requested by team members, and the any test-unique methods of how data will be transferred to contractors or outside customers. Although this information may be standardized for select CTFs, identification and understanding of these processes in the planning phase is critical for efficient data processing and delivery following test.

4.0 TEST REPORTING



This section describes the types of technical reporting products that may be authored following test execution, and should include expected delivery timelines. Test teams should coordinate with the customer to determine the required reporting product(s) and their delivery timeline(s). Specific guidance on 412 TW reports, including intended uses, size, delivery timelines, and expected practices, are provided in EdwardsAFBI 99-103, *412 TW Technical Report Program* (Reference 13).

Test results can be communicated in a variety of formats, such as those listed in Sections 4.1 to 4.8.

4.1 Watch Items and Deficiency Reports

A potential deficiency may be considered a watch item (WIT) until the team determines it to be a true deficiency. Deficiency reports (DRs) document system deficiencies identified during test. If the deficiency remains and it satisfies the criteria of either a Category I or Category II DR, it will be submitted as a DR. A WIT will be closed if it does not meet the criteria of a DR. Deficiency and WIT

reporting should be done IAW T.O. 00-35D-54, *USAF Deficiency Reporting, Investigation, and Resolution* (Reference 14), EdwardsAFBI 99-224, *Deficiency Reporting* (Reference 15), and applicable CTF guidance.

4.2 Quick Look Reports

A quick look report is a high-level test summary developed by the test team after each test event and is provided to stakeholders according to an agreed upon data distribution plan, if appropriate. Quick look report information will include aircraft test configuration, test points planned, test points attempted, and a brief discussion of preliminary results with aircrew observations. These reports are usually generated after each test mission.

4.3 Preliminary Report of Results

The preliminary report of results (PRR) is a quick-reaction report to transmit principal test and evaluation findings to the customer in management terms from a management perspective, and is generally not used to support major program milestone decisions.

4.4 Capability Report

The capability report (CR) provides overall DT&E results to support timely programmatic decisions. It is intended to address the overall results in the context of combat capability, with the respective consequences of the results on the required capabilities.

4.5 Technical Information Memorandum/Handbook

Technical information memorandums (TIMs) and technical information handbooks (TIHs) primarily document processes, provide instruction, or archive important technical information for engineering reference. Additionally, TIMs and TIHs may document the analysis used to substantiate recommendations regarding system models or flight manual charts.

4.6 Technical Report

The formal TR is a detailed report that presents the analyses, evaluation, results, and the conclusions and recommendations of the test program. The TRs and their related data packages are the most common 412 TW technical reporting products.

4.7 Data Package

Data packages (DPs) contain supplemental test data and/or results (not ratings). The DP formatting can vary and the test team should select the best way to communicate the data. Consult with the technical expert(s) and the chief engineer, who approve the DP.

4.8 Test Complete Letter

If test is intended only to collect data (only collect-type objectives are planned), a test complete letter (TCL) may be issued to inform the customer that the data collection is complete and to indicate that all applicable data are transmitted. The TCL contains no analyses, subjective assessments, ratings, conclusions and/or recommendations.

5.0 References

References provide the information necessary for a reader to locate and retrieve any source cited in the body and appendices of the document. References should be listed in the order they appear in the test plan. Reference information generally includes:

- Who – author (when known; omit for test plan references)
- What – document number, then title in italics
- Publisher – name of publishing organization, then location (city, state)
- When – date of publication (use a consistent format; if you have the day, month, and year for some, but only the month and year for others, simply use month and year in all cases)
- Classification level (if applicable)

APPENDICES

Test plan appendices contain supplemental information that clarifies or supports the body of the test plan. Table 4 includes appendices that are often included in test plans.

Table 4 Common Test Plan Appendices

Appendix	Inclusion
Rating Scales	Required if Ratings are Used
Detailed Test Item Description	Optional
Test Point Matrix	Optional
Test Procedure/Maneuver Description	Optional
Requirements Traceability	Optional
Parameter List	Required if Not in Main Body
Data Analysis Plan	Required if Not Addressed Elsewhere
Environmental Checklist	Required
Abbreviations, Acronyms, and Symbols	Required
Distribution List	Required

Other than the Distribution List and Abbreviations, Acronyms, and Symbols appendices (which are always, respectively, the last and second-to-last appendices in the test plan), there is no required order of appendices. Refer to the following sections for descriptions of these common appendices.

Rating Scales Appendix:

The 412 TW uses standard MOP descriptors and test objective rating criteria, to include the 412 TW Rating Scale and discipline-specific rating scales. The intent of these scales is to provide consistency in the individual and overall ratings of SUTs. Generally, discipline-specific ratings are used to support the overall 412 TW rating.

If these scales do not seem appropriate to your testing, consult with appropriate technical experts before constructing a questionnaire or rating scale.

If ratings will be used, then a Rating Scales appendix is required.

412 TW Rating Scale.

Use the 412 TW Rating Scale (Table 5) and/or the 412 TW Regression Rating Scale (Table 6) to assess the overall SUT. The overall rating of an SUT is based on its effectiveness or capability. Test results are captured using descriptors for individual MOPs. These descriptors are consolidated into a rating of each specific test objective, which are further consolidated into ratings for general test objectives and ultimately, the overall system rating. Further 412 TW Rating Scale guidance will be available in the forthcoming 412TW-TIH-21-01, *Technical Report Author's Guide* (Reference 16). The colors' tones have been adjusted since 2014 for easier use (Figure 3).

Table 5 412 TW Rating Scale

How Well Does the System Meet Mission and/or Task Requirements?	Changes Recommended for Mission/Task Improvement	MOP Descriptor	Test Objective Rating
Exceeds requirements	None	Excellent	Satisfactory
Meets all or a majority of the requirements	Negligible changes needed to enhance or improve operational test or field use	Good	Satisfactory
Some requirements met; can do the job, but not as well as it could or should	Minor changes needed to improve operational test or field use	Adequate	Satisfactory
Minimum level of acceptable capability and/or some non-critical requirements not met	Moderate changes needed to reduce risk in operational test or field use	Borderline	Marginal
One or some of the critical functional requirements were not met	Substantial changes needed to achieve satisfactory functionality	Deficient	Unsatisfactory
A majority or all of the functional requirements were not met	Major changes required to achieve system functionality	Unusable	Unsatisfactory
Mission not safe	Critical changes mandatory	Unsafe	Unsatisfactory

Table 6 412 TW Regression Rating Scale

How Does the System Performance/Functionality Compare with Previous Test Results?	Rating
Performance or functionality was improved.	Improved
No change to performance or functionality.	Unchanged
Performance or functionality was degraded.	Degraded

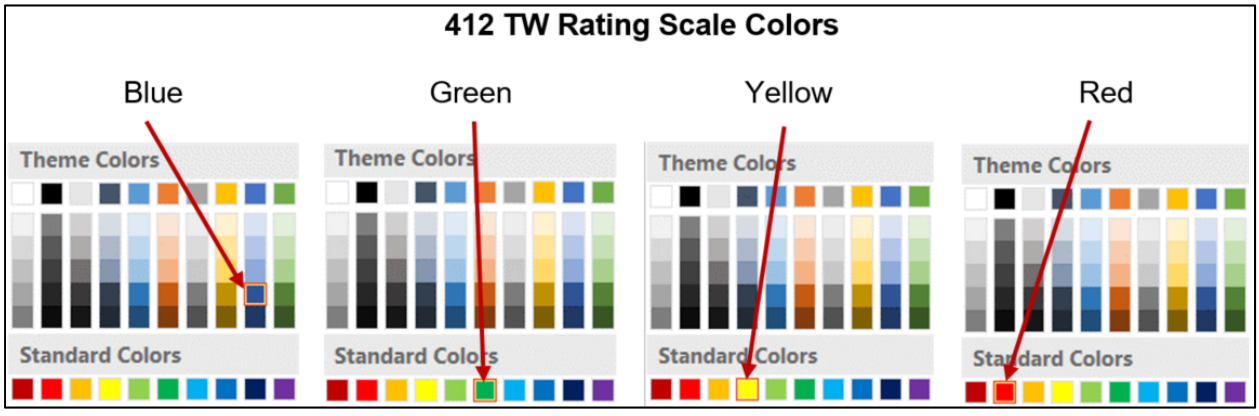


Figure 3 412 TW Rating Scale Colors

Commonly Used Discipline-Specific Rating Scales.

Various organizations across the 412 TW use discipline-specific rating scales. Typically, these scales include both descriptors and numbers. The numbers used in these scales are used to roughly convert subjective data into a numerical database for statistical analysis or graphical presentation and often come from a questionnaire used to solicit aircrew or maintainer opinions. The most common discipline-specific rating scales are the Handling Qualities Rating Scale (Cooper-Harper), the 412 TW Revised Bedford Workload Scale, and the General Purpose Scale. Many other scales exist. Contact the appropriate discipline technical expert for guidance on the use of these scales.

Detailed Test Item Description Appendix:

This optional appendix is for expanded details of the test item which are too cumbersome for the main body. For readability, it may make sense to repeat portions of the test item description from the main body in this appendix. Examples of information best documented in the Detailed Test Item Descripion appendix include:

- An expanded description of the SUT
- Subsystem-level schematics
- Algorithm details
- Close-up depictions of key components
- Mass properties tables
- Instrumentation systems
- System modifications that make the SUT non-production representative, but are not expected to affect the overall test result (potentially limiting the application of test results to a broader population)

Test Point Matrix Appendix:

This optional appendix lists the test points required to meet the test completion criteria. The test point matrix contains altitudes, airspeeds, test maneuvers, any additional information required to execute the test point. The test point matrix should be one of the early planning tools that outlines the scope of the test program and ensures that no gaps are left in the planning process.

It should be reviewed at early test plan working groups and may be a driver for putting together a statement of capability for a test program. The information is often presented in a tabular format with columnar headings of information pertinent to the test, and may include figures.

Test Procedure/Maneuver Description Appendix:

This optional appendix lists the procedure(s) required to accomplish a given maneuver or test run. The Test Procedure/Maneuver Description appendix should be one of the early planning tools and should be closely coordinated with the aircrew or system operator. The information is best presented in a step-by-step format, and will often be consistent with similar test programs.

The information in this section should be detailed enough to build test cards, but test teams are cautioned not to include final test card levels of detail in the test plan. Safety planning and other considerations must also be incorporated into the final test cards, and are not typically available when the test plan is finalized.

Requirements Traceability Appendix:

This optional appendix should cross-reference the test objectives, MOPs, and/or test points to the requirements document (e.g., CDD, ORD, specifications, etc.). If the requirement traceability is simple, it could be included in the test point matrix table instead of in a standalone appendix.

Parameter List Appendix:

This optional appendix states the minimum data parameter (also known as test measurand) requirements; if this information is not captured by any other test document, the appendix is required. The parameter list should address both data available via a data bus (often in MIL-STD-1553B format) and via special instrumentation (often known as orange wire). In cases where the entire data bus is required, teams may want to reference the ICD, rather than listing every parameter. Typical details included in the parameter list include:

- Name
- Description
- Telemetry rate
- Data rate
- Units
- Designate: SOF, SOT, or RFD

Data Analysis Plan Appendix:

In consultation with technical experts, detailed information should be included in a data analysis plan (either as a DAP appendix or a standalone document). The DAP should carry the reader from raw collected data to the final data product in the report. A DAP appendix or standalone document should capture the algorithms for data reduction and analysis and plans for final data products prior to testing. Each Engineering Squadron/Flight should have detailed requirements for appropriate DAP content. The DAP should be coordinated with technical experts prior to the Technical Review Board.

Although the format of the DAP is ultimately the test team's decision, a standalone DAP may provide the team greater flexibility than a DAP appendix. Having the DAP as a standalone document allows the DAP to be updated with evolving analysis methods throughout the test program without having to formally amend the test package. Additionally, DAPs may be lengthy, and keeping the DAP separate can improve the readability of the test plan.

Environmental Checklist Appendix:

This required appendix contains the approved environmental checklist referred to in Section 1.9 Environmental Impact Assessment. The 412 TW Environmental Management Office may be contacted at: (661) 277-1401 or 412TW.CEV.EIAP@us.af.mil.

Abbreviations, Acronyms, and Symbols Appendix:

Generally, the technical editor will compile and update this appendix (required excepting test plans of 20 or fewer pages cover to cover). This appendix will include all abbreviations, acronyms, and symbols in figures, tables, and text. This appendix is always the next-to-last section of the test plan, and should be referred to in a footnote to the first table or figure title in the main body (whichever appears first).

Distribution List Appendix:

Generally, the technical editor will compile and update this required appendix in coordination with the test team. The distribution list is always the last section of the test plan and contains the 412 TW/PO-approved list of recipients of the final test plan; the list is kept updated in the current test plan template. Changes to the list should be approved by the CTF's Commander or Engineering Director.

AUTHOR'S GUIDE REFERENCES

1. 412 TW-TIH-93-01, *Air Force Flight Test Center Test Plan Preparation Guide*, Air Force Flight Test Center, Edwards AFB, last updated February 1999.

2. EdwardsAFBI 99-101, *412 TW Test Plans*, 412th Test Wing, Edwards AFB, California, September 2016.

3. EdwardsAFBI 99-105, *Test Control and Conduct*, 412th Test Wing, Edwards AFB, California, January 2014.

4. AFTCI 91-202, *AFTC Test Safety Review Policy*, 41th Test Wing, Edwards AFB, California, November 2018.

5. DoDM 5200.01, Volume 2, *DoD Information Security Program: Marking of Classified Information*, DoD, Washington D.C., February 2012, updated March 2013.

6. DoDD 5230.24, *Distribution Statements on Technical Documents*, DoD, Washington D.C., August 2012, updated April 2016.

7. AFI 61-201, *Management of Scientific and Technical Information (STINFO)*, USAF, Washington D.C., January 2016.

8. Defense Technical Information Center website: https://discover.dtic.mil, last accessed January 2021.

9. DoDM 3200.14, Volume 1, *Principles and Operational Parameters of the DoD Scientific and Technical Information Program (STIP): General Processes*, DoD, Washington D.C., March 2014.

10. AFI 99-103, *Capabilities-Based Test and Evaluation*, USAF, Washington D.C., April 2017.

11. DoDI 5200.02T, Enclosure 4, *Operation of the Defense Acquisition System*, DoD, Washington D.C., updated April 2020.

12. 412 OG O.I. 11-5, *Briefing/Debriefing and Flight Briefing Room Requirements*, 412th Test Wing, Edwards AFB, California, January 2010.

13. EdwardsAFBI 99-103, *412 TW Technical Report Program*, 412th Test Wing, Edwards AFB, California, March 2013.

14. T.O. 00-35D-54, *USAF Deficiency Reporting, Investigation, and Resolution*, 558 CBSS/BGHA, Tinker AFB, Oklahoma, September 2015.

15. EdwardsAFBI 99-224, *Deficiency Reporting*, 412 TW, Edwards AFB, California, April 2017.

16. 412TW-TIH-21-01, *Technical Report Author's Guide*, 412th Test Wing, Edwards AFB, California, To Be Published.

APPENDIX A – TEST PLAN TEMPLATE EXAMPLE

This section contains a copy of the 412 TW Test Plan Template for instructional purposes. For the most up-to-date version in MS Word, please contact your technical editor.

412TW-TP-YY-##

Work with your tech editor to assign a test plan number.

AIRCRAFT PROGRAM TEST PLAN TEMPLATE

Write a brief and descriptive title of the test project, including the aircraft platform. Acronyms are acceptable if they are commonly used. The title should end with the words "Test Plan"

FIRST LAST
Project Engineer

FIRST LAST
Rank, USAF
Project Pilot

No more than two names (usually the project engineer and the aircrew) should be listed. Include other major contributors on the signature page and/or the SF 298.

Delete this info container and replace with a cover photo if desired.

This test plan template is a companion to the *Test Plan Author's Guide* (412TW-TIH-20-01). The template contains enough information for an experienced author to populate the test plan content. First-time authors should read the guide before attempting to fill in the template, as it contains basic philosophies, clarifying information, and additional guidance.

Text in black should remain as written.
Text in green highlight is fill-in-the-blank.
Text in blue is informational and should be deleted once addressed.

412TW

MONTH 202X
TEST PLAN

The test plan date is when the test plan is approved by the final signature (usually the Chief Engineer) on the signature page

DISTRIBUTION STATEMENT X. Distribution statement text. All test plans must have a Distribution Statement and Controlled Unclassified Information Designation(s) and banner markings; this will be coordinated by the test team and customer, with formatting assistance provided by the technical editor. For help, see the Test Plan Author's Guide.

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Distribution Statement: X

POC: Author (name optional), Email or Phone Number

412TH TEST WING
EDWARDS AIR FORCE BASE, CALIFORNIA
AIR FORCE MATERIEL COMMAND
UNITED STATES AIR FORCE

This document (412TW-TP-YY-XX, *Aircraft Program Test Plan*) was submitted under job order number XXXXXXXX by the Commander, 412th Test Wing, Edwards AFB, California 93524-6843.

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Prepared by:

The primary author and major contributors should be listed here, where applicable. Other contributors to the test plan may be acknowledged in a Preface.

FIRST LAST
Project Engineer

FIRST LAST
Rank, USAF
Aircrew

This test plan has been reviewed and is approved for publication:

The approval authority signatures are IAW Section 3.5 of EdwardsAFBI 99-101.

FIRST LAST
Chief Engineer
XXX CTF

REPORT DOCUMENTATION PAGE	Form Approved OMB No. 0704-0188

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1. REPORT DATE *(DD-MM-YYYY)*	2. REPORT TYPE	3. DATES COVERED
DD-MM-20YY	Test Plan	Beginning Month 20YY Match the "is planned to start" month/year in section 1.1 Overview

4. TITLE AND SUBTITLE	5A. CONTRACT NUMBER
Aircraft Program Test Plan This should match the cover page and signature page content - use upper/lower case here and the signature page.	5B. GRANT NUMBER
	5C. PROGRAM ELEMENT NUMBER
6. AUTHOR(S) Last, First, Rank, USAF, Project Engineer This should be the same list of "Prepared by" authors shown on the signature page, along with engineers and/or aircrew who contributed significant content per test team judgement.	5D. PROJECT NUMBER JON#HERE
	5E. TASK NUMBER
	5F. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) 412th Test Wing Edwards AFB CA 93524-6843	8. PERFORMING ORGANIZATION REPORT NUMBER 412TW-TP-YY-XX
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) Program Office Symbol Address XXX AFB ST Zip Code+4	10. SPONSOR/MONITOR'S ACRONYM(S)
	11. SPONSOR/MONITOR'S REPORT NUMBER(S)

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13. SUPPLEMENTARY NOTES
SC: 012100 (This number comes from STINFO via EAFB Technical Library)
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Print this document in COLOR.

14. ABSTRACT
This test plan presents...
Copy/paste the first paragraph of section 1.1 Overview here, removing acronyms not used again in the same paragraph. Tech Editing will check for updated content prior to milestone meetings and final distribution.

15. SUBJECT TERMS
Key words; ALPDRPSS(Acronym Left Parens Definition Right Parens Semicolon Space); (these terms help readers find your document in DTIC)

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19A. NAME OF RESPONSIBLE PERSON
A. REPORT	B. ABSTRACT	C. THIS PAGE			XXX FLTS or XXX CTF Chief Engineer
U	U	U	Same as Report	XX	19B. PHONE NUMBER (INCLUDE AREA CODE) Chief Engineer's 661-###-####

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TABLE OF CONTENTS

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1.0 INTRODUCTION

1.1 Overview

This test plan presents the background, test objectives, procedures, and reporting requirements for the test plan title. The overall test objective is to XX (see below). Testing was requested by the Program Office (PO), City/Base, State. The lead developmental test organization is the Air Force Test Center, Edwards AFB, California. The operational test organization (OTO) is XXX. The executing test organization is the 412 TW/XXX FLTS, Edwards AFB. The participating test organization(s) (PTO) is XXX. The stakeholders are: any organization including contractors/vendors that produce, consume, analyze, and/or report the test data. Testing is scheduled to begin in Month YYYY at Edwards AFB, and will consist of approximately XX ground and XX flight test hours (or other applicable scope metric[s]).

Generally, one of the following three statements will provide a framework for an overall test objective: Adjust the chosen statement to provide the appropriate details.

- Test the system in the specified areas to provide a recommendation, or
- Test the system in the specified areas to show its characteristics, performance, or functionality, or
- Collect information on the system in the specified areas in support of analysis efforts.

Adjust the following:

- Replace “system” with the appropriate terms describing the system under test (SUT).
- Replace “in the specified areas” with specific capabilities and engineering disciplines, as well as regression testing and assessment of military utility, as appropriate.
- Expand “provide a recommendation” to clarify whether the recommendation concerns readiness for OT&E, readiness for fielding, or some other acquisition recommendation.
- Modify “characteristics, performance, or functionality” to specify the level of analysis and products expected from the test.
- Augment “in support of analysis efforts” with information as to what type of analysis effort is planned and who is responsible for the analysis.

1.2 Background

Include at least the following information:

- A brief, high-level description of the test, to include why the test is being conducted.
- A summary of relevant program history leading up to the test. Include if/how this test plan fits into the broader test/program picture.
- A discussion of previous related tests, problems found during operational use, and significant results.
- Entrance criteria for this test program (technical prerequisite work).
- Introduction to technical concepts.

1.3 Test Item Description

Include enough information to understand the SUT:

- Clearly state the SUT and what parts of the system are new or test unique.
- Include a short overall description and figures of the item to be tested.

- Identify any specific configurations required, including software loads, stores, etc.
- Clearly state whether and why the SUT is considered production representative.
- Descriptions of instrumentation that affects the SUT may be provided here. A list of instrumentation requirements should be included in the Test Resources Requirements section.
- Refer to source documents containing detailed descriptions (e.g., flight manual, specifications, etc.).

Additional test item description information can be provided in a Detailed Test Item appendix.

1.4 Test Resource Requirements

Identify all resources required to conduct the mission (e.g., aircraft, ranges, hardware, software, facilities, personnel, etc.) in the appropriate sections below. List the resources, elaborating on any whose purpose is not obvious. This can include a wide variety of needs, ranging from special test equipment and analysis tools to outside range or technical support. Add additional sub-sections for your test program as appropriate.

1.4.1 Modeling and Simulation Resources

Briefly describe modeling and simulation (M&S) resources used to prepare for the test, in terms of predicting test results, establishing system maturity, providing understanding of system behavior, augment or serve as the primary venue for test results, and training personnel. Refer to documents containing detailed requirements where appropriate. Explain which modeling and simulation tools will be used to generate predictions, support test execution, and/or compare test results. Describe the maturity or known accuracy of these models. If the model is considered validated, state that fact and the validation authority, if known.

1.4.2 Test Facilities, Ranges, and Resources

Testing will be conducted at Edwards AFB. Flight testing is planned to be conducted within R-2508. Other civil airspace may be used if test requirements dictate.

Briefly state requirements for contractor- or government-owned test ranges, airspaces, airfields, facilities, and their associated resources. Refer to documents containing detailed descriptions, if appropriate. If there are reasons for using particular resources (such as range size, threats, altitude floor, speed restrictions, etc.), state those reasons here. Examples of test facilities, ranges, and support are provided in Table 1 of the *Test Plan Author's Guide*.

1.4.3 Test System/Aircraft

If the aircraft is the SUT, this section may be deleted, and the information wrapped into section 1.3 Test Item Description.

The test aircraft is a platform aircraft (USAF S/N XXX) or similar, with SUT/software/configuration installed. The aircraft requires OFP XXX.

Briefly state the test aircraft to be used or which will carry the item under test. Identify any flight certification requirements that allow the SUT to be installed and operated on the host system, such as Temporary 2 (T-2) modifications, military flight releases, contractor aircraft/engine operating limitations, contractor owned, contractor operated (COCO) contracts, or PO configuration control boards. Include any unique reference documents containing detailed test vehicle descriptions.

1.4.4 Instrumentation and Parameter Requirements

Briefly state the instrumentation required (e.g., strain gauges, recorders, cameras, spectrum analyzers) on the SUT, and onboard the test aircraft. Detailed descriptions of the instrumentation system should be placed in the Detailed Test Item Description appendix or referred to if contained in separate documents. Lengthy parameter lists should be placed in the Parameter List appendix.

1.4.5 Support Vehicles/Aircraft

Briefly state any support vehicle(s) or aircraft requirements. If appropriate, documents containing detailed support vehicle/aircraft descriptions may be referred to. The focus should be on the technical requirements needed to accomplish the test objectives, such as aircraft with a desired radar cross section. If there are safety requirements such as safety chase, those should be identified in the safety plan.

1.5 Safety Considerations

A separate safety plan will be developed IAW AFTCI 91-202, *AFTC Test Safety Review Process* (Reference X). Note any safety considerations that also affect the technical approach, such as resource requirements or specific process/execution considerations.

1.6 Security Requirements

If there are special security procedures for this test, briefly state them in this section. More in-depth descriptions (over one page) should be included in an appendix. Cite the authority for each type of security required. All of the security issues below must be considered regardless of the overall classification of the test program. CAUTION: Consider the security classification of the test plan itself before including any of the following content.

- General Security: State the classification of the test and reference the appropriate security classification guide(s).
- Operations Security
- Communications Security
- Competition Sensitivity: If there is competition-sensitive information associated with the test, state that fact and describe how the competition-sensitive information will be protected. If the test is conducted during a source selection, reference should be made to any special instructions required by the source selection plan.

All test planning, procedures, data handling (i.e., duplication and delivery), and data analysis will be IAW with the most current version of the following:

- AFPD 16-14, *Security Enterprise Governance*, (Reference X)
- AFI 31-101, *Integrated Defense* (Reference X)
- AFI 16-1404, *Air Force Information Security Program* (Reference X)

Test data will be classified up to the X level. Operations security (OPSEC) will be adhered to IAW AFI 10-701, *Operations Security (OPSEC)* (Reference X). Communications security (COMSEC) will be adhered to IAW AFMAN 17-1302-O, *Communications Security (COMSEC) Operations (O)* (Reference X).

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1.7 Key Stakeholder Contact Information

Table 1 lists key government and contractor personnel with responsibilities essential to test execution, analysis, and reporting. This section is not meant to be a comprehensive list of all test team participants, nor is it necessary to update upon a personnel change.

Table 1 Key Project Personnel

Name	Function	Organization	Contact Info
	Project Test Lead	XXX FLTS	661-275-xxxx
	Program Manager	XXX FLTS	661-275-xxxx
	Project Engineer	XXX FLTS	661-275-xxxx
	Discipline Engineer	XXX FLTS	661-275-xxxx
	Flight Test Engineer	XXX FLTS	661-275-xxxx
	Project Pilot	XXX FLTS	661-275-xxxx
	[Company] Test Lead	Company Name	xxx-xxx-xxxx
	Range Manager	UTTR	xxx-xxx-xxxx
	Test Manager	SPO	xxx-xxx-xxxx

1.8 Test Environment Requirements

Describe the technical requirements for location(s), time(s) of day, weather (e.g., precipitation, wind, visibility, and/or temperature), etc., including any technical limits. If there are no unique test environment requirements, state that in order to avoid ambiguity.

1.9 Environmental Impact Assessment

As required by 32 CFR 989, *Part 989 – Environmental Impact Analysis Process (EIAP)* (Reference X), an assessment of environmental impacts from the XXX test program was conducted. The 412th Test Wing Environmental Management Environmental Checklist for Projects is provided in Appendix X. Based on the Environmental Checklist, significant impacts on the human environment are not likely and no further environmental documentation is needed. The 412 TW Environmental Management Office may be contacted at: (661) 277-1401 or 412TW.CEV.EIAP@us.af.mil.

2.0 TEST AND EVALUATION [Page breaks not required before 2.0, 3.0, etc. headers.]

Contextual information may be included at the beginning of this section, such as:

- Definition of terms
- Phases of test
- Technical build-up approach
- Use of statistical methods
- Use of modeling and simulation

2.1 General Test Objectives (GTOs) and Specific Test Objectives (STOs)

This section is a comprehensive listing or table (not both) of all GTOs and/or STOs, and (optionally, if the table would not exceed one page) measure of performance (MOP) names. Information regarding how to write GTOs and STOs, including examples, can be found in the *Test Plan Author's Guide*. Details of the

MOPs should be reserved for Section 2.3. If desired, the overall test objective may be repeated here. The technical editor can assist in formatting the list or table of the test objectives.

Test objectives listed in text format:

The test objectives and (optional) MOP names for this test are:

Overall – Test objective fully restated. [Optional]
- GTO 1 – Test objective fully stated.
  - STO 1.1 – Test objective fully stated.
    - MOP 1.1.1 – MOP Name
    - MOP 1.1.2 – MOP Name
  - STO 1.2 – Test objective fully stated.
    - MOP 1.2.1 – MOP Name
    - MOP 1.2.2 – MOP Name
  - STO 1.n – Test objective fully stated.
    - MOP 1.n.1 – MOP Name
- GTO 2 – Test objective fully stated.
  - STO 2.1 – Test objective fully stated.
    - MOP 2.1.1 – MOP Name
    - MOP 2.1.2 – MOP Name
  - STO 2.n – Test objective fully stated.
    - MOP 2.n.1 – MOP Name

OR test objectives listed in table format, example 1 (MOPs column optional):

Table 2 Test Objectives

Overall Test Objective Fully Stated [This row optional.]		
GTOs	STOs	MOPs (this column is optional)
GTO 1 - Test objective fully stated.	STO 1.1 - Test objective fully stated.	MOP 1.1.1 – MOP Name
		MOP 1.1.2 – MOP Name
	STO 1.2 - Test objective fully stated.	MOP 1.2.1 – MOP Name
		MOP 1.2.2 – MOP Name
	STO 1.n - Test objective fully stated.	MOP 1.n.1 - MOP Name
GTO 2 – Test objective fully restated.	STO 2.1 - Test objective fully stated.	MOP 2.1.1 – MOP Name
		MOP 2.1.2 – MOP Name
	STO 2.n - Test objective fully stated.	MOP 2.n.1 - MOP Name

OR in this table format, example 2 (MOP rows optional):

Table 2 Test Objectives

Test Objective/MOP	Description
Overall	**Test objective fully stated.**
GTO 1	**Test objective fully stated**
STO 1.1	Test objective fully stated.
MOP 1.1.1	MOP Name
MOP 1.1.2	MOP Name

STO 1.2	Title
MOP 1.2.1	MOP Name
MOP 1.2.2	MOP Name
STO 1.n	Title
MOP 1.n.1	MOP Name
GTO 2	**Title**
STO 2.1	Title
MOP 2.1.1	MOP Name
MOP 2.1.2	MOP Name
STO 2.n	Title
MOP 2.n.1	MOP Name

2.2 Potential Impacts to Completion Criteria

Describe any test-unique factors that could realistically interfere with meeting test objectives. Focus on realistic risks unique to your test (or type of test). Clearly identify the affected test objectives, as well as how testing and results could be impacted.

2.3 GTO 1 – Text of GTO 1

The title/header of this section should fully restate the GTO. If this pushes the title to two lines, authors may consider shortening the title, but should retain the action verb.

2.3.1 STO 1.1 – Text of STO 1.1

The title/header of this section should fully restate the STO. If this pushes the title to two lines, consider shortening the title, but should retain the action verb.

2.3.1.1 MOP 1.1.1 – MOP Name

<MOP name> is defined as …

State the MOP name, and define it in one or two sentences. The MOP name does not include an action verb.

Consider how to best organize the MOPs. Some MOPs may share common aspects (such as evaluation criteria or methodology). In those cases, authors may choose to create an introductory section prior to the MOPs that details those shared aspects such that they are not repeated for each MOP, or address multiple MOPs in a table (for example, one MOP per column, with merged cells as appropriate). Authors should make every attempt to avoid making the same statement again and again throughout the Test and Evaluation section.

The MOP names and accompanying sections may be written in either text or table format.

2.3.1.1.1 Test Methodology

The test methodology section is a MOP-specific description of the test approach outlining how the team will use the SUT and support resources to collect the required data. Include a list of the maneuvers to be used and the test conditions/states or refer to the appendices in which they are discussed, as appropriate. This section provides enough information to start writing test cards and help establish the general order of the test cards (do not include the test cards themselves in the test plan).

2.3.1.1.2 Test Completion Criteria

The test will be considered complete when XXX.

State how the test team will know when the test is finished. If possible, include a quantitative metric for completion (such as time-on-condition, samples collected, runs complete, etc.). Deficient system performance does not necessarily affect test completion criteria; the test is still considered complete if identified completion criteria are met.

2.3.1.1.3 Expected Test Results

Discuss the realistically possible test outcomes for the MOP from a technical standpoint based on the results from modeling and simulation, lab environments, installed system test, and/or previous test performance. Do not simply restate the evaluation criteria. Additional detail is required if:

- The probable outcomes are not well-understood and are different from the evaluation criteria.
- The results are not binary (and predictions provide an expectation of system performance).
- The system performance is expected to be borderline or worse.

Sample wordings:

- Based on lab results, models, previous performance, predictions, etc., the SUT is expected to have the following characteristics: X
- This MOP is expected to be borderline/deficient/unacceptable/unsafe, but testing is planned because reason. Explain why the expected result is other than good and why testing is still planned.
- The results of this MOP are expected to be good as defined by the evaluation criteria. This is only appropriate for well-understood, simple tests.
- The regression test results of this system are expected to be unchanged from baseline.

2.3.1.1.4 Data Requirements

Identify the MOP-specific data requirements to conduct data analysis. These requirements should be identified by the parameter common name (e.g., altitude or airspeed), but not necessarily the measurand ID (e.g., XD0007). If the list of specific data parameters is large, it can be provided in a comprehensive Parameter List appendix or standalone document. Data may also include surveys, video, or other products besides parameters. These requirements may include safety and/or technically required parameters.

2.3.1.1.5 Data Analysis and Final Data Products

Explain how data will be processed, analyzed, and presented. If the processing and analysis is expected to be simple, provide analysis methods (e.g. equations, algorithms) in this section. Otherwise, summarize the data analysis methods and list the final data products. Include the detailed information in a data analysis plan (either as a test plan appendix or a standalone document).

2.3.1.1.6 Evaluation Criteria

Results will be considered good if XXX.

Results will be considered borderline if XXX.

Results will be considered deficient if XXX.

Regression test results will be considered improved, unchanged, or degraded from the baseline.

Authors are not required to use and identify evaluation criteria for all seven descriptors (excellent, good, adequate, borderline, deficient, unusable, unsafe [see the 412th Test Wing Rating Scale in Appendix X]), but it is encouraged. Authors may choose to define criteria for one descriptor and add an "otherwise, results are deficient" statement. Do not associate evaluation criteria with ratings (satisfactory, marginal, and unsatisfactory), as those are reserved for test objectives. Evaluation criteria are not required for data collection test objectives, and may not be appropriate for other test objectives.

Sample MOP Table with Test Points Row (no table numbers or titles are required for MOP tables - the numbered MOP Name header is sufficient):

MOP Description	
Test Methodology	
Test Completion Criteria	
Expected Test Results	
Data Requirements	
Data Analysis and Final Data Products	
Evaluation Criteria	
Test Points	

Sample MOP Table with Test Point Matrix:

MOP Description					
Test Methodology					
Test Completion Criteria					
Expected Test Results					
Data Requirements					
Data Analysis and Final Data Products					
Evaluation Criteria					
Test Points					
Numbers	**Minimum Revisits (Cumulative)**	**Mode**	**Antenna Positions**	**Ground Range (km)**	**Squint Angle (deg)**

3.0 TEST CONDUCT

This section describes test-unique aspects beyond the requirements in USAF instructions. This section should be closely coordinated with aircrew and test operations personnel.

The XXX Combined Test Force will conduct the XXX evaluation at Edwards AFB IAW the responsibilities and procedures specified in EdwardsAFBI 99-105, *Test Control and Conduct*

(Reference X), and additional instructions as applicable to your unit and test program (e.g., CTF supplements to EdwardsAFBI 99-105).

3.1 Readiness Reviews

Provide information on the following test readiness review (TRR) elements:

- A timeline of the TRR relative to test events
- Required attendees, briefers, and approvers
- Readiness to test
- Program-unique aspects
- Stakeholder concurrence to proceed if required

Typical topics for the TRR include:

- Introduction & Overview
  - Test objective review
  - High technical risk areas
- Planning
  - SUT/aircraft status
  - Test completion criteria review
  - Test procedure status
  - Test schedule and tempo
- Provisioning status
  - Instrumentation
  - Software and hardware configuration
  - Stores/special test equipment
  - Documentation (T-2 modifications, Form F, weight and balance, etc.)
  - Mission planning
  - Control room
  - Real-time data (both technical and safety requirements)
  - IT/networks/data distribution plan
  - Safety
  - Security
  - Team training
  - Airworthiness process
- Execution
  - Go/no-go criteria
  - Operational limitations
  - Mission materials (cards, brain books, etc.)
  - Brief and debrief timing and content
- Analysis
  - WIT/DR plan
  - Data analysis tool status
- Reporting
  - Post-mission and final reporting plan

3.2 Pretest Briefing(s)

Describe any test-unique aspects of day-prior or day-of briefings to be held prior to test execution. Identify attendees (e.g., contractor, chase pilot, PTO, etc.) and what will be addressed in each briefing. Additional briefing items may be required by the safety plan. Further guidance may be found in 412 OG O.I. 11-5, *Briefing/Debriefing and Flight Briefing Room Requirements*. Identify test-unique topics such as:

- SUT status and checkout
- Instrumentation status and checkout
- Ground station status and checkout
- Software and hardware configuration
- Test objective and procedure review
- Test completion criteria
- Go/no-go criteria
- Real-time data requirements

3.3 Test Execution

This section may include test procedures and setup unique to the test program. For example:

- Instrumentation calibration procedures
- Test facility layout
- Definitions of unique roles
- Test flow and buildup

3.4 Posttest Briefing

All personnel associated with the test execution will attend a posttest briefing. Items to be discussed at the posttest brief may include, but are not limited to:

Describe any posttest briefings, to include attendees and topics to be addressed in each briefing. Refer to 412 OG O.I. 11-05 and identify test-unique topics such as:

- SUT status
- Instrumentation status
- Test points attempted/completed
- Results
- Path forward/next steps

3.5 Posttest Data Procedures

Describe how data acquired during the test will be managed, requested, and distributed. Identify topics such as:

- System on which data will be stored
- Process of how posttest data will be requested by team members
- Method of how data will be transferred to contractors or outside customers, if different from the data request process

4.0 TEST REPORTING

Describe the type of technical reporting products that will be authored, as well as the expected delivery timeline to the customer. For data collection efforts, state that no final reports will be issued. Choose from the following, and delete any sections that are not applicable:

4.1 Watch Items (WITs) and Deficiency Reports (DRs)

A potential deficiency may start as a WIT and may remain as a WIT until the team determines it to be a true deficiency. If the deficiency remains and satisfies the criteria of either a Category I or Category II DR, it will be submitted as a DR to XXX PO. A WIT will be closed if it does not meet the criteria of a DR.

The DRs will be written IAW T.O. 00-35D-54, *USAF Deficiency Reporting, Investigation, and Resolution* (Reference X), and 412 TW deficiency reporting guidance, EdwardsAFBI 99-224, *Deficiency Reporting* (Reference X).

4.2 Quick Look Reports

The test team will prepare quick look reports after each test event and send the reports to stakeholders. Quick look report information will include aircraft test configuration, test points planned, test points attempted, and a brief discussion of test results with aircrew observations.

4.3 Preliminary Report of Results (PRR)

In accordance with EdwardsAFBI 99-103, *412 TW Technical Report Program* (Reference X), a PRR will be provided by the 412 TW upon completion of XXX, which will include preliminary test results.

4.4 Capability Report (CR)

In accordance with EdwardsAFBI 99-103 (Reference X), a CR will be provided by the 412 TW upon completion of the test activities finalizing Project Name, which will include test results.

4.5 Technical Information Memorandum/Handbook

In accordance with EdwardsAFBI 99-103 (Reference X), a technical information memorandum (TIM) or technical information handbook (TIH) will be provided by the 412 TW upon completion of Project Name, which will document processes, provide instruction, or archive important technical information for engineering reference.

Technical information memorandums (TIMs) and technical information handbooks (TIHs) are intended primarily to document processes, provide instruction, or archive important technical information for engineering reference. They may also be used to document the analysis used to substantiate recommendations regarding system models or flight manual charts.

4.6 Technical Report (TR)

In accordance with EdwardsAFBI 99-103 (Reference X), test results and recommendations will be provided in a TR by the 412 TW upon completion of the test activities. If your timeline will differ from that specified by EdwardsAFBI 99-103, state that here.

4.7 Data Package (DP)

In accordance with EdwardsAFBI 99-103 (Reference X), one or more data packages will be provided by the XXX CTF upon completion of the test activities finalizing Project Name.

4.8 Test Complete Letter (TCL)

A TCL may be issued to inform a customer that a collect-only test has been completed. The TCL contains no analyses, subjective assessments, ratings, conclusions and/or recommendations.

5.0 REFERENCES

In the main body of the test plan, use the document number (if there is one), and the complete, italicized title of your reference on first use, followed by the reference number in parentheses:

"The test-based lift curves are documented in 412TW-TR-02-97DP1, *AN/APX-99 Spoilers Test and Evaluation Data Package 1* (Reference X)."

On subsequent references back to a reference already discussed, use a shortened, non-italicized title followed by the reference number in parentheses. Be consistent and keep using this same shortened title every time you refer to the document:

"The AN/APX-99 drag polars are documented in Data Package 1 (Reference X)."

- Be careful about the distribution level of the material you are using as references. And be sure that content (including text, figures, and tables) from more-restricted material is not included in a report with less-restricted distribution. Check with the Edwards AFB Technical Research Library on the level of distribution statements.
- Do not reference classified documents in unclassified reports that are approved for public release. Avoid referencing classified documents in limited distribution unclassified reports, if possible.
- Do not reference an MFR; include a copy of the MFR in an appendix.
- Unless the material is proprietary or has a different distribution level than the test plan, it is best to include the actual contractor material in an appendix to ensure availability to readers. If the contractor's material is proprietary, check with the Edwards AFB Research Technical Library for guidance.
- If you use a classified reference, ask your technical editor for formatting guidance on placing classified references in unclassified test plans.

The standard formatting guidance varies for different types of references. The most common types of references include:

- 412 TW Test Plan
    - 412TW-TP-20-01, *KC-46A and SR-71A Aerial Refueling Evaluation Test Plan*, 412th Test Wing, Edwards AFB, California, February 2020.

Author names are not included in test plan references.

- 412 TW Technical Report
    - Active Duty Author

        - 412TW-TR-86-44, *KC-135R and SR-71A Aerial Refueling Test and Evaluation*, Eddard P. Stark, Second Lieutenant, USAF, 412th Test Wing, Edwards AFB, California, December 2020.
    - DoD Civilian Author
        - 412TW-TR-86-45, *KC-46A and SR-71A Aerial Refueling Test and Evaluation*, Jon A. Nieve, 412th Test Wing, Edwards AFB, California, December 1987.
    - Multiple Authors
        - 412TW-TR-86-44, *KC-46A and SR-71A Aerial Refueling Test and Evaluation*, Harry J. Potter and Tyrion R. Lannister, 412th Test Wing, Edwards AFB, California, December 1986.
- Contractor Test Plan/Report
    - TIS FA1198, *Flight Test of the Production F100-PW-220 Engine in the F-16*, General Dynamics Fort Worth Division, Fort Worth, Texas, revised June 1986.
    - S842-911000, *System Specification for USAF KC-46 System*, Revision A, The Boeing Company, Seattle, Washington, August 2011.
    - TDOC-1488, *C-5 Communication Navigation Surveillance/Air Traffic Management (CNS/ATM), SATCOM Test Information Sheet (TIS) C-5M CNS/ATM, Ground and Flight Test*, Lockheed Martin Aeronautics Company, revised January 2018.
- Aircraft Flight Manual
    - T.O. 1F-16C-1, *Flight Manual, USAF Series Aircraft, F-16C*, General Dynamics Fort Worth Division, Fort Worth, Texas, July 1984.
    - T.O. 1C-5M-1, Flight Manual, USAF Series Aircraft, C-5M and C-5M (SCM), Lockheed Martin Aeronautics Company, Marietta, Georgia, January 2011.
- Military Specification
    - MIL-STD-210B, *Military Standard Climatic Extremes for Military Equipment*, Hanscom AFB, Massachusetts, December 1973.
    - MIL-STD-1472G, *Department of Defense Design Criteria Standard Human Engineering*, U.S. Army Aviation and Missile Command, Redstone Arsenal, Alabama, January 2012.
- Instruction/Guidance Reference
    - AFTCI 91-202, *Air Force Test Center Test Safety Review Policy*, Edwards AFB Supplement, Edwards AFB, California, November 2018.
    - EdwardsAFBI 99-101, *412 TW Test Plans*, 412th Test Wing, Edwards AFB, California, August 2020.
- Reference Manual
    - Altitude Tables, 1962 United States Standard Atmosphere, Air Force Flight Test Center, Edwards AFB, California, April 1962.

- *Performance and Flying Qualities UFTAS Reference Manual*, Air Force Flight Test Center, Edwards AFB, California, October 1984.
- AFFTC-TIH-81-5, *AFFTC Standard Airspeed Calibration Procedures*, Air Force Flight Test Center, Edwards AFB, California, revised June 1984.
- NASA-TM-X-74335, *U.S. Standard Atmosphere 1976*, National Aeronautics and Space Administration, Washington, DC, October 1976.
- PRIME Item Development Specification (PIDS)
- Prime Item Development Specification for Turbofan Engine F100-PW-200, 16PRXXXX, Pratt and Whitney Aircraft Group, West Palm Beach, Florida, July 1980.

- Book Reference
  - Parkinson, Cyril N., *Parkinson's Law and Other Studies in Administration*, Houghton Mifflin Company, Boston, Massachusetts, 1957.
- Journal Article
  - Carrier, G. F., "Heuristic Reasoning in Applied Mathematics," *Quarterly of Applied Mathematics, Vol XXX, No. 1,* Brown University, Providence, Rhode Island, William Byrd Press, Richmond, Virginia, April 1972, pp. 11–15.
  - House, A. S., et al., "Articulation-Testing Methods: Consonantal Differentiation with a Closed-Response Set," *Journal of the Acoustical Society of America, Vol. 37, No. 1*, Melville, New York, January 1965, pp. 158–166.
- Contribution to Symposium or Conference
  - Brown, R.C., "Fatigue, Fact or Fiction?" Presented at the Symposium on Fatigue (eds. Floyd, W.F. and Welford, A.T.), held by Ergonomic Research Society, Cranfield, England, 24–27 March 1952, H.K. Lewis and Co., Ltd., London, England, 1953, pp. 24–27.
- Letter OR EMAIL
  - See letter in Appendix X dated 15 March 2001, from Joseph Engineering, Inc., to Penny R. Cade, project engineer, concerning minimum ground control speeds.
  - See email in Appendix X sent 1 April 2001, from Bernice Smith, project manager, to Joseph Clark, project engineer, concerning the capability of the YNEW aircraft.

Whenever practical, include a copy of letters or emails in an appendix. Ensure the distribution statement, dissemination, and classification levels have been reviewed and are compatible with the overall test plan. If the letter/email's distribution/dissemination varies from the test plan, or the size/dimensions don't readily fit in a printed format, consider publishing the appendix under separate cover, which can include a CD or DVD for the reference document itself.

- WEBSITE
  - Government Publications, accessed 2 July 2001, http://bookstore.gpo.gov.

Whenever practical, download the information you're using and include it in an appendix or data package with proper attribution (same information as shown in the example above). This will help the reader if the website closes, changes address, or is updated and the cited information deleted.

The most commonly used references in test plans are given below. Ask your technical editor to help ensure the references you use are up-to-date:

1. AFMAN 13-212, *Range Planning and Operations*, Volume 1, The Secretary of the Air Force, HQ USAF, Washington, D.C., June 2018.

2. AFTCI 91-202, *Air Force Test Center Test Safety Review Policy*, Edwards Air Force Base Supplement, Edwards AFB, California, November 2018.

3. AFPD 16-14, *Security Enterprise Governance*, HQ USAF, Arlington, Virginia, July 2017.

4. AFI 31-101, *Integrated Defense*, HQ USAF, Arlington, Virginia, October 2009.

5. AFI 16-1404, *Air Force Information Security Program*, HQ USAF, Washington, D.C., May 2015.

6. AFI 10-701, *Operations Security (OPSEC)*, AF/A3Z CI, Information Operations Division, July 2018.

7. AFMAN17-1302-O, *Communications Security (COMSEC) Operations (O)*, SAF/CIO A6, Washington D.C., February 2017.

8. AFI 32-7061, *The Environmental Impact Analysis Process*, HQ USAF/A7CI, Washington, D.C., March 2003 (Certified Current as of March 2014).

9. AF Form 813, Control Number 12-0242a, *Request For Environmental Impact Analysis*, HQ USAF, Washington, D.C., August 1993.

10. O.I. 99-7, *Test Card Development and Approval*, Revision C, Edwards AFB, California, July 2010.

11. EDWARDSAFBI 99-105, *Test Control and Conduct*, 412 TW, Edwards AFB, California, September 2019.

12. T.O. 00-35D-54, *USAF Deficiency Reporting, Investigation, and Resolution*, 558 CBSS/GBHA, Tinker AFB, Oklahoma, September 2015.

13. EDWARDSAFBI 99-224, *Deficiency Reporting,* 412 TW, Edwards AFB, California, April 2017.

14. EDWARDSAFBI 99-103, *412 TW Technical Report Program,* 412 TW, Edwards AFB, California, August 2013.

15. EDWARDSAFBI 99-101, *412 TW Test Plans,* 412 TW, Edwards AFB, California, September 2016.

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APPENDIX X – RATING SCALES

Include all of the rating scales that your test program will use. If ratings will be used, then a Rating Scales appendix is required. Two 412 TW rating scales (updated in 2021) are provided below.

Table X1 presents the 412 TW Rating Scale and Table X2 presents the 412 TW Regression Rating Scale.

Table X1 412 TW Rating Scale

How Well Does the System Meet Mission and/or Task Requirements?	Changes Recommended for Mission/Task Improvement	MOP Descriptor	Test Objective Rating
Exceeds requirements	None	Excellent	Satisfactory
Meets all or a majority of the requirements	Negligible changes needed to enhance or improve operational test or field use	Good	Satisfactory
Some requirements met; can do the job, but not as well as it could or should	Minor changes needed to improve operational test or field use	Adequate	
Minimum level of acceptable capability and/or some non-critical requirements not met	Moderate changes needed to reduce risk in operational test or field use	Borderline	Marginal
One or some of the critical functional requirements were not met	Substantial changes needed to achieve satisfactory functionality	Deficient	Unsatisfactory
A majority or all of the functional requirements were not met	Major changes required to achieve system functionality	Unusable	
Mission not safe	Critical changes mandatory	Unsafe	Unsatisfactory

Table X2 412 TW Regression Rating Scale

How Does the System Performance/Functionality Compare with Previous Test Results?	Rating
Performance or functionality was improved.	Improved
No change to performance or functionality.	Unchanged
Performance or functionality was degraded.	Degraded

APPENDIX X – DETAILED TEST ITEM DESCRIPTION

Optional. Examples of information best documented in a Detailed Test Item Description appendix include:

- An expanded description of the SUT
- Subsystem-level schematics
- Algorithm details (if part of the SUT)
- Closeup depictions of key components
- Mass properties tables
- Instrumentation systems
- System modifications that make the SUT non-production representative, but are not expected to affect the overall test result (potentially limiting the application of test results to a broader population)

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APPENDIX X – TEST POINT MATRIX

Optionally, list the test points required to meet the test completion criteria. Consult your tech expert for modifications to the Table XX example.

Table XX Example Test Point Matrix

Test Point	Config	PA (ft)	Mach/ KCAS	AOA (deg)	NZ (g)	FLCS Mode	Maneuver	Notes
FQ.01.001	Ferry	5,000	345		1	UA	Receptacle Tracking	2 test booms required
FQ.01.002	Clean	20,000	220	16	2	UA	Wings Level Sideslip	

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APPENDIX X – TEST PROCEDURE/MANEUVER DESCRIPTION

Optionally, list the procedure required to accomplish a given maneuver or test run. Do not include test cards in the test plan.

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APPENDIX X – REQUIREMENTS TRACEABILITY

Optionally, cross-reference the test objectives, MOPs, and/or test points to the requirements document (i.e., TEMP, ORD, specifications, etc.). Table X1 provides an example**:**

Table X1 Requirements Traceability Chart Example

STO	MOP	Test and Evaluation Master Plan	Capability Development Document	Operational Requirements Document	System Specification
1	1.1	Section 1.2.3	Section 4.5.6	Section 7.8.9	Section 10.11.12
	1.2				
2					
…					

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APPENDIX X – PARAMETER LIST

State the minimum parameter requirements; if this information is not captured by any other test document, the appendix is required. Table XX provides an example:

Table XX Parameter List Example

Parameter Code	Description	Source	Data Range	Units	Data Rate (Hz)	TM Rate (Hz)	RFD	SOT
OW6969	CG Normal Accel (Nz)	Orange Wire	-4/+10	g	400	200	x	x
AA123	Left Engine Thrust Request	1553 Bus Meas	-10/+150	deg	64	50	x	---
BB456	Right Engine Thrust Request	1553 Bus Meas	-10/+150	deg	64	50	x	---
CC789	Pressure Altitude	1553 Bus Meas	-10,000/ +100,000	ft	64	16	---	x

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APPENDIX X – DATA ANALYSIS PLAN (DAP)

The DAP appendix (required if applicable and not a standalone document) contains: algorithms for data reduction and analysis, and final data products. The appendix should carry the reader from raw collected data to the final data product in the report. Consult relevant discipline technical experts for format and content.

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APPENDIX X – ENVIRONMENTAL CHECKLIST

This required appendix contains the environmental checklist referred to in the Environmental Impact Assessment section. Contact Environmental Management for an updated Enviromental Checklist at: (661) 277-1401 or 412TW.CEV.EIAP@us.af.mil.

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APPENDIX X – SENSORS TEST ITEM DESCRIPTION
(Published under Separate Cover)

This example appendix included for formatting guidance in the event the test plan refers to a classified appendix.

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APPENDIX X – ABBREVIATIONS, ACRONYMS, AND SYMBOLS

Generally, the technical editor will compile and update this required appendix, which will include all abbreviations, acronyms, and symbols in the document, including those in figures, tables, and text.

Abbreviation	Definition
412 TW	412th Test Wing

APPENDIX X – DISTRIBUTION LIST

Generally, the technical editor will compile and update this required appendix in coordination with the test team, the Program Office (PO), and the latest 412 TW guidance. The distribution list is always the last section of the test plan and contains the PO-approved list of recipients of the final test plan including DTIC, the Edwards AFB Technical Research Library, and the AFTC History Office. All CUI documents require an individual named as the recipient (i.e., don't just list the office without a person's name). Inclusion of contractors on the distribution list should be reviewed by the Chief Engineer for PO approval:

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Defense Technical Information Center Attn: Jack Rike Email: jackie.l.rike.civ@mail.mil	1	0
Totals:	4	2

APPENDIX B – ABBREVIATIONS, ACRONYMS, AND SYMBOLS

Abbreviation	Definition
412 OG	412th Operations Group
412 TW	412th Test Wing
AFB	Air Force Base
AFI	Air Force Instruction
AFTC	Air Force Test Center
AFTCI	Air Force Test Center Instruction
BAF	Benefield Anechoic Facility
CDD	Capabilities Development Document
CEP90	circular error probable of 90 percent
CPD	Capability Productions Document
CR	capability report
CTF	Combined Test Force
CUI	controlled unclassified information
DAP	data analysis plan
DIADS	Digital Integrated Air Defense System
DoD	Department of Defense
DoDD	Department of Defense Directive
DoDI	Department of Defense Instruction
DoDM	Department of Defense Manual
DP	data package
DR	deficiency report
DT	developmental test and evaluation
DT&E	developmental test and evaluation
DTIC	Defense Technical Information Center
EAFB	Edwards Air Force Base
EdwardsAFBI	Edwards Air Force Base Instruction
FTRR	flight test readiness review
GPS	global positioning system
GTO	general test objective
HOTAS	hands-on throttle and stick
HITL	hardware-in-the-loop
HQS	handling qualities simulator
Hz	hertz
IAW	in accordance with
ICD	initial capabilities document
IDAL	Integrated Defense Avionics Lab
IFAST	Integrated Facility for Avionics Systems Testing
ISTF	integrated system test facility

Abbreviation	Definition
JSE	Joint Simulation Environment
LRR	launch readiness review
LRU	line-replaceable unit
MIL-STD	military standard
MOP	measure of performance
M&S	modeling and simulation
MS Word	Microsoft Word
N/A	not applicable
No.	number
O.I.	Operating Instruction
ORD	operations requirement document
OT	operational test
PIRA	Precision Impact Range Area
PMSR	Point Mugu Sea Range
PO	program office
PRR	preliminary report of results
RFD	required for data
RMCC	Ridley Mission Control Center
SIL	system integration laboratory
SOC	statement of capability
SOF	safety of flight
SOT	safety of test
STE	Special Test Equipment
STINFO	scientific and technical information
STIP	Scientific and Technical Information Program
STO	specific test objective
SUT	system under test
T.O.	Technical Order
T/N	tail number
T-0	test day
T-1	test day minus 1
T-2	Temporary 2
TCL	test complete letter
TIH	technical information handbook
TIM	technical information memorandum
TP	test plan
TR	technical report
TRR	test readiness review
TW	Test Wing
U.S.	United States

Abbreviation	Definition
USAF	United States Air Force
UTE	unexpected test event
UTSO	Unit Test Safety Officer
vs.	versus
WIT	watch item
WSTC	White Sands Test Center

APPENDIX C – DISTRIBUTION LIST

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Totals:	2	2