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EDWARDS AIR FORCE BASE**

**EDWARDS AIR FORCE BASE
INSTRUCTION 99-105**



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Test and Evaluation

TEST CONTROL AND CONDUCT

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This Edwards Air Force Base Instruction (EDWARDSAFBI) implements Air Force Instruction 99-103, *Capabilities-Based Test and Evaluation*. This instruction specifies the responsibilities of key personnel and procedures for the control and conduct of flight and ground testing for which the 412th Test Wing (TW) is responsible. It presents guidelines on the preparation of test procedures and test cards, test team member qualifications and training, and control room procedures for test missions that require some form of real-time data monitoring and control. It applies to all 412th TW units and detachments regardless of their operating location. It also applies to those Air National Guard and Air Force Reserve units supporting flight and ground testing for which the 412th TW is responsible. This publication may be supplemented at any level, but all direct Supplements must be routed to the OPR of this publication for coordination prior to certification and approval. Requests for waivers must be submitted to the OPR listed above for consideration and approval. Ensure that all records created as a result of processes prescribed in this publication are maintained IAW Air Force Manual (AFMAN) 33-363, *Management of Records*, and disposed of IAW Air Force Records Information Management System (AFRIMS) Records Disposition Schedule (RDS). Refer recommended changes and questions about this publication to the Office of Primary Responsibility (OPR) using the AF Form 847, *Recommendation for Change of Publication*; route AF Forms 847 from the field through the appropriate functional chain of command.

SUMMARY OF CHANGES

This publication is updated to include changes to organizations and instructions as applicable at the time of revision as a result of the AFMC 5-Center reorganization and consolidation of the 412th TW and the 95th Air Base Wing (ABW). Changes were also made to control room personnel crew rest requirements

1. General.

1.1. This instruction applies to both flight and ground tests in support of a test plan. A test can be a ground or flight activity to gather specific information, answer a customer's question, or provide information not wholly covered by an approved instruction/training manual. This instruction is not intended to cover system check-outs or maintenance troubleshooting.

1.2. Test organizations at the 412th TW will conduct flight and ground tests in accordance with an approved test plan (EAFBI 99-101, *Test Plans*) and an approved safety plan (AFTCI 91-202 *Test Safety Review Process Edwards Supplement*). The Combined Test Force (CTF) director, United States Air Force Test Pilot School (USAF TPS) Commandant, squadron commander, or project manager will prepare written procedures in order to implement the provisions of this instruction and execute the test activity as stated in the test plans.

1.3. Overall Safety. Test personnel must recognize that no guidance on test conduct can be all-encompassing to the extent that test execution becomes mechanical. Test card content and procedures should not be taken as direction to do something unwise. Test aircrew, engineers, technicians, test essential personnel, and maintainers should not hesitate to point out at any time circumstances that will (in their judgment) put the aircraft or crew in an unplanned hazardous situation.

1.4. Overall Security. Test personnel will adhere to appropriate security protocol at all times in order to protect sensitive and classified information. Classified data will be properly marked and will be shared on a "need-to-know" basis only with those individuals holding the requisite security clearance. For more information on the distributing and safeguarding test information, please reference AFI 99-103, *Capabilities-Based Test and Evaluation*.

2. Policies.

2.1. Qualification and Training:

2.1.1. Test organizations will ensure personnel conducting flight and ground tests (to include test directors, test conductors, engineers, aircrew and maintenance personnel) are current and qualified in the duties they are required to perform in support of test operations or under the supervision of a qualified instructor. Test organizations will document aircrew training, qualification, and currency to perform specialized flight test events. This includes but is not limited to photo and/or safety chase, high angle of attack testing, munitions deliveries, and air drop of cargo or paratroopers. Medium and high-risk events in manned aircraft crewed entirely by individuals other than graduates of a test pilot school will be permitted only if documented in the approved safety package. Individuals other than test pilot school graduates may crew with test pilot school graduates in elevated-risk missions at the discretion of the CTF director, USAF TPS Commandant or squadron commander.

2.1.2. Test organizations will establish a training for Test Control Personnel. Refer to AFTCI 99-110 and local supplements for more information on qualification and training requirements.-The CTF Director, USAF TPS Commandant, or squadron commander will approve qualifications and authorize test essential personnel to perform their duties, and will designate instructor test directors and/or conductors to conduct and document initial and/or recurring checkouts of test directors and test conductors during test/simulated missions. Test Unit Leadership will ensure that all other test essential personnel receive training appropriate to their assigned task.

2.1.3. Test organizations through the maintenance group will ensure that maintainers and instrumentation technicians are qualified to perform their required duties through appropriate training prior to working on test articles and conducting ground or logistics tests. The test organization is responsible for any test-unique training or qualifications on equipment or capabilities not currently fielded. Test organizations will ensure that all personnel operating data acquisition systems receive training in the proper operation of the system.

2.2. Test Conduct:

2.2.1. All ground test and flight test events executed under a test plan will be conducted from approved test cards or test procedures. Each flight test organization will establish and maintain a unit test card development and coordination process that includes procedures for updating and approving changes to test cards based upon lessons learned.

2.2.2. Flight test cards will contain the following minimum information, as applicable:

2.2.2.1. aircraft configuration with weight and balance as applicable

2.2.2.2. aircraft operating limits critical to the test point

2.2.2.3. test limits

2.2.2.4. initial conditions

2.2.2.5. challenge and response items: flight test technique

2.2.2.6. allowable data bands

2.2.2.7. maneuver parameters with associated abort, terminate and/or knock-it-off tolerances. For diving maneuvers with less than eight seconds of time safety margin (defined in AFI 11-2FTV3, EAFB Sup 1 *Flying Operations*), the following additional requirements will be on the test cards:

2.2.2.7.1. maneuver parameters that define the worst-case vector upon which the time safety margin was based, to include:

2.2.2.7.1.1. dive angle

2.2.2.7.1.2. bank angle

2.2.2.7.1.3. airspeed

2.2.2.7.1.4. load factor (g)

2.2.2.7.1.5. altitude

2.2.2.7.2. maximum terrain height in test area if altitude not listed in AGL

altitude

2.2.2.7.3. any other maneuver parameter and associated tolerance documented in the test safety package

2.2.2.8. maneuver recovery procedure(s) that includes applicable tolerances

2.2.2.9. data acquisition system settings

2.2.2.10. risk level

2.2.2.11. go or no-go criteria

2.2.2.12. test card number

2.2.3. The risk level of each elevated risk mission will be annotated on the schedule in the remarks section of Center Ops On-Line (COOL). Based on the risk level of the test card package, each commander's approval signature is valid for a specific approval period listed below (i.e. for a 14-day approval period, if the approval signature was on 1 May, then the test may be executed through the end of the day on 15 May without obtaining an updated approval signature).

2.2.3.1. Low Risk: SQ/CC approval signature valid for 90 days.

2.2.3.2. Medium Risk: OG/CC approval signature valid for 90 days. Submit test card packages for initial approval to OG/CC no later than three business days prior to desired test execution date (one full business day prior when requiring updated approval signature).

2.2.3.3. High Risk: TW/CC approval signature valid for 90 days. Submit test cards or test procedures for initial approval to OG/CC no later than five business days prior to desired test execution date (two full business days prior to the OG/CC when requiring updated approval signature).

2.2.4. All test missions will be pre-briefed in accordance with 412th TW briefing guidelines (See OG OI 11-5 *Briefing/Debriefing and Flight Briefing Room Requirements*). All applicable safety package test hazard analyses (AFTC Form 5000, *Test Hazard Analysis*), along with the general minimizing procedures-for all test events, will be briefed regardless of risk level. The AFTC Form 5001 requirements take precedence over those specified in the test plan.

2.2.5. Test events will be executed per the briefed test cards and/or procedures unless safety would be compromised in which case the test point will not be executed. The test conductor may make adjustments to the cards as long as the new conditions are within the test and safety plan requirements and parameters involved are not safety-of-flight related. An example of a minor adjustment would be to move the aircraft altitude up 5,000 feet to avoid a bank of clouds where the new conditions are within the test plan requirements.

2.2.6. All test missions will be debriefed to ensure that test results are properly documented. To the maximum extent possible, all test aircrew, the test director, test conductor, control room engineering representatives, and chase/support aircrew should attend the debriefing. Test organizations will ensure that daily flight or system test reports are completed and that the test data are properly transmitted to the appropriate data

analysis agency. Deficiencies found during the test will be recorded and a unit flight crew information file (FCIF) notice created, if appropriate. Lessons learned from the test will be captured and incorporated into changes in the test cards. Unexpected events must be reported and investigated, as required by AFTCI 91-202 Edwards Supplement.

2.3. The level of test control required (e.g. monitoring safety of flight real-time information required to ensure safe & effective test execution) will be determined during the safety review process and documented in the safety plan for the test activity.

3. Procedures.

3.1. Control Room Procedures:

3.1.1. These instructions apply to ground and airborne control room operations. The control room will have two-way communication with the aircrew and capability to monitor safety of flight, safety of test, or other real-time information required to ensure safe & effective test execution. A control room must provide the ability to monitor and analyze real-time data, giving point-to-point clearance if a build-up sequence is specified in the safety plan.

3.1.2. Every individual in the control room shall be trained in his or her responsibilities and must be familiar with the responsibilities of others in the control room.

3.1.3. The test conductor will review a standardized list of unambiguous challenge-and-response commands at the flight test briefing. Example commands and definitions are listed below, but test organizations or test and safety plans may amend or expand to these. Test team personnel will use these challenge-and-response calls for each test point. The test conductor must be familiar with pilot workload so that challenge-and-response items will have proper pacing. As necessary for safety-of-flight, test team personnel may make additional calls to direct the test aircrew to cease flight test execution and initiate the planned immediate recovery procedure. Test termination criteria and coordination with the ground control center will be briefed, as applicable.

3.1.3.1. “Complete” – informs flight test crews the desired event is complete.

3.1.3.2. “Terminate” – ceases flight test execution when continued maneuvering or progress will not achieve desired results. Note, remotely piloted aircraft (RPA) flight test will not use terminate to cease maneuvering. For RPA flight test, units will designate a different term for ceasing flight test execution. During weapons testing, the terminology of “Terminate” will not be used. In such events, weapons testing range control authorities use “Terminate” for drone or weapon flight termination.

3.1.3.3. “Abort” – alerts flight test crews that planned maneuver limits will be exceeded, and directs aircrew to initiate the planned recovery procedure immediately.

3.1.3.4. “Knock-it-off” – alerts flight test crews that a dangerous situation is developing and directs all participating aircrew to cease maneuvering, establish safe flight parameters, deconflict flight paths, and obtain situational awareness on all flight members.

3.1.3.5. “Skip it”, to cease weapon employment when continued progress will not achieve intended results.

3.1.4. There is a single, single, highly experienced individual designated as the test director who acts as the supervisor of the control room and has emergency-direct communication with mission-test pilot.

3.1.5. There is a single, experienced individual designated as the test conductor who is the primary communicator with the test aircrew. The test conductor will clear the test pilot to proceed from one test point to the next. The test director and test conductor may be the same person for simple test missions. The Squadron Commander or CTF Director may approve and permit, the Test Director to execute Test conductor duties during test missions. Such approvals must be documented in Squadron specific training folders.

3.1.6. Continuity of test essential personnel is maintained from mission to mission to the greatest extent reasonably possible. All essential test essential personnel will be in direct communication with each other and with the test conductor. All essential test essential personnel will monitor aircrew-to-control room communications. In-flight video of the aircraft may be required to enhance the situational awareness of test essential personnel. Any member of the aircrew or control room may recommend termination of a test point to the test conductor. Teamwork will be stressed. A test mission “dress rehearsal” should be conducted in an actual control room with test personnel before the start of test programs. During this rehearsal, as much of the aircraft-to-control room real-time system should be exercised as possible. Simulators may be utilized to enhance the technical and safety understanding of critical parameters for planned test conditions. Operator-in-the-loop simulations may be utilized to provide additional understanding of test system response.

3.1.7. All safety-of-flight and safety-of-test information will be continuously monitored and a procedure will be in place to immediately notify the test aircrew if safety limits are approached or exceeded or if critical data displays malfunction for any reason. Where available, the test conductor will also monitor a set of designated parameters. Graphic displays may be required to give a perceptible warning when a parameter is out of limits. Mission and test maneuver termination criteria will be established by test personnel and documented in the test plan and safety plan. Specific mission termination criteria will be discussed in the mission pre-briefing. The flight and/or test will be terminated if monitoring capability is lost for any safety of flight and/or test parameter identified in the safety plan, if data analysis indicates an aircraft and/or test limit may be exceeded on the next test point or maneuver, an aircraft limit is exceeded, or if any unexpected event occurs during the test that in the opinion of the pilot or test director compromises safety. For remotely piloted aircraft (RPA) tests, the chase aircrew or RPA pilot may take control of the vehicle for safety reasons without concurrence from the control room. For small UAS tests, the safety operator may take control of the vehicle for safety reasons without concurrence from the control room.

3.1.8. All test essential personnel will observe a period of 12 hours crew rest prior to reporting for duty and participating in a test mission. In addition, the duty day for test essential personnel will not be longer than 12 hours from the time the individual reports for duty until engine shut down or test completion. For long-duration test missions, test organizations should consider rotating test essential personnel, but the CTF director or squadron commander may extend the crew duty day up to 14 hours for test essential personnel when only one individual is monitoring a set of parameters. Crew duty day

may be increased to 18 hours if two or more individuals are monitoring a set of parameters. All personnel in the control room shall be alcohol-free for 12 hours prior to entering the control room for a test mission. No personal cell phones shall be on during control room duty.

3.2. Key mission control personnel duties:

3.2.1. The following key mission duties are standard for a test organization conducting tests using a control room. Depending on the complexity of the test mission, an individual may fulfill more than one key mission duty. For example, the operations engineer may also perform as the test conductor and the duty pilot may also perform as the test director. Contractual requirements or test activities involving multiple government agencies may also necessitate some modification of the responsibilities listed. Test organizations may modify the allocation of the key duties below if necessary, but should ensure that all essential duties are assigned to an individual and that any changes are captured in a unit OI.

3.2.2. The test director is responsible for the technical quality, security, safety, and support aspects of the mission, as identified in the test plan. The test director:

3.2.2.1. Verifies that the test cards and/or procedures have been properly reviewed and approved.

3.2.2.2. Ensures key personnel attend both pre- and post-test briefings. The test director will ensure that test cards and safety packages are fully briefed and will ensure that test results are properly documented.

3.2.2.3. Supervises the control room and validates qualifications of all test personnel in the control room.

3.2.2.4. Possesses the authority to terminate the test point or mission if the technical validity of the test is in question or safety is jeopardized.

3.2.2.5. Makes the final decision on the real-time selection of options during the test mission.

3.2.2.6. Has emergency direct communication with mission test pilot.

3.2.3. The test pilot/remote operator is responsible for the safe operation of the test aircraft and successful completion of the test mission. If the test pilot/remote operator is not the pilot in command, the pilot in command will be the final authority on aircraft safety and the test pilot will be responsible for the execution of the test points. The test pilot/remote operator:

3.2.3.1. Assists the discipline engineer in preparation and review of the test plan.

3.2.3.2. Prepares or assists the operations engineer or discipline engineer in the preparation of the safety review package and participates in the Safety Review Board.

3.2.3.3. Assists operations engineer in the preparation of test cards and reviews test points and test mission profile for safety and operational practicality.

3.2.3.4. Possesses the authority to terminate the test point or mission for any safety of flight reason

- 3.2.3.5. Performs test maneuvers as briefed, or in the case of multi-crew aircraft, oversees test maneuvers, as appropriate.
 - 3.2.3.6. Leads the mission briefing and debriefing.
 - 3.2.3.7. Completes post-mission reports, as required.
- 3.2.4. The chase pilot is responsible for clearing airspace, being in position to take photographs, checking over the test aircraft between test points, and assisting the test aircraft in an emergency. The chase pilot:
- 3.2.4.1. Attends mission briefings.
 - 3.2.4.2. Reviews all mission maneuvers with test pilot and ensures that the following items are briefed: chase position and expected results, minimum anticipated altitudes and terrain clearance, aircraft limits for both test and chase aircraft, altitude deconfliction and plan for lost sight, and rendezvous/rejoin plan.
 - 3.2.4.3. Ensures chase crewmembers understand their duties for the mission and reviews aircrew duties in the event of an emergency in the test or chase aircraft.
- 3.2.5. The test conductor is responsible for real-time coordination of ground activities with the aircrew; paces the progression through the test cards, as agreed to in the mission pre-briefing; defers to the test director for decisions, as appropriate; and is the primary communicator to the aircraft. The test conductor may be airborne in the test or support aircraft. The test conductor:
- 3.2.5.1. Makes test-point terminate and go or no-go calls based on real-time engineering analyses of control room data. Terminates test points if the technical validity of the test is in question or safety is jeopardized.
 - 3.2.5.2. Briefs test cards during mission briefing. Briefs test hazard analyses and general minimizing considerations (AFTC Forms 5000 and 5001) for all applicable test points during mission briefing. Briefing tasks may be delegated.
 - 3.2.5.3. Coordinates control room and/or aircraft setup, when required.
- 3.2.6. Essential personnel may be discipline engineers or any personnel that occupy a position in the control room and are required by an operating instruction, test plan, or safety plan. The essential personnel engaged in the test are responsible for the technical adequacy of their discipline's portion of the test, and:
- 3.2.6.1. Are responsible for the preparation of the test plan according to EAFBI 99-101.
 - 3.2.6.2. Assist in the preparation of the safety review package and participates in the Safety Review Board.
 - 3.2.6.3. Work with the operations engineer to prepare test procedures or test cards.
 - 3.2.6.4. Are qualified to determine what control room parameters are required and monitor those data or parameters in real time.
 - 3.2.6.5. Monitor critical data from a safety and technical standpoint.

- 3.2.6.6. Determine if test point was adequate and gives test conductor recommendation to repeat point or proceed.
 - 3.2.6.7. Inform test conductor if parameters are off-scale or inoperative.
 - 3.2.6.8. Inform test conductor when a critical parameter limit is being approached or has been exceeded by the test aircraft.
 - 3.2.6.9. Participate in control room configuration determination.
 - 3.2.6.10. Analyze test data and provides assessments as to test system compliance with specifications and mission suitability.
- 3.2.7. The engineer is responsible for test preparation and initial post-test reporting. The operations engineer:
- 3.2.7.1. Assists the discipline engineer in preparation and review of the test plan.
 - 3.2.7.2. Constructs test cards and/or test procedures in coordination with discipline engineers, test pilots, and test conductor. Reviews test cards for compliance with safety review package. Provides test cards to the appropriate approval authority for signature. Provides approved test cards, applicable test hazard analyses, and general minimizing considerations, to test pilots, test conductor, and others, as required, prior to test mission pre-briefing.
 - 3.2.7.3. Provides coordination between operations, engineering, and maintenance to schedule the test article, support aircraft, and test ranges. Ensures proper test article configuration and data acquisition system configuration.
 - 3.2.7.4. Monitors and provides guidance on aircraft systems operation and data acquisition system operations during test mission.
 - 3.2.7.5. Gathers post-mission reports and forwards test data to the appropriate data analysis activity. Ensures that lessons learned, deficiencies, or unusual flight events are documented and resolved, as required.
- 3.2.8. The duty pilot and/or operations duty officer is responsible for advising the test pilot from the control room or operations desk on workaround and emergency procedures.
- 3.2.9. The instrumentation engineer and/or technician, if required, is/are responsible for the pre-flight, post-flight, and real-time operation of the data acquisition system.
- 3.2.10. The Range Control Officer (RCO), if required, is responsible to the test director for real-time execution and coordination of all inter- and intra-range support. The RCO prepares and coordinates documentation and procedures with range users and other support ranges, where necessary, to satisfy test mission requirements.
- 3.2.11. The Range Data Production Analyst (DPA), if required, is responsible for development of real-time and post-flight data products, pre-mission preparation of mission control rooms and computer systems, and operation of the mission control rooms and associated data processing systems during test mission support (real-time and post-flight). The DPA is the liaison between users of the data support systems, airborne instrumentation project engineers, and the data processing staff. The DPA has overall

responsibility for ensuring compatibility between the airborne instrumentation and ground data processing systems and interfaces.

3.2.12. The Range Safety Officer (RSO), if required, is directly responsible to the 412th TW Commander and Chief of Safety for protection of the general public. The RSO may cancel or terminate test missions that violate range safety criteria or pose a potential threat to personnel, facilities, or property. In the event of imminent danger or errant flight of these systems, the RSO may directly invoke recovery or destruct actions on these vehicles using the ranges flight termination systems or by direction to project personnel.

ERNEST J TEICHERT III
Brigadier General, USAF
Commander

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

AFI 11-202 Volume 1/AFMC Supplement 1, *Aircrew Training*, 25 July 2011

AFI 11-2FTV3, EAFB Sup 1, *Flying Operations*, 22 August 2012

AFI 99-103, *Capabilities-Based Test and Evaluation*, 06 April 2017

AFMAN 33-363, *Management of Records*, 01 March 2008

AFFTCI 99-101, 412 TW *Test Plans*, 07 August 2013

EAFBI 13-100, *Flying and Airfield Operations*, 01 August 2013

Adopted Forms

AF Form 847, *Recommendation for Change of Publication*

Abbreviations and Acronyms

ABW—Air Base Wing

AFMAN—Air Force Manual

AFRIMS—Air Force Records Information Management System

COOL—Center Ops On-Line

CTF—Combined Test Force

DPR—Data Production Analyst

FCIF—Flight Crew Information File

OPR—Office of Primary Responsibility

RCO—Range Control Officer

RDS—Records Disposition Schedule

RPA—Remotely Piloted Aircraft

RSO—Range Safety Officer

TW—Test Wing

USAF TPS—United States Air Force Test Pilot School