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(AFRL)

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This instruction implements Air Force Policy Directive (AFPD) 61-1, *Management of Science and Technology*, Air Force Instruction (AFI) 99-103 Air Force Materiel Command (AFMC) Supplement, *Capabilities Based Test and Evaluation*, AFI 91-202 AFMC Supplement, *The US Air Force Mishap Prevention Program*, and AFI 62-601 AFMC Supplement, *USAF Airworthiness*. It establishes policy for how the Air Force Research Laboratory (AFRL) conducts flight activities in support of its research mission. This instruction applies to all AFRL personnel involved with the planning, management, or execution of flight activities. This publication may be supplemented at any level, but all direct supplements must be routed to the Office of Primary Responsibility (OPR) of this publication for coordination prior to certification and approval. Refer recommended changes and questions about this publication to the OPR using DAF Form 847, *Recommendation for Change of Publication*. Route DAF Form 847 from the field through the appropriate functional chain of command. The AFRL Deputy Commander (AFRL/CD) is the waiver authority for all compliance items in this publication. Submit requests for waivers through the chain of command to the publication OPR. Ensure all records created as a result of processes prescribed in this publication are maintained in accordance with (IAW) Air Force Instruction (AFI) 33-322, *Records Management and Information Governance Program*, and disposed of IAW Air Force Records Information Management System (AFRIMS) Records Disposition Schedule (RDS).

SUMMARY OF CHANGES

This publication replaces AFRL Manual (AFRLMAN) 99-103, *AFRL Flight Test and Evaluation*, in its entirety and must be completely reviewed. This publication updates roles and responsibilities to reflect current AFRL organization as well as grant of full Flight Operations Authority (FOA) to AFRL beyond that previously limited to Small Unmanned Aerial Systems (SUAS). Changes include: expanded or new information on the flight activity review and approval process, test plan content, air system modification, airworthiness process, cyber vulnerability assessment and authorization decisions, and flight operations.

Chapter 1

PURPOSE, SCOPE, AND INTENT

1.1. Purpose. The purpose of this volume is to standardize policy, establish roles and responsibilities, and define basic guidance for the conduct of flight test and training activities within AFRL.

1.2. Scope. This volume applies to any flight or flight-related activity (e.g., high-speed taxi, flight training, deployed operation, etc.) that wholly or partly meets any of the criteria listed below. Throughout this volume, the terms "flight activity" and "flight test" may be used interchangeably. Activities covered include any that:

1.2.1. Utilize resources owned, possessed, leased, expended, or operated by AFRL (personnel, aircraft, equipment, facilities, funding, etc.) except as exempted in Par. 1.2.7.

1.2.2. Take place in airspace arranged for use by AFRL or its partners, or where AFRL/CC (or delegated subordinate commander/director) has responsibility for the safety of the general public.

1.2.3. Are accomplished with AFRL as the assigned or acting Lead Test Organization (LTO) responsible for the conduct of safe/efficient flight activities, even if AFRL resources are not at risk (see Par. 3.4.2.1.).

1.2.4. Are executed by organizations under contract to AFRL where the Air Force is charged with mishap investigation responsibility, provides the mishap convening authority, or has more than a minimal risk of liability. The term "contract" in this context includes other similar legal instrumentalities such as Cooperative Research and Development Agreements , Other Transactions for Research, etc.

1.2.5. Utilize AFRL (or other) resources that present unique hazards, create commitments, or introduce liabilities not addressed by other published procedures or management directives.

1.2.6. Are specified for application of this volume by the AFRL Commander, Center Test Authority (CTA) or FOA.

1.2.7. Do not meet one of the following exceptions. Contact the AFRL Operations Directorate (AFRL/DO) to confirm if any of these exceptions apply.

1.2.7.1. The activity is a service or deliverable provided to AFRL under a grant or is purchased by AFRL solely as a commodity. Under a commodity purchase, procedures used are typically accomplished by the vendor in accordance with civil or industry standards outside of AFRL's purview.

1.2.7.2. AFRL resources are provided on a loan basis or as a consequence of being asked to develop or deliver a product for transfer to a customer to support their end use or objectives. This exception applies only when any AFRL support does not include operation or flight test of the resulting product(s) or the responsibility to arrange or oversee such activities. In such cases, AFRL is not pursuing its own objectives, receives no benefit other than the goodwill generated from the service provided, and accepts the risk of loss or damage to its own resources.

1.3. Definitions.

1.3.1. Aerospace/Air Vehicle: Includes, but is not limited to, manned aircraft, unmanned aerial systems (UAS), atmospheric rockets, balloons, guided munitions, and in-ground-effect vehicles. The source for a vehicle's build (e.g., in-house construction, commercial-off-the-shelf [COTS], contracted design, etc.) does not matter in this context.

1.3.2. Flight Activity: Any set of related events where a vehicle moves through the air making use of the physics of controlled or maneuvering aerial transport. It includes balloon flight, but does not include activities where the flight path is solely ballistic in nature. AFRL flight events can be conducted as experiments, tests, and demonstrations; military exercises; training; competitions; and, real-world operations (e.g., ferry flights, deployed operations, authorized support to domestic civil authorities). Flight activities include circumstances where research accomplished is being conducted in conjunction with flight, but does not materially affect the actual mechanics of flight (e.g., the system under test [SUT] is a payload). They also include Science, Technology, Engineering and Math Outreach support and flight constrained by captive means such as netted enclosures, indoor/walled facilities, tethers, etc.

1.3.3. Flight-Related Activity: Events that are not flight activities, but involve using an aerospace vehicle for some form of operation. This includes taxi, aircraft ground test, cockpit evaluations, and other similar actions. Such activities are typically considered laboratory or field activities outside the purview of this volume, but which may be subject to ground test review and approval processes. Flight-related activities that possess the potential for flight (even if unintended) such as high-speed taxi are governed as flight activities.

1.3.3.1. For manned aircraft and Groups 4 and 5 UAS, ground operations involving taxi speeds reaching $0.5V_{stall}$ (indicated airspeed) or greater will be treated as flight activities. (See Chairman of the Joint Chiefs of Staff Instruction [CJCSI] 3255.01, *Joint Unmanned Aircraft Systems Minimum Training Standards*, Par. 9.a. or AFMAN 11-502, *Small Unmanned Aircraft Systems*, **Fig. A2.1** for definitions of Department of Defense [DoD] Groups 1-5 UAS.)

1.3.3.2. For Groups 1-3 UAS, it will be up to FOA discretion when taxi operations will be treated as flight activities.

1.4. Intent. AFRL activities require unique rule sets driven by its science and technology (S&T) mission. This volume is based on the core tenets of Department, Service, and Major Command (MAJCOM)-level policies and practices for Test and Evaluation (T&E), safety, airworthiness, cyber resiliency, etc., but with modifications to enable agility and innovation balanced with risk tolerance appropriate to the S&T environment.

1.4.1. Method and Assurance. The intent of this volume is to ensure a suitable level of application of technical rigor to AFRL research involving flight activity along with providing assurance of safe and efficient execution with good stewardship of resources. Regardless of the level of complexity or rigor in an AFRL flight test, there must be appropriate documentation of the objectives and method of test as well as identification and acceptance of risks by the proper authorities.

1.4.2. Importance of Tailoring. AFRL conducts flight tests/experiments across a wide spectrum of investment, technology maturity, risk levels, and safety challenges. Accordingly, AFRL members managing these activities shall tailor the level of planning, rigor, and oversight according to the complexity (safety, cost, design, operations, etc.) and risk of the flight activity. The principles of tailoring are exercised by those composing test plans, developing test procedures, and exercising process review and oversight. Approval authorities apply their judgment as to the suitability of the tailoring applied when they approve, disapprove, or direct changes to a proposed flight test activity.

1.4.3. Regardless of complexity of the flight activity, all AFRL Program Managers (PM) and Scientists and Engineers (S&E) shall follow the review, approval, and execution processes outlined in this volume.

1.5. Authority. Authority to oversee and direct the AFRL Flight Activity Process and related policies as set forth in this volume is vested in the AFRL CTA who is appointed in writing by AFRL/CC IAW AFI 99-103 with duties further delineated in AFMC Instruction (AFMCI) 36-2645, *Senior Functional Roles and Responsibilities*. Authority to oversee AFRL flight operations is vested in the AFRL FOA IAW AFI 11-401, *Aviation Management*, AFMC Supplement. Within the context of AFMAN 11-502, the role of "commander (or equivalent)" for AFRL small UAS (SUAS) flight operations is vested with FOA. Additionally, per AFMAN 11-502 Par. 2.6, AFRL – as an AFMC Research, Development, Test and Evaluation (RDT&E) unit – will use test plans approved through the processes contained within this volume in lieu of Concepts of Employment (CONEMP) to govern test, training, or operational flight activities employing SUAS. Compliance with this volume does not otherwise provide authority to violate Air Force, AFMC, or AFRL instructions/directives or flight manual guidance.

1.6. Process Assistance. This volume provides policy and guidance for the overall AFRL flight activity planning, review, approval, and oversight process. For specific detail on implementation of any aspect of the process and examples for reference or emulation, see the AFRL Flight Activity Process Guide (located on the AFRL/DO Sharepoint site) or contact the AFRL/DO staff for information and/or assistance.

1.7. Waivers. As this volume is directive across the entire AFRL enterprise, it constitutes Tier 3-level guidance IAW AFI 33-360 *Publications and Forms Management*, where the AFRL Commander exercises waiver authority at the wing commander or equivalent level. Waiver requests will be staffed through the Technology Directorate (TD) (i.e., two-letter mission organization or 711 Human Performance Wing [HPW]) Test Lead or Deputy Director and submitted to the AFRL/DO staff for coordination by the CTA. This publication may be supplemented at any level, but all direct supplements must be routed to the office of AFRL/DO for coordination prior to certification and approval. Waivers to AFIs will be coordinated through this same routing chain. Any Defense Contract Management Agency Instruction (DCMA-INST) 8210.1X waivers will utilize the AFRL FOA as the Operations Group Commander (OG/CC) equivalent.

Chapter 2

AFRL FLIGHT ACTIVITY PROCESS

2.1. Overall Process and Terminology. The AFRL Flight Activity Process involves five general phases: planning; review; approval; execution; and, reporting/closeout. See Figure 3.1 in AFRLI 61-103, *AFRL Research Test Management* (Parent) for a depiction of these phases and **Figure 2.1** below for how they are implemented. All AFRL flight activities shall have a governing document (i.e., test plan, training plan, operations plan, Concept of Operations [CONOP], etc.), generically referred to in this volume as the "test plan" since most AFRL flight activities are tests. All of the documentation developed, collected, and processed through the AFRL Flight Activity Process to secure signature and approvals will be referred to collectively as the "test package."

2.1.1. Planning. The goal of the Planning Phase is to produce a quality test plan that identifies the flight activity objectives, test methodology, and test-unique hazards with sufficient controls (within program constraints) to support approval in a timely manner. **Chapter 3** discusses Preliminary Planning and **Chapter 4** covers Test Plan Development.

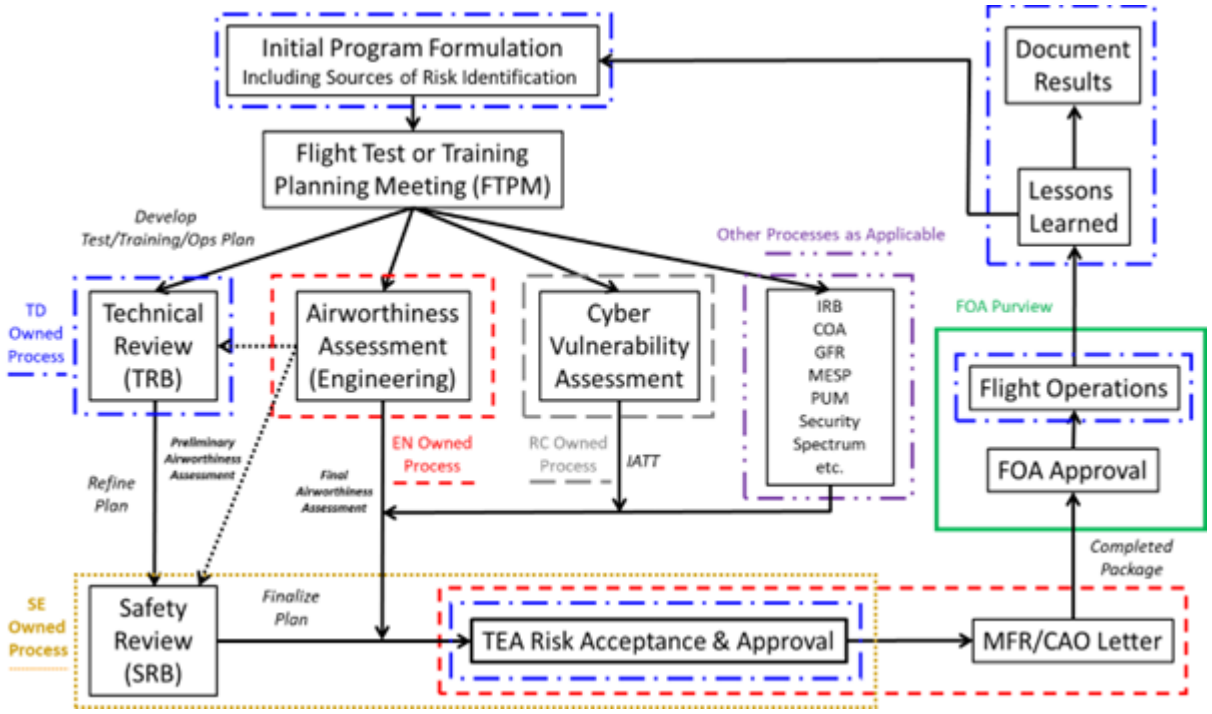
2.1.2. Review. All flight test plans require appropriate reviews before they are approved for execution. A technical review assesses the adequacy and soundness of the system design and test plan to verify that the overall method of test will meet test objectives at an acceptable level of technical risk. A safety review involves an independent assessment of the program safety planning and consideration of mitigation measures that establishes the residual safety risk per AFI 91-202 AFRL Supplement. Cyber and human participant/subject assessments as applicable determine adequacy of measures taken to address these aspects of a test IAW AFRLI 17-130, *AFRL Cybersecurity Program Management* and AFRLI 61-103, *AFRL Test Activity Involving Human Participants*, Volume 2, respectively. The Review Phase is discussed in **Chapter 5** of this volume.

2.1.3. Approval. The Approval Phase requires the test package to be coordinated and approved by senior leadership prior to execution. The Test Execution Authority (TEA) accepts the residual risks identified to AFRL resources (funding, property, personnel). The appropriate airworthiness authority ensures the validity of the independent airworthiness assessment and provides airworthiness approval in the form of a Military Flight Release (MFR) or Civil Air Operations (CAO) letter. The cyber Authorizing Official (AO) issues an Authorization to Operate (ATO) or Interim Authority to Test (IATT) to accept any residual cyber risk and permit operations that comply with any stipulated cyber mitigations. Both TEA and FOA approve the complete test package and give final overall approval to proceed with the flight test activity. The FOA *approval* role may be exercised on behalf of FOA by FOA staff (AFRL/DO) or under certain circumstances by AFRL Technical Directorate (TD) Directors/Commanders for LOW Risk flight activities at the FOA's discretion (see Par. 5.5.4.3). The FOA *oversight* role cannot be delegated except for certain duties associated with aircrew management as specified in AFI 11-401 AFMC Supplement. The Approval Phase is outlined in **Chapter 5**.

2.1.4. Execution. During flight execution, changes to requirements or technical understanding, programmatic imperatives, or unexpected events (to include mishaps) may trigger revisions to test plans. Additionally, test card approvals, airspace permissions, operator qualifications and flight reporting must be properly secured or executed. **Chapter 6** presents considerations and requirements for the Execution Phase.

2.1.5. Reporting/Closeout. When the test program is complete, the test team shall close and archive the test package and record lessons learned for other test programs to leverage. Closeout and lessons learned documentation requirements are included in **Chapter 7**.

Figure 2.1. AFRL Flight Activity Process.



2.2. Implementation. The AFRL Flight Activity Process is adapted from core tenets of the United States Air Force (USAF) T&E, safety and AW processes. It addresses the requirements of additional processes (airspace, cyber, contracting, etc.) as well. The process is adapted to accommodate the unique S&T mission of AFRL.

2.2.1. Test/Training/Operations. The AFRL Flight Activity Process shall be used for all flight activities including, but not limited to, test, training, operational missions, and support to exercises. Most AFRL flight activities are conducted with air vehicles that are not produced by programs of record and thus do not possess Mission Design Series (MDS) designations. Lifecycle considerations have not been addressed and these air vehicles are not accompanied by mature documentation (such as flight manuals, Technical Orders [TO], AFI 11-2x [MDS] Volumes 3, etc.) outlining procedural requirements as well as aircraft, weather, and other limits. The AFRL Flight Activity Process ensures appropriate planning, reviews, and approvals adequately compensate for this lack of documentation.

2.2.2. Tailoring. In coordination with Headquarters (HQ) AFRL Functional Directorate (FD) Point of Contacts (POC), the PM ensures all strategies for T&E, test plans, briefings, and reports are flexible and tailored to fit the specific needs of S&T programs consistent with sound systems engineering practices, program risk, statutory and regulatory requirements, the time-sensitive nature of user necessities, and common sense. Planning, execution, and reporting must also be tailored for emerging contingencies. Accordingly, FD POCs will support tailoring of the AFRL Flight Activity Process requirements and timeline according to the complexity and risk of the flight activity. The AFRL CTA retains the prerogative to review and recommend changes to the level of tailoring proposed for acceptance by approval authorities for any particular flight activity.

2.2.3. Collaboration and Early FD POC Involvement. Collaboration is the cornerstone to achieving safe, efficient flight test and the Integrated Test Team (ITT) is a key mechanism to achieve this collaboration. The ITT consists of the PM, test team members, operators, and FD POCs working as a team. While the AFRL Flight Activity Process has built-in pre-planning engagements – the prime example being the Flight Test or Training Planning Meeting (FTPM) – additional formal and informal engagements with HQ POCs are necessary for success.

2.2.4. Event-Driven Schedules. Adequate time and resources must be anticipated and provided for all phases of the Flight Activity Process. See **Figure 3.1** for an example of a representative schedule.

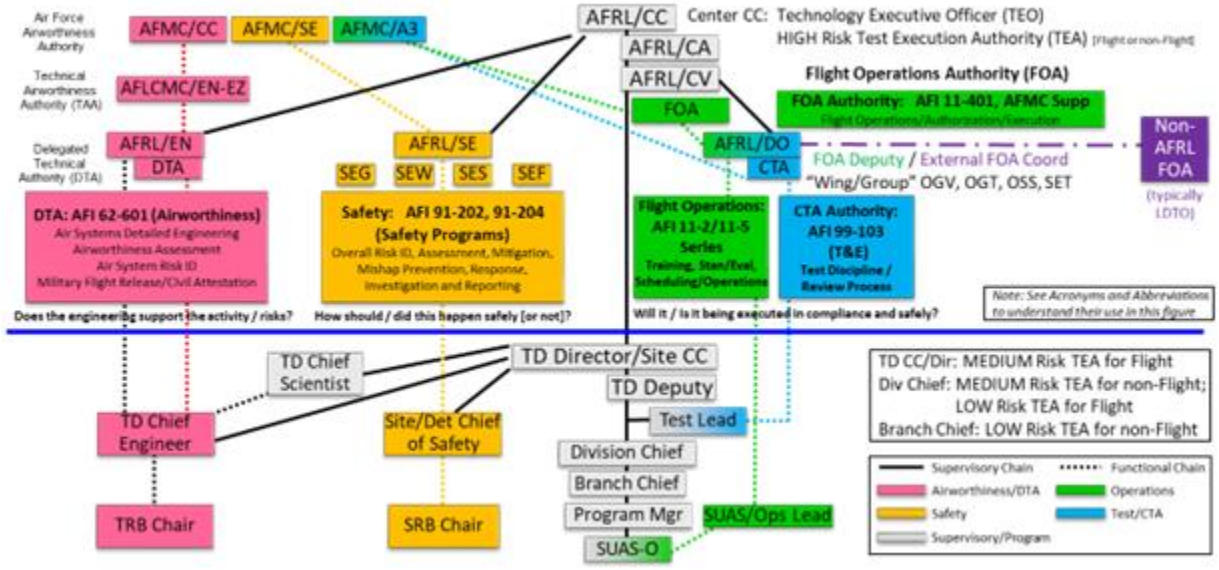
2.2.5. Objectivity. All participants in AFRL flight test activities must strive to be objective, unbiased, and free from outside influences to ensure the integrity of evaluation results.

2.2.6. Flight Activity and Chains of Authority in AFRL. The AFRL Flight Activity Process intertwines multiple chains of authority: supervisory/programmatic; operations; and, functional (test, safety, airworthiness, cyber, etc.). The supervisory chain is endowed with risk acceptance and test execution approval authorities. The operations chain is endowed with flight operations oversight authority. Functional chains possess authorities commensurate with their types of expertise; for example, airworthiness determinations being made by the engineering functional, residual safety risk determinations by the safety functional, and so on. See **Figure 2.2** for a depiction of these chains of authority and their relationships. Various aspects of two chains associated with test approval authorities are described below: the program (or Technology Executive Officer [TEO]) chain and the flight operations chain.

2.2.6.1. Supervisory/Programmatic Chain. The TEO chain of command oversees all AFRL programs, personnel, and resources. The appropriate authorities in this chain of command are the only personnel who can serve as TEA, approve the validity of a TD's programs and flight activities, and accept risk to their resources. This chain starts with the PM and goes up through the Division Chief, the TD Director/Commander, and AFRL/CC. Note: See AFI 91-202 AFRL Supplement, which defines the program chain echelons empowered to accept risks based on the assessed residual safety risk levels.

2.2.6.2. Operations Chain. The operations chain of command oversees day-to-day flight operations and ensures safe, efficient flight activities. This chain is based on FOA assignment per AFI 11-401 AFMC Supplement. When AFRL possesses the cognizant FOA, the oversight chain starts with the TD-appointed SUAS Lead for unmanned flight operations, or, when applicable, with an appointed Government Flight Representative (GFR) for manned or unmanned operations. This chain goes up through the office of AFRL/DO to the AFRL FOA and to the Director, HQ AFMC Air, Space and Cyberspace Operations Directorate (HQ AFMC/A3/6).

Figure 2.2. AFRL Supervisory, Operations, and Functional Chains of Authority.



2.2.6.2.1. IAW AFI 11-401 AFMC Supplement and this instruction, the AFRL FOA is a senior, rated official who possesses the credentials and experience to attest to the safe, efficient nature of the flight test plan and to the qualification of the aviators involved. When providing approval for a flight activity to enter execution, the FOA is confirming that proper risk acceptances by all relevant authorities (technical, safety, airworthiness, and cyber) have been secured and the flight activity is ready to proceed. FOA approval is the second of two approvals (the other being that provided by the TEA) which must be secured for a flight activity to commence.

2.2.6.2.2. If a government, non-AFMC flying unit owns and operates the test aircraft, their equivalent FOA will oversee day-to-day flight operations of their aircraft, but only the assigned AFMC TEA and FOA can approve the participation of AFMC personnel and resources and consequent test execution. See Par. 3.4.3. for guidance when multiple FOAs are involved in an integrated flight activity. See the AFRL Flight Activity Process Guide for guidance on how to authorize AFRL personnel to fly on other units' aircraft.

2.2.7. Combined Reviews/Approvals. For those tests that are easily understood, less complex, or low in risk, the test team may request various combinations of reviews/approvals in lieu of separate forums to minimize impacts to resources and shorten execution timelines. Teams should contact the Technical Review Board (TRB) and Safety Review Board (SRB) Chairs for a final determination on this potential course of action. When a Combined Review Board (CRB) approach is employed, teams will ensure the test plan is sufficiently mature for technical and safety review prior to holding the combined forum. When circumstances warrant, AFRL/DO staff and the TD can work to invite the TEA, Delegated Technical Authority (DTA), and FOA to obtain most or all applicable approvals in one setting.

2.2.8. Accepting Other Government Flight Test Organizations' Reviews. To eliminate duplication of effort, technical and safety reviews conducted by other government organizations partnered with AFRL possessing mature, well-defined, and documented review procedures may be accepted at the discretion of the TD Chief Engineer (for technical reviews), site/detachment Chief of Safety (COS) (for safety reviews), TEA, and CTA. The Test POC assigned by the AFRL/DO office to the program will be invited to attend these reviews and will assist these entities as necessary to document the results per AFRL processes for risk acceptance and approval. See Par. 5.1.2. for more details in this regard.

2.2.8.1. If the parties to a flight activity agree that the organization serving as Lead Developmental Test and Evaluation Organization (LDTO) will not conduct a TRB, then the sponsoring TD must do so.

2.2.8.2. If the organization with mishap accountability and a share in any minimal risk of liability decides not to conduct a safety review, then AFRL must conduct one. See AFI 91-202 AFRL Supplement for more information on requirements for accepting other organization's safety reviews.

2.3. Roles and Responsibilities. All AFRL personnel involved in flight activities are responsible for adhering to the AFRL Flight Activity Process and using the Flight Activity Process Guide as outlined in this volume.

2.3.1. AFRL CTA will:

2.3.1.1. Oversee and standardize T&E functional policy and processes as well as manage the T&E functional workforce within AFRL IAW AFI 99-103 AFMC Supplement and AFMCI 36-2645.

2.3.1.2. Be the focal point to the TEO, PM, ITT and Test Lead for flight activity guidance and assistance and to Center-level leadership for issues concerning flight activity policy, processes, and procedures.

2.3.1.3. Establish and oversee the AFRL Flight Activity process. Set policy for test plan development, review, and approval processes and ensure their adequacy in implementation.

2.3.1.4. Assist the PM and ITT in identifying government organizations, as necessary, to help with flight testing, airspace, or any other required resources.

2.3.1.5. Maintain a cadre of trained/qualified flight test Subject Matter Experts (SME) to provide programs with flight activity expertise and advice. Support PMs as needed with: application of the principles of integrated test; preparation of test plans; development of technical and safety review documentation; and, securing relevant approvals. Train and guide test teams to properly implement all aspects of the process described in this volume and recommend appropriate flight test techniques, procedures, and best practices.

2.3.1.6. Represent AFRL on T&E issues to HQ AFMC, HAF/TE, MAJCOMs, and other external agencies.

2.3.2. AFRL FOA will:

2.3.2.1. IAW Par. 5.21 of AFI 99-103 AFMC Supplement approve all flight activities where AFRL has FOA responsibility. Approval authority may be exercised by the AFRL/DO Director or Deputy on behalf of FOA or under certain circumstances as described in Par. 5.6.6.1. to AFRL TD Directors/Commanders for LOW risk flight activities.

2.3.2.2. Maintain day-to-day oversight of training, qualification, and operations of all assigned aircraft and operators. Perform Operations Group (OG) and Wing CC-level oversight functions assigned in all AFI 11-2 and 11-5 series and AFI 11-401, as necessary, to include:

2.3.2.2.1. Review/approve training, qualifications, and currencies of assigned operators.

2.3.2.2.2. Provide flight authorization for all AFRL personnel and Maintenance/Engineering Support Personnel (MESP). See Paragraphs **3.4.2.4.5 and 5.6.9.3.1** for more details.

2.3.3. AFRL TD Directors/Commanders will:

2.3.3.1. Appoint a TD Test Lead to serve as the central point of contact for the entire portfolio of TD test programs.

2.3.3.2. Appoint a TD SUAS Lead (if SUAS are government-owned and/or government-operated) to oversee the unit's SUAS training, qualification, and operations.

2.3.3.3. Approve LOW risk flight test activities for their TD when such authority has been granted for exercise on behalf of the AFRL FOA.

2.3.4. AFRL/DO will:

2.3.4.1. In the person of the Director (and Deputy Director) serve as AFRL Center Senior Functional for T&E and head of the CTA office (when appointed by AFRL/CC). As an organization serve as staff for FOA and CTA.

2.3.4.1.1. In the person of the Director (and Deputy Director) serve as approval authority for LOW risk flight activities when empowered to do so on behalf of the AFRL FOA.

2.3.4.1.2. As an office assist in FOA oversight by performing Group-level training, standardization/evaluation (Stan/Eval), operations, and audit functions. Monitor flight activities to ensure they proceed IAW approved test plans, approved technical and safety review documentation, all other relevant approvals (cyber authorization decision, proper use memorandum, etc.), and the principles of integrated test.

2.3.4.2. As an office act as liaison between AFRL and other AFMC FOAs and their staff. Provide staffing functions for FOA to include test card approval processing.

2.3.4.3. As an office provide technical (T&E) representatives for technical and safety reviews from staff personnel when requested. Serve as SRB Chairs when appointed by the AFRL COS IAW AFI 91-202 AFRL Supplement. AFRL/DO staff serving in any of these roles will not be the Test POC for the flight activities being reviewed.

2.3.4.4. As an office provide AFRL GFR administrative support and coordination. AFRL/DO staff will maintain a list of current/qualified GFRs for oversight of contractor operations. AFRL/DO will also serve as liaison to HQ AFMC/A3/6 for updates/interpretations/waivers to DMCA INST 8210.1X, *Contractor's Flight and Ground Operations*, AFI 10-220, *Contractor's Flight and Ground Operations*, and applicable service guidance. AFRL GFRs will support the AFRL/DO staff with mechanisms to facilitate GFR training, information crossflow, and standardization of application across the AFRL enterprise.

2.3.4.5. In the person of the Director (or Deputy Director) appoint a SUAS PM on the AFRL/DO staff to perform duties IAW AFMAN 11-502.

2.3.4.6. Establish inter-Center support agreements with the Air Force Test Center (AFTC) as needed IAW AFI 99-103 AFMC Supplement.

2.3.5. AFRL/SE and Site/Detachment Chief of Safety. AFRL/SE and AFRL COS roles and responsibilities in support of the AFRL Flight Activity Process are described in AFI 91-202 AFMC and AFRL Supplements. Information about safety investigation processes can be found in AFI 91-204, *Safety Investigations and Reports*. Reference these documents for more information on mishap convening authority identification, SRB Chair selection and training, SRB conduct, mishap handling, and other activities relevant to flight operations.

2.3.6. AFRL Delegated Technical Authority (DTA). The roles and responsibilities of the AFRL DTA, residing in the AFRL Engineering and Technical Management Directorate (AFRL/EN) and exercised in support of the AFRL Flight Activity Process, are described in AFI 62-601, *USAF Airworthiness*, AFMC Supplement, AFRLI 61-601, *AFRL Airworthiness*, and various Airworthiness Bulletins (AWB). Reference these documents for more information on the airworthiness process and its relationship to flight activities.

2.3.7. Technology Directorate Chief Engineers will:

2.3.7.1. Chair TRBs for flight test activities within their TDs.

2.3.7.2. When unavailable, appoint TRB Chairs to perform such duties in their stead who possess the requisite knowledge and experience to satisfactorily assess the technical risk of flight test activities within their TDs.

2.3.7.3. Ensure minutes are published in a timely fashion for TRBs held within their TDs that document action items assigned and closed and that capture, for the record, the final technical risk level assessed for the flight test activity reviewed.

2.3.7.4. Assess the adequacy of TRBs conducted by agencies outside of AFRL – such as those by LDTOs – and when found to be unsatisfactory for whatever reason, conduct supplemental reviews to the extent necessary to ensure the requisite adequacy.

2.3.8. Technology Directorate Test Leads will:

2.3.8.1. Manage support to TD flight activity review and approval processes and document processing. Assist CTA in training TD S&E workforce on the AFRL Flight Activity Process and flight test techniques, procedures, and best practices.

2.3.8.2. Serve as the central point of contact between TD PMs and AFRL/DO and the other FDs. Test Leads will serve to guide and assist individual program teams with meeting AFRL Flight Activity Process requirements.

2.3.8.3. Act as the primary POC within the TD for execution and oversight of any internally-instituted TD flight activity management processes.

2.3.8.4. Assist PMs in the development of test strategies. To the extent practical, participate as a member on program test teams to assist in test planning.

2.3.8.5. Assist the TD Chief Engineer with execution of TRBs and processing of resultant documentation.

2.3.8.6. Assist programs with range interactions (e.g., Program Introduction Documents/Statements of Capability, range time and airspace scheduling, etc.).

2.3.8.7. Approve test cards within the parameters stipulated in **Para 5.6.9.1** and **Table 5.2**.

2.3.8.8. Submit an annual forecast to AFRL/DO of known or proposed flight test requirements to be pursued by the TD in the forthcoming calendar year. Submit this forecast not later than the second Friday of December of the year prior to the forecasted year. This forecast will be used to support resource and workload planning internal to AFRL as well as with external partners such as AFTC.

2.3.9. TD SUAS Leads will:

2.3.9.1. Coordinate with AFRL/DO staff and their TD Test Lead to oversee TD SUAS operations.

2.3.9.2. Serve as first member of the operations functional chain. Coordinate TD SUAS Operator (SUAS-O) compliance with all relevant 11-series AFIs and MAJCOM directives/policies.

2.3.9.3. Conduct unit-level standardization/evaluations and training functions or defer those functions to the office of AFRL/DO.

2.3.9.4. Engage with the staff of AFRL/DO to secure any required qualification and proficiency training for TD SUAS-Os.

2.3.9.5. Support the technical and safety review processes for own TD operations using SUAS.

2.3.9.6. Approve training flight cards within the parameters stipulated in **Para 5.6.9.1** and **Table 5.2**.

2.3.10. PMs will:

2.3.10.1. Ensure program flight activities (contractor and government) are planned/documented, reviewed, approved, and conducted in accordance with this volume. PMs will ensure independent, government-led technical and safety reviews are adequately conducted by qualified organizations for all tests. When AFRL is not the LTO and these reviews are not conducted IAW such principles, PMs will utilize AFRL processes and resources to ensure adequacy in this regard.

2.3.10.1.1. In coordination with the TD Test Lead and AFRL/DO Test POC, ensure test plans are of sufficient quality before they are submitted for AFRL Flight Activity Process reviews.

2.3.10.1.2. Ensure test plans are submitted for reviews/approvals with sufficient time based on this instruction to ensure the program meets requirements and planned schedules.

2.3.10.1.3. Ensure completion of technical and safety review action items and incorporation of changes directed to flight activity packages.

2.3.10.2. Ensure program protection measures to include those for operations security, cybersecurity, and anti-terrorism are implemented as applicable when sponsoring flight activities. Consult AFRLI 63-113, *Program Protection Planning for the Air Force Research Laboratory (AFRL)*, for guidance in this area.

2.3.11. Additional Test Execution Personnel may include the following. (Titles for these personnel may vary, but their responsibilities should be performed by someone on the test team.)

2.3.11.1. Test Director. A single, highly-experienced individual should be designated as the Test Director who acts as the supervisor of the control room or other test oversight location and has emergency direct communication with all critical test personnel such as the lead pilot in command (PIC). The Test Director can be provided from the TD that is home to the program or an external agency, but should possess applicable training or experience to successfully perform this duty. The Test Director is responsible for the overall technical quality, security, safety, and support aspects of the flight activity, as identified in the test plan. The Test Director:

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

2.3.11.1.2. 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.

2.3.11.1.3. Supervises the test team and validates qualifications of all test personnel.

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

2.3.11.1.5. Makes the final decision on the real-time selection of options during a flight mission.

2.3.11.1.6. Has emergency direct communication with the flight mission PIC.

2.3.11.2. Test Conductor (TC). A single, experienced individual should be designated as the TC who is the primary communicator with the test aircrew. The TC can be provided from the TD that is home to the program or an external agency, but should possess applicable training or experience to successfully perform this duty. The TC will clear the test pilot or UAS operator to proceed from one test point to the next. The Test Director and TC may be the same person for simple test missions. The TC is responsible for real-time coordination of ground activities with the aircrew; paces progression through the test cards as agreed to in the mission pre-briefing; and, defers to the Test Director for decisions, as appropriate. The TC may be airborne in a test or support aircraft. The TC:

2.3.11.2.1. Briefs test cards during the mission briefing as well as Test Hazard Analyses (THA) and General Minimizing Procedures (GMP) for all applicable test points. These briefing tasks may be delegated.

2.3.11.2.2. Makes test-point terminate and go or no-go calls based on real-time engineering analyses of data available at the test oversight location. Makes test point termination decisions balancing resource considerations against any doubts in the technical validity of the test. Terminates test points when safety is jeopardized.

2.3.11.2.3. Coordinates test oversight location and/or aircraft setup, when required.

2.3.11.3. Aircraft Operator(s). The pilot or UAS operator is responsible for the safe operation of their test aircraft and successful completion of the test mission. If the pilot/UAS operator is not the PIC, the PIC will be the final authority on aircraft safety. The pilot or UAS operator:

2.3.11.3.1. Assists in preparation and review of the test plan.

2.3.11.3.2. Prepares or assists in the preparation of the safety review package and participates in the SRB.

2.3.11.3.3. Assists in the preparation of test cards and reviews test points and test mission profiles for safety and operational practicality.

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

2.3.11.3.5. Performs test maneuvers as briefed, or in the case of multi-crew aircraft, oversees test maneuvers, as appropriate.

2.3.11.3.6. Leads the mission briefing and debriefing.

2.3.11.3.7. Completes post-mission reports, as required.

2.3.11.4. Safety Observer. An experienced individual or cadre of individuals should be designated safety observer(s) with the singular function to ensure safe execution of the flight activity and supporting ground operations. The safety observer(s) will not be assigned any additional duties beyond those required to fulfill this function.

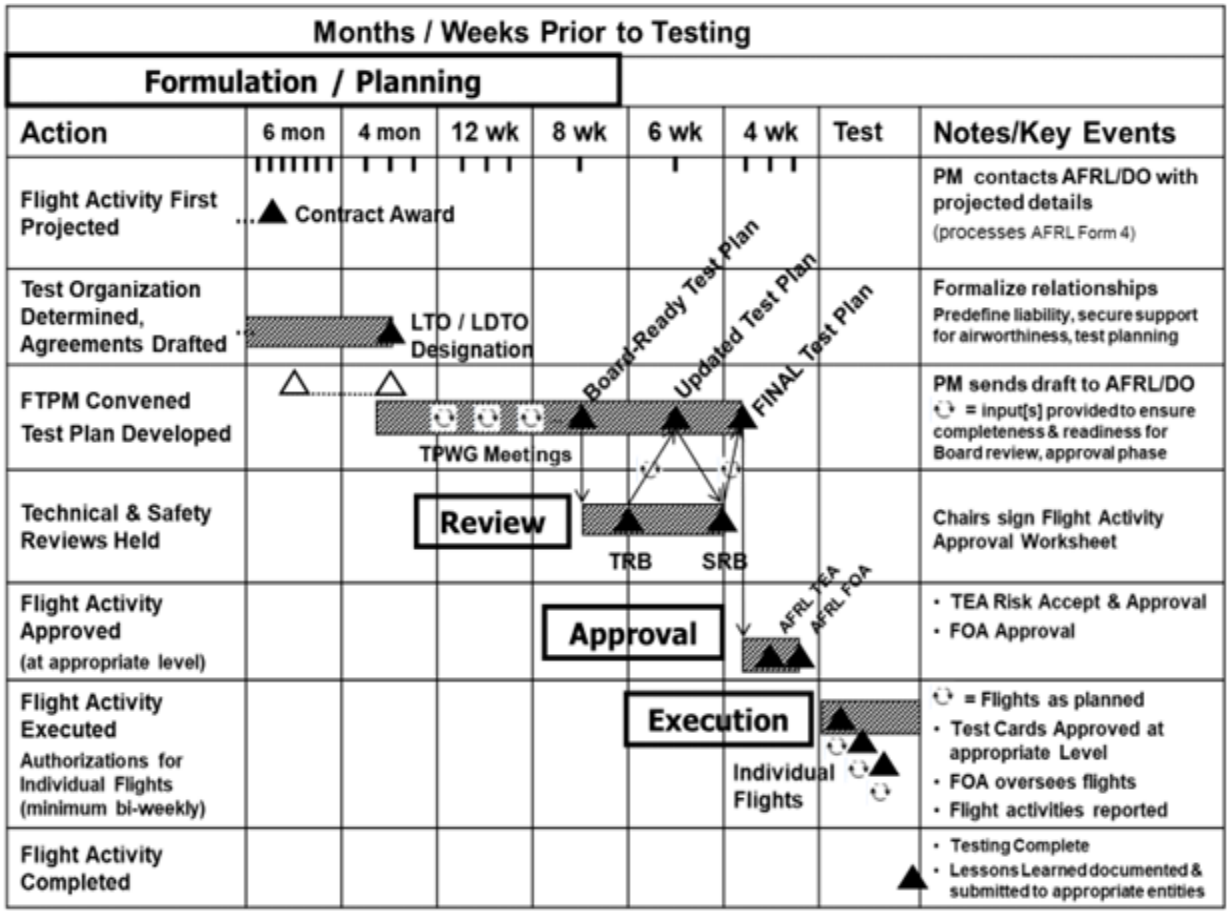
Chapter 3

PRELIMINARY PLANNING

3.1. Test Concept Development. Each AFRL S&T program has its own unique and special requirements. This chapter lists the basic steps and long-lead planning considerations that are common to most AFRL flight activities. **Chapter 4** presents detailed test planning activities to accomplish once the basic strategy is complete. For information on planning considerations and process details beyond that presented in this volume, see the AFRL Flight Activity Process Guide.

3.2. Test Strategy. Document the overall objectives, System Under Test (SUT) description, proposed test team structure, and timeline of the program's flight/test activities. There is no prescribed format for the test strategy; TDs may use or develop their own program documentation requirements or leave it up to the PM. (Note: This strategy document may serve as the basis for a Program Introduction Document [PID] should a formal arrangement with an LDTO become necessary). Additionally, PMs may contact TD Test Leads and/or the AFRL/DO staff for assistance in developing test strategies. These offices will share lessons learned from previous tests and advise PMs/S&Es on long-lead planning considerations.

Figure 3.1. Representative Flight Activity Planning Schedule.



3.3. Test Schedule. Every flight activity requires various actions, resources, and approvals to enable it to go forward. PMs must consider all of these factors when formulating a schedule to meet program objectives. Accordingly, schedules will vary from program to program, but it remains useful to consider what a representative schedule entails as depicted in **Figure 3.1**. While the schedule presented in this figure is intended to be expository, it is both typical and realistic for many AFRL programs.

3.4. Major/Mandatory Planning Considerations.

3.4.1. Aircraft. The most important planning consideration, aircraft selection, impacts every other planning aspect (owner/operator, contracting, oversight, operational procedures, etc.) and must be determined early, but smartly. If the test objective is to develop a new aircraft or modify an existing aircraft subsystem, then the aircraft choice is already directed. Otherwise, aircraft selection though bounded by test strategy/objectives, may be heavily influenced by other factors such as cost or availability.

3.4.1.1. Manned versus Unmanned. Manned aircraft often provide more capability and flexibility, but require long-lead planning documents such as contracts or Memoranda of Agreement (MOA). UASs can provide cost and risk advantages, but PMs must ensure UAS capabilities meet the test requirements.

3.4.1.2. Owner. The aircraft owner drives many of the long-term planning considerations. Government-owned aircraft can have long scheduling timelines, can be expensive, and may require signed agreements. Contractor-owned aircraft by definition require approved contracts as well as specific airworthiness planning considerations (see AFRLI 61-601 in this regard).

3.4.1.3. Operator. The aircraft operators must have appropriately documented training, qualification, procedures, and approval to fly the aircraft. These requirements are typically defined in AFIs, Federal Aviation Administration (FAA) regulations, or other governing documents. Contact the AFRL/DO staff for assistance in understanding and complying with these requirements.

3.4.1.4. Civil Aircraft Operations (CAO) versus Public Aircraft Operations (PAO). Contracted flights are CAO unless specifically designated and declared as PAO by the appropriate airworthiness authority. When the appropriate airworthiness authority designates and declares contracted flights as PAO, the Air Force becomes responsible for oversight of the operation, including aircraft airworthiness, aircrew qualification and training, maintenance procedures, and safety standards.

3.4.1.5. Airworthiness. All AFRL flight activities require some form of airworthiness approval. This can range from a CAO letter verifying a contractor-owned aircraft has the appropriate documentation to independently assessing a new aircraft built by AFRL.

3.4.2. Test Organization. Organizing to pursue a test activity should be tailored to the complexity of the test. If required by extensive scope or if multiple organizations are involved, a formal ITT may be formed. The ITT should be constituted sufficiently early to shape the test requirements and strategies of the program. ITT membership will typically include the AFRL PM and representatives from the program office (as assigned), the requirements community (as involved), any associate test organizations, system contractors, and any others that add value. ITTs are not required and simpler tests may proceed with reduced membership.

Responsibility to develop the test plan and execute it typically falls to the program's test team which may be organic or out-sourced. For a simple flight activity or a small program team, the test team might consist only of the PM, the TD Test Lead, and/or the AFRL/DO Test POC. Test teams may be organized using the following constructs or elements as appropriate.

3.4.2.1. Lead Test Organization. The LTO is the construct used when the test team is organic to AFRL (to include its contractors) and possesses the qualifications and resources necessary for the planning, safety, execution, and reporting of a test activity. The AFRL TD that owns the program is designated as the LTO. If more than one TD is involved, the one with the preponderance of resources involved will be the LTO or as agreed upon.

3.4.2.2. Lead Developmental Test Organization. An LDTO is a test team external to AFRL that functions as the lead integrator for a program's test activities. Since AFRL performs S&T and not formal Developmental Test and Evaluation (DT&E), LDTOs are usually used for their expertise in test or for their unique test assets, but not for T&E as prescribed in AFI 99-103. See the AFRL Flight Activity Process Guide and AFI 99-103 AFMC Supplement for guidance on how to establish a relationship with an LDTO. Examples of mechanisms to procure support include use of PIDs, Statements of Capability, Memoranda of Understanding (MOU), and AFMC Form 42, *Lead Developmental Test and Evaluation Organization Designation*. When an LDTO is to be employed, all AFRL programs are required to use AFMC Form 42 unless waived by AFRL CTA. This form is particularly beneficial in documenting roles and responsibilities in test efforts involving multiple, participating agencies.

3.4.2.3. Participating Test Organization (PTO). A PTO is any test organization with whom a supporting relationship is established to provide specific test data, resources, or execution for a test program or activity.

3.4.2.4. Test Operations Team. A typical AFRL test operations team includes the Test Director, Test Conductor, Safety Observer, and aircraft operators. Additional members may be required to fulfill specialized ground or inflight functions. Duties of these team members are described in the following paragraphs. Frequently, the non-aircrew members of the test operations team will operate from a test oversight location such as a control room or ground control station. A test oversight location is defined as any setup or facility, ground or airborne, that provides 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 and effective test execution. A test oversight location typically provides the ability to monitor and analyze real-time data and give point-to-point clearance such as for a build-up sequence specified in a test or safety plan.

3.4.2.4.1. Test Director. The Test Director is responsible for the overall technical quality, security, safety, and support aspects of the mission, as identified in the test plan. See Par. 2.3.11.1. for more details on Test Director duties.

3.4.2.4.2. Test Conductor. The Test Conductor is responsible for real-time coordination of supporting ground activities and is the primary communicator to the aircrew during flight activities. See Par. 2.3.11.2. for more details on Test Conductor duties.

3.4.2.4.3. Aircraft Operator(s). The test pilot or UAS operator is responsible for the safe operation of the aircraft and successful completion of the mission. See Par. 2.3.11.3. for more details on aircraft operator duties.

3.4.2.4.4. Safety Observer. The safety officer is responsible for monitoring flight and supporting ground activity execution to ensure safety protocols are followed and to be on the lookout for developing situations that could lead to unsafe conditions. See Par. 2.3.11.4. for more details on safety officer duties.

3.4.2.4.5. Maintenance/Engineering Support Personnel (MESP). MESPs are government or program-affiliated contractor personnel who are required to perform inflight duties. Authorization of such individuals to participate as mission aircrew requires fulfillment of certain actions to include the following long-lead items: contract/Position Description/Statement of Duties and Experience language allowing flight as a normal part of the position; flight physical exam; and, required physiological or aircrew life-support training.

3.4.3. Flight Operations Authority Relationships. When AFRL serves as the LTO and is supported by entities that possess their own FOA, the AFRL FOA will serve as lead for purposes of overall flight operations oversight unless delegated to one of the participating entities' FOA. This arrangement does not override the other FOA(s) prerogatives with respect to oversight of their entity's participation in an AFRL-led test activity, but allows for a single integrated perspective in the oversight function. When another agency serves as LDTO for an AFRL test, the other agency's FOA has the overall lead with the AFRL FOA retaining prerogative over AFRL entity participation. When multiple FOAs are in play for a flight test activity, they will coordinate their oversight prerogatives so the test team has a clear picture of their duties with respect to reporting and otherwise being responsive to these authorities' requirements.

3.4.4. Airspace/Location of Test. Flight activities in support of S&T objectives may require use of specialized airspace and ranges. AFRL programs must ensure they schedule the correct airspace, receive approval to conduct the test in that airspace, and properly train the operators prior to execution to operate there. For assistance in this regard, see the TD Test Lead or AFRL/DO staff. Airspace types vary as described below and are an important consideration when planning a flight activity.

3.4.4.1. National Airspace System (NAS). The NAS consists of all airspace, navigation facilities, and airports in the U.S. to include that which falls under civil or military jurisdiction. However, as used in this volume, the term NAS shall refer only to that part that is not restricted Special Activity Airspace (SAA) as defined below. When understood in this context, the NAS is typically used for simple, low-risk tests that can be conducted completely under FAA rule sets. Such operations generally require no special scheduling or approval.

3.4.4.2. Special Activity Airspace (SAA). SAA is the term used to describe Military Airspace. SAA consists of Airspace for Special Use (ASU) and Special Use Airspace (SUA). ASU areas typically support military operations or training and include aerial refueling tracks/anchors, low altitude tactical navigation routes, etc. SUA includes restricted airspace, warning areas, and military operating areas among others. This type of airspace is frequently used by AFRL because the nature of many of its SUTs (e.g., sensors, lasers, weapons, or modified aircraft) precludes their flight/operation in unrestricted airspace. SUA requires scheduling through the owning military unit and approval to conduct the test profiles from the range safety officer. Also, use of SUA requires separate approvals for any special frequencies or directed energy emissions. See the AFRL Flight Activity Process Guide or the AFRL Spectrum Manager (SM) for guidance in this regard.

3.4.4.3. Certificates of Waiver or Authorization (COA) for Unmanned Aerial Systems. A COA is a form of permission granted by the FAA that designates specific airspace for UAS operations and is generally only granted to a public entity. COAs define the location and dimensions of a volume of airspace within the NAS in which UAS are authorized to fly, what safety procedures must be used, and what restrictions should be observed. UAS that are not instrument-certified can only fly in SUA or COAs. COAs must be developed in coordination with the local Air Traffic Control (ATC)/FAA organization and approved before they can be activated.

3.4.5. Captive Flight. Some flight activities are designed to be conducted in enclosures, as tethered operations, or in other environments where the extent of flight is constrained in some physical manner. Such designs can raise the question whether the envisioned activity should be governed under flight or ground review and approval processes. In those cases where the flight activity meets the definition stated in Par. 1.3.2., but the test team believes ground activity approval processes can be employed instead, they should bring their rationale to the FTPM where the AFRL/DO staff can provide an authoritative determination.

3.4.6. Mishap Accountability. A mishap is an unplanned occurrence, or series of occurrences, that results in damage or injury and meets Class A, B, C, D or E mishap reporting criteria IAW AFI 91-204. Detailed information on mishap accountability and investigative responsibility must be documented in the test plan. If multiple agencies are involved in a test , formal agreements may be necessary to ensure mishap accountability and investigative roles and responsibilities are clearly identified and understood. For tests that include non-AFRL resources, the AFRL assets that are at risk for the test should be explicitly identified. See AFI 91-202 AFMC and AFRL Supplements, AFI 91-204 and/or AFRL/SE for amplifying information.

3.5. Other Planning Considerations.

3.5.1. Contracting.

3.5.1.1. Contract Language. When AFRL contracts include flight tests conducted either by the contractor or in support of the government, consideration should be given to including specific language about AFRL flight activity processes. The PM should highlight the plan or potential for flight activity to the Contracting Officer before contract

solicitation so the latter may incorporate appropriate language as required. The PM is also highly encouraged to arrange AFRL/DO review of the solicitation package prior to release to industry. If a contractor will be required to conduct the test or provide documents to support the test, the PM should consider contract language, including generation of DD Form 1423 Contract *Data Requirements List (CDRL)* that require the contractor to:

3.5.1.1.1. Write a test plan and submit it to the government for review and approval prior to first test.

3.5.1.1.2. Support the airworthiness process to include airworthiness risk assessment per AFI 62-601 AFMC Supplement and AFRLI 61-601.

3.5.1.1.3. Participate in reviews (safety/technical) and approvals (TEA/FOA).

3.5.1.1.4. Follow AFRL processes for reporting/handling unexpected events/mishaps.

3.5.1.1.5. Document and provide the government with lessons learned.

3.5.1.1.6. Provide the government with any recorded data and analyses as required.

3.5.1.2. Ground and Flight Risk Clause (GFRC) and Government Flight Representative Oversight. When a test activity is deemed a PAO, government oversight is required and the contract must include the appropriate clauses/language. If either the GFRC (DFARS 252.228-7001) or AFI 10-220 (DCMA-INST 8210.1X) applies, GFR oversight is required. Contact the Administrative Contracting Officer and AFRL/DO staff for GFR assignment to the contract. In all cases, tailor the oversight with the complexity of the flight activity and seek guidance as needed from AFRL/DO personnel or a qualified AFRL GFR.

3.5.2. Program Security/Cybersecurity. PMs shall follow AFRL and TD program security measures as well as cybersecurity requirements as dictated by Air Force policy and instruction. If unsure how to proceed, contact the TD security lead or HQ AFRL Security Office (AFRL/DSI) for program security. Contact the TD Information System Security Manager (ISSM) or HQ AFRL Cybersecurity Office (AFRL/RCCS) for information technology security.

3.5.2.1. See AFRLI 63-113, *Program Protection Planning for the Air Force Research Laboratory*, for program security and AFRLI 17-130 for cybersecurity guidance.

3.5.2.2. Based on the level of sensitivity of transmitted data, consider encryption and other technical or procedural mechanisms to mitigate program and cyber risks.

3.5.3. Human Subjects/Participants in Research. See AFRLI 40-402, *Using Human Subjects in Research*, and AFRLI 61-103 Volume 2 for guidance in this area. If any doubt exists about whether or not human participation in a flight activity must follow human-use protocols, seek a determination from the AFRL Institutional Review Board (IRB).

3.5.4. Frequency Management and the AFRL Spectrum Manager. The PM should coordinate at the beginning of the program with the AFRL SM in AFRL/DO to ensure spectrum approvals are in place as needed, even if a contractor is intending to use a non-DoD frequency. If flying in SAA, engage the Range SM or test site Frequency Manager as soon as possible. The AFRL SM will assist as required.

3.5.5. Directed Energy (DE)/Laser Clearance and Safety. Use of DE during testing requires special notifications/approvals. Ensure you engage a Laser Clearing House POC via Safety channels and comply with DoDI 3100.11 *Management of Laser Illumination of Objects in Space* when conducting any DE testing. Ensure the range safety or test site safety office has approved DE employment on any military range where you intend to use it. Follow the instructions of FAA Advisory Circular (AC) Number 70-1 for any laser operations that may affect aircraft operations in the NAS. See AFRL/SE for questions on DE safety protocols.

3.5.6. Configuration Control Process. Each mission organization that conducts flight activities must have an aircraft configuration control process IAW AFRLI 61-601. The TD Chief Engineer is responsible for oversight of this process which ensures configuration changes will not result in unsafe conditions with the structural characteristics, the performance and flying qualities, flight control capabilities, or electrical features of the aircraft. For complex air vehicles, consider establishing a Configuration Control Board (CCB). For assistance on configuration control, see the TD Chief Engineer or AFRL/EN.

3.5.6.1. Maintenance and Repair Procedures versus Modification. All modifications to aircraft must be properly documented via a configuration control process. Normal maintenance and repair procedures do not require configuration control documentation, but should be documented on maintenance forms or logs.

3.5.6.2. Modification to Manned Aircraft. Except in rare or temporary circumstances, AFRL does not own manned aircraft; accordingly, all modifications to manned aircraft will be accomplished by the aircraft owner. AFRL PMs will ensure contractors follow FAA guidance for documentation (e.g., FAA Form 337, *Major Repair and Alteration [Airframe, Powerplant, Propeller, or Appliance]*) and share those documents with AFRL/EN. Modifications to government-owned aircraft will be accomplished by the owning unit and Air Force Life Cycle Management Center (AFLCMC) program office.

3.5.6.3. Logistics and Support. Determine the support requirements to meet performance and readiness objectives. Areas to consider for planning purposes: maintenance; training and training support; manpower/personnel; Information Technology (IT)/computer support; supply; facilities; technical data; packaging, handling, storage and transportation; support equipment; and, design interfaces.

3.5.7. Other Non-standard Planning Considerations.

3.5.7.1. Air Force Instruction Waivers. If a waiver to an AFI or TO is anticipated, start the process early as staffing timelines can be lengthy depending on the waiver authority level.

3.5.7.2. Proper Use Memorandum (PUM). Requirements for PUMs stem from statute, Executive Orders, policies, and AFI 14-104, *Oversight of Intelligence Activates*. A PUM is required any time a flight (or space) activity will result in the collection of data on U.S. persons whether by design or inadvertently. PUMs are required regardless of the type of airspace in which one may be conducting flight operations. The intended purpose of the vehicle sensor that can collect such data is irrelevant – only its capability matters – so PUM

requirements are applicable beyond those activities that are solely for intelligence collection. PUMs are approved at the MAJCOM A2 level so composition, staffing, and approval timelines can be significant (i.e., on the order of three to six months). PMs are highly encouraged to contact their TD Test Lead and/or AFRL/DO staff for guidance on PUM requirements for their flight test activities.

3.6. Flight Test or Training Planning Meeting (FTPM). Early tester involvement is a key principle that undergirds the concept of the FTPM. The FTPM is held as a part of or soon after the Initial Program Formulation Phase that a program conducts when envisioning some future flight activity. This meeting allows the PM and test team to introduce the flight activity concept to the HQ AFRL organizations that oversee the test process (to include AFRL/DO/EN/RC/SE). At the FTPM, FDs, the PM, and test team work together to identify and tailor the AFRL Flight Activity Process requirements and milestones that will apply to the program. During the FTPM or shortly thereafter, an AFRL/DO POC will be assigned to help the PM transition from preliminary to detailed planning and facilitate the program's vetting through the AFRL Flight Activity Process. Occasionally, as programs plan for and proceed with their flight activity, significant changes in scope (objectives, procedures, participants, venues, etc.) may prompt a follow-on FTPM to be convened to address these changes as appropriate. Scheduling a FTPM as early as practical allows the PM to leverage AFRL subject matter expertise to properly manage the various risks encountered in flight activities and to balance them with the programmatic risks the PM and the program management chain are willing to bear.

Chapter 4

TEST/TRAINING/OPERATIONS PLAN DEVELOPMENT

4.1. Introduction/Administration. Because of the nature of S&T and overlapping management within AFRL, the test plan is often the single-source approved document that combines: test approach; safety considerations; airworthiness information; operator training/qualification summaries; operational limits; and, aircraft limits. On rare occasions, these items may be broken up into separate documents, but generally, they should be combined into one overarching test plan. Test plans in AFRL should be tailored to the complexity of the flight activity, but require a minimum of certain information to explain the objectives, the methodology, and the risk management/safety measures. Test plans document the following:

4.1.1. Objectives – to what ends tests will be accomplished

4.1.2. Test methodology and test points – how tests will be accomplished

4.1.3. Measurement and instrumentation requirements – what data will be acquired

4.1.4. Data analysis plan – how data will be collected/processed to answer the objectives

4.1.5. Metrics – how success (or failure) will be assessed

4.1.6. Limitations – why the test may not be fully successful

4.1.7. Management information – resources, schedule, reporting, etc.

4.1.8. Safety – risks to personnel and property and how they will be mitigated

4.2. Format/Style/Length. Test plans come in a variety of formats, styles, and lengths; there is no required template in AFRL. The AFRL Flight Activity Process Guide has a test plan outline and several templates test teams can use as they prefer. Some considerations to keep in mind when composing test plans are as follows:

4.2.1. Test Approach or Build-up. During test plan development, the test team will carefully consider the test approach or build-up. The way the test approaches a hazardous or unknown condition must be clearly defined. If predictive analyses do not exist, or have questionable validity, the test methodology may require a more refined build-up approach to offset the risk. Criteria to continue, or more importantly when to stop, can provide good risk control by providing a clearly-defined roadmap that governs the test team's decision-making. This decision-making process is extremely important and should be documented.

4.2.2. Test Plan Size and Complexity. The test team must consider the size and complexity of the test plan and assess whether a review of a large, complex test plan is more or less advantageous than several smaller phased test plans/reviews. When appropriate, teams may conduct test/safety planning for large, complex test efforts using smaller, less complex plans and reviews matched to progressive phases of the test project.

4.2.3. Test Plan Approach/Format. Given the variety in tests' extent, duration, and scope, test plan approach and format may vary IAW the principle of tailorability. For some activities, capstone documents in which individual test phases or campaigns are described and reviewed/approved through separate annexes will work best. For simple, limited, low risk events a set of briefing slides may prove sufficient. Consult with AFRL/DO staff to assess the best course of action in this regard.

4.3. Test Plan Sections. Regardless of format, the test plan should contain the following elements: overview, test objectives, a description of the SUT, the method of test, a data management plan, airspace/flight profile(s), safety considerations, envelope/limitations, and operator training/qualification.

4.3.1. Overview. Summarize the purpose of the test, program objectives, and any pertinent background information (such as previous tests, simulations, or how this test affects other tests or broader research campaigns).

4.3.2. Test Objectives. State and list, clearly and concisely, the primary test objective(s) and any sub-objectives. Identify the phenomena or events of prime importance expected to be observed or measured. Identify any critical questions or issues to be answered by the test program.

4.3.3. System Under Test (SUT)/Test Item Description. Describe the aircraft and/or test item (size, shape, dimensions, weight, speeds, payload capacity/information, instrumentation, power requirements/availability, etc.); aircraft modifications and configuration control process/approval; flight control system; test/support equipment; cyber topology; and, any other pertinent hardware or software.

4.3.4. Method of Test (MOT). Provide detailed test approach and procedures consisting of:

4.3.4.1. detailed description and discussion of each type or phase of test (instrumentation checkout, electromagnetic interference/compatibility [EMI/EMC] tests, ground runs [as applicable], taxi tests, flight profiles)

4.3.4.2. number of tests/flights planned/required

4.3.4.3. purpose, objective and success criteria of each test/flight

4.3.4.4. vehicle configuration for each flight

4.3.4.5. discussion of how each ground (if applicable) and flight test will be conducted from start to finish

4.3.4.6. -contingency plans

4.3.4.7. -communications equipment and procedures

4.3.4.8. -radio and test terminology

4.3.4.9. -role and responsibilities of test personnel

4.3.4.10. -how deviations from the test plan will be handled

4.3.4.11. -test, weather, and safety go/no-go lists

4.3.4.12. -test execution success criteria

4.3.5. Data Management Plan.

4.3.5.1. Instrumentation Requirements. Describe test instrumentation, its required precision/accuracy, and its anticipated effect on the air vehicle and/or influence (if any) on the test environment.

4.3.5.2. Data Analysis Plan. Regardless of format for the data analysis plan, clearly indicate: Measures of Performance (MOP) defined in terms that can be measured; required parameters; collection methods; initial quality check methods; algorithms and tools to be applied; tool validation methods; analysis methods (explaining why the method was selected); completion criteria; evaluation criteria stated in terms of the MOP (if applicable); and, evaluation products.

4.3.6. Airspace/Flight Profile(s)/Test Locations. Include information on: test location/airspace (e.g., map, chart or photo of area); flight profile/test patterns/points (e.g., depictions on maps, charts, or drawings showing airspeeds, altitudes, etc.); and, location of test personnel and equipment.

4.3.7. Caution/Kill Boundaries. For UAS, include Caution/Kill Boundaries on a map or chart. See the AFRL Flight Activity Process Guide for considerations in determining such boundaries.

4.3.8. Safety Planning. The objective of safety planning is to identify and assess hazards and develop controls or mitigation measures to reduce the risk to an acceptable level. Of particular interest is accounting for how safety of personnel will be ensured. AFRL test plans typically include safety considerations rather than having them addressed in a separate safety plan, though use of a separate, complementary document is acceptable. The following items comprise the safety portion of the test plan. Refer to AFI 91-202 and its supplements or contact AFRL/DO or the local AFRL Safety office if you have questions.

4.3.8.1. General Hazard Identification. Some hazards will be inherent to operating the system and others will be induced by the test itself. For test safety planning, a goal is to employ standard procedures as much as possible for identifying and addressing general and test-unique safety concerns. If the nature of the test increases the probability or severity of non-unique hazards they should be addressed, mitigated, and documented.

4.3.8.2. Test-Unique Hazard Identification. The team will identify unique hazards associated with each type of test or activity. In some cases test activities may only elevate the risk associated with routine operational hazards while in others it introduces new sources of risk. In the safety documentation, descriptions of test-unique hazards should adequately capture the new source of risk including the act or condition itself and its effects. It is often helpful to assess the risk (probability and severity) prior to applying mitigations in addition to doing so after mitigations are in place. Sources for identifying test-unique hazards include:

4.3.8.2.1. Archived test and safety planning to include lessons learned and THAs from similar tests.

4.3.8.2.2. Personnel or test teams with experience in similar test activities or testing in general to include staff within AFRL/DO and AFRL/SE.

4.3.8.2.3. Research data found in technical libraries, the internet, etc.

4.3.8.3. Hazards Controls or Elimination. Once the causes of each hazard have been identified, minimizing procedures or controls are used to reduce risk by reducing severity or probability or both. The following order of precedence should be applied to eliminate or control any hazards identified during the safety planning.

4.3.8.3.1. Design the test to eliminate the probability of the hazard occurring. This could include a decision to not perform the test if the risk is deemed to be unacceptably high. A redesign of the system to eliminate the hazard is another option.

4.3.8.3.2. Change the test methodology to reduce the probability, severity, or exposure to the hazard. For example, building up to the test condition can be a strong control method (per Par. 4.2.1.).

4.3.8.3.3. Incorporate safety devices (e.g., additional power sources, recovery parachutes).

4.3.8.3.4. Provide caution and warning devices to detect an unsafe condition or trend, or, install instrumentation and data displays with active monitoring.

4.3.8.3.5. Develop procedures and training when it is impractical to change the design or test methodology.

4.3.8.4. Hazard Mitigation.

4.3.8.4.1. General Minimizing Procedures (GMP). GMPs are stand-alone phrases/statements representing standards or best practices used to employ or comply with test build-up approaches, SUT restrictions, critical parameter monitoring, go/no-go criteria, weather or environmental criteria, chase aircraft requirements, and/or other items of test safety concern.

4.3.8.4.2. Test Hazard Analyses (THA). THAs are used to document and identify test-unique hazards and the actions necessary to minimize or control them to an acceptable level of risk. Use a separate THA for each test-unique hazard. If a hazard is not unique to a series of tests, no THA is required. For example, midair collision with non-participating aircraft and bird strikes are not generally considered test-unique hazards. However, should the very nature of the test increase the probability of these hazards above that of normal operations, they should be addressed as test-unique hazards. See AFI 91-202 AFMC Supplement, Figure A20.5 or the AFRL Flight Activity Process Guide for a copy of the THA form.

4.3.8.5. Waivers. If there are any AFI or TO waivers associated with the flight activity, note it in the test plan for consideration at the safety review.

4.3.8.6. AFRL Unexpected Event Worksheet (see **Attachment 2**). This worksheet is used by the test team to provide a ready reference to guide reporting on an unplanned occurrence to the offices of AFRL/DO and/or AFRL/SE. Examples of such events are a near miss, mishap, or unplanned test suspension/stop. The worksheet guides affected parties to take appropriate response actions such as preserving the mishap scene, arranging photographs, gathering witness statements, etc. It is also useful in supporting Operational Report/Commander Critical Information Requirement (OPREP/CCIR) submissions.

4.3.8.7. Mishap Accountability. This consideration identifies the Mishap Convening Authority (MCA) and/or any non-standard accountability information. The MCA for a particular flight activity is not always obvious and in some cases may require an MOA assigning convening authority to a government agency other than AFMC. See AFI 91-202 and 91-204 as supplemented and/or contact the local site/detachment safety office or HQ AFRL/SE for further guidance.

4.3.9. Aircraft Envelope/Flight Manual/Limits. Provide information on the aircraft approved operating envelope(s). List or provide reference to aircraft limitations for weight, speed, altitude, normal force (G), bank angle, etc. Provide or reference any materials that describe the aircraft operator's manual (or pilot's operating handbook) and/or checklist(s).

4.3.10. Operational and Weather Limits. Provide information on limitations to operations such as those that pertain to fuel, electrical systems, command and control (C2) link ranges, etc. Provide limits for crosswinds, gusts, icing, turbulence, and other weather factors as applicable.

4.3.11. Operator Qualification Documentation. Identify the minimum qualifications all operators must possess to support the flight activity. Prior to the SRB, identify the operators by name and provide their ratings, experience, and currency to the office of AFRL/DO and the GFR as applicable. AFRL/DO staff will provide this information as part of the flight activity package to the FOA for review/approval.

4.3.12. Cyber Vulnerability Mitigation. AFRL systems under test almost invariably possess an information technology (IT) element. These IT elements must be evaluated for cyber vulnerabilities and any identified should be mitigated either through design or operational consideration. For example, telemetry links can be encrypted to eliminate or lessen the probability of sensitive data compromise; UAS flight operations can be conducted over remote ranges to mitigate against the possibility of air vehicle hijacking. Accordingly, in the flight activity plan include verbiage to describe all steps taken to mitigate cyber vulnerabilities in the SUT and in the MOT. If a cyber topology is not included with this verbiage, ensure one is provided to the TD ISSM or AFRL/RCCS in the request for issuance of an ATO or IATT.

4.4. Additional Sections as Required.

4.4.1. Frequency Deconfliction Plan. A frequency deconfliction plan should be developed for tests involving UAS, electronic warfare, or high-signal density environments. All data/communication/voice links utilized in a test must be properly deconflicted from other transmission sources that may be authorized in the local environment.

4.4.2. DCMA-INST 8210.1C, Flight Operations Procedures (FOP)/Ground Operations Procedures (GOP). If there are FOPs/GOPs being executed by contractors, ensure these procedures reference the test plan as an authoritative document. The "Service Guidance" language in the DCMA-INST is not an obvious reference to the test plan and therefore should not be depended upon as a means to ensure adherence by the contractor.

4.4.3. Security Considerations. Identify any actions (operations security measures, communications security measures, etc.) to thwart hostile intelligence collection, protect data or test communications, or otherwise meet security requirements as necessitated by the Program Protection Plan. If appropriate, develop a security plan, coordinate it with the appropriate security office, and include or reference it in the test plan.

4.5. Test Plan Amendments. It is common for test program changes to arise after test package approval. Unexpected results, overly restrictive controls, hazards not previously identified or adequately controlled, configuration changes and changes in risk level all constitute reasonable grounds for changing test and safety planning. Test package amendments may require test card changes and re-approval. There are three types of test package amendments: out-of-scope, in-scope, or administrative changes. The TD Test Lead will gain concurrence from the TRB Chair, SRB Chair and AFRL/DO when determining whether a proposed change is in-scope.

4.5.1. Administrative Changes. Clarity/grammar corrections, etc. Changes are made directly to the test package and may not require any approvals. Test card changes that continue to adhere to the approved test plan do not require the test plan to be amended.

4.5.2. In-Scope Amendments. An in-scope amendment is a minor test plan change that modifies test procedures but does not affect technical or safety risks, as determined by the TRB and SRB chairs. In-scope amendments may be documented in a memorandum and approved by AFRL/DO. The memo will be written by the Mission Directorate and approved by AFRL/DO. The TRB Chair, SRB Chair, and/or AFRL/DO may determine in- scope amendments require higher approval to include: TEA and/or FOA. AFRL/DO will provide the final memo to TRB/SRB members and approval authorities as an info copy.

4.5.3. Out-of-Scope Amendments. An out-of-scope amendment is any safety plan change or a major test plan change. New Technical/Safety reviews must occur and may be accomplished outside of a board per **Chapter 5**. Out-of-Scope Amendments require a new test package approval via a TAW. The approval authority for a decrease in risk level will be based on the "original" risk level. An out-of-scope amendment requires TRB Chair, SRB Chair, TEA, DTA, and FOA signatures on the AFRL Test Approval Worksheet.

4.6. Training Plans and Operations Plans. Per Par. 2.1., a governing document is required for all AFRL flight activities. When warranted, a test plan may be modified to encompass more steady-state activities such as training or sustained operations. In these cases, test objectives may include training objectives or operational objectives, but the majority of the plan content as described herein is still required.

4.6.1. Training Plan. As UAS operations become more prevalent and/or normalized within AFRL, the level of training requirements in any one TD may reach a level where a dedicated training plan is preferred over authorizing such activities under a test plan or plans. Development of a training plan and its subsequent review and approval will entail the same elements and processes as for a test plan with the following exceptions:

4.6.1.1. Instead of a TRB, an Operations Review will be held, chaired by the AFRL Flight Operations Support Division Chief (AFRL/DOO), to assess the adequacy/compliance of the proposed learning objectives and curriculum. These learning objectives and curriculum will substitute for the test objectives and MOT.

4.6.1.2. Instead of a SUT, the training plan will provide descriptions of the aircraft and ground control systems to be employed to achieve training objectives. Aircraft and operational limits associated with these systems will be listed as well.

4.6.1.3. A data management plan is optional.

4.6.1.4. Unit Standard Operating Procedures (SOP) approved by FOA may be referenced in addition to or in lieu of FOPs/GOPs.

4.6.1.5. All other elements of the AFRL Flight Activity Process (airworthiness, safety review and residual risk assessment, TEA and FOA sign-off, test card approval, etc.) will be followed. Approval of flight activity plans that are purely training in nature cannot be exercised on behalf of FOA by a TD under the auspices of Par. 5.6.6.1.

4.6.2. Operations Plan. On occasion, AFRL technology development efforts will be deployed directly to the field in support of real-world peacetime or combat operations. Frequently, under these circumstances, transition of an AFRL system to a program office or a user will be delayed for an extended period of time. This may be due to a customer desire for the system to undergo an evaluation before assignment to and/or possession by the user is formally declared. In these instances, AFRL retains oversight of and liability for the system while it is undergoing evaluation. Such evaluations are governed by an AFRL operations plan which is a test plan tailored to the fielded environment and the more operational focus of the system's use. In an operations plan, the test objectives are typically listed as MOPs and/or Measures of Effectiveness (MOE) and address operational utility in terms of system effectiveness and suitability. It is highly desired that the test objectives be developed in concert with the operational customer and that this entity have a role in data collection, analysis, and evaluation. Additionally, if AFRL deploys any of its personnel such as civilian or military liaison officers to the fielded system site, they must undergo a pre-deployment orientation provided by AFRL/DO staff to ensure they understand the extent and limits of their responsibilities, their chain of command, and expectations for reporting on-going and unusual events. In all other respects, the operations plan possesses the elements of a test plan as delineated herein and follows the same AFRL Flight Activity Process. All AFRL authorities remain intact such as FOA responsibility to exercise continuing day-to-day oversight of flight activities. The importance of adherence to these requirements and prerogatives is paramount for the safe and effective execution of AFRL programs in these environments.

4.7. Time/Amendment Limits. In general, flight test/operations plans shall only be valid for two years after TEA and FOA approvals. Flight training plans are valid for three years after FOA approval. Because small changes add up over time and can create confusion within a flight activity plan, once the aforementioned validity dates are exceeded, the plan should be revised as necessary and submitted for approval. Plans that require no revisions or updates must still be reviewed and reapproved to establish new validity dates and version numbers. Additionally, test/operations plans shall not include more than ten amendments each and if an eleventh amendment is necessary, a re-write and re-submission for approval is required. The time/amendment limits for test/training/operations plans may be extended by FOA, but this extension authority cannot be delegated or exercised on behalf of FOA.

4.8. Version Control. The PM or test team will ensure a valid version control method is applied/enforced with all AFRL flight activity plans. Version control is particularly important because AFRL practice is to include operations and aircraft limits and procedures in the plan and supporting processes such as airworthiness depend on accurate knowledge of the most current plan. Poor version control of the plan could lead to a mishap.

4.9. Test Cards. Test or Flight Cards are documents describing flight activity procedures in a step-by-step or checklist format. Used during flight execution, the purpose of such cards is to ensure the entire test team works in concert to successfully complete flight activities and has readily-available access to critical flight information/limits. Inherently, test cards should be a synopsis of limits, settings, procedures, cautions, warnings, and other relevant data immediately available for reference by all members of the test team so they can execute flight activities effectively, efficiently and safely.

4.9.1. All flight test events and flight-associated ground test events (where an aircraft moves under its own power, such as taxi) will be conducted from approved test cards or written test procedures. For SUAS training and proficiency flights where unit SOPs are available and sufficient for the circumstances, they may be used in lieu of test cards IAW the training plan and with the approval of the appropriate authority as indicated in **Table 5.2**.

4.9.2. Test teams may develop their own test card format to ensure maximum flexibility and ease of use. While no minimum information requirements exist, test teams should consider inclusion of the following elements:

4.9.2.1. - Aircraft configuration with weight and balance

4.9.2.2. - Aircraft operating limits critical to the test points

4.9.2.3. - Test limits

4.9.2.4. - Weather limits

4.9.2.5. - Initial conditions

4.9.2.6. - Challenge and response scripts as required

4.9.2.7. - Flight test techniques

4.9.2.8. - Planned flight paths and relevant waypoints (i.e., flight profiles)

4.9.2.9. - Allowable data bands or test condition parameter tolerances

4.9.2.10. - Data acquisition system settings

4.9.2.11. - Expected results

4.9.2.12. - Risk level(s)

4.9.2.13. - Go and/or No-Go criteria

4.9.2.14. - Knock-it-off, test suspension, and/or test stop criteria

4.9.2.15. - Space to allow manual recording of parameters or other notes

4.9.2.16. - Appropriate program security markings

Chapter 5

REVIEWS AND APPROVALS

5.1. Introduction to Reviews. Independent technical and safety reviews shall be accomplished for all flight activities where AFRL resources will be used or are at risk, AFRL has mishap accountability, or retains more than a minimal risk of liability.

5.1.1. If the flight activity is either wholly or partly executed under an AFRL contract, then AFRL will ensure government TRB and SRB reviews are conducted prior to approval of the government or contractor-developed test plan. Mishap investigative responsibility will be exercised IAW AFI 91-204 and AFMC Supplement. The PM is responsible for ensuring the requirements for the contractor to provide an acceptable test plan and to support related government processes (airworthiness, TRB, SRB, mishap investigation, etc., as applicable) are included in the contract.

5.1.2. Per Par. 2.2.8., technical and safety reviews conducted by other government organizations may be accepted as reciprocal and sufficient at the discretion of the TD Chief Engineer, Site/Detachment COS, and CTA. When the decision is made to accept another organization's review processes, AFRL personnel will observe those processes. The specific level of AFRL involvement will be agreed upon by both parties prior to the commencement of the review processes. Under circumstances where an LDTO is involved, AFRL programmatic risk acceptance/approval is required, but, per AFI 91-202_AFMCSUP, the TEA will reside within the same Center as the LDTO. Additionally, AFRL FOA approval is only needed when AFRL has a flight role (e.g., as PTO providing organic SUAS or contracted manned assets).

5.1.3. If the other government agency does not conduct a technical or safety review or, in the opinion of the TD Chief Engineer, site/detachment/HQ COS, or CTA any review (as applicable to their purview) is not acceptable, then AFRL will conduct the technical or safety review as required.

5.1.4. When AFRL is party to a flight activity led or conducted by another organization and provides resources such as equipment and/or personnel, the TD Test Lead in consultation with the office of AFRL/DO will make a determination if AFRL involvement is as a PTO or is in some other role. If involvement is determined to be as a PTO, the shadow process will be employed – regardless if AFRL has any technical or operational objectives associated with its involvement – so a proper risk acceptance can be made by AFRL authorities. If AFRL involvement is assessed as not rising to the level of PTO and is not in the pursuit of AFRL objectives, a memorandum for record documenting that the AFRL Flight Activity Process is not applicable will be processed for signature by the AFRL/DO Director or Deputy.

5.1.5. For flight activities of medium to high complexity or risk, provide a draft test plan to the AFRL/DO Test POC and the TD Test Lead not less than seven weeks prior to the intended date for the first test event (e.g., ground test, high-speed taxi, or initial flight). For simple or urgent flight activities this lead time may be reduced, but submission as early as possible is highly encouraged to avoid delays and lack of time to make necessary changes as part of the review and approval process.

5.2. Technical Review. A technical review is the formal review and resulting documentation to ensure a thorough assessment of the test plan for technical soundness and adequacy. The technical review will verify the overall MOT is adequate to evaluate the requirements and verify that objectives can be met with acceptable technical risk.

5.2.1. Office of Primary Responsibility. The AFRL technical review process is primarily a TD function owned by the Chief Engineer. Typically, technical review chair responsibilities for flight activities are exercised by the Chief Engineer, but chair responsibilities may be delegated to an individual independent from the program and who possesses the technical expertise to review it comprehensively. The TD Test Lead manages support to the TD's independent technical review process and unless relieved of the responsibility serves as the secretariat for proceedings and resultant documentation.

5.2.2. Technical Review Board (TRB). The TRB is the normal method for accomplishing a technical review. The TRB is a formal gathering of an independent group of knowledgeable individuals convened to ensure a thorough assessment of the test plan for technical soundness and adequacy. For large or complex efforts, review board members from outside the TD can be particularly valuable and are highly encouraged. The employment of a formal TRB is highly desired when: there are multiple engineering disciplines involved; the SUT, test method, or analyses are especially complex; envelope expansion or other elevated risk testing is involved; and/or, new test or analysis methods will be applied. Multiple TRBs may be held for phased efforts or those where significant changes become necessary.

5.2.2.1. Tailorability. The decision to conduct a formal TRB versus an assessment reduced in scope to that of a single reviewer is based primarily on the test plan size, complexity, maturity of test item/methodology, as well as expected technical risk level and is determined by the assigned TRB Chair. The extent of TRB membership is at the discretion of the TRB Chair. If the technical risk is sufficiently low or negligible, the TRB Chair may elect to conduct a review without convening a formal board and this is known as an "informal TRB."

5.2.2.2. Combined Review Board (CRB). For those tests that are easily understood, less complex, lower in risk, or under circumstances of great urgency, the test team may request a CRB in lieu of separate board reviews to minimize impact to resources and shorten the timeline. Teams should contact the TRB and SRB Chairs for final determination/concurrence on this course of action and secure AFRL/DO Director or Deputy concurrence as well. When a CRB is held, the TRB and SRB Chairs will co-chair the forum. Teams will ensure the test plan is sufficiently mature prior to the CRB. Careful attention should be paid to fulfillment of all the roles and responsibilities outlined in this document during such combined forums.

5.2.3. Technical Review Conduct. At a minimum, technical reviews will assess objectives, test approach, requirements, techniques, measures, and success criteria. This review will also ensure that environmental assessments have been completed and referenced in the test plan. The technical review board members will advise the TRB Chair who will assign a technical risk to the program.

5.2.3.1. For a formal TRB, allow participants sufficient time to review the documentation. The PM should distribute the documents to TRB members not less than one week prior to the TRB or with greater lead time if directed by the TRB Chair or TD policy. The TRB is conducted according to a prepared agenda, a sample of which can be found in the AFRL Flight Activity Process Guide. A list of suggested questions to be addressed at a TRB can also be found at the AFRL Flight Activity Process Guide.

5.2.3.2. The TRB Chair appoints someone to record and publish the minutes, typically the TD Test Lead. Minutes of the meeting are recorded and include the items of discussion, an overall technical assessment in regards to readiness to start testing, and a technical risk level. Action items and recommendations will be specified and included in the minutes.

5.2.3.3. The TRB Chair will ensure the appropriate AFRL/DO Test POC or suitable substitute from that office is invited to the TRB with sufficient lead time to secure representation.

5.2.4. Technical Review Outcomes. Changes to the test plan, other than strictly editorial, must be discussed and agreed upon by the TRB members during the TRB meeting or during the action item closure phase. The test team will modify the test plan to incorporate the appropriate recommendations from the technical review. Through signature (and comment as necessary) on the AFRL Test Approval Worksheet, the TRB Chair recommends to the TEA an overall technical risk level and whether or not to execute the flight activity based on the technical review. See **Attachment 4** for suggested criteria to use in assessing technical risk.

5.3. Safety Review. The purpose of the safety review is to allow an independent team to formally review the test team's safety planning to ensure all test hazards have been identified and mitigated to the extent practical, and then recommend the residual safety risk level. The documentation from the safety review should reflect a suitable level of clarity and maturity for the TEA to make an informed decision on whether to accept the risk of the test and to approve (with FOA) entrance into test execution. The safety review process is fully developed in AFI 91-202 AFMC and AFRL Supplements. This section provides a short summary of relevant highlights.

5.3.1. Office of Primary Responsibility (OPR). The AFRL safety review process is primarily a Safety Office function and is chaired by a qualified safety review chair as assigned by the TD's local Site/Detachment Safety Office or HQ AFRL/SE.

5.3.2. Safety Review Board (SRB). For most flight activities, the SRB is a formal safety review meeting attended by independent safety reviewers and project personnel and is presided over by a designated SRB Chair. Multiple SRBs may be held for phased efforts or those where significant changes to the manner or scope of a flight activity become necessary. If the risk is sufficiently low, the SRB Chair may elect to conduct a solitary review known as an "informal SRB" IAW AFI 91-202 AFRL Supplement Par. 13.6.2.2.1.

5.3.2.1. Tailorability. The decision to conduct a formal SRB versus an informal one is based primarily on the test plan size, complexity, maturity of test item/methodology, and expected risk level and is determined by the assigned SRB Chair.

5.3.2.2. Combined Review Board (CRB). For those tests that are easily understood, less complex, lower in risk, or under circumstances of great urgency, the test team may request a CRB in lieu of separate board reviews to minimize impact to resources and shorten the timeline. Teams should contact the TRB and SRB Chairs for final determination on this course of action. Teams will ensure that the test plan is sufficiently mature for safety review prior to the CRB.

5.3.3. Safety Review Conduct. The safety review process ensures a thorough assessment of the adequacy of test safety planning. The process evaluates the extent to which the test plan addresses the severity and the probability of occurrence of known hazards and assists in minimizing them to the extent reasonably possible. It results in the recommended residual risk level.

5.3.3.1. Safety risk is defined as a combination of mishap severity and mishap probability. The overall residual safety risk level is the degree of risk assumed by leadership in allowing the proposed test to be accomplished in the manner described and under the conditions specified. Test teams will propose a residual safety risk level. The independent reviewers of the SRB will evaluate test-unique hazards identified by the test team or in the course of the safety review process, assess proposed mitigations and corrective actions, and affirm or modify the test team's proposed overall residual safety risk level. If any board members have concerns about the test proceeding at the assigned risk level, they should document and communicate them to the test approval authorities in the SRB minutes and Test Approval Worksheet.

5.3.3.2. Test teams use system safety techniques, prior experience, legacy system research, lessons learned and overall engineering judgment to identify test hazards and assess risk by evaluating the credible outcome (mishap severity) of each hazard together with the associated probability of occurrence. The mishap severity and probability is then plotted on the Test Hazard Matrix published in AFI 91-202 AFMC Supplement Attachment 20 to determine the hazard's overall risk level. Although the goal is to minimize risk through good test and safety planning/review processes, the resulting residual risk must be accepted by the TEA or the test may not proceed to execution.

5.3.3.3. When considering flight activity safety risk, the safety reviewers will consider the qualifications and experience of personnel executing the flight activity.

5.3.3.4. IAW AFI 91-202 AFRL Supplement, a T&E representative is a recommended member of the SRB. A best practice is for this board member to be a representative from the AFRL CTA staff (but not the assigned AFRL/DO Test POC) who possesses the requisite two-years experience in T&E. Whether or not a CTA representative serves as an SRB member, the SRB Chair will extend an invitation to the AFRL/DO Test POC for the program being reviewed to attend the SRB.

5.3.4. Safety Review Administration.

5.3.4.1. The AFRL PM is responsible for ensuring a safety review is conducted for flight activities.

5.3.4.2. Refer to the AFRL Flight Activity Process Guide for a sample SRB agenda, questions to ask during a safety review, and other notes. Also reference AFI 91-202 AFRL Supplement Attachment 21 for a comprehensive SRB checklist, standardized AFRL SRB Minutes format, and training documentation for SRB member training.

5.3.4.3. The AFRL SRB should be held four to six weeks prior to the intended date for the first test event. SRB members are required to review the most current, sufficiently mature version of the test plan prior to the SRB. IAW AFI 91-202 AFRL Supplement, the SRB can be scheduled no earlier than 15 working days from the day of the SRB Chair's receipt of the draft test plan unless the site/detachment/HQ COS approves a shortened timeline. Coordinate SRB schedule and deliverables with the site/detachment/HQ safety office or the LDTO safety office (when applicable) IAW their requirements.

5.3.4.4. IAW AFI 91-202 AFMC and AFRL Supplements, the site/detachment/HQ COS will either serve as the SRB Chair or designate one. The SRB Chair will select board members.

5.3.4.5. An AFRL safety review chair will be assigned to AFRL tests conducted by partner organizations.

5.3.4.6. IAW AFI 91-202 AFRL Supplement, SRB minutes are required and must signed by the SRB Chair and the PM. Signature by the SRB Chair establishes the recommended residual safety risk level. Signature by the PM signifies acknowledgment. Both signatures reflect assertion the action items resulting from the SRB have been closed.

5.3.5. Action items involving changes to the test plan, other than strictly editorial, must be discussed and agreed upon by the SRB members during the meeting or during the action item closure phase. Once test plan changes resulting from SRB action items are incorporated into the test plan, that version reflecting all directed changes will become the authorized test plan submitted for TEA and FOA approval.

5.3.6. Safety Review Outcomes. The SRB Chair ensures all hazards are identified, controls are developed, certifies the completeness of the safety plan, and establishes a risk level for each individual hazard and event. Through signature (and comment as necessary) on the AFRL Test Approval Worksheet, the SRB Chair recommends an overall residual safety risk level to the TEA and FOA along with any concerns they have with the flight activity proceeding to execution based on their review. Although residual safety risk level is properly characterized by probability and consequence, qualitative descriptions of safety risk levels are as follows:

5.3.6.1. Negligible risk: A subset of LOW risk. Activities that are normal, routine, or operationally representative.

5.3.6.2. LOW risk: Tests or activities that present little to no greater risk than normal operations (such as operating the system using proven procedures) after all precautionary measures have been taken.

5.3.6.3. MEDIUM risk: Tests or activities that present a greater risk to personnel, equipment, and/or property than normal after all precautionary measures have been taken.

5.3.6.4. HIGH risk: Tests or activities that present a significant risk to personnel, equipment, and/or property after all precautionary measures have been taken.

5.4. Negligible Risk Review (NRR). An NRR is a streamlined technical and safety review process applicable to a subset of flight activities where all risks are LOW. A flight activity is a candidate for an NRR if it is anticipated that the probability of achieving the technical objectives is high and all identified hazards will fall within the Negligible severity risk and Occasional or lower probability areas (Blocks 18-20) as indicated in Figure A20.1., Test Hazard Matrix, found in AFI 91-202 AFMC Supplement. NRRs are typically held for flight activities that are normal, routine, and operationally representative where the risks effectively reduce to those experienced in standard (non-test) operations. When an NRR appears applicable, the TRB will be conducted as an "informal TRB" (see Par. 5.2.2.1.) and the SRB will be conducted as an "informal SRB" per AFI 91-202 AFRL Supplement. Candidate flight activities within AFRL eligible for NRR consideration may prove infrequent since many involve developmental aircraft that do not possess validated flight manuals, TOs, AFI 11-series operational flight volumes, etc. Tests are nominated for the NRR process by the PM, TD Test Lead, or AFRL/DO staff.

5.4.1. In addition to the requirements stated above, a candidate for an NRR must also meet the following criteria:

5.4.1.1. Testing will adhere to normal operating procedures and existing risk control measures as defined in the approved flight manual(s), TOs, test facility procedures, and/or applicable operational guidance/instructions (e.g., AFIs, AFMC Instructions, AFRLIs).

5.4.1.2. GMPs are allowed only to the extent they clarify or further restrict already existing guidance. If the test team or reviewers identify test-unique hazards that warrant a THA, then an NRR is not appropriate.

5.4.1.3. Routine and existing aircrew/operator training, qualification, and proficiency are sufficient to perform the test activity, test, or maneuver.

5.4.1.4. Flight procedures do not involve the use of abnormal or emergency procedures, specialized checklists, or non-standard configurations.

5.4.1.5. The SUT has no airworthiness impact, such that a failure or malfunction of the SUT could cause the use of abnormal or emergency procedures to safely recover the aircraft.

5.4.2. Procedurally, the NRR is processed the same as for higher risk flight activities. Minutes are composed and signed by the TRB and SRB Chairs and the Test Approval Worksheet is used to capture the risk level recommendations for TEA and FOA approval.

5.5. Additional Reviews.

5.5.1. Internal TD program reviews, processes, and approvals are not an AFRL enterprise issue and therefore are not addressed in this AFRLI.

5.5.2. Program Design Reviews. If a program employs systems engineering design reviews as part of its developmental approach, the PM is encouraged to invite participation from HQ AFRL FD POCs.

5.5.3. Test Readiness Reviews (TRR). TRRs are a best practice to ensure that all preparations for initiating a test have been completed and known anomalies will not compromise the execution of the test. Readiness reviews should be conducted before the commencement of elevated risk (MEDIUM or HIGH) and/or complex test activities or after an extended break in test activity. All reasonable efforts to minimize risk should be made and verified to the TEA and FOA. It is highly encouraged that an invitation be extended to the AFRL/DO Test POC and TD Test Lead to attend program readiness reviews.

5.6. Approvals. The approval phase provides appropriate leadership the opportunity to make informed risk acceptance and test approval decisions based on the technical, airworthiness, cyber, and safety assessments completed in the review phase. The approvals delineated below are required before the start of any flight activity. These approvals will be documented using the latest variant of the Test Approval Worksheet (which replaces the formerly used AFRL Forms 19 and can be found at **Attachment 3**). NOTE: Not all approval authorities are within AFRL; therefore, PMs should ensure time for these approvals is included in the test schedule.

5.6.1. Approval is defined as permission to conduct or participate in the flight activity or flight test project. A signed safety package does not authorize deviation from DoD, Air Force, AFMC, or AFRL Instructions/Directives.

5.6.2. The TEA, FOA, or any other authority on the approval path may require a Test Approval Briefing (TAB) to assist in making an informed decision. A TAB should be an executive-level presentation that provides a test project overview and highlights test objectives, overall test approach, test unique hazards, mitigation measures, discussion points during the independent reviews, and any contention or disagreement among the members of the independent board(s) or the test team.

5.6.3. Test Risk Acceptance and Plan Approval by Test Execution Authority (TEA). The TEA is a senior leader in the operations chain who can attest to the validity of the test, approve the test plan (along with FOA), and accept the residual safety and technical risks to government resources. The senior leader serving as TEA is based on the assessed residual safety risk level as outlined in **Table 5.1** below and AFI 91-202 AFMC and AFRL Supplements. For the purposes of flight activity risk acceptance, when the assessed technical airworthiness risk is different from the assessed residual safety risk, TEA will sign for the Safety Risk and the Airworthiness Risk Acceptance Authority (RAA) will accept the airworthiness risk via a separate line on the TAW. When Safety and Airworthiness Risk levels are the same, a single TEA signature will suffice as acceptance of both Safety and Airworthiness Risk.

Table 5.1. Flight Test Execution Authority Approval Levels.

Organization Level	LOW Risk	MEDIUM Risk	HIGH Risk
SRB Chair	Coord	Coord	Coord
Division Chief	Approve	Coord	Coord
TD CC/Director	Info	Approve	Coord
AFRL/SE	Not Required	Not Required	Coord
AFRL/CC	Not Required	Not Required	Approve
HQ AFMC/A3/6 & SE	Not Required	Not Required	Info

5.6.4. Airworthiness Approval. The appropriate airworthiness authority validates the independent airworthiness assessment and provides airworthiness approval in the form of an MFR or CAO letter. See AFRLI 61-601 for more information and guidance.

5.6.5. Cyber Approval. AFRL test teams are responsible for complying with AFRLI 17-130 in order to secure an ATO or IATT from the proper AO who through their approval accepts any residual cyber risk. An ATO or IATT should be included in the test package for FOA approval.

5.6.6. FOA Approval. The FOA is a senior, rated official possessing flight domain expertise who ensures the flight activity can be conducted safely and efficiently before giving approval to its execution.

5.6.6.1. Exercise of SUAS Flight Approval Authority on behalf of FOA. Limited flight activity approval authority may be exercised on behalf of AFRL FOA if conferred in writing to an individual by name IAW AFMAN 11-502 for programs encompassing the following:

5.6.6.1.1. Unmanned aircraft with gross takeoff weights no higher than 100 pounds and that attain speeds no greater than 250 knots indicated air speed.

5.6.6.1.2. Residual safety risk is assessed no higher than LOW.

5.6.6.1.3. Technical airworthiness risk is assessed as no higher than MEDIUM.

5.6.6.2. Timeline. The finalized test/training/operations plan incorporating all changes directed by the review process should be submitted to the office of AFRL/DO at least two weeks prior to the intended date for the first flight activity event. This deadline should be interpreted as a “not later than” date under normal circumstances. Contact AFRL/DO staff should unusual circumstances arise that would prevent meeting the two week timeline. This two-week period is required to enable sufficient time for TEA and FOA review and approval of a completed flight activity package.

5.6.7. Manned Ferry and Functional Check Flights (FCF). All flights dedicated to ferry or checkout purposes associated with an AFRL-sponsored activity should be included in a flight test/training/operations plan. However, there may be occasions when all such flights cannot be anticipated and may require relatively short-notice scheduling and approval. In these cases, individual manned ferry and FCF flights can be planned, reviewed, and approved using a process alternate to the formal test process described elsewhere in this volume. The alternate ferry/FCF process can be applied only under the following circumstances:

5.6.7.1. Flights meet the requirements associated with a negligible level of risk, that is, they are normal, routine, or operationally representative. Such flights, therefore, cannot include aircraft envelope expansion.

5.6.7.2. Flights are conducted exactly as described in the flight plan (DD Form 175, *Military Flight Plan*, or FAA equivalent such as Form 7233-1, *Flight Plan Document Information*) and test cards for FCFs. No allowance is given for deviations of convenience, use of the flights to meet proficiency or training requirements, or conduct of maneuvers unnecessary to meet ferry or FCF objectives.

5.6.7.3. Aircraft limits are specified in appropriate documentation (e.g., a test/training/ operations plan, Pilot Operating Handbook, Military Flight Release, or FAA certification forms) and made known to the aircrew.

5.6.8. The alternate ferry/FCF process consists of the following elements:

5.6.8.1. A flight plan filed with the FAA (or IAW International Civil Aviation Organization requirements when Outside Contiguous United States [OCONUS]) by the PIC to serve as the flight profile description in lieu of test plan content.

5.6.8.2. Completed GFR requirements as applicable (procedure approvals, verification of aircrew qualifications, etc.).

5.6.8.3. Test/Flight cards developed by the test team and submitted to the office of AFRL/DO for approval (for FCFs only).

5.6.8.4. Airworthiness documentation issued/secured by the AFRL DTA as appropriate.

5.6.8.5. A Test Approval Worksheet processed for signature by FOA or an entity empowered to sign on behalf of FOA who provides both risk acceptance and flight activity approval. TRB Chair and SRB Chair signatures are not required.

5.6.8.6. A Manned Flight Operational Risk Management (ORM) Worksheet processed before each flight and sent to the AFRL/DO Test POC.

5.6.8.7. An Unexpected Event Worksheet processed when an incident is experienced during a ferry flight or FCF that merits review by AFRL/DO/EN/SE.

5.6.8.8. Flight reporting to the AFRL/DO Records Manager both pre- and post-mission IAW standard processes.

5.6.9. Other Approvals. While FOA approval is the final step in the approval process and the AFRL flight team is cleared to execute, the following additional elements as applicable must be considered.

5.6.9.1. Test/Flight Cards. Test or Flight Cards describe the flight activity procedures, limits, and coordination procedures. They are composed by the test team in accordance with the test plan to guide flight execution and provide a mechanism for data capture.

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

5.6.9.1.2. Flight activity events will be executed per the briefed test/flight card and/or procedures unless safety would be compromised. If, in the opinion of the Test Director or PIC, safety will be compromised, the flight activity event will not be executed. The test conductor may make real-time, minor adjustments to the cards as long as the parameters involved are not safety-of-flight related, do not violate test/flight limits, and do not compromise test objectives.

5.6.9.1.3. Test/Flight cards may be reused for multiple projects, but must be approved prior to mission execution with the appropriate approval authorities and for periods as delineated in **Table 5.2**. LOW/MEDIUM risk cards included in and approved as part of the flight test/training/operations plan and which remain unchanged (excepting for administrative elements) are not subject to the expiration timelines of **Table 5.2**. In contrast, HIGH risk test cards cannot be pre-approved even if incorporated in the test plan and are always subject to expiration 14 calendar days after approval or renewal by FOA.

Table 5.2. Test/Flight Card Approval Authorities and Expiration

Organizational Level[1]	LOW Risk[2]	MEDIUM Risk[3]	HIGH Risk[4]
TD Test Lead (Test Plans)	Approve[5]	Coord	Coord
TD SUAS Lead (Training Plans)	Approve[5]	Coord	Coord
AFRL/DO	Info	Approve	Coord
FOA		Info	Approve
AFRL/CC			Info

[1]Approval authorities as delineated within this table are not delegable except as noted.

[2] LOW risk test card approval is valid for 30 calendar days.

[3] MEDIUM risk test card approval is valid for 14 calendar days.

[4] HIGH risk test card approval is valid for 14 calendar days.

[5]Copies of all test cards approved or renewed within a TD must be provided to the AFRL/DO Test POC prior to flight. Failure to do so may result in approval authority being withdrawn to the AFRL/DO level.

Expired MEDIUM and HIGH risk test cards that are not changed in any substantive way (i.e., allowing for update of administrative data such as test date, aircrew names, assigned radio frequencies, etc.) may be renewed by the TD Test Lead. Test cards with substantive changes require approval as stipulated in the table above.

5.6.9.1.4. Test cards should reflect test or training points/conditions/profiles from the test/training/operations plan. Outside of a training plan, test cards should not be used as a means to add unplanned flight events whose sole purpose is to support operator proficiency or currency requirements. Should circumstances warrant using a test or operations plan to support such requirements, the test plan amendment process will be employed and all proficiency/currency test cards will be approved at the AFRL/DO level.

5.6.9.2. Flight Operations Procedures (FOP)/Ground Operations Procedures (GOP) Approval. As defined in AFI 10-220 (DCMA-INST 8210.1X), execution of FOPs/GOPs by contractors may be required and must be approved by the assigned GFR before flight operations commence.

5.6.9.2.1. FOPs/GOPs are required if either the contract itself or the contractual Performance Work Statement/Statement of Work includes a GFRC or stipulates adherence to AFI 10-220/DCMA-INST 8210.1X (past or current version).

5.6.9.2.2. Regardless of contract language, the GFR will work with the contractor to tailor the FOPs/GOPs, as necessary. If applicable and appropriate, it is permissible and recommended that the FOPs/GOPs simply reference the AFRL test plan to meet the intent of this requirement.

5.6.9.3. Personnel Flight Approvals. AFRL personnel (government and in-house contractors) must follow guidance in AFI 11-401 AFMC Supplement before flying on any manned aircraft. See the AFRL Flight Activity Process Guide for more information.

5.6.9.3.1. Maintenance/Engineering Support Personnel (MESP). AFRL-sponsored MESPs must be approved before they may be permitted to participate in any manned flight activity. MESP participation in flight beyond 12 flight-days per year requires a waiver approved by HQ AFMC/A3V, so coordinate this approval well before an MESP reaches the limit. The AFMC Supplement to AFI 11-401 as well as the AFRL Flight Activity Process Guide provide details on the approval and waiver processes.

5.6.9.3.2. Standardization/Evaluation (Stan/Eval) Flights. Within AFRL, the AFRL/DOO office performs the traditional functions assigned to a Stan/Eval organization. Accordingly, members of AFRL/DOO are authorized to fly as crewmembers on any AFRL aircraft on a noninterference basis. They will log other time (XP, XN, etc.) if not qualified in the aircraft. FOA approval is required if a mandatory pilot position is occupied.

5.6.9.3.3. Familiarization Flights. Familiarization flights shall be flown on a non-interference basis and at no additional cost to the affected program or sponsoring unit. Familiarization flight requests should take into consideration availability of room on the aircraft, mission constraints, and familiarization objectives. The criteria for a familiarization flight are as follows:

5.6.9.3.3.1. Familiarization flights are intended for AFRL personnel with duties related to or in support of aviation research.

5.6.9.3.3.2. Flights will take place in the most appropriate aircraft that relates to the individual's duties.

5.6.9.3.3.3. An individual is not restricted to flying only in aircraft associated with their unit or program.

5.6.9.3.3.4. An individual can receive no more than one familiarization flight for each program they work while serving in AFRL.

5.6.9.3.3.5. Justification must be provided to FOA for approval and must clearly and specifically explain how the familiarization flight will benefit AFRL and/or the USAF.

5.6.9.3.4. Operational Support Flyers. Personnel who are designated operational support flyers (e.g., student flight surgeons assigned to USAF School of Aerospace Medicine [USAFSAM]) will be managed IAW AFI 11-402, *Aviation and Parachutes Service, Aeronautical Ratings and Aviation Badges*. The 711th Human Performance Wing (HPW) Aerospace Medicine Department (USAFSAM/FE) serves as the office for administration of requirements associated with personnel who hold operational support flying status. Since AFRL is not an organization with organic manned flying assets nor the full complement of supporting infrastructure found in a flying wing, some flying program administration services must be obtained from the local Air Base Wing. Provision of such support is typically arranged via letters of agreement.

5.6.9.4. Federal Aviation Administration (FAA) Launch License. Some flight tests involving air-launch of a vehicle (expendable, reusable, space-access, etc.) using civil/commercial aircraft will necessitate securing an FAA launch license. Such a license is an approval that is separate from airworthiness, but may become required upon DTA declaration that a flight activity is a contractor-owned, contractor-operated civil aircraft operation. Contact AFRL/DO staff for assistance if a flight test may require this type of license.

Chapter 6

FLIGHT EXECUTION

6.1. Introduction. With an approved test/training/operations plan and approved test/flight cards, AFRL flight activity teams are cleared to execute. However, there are still coordination and reporting requirements to be accommodated before and during flight operations. This chapter introduces many of these standard considerations and requirements the test team must address. For more information, see your assigned AFRL/DO Test POC or TD Test Lead.

6.2. Test Readiness Review (TRR). If held, the TRR will ensure all preparations for (re)commencing a test have been completed and known anomalies have not compromised the execution of the test. See Par. 5.5.3 for additional explanation.

6.3. Test Card Approval. As described in **Chapter 5**, test cards have expiration timelines associated with them relative to their approval. Ensure test cards are approved and not expired before each high- speed taxi or flight activity.

6.4. Airspace/Range/Certificate of Waiver or Authorization (COA) Approvals. AFRL and AFRL-sponsored flight teams shall receive an airspace/range Local Area Orientation briefing, per owning organization policies for the operating airspace in which they intend to fly.

6.4.1. DoD Special Activity Airspace. The owning unit of an SAA usually provides a range brief to ensure customers understand the expectations and operating procedures for those using the range's airspace and infrastructure. The range brief defines requirements for operations, weapons release, frequency management, safety considerations, no fly areas, weather minimums, etc. All flight team members must review the range brief and meet the requirements of the airspace owner. If in doubt, contact the Range Safety Officer to discuss requirements.

6.4.2. Federal Aviation Administration (FAA) Certificate of Waiver or Authorization (COA). COAs describe airspace and required procedures designated for UAS operations. To support issuance of COAs, the FAA has published requirements for and restrictions on COA applications that may involve significant analyses and other data demands so advance planning and coordination by test teams is well-advised. All flight team members must review COA documentation governing use of airspace they intend to operate in and follow any training requirements imposed by the COA owner.

6.5. Flight Authorizations. Each AFRL or AFRL-sponsored flight requires a flight authorization. For information and guidance beyond that presented below, see the AFRL Flight Activity Process Guide.

6.5.1. AFI 11-401 (Par. 1.8) and AFMAN 11-502 (Par. 2.2) require commander written authorization or verbal order by an authenticating official for qualified personnel to perform inflight duties (on manned or RPA missions) or flight authorization from the appropriate flight approval authority (for SUAS missions). Within AFRL, the intent of this guidance will be considered met through the test card approval process. The TD Test Lead, TD SUAS Lead, AFRL/DOO, and/or GFR will ensure all mission crewmembers (pilot, SUAS-O, visual observer, etc.) comply with medical, currency, and any read file requirements via coordination or review of test cards, ORM worksheets, or in the case of the GFR, DD Form 2628 and DCMA Form 644.

6.5.2. Contractor operations must follow the additional guidance stipulated in DCMA-INST 8210.1X (version as referenced on contract). Contact AFRL/DO personnel or the assigned GFR for further information.

6.6. Flying Operations AFIs. All AFRL and AFRL-sponsored flight activities shall adhere as appropriate to the 11-series AFIs. For a list of relevant AFIs, see the AFRL/DO Flight Activity Process Guide or contact AFRL/DO staff. At a minimum, AFRL programs will comply with AFI 11-401; AFI 11-202 Volume 3, *Flying Operations*, AFMC Supplement; AFI 11-202/2FTV1, *Flight Test Aircrew Training*; AFMAN 11-502; and/or, DCMA-INST 8210.1X. AFI 11-202V3 AFMC Supplement (Par. 4.5.1.12) and AFMAN 11-502 (Pars. 4.6, 5.6, and 6.7) require completion of risk management assessment worksheets prior to mission execution. To meet the intent of this guidance, an ORM worksheet will be used (see **Attachment 5** for standard worksheets which can be tailored with AFRL/DO concurrence). All waivers to AFIs must be accomplished before flight/test execution. Route all waiver requests through the office of AFRL/DO IAW Par. 1.7 above.

6.7. Deployed Operations. AFRL flight operations conducted in support of contingency or named operations require some additional considerations and approvals. Typically, such operations are conducted under the auspices of an Integrated System Evaluation (ISE), Early Operational Assessment (EOA), or Advanced Development Program Office (ADPO) operational demonstration – all forms of flight testing focused on operational measures of effectiveness. The program customer or user will frequently assess the results of such tests to determine if the deployed capability demonstrates military value and should be considered for handover to the operational community or transition to an acquisition program. Given the unique challenges of the deployed environment, such programs must:

6.7.1. Gain AFRL/CC approval before deploying personnel and equipment OCONUS. Be prepared to provide a TAB to the Commander if requested. Notify HQ AFMC/A3/6 through the office of AFRL/DO of the deployment as well.

6.7.2. Gain Geographic Combatant Command (e.g., United States Central Command and USAF Component Command (e.g., United States Air Forces Central approval before deploying equipment OCONUS. Unless deploying in Temporary Duty status, all government employees (military and civilian) must be on General Commanding-approved unit line numbers and receive proper area of responsibility (AOR) deployment training before traveling OCONUS.

6.7.3. Integrate into local base and host nation operations procedures (e.g., local Operations Support Squadron guidance for airspace and ground operations).

6.7.4. Integrate into theater command and control (C2) processes (e.g., Air Tasking Order, Airspace Control Orders) and applicable Rules of Engagement/Special Instructions. Such integration may require formal MOA/MOU or other instrumentalities to clarify C2 authorities. In certain situations, deployed personnel from AFRL or under contract to AFRL may be directed by local operational authorities to take actions that put aircraft at risk or which may be contrary to contractual obligations. These circumstances should be anticipated to the greatest extent possible and measures put in place to deal with them in a timely manner so personnel know what orders are legitimate and what liabilities may ensue.

6.7.5. Develop a government operations oversight structure in coordination with FOA and the AFRL/DO staff. This construct may include use of customer unit personnel or local base personnel.

6.7.6. Address other considerations critical to mission success: logistics, base operating support (to include IT, bed-down coordination, and other host-tenant relationships), frequency management, mishap response plans, mishap convening authority assignment, etc.

6.8. Outside Contiguous United States (OCONUS) Operations (Non-Contingency). Normal flying operations (i.e., those not within the AOR of military contingencies or named operations) that occur in OCONUS airspace may be approached in a fashion similar to those in the Contiguous United States (CONUS). However, PMs must address all planning considerations found in this volume in coordination with host nation and theater command contacts. Rulesets for OCONUS airspace are, in particular, likely to be different than CONUS operations.

6.9. Test/Training/Operations Flights. IAW **Para. 2.2.1** above, the test package substitutes for the lack of system and operator documentation (TOs, pilot handbooks, inflight guides, etc.) normally expected to accompany a mature airborne vehicle but absent for the developmental systems and technologies being researched. Given this lack of supporting materials, the test package becomes critical to safe and effective flight operations. In this vein, the approved test plan, test cards, safety plan and balance of test package documentation form the basis by which the TEA and FOA can expect the test team to perform the flight activity.

6.9.1. Training flights/profiles using a developmental aircraft must be conducted under an approved test plan, not a training or operations plan. In this context the test plan serves to define the approved operating envelope for the aircraft and the profiles that may be flown.

6.9.2. Flights for training, operator proficiency, operations, or other non-RDT&E objectives using developmentally-mature or proven aircraft (e.g., COTS UAS) may be conducted under a training plan or CONOPs approved IAW applicable AFMC policies/directives. Training plans or CONOPs developed for such purposes may reference or leverage SOPs developed for use in local airspace, facilities, and other venues with normalized/institutionalized operations.

6.10. Flight Reporting. The following requirements hold regardless if the flight activity involves AFRL as LTO or PTO or simply as sponsor.

6.10.1. Preflight Reporting. For government-owned, non-program UAS operations (e.g., unit-sponsored training), flight schedules shall be developed by the owning TD SUAS Lead and provided to the AFRL/DO Records Manager before flight. For all program-sponsored flight operations, the PM shall provide the flight schedule to AFRL/DO Records Manager. Where a GFR is involved in operations oversight, ensure the GFR has approved contractor flight missions in advance.

6.10.2. Report flights (or series of flights) no later than the day prior with the following information: dates; airfield/airspace location(s); approximate takeoff times and sortie lengths; aircraft owner(s) and type(s); operators/MESPs on manned flights; and, aircraft operators of UAS.

6.10.3. Post Flight Reporting. The TD SUAS Lead or PM will track all flight information (for all government and contractor flight vehicles) and provide this information at the end of each week of flights to the AFRL/DO Records Manager updating pre-flight reporting estimates as necessary.

6.10.4. Reporting Format. The AFRL/DO Records Manager will provide test teams with the latest preferred means to report flight information.

6.11. Test Conduct.

6.11.1. The procedures, restrictions, and mitigations documented in an AFRL-approved test package must be followed while conducting flight activities in order to maintain the accepted level of risk. The test package is a contract between the test team and the TEA/FOA. The Test Director is responsible for reviewing the test package and ensuring all applicable requirements are incorporated into the test procedures. Test personnel will review the hazards, minimizing procedures or controls, emergency procedures or corrective actions, and go/no-go criteria before beginning the test.

6.11.2. The test will be executed according to the approved test package. Changes to the test package will require further review and authorization/approval as described in Par. 4.5. Changes may occur because of unexpected test results, overly restrictive controls, test program initiated changes, system maturity/configuration changes, or hazards not previously identified or adequately controlled.

6.11.3. All test missions will be pre-briefed IAW AFRL briefing guidelines. See the AFRL Flight Activity Process Guide for these guidelines. All applicable THAs/GMPs will be briefed regardless of risk level. Ensure test terminology and test personnel responsibilities are highlighted. The AFRL Flight Activity Process Guide provides guidance on test terminology and its proper use.

6.11.4. All safety-of-flight and safety-of-test information will be continuously monitored. Procedures will be in place to immediately notify test aircrews if safety limits are approached or exceeded or if critical data displays malfunction for any reason.

6.11.5. Maintenance/Engineering Support Personnel (MESP). MESPs will perform flight duties only as authorized.

6.11.6. All test missions will be de-briefed after the flight activity to capture which test points were successfully accomplished, which points were not and why, and notably to cover any lessons learned during test execution.

6.12. Next Phase Approval. Test plans that have defined phases of testing often specify criteria or thresholds for progressing from phase to phase. PMs and test teams will notify their assigned technical and safety review chairs, TD Test Lead, and AFRL/DO staff of the intent to move on to a next phase. Example: a test team might employ a build-up approach by designing a first-flight phase to prove out their aircraft's flight envelope and then progress to another phase where they test an aircraft payload. Before progressing to the payload tests, the test team should show that they met their prescribed first-phase exit criteria and next-phase entrance criteria in their notifications of the TRB Chair, SRB Chair, TD Test Lead, and AFRL/DO Test POC.

6.13. Test Plan Changes During Execution. Changes to the test plan during execution must be approved through amendments which require appropriate level review as discussed in Par 4.5. Consult with AFRL/DO staff for advice, but ultimately test teams must secure buy-in from the technical and safety review chairs (and potentially FOA if the changes are major in scope) on the nature of changes and the extent of necessary review. Resulting actions may vary from no action, to electronic review/approval, to re-accomplishing a full set of reviews/approvals followed by applicable approval signatures.

6.14. Configuration Management/Aircraft Modifications. Modifications to aircraft after the test plan is approved may induce changes to the test plan and/or the aircraft airworthiness documentation.

6.14.1. Modifications are hardware or software changes or alterations to aerospace vehicles, airborne support equipment, external and internal stores, subsystems, components, or instrumentation.

6.14.2. Document all modifications and configuration changes via the Configuration Control Process described in Par. 3.5.6.

6.14.3. Consult AFRL/EN for determinations between minor and major, non-reportable and reportable aircraft modifications and whether or not a modification invalidates the aircraft's airworthiness approval documentation. Major modifications include changes to critical areas of primary structure, propulsion systems, avionics systems, software, aerodynamics, or flight control systems. Consult with the TD Chief Engineer, safety review chair, AFRL/DO staff, or TD Test Lead for assistance in determining whether aircraft modifications will drive change(s) to the test plan.

6.15. Test Delay/Pause/Suspension. Flight activities may be delayed, paused, or suspended and eventually resumed depending on the circumstances involved.

6.15.1. Delays. Causes for delay include equipment issues, deteriorating weather conditions, personnel unavailability, and similar benign considerations. Delays are typically called by members of the test team for programmatic reasons or test/training/operations plan compliance and it is they who make the decision to resume flight activities when conditions become favorable or meet requirements.

6.15.2. Pauses. Pauses involve more deliberation than delays. Pauses can be called by anyone on the test team or in the programmatic (supervisory), operational, or functional management chains. Potential reasons for calling a pause include: actions not in compliance with the test/training/operations plan; anomalous test results, operating in an unsafe manner, experiencing an unexpected event including those that may qualify as a mishap, etc. Once instituted, a flight activity pause (that has not been elevated to a suspension due to being assessed as an unsafe event or mishap) may only be resumed with the concurrence of the AFRL/DO Director or Deputy and in coordination with the GFR if applicable.

6.15.3. Suspensions. Suspensions are declared by the TEA or AFRL/DO Director or Deputy typically after notification of a test pause that is then determined to merit elevation to a suspension; however, a test pause need not be declared prior to putting a suspension into effect. Testing will be suspended in the event of a mishap declared as such by AFRL/SE or the site/detachment safety offices or if the test team encounters a significant hazard or experiences an unsafe event. AFRL/DO staff will advise the cognizant safety office(s) to determine if a supplemental safety review is required to resolve the unsafe condition. Suspensions require a return-to-fly (RTF) action via test/training/operations plan amendment which must be processed for approval by TEA and FOA. Corrective actions/mitigating measures will be documented via this amendment. A flight activity plan amendment does not take the place of a safety event investigation as required by AFI 91-204.

6.16. Unexpected Event or Result. An unexpected event or result is any unplanned occurrence (to include events that are ultimately assessed to be mishaps) that warrants a pause in the flight activity. If an unexpected event occurs, the test team will put the flight activity on hold; complete and submit an Unexpected Event Worksheet (see **Attachment 2**); and, consult with the TD Test Lead, AFRL/DO staff, and AFRL/SE (if the event/result has safety implications). While the test points or flight conditions associated with the unexpected event will not be reflown until cleared to do so, other unrelated test points can continue if the test team and the operations/safety team agree. Unexpected test results include, but are not limited to:

6.16.1. Unexpected or unplanned damage to the system under test or support equipment.

6.16.2. Exceeding safety or test limits or experiencing a significantly unfavorable departure from predicted simulation/analysis. NOTE: For all measurements that impact test safety, a predefined set of yellow/red limits and corrective action(s) to be taken in response should be defined ahead of time so that the test team does not debate the significance of an exceedance and instead immediately implements corrective action(s).

6.16.3. Occurrence of a THA hazard whether or not the anticipated corrective action(s) was employed.

6.16.4. Occurrence of a hazard not already identified and mitigated by the procedures defined in a THA that required or will require corrective action.

6.17. Mishaps and Mishap Reporting. A mishap is an unplanned occurrence, or series of occurrences, that results in damage or injury and/or meets Class A, B, C, D or E mishap reporting criteria as described in AFI 91-204 and its AFMC Supplement.

6.17.1. Report all mishaps IAW the flight activity plan, the associated range/COA/airspace procedures, and the AFRL Unexpected Event Worksheet.

6.17.2. Equipment destruction is not considered a mishap if destruction/damage was an expected or desired outcome of the test, it occurred at the planned time, for anticipated reasons, and it served to meet the test objectives as documented in the test plan.

6.17.3. After safety office declaration of a mishap, the office of AFRL/DO will issue a notice of suspension of operations. If it has not already done so, the AFRL program that experienced the mishap will discontinue flying operations immediately.

6.17.4. The program/test team will work with AFRL/DO/EN/SE in support of mishap and/or RTF investigations to present findings and recommend actions to ensure future mishaps do not occur from the same or similar hazards.

6.17.5. RTF investigations and follow-on recommendations for action/change resulting from a mishap are separate from mishap investigations and recommendations specified by AFI 91-204. RTF actions may incorporate mishap investigation recommendations, but the RTF investigation is a parallel effort and is not necessarily contingent upon mishap investigation results.

Chapter 7

PROJECT REPORTING AND CLOSEOUT

7.1. Project Completion or Termination Notification. The PM will notify the appropriate TD Test Lead, TRB Chair, SRB Chair, DTA, and AFRL/DO Test POC when the test is complete or test activity has been terminated.

7.2. Test Reporting. Because of the nature of S&T, no unique or formal final test reports are required for AFRL projects separate from what is required by existing S&T management guidance. That said, there are two major types of documents identified below that may be appropriate for test teams to create that are distinct from what is required for archival purposes in a research and development (R&D) case file. Test teams should compose such reports when circumstances warrant following AFRL and TD Scientific and Technical Information guidance. The report types are:

7.2.1. Reports intended primarily for AFRL-wide or TD use, such as handbooks and technical information memoranda.

7.2.2. Reports intended primarily for external customers.

7.3. Project Completion. Upon project completion, the PM shall ensure test-related activities are properly documented IAW AFRL program management and case file requirements. (See AFRLGM2020-61-014, *Air Force Research Laboratory Program Management*, and AFRLI 61-201, *AFRL Research and Development Work Unit Records and Science and Technology [S&T] Reporting*, and higher-level instructions as referenced therein.) This includes capturing and archiving as appropriate test planning artifacts, test review and approval documentation, raw and/or processed data, test results, supporting media (e.g., electronic, photographic, etc.), lessons learned, and other relevant documentation. In addition to program management and R&D case file requirements, PMs should provide AFRL site/detachment safety offices with safety lessons learned, assessments of the effectiveness of hazard controls or minimizing procedures, descriptions of unexpected hazards encountered, and suggestions for improving the safety review process.

HEATHER L. PRINGLE, Brigadier General, USAF
Commander, Air Force Research Laboratory

Attachment 1

GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION

References

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AFI 99-103 with (AFMC Supplement, 19 June 2020), C*apability-Based Test and Evaluation*, 18 November 2019

AFI 91-202 (with AFMC Supplement, 17 May 2017 and AFRL Supplement, 14 March 2019), *The US Air Force Mishap Prevention Program*, 24 June 2015

AFI 62-601 (with AFMC Supplement, 28 March 2016), *USAF Airworthiness*, 11 June 2010

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AFI 11-502V1, *Small Unmanned Aircraft Systems Training*, 19 August 2015

AFI 11-502V2, *Small Unmanned Aircraft Systems Standardization/Evaluation Program*, 19 August 2015

AFI 11-502V3, *Small Unmanned Aircraft Systems Operations*, 21 August 2015

AFRLI 61-601, *AFRL Airworthiness*, 5 September 2017

AFRLI 63-113, *Program Protection Planning for the Air Force Research Laboratory*, 1 May 2018

AFI 91-204 (with AFMC Supplement, 9 April 2019), *Safety Investigations and Reporting*, 27 April 2018

DoDI 3100.11, *Management of Laser Illumination of Objects in Space*, 24 October 2016

AFRLI 40-402, *Using Human Subjects in Research*, 13 April 2016

AFI 14-104, *Oversight of Intelligence Activates*, 5 November 2014

AFI 11-402, *Aviation and Parachutes Service, Aeronautical Ratings and Aviation Badges*, 3 December 2010

AFI 11-202V3 AFMC Supplement, *General Flight Rules*, 24 November 2015

AFI 11-202/2FTV1, *Flight Test Aircrew Training,* 28 February 2017

AFRLI 61-108, *Science and Technology Program Management,* 19 November 2013

AFRLI 61-201, *AFRL Research and Development (R&D) Work Unit Records and Scientific and Technical (S&T) Reporting*, 9 February 2016

Prescribed Forms

None

Adopted Forms

AF Form 847, *Recommendation for Change of Publication*

AFMC Form 42, *Lead Developmental Test and Evaluation Organization*

DD Form 1423, *Contract Data Requirements List*

FAA Form 337, *Major Repair and Altercation (Airframe, Powerplant, Propeller or Appliance*)

DD Form 175, Military Flight Plan

FAA Form 7233-1, Flight Plan Documentation Information

DD Form 2628, Request for Approval of Contractor Flight Crewmember

DCMA Form 644, Request for Flight Approval

Abbreviations and Acronyms

AC—Advisory Circular

AF—Air Force

AFI—Air Force Instruction

AFLCMC—Air Force Life Cycle Management Center

AFMC—Air Force Materiel Command

AFMC/A3—Air Force Materiel Command Air, Space and Information Operations

AFMC/CC—Air Force Materiel Command Commander

AFMCSUP—Air Force Materiel Command Supplement

AFPD—Air Force Policy Directive

AFRL—Air Force Research Laboratory

AFRL/CC—Air Force Research Laboratory Commander

AFRL/CV—Air Force Research Laboratory Vice Commander

AFRL/DO—Air Force Research Laboratory Operations Directorate

AFRL/DOO—Air Force Research Laboratory Operations Directorate, Operations Division

AFRL/DSI—Air Force Research Laboratory Director of Staff Information Protection Division

AFRL/EN—Air Force Research Laboratory Engineering & Technical Management

AFRL/RCCS—Air Force Research Laboratory Cybersecurity Office

AFRL/RD—Air Force Research Laboratory Directed Energy Directorate

AFRL/RY—Air Force Research Laboratory Sensors Directorate

AFRL/SE—Air Force Research Laboratory Safety Directorate

AFRLI—Air Force Research Laboratory Instruction

AFTC—Air Force Test Center

AO—Authorizing Official

AOR—Area of Responsibility

ASU—Airspace for Special Use

ATC—Air Traffic Control

ATO—Authorization to Operate

AW—Airworthiness

AWB—Airworthiness Bulletin

C2—Command and Control

CAO—Civil Aircraft Operation

CC—Commander

CCB—Configuration Control Board

COA—Certificate of Waiver or Authorization

CONEMP—Concept of Employment

CONOP—Concept of Operation

CONUS—Contiguous United States

COS—Chief of Safety

COTS—Commercial-Off-The-Shelf

CRADA—Cooperative Research and Development Agreement

CRB—Combined Review Board

CTA—Center Test Authority

DCMA-INST—Defense Contract Management Agency Instruction

DE—Directed Energy

DoD—Department of Defense

DT&E—Developmental Test and Evaluation

DTA—Delegated Technical Authority

EPNER—École du Personnel Navigant d'Essais et de Réception (French Test Pilot School)

FAA—Federal Aviation Administration

FTPM—Flight Test or Training Planning Meeting

FCF—Functional Check Flight

FD—Functional Directorate

FOA—Flight Operations Authority

FOP—Flight Operations Procedure

G—Normal Force

GFR—Government Flight Representative

GFRC—Ground and Flight Risk Clause

GMP—General Minimizing Procedure

GOP—Ground Operations Procedure

HPW—Human Performance Wing

HQ—Headquarters

IATT—Interim Authority to Test

IAW—In Accordance With

IRB—Institutional Review Board

ISE—Integrated System Evaluation

ISSM—Information System Security Manager

IT—Information Technology

ITT—Integrated Test Team

LDTO—Lead Developmental Test and Evaluation Organization

LTO—Lead Test Organization

MAJCOM—Major Command

MCA—Mishap Convening Authority

MDS—Mission Design Series

MESP—Maintenance/Engineering Support Personnel

MFR—Military Flight Release

MOA—Military Operating Area; Memorandum of Agreement

MOE—Measure of Effectiveness

MOP—Measure of Performance

MOT—Method of Test

MOU—Memorandum of Understanding

NAS—National Airspace System

NRR—Negligible Risk Review

OCONUS—Outside Contiguous United States

OG—Operations Group

OPR—Office of Primary Responsibility

OPREP/CCIR—Operational Report/Commander Critical Information Requirement

ORM—Operational Risk Management

PAO—Public Aircraft Operation

PIC—Pilot in Command

PID—Program Introduction Document

PM—Program Manager

POC—Point of Contact

PTO—Participating Test Organization

PUM—Proper Use Memorandum

R&D—Research and Development

RDT&E—Research, Development, Test, and Evaluation

RTF—Return to Flight

S&E—Scientists and Engineers

S&T—Science and Technology

SAA—Special Activity Airspace

SM—Spectrum Manager

SME—Subject Matter Expert

SOC—Statement of Capability

SOP—Standard Operating Procedure

SRB—Safety Review Board

Stan/Eval—Standardization/Evaluation

SUA—Special Use Airspace

SUAS—Small Unmanned Aerial System

SUAS-O—Small Unmanned Aerial System Operator

SUT—System Under Test

T&E—Test and Evaluation

TAB—Test Approval Brief

TC—Test Conductor

TD—Technology Directorate

TEA—Test Execution Authority

TEO—Technology Executive Officer

THA—Test Hazard Analysis

TO—Technical Order

TPS—Test Pilot School

TRB—Technical Review Board

TRR—Test Readiness Review

UAS—Unmanned Aerial System

USAF—United States Air Force

USAFSAM—United States Air Force School of Aerospace Medicine

USAFSAM/FE—USAFSAM Aerospace Medicine Department

VStall—Stall Velocity

XN—Navigator/Combat Systems Officer Aircrew

XP—Pilot Aircrew

Terms

Airworthiness (AW)—The property of an air system configuration which enables it to safely attain, sustain, and complete flight in accordance with its approved usage and operating limits.

Airworthiness Technical Risk—The independently assessed, unmitigated risk that an air vehicle will be able to safely attain, sustain, and complete flight in accordance with approved usage and operating limits, per AFI 62-601.

Center Test Authority (CTA—) - Center-level office which serves as focal point to the TEO, TD Test Lead, PM, and program test team for test program assistance and to center leadership for issues concerning T&E policy and procedures as they relate to S&T decision making. Per AFI 99-103 AFMC Supplement and AFMCI 36-2645, CTA also provides senior functional management of the T&E workforce.

Combined Review Board (CRB)—A single review that includes the airworthiness, technical, safety, and other relevant reviews in one forum. The CRB is typically employed under exigent circumstances (such as rapid response to an urgent operational need) or when the test complexity is so low that serial conduct of constituent reviews is considered inefficient.

Flight Test or Training Planning Meeting (FTPM)—A meeting held as a part of or subsequent to the Initial Program Formulation Phase of the AFRL Flight Activity Process to permit the PM and test team to introduce their flight activity concept to the HQ AFRL organizations that oversee the process (AFRL/DO/EN/RC/SE). At the FTPM, headquarters functionals, the PM, and test team work together to identify and tailor the AFRL Flight Activity Process requirements and milestones that will apply to the program. A primary goal is to identify long-lead items the program must address to ensure they are resolved in time to meet program goals.

Flight Operations Authority (FOA)—The group commander designated (or equivalent) who is responsible for the oversight of day-to-day flight operations and compliance with USAF and AFMC flight operations policies. FOAs also ensure ORM principles are emphasized before all flying activities.

General Minimizing Procedure (GMP)—A mitigation measure for general (i.e., not test-unique) hazards. GMPs are stand-alone phrases/statements and are used to address SUT restrictions, test build-up, critical parameter monitoring, go/no-go criteria, weather or environmental criteria, range-unique hazards, and chase aircraft requirements among other items of flight safety concern.

Independent—Being in a position with respect to some matter where one cannot be influenced or controlled by others because one is not subject to the others' authority or jurisdiction or has not had a significant role in the evolution of the matter under consideration. In the context of the AFRL Flight Activity Process, the principle of independence effectively precludes program personnel or those who have had a significant role in supporting them from being members of review boards.

Lead Test Organization (LTO)—The designation given an AFRL program team when it decides to lead the conduct of a test and/or be responsible for overseeing other organizations supporting their flight research program. The LTO designation accrues when the AFRL program team elects not to turn over test execution leadership for their program to an LDTO.

Lead Developmental Test and Evaluation Organization (LDTO)—The lead government organization that is most qualified, resourced, and/or capable to conduct a test and/or be responsible for overseeing a confederation of T&E organizations, each with different but necessary skills, in support of a test program. LDTO designations are made by the TEO (or when delegated within AFRL by TD Directors/ Deputies) and approved by HQ AFMC/A3/6.

Maintenance/Engineering Support Personnel (MESP)—An individual whose particular expertise is required inflight to provide assistance with or observation of test techniques, data collection, systems operation, resource monitoring, or crew procedures.

Participating Test Organization (PTO)—Any test organization required to support a lead test organization by providing specific data or resources for a test program or activity.

Program Manager (PM)—As used within this volume, the designated individual with responsibility for and authority to accomplish S&T program objectives. The PM is accountable for credible cost, schedule, and performance reporting to the TEO.

Safety Review Board (SRB)—A gathering of subject matter experts under the leadership of an appointed Chair whose function is to ensure hazards of a test activity are identified, appropriate risk controls are applied, and residual risk is clearly communicated for acceptance by the appropriate TEA. The SRB is designed as the primary mechanism to ensure an objective, independent, and unbiased safety review. The primary outcome of the SRB is the assessed residual safety risk level of the flight activity.

Safety Risk—The relative probability and consequence that an endeavor will experience damage to or destruction of resources, and/or, injury or death by the personnel involved in or affected by the activity. A mitigated safety risk results when measures are applied to reduce the probability of occurrence or severity of consequence associated with the hazard(s). Residual safety risk is the level of risk which remains after all mitigation measures have been applied.

Technical Review Board (TRB)—A gathering of subject matter experts under the leadership of an appointed Chair whose function is to assess the method being employed by a test team on a research activity. The TRB ensures the objectives are properly formulated, the method of test is appropriate for the test objectives, the data management plan sufficiently addresses the data acquisition and analysis requirements, and the overall approach is executable within the constraints of resources and time. The primary outcome of the TRB is the assessed technical risk level of the test approach.

Technical Risk—The relative probability and consequence that an endeavor will fail to achieve the research or test objectives that have been defined for it.

Test Approval Briefing (TAB)—An executive-level presentation that provides a flight test activity overview and highlights test objectives, overall test approach, test-unique hazards, mitigation measures, discussion points during the independent reviews, and any contention or disagreement among the members of the independent board(s) or the test team.

Test Execution Authority (TEA)—The government individual at the management level identified in AFI 91-202 AFRL Supplement responsible for accepting the risks assessed in reviews (technical and safety) and authorizations (cyber, PUM, spectrum, etc.) as documented in a flight activity package and for approving the test to proceed. Within AFRL, FOA approval must also be obtained before a flight activity may actually proceed to execution.

Unexpected Event—Any unplanned or unanticipated occurrence, or series of occurrences, during flight operations that results in (or has the potential to cause) injury or death, damage to the SUT (excluding normal wear and tear), property damage, anomalous performance, or departure from the assigned airspace. An unexpected event may or may not be classified as a mishap.

Attachment 2

EXAMPLE UNEXPECTED EVENT WORKSHEET

Figure A2.1. Example Unexpected Event Worksheet.

Card #	AFRL UNEXPECTED EVENT WORKSHEET Submit to AFRL/DO within 8 hours of a reportable event. Mark this document appropriately (e.g., FOUO) when completed with event details.	Date

SECTION I: COMPLETED PRIOR TO FLIGHT ACTIVITY

Program Title		AFRL Tracking #	

Contact Information

1. Test Director (Name, Work Phone #, Field Phone #, email)
2. Alternate On-Site POC (Name, Work Phone #, Cell Phone #, email)
3. Program Manager (Name, Work Phone # , Cell Phone #, email)
4. AFRL/DO Test POC (Name, Work Phone #, Cell Phone #)
5. AFRL Deputy Director of Operations (Name, Work Phone #, Cell Phone #)
6. AFRL Director of Operations (Name, Work Phone #, Cell Phone #)
7. AFRL Flight Safety (Work Phone #, 24hr Cell Phone #,)

Flight Safety, 937-255-0494, 24 Hour Cell: 937-608-4569

Range or Locality Emergency Services Contact Information:

SECTION II CHECKLIST:

To be completed by the Test Director in order listed if an unexpected event occurs.

If an unexpected event occurs, initial checklist items as they are completed.

Initials or N/A		Event Information
	1. Ensure immediate personnel safety & medical treatment	Aircraft Type/Tail #
	2. Contact local emergency services (if necessary)	Weather (wind, visibility, ceiling, temp. & dew point, altimeter setting)
	3. Minimize potential for further damage to wreckage (if applicable) and other assets	
	4. Contact Program Manager & AFRL/DO POC. If PM & DO Test POC are unavailable, contact AFRL Deputy Director of Operations, AFRL Director of Operations, or AFRL SE	Initial Cost Estimate (scope of cost/damage estimate)
	a. Date & Time of Contact for PM	
	b. Date & Time of Contact for DO Test POC Or Deputy Director of Operations, Director of Operations, or AFRL/SE	Did any injuries occur? (Yes/No)

5. Record any instructions received from PM, DO Test POC, Deputy Director of Operations, Director of Operations, or AFRL/SE

Page 1 of 3

☐	6. Secure scene of mishap (Test Director)
☐	7. Photograph the site thoroughly (Test Director)
☐	8. Gather participant information (Utilize Section III Block 1 to record contact information)
☐	a. Gather contact and other information listed in Section III, Block 1, for all participants who were present
☐	b. Identify and note which participants were witnesses
☐	c. If necessary, separate witnesses; gather witness statements
☐	9. Record Narrative Summary of Event (Utilize Section III Block 2 to record summary)
☐	10. Email Unexpected Event Worksheet to afrl.do.workflow@us.af.mil and afrl.se.workflow@us.af.mil **NOTE: Email of Unexpected Event Worksheet to AFRL/DO and AFRL/SE is NOT a substitute for telephonic notification in Section II, Step #4.**

SECTION III / BLOCK 1

Witness		Participant Information
Yes	No	Name (last, first)/Team Role/ Organization/ Phone/ Email
☐	☐	
☐	☐	
☐	☐	
☐	☐	
☐	☐	
☐	☐	
☐	☐	
☐	☐	
☐	☐	
☐	☐	
☐	☐	
☐	☐	
☐	☐	
☐	☐	
☐	☐	
☐	☐	

SECTION III Continued / BLOCK 2

Provide detailed timeline of events starting at appropriate time prior to mishap continued through the mishap sequence

Example Narrative

0710 - Preflight completed
0730 - Takeoff
0742 - Bolt fell off
0800 - Engine shutdown
0815 - Aircraft impacted terrain
etc.

Supplemental Information / BLOCK 3

Attachment 3

EXAMPLE TEST APPROVAL WORKSHEET

Figure A3.1. Example Test Approval Worksheet.

TEST APPROVAL WORKSHEET

(* indicates applicable only to flight activity)

1. AFRL Tracking #*	2. Program Manager (Name, Office Symbol)	3a. Commercial Phone #	3b. DSN Phone #

4. Purpose	

SECTION I: PROGRAM INFORMATION

5. Program Title	6. Assigned LTO/LDTO*	7. Contract #	8. GFR*	9. MESP*

10. Description of Test and/or Test Modification (to include # and types of vehicles, AFRL assets, other involved organizations, and program-level objectives).

SECTION II: PLANNING PHASE

11. Signature indicates reviewer certifies test planning and documentation are mature and test should proceed to formal review phase.

	Name, Office Symbol	Signature
AFRL/DO Test POC*		
TD Test Lead		

SECTION III: REVIEW PHASE

12. Technical Review Board*

☐ As the TRB Chair, I certify that an Environmental Impact Analysis has been conducted and reviewed.	Technical Risk Level
TRB Chair Name, Grade/Rank, Office Symbol	Signature
☐ See reverse side for remarks	

13. Safety Review Board

☐ Board Member(s) non-concurred with risk level. See reverse side for remarks	Mitigated Safety Risk Level
SRB Chair Name, Grade/Rank, Office Symbol	Signature
☐ See reverse side for remarks	

14. Airworthiness Assessment*

DTA Name, Grade/Rank, Office Symbol	Signature	Airworthiness Technical Risk Level

SECTION IV: APPROVAL

15. Test Execution Authority

In the role of Test Execution Authority for this test, I accept the risks as noted below and approve this test to execute.

Name, Grade/Rank, Office Symbol	Signature	TEA Assessed Risk Level

16. CAO or MFR #*		17. Date of ATO or IATT		☐ ATO/IATT Not Required

18. Flight Operations Authority*

As AFRL Flight Operations Authority, I certify the AFRL Flight Activity review process is complete and I approve this test to execute.

Name, Grade/Rank, Office Symbol	Signature	Final Risk Level

Block 10 continued - Test Description/Test Team Remarks

Block 12 continued - TRB Chair Remarks

Block 13 continued - SRB Chair Remarks (as well as those of non-concurring SRB members if applicable)

Block 14 continued - DTA Remarks ☐ CAO ☐ PAO

Block 15 continued - TEA Remarks

Block 18 continued - FOA Remarks

Attachment 4

SUGGESTED CRITERIA TO USE IN TECHNICAL RISK ASSESSMENTS

Figure A4.1. Suggested Criteria To Use In Technical Risk Assessments.

Risk Area	LOW	MEDIUM	HIGH
SUT Maturity	Mature, **FULLY**-proven design (i.e., software, hardware, and components) or a design with few/minor changes from a known. Analogous design peer or baseline. **SIGNICANT** previous testing in Lab, Field and/or Flight Test environments.	Less mature, **PARTIALLY**-proven design (i.e., software, hardware, and components) or a design with some significant changes from known/analogous design peer or baseline. **SOME** previous testing in Lab, Field and/or Flight Test environments.	Immature or new, **UNPROVEN** design (i.e., software, hardware, and components) or "first of" with little to no known/analogous design peer or baseline. **LITTLE** previous testing in Lab, Field and/or Flight Test environments.
SUT Performance	Performance is stable, understood, and predictable with **HIGH CONFIDENCE** across all areas of planned test envelope.	Performance is somewhat stable, understood, and predictable with at least **MEDIUM CONFIDENCE** across all areas of planned test envelope.	Performance is somewhat stable, understood, and predictable with **LOW CONFIDENCE** across all areas of planned test envelope.
Test Objectives, Methodology & Data Analysis	**SIGNIFICANT** buildup approach events completed (M&S, HITL, SIL, Lab/Ground/ Flight Test). **STRONG** traceability between test objectives, requirements, previous test results, and design of the test. **HIGH CONFIDENCE** in test methodology, test point selection, MOPs, evaluation criteria, data analysis and/or predicted results. Few if any test changes anticipated.	**SOME** buildup approach events completed (M&S, HITL, SIL, Lab/Ground/Flight Test). **SOME** traceability between test objectives, requirements, previous test results, and design of the test. **MEDIUM CONFIDENCE** in test methodology, test point selection, MOPs, evaluation criteria, data analysis and/or predicted results. Some changes to test are anticipated after analysis of initial results.	**LITTLE** test buildup or significant lack of relevant M&S, HITL, SIL, Lab/Ground/Flight Test prior to the current test events. **WEAK** traceability between test objectives requirements, previous test results, and design of the test. **LOW CONFIDENCE** in test methodology, test point selection, MOPs, evaluation criteria, data analysis and/or predicted results. Significant changes to test are likely after analysis of initial results.
Instrumentation	Mature, proven data parameters, sample rates, resolution, truth sources/sensors, data acquisition system(s), etc. All available and known **HIGH CONFIDENCE**	Less mature or partially proven data parameters, sample rates, resolution, truth sources/sensors, data acquisition system(s), etc. Some available or known **MEDIUM CONFIDENCE**	Immature or unproven data parameters, sample rates, resolution, truth sources/sensors, data acquisition system(s), etc. Few available or known **LOW CONFIDENCE**

Risk Area	LOW	MEDIUM	HIGH
SUT Operations, Maintenance & Sustainment	Operation, maintenance, and troubleshooting procedures documented and complete with **MINOR** omissions in key SUT operational areas. Operators and maintainers have significant, recent experience and have **HIGH CONFIDENCE** in ability to operate, maintain, and sustain SUT as required for test.	Operation, maintenance, and troubleshooting procedures have **SIGNIFICANT** omissions in key SUT operational areas. Operators and maintainers have some/fairly, recent experience and have **MEDIUM CONFIDENCE** in ability to operate, maintain, and sustain SUT as required for test.	Operation, maintenance, and troubleshooting procedures documented and complete with **CRITICAL** omissions in key SUT operational areas. Operators and maintainers have little/no, recent experience and have **LOW CONFIDENCE** in ability to operate, maintain, and sustain SUT as required for test.
Test Vehicle Modification & Integration	Modification and integration procedures are **FULLY** defined. Test vehicle has been previously modified in **HIGHLY** similar fashion with analogous SUT integrated successfully. Modification and integration team are **HIGHLY** experienced with vehicle/SUT and have **HIGH CONFIDENCE** in their ability to modify test vehicle and integrate while maintaining cost and schedule.	Modification and integration procedures are **SOMEWHAT** defined. Test vehicle has been previously modified in a **SOMEWHAT** similar fashion and similar SUT integrated successfully. Modification and integration team are **SOMEWHAT** experienced with vehicle/SUT and have **MEDIUM CONFIDENCE** in their ability to modify test vehicle and integrate while maintaining cost and schedule.	Modification and integration procedures are **POORLY** defined. Test vehicle may have been previously modified with limited similarity and no analogous SUT has been integrated successfully. Modification and Integration team have **LITTLE** experience with vehicle/SUT and have **LOW CONFIDENCE** in their ability to modify test vehicle and integrate while maintaining cost and schedule.
Test Resources Airspace/Range Availability	Few schedule issues or concerns. **HIGH CONFIDENCE** regarding test resources, airspace or range availability.	Some schedule issues or concerns. **MEDIUM CONFIDENCE** regarding test resources, airspace or range availability.	Serious schedule issues or concerns **LOW CONFIDENCE** regarding test resources, airspace or range availability.
Test Events & Schedule Adequacy	Schedule is adequate to accomplish the number/types of events. **HIGH CONFIDENCE** that contingencies can be mitigated within current schedule.	Schedule is somewhat aggressive to accomplish the number/types of events. **MEDIUM CONFIDENCE** that contingencies can be mitigated within current schedule.	Schedule is highly aggressive to accomplish the number/types of events. **LOW CONFIDENCE** that contingencies can be mitigated within current schedule.

Attachment 5

EXAMPLE OPERATIONAL RISK MANAGEMENT (ORM) WORKSHEETS

Figure A5.1. Example Manned Flight ORM Worksheet.

AFRL Manned Flight Test Ops ORM Assessment

Date: _____ Program: _____ Vehicle: _____ Flight # ____

	GREEN	YELLOW	RED
HUMAN	Place "X" in appropriate box		
Each Aircrew Member (Pilots, MESP, etc)			
Qualified	Fully Qualified	In Training or MESP First Flight	Untrained
Instructional Complexity	No training occurring during the flight	1 individual being trained	More than 2 individuals being
Currency (this mission & aircraft)	< 14 Days	14-30 Days	> 30 Days
Proficiency (this aircraft)	>100 hrs or 20 flights, or instructor aboard	<100 hrs or 5-20 flights, no instructor	< 5 Flights, no instructor aboard
Sleep (Crew Rest)	≥ 8 Hours	6 – 8 Hours	≤ 6 Hours
Crew/Personal Concerns	None	Minor	Major
MISSION/OPS	Place "X" in appropriate box		
Test Location Familiarity	> 3 Previous Tests at this Location	1 - 3 Previous Tests at this Location	First Time at this Location
Test Location/Enroute Weather (including ceiling, crosswinds, convective activity)	All Criteria Acceptable and VFR clearly maintainable throughout flight	Slight Msn Impact, or IFR Alternate Required, or 1-2 Criteria Within 30% of Limits	Significant Msn Impact, or IFR required, or 1-2 Criteria Within 10% of Limits, or > 2 Criteria Within 30% of Limits
Bird Activity (check US Avian Hazard Advisory System at www.usahas.com, verify on-site, prior to start of testing)	Low	Moderate	Severe
Mission Duration	< 60 minutes	60-180 minutes	> 180 minutes
Takeoff Times	Between Sunrise &	All Other Times	At Night
Landing Times	Between Sunrise & Sunset	All Other Times	At Night
Duration of Duty Day (at planned landing time)	< 8 Hours	8 - 12 Hours	> 12 Hours or > 14 hrs since waking
Number of Sorties	1st Flight of the Day	2nd Flight of the Day	3rd or more flight or Second Night Sortie
Mission Complexity	Low/Normal	Demanding	Extremely Demanding
Mission Plan Changes	None	Minor	Major
Safety Risk	Low	Medium	High
Check AFRL Flight Crew Information File (FCIF) folder (Flight Crew Information Folder)	0 Notices pertaining to systems under test or all relevant issues have been satisfactorily addressed		Relevant notices exist and not yet complied with
SYSTEMS (Aircraft, test items)	Place "X" in appropriate box		
Config Changes (hardware/software)	None	Minor, or first flight after down time >30 days	Major modifications, or Functional Check Flight, or down time > 90 days
Maintenance Write-ups	0 Write-ups outstanding	≤ 3 Minor Write-ups outstanding – no impact on meeting test objectives and/or compromising safety	≥ 1 Major Write-up(s) outstanding impacting meeting test objectives and/or compromising safety or > 3 Minor Write-ups outstanding
Service Bulletins/Safety Supplements	0 New Bulletins / Supplements outstanding; all existing complied with and reviewed/approved by SRB and TAA		Service Bulletin/Safety Supplement exists, applicable to system under test, and not yet complied with
TOTAL ORM LEVEL	**GREEN** (< 3 Total Yellows/Reds, with no more than 1 Red)	**YELLOW** (≥ Total 3 Yellows/Reds, with no more than 1 Red)	**RED** (2 or More Reds)

Test Director: Discuss How ORM Which Shows Up as Yellow or Red Was Addressed/Mitigated/Who Was Notified (use continuation page as needed)

Mission Completed (y/n): _____

If Not, Why:

Initials _____

GREEN ORM: If any specific area is Red, look at ways to lower risk in that area. Test Director or Test Safety Officer discretion to continue test.

YELLOW ORM: Try to mitigate to Green ORM. Work with Test Director, Vehicle Operator, and Test Safety Officer to lower ORM risk. If unable to lower risk, AFRL Branch Chief must be notified and approve test start.

RED ORM: Try to mitigate to Green or Yellow ORM. Work with Test Director, Vehicle Operator, and Test Safety Officer to lower ORM risk. If unable to lower risk, AFRL Division Chief must be notified and approve test start.

INSTRUCTIONS:

1. Complete this assessment prior to each flight or like series of consecutive sorties.
2. Maintain completed forms in test log book.
3. If Total ORM level is Yellow or Red, notify AFRL/SEF and AFRL/DO that approval to continue with testing was sought/garnered by the appropriate level of authority. Notification should be made within 4 hours of the start of the test. Preferred method of notification is by e-mailing the completed form to Afrl.se.workflow@wpafb.af.mil and afrl.do.workflow@us.af.mil
4. Provide copy of completed forms to AFRL/SEF and AFRL/DO upon the completion of the test program.

Figure A5.2. Example Small Unmanned Aerial System Flight ORM Worksheet.

AFRL SUAS Test Ops ORM Assessment

Date: _____ Program: _____ Vehicle: _____ Flight # ____

		GREEN		YELLOW		RED
HUMAN			Place "X" in appropriate box			
Mission Commander/Instructor						
Qualified	☐	Fully Qualified	☐	In-Training	☐	No Training at All
Currency	☐	< 30 Days	☐	30-60 Days	☐	> 60 Days
Crew Rest	☐	≥ 12 Hours			☐	< 12 Hours
Personal Concerns	☐	None	☐	Minor	☐	Major
Air Vehicle Operator/Instructor						
Qualified	☐	Fully Qualified	☐	In-Training	☐	No Training at All
Currency	☐	< 30 Days	☐	30-60 Days	☐	> 60 Days
Crew Rest	☐	≥ 12 Hours			☐	< 12 Hours
Personal Concerns	☐	None	☐	Minor	☐	Major
Crew Chief						
Qualified	☐	Fully Qualified	☐	In-Training	☐	No Training at All
Currency	☐	< 30 Days	☐	30-60 Days	☐	> 60 Days
Crew Rest	☐	≥ 12 Hours			☐	< 12 Hours
Personal Concerns	☐	None	☐	Minor	☐	Major
Circadian Rhythms	☐	No Change	☐	Minor Change	☐	Major Change
MISSION/OPS			Place "X" in appropriate box			
Test Location Familiarity (Mission CC)	☐	> 3 Previous Tests at this Location	☐	1-3 Previous Tests at this Location	☐	First Time at this Location
Test Location Familiarity (AVO)	☐	> 3 Previous Tests at this Location	☐	1-3 Previous Tests at this Location	☐	First Time at this Location
Test Location Weather	☐	Zero to minor impacts to mission completion	☐	Major impacts to mission completion	☐	Current forecast does not allow completion of mission
Flight Duty Period	☐	< 10 hours	☐	10-12 hours	☐	12-14 hours
Bird Activity (check US Avian Hazard Advisory System at www.usahas.com)	☐	Low	☐	Moderate	☐	Severe
Mission Complexity	☐	Low/Normal	☐	Demanding	☐	Extremely Demanding
Check AFRL Flight Crew Information Folder (Flight Crew Information Folder)	☐	0 Notices pertaining to systems under test or all relevant issues have been satisfactorily addressed	☐	Minor notices exist and not yet complied with	☐	Major notices exist and not yet complied with
VEHICLE/GCS/LAUNCH SYSTEM/RECOVERY SYSTEM			Place "X" in appropriate box			
Aircraft/GCS Configuration Changes (hardware/software)	☐	None	☐	Minor or Functional Check Flight or first flight after down time > 30 days	☐	Major modifications or down time > 90 days
Maintenance Write-ups	☐	0 Write-ups outstanding	☐	≤ 3 Minor Write-ups outstanding – no impact on meeting test objectives and/or compromising safety	☐	≥ 1 Major Write-up(s) outstanding impacting meeting test objectives and/or compromising safety or > 3 Minor Write-ups outstanding
Service Bulletins/Safety Supplements	☐	0 New Bulletins / Supplements outstanding; all existing complied with and reviewed/approved by SRB and TAA		Minor Bulletin / Supplement exists, applicable to system under test, and not yet complied with	☐	Major Bulletin / Supplement exists, applicable to system under test, and not yet complied with
TOTAL ORM LEVEL	☐	**GREEN** (< 3 Total Yellows/Reds, with no more than 1 Red)	☐	**YELLOW** (≥ Total 3 Yellows/Reds, with no more than 1 Red)	☐	**RED** (2 or More Reds)

Test Director: Discuss How ORM Which Shows Up as Yellow or Red Was Addressed/Mitigated/Who Was Notified (use continuation page as needed)

Mission Completed (y/n): ____

If Not, Why:

Initials _____

GREEN ORM: If any specific area is Red, look at ways to lower risk in that area. Test Director or Test Safety Officer discretion to continue test.

YELLOW ORM: Try to mitigate to Green ORM. Work with Test Director, Vehicle Operator, LNO, and Test Safety Officer to lower ORM risk. If unable to lower risk, AFRL Branch Chief, SQ/CC, or equivalent level of supervision must be notified and approve test start.

RED ORM: Try to mitigate to Green or Yellow ORM. Work with Test Director, Vehicle Operator, and Test Safety Officer to lower ORM risk. If unable to lower risk, AFRL Division Chief, OG/CC, or equivalent level of supervision must be notified and approve test start.

INSTRUCTIONS:

1. **Complete this assessment prior to each flight or like series of consecutive sorties.**
2. **Maintain completed forms in test log book.**
3. **If Total ORM level is Yellow or Red, notify AFRL/SEF and AFRL/DO that approval to continue with testing was sought/garnered by the appropriate level of authority. Notification should be made within 4 hours of the start of the test. Preferred method of notification is by e-mailing the completed form to AFRL.SE.Workflow@US.AF.mil and afrl.do.workflow@us.af.mil.**
4. **Provide copy of completed forms to AFRL/SEF and AFRL/DO upon the completion of the test program.**