

**BY ORDER OF THE COMMANDER  
HILL AIR FORCE BASE (AFMC)**



**AIR FORCE INSTRUCTION 91-202  
HILL AIR FORCE BASE  
Supplement 1  
25 APRIL 2001**

**Safety**

**THE US AIR FORCE MISHAP PREVENTION PROGRAM**

**COMPLIANCE WITH THIS PUBLICATION IS MANDATORY**

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Maintain and dispose of records created as a result of prescribed processes in accordance with *AFMAN 37-139, Records Disposition Schedule*.

**SUMMARY OF REVISIONS**

Key addition to this revision includes a new OO-ALC System Safety Program, Chapter 9. The intent of Chapter 9 is to ensure unambiguous communication, resolution, tracking and accountability for safety engineering of weapon systems and major construction. Another major emphasis is to help Chief Engineers successfully meet the intent of Operational Safety, Suitability and Effectiveness (OSS&E) – to obtain and provide for logistics support. Public and private aircraft mishaps show that a “change” in production or manufacturing process, parts substitution, or contracting methods may lead to failures and faults causing catastrophic results for both people and systems. Many of these mishaps show that safety engineering was not involved with a change or qualified in a specialty field. In some cases safety reviewers did not get all the information. Systems, depot, industrial and manufacturing engineering should establish firm safety engineering lines to communicate Environmental Safety and Occupational Health (ESOH) issues with USAF weapon system managers and ensure total OSS&E. The second important addition is in Chapter 12. Test Management is responsible to ensure suspended items be safe for testing and sign a statement.

***AFI 91-202, 1 August 1998 is supplemented as follows:***

9.1.2 System Safety Programs work best when implemented by engineering staffs who report to the director responsible for Operational Safety, Suitability and Effectiveness (OSS&E), configuration control of systems and division managers responsible for item or engineering management of end items. For the latter, assigned System Safety Program Managers (SSPM) should be knowledgeable within the specialty field.

9.1.3 Avoid using written advisory alone to mitigate a Category I or II hazard according to Military Standard 882D, "Standard Practice for System Safety." In those cases controlling Category I or II hazards using written advisory (procedures and training), the Center Commander will approve the decision based on an analysis summary and risk assessment.

9.2.1. The systems engineering process involves maintenance engineering and is commonly known as sustaining engineering or sustainment.

9.2.2. Directorates employing sustainment-engineering functions shall develop System Safety Programs and Plans (SSPP) within Integrated Product Development programs, business plans and local industrial equipment purchasing policies or other contracts and agreements. SSPPs will describe to program management - reporting requirements and methods to ensure effective communication and resolution of hazards. Manufacturing efforts involving modifications to weapon systems should include an integrated safety engineering and system safety program to ensure weapon system mishap resolution and accountability. SSPM supporting manufacturing and depot functions shall be members of Material Safety Task Groups described in *AFI 91-204 and supplements, "Safety Investigation and Reports."*

9.2.2.1. (Added) Program managers include, but are not limited to, Product Group Managers (PGM) System Support Manager (SSM), System Manager (SM), or Project Manager (PM). Also include Supply Chain Managers (SCM), or Item Managers (IM) responsible or delegated engineering authority for modification of end items. The intent in clarifying this definition is to emphasize the importance of "independent safety review". The engineering organization approving a modification should not develop and approve a safety engineering effort, analysis or review.

9.2.3. Directors will ensure System Safety staffs integrate Environmental, Safety, Occupational Health, and Fire Protection (ESOH & F) programs to ensure consistent hazard risk management within program, product, manufacturing, production, and project areas.

9.2.3.1. (Added). OO-ALC engineering activities responsible for Operational Safety, Suitability and Effectiveness of end items will include system safety program elements within agreements with support agencies and contractors.

9.2.3.2. (Added). Reliability and Maintainability programs enhance mission goals by integrating ESOH & F elements within the OSS&E program.

9.2.4. Coordinate residual risk or acceptance documents using *AF Form 1768, Staff Summary Sheet*, or equivalent with OO-ALC/SES, OO-ALC/SE, and OO-ALC/CC (in-turn) for all hazards that influence, affect, or include Center activities.

9.2.5. Coordinate proposal and bid activities with OO-ALC/SES.

9.2.5.1. (Added) OO-ALC/SES shall be a member of Acquisition Strategy Programs (ASP) or similar engineering related proposal/contract activities.

9.2.5.2. OO-ALC/SES shall be a member of Center level proposal development team reviews and is the review authority for all required safety contract Data Item Deliverables (DID).

9.3.5.1. This supplement along with information hosted on the [Systems Flight](#) web site and *Hill AFB Instruction 91-202, Standardized OO-ALC Mishap Prevention Program*, provides appropriate tailoring for the OO-ALC System Safety Program.

9.3.5.2. Program Managers (PM) must ensure system safety staffs integrate SSPs within directorate business practices (BP), sustainment engineering or other acquisition activities, instructions or procedures. Coordinate documents with OO-ALC/SES for review and comment.

9.3.5.3. PMs will coordinate safety related engineering activities requiring OO-ALC/CC action, influence, or approval with OO-ALC/SES.

9.3.5.5. System safety staffs must coordinate design and program reviews with the appropriate center safety, Ground, Weapons, or Flight Safety organization. In most cases, it is prudent to have OO-ALC/SES coordinate reviews.

9.3.5.6. PMs will ensure system safety managers have the resources to implement effective programs. Ensure staffs implement the program under directorate supervision to assure appropriate authority approval for risk acceptance during test program activities.

9.3.5.9. The following are examples that may cover hazard tracking, resolution and documentation requirements:

- Materiel Safety Task Group,
- Multi-National Cockpit Review Teams (MCRT/F-16),
- Flight Manual Review Conference,
- System Safety Groups,
- Integrated Program Management Review,
- Operational Risk Management,

- Technical Coordinating Groups,
- Flight Safety Working Group,
- Maintenance Managers Conferences,
- Wing Commanders Conferences,
- Test planning.

Maintain management acceptance of residual risk indefinitely for high or medium hazards

9.3.5.12. (Added). OO-ALC/SES and the program SSPM will be team members for System Safety Engineering Analyses (SSEA) activities occurring at OO-ALC or affecting OO-ALC OSS&E efforts.

9.4. OO-ALC/SES will be a member of SSGs to ensure proper interpretation of system safety policy and requirements.

9.5. A non-developmental item (NDI) is not the same as commercial-off-the shelf. See *DoD 5000.2R, Information Security Program*, for detailed description of commercial item (CI), modified CI, and NDI. Items, including those used to support health and environmental projects, proposed for use within major weapon systems, industrial facilities or laboratories require appropriate level of analysis before source selection efforts or purchase.

9.6. OO-ALC Directors will ensure PMs coordinate weapon system risk assessments (See paragraph 18.3 of Air Force System Safety Handbook) with the SSPM, OO-ALC/SES/SE and OO-ALC/CC in-turn. OO-ALC/SES and Safety Office (OO-ALC/SE) will make a determination in the recommended risk level and approval authority.

9.7. Coordinate System Safety Engineering Analyses (SSEA) efforts, proposing the use of OO-ALC resources, with OO-ALC/SES.

9.8 (Added). OO-ALC/SES will coordinate training courses with AFMC/SE.

10.1.2.1. OO-ALC/SEW implements the weapons safety program on behalf of OO-ALC/CC. All directorates, squadrons, and tenants, with hazardous explosives exposure or weapons safety involvement, will develop and implement the unit Weapons Safety Program based on the AF Mishap Prevention Program outlined in *AFI 91-202, The US Air Force Mishap Prevention Program*, and *supplements*. Weapons Safety Division (OO-ALC/SEW) will provide annual assessments and periodic spot inspections for all units involved with explosives, including tenants.

10.1.2.2. (Added). Issue *AF Form 2047, Explosives Facility License*, and coordinate on locally developed Explosive Operating Instruction (EOI), Test Directives (TD), and other weapons safety documentation which impact Hill AFB or GSU organizations.

10.1.2.3. (Added). Maintain Explosive Site Plans (ESP) and explosive authorizations. OO-ALC/SEW provides computer-generated printouts of explosive authorizations to Hill AFB and GSU organizations.

10.1.2.4. (Added). Review ESPs, waivers, exemptions, and deviations, then submit them to higher headquarters. Unit weapons monitors will actively participate, in coordination with OO-ALC/SEW, in the development of ESPs, explosive waivers, exemptions, and deviations.

10.1.3. (Added). Directorates with Integrated Weapons System Management (IWSM) Programs are responsible for product safety for the weapons system. This includes safety groups, weapons systems technical orders (TO), and other operations that do not affect Hill AFB or geographically separated units (GSU) personnel, facilities, equipment, or missions. The weapons safety functions that do affect Hill AFB and GSU systems do require coordination with the OO-ALC/SEW.

10.2.4. (Added). Hill AFB Directorates, GSUs, and tenants with a weapons mission will appoint at least one weapons safety monitor and alternates as necessary. Provide a letter to OO-ALC/SEW within two weeks of appointment. OO-ALC/SEW will schedule training for these personnel. Weapons safety monitors require training in safety program management, explosive safety standards, mishap investigation and reporting, and explosive site planning. They will be capable of implementing the OO-ALC safety programs for the assigned weapons programs. The weapons safety monitor must have direct access to the director or squadron commander.

10.4.9. The OO-ALC/SE will advise OO-ALC Commander (OO-ALC/CC) on explosive safety issues and exceptions at least semi-annually or as needed.

10.4.12 (Added) Directorate Safety Staff/Monitors will review and coordinate:

- EOIs.
- TDs.
- Explosive Facility Licenses.
- Explosive Operation Analyses.
- Explosive Risk Assessments.
- QD Waivers and Exemptions.
- Requests for AFI Deviations.
- AF Form 332, Base Civil Engineer Work Request.*
- All other organizational weapons safety issues.

10.10.2.1. (Added). Industrial and Logistics Training Division (OO-ALC/TIU) provides initial weapons safety training for Hill AFB and GSU employees with hazardous explosives exposure or weapons safety involvement. OO-ALC/SEW will monitor this training and will provide any specialized training as necessary.

10.11.1. (Added). OO-ALC/SEW will chair the Hill AFB Weapons Safety Interchange Group. Appointed weapons safety monitors are permanent members of the Weapons Safety Interchange Group and will meet at least once each calendar quarter. The purpose of the Weapons Safety Interchange Group is provide a forum for open discussion of general issues affecting weapons safety and to promote information exchange between organizations.

## **Chapter 12 (Added). TEST SAFETY**

12. Test Safety. The Technology and Industrial Support Directorate (OO-ALC/TI) is the center test authority for ground or flight related testing originating at Hill AFB. Aircraft, munitions, missiles, and their component tests conducted by or for Hill AFB organizations, or that involve Hill AFB managed facilities, assets, products, or personnel must comply with *Hill AFB Instruction 99-101, OO-ALC Test and Evaluation Risk Management*, and this supplement. All Hill AFB guided programs directed by *61 series, Scientific/Research and Development*, and *99 series, Test and Evaluation publications* will conduct test safety efforts as outlined in this supplement. Programs include, but are not limited to the following:

- PMD-directed acquisition systems (ACAT) I through IV.
- Modification programs.
- Non-developmental item (NDI) programs.
- Multiple-service programs.
- Commercial off-the-shelf (COTS) systems.
- Automated information systems.

One-of-a-kind systems or facilities, or programs that develop or procure only very few units over an extended period (such as a space system).

- Prototype systems.
- Science and Technology (S&T) programs.
- Programs directed by higher authority.

12.1. Tests applied to the programs in this supplement and covered by this supplement are those designed to obtain, verify, or provide data for evaluation of the following:

- Research and development (R&D).
- Progress in accomplishing development objectives.
- Performance and operational capability of systems, subsystems, components, and equipment.
- Verifying design requirements.

12.1.1. Test safety review does not apply to the following:

- Routine operational tests after maintenance.
  - TOs (e.g., aircraft functional check flights, normal use of laboratory test equipment required by standard laboratory procedure, or troubleshooting equipment malfunctions).
- Test beds or facilities, built or designed to perform special testing repetitively provided
- Mil-Std-882 analyses document the facility, equipment design and operating procedures.

12.1.2. OO-ALC testing organizations will submit waiver requests through the OO-ALC/SE office before AFMC review. OO-ALC/SE will forward to HQ AFMC/SE.

12.2. Coordinate tests, managed and conducted by Hill AFB testing organizations, with other agencies test safety office when involving personnel, facilities, or equipment of that agency or contractor. To ensure identification and control of hazards the appropriate authority or designee will review test procedures when their organizational personnel, facilities, or equipment supports another agency or contractor's test.

12.2.1. Use the *OO-ALC Form 518, Test Project Safety Review*, and *OO-ALC Form 519, Test Hazardous Analysis (THA)*, or similar approved, for all safety reviews.

12.3. The Test Organization Commander is OO-ALC/CC.

12.3.1. OO-ALC/SE is the primary Test Organization Safety Office responsible for directing the test safety program. OO-ALC/SE/SES will chair or delegate SRBs.

12.3.2. Directorates will develop OO-ALC/SE approved Operating Instructions (OI) to implement this supplement.

12.3.3. Safety review authority determines final review by a single test safety individual or formal Safety Review Board (SRB). OO-ALC/SE, at its discretion, may use another organization Safety Review Board process. For all tests, use criteria in *AFI 91-202/AFMC Sup 1*. Directorate safety staff or designee is the safety review authority for all other tests provided they develop specific OIs to implement this supplement. Coordinate test and safety plans with OO-ALC/SE, 10 workdays before testing and before final safety review, when appropriate.

12.3.4. Assistance must meet the intent of independent review. Under no circumstances will safety review authorities develop the safety plan.

12.3.5. When at other installations. Tenant test activities will ensure coordination with OO-ALC/SE when appropriate. In all cases, tenants will ensure formally trained weapons/explosives specialists/engineers make determinations as to whether or not OO-ALC/SE requires Test Plan coordination and approval.

12.3.6. When required, the safety review authority will involve all applicable support agencies. Agencies included, but not limited to are: industrial safety, system safety, explosive safety, health, environmental, and fire department.

12.3.7. Air Force Institute of Technology (AFIT) WCIP 057 System Safety Management Course trained personnel should develop or review test hazard analyses (THA) and advise the safety review authority.

12.3.8. Contact the safety review authority.

12.3.9. Involve the appropriate system safety staff in test safety planning when necessary.

12.3.10. The test manager or planner will become thoroughly familiar with this supplement.

12.3.11. Ensure the THA addresses all aspects of test conduct before final safety review and endorsement by appropriate authorities.

12.3.12. The appropriate authority will assure the intent of independent review, before endorsing the final test plan.

12.4. Test Safety Review Process. The test safety review process consists of these main functions: plan, review, coordination and approval, execution, safety revisions, feedback and test completion or termination. All test programs (ground, flight, space, etc.) will follow this process through the life of the program. Test safety success depends on early and continuous involvement of the test safety personnel. Safety's early involvement as an integral member in test planning may mitigate cost or schedule impacts to the test program.

12.4.1. When modifying approved or developing new test plans or OIs affecting safety, the test manager will involve OO-ALC/SE.

12.4.2. Use the safety order of precedence in *Mil-Std-882*, Current version to eliminate or control hazards.

12.5. Safety Plan/Solution Documentation. The following documents comprise the elements of the safety plan:

12.5.1. Test Hazard Analyses (THA). These are prepared during the test-planning phase and finalized during the safety review. Paragraph 12.13. of this publication describes the content of a THA.

12.5.2. Final Safety Review Documentation. This information provides a summary of the safety review. The SRB minutes may suffice if a formal board met. This information will include, but is not limited to:

12.5.3. Date.

12.5.4. Test or project identifier.

12.5.5. SRB attendees or individuals who coordinated on the safety plan/solution if an SRB was not convened.

12.5.6. Mishap accountability.

12.5.7. Specific minimizing procedures, controls, restrictions, and go/no-go lists.

12.5.8. Special considerations.

12.5.9. Action items.

12.5.10. Overall risk assessment.

12.5.11. Other supporting documentation. The Test Safety Plan will include an endorsement, from the Project Engineer, certifying Condition Code (CC) – J assets safe to test. Include Condition Codes on *OO-ALC Form 518* under salient features in Section IV, paragraph 3, “Test Item Description” for each test.

12.6. Each test plan is subject to separate technical and safety reviews. Technical review guidance for flight tests is in *AFMCPD 99-1, Test and Evaluation (T&E) Risk Management*. For other tests where there is no requirement for a formal technical review, the test safety office will determine when the technical adequacy of the plan is sufficient to continue with the safety review. The final safety review takes place after test plan approval. Safety review authorities will stipulate membership in their local OIs. At a minimum, OO-ALC/SE divisions, at their discretion, will be members of all SRBs. In all cases, directorates will ensure an AFIT trained System Safety Program Manager (SSPM) advise the board.

12.6.1. When a test is ready for a safety review, Center test safety determines if an SRB is required based on the scope, complexity, similarity to previous tests, and anticipated risk level. Attach documentation of the SRB results to the test plan. Resolve action items before issuing of SRB minutes; however, document them for lessons learned. The minutes will recommend to the appropriate authority whether or not to execute the test.

12.6.2. OO-ALC/SE coordinates on all test safety review activities before appropriate authority endorsement.

12.7. Coordination/Approval.

12.7.1. Provide the test plan and supporting safety documentation to the safety review authority. Allow at least 5 working days for this safety review. If not using the *OO-ALC Form 518* and *OO-ALC Form 519*, append a signature cover page to the test plan. Cover page will include coordination signatures for all SRB members, Test Organization Safety Office representative, and appropriate authority.

12.7.2. OO-ALC/SE will coordinate on all test activities prior to final safety review and appropriate authority approval for all but low risk, non-explosive, and non-propellant testing.

12.7.3. The review authority SSPM will ensure the THA covers all aspects of test conduct.

12.7.4. Appropriate authority for high-risk tests will be OO-ALC/CC and Wing Commanders or Directors for medium-risk. Appropriate authority for all low risk tests will be Squadron Commander or designee.

12.8. The test planner/manager is responsible for reviewing the safety plan/solution and ensuring all applicable requirements are in 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.

12.8.1. Conduct the test according to the approved test and safety plans. Changes to either of these plans will require further safety review. Changes may occur because of unexpected test results, overly restrictive controls, test program initiated changes, or hazards not previously identified or adequately controlled.

12.8.2. Category I or II potential hazards. To verify new ammunition, explosives, or propellant test procedures accomplish a "dry run or walk through" using simulated or inert items. Considering the hazards identified in the THA, incorporate emergency procedures in the test plan.

12.9. Center Test Safety is the safety review authority. In all cases coordinate revisions with appropriate OO-ALC/SE division when applicable.

12.10. Periodic test and safety plans will receive a complete review at least annually. Exceptions to the Annual review are for those "periodic" tests that occur infrequently (e.g., review 2-3 years). Instead of an annual review, test and safety plans will receive a thorough review at least 30 days before the actual test. Test engineer or director will review plan for technical adequacy and the directorate safety representative will review safety plan for adequacy. There is no restriction on amendments allowed to a safety plan. However, other safety review authorities must approve changes, in consultation with OO-ALC/SE if required. This may require reconvening of SRB before conducting test.

12.11. The test manager notifies test safety when the test is complete. Notification includes any safety lessons learned, effectiveness of hazard controls or minimizing procedures, unexpected hazards, value added from the safety review process, and suggestions for improving the safety review process. The notification can be in several forms from a telephone call to a formal report. Document the action for future use as a lessons learned.

12.12. Coordinate all deviations, to this supplement, with OO-ALC/SE before appropriate authority endorsement. Non-OO-ALC organizations wanting to use OO-ALC facilities for

testing will comply with this supplement. In all cases, OO-ALC/SE will direct test safety activities.

12.13. THA Format. This identifies the test unique hazards and the actions necessary to minimize or control them. A THA includes the following information:

12.13.1. Test Title. Provide information concerning test identification to relate this specific THA to a specific test or test series.

12.13.2. Hazard. This is the condition or situation having the potential to result in a mishap or accident. It is a condition or situation that precedes or accompanies the unplanned, uncontrolled release, transfer, or dissipation of energy (e.g., kinetic, potential, chemical, laser, nuclear, and electrical, etc.) The statement describes the condition or situation, not the mishap itself.

12.13.3. Cause. A cause is the circumstance or action that leads to the hazard's occurrence. It may be a failure mode, operator error, or out-of-limit condition. A hazard may have multiple causes. Identify each.

12.13.4. Effect. This is the mishap or accident to avoid. A result that identifies who or what resources injured, damaged, or destroyed if the hazard occurs.

12.13.5. Controls/Minimizing Procedures. Explain the actions to be taken (e.g., remove, mitigate, or warn of the existence of a hazard cause) to prevent the hazard from occurring. Use *Mil-Std-882, Section 4, General Requirements*. Failure to consider the negative impact implied for test planning results in "likely" probabilities of serious injury, death, and/or total system loss.

12.13.6. Corrective Actions/Emergency Procedures. Steps used to recover from a hazardous situation, or to limit the extent of the injury or damage due to a hazard that is occurring.

12.13.7. Comments. Additional considerations.

12.13.8. Hazard Category. Use the category definitions established by the Risk Assessment Matrix shown in the *AFMC Supplement* and *MIL-STD-882*.

12.13.9. Hazard Probability. Use the probability definitions established in the Risk Assessment Matrix shown in the *AFMC Supplement* and *MIL-STD-882*. The probability must consider that the hazard may have multiple dependent or independent causes.

12.13.10. Risk Level. Assigning a residual risk level is a prime purpose of the THA process and this form. The residual risk level (high, medium, low, etc.) is arrived at by determining the hazard category and hazard probability using a matrix similar to the one shown in the *AFMC Supplement*. The hazard category for a test-specific hazard is easily established; however, assignment of the hazard probability can be highly subjective, and is at the very heart of risk

assessment. It is here that considerable insight, experience, and engineering judgment come into play.

12.13.11. The THA will consider all engineering and industrial performance (e.g., setup, maintenance, servicing, storage, transportation, etc.) aspects of test activity having potential causal factors leading to a mishap.

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