



AF 9100:2026

Aerospace Quality Management System

TECHNICAL PROFILE BOOK

Propulsion, Energy Storage and Hazardous Interfaces — Technical Application Book

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Publication identity and application

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Use and document-control boundary

This companion implements the supplied AF 9100 requirement basis without changing the original standard. Its process allocation, examples, checklists and record design are authored implementation material. Actual mission or product limits, specialist procedures, permissions and genuine observations must be completed before consequential use. Applicable source minima and independent decision conditions cannot be reduced by this companion.

The printed edition date identifies the companion series; it is not evidence that later preparation, review or operational decisions occurred on that date. New support codes in this set are proposed allocations for controlled registration. Established AF-IG-9100-001, AF-FAQ-9100-001 and AF-TR-9100-001 identities are retained; earlier files, the corporate master list and ASTRA codes are not overwritten.

Equivalent combined or digital records are permitted when all required fields, relationships, authority and history remain intact. A completed PDF field or typed name is not evidence of an authenticated approval. Blank records in this delivery contain no invented applicant, signature, event or result.

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Select actual scope → complete application criteria → use the applicable procedure and technical book → capture authentic evidence → evaluate every applicable condition → obtain the required independent decision. Document availability does not establish implementation or conformity.

1 Scope, responsibility and source priority

Assurance of coupled energy architecture, batteries, chemical and hydrogen interfaces, rotating machinery, protective functions and separately authorized hazardous tests.

Boundary	Required implementation decision
Object and route	Identify ORG, PRD, SVC, PRC, PER, SUB or CAB separately. Combined records do not merge outcomes.
Activity	Apply source technical modules by performed or retained responsibility, including relevant outsourced work.
Authority	Technical release, employer task permission, independent attestation and statutory authorization remain distinct.
Source priority	AF 9100:2026 and all compatible binding obligations control. This companion does not import ASTRA programme rules or external normative schemes.

2 Technical profile and prospective parameter completion

Architecture; operating/storage duty; material compatibility; containment; degradation; critical part life; protection criteria; actual specialist test authority

Parameter record	Content required before evaluating results
Identity and trigger	Stable criterion ID, source anchor, owner, actual object, phase, mode and reason it applies.
Limit or attribute	Value/range with compatible units and boundary convention, or an observable state with every essential step.
Technical basis	Actual environment, duty, consequence, derivation, qualified evidence and relevant approval.
Method and representation	Inspection, analysis, demonstration or test; method version, article/population, configuration and validity limits.
Uncertainty and decision	Corrections, model, covariance, coverage, pre-agreed rule, sample/scoring logic and hold conditions.
Authority and change	Technical and independent approvals, actual effectivity, preserved earlier basis and reopening triggers.

The fields above are completed for the actual application. A blank limit, undefined domain or unvalidated method prevents the dependent claim; the book deliberately does not invent one severity, tolerance or task threshold for unrelated applications.

3 Subject-by-subject implementation

19.1 — Energy-system boundary and coupled hazards

Source p. 37; complete conditions reproduced in Appendix A.

Implementation record: Energy-system architecture; integrated hazard analysis; lifecycle controls; specialist approvals.

Application check: Review every source clause and normative annex against actual activity and retained outsourced responsibility. Record affirmative triggers and reasoned exclusions; lack of resources, a small workforce or another certificate is not an exclusion rationale.

Review boundary: An undefined object, unjustified exclusion or unresolved essential criterion holds admission or acceptance. Record each source condition separately in the linked checklist and preserve approved exclusions.

19.2 — Electrical storage and battery systems

Source p. 37; complete conditions reproduced in Appendix A.

Implementation record: Battery configuration; qualification basis; life and condition data; protection verification; reuse assessment.

Application check: Review every source clause and normative annex against actual activity and retained outsourced responsibility. Record affirmative triggers and reasoned exclusions; lack of resources, a small workforce or another certificate is not an exclusion rationale.

Review boundary: An undefined object, unjustified exclusion or unresolved essential criterion holds admission or acceptance. Record each source condition separately in the linked checklist and preserve approved exclusions.

19.3 — Hydrogen, fuels and chemical-energy systems

Source p. 38; complete conditions reproduced in Appendix A.

Implementation record: Compatibility assessment; containment and protection evidence; supply controls; authorized procedures.

Application check: Review every source clause and normative annex against actual activity and retained outsourced responsibility. Record affirmative triggers and reasoned exclusions; lack of resources, a small workforce or another certificate is not an exclusion rationale.

Review boundary: An undefined object, unjustified exclusion or unresolved essential criterion holds admission or acceptance. Record each source condition separately in the linked checklist and preserve approved exclusions.

19.4 — Propulsion and rotating-machinery assurance

Source p. 38; complete conditions reproduced in Appendix A.

Implementation record: Operating-envelope basis; critical-part genealogy; qualification and acceptance; life-management records.

Application check: Review every source clause and normative annex against actual activity and retained outsourced responsibility. Record affirmative triggers and reasoned exclusions; lack of resources, a small workforce or another certificate is not an exclusion rationale.

Review boundary: An undefined object, unjustified exclusion or unresolved essential criterion holds admission or acceptance. Record each source condition separately in the linked checklist and preserve approved exclusions.

19.5 — Hazardous tests and emergency preparedness

Source p. 38; complete conditions reproduced in Appendix A.

Implementation record: Test safety review; readiness approval; abort rules; anomaly evidence; restart and reuse decisions.

Application check: Define protected test environment, expected outcomes, stop controls and evidence. Include supplier loss and compromise of technical records, not only discussion of an ideal scenario.

Review boundary: Availability restored without required integrity or protective evidence does not authorize assured use. Record each source condition separately in the linked checklist and preserve approved exclusions.

4 Representative evaluation and adverse evidence

Risk, Criticality, Hazards and Residual Acceptance

Witness or trace: Convert each relied-upon mitigation into a controlled requirement with an owner, acceptance condition and verification. Examine whether a human action has enough time and information to work.

Synthetic challenge: An expensive support cart is classified C0 because it is not flight hardware. Reassess actual human exposure and credible unintended movement. Use consequence rather than equipment label;

require the corresponding technical review and protective evidence.

Verification Campaigns, NDT and Test Reporting

Witness or trace: Capture raw inputs and responses, conditions, operator, method version, deviations, interruptions and alarms. Label simulated or model-derived results and expose inaccessible features.

Synthetic challenge: One NDT demonstration detects an easy reference flaw and is claimed to prove all installed defects are detectable. Restrict the conclusion to the demonstrated material, geometry, access and technique. Establish representative defect and statistical evidence before a broader detection claim.

Continuity, Emergency Interfaces and Assured Recovery

Witness or trace: Record real event chronology, affected configurations and outputs, original evidence and required notices. Keep protective operations distinct from investigation and public status administration.

Synthetic challenge: An exercise meets RTO 4 h and RPO 1 h but loses a configuration link. Record the time objectives as met and assured use as held. Correct and repeat the relationship check before accepting recovery.

5 Interface records, decisions and continuing use

Record	Required implementation purpose
AF-FR-9100-014	Risk, Hazard, Criticality and Residual Decision
AF-FR-9100-016	Design, Interfaces, Gates and Engineering Budgets
AF-FR-9100-023	Sample, Verification Campaign and Technical Report

Qualification, instance acceptance, current operating capability and independent attestation retain separate evidence and decisions. A new site, material, supplier, digital load, use environment or duty requires a relevant difference and requalification review. No previous result transfers automatically because the name is unchanged.

Appendix A — Controlling source and evidence

Source: AF 9100:2026, Aerospace Quality Management System, FIRST EDITION, 29 September 2026; supplied 131-page PDF. Source page references below locate the original publication. These excerpts are read with the complete applicable standard; local implementation sequences do not replace it.

19.1 Energy-system boundary and coupled hazards

SOURCE p. 37 | Normative when applicable

19.1(a) The organization shall assess energy generation, storage, conversion, distribution and isolation as an integrated system. Mechanical, thermal, electrical, chemical and control-system interactions shall be considered under normal and credible abnormal conditions.

19.1(b) Energy budgets, protection, degradation and support interfaces shall be traceable to requirements. The assurance plan shall address transport, storage, charging or fueling, operation, maintenance and emergency response. Detailed hazardous procedures shall be approved by appropriately authorized specialists.

Required evidence: Energy-system architecture; integrated hazard analysis; lifecycle controls; specialist approvals.

19.2 Electrical storage and battery systems

SOURCE p. 37 | Normative when applicable

19.2(a) Battery assurance shall control cell and module provenance, configuration, manufacturing consistency, state estimation, electrical protection, thermal management and mechanical integration. The program shall define relevant operating and storage limits and the evidence supporting them.

19.2(b) Qualification shall address credible failure propagation, abnormal charging, damage, aging and environmental exposure within the applicable technical basis. Service decisions shall consider actual history and condition. Reuse or second-life application shall require a new suitability assessment; history shall not be erased.

Required evidence: Battery configuration; qualification basis; life and condition data; protection verification; reuse assessment.

19.3 Hydrogen, fuels and chemical-energy systems

SOURCE p. 38 | Normative when applicable

19.3(a) The organization shall define material compatibility, containment, leak detection, isolation, ventilation, ignition control and emergency interfaces appropriate to the system. Supply quality and contamination shall be controlled where they affect safety or performance.

19.3(b) Test, maintenance and fueling procedures shall specify authorized personnel, boundaries and acceptance criteria under the applicable engineering basis. Alternative fuel claims shall identify compatibility and limitations; sustainability evidence shall not be interpreted as proof of technical interchangeability.

Required evidence: Compatibility assessment; containment and protection evidence; supply controls; authorized procedures.

19.4 Propulsion and rotating-machinery assurance

SOURCE p. 38 | Normative when applicable

19.4(a) Propulsion and rotating equipment shall have controlled requirements for operating envelope, life, materials, balance, lubrication, thermal behavior, control and protective functions as relevant. Critical parts and process histories shall be traceable.

19.4(b) Qualification and acceptance shall address the intended duty and credible degradation. Changes affecting speed, load, control logic, materials or interfaces shall be assessed against the approved basis. This clause establishes assurance responsibilities and does not prescribe propulsion design parameters.

Required evidence: Operating-envelope basis; critical-part genealogy; qualification and acceptance; life-management records.

19.5 Hazardous tests and emergency preparedness

SOURCE p. 38 | Normative when applicable

19.5(a) Tests involving hazardous energy shall have a documented safety review, approved boundaries, instrumentation, protective arrangements, personnel authorization and emergency response. Test acceptance criteria and safety-abort criteria shall be distinguished.

19.5(b) After a test anomaly or protective-system intervention, restart shall require an authorized assessment. The organization shall preserve data and inspect affected equipment or articles before reuse. Lessons shall be incorporated into subsequent test readiness.

Required evidence: Test safety review; readiness approval; abort rules; anomaly evidence; restart and reuse decisions.

M.1 Verification-method and acceptance planning

SOURCE p. 73 | Normative when applicable

M.1(a) The organization shall identify the requirement, method, configuration, conditions, equipment, data, uncertainty, acceptance rule and responsible reviewer for each verification activity. Acceptance and abort criteria shall be defined before execution.

M.1(b) The test basis shall justify environmental profiles and margins using the actual duty, applicable technical requirements and limitations of the test article. This standard does not prescribe a single vibration, shock, fire, thermal-vacuum, EMC or load profile for every product.

M.2 Anomalies, retest and evidence exclusion

SOURCE p. 73 | Normative when applicable

M.2(a) Test anomalies shall be recorded with actual conditions and potential effects on validity. The decision to repeat, modify or exclude a result shall be technically justified and approved. All original results shall remain traceable.

M.2(b) Retesting after a repair or software change shall identify the changed configuration and the extent of regression needed. Repeating only the previously failed check shall not be sufficient when the change can affect other requirements. A pass after uncontrolled tuning shall not be represented as the result of the original plan.

M.3 Qualification by similarity and analysis

SOURCE p. 74 | Normative when applicable

M.3(a) Use of similarity shall identify the reference article, verified evidence, differences and their effects on relevant failure mechanisms. The organization shall demonstrate that the prior evidence bounds the new configuration and conditions.

M.3(b) Analysis-based acceptance shall record the model, assumptions, validation, uncertainty and sensitivity. An independent reviewer shall be able to reproduce material calculations from the retained inputs. Unsupported similarity statements shall remain open evidence gaps.

Source tables — complete field and decision payloads

Table M-1 — Test-plan and report data requirements

Source p. 73 | Required structure when applicable

Area	Required content
Identity	Program; requirement IDs; test/report IDs; revision; article serial/lot; hardware/software configuration.
Objective	Claim being evaluated; acceptance criteria; excluded claims; required confidence or coverage.
Method	Procedure; setup; sequence; conditioning; instrumentation; sampling; data processing; approved deviations.
Environment	Relevant physical conditions, profiles, tolerances, duration, interfaces and monitoring locations.
Measurement	Equipment identity, calibration, range, resolution, uncertainty, correction and decision rule.
Safety and authority	Test authorization, hazards, limits, abort criteria, emergency arrangements and responsible personnel.
Execution	Actual date/time, performer, observations, raw data, environmental records, anomalies and interruptions.
Analysis	Calculations, software/tools, assumptions, exclusions, uncertainty, comparison with criteria and limitations.
Review	Technical review, independent review when required, anomaly disposition and authorized conclusion.
Retention	Raw and processed data, configuration, photographs where useful, records location, access and retention.

Table M-2 — Qualification-domain matrix

Source p. 73 | Required structure when applicable

Domain	Program-specific basis to establish	Evidence limitations to address
Mechanical / structural	Loads, dynamics, fatigue duty, attachment, shock/vibration and structural acceptance.	Boundary conditions, scaling, article representativeness and cumulative damage.
Thermal / climatic	Temperature, humidity, icing, dust, salt, altitude and cycling as applicable.	Dwell, gradients, condensation, combined environments and service duration.
Space environment	Vacuum, thermal balance/cycling, radiation, charging and contamination.	Mission equivalence, dosimetry, material behavior and inaccessible damage.
Electrical / EMC	Power quality, transients, emissions, immunity, grounding, ESD and relevant external fields.	Installation effects, cable configuration, modes, frequency coverage and failure criteria.

Domain	Program-specific basis to establish	Evidence limitations to address
Fire / hazardous energy	Applicable ignition, containment, propagation, smoke or emergency requirements.	Scale, ventilation, material state, energy inventory and authorized facility capability.
Software / digital	Requirements, interfaces, timing, robustness, security and configuration.	Coverage, target equivalence, systematic defects and tool limitations.
AI / autonomy	Domain, scenario coverage, data quality, performance, fallback and intervention.	Distribution shift, rare conditions, confidence and authority boundaries.
Human-system / operations	Representative users, tasks, workload, emergency and maintenance conditions.	Participant representativeness, learning effects and simulated-environment limits.

Appendix B — Local implementation and release

Readiness condition	Evidence before consequential use
Authority and responsibility	Actual legal operator, owner, competent technical authority, independent reviewer and permitted result class are recorded.
Scope and criteria	Object, configuration, site, period, trigger, every technical value or observable attribute, units and prospective approval are complete.
Evidence and methods	Original accessible evidence, representative observations, valid methods, uncertainty, adverse cases and limitations support the intended conclusion.
People and independence	Competence is current for each task; genuine conflicts, relevant prior work and needed separation have been checked.
Records and tools	Field meanings, unique IDs, original history, access, retention, recovery and actual deployed workflows have passed local validation.
Decision and public use	All relevant blockers are resolved; required independent decision and written permissions precede the exact public claim.
Continuity and handover	Receiving custody, unresolved duties, corrections and historical decisions survive transfer, retirement or provider closure.

Record the completed local readiness and actual authorization in AF-FR-9100-032 or an equivalent controlled record. Preserve the unchanged source standard and each earlier decision basis. A blocked activity may continue only within a genuinely permitted development boundary, not as a provisional conformity certificate.