



AF 9300

Aerospace Testing, Verification & Qualification

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Document identity and authority

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Use of this publication

AF 9300 defines evidence, process and decision controls for aerospace testing, verification and qualification. It does not supply universal product test levels or statutory permissions. Actual numerical profiles, methods, acceptance criteria and authorities are completed for the declared programme.

Annexes Q-V contain synthetic calculations, cases, diagrams, implementation routes, questions and navigation. Their numbers and example outcomes are not default requirements or records of actual tests.

Supporting documents provide implementation models and blank controlled records. A template, typed name or completed checklist does not establish an authenticated approval, AF recognition or an operational authorization.

Reader route and decision boundaries

1 Define the question

Use Clauses 0-6 and Annexes A-D to define the object, requirement, intended conclusion and complete decision parameters.

2 Establish a credible test basis

Use Clauses 7-12 and Annexes E-H for article pedigree, method/facility capability, metrology, uncertainty and trustworthy digital evidence.

3 Authorize and control execution

Use Clauses 13-15 and Annexes I-K for readiness, protective conditions, actual observations, anomalies, retest and technical review.

4 Demonstrate the claim

Use Clauses 16-19 and Annex L for statistical or modeled evidence, design/process qualification and item/lot acceptance.

5 Apply the relevant disciplines

Select Clauses 20-27 according to actual environmental, mechanical, structural, electromagnetic, energy, material, digital and human/operational activities.

6 Maintain validity

Use Clauses 28-32 and Annexes M-P for external evidence, bounded reports, change, requalification, assurance and publication control.

Decision boundary: Test completion, evidence validity, requirement conformity, qualification and operating permission are distinct states. No score compensates for an unresolved mandatory condition.

Contents - clauses and annexes

Entries and PDF bookmarks locate the controlled clauses and annexes. Page references apply to this file.

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0 Introduction and intended outcomes

AF 9300 establishes a controlled basis for aerospace testing, verification and qualification. Its purpose is to connect a question that must be answered with a defined article, a suitable method, a representative exposure, trustworthy observations and an authorized conclusion. A successful test run is useful only when the resulting evidence answers the intended question within its declared limitations.

0.1 The evidence-to-decision chain

(a) The organization shall preserve traceability from the originating need and requirement through verification strategy, test specification, article configuration, facility and measurement chain, raw observations, processing, uncertainty, evaluation and final disposition. Each link shall have a controlled identity and accountable owner.

(b) The organization shall distinguish whether evidence concerns a design, an individual item, a manufacturing population, a process, a software baseline, an operating scenario or a provider capability. Evidence shall not migrate between these objects without an explicit equivalence assessment.

(c) Testing, analysis, inspection and demonstration may be combined. The selected combination shall cover the requirement and its interfaces; a convenient method shall not replace an essential observation merely because it produces a favorable outcome.

0.2 Four distinct questions

Table 0-1. Decision purposes

Purpose	Question addressed	Boundary
Verification	Does the defined object satisfy its specified requirements?	The requirements, configuration and conditions examined.
Validation	Does the defined solution satisfy its intended use and stakeholder need?	The users, tasks, environment and operational scenarios represented.
Qualification	Has the design or process demonstrated suitability for a declared envelope and lifecycle?	The qualified configuration, exposures, mechanisms and supporting argument.
Acceptance	Does this identified item or lot meet the conditions for receipt or release?	The serial number or population and the acceptance plan actually applied.

Qualification shall not by itself accept every subsequently produced item. Acceptance screening shall not be represented as design qualification. Validation shall not be inferred solely from compliance with a poorly specified requirement. A report, qualification decision and operational authorization are separate controlled outputs.

0.3 State separation

Evidence shall be classified as proposed, collected, validated for processing, technically accepted for a stated use, rejected, superseded or withdrawn as appropriate. Requirement evaluation shall use PASS, FAIL, HOLD or approved N/A. These states shall not be inferred from a file upload, a completed execution or an administrative signature.

A test execution shall separately record NOT STARTED, READY, RUNNING, PAUSED, ABORTED or COMPLETED. A completed execution can produce invalid data, a valid failure or an indeterminate result. A qualification claim shall separately record NOT ESTABLISHED, QUALIFIED WITHIN SCOPE, SUSPENDED, SUPERSEDED or WITHDRAWN.

0.4 Language and status

Shall identifies a proposed requirement. Should identifies guidance. May identifies a permitted option. Notes, synthetic examples and worked calculations are informative unless an explicit normative condition identifies otherwise. The document is an original FIRST EDITION manuscript prepared for Aerospace Federation review. Approval and effective dates are not asserted.

Proportional implementation is permitted, but no proportionality argument shall erase traceability, competence, valid methods, safe execution, honest uncertainty, adverse results or eligible decision authority. Annex P defines the proposed publication-control process.

Required evidence: One complete evidence chain with object identity, method, actual observations, validity review and a bounded conclusion.

Decision control: Missing linkage between the tested object and the claimed object prevents the dependent claim.

1 Scope and application boundaries

1.1 Activities and organizations

This standard applies to organizations planning, procuring, performing, reviewing or relying on aerospace tests and associated verification or qualification evidence. It includes in-house and independent facilities, laboratories, design and manufacturing organizations, integrators, maintenance providers, software teams, model developers, test ranges and programme authorities within their actual responsibilities.

The subject matter includes aviation, unmanned and autonomous systems, space systems and ground support, defense aerospace, critical subsystems, materials, manufacturing processes, digital systems, human-system interfaces and supporting infrastructure. Applicability follows the work performed and the responsibility retained; the name or size of the organization does not determine the required controls.

1.2 Objects and levels

(a) The organization shall define the object of each evaluation and its level: material or coupon, component, equipment, subsystem, integrated system, service, process, software or model. The evaluated configuration shall include relevant hardware, software, firmware, data, interfaces and support equipment.

(b) Lower-level evidence may support a higher-level conclusion only where integration effects, interface assumptions and the remaining verification gap are identified and addressed. An assembly of qualified components is not automatically a qualified integrated system.

(c) A provider-capability evaluation shall identify the methods, ranges, sites, equipment, personnel and decision functions examined. Capability at one facility or range shall not be generalized to another without supporting evidence.

1.3 Included lifecycle

The programme shall consider development, design qualification, production acceptance, installation, commissioning, modification, maintenance, repair, storage, transport, reactivation and retirement where these affect the claim. It shall address nominal, boundary, transient, degraded and abnormal conditions required by the intended use.

Development evidence may be reused when its configuration, controls and records satisfy the intended formal use. Retrospective relabeling of an uncontrolled experiment as a qualification test is prohibited. Gaps shall be closed by documented additional work or shall remain unresolved.

1.4 Limits and retained duties

AF 9300 does not grant airworthiness, flight, launch, range, facility or hazardous-work permission. Applicable legal, competent-authority and contractual conditions remain independently binding. The standard does not prescribe universal vibration levels, temperatures, life factors, sample sizes or qualification margins for all products.

An organization shall identify which design, acceptance and operational decisions it is authorized to make. Outsourcing a measurement or test does not transfer the receiving organization's retained responsibility for the use of that evidence.

Required evidence: Approved object and lifecycle statement, responsibility boundaries, sites, interfaces and applicable technical modules.

Decision control: An undefined object, unsupported exclusion or absent permission blocks the affected work or conclusion.

2 Applicability, precedence and programme parameters

2.1 Activity-based application

Clauses 0-19 and 28-32 form the common control framework, applied according to actual responsibility. Clauses 20-27 add technical controls when their activities or dependencies are present. Annex A provides the selection matrix. Cross-cutting digital, metrology, data and safety duties apply even when the primary test discipline is different.

The organization shall document every N/A determination by absent activity or responsibility, supporting evidence, reviewer and change trigger. Unavailable evidence, outsourced work or lack of equipment are not grounds for N/A. A programme shall identify which duties belong to the customer, laboratory, article owner and qualification authority.

2.2 Precedence and conflicts

Applicable obligations, the approved requirement baseline, the declared AF 9300 criteria and programme commitments shall be satisfied together. A conflict shall be recorded and referred to the authorities responsible for the conflicting requirements. The laboratory shall not silently choose the least demanding condition.

The controlled standard governs supporting templates within its declared scope. A local procedure may impose additional controls. It shall not convert a failed mandatory requirement into PASS or conceal a deviation from an agreed method. A commercial concession shall be reported separately from technical conformity.

2.3 Parameter completion

Before a dependent decision, the programme shall complete every applicable parameter in Annex B, including units, numerical or categorical value, technical basis, uncertainty treatment, owner, approver, validity and review trigger. The parameter set shall distinguish the product limit, commanded test target, allowed test-control tolerance, measurement uncertainty and protective trip threshold.

An unresolved parameter shall be linked to the decisions it blocks. A schedule date, equipment default, previous programme or illustrative example does not supply an approved value. Conservative assumptions require a demonstrated direction of conservatism for the actual failure mechanism.

2.4 Tailoring and equivalence

Tailoring shall identify the original condition, proposed implementation, rationale, affected mechanisms, evidence, residual gap and authorized agreement before use. A change in method, specimen or facility shall be assessed for equivalence at the level of the resulting conclusion, not merely similarity of equipment names.

The responsible authority shall reject equivalence where an essential mechanism is unrepresented, uncertainty is unbounded, article history is unknown or the proposed method cannot observe the relevant failure. Unresolved equivalence remains HOLD.

Required evidence: Applicability matrix, obligation register, completed parameter profile and signed scope of any agreed tailoring.

Decision control: A missing essential decision parameter or unresolved precedence conflict prevents release of the affected activity.

3 Terms, quantities and interpretation

3.1 Core technical terms

Table 3-1. Defined terms

Term	Meaning in this standard
Test article	The identified physical or digital object presented for the activity, including its relevant configuration and history.
Measurand	The quantity intended to be measured, with its conditions and definition sufficiently specified.
Test specification	The controlled statement of purpose, article, conditions, sequence, observations, criteria and required records.
Test procedure	The executable instructions implementing the specification in a particular approved arrangement.
Verification matrix	The controlled mapping of individual requirements to methods, levels, evidence and dispositions.
Qualification envelope	The bounded set of configuration, environment, duty, life and interface conditions supported by a qualification decision.
Acceptance limit	A boundary used to decide conformity under a stated decision rule; distinct from a protective equipment trip.
Measurement uncertainty	A parameter or interval describing the dispersion of values reasonably attributable to the measurand under the stated model.
Representativeness	The justified relationship between the specimen or scenario and the object or population about which a claim is made.
Guard band	An intentional separation between an acceptance boundary and a specification boundary under a declared decision rule.

Term	Meaning in this standard
Anomaly	An unexpected observation or departure requiring evaluation; it is not automatically an article failure or a laboratory error.
Retest	A further execution with an explicit purpose and retained linkage to the prior run, findings and changes.
Requalification	Evidence and decision work needed to re-establish a qualification basis after a relevant change or loss of validity.

3.2 Quantity conventions

Quantities shall identify units, reference conditions, sign conventions, coordinate systems, bandwidths and time bases where relevant. A logarithmic quantity shall identify whether it represents an amplitude or power ratio and the reference. A spectrum shall identify one-sided or two-sided representation and its density units.

The programme shall distinguish repeated measurements, independent specimens, independent demands, exposure time and lifecycle cycles. These are different statistical denominators. A numerical value without its applicable unit, population and condition shall not support a decision.

3.3 Decision meanings

PASS means the complete applicable criterion is demonstrated using evidence accepted for that purpose. FAIL means an applicable criterion is demonstrated not to be met. HOLD means the criterion or the necessary evidence or authority is unresolved. Approved N/A means an applicability trigger or retained responsibility is absent, with an authorized rationale.

A measured result classified as indeterminate under the agreed uncertainty rule shall produce HOLD for the dependent conformity decision unless a separately approved rule defines a different explicit, reported conclusion. Neither uncertainty nor test-control tolerance shall be used as an undeclared allowance on the product requirement.

3.4 Abbreviations

Table 3-2. Abbreviations

Abbreviation	Meaning
DAQ	Data acquisition
EMC	Electromagnetic compatibility
HIL	Hardware-in-the-loop
NDT	Nondestructive testing
PSD	Power spectral density
RMS	Root mean square
TRR	Test readiness review
V&V	Verification and validation

Required evidence: Programme quantity dictionary and consistent state definitions in forms, software and reports.

Decision control: Ambiguous units, populations or states shall be resolved before the affected result is accepted.

4 Governance, competence and independence

4.1 Accountable roles

The organization shall appoint an accountable programme owner, technical authority, test director, article custodian, metrology owner, data owner and eligible reviewers and decision makers. Roles may be combined where competence, capacity and required independence remain demonstrated. Delegation shall state scope, limits, deputies and retained responsibility.

The technical authority shall approve methods and criteria. The test director shall control the authorized execution. The evidence reviewer shall determine whether results are valid for their intended use. The qualification authority shall make the bounded qualification decision. An administrative or purchasing approval shall not imply these technical decisions.

4.2 Competence and task authorization

Competence shall be demonstrated for the actual method, range, facility, software, hazard and decision role. The organization shall retain education or experience basis, observed performance, training, supervised practice, assessed limitations and authorization. Attendance alone shall not establish competence.

Authorization shall be reviewed after significant method or equipment change, extended absence, evidence of poor performance or an expired local currency condition. The programme shall provide suitable supervision and prevent access privileges from being treated as technical authority.

4.3 Impartiality and technical challenge

The organization shall identify interests, prior authorship, commercial incentives and reporting relationships that could impair objective review. Material conflicts shall be removed or controlled through a documented arrangement suitable for the consequence of the decision. The author of a material disputed result shall not be the sole final adjudicator of its validity.

Technical dissent shall be recorded with evidence, disposition and the deciding authority. Schedule or commercial pressure shall not suppress an adverse result. Independent review depth shall follow consequence, novelty, uncertainty and reliance on the evidence rather than document volume.

4.4 Communication and protective authority

Personnel shall have an accessible route to report unsafe conditions, evidence concerns and conflicts without retaliation for good-faith reporting. Every person shall be able to request protective intervention. Immediate safe action shall not await routine approval paperwork.

The test director shall maintain a single understood command structure during execution, including remote participants and external emergency interfaces. The authority to stop an activity and the authority to restart it shall be explicit and shall not be inferred from seniority alone.

Table 4-1. Separation of decisions

Decision	Eligible function	Minimum record
Readiness	Test director with technical and safety concurrence	Actual configuration, conditions, open items and scope of permission to test.

Decision	Eligible function	Minimum record
Result validity	Competent technical reviewer	Method, data quality, limitations and accepted purpose.
Requirement closure	Requirement owner and eligible reviewer	Criterion, evidence and PASS/FAIL/HOLD/N/A rationale.
Qualification	Designated qualification authority	Complete envelope, evidence dossier, restrictions and change triggers.

Required evidence: Role and authority schedule, competence records, conflict controls and decision signatures with scope.

Decision control: Missing eligible competence or an unmanaged material conflict prevents the affected review or authorization.

5 Programme definition and contract review

5.1 Intake and feasibility

Before commitment, the organization shall review the customer's intended conclusion, requirement baseline, article, population, requested conditions, delivery, access restrictions and report use. It shall confirm capability across range, uncertainty, facility limits, staff, schedule, equipment availability and subcontracted work.

A quotation or accepted order shall not be treated as technical feasibility approval. Unclear or conflicting criteria shall be resolved with the requirement owner. The organization shall disclose capability limitations and obtain agreement on any change to the requested method or scope.

5.2 Integrated test and qualification strategy

The programme shall identify the model or article philosophy, verification levels, methods, evidence reuse, sample allocation, environmental sequence, expected damage or life consumption and integration tests. It shall separate exploratory work, qualification, acceptance and operational validation purposes.

The strategy shall allocate responsibilities, dependencies, resources, witnesses, reviews and decision gates. It shall identify tests that can alter the article or invalidate later observations. Combined or sequential exposures shall be selected by relevant mechanisms and lifecycle conditions, with an explanation for omitted interactions.

5.3 Risk and assurance depth

The programme shall assess the consequence of a wrong conclusion, including false acceptance, false rejection and failure to detect a hazardous or mission-critical behavior. It shall consider novelty, representativeness, method maturity, measurement limitations, sample uncertainty and reliance on models or supplier evidence.

The resulting assurance plan shall define independent review, additional observations, replication, witness points and escalation. Higher assurance shall improve the evidence and decision controls; it shall not be represented solely by additional signatures on the same unsupported result.

5.4 Programme baseline and gates

The programme baseline shall include requirements, applicability, parameter profile, verification matrix, specifications, schedules and authority allocation. Changes shall follow Clause 30. Gate criteria shall identify the evidence required to proceed and the conditions that cannot be waived by an aggregate score.

Table 5-1. Programme gates

Gate	Required outcome	Blocking condition
Scope agreement	Defined object, purpose, criteria and retained duties	Ambiguous requirement or capability gap.
Method readiness	Suitable method, validated tools and representative arrangement	Unobserved mechanism or uncontrolled uncertainty.
Execution readiness	Article, facility, people, safety and data chain ready	Critical prerequisite unresolved.
Evidence acceptance	Complete, traceable and technically valid results	Missing raw evidence or unresolved anomaly effect.
Qualification decision	Supported envelope and declared limitations	Applicable FAIL or HOLD concealed or unresolved.

Required evidence: Contract review, approved programme plan, risk-based assurance allocation and gate records.

Decision control: A programme milestone shall not substitute for satisfaction of its technical exit criteria.

6 Requirements, methods and verification coverage

6.1 Requirement quality

Each requirement shall have a unique stable identifier, source, owner, applicable object, measurable or observable condition and acceptance criterion. Compound requirements shall be decomposed into independently evaluable conditions or shall retain explicit subcondition states. Vague terms such as adequate, robust or representative shall be converted into a reviewable criterion before closure.

The programme shall identify assumptions, inherited requirements and interface dependencies. A derived test criterion shall retain its relation to the originating need and design requirement. Changing the test criterion shall not silently change the requirement.

6.2 Verification matrix

The matrix shall identify the requirement baseline, verification method, level, stage, article or population, specification, evidence reference, result, reviewer and remaining gap. It shall show test, analysis, inspection and demonstration coverage separately where they contribute different parts of the conclusion.

Coverage percentages may be used for planning only. They shall disclose the denominator, applicable states and critical gaps. A high completion percentage shall not compensate for an unverified critical interface or any failed mandatory condition.

6.3 Method allocation and combination

The chosen method shall be capable of resolving the requirement under its relevant conditions. Analysis shall identify model limitations and empirical support. Inspection shall identify observable features and access limits. Demonstration shall identify conditions and objective observations. Test shall identify controllable inputs, measurements and decision criteria.

Where methods are combined, the programme shall explain how their uncertainties and gaps interact. Evidence derived from one common source shall not be counted as multiple independent confirmations. The absence of an observed fault in a limited demonstration shall not establish comprehensive reliability.

6.4 Closure and unresolved work

The requirement owner shall close a condition only after evidence is accepted for the correct object and purpose. The record shall retain adverse observations, deviations, assumptions, uncertainty and any restriction. Deferred work shall retain an owner, due condition and the decisions it blocks.

A concession or accepted departure shall remain visible as a separate authorization. It does not make the original requirement satisfied. Public or contractual claims shall identify the actual criteria met and shall not use a summary PASS to hide open FAIL or HOLD states.

Required evidence: Requirement-level verification matrix with explicit gaps, evidence links and independent closure of material conditions.

Decision control: Closure is prohibited when the only support is a test name, a report filename or an unreviewed supplier statement.

7 Test articles, sampling and configuration pedigree

7.1 Receipt and identity

The article custodian shall verify identity, quantity, serial or batch number, configuration, condition, accompanying data and chain of custody on receipt. Receipt discrepancies shall be recorded and protected from unapproved correction. The article shall be identified throughout storage, preparation, testing, movement and return.

The record shall include relevant software and firmware versions, parameter files, material and process pedigree, repairs, modifications, storage and transport history, prior exposures and life consumed. Unknown history shall be treated as a potential representativeness limitation.

7.2 Selection and representativeness

The sampling plan shall define the target population, selection mechanism, sample size, inclusion and exclusion rules, batch or unit independence, acceptance logic and limits of inference. Selection shall be completed before outcome-driven substitution is possible. Replacing a difficult or failing specimen requires a documented reason and preserved original disposition.

A design qualification article shall represent the relevant design and manufacture, including worst-relevant tolerances, interfaces and materials. The programme shall justify any surrogate, engineering model, coupon, scaled article or modified fixture. Repeated runs on one article shall not be counted as independent manufacturing specimens.

7.3 Preparation and preservation

Preparation shall follow controlled instructions and preserve the features under evaluation. Conditioning, cleaning, machining, assembly, lubrication, software loading and instrumentation attachment shall be recorded where they can affect the result. Reference measurements and photographs shall establish the pre-test condition where needed.

Storage and transport controls shall protect against contamination, electrostatic damage, moisture, mechanical load and configuration change as applicable. Access and intervention shall be recorded. A custody break shall trigger an assessment of identity and condition before continued use.

7.4 Tested-as versus claimed-as

The programme shall reconcile the tested configuration with the configuration named in the conclusion. Every difference shall have an effect assessment addressing mechanism, interfaces, uncertainty and remaining evidence. Similarity in part number or external appearance is insufficient.

The final article disposition shall identify damage, consumed life, restrictions, quarantine, destructive-test remains and permitted subsequent use. A qualification article subjected to extra stress shall not automatically be accepted for operational service.

Required evidence: Article pedigree, sampling rationale, configuration reconciliation, pre/post condition and authorized disposition.

Decision control: Unresolved identity, unknown critical history or unassessed configuration differences block the dependent qualification or acceptance claim.

8 Method selection, validation and controlled execution documents

8.1 Fitness for intended use

The method owner shall define the intended measurand or observation, article class, range, environment, required discrimination, limitations and decision use. Method suitability shall be evaluated before routine use and after a relevant change. A recognized name, customer preference or previous successful run does not establish fitness for the current task.

A method adopted without modification shall still be verified as implementable with the actual personnel, equipment, software and environment. A developed, modified or extended method shall receive validation sufficient to demonstrate performance in its intended domain. The validation shall identify what remains untested.

8.2 Validation characteristics

As applicable, validation shall address repeatability, reproducibility, bias, resolution, sensitivity, selectivity, working range, detection capability, response time, robustness, uncertainty and resistance to known interferences. The characteristics selected shall follow the requirement and potential failure mechanisms.

The validation plan shall predefine acceptance criteria and use suitable reference information, independent comparison, controlled specimens or challenge cases. Agreement with one favorable sample shall not establish validity over a broad range. Calibration of individual instruments shall not be treated as validation of the complete method.

8.3 Specification and procedure

The test specification shall define purpose, requirement links, article baseline, environmental and operational conditions, sequence, duration, pre/post checks, observations, criteria, uncertainty rule, anomaly handling and required outputs. It shall distinguish commanded conditions from conditions actually achieved at the article.

The executable procedure shall define the arrangement, equipment, channel map, software, roles, steps, hold points, records, stop conditions and restoration. Personnel shall have the current approved procedure at the point of use. Handwritten or electronic execution changes shall be attributable and controlled.

8.4 Method change and continuing validity

Method changes shall be assessed for affected mechanisms, historical comparability and dependent claims. The owner shall define revalidation and bridging evidence. A change to filtering, sampling, fixture, sensor placement or software can be significant even when the nominal test name remains unchanged.

The organization shall monitor method performance through appropriate check artifacts, control data, inter-operator or inter-facility comparison, blind challenges or other justified techniques. An unfavorable comparison shall trigger investigation of the affected results, not merely exclusion of the inconvenient data.

Required evidence: Method validation dossier, implementation verification, approved specification/procedure and continuing performance records.

Decision control: A method outside its demonstrated domain or with unresolved validity concerns shall not produce an unqualified conformity statement.

9 Facilities, fixtures and environmental control

9.1 Facility capability

The facility owner shall define usable ranges, capacities, control and measurement performance, environmental limitations, protective systems and combinations that cannot be applied together. Capability shall be demonstrated in the actual configuration, including loads and article interactions where relevant.

The facility shall maintain suitable utilities, access control, emergency arrangements and environmental monitoring. Maintenance or equipment availability alone does not establish current capability. A critical facility change shall trigger re-verification before dependent work resumes.

9.2 Fixture and boundary conditions

The fixture, mounting, restraint, electrical bonding, fluid connections, thermal interfaces, harnesses and support equipment shall reproduce or conservatively represent the relevant boundary conditions. The programme shall assess fixture dynamics, compliance, thermal conductance, leakage, contamination and instrumentation loading as applicable.

The fixture shall not introduce an unrecognized failure mode or hide the article response. Resonance surveys, load-path checks, thermal mapping or interface measurements shall be performed where needed. A fixture qualified for one article does not automatically represent a different mass, stiffness, geometry or interface.

9.3 Spatial and temporal uniformity

Where the claim relies on an exposure throughout an article volume or across time, the method shall define mapping, sensor locations, allowed gradients, stability criteria and duration accounting. A chamber set point shall not be substituted for article temperature or another required local condition without a demonstrated relationship.

The programme shall identify start and stop rules for dwell, recovery and accumulated exposure. Time outside the qualified tolerance shall be recorded and dispositioned. A nominal average cannot conceal an unacceptable local excursion.

9.4 Contamination and interference

The facility shall control influences that could alter the article or measurement, including vibration, electromagnetic interference, grounding, temperature, humidity, particles, residual chemicals, pressure and background radiation where relevant. Blank, reference or background measurements shall be used where needed to establish the contribution.

Adjacent work and shared services shall be reviewed for interaction. The organization shall document the configuration of doors, shields, penetrations, loads and services where these affect the method. Uncontrolled interference shall lead to isolation of affected data and an impact review.

Required evidence: Facility and fixture capability record, environmental mapping, interface definition and current readiness status.

Decision control: Unverified boundary conditions or an exposure outside demonstrated facility capability prevent acceptance of affected results.

10 Metrology, equipment and measurement traceability

10.1 Measurement-chain definition

The metrology owner shall identify the complete chain from physical quantity through sensor, conditioning, wiring, conversion, time synchronization, software transformation and displayed or recorded result. Every safety- or decision-relevant channel shall have a unique identity, range, location, orientation, unit and applicable correction.

The chain shall be capable of resolving the required effect with suitable uncertainty, bandwidth, dynamic range and environmental tolerance. A high digital resolution shall not be represented as equivalent to measurement accuracy or low uncertainty.

10.2 Calibration and reference basis

Equipment requiring calibration shall have a valid record linked to its identity, range, method, reference basis, results, uncertainty, corrections and applicable conditions. The organization shall demonstrate an unbroken, documented relationship to suitable measurement references where quantitative traceability is necessary.

Where direct traceability to a recognized physical reference is not technically available, the organization shall define an appropriate alternative basis, its limitations and independent corroboration. An unexplained certificate number or supplier assertion is insufficient. Applied corrections shall be controlled and included in uncertainty evaluation.

10.3 Intervals and intermediate checks

Calibration and checking intervals shall be based on required performance, stability, use, environment, history and consequence. An interval shall not be selected solely because it is administratively convenient. Equipment used outside its verified range or after a relevant repair shall receive an appropriate check before use.

Intermediate checks shall have defined artifacts, conditions, acceptance limits, frequency and response. A successful zero check does not demonstrate span or dynamic response. Pre/post checks shall be used where drift during the run could affect the conclusion.

10.4 Out-of-tolerance and impact assessment

Equipment found damaged, unstable, out of tolerance or otherwise suspect shall be identified and prevented from uncontrolled use. The owner shall establish the last defensible valid condition and assess potentially affected results, considering drift evidence, direction, magnitude, margins, uncertainty and use history.

The assessment shall identify affected reports and decisions, required notifications, remeasurement or withdrawal and the basis for any results retained. Neither automatic invalidation of every historical result nor automatic retention because a report was issued is acceptable without an evidence-based assessment.

Table 10-1. Equipment status controls

State	Permitted use	Required action
Verified for scope	Use within stated range, conditions and validity	Check identity and required intermediate checks.
Restricted	Only the specifically demonstrated unaffected scope	Visible restriction and approved basis.
Suspect or overdue	No dependent decision use without valid disposition	Protect work and assess impact.
Restored	Use after appropriate calibration/check and authorization	Preserve fault, repair and historical impact record.

Required evidence: Measurement-chain map, calibration and correction records, check results and retrospective impact assessments.

Decision control: Suspect equipment shall not be used to confirm its own validity without an independent suitable reference.

11 Measurement uncertainty and conformity decision rules

11.1 Measurement model

The organization shall define the measurand, measurement model, input quantities, corrections, distributions, sensitivities and dependencies relevant to the result. The uncertainty budget shall include significant contributions from calibration, repeatability, resolution, drift, environmental effects, fixtures, sampling, alignment, processing and method bias as applicable.

Known significant systematic effects shall be corrected where practicable and appropriate; the uncertainty of the correction shall remain included. Treating an uncorrected bias as if it were a

zero-mean random contribution requires a justified model and disclosure.

11.2 Combination and coverage

Standard uncertainties shall be combined using a model appropriate to their dependence, distributions and nonlinearity. Correlation shall not be ignored merely because individual components are listed in separate rows. A root-sum-of-squares calculation requires suitable independence or covariance treatment.

The reported expanded uncertainty or coverage interval shall identify the coverage factor or interval method, intended coverage and assumptions. A factor of two shall not be asserted to provide a precise confidence level for every distribution or limited dataset. Asymmetric or bounded results may require asymmetric intervals.

11.3 Rule agreed before evaluation

The requirement owner and responsible technical authority shall approve how uncertainty affects conformity before results are evaluated. The rule shall identify specification boundaries, acceptance and rejection regions, guard bands, treatment of equality, unresolved regions and the consequences of false decisions.

A product tolerance shall not be enlarged by instrument uncertainty unless the controlling requirement explicitly defines that rule. Test-control tolerance describes allowed exposure error and is not an allowance on product performance. The report shall state the rule actually used and any departure from the agreed rule.

11.4 Indeterminate outcomes

Where the agreed rule cannot establish conformity or nonconformity, the result shall be reported as indeterminate and the dependent requirement state shall remain HOLD. Permitted responses include improved measurement, additional justified evidence, revised scope or an authorized disposition that truthfully preserves the unmet or unresolved original criterion.

The organization shall not repeatedly measure until a favorable value appears, discard adverse results without cause or change the decision rule after observing the outcome. A revised rule requires controlled agreement, a valid technical basis and disclosure of its effect on all relevant results.

Table 11-1. Illustrative interval rule, not a universal mandatory rule

Relationship to an inclusive specification interval	Result under this declared example rule	Requirement state
Entire reported coverage interval inside specification	Conforming for the stated decision basis	PASS if all other conditions are met.
Entire interval outside specification	Nonconforming	FAIL.
Interval overlaps a boundary	Indeterminate	HOLD.
Method or data invalid	No valid conformity conclusion	HOLD; investigate and protect dependent use.

Required evidence: Approved uncertainty budget, decision rule and result-specific application including units and boundary treatment.

Decision control: A decision-sensitive uncertainty contribution left unresolved prevents an unqualified PASS.

12 Data acquisition, processing and digital integrity

12.1 Acquisition design

The data owner shall define channels, sampling, bandwidth, anti-alias protection, resolution, dynamic range, time synchronization, triggers, buffering and expected data volume. The design shall capture relevant transients and response durations without clipping, aliasing or unacceptable timing ambiguity.

The organization shall validate the complete acquisition route using known inputs or suitable end-to-end challenges. A sample rate merely exceeding twice a stated frequency does not establish adequacy without the signal bandwidth, filter response and observation purpose. Independent protective monitoring shall be considered where failure of the recording chain could also defeat protection.

12.2 Raw data and provenance

Raw observations shall be retained in a protected form with run ID, article configuration, channel metadata, timestamps, acquisition settings, software identity, operator and relevant event log. The programme shall define what constitutes raw data for instruments that internally transform signals and shall preserve available native records and settings.

Corrections, exclusions, resampling, filtering and derived results shall be reproducible from the retained basis. Every transformation shall record code or tool version, parameters, execution identity and output linkage. A screenshot or summary spreadsheet shall not replace essential raw observations.

12.3 Software and automated decisions

Software used to acquire, calculate, transform, compare or approve results shall be validated for its intended reliance. Validation shall include boundary values, unit conversion, missing data, saturation, time discontinuity, invalid configuration, failed sensors and prohibited state transitions as applicable.

Automated PASS shall require all applicable conditions and valid inputs. Blank, zero, absent, stale or out-of-range data shall not default to success. Access administration shall not grant authority to alter technical conclusions or suppress audit history.

12.4 Storage, transfer and recovery

The organization shall control access, backup, integrity checks, retention, secure transfer and recovery for the required lifetime. Records shall preserve relationships and decision meaning when formats or systems change. Restricted information shall have an authorized review route sufficient for the claimed conclusion.

Recovery shall verify that article identities, baselines, raw/processed links, signatures, adverse results, states and withdrawal notices remain consistent. Restoring a file count or a checksum alone does not establish semantic correctness. Suspect restored records shall not automatically regain valid approval status.

Required evidence: Acquisition design, channel map, validation results, raw-data inventory, transformation history and demonstrated recovery.

Decision control: Loss of essential raw evidence or unverifiable processing prevents use of the affected result for formal closure.

13 Test safety and readiness authorization

13.1 Hazard assessment

Before execution, the programme shall assess hazards from the article, facility, energy sources, pressurization, thermal conditions, motion, emissions, chemicals, remote control and foreseeable failures. The assessment shall address people, property, environment and interactions with adjacent activities.

Controls shall be assigned to competent owners and verified before the hazard is introduced. The programme shall identify protective barriers, limits, exclusion areas, emergency arrangements and residual-risk authority. This standard does not replace equipment-specific safe operating instructions or required permissions.

13.2 Limits, interlocks and stop conditions

The specification shall distinguish performance acceptance limits, test-control tolerances and protective stop thresholds. Protective settings shall have a technical basis including response delay, measurement uncertainty and consequence. Personnel shall know the observable conditions requiring pause, abort or immediate protection.

Interlocks and emergency functions credited for protection shall be checked in a safe, controlled manner appropriate to their design. Bypasses shall be identified, bounded and specifically authorized; their combined effects shall be assessed. An unverified essential protective function is a no-go condition.

13.3 Readiness review

The TRR shall verify the actual article, procedure, facility, fixture, measurement and data chain, competence, roles, environmental conditions, safety controls, permissions, evidence criteria and anomaly response. It shall reconcile open items and identify which block execution or later use of results.

The readiness decision shall state the permitted activity, baseline, limits, witnesses, hold points and expiry or invalidation triggers. Prior readiness for a different article, software load, fixture or condition shall not authorize the changed arrangement without review.

13.4 Change between readiness and execution

The test director shall confirm that the approved readiness basis remains current at the start of work. Changes in personnel, article condition, calibration, facility, weather, control settings or concurrent work shall be reviewed for impact. An urgent schedule shall not remove this check.

Restart after an abort or significant interruption shall require a defined restoration and readiness decision. Immediate protective action may precede documentation, but the subsequent record shall preserve the chronology, actual state and basis for resumption.

Required evidence: Test hazard assessment, verified controls, completed readiness gate and bounded permission to execute.

Decision control: Missing essential protection, competence, authority or configuration evidence prevents start or restart.

14 Execution, observations and anomaly control

14.1 Controlled start and run

The test director shall confirm the article and procedure identities, approved setup, channel health, time basis, initial condition and required witnesses before initiating the run. The run record shall identify actual start, stop, interruptions, steps, operator actions and achieved conditions.

Personnel shall record observations contemporaneously where practicable. Corrections shall preserve the original entry and identify author, time and reason. A procedure step shall not be marked complete solely because its scheduled time has passed.

14.2 Exposure accounting

The run record shall distinguish commanded, controlled and independently measured conditions. It shall identify ramp periods, dwell, recovery, cycles, accumulated dose or exposure and any time outside tolerance. A nominal programme filename is insufficient evidence of achieved exposure.

Overtest and undertest shall both be evaluated. An overtest can damage the article or create an unrepresentative mechanism; it is not automatically conservative. An undertest leaves a coverage gap unless a valid argument or additional work closes it.

14.3 Anomaly triage

Unexpected behavior shall be recorded with time, configuration, conditions, data references, immediate action and preliminary consequence. The test director shall protect people and the article, preserve evidence and determine whether continuing could compromise safety or interpretation.

The investigation shall distinguish article behavior, facility behavior, measurement fault, procedure deviation and unresolved cause. An anomaly shall not be assigned to the laboratory merely to preserve a product PASS, nor assigned to the article without examining the measurement chain.

14.4 Retest and resumption

A retest plan shall identify its purpose, prior run, causal or validity findings, changed conditions, acceptance basis and effect on earlier evidence. The original result shall remain visible. An unchanged repeat can improve understanding but does not erase a valid failure.

The programme shall identify whether the retest article has accumulated damage or conditioning that affects comparability. An article repair or software update creates a changed baseline and shall be reflected in the claim. Restart requires the applicable Clause 13 checks.

Table 14-1. Anomaly disposition routes

Finding	Evidence treatment	Next decision
Demonstrated invalid measurement	Retain record; exclude only the affected result with justification	Repair/validate chain and determine required repeat scope.
Valid article failure	Retain FAIL and affected requirement links	Correct design/process or record a truthful authorized departure.

Finding	Evidence treatment	Next decision
Cause unresolved	Preserve uncertainty and affected data	HOLD dependent conclusions; investigate.
Exposure outside plan	Assess safety, mechanism and coverage	Additional work, restricted use or rejection of affected evidence.

Required evidence: Actual run log, exposure record, anomaly chronology, retained original data and authorized retest scope.

Decision control: Retest success shall not automatically close the original anomaly or the affected requirement.

15 Result reduction, interpretation and technical review

15.1 Processing plan

Before evaluation, the analyst shall define calculation methods, filtering, averaging, segmentation, outlier treatment, corrections and reporting precision. The approach shall preserve the phenomena relevant to the criterion. Data processing shall not suppress transients, peaks or intermittent failures that the requirement intends to detect.

Changes to processing after observing results shall be justified, controlled and compared with the original method. Exploratory analyses may identify new questions; they shall not be presented as if all hypotheses and criteria were predeclared.

15.2 Data validity and completeness

The reviewer shall check identities, acquisition settings, timing, saturation, missing channels, dropouts, range, pre/post checks and achieved conditions. Missing data shall be bounded in time and consequence. Interpolation or reconstruction shall be identified as derived information, with an uncertainty and use limitation.

A valid measurement and a representative test are separate requirements. A precisely measured response under the wrong mounting, software or environment shall not close the intended requirement. The report shall identify every material limit on interpretation.

15.3 Interpretation and uncertainty

The analysis shall compare results with the approved criterion and uncertainty rule at the correct level of aggregation. It shall distinguish observed maxima, estimated population behavior, model predictions and guaranteed limits. The analyst shall identify statistical and engineering assumptions and sensitivity to them.

Where several conditions must be satisfied, the conclusion shall preserve each condition. Averaging across axes, channels, specimens or environments shall not hide an individual limit exceedance unless the controlling criterion expressly defines that aggregate.

15.4 Independent technical review

Review shall be sufficient to reproduce material calculations, trace critical conclusions to raw observations and challenge alternative explanations. The reviewer shall confirm competence, method validity, article representation, uncertainty, anomalies and scope before accepting evidence.

Review findings shall identify criterion, evidence, consequence, owner and closure test. Material findings shall be closed by an eligible reviewer with adequate independence. The final review record shall preserve disagreements and the authority resolving them.

Required evidence: Reproducible processing record, validity checks, criterion-level evaluation and technical review findings.

Decision control: A result that cannot be reproduced or whose material processing choices are undisclosed remains unacceptable for formal closure.

16 Statistical evidence and reliability demonstration

16.1 Claim and population

The statistical plan shall define the population or stochastic process, response variable, unit of observation, selection scheme, dependence, target, confidence or credibility interpretation and decision rule. It shall identify whether the claim concerns design behavior, manufacturing variation, failure probability per demand or failure rate over exposure.

The programme shall distinguish uncertainty from finite sampling and measurement uncertainty. A large volume of correlated measurements from one specimen shall not be represented as a large independent sample of manufactured units.

16.2 Plan before data

Sample size, stopping rules, exclusions, failure definitions and analysis methods shall be set before formal demonstration data are collected. Sequential or adaptive designs are permitted when their decision properties and stopping rules are established in advance.

Repeatedly examining data and stopping at the first favorable confidence interval can change the error properties. Unplanned interim decisions shall be disclosed and evaluated. Tests of many metrics shall address multiplicity where the claimed joint assurance depends on it.

16.3 Failure and censoring

Every relevant failure, withdrawal, interruption and censored exposure shall be recorded with a reason and its treatment in the analysis. The programme shall not exclude early failures as conditioning unless that exclusion was justified in the claim and plan and the resulting claim is appropriately limited.

Zero observed failures do not prove zero failure probability. A bound shall state the assumed model, independent sample or total exposure, confidence level and population. Common-cause failures, changing conditions and repairable-system behavior require models suitable for those features.

16.4 Accelerated and extrapolated evidence

Acceleration models shall identify the physical mechanism, stress variable, fitted parameters, uncertainty, validation range and evidence that the accelerated condition preserves the relevant failure mechanism. Extrapolation shall be bounded and subject to independent technical review.

A fitted line, high correlation coefficient or convenient acceleration factor shall not establish mechanism validity. The programme shall examine competing mechanisms, interaction effects, specimen variability and uncertainty in field exposure. Unsupported life extrapolation shall remain HOLD.

Table 16-1. Statistical inference boundaries

Data structure	Potential use	Prohibited shortcut
Random independent production specimens	Inference to the defined sampled population	Treating convenience-selected units as random without justification.
Repeated demands on a stable system	Demand-reliability evidence under justified independence	Ignoring shared state, learning, wear or correlation.
Total exposure under a constant-rate model	A rate bound within that model	Claiming the same rate through wear-out or changing duty.
Accelerated specimens	Model-based life inference in a validated domain	Treating stress-time equivalence as universal.

Required evidence: Predeclared statistical plan, complete data including failures/censoring, model checks and bounded inference.

Decision control: An unsupported denominator, independence assumption or acceleration mechanism prevents the associated reliability claim.

17 Analysis, simulation and model-based evidence

17.1 Intended use and credibility

The model owner shall define the question, decision consequence, modeled system, inputs, outputs, domain, assumptions and limitations before relying on a model result. The programme shall identify which requirements the model supports and which remain dependent on physical or operational evidence.

Credibility shall be evaluated for the intended use. A model validated for one geometry, boundary condition, operating mode or response quantity shall not be assumed valid for another. Visual realism and numerical precision shall not be treated as evidence of physical validity.

17.2 Model verification

The owner shall verify implementation against the model's mathematical or logical specification using appropriate benchmark problems, code tests, conservation checks, convergence studies, independent calculations or other justified techniques. Solver settings, discretization, tolerances and software versions shall be controlled.

Numerical error, coding defects and input errors shall be distinguished from uncertainty in physical assumptions. A converged solution may still be physically wrong. Automated workflows shall detect failed convergence, missing inputs and unsupported extrapolation instead of issuing a normal-looking result.

17.3 Validation and calibration separation

Validation shall compare model predictions with relevant independent observations under identified conditions and metrics. If data are used to calibrate or tune a model, the validation strategy shall account for that dependence and preserve a suitable independent challenge. Agreement with calibration data alone shall not be claimed as independent predictive validation.

The assessment shall identify measurement uncertainty in the reference data, model discrepancy, parameter uncertainty, sensitivity and coverage of the domain. A single global correlation metric shall not conceal critical local errors, wrong failure modes or poor boundary behavior.

17.4 Use, update and communication

Each relied-on result shall record model baseline, input provenance, execution settings, output identity, uncertainty, sensitivity, validation domain and reviewer. The decision maker shall receive the material limitations in a form usable for the actual decision.

Updates, surrogate models, learned components and digital twins shall have controlled data and configuration. New operating observations may invalidate the prior model domain. An adaptive model shall not expand its qualified use merely because it has processed more data.

Required evidence: Model-use statement, verification and validation dossier, independent challenge, uncertainty and result provenance.

Decision control: A model outside its justified domain cannot close the affected requirement without adequate additional evidence.

18 Design and process qualification

18.1 Qualification basis

The qualification authority shall define the qualified object, configuration, intended envelope, lifecycle, failure mechanisms, interfaces and evidence strategy. Qualification levels, durations, cycles and margins shall be derived from the actual requirement basis, environmental characterization, variability, uncertainty and consequence.

A generic factor or prior programme shall not establish a universal qualification margin. The programme shall distinguish a margin applied to an input exposure from the measured margin in an output performance criterion. Both require a defined basis and interpretation.

18.2 Article and sequence philosophy

The plan shall identify whether dedicated qualification articles, production-representative articles or a justified combined qualification/acceptance approach are used. It shall define article representativeness, accumulated damage, life consumption, destructive work and the permitted later use of the article.

The order of exposures shall address mechanisms affected by conditioning, aging, damage, repair or contamination. Testing each environment separately may leave an interaction gap. Conversely, combining extremes that cannot occur together can create an irrelevant mechanism; the selection shall be justified.

18.3 Qualification dossier and decision

The dossier shall include the approved requirement baseline, completed matrix, article pedigree, methods, achieved conditions, accepted evidence, anomalies, deviations, uncertainty, independent review and configuration reconciliation. Every applicable condition shall have an explicit disposition.

The decision shall state the exact qualified envelope, configuration family, permitted variants, restrictions, assumptions, production controls, acceptance obligations and invalidation triggers. A concession shall remain visible. An unqualified claim of full conformity is prohibited where an applicable requirement remains FAIL or HOLD.

18.4 Family qualification and similarity

Qualification of a family shall define its member boundaries and identify worst-relevant cases by mechanism. A single specimen need not be worst case for all thermal, structural, electrical, software or human factors. The programme shall document the coverage of each relevant extreme and combination.

Similarity shall compare design, materials, processes, interfaces, loads, duty, software, environment and evidence quality. Unassessed differences shall remain gaps. Qualification shall not transfer solely through a common brand, platform name or supplier.

Table 18-1. Qualification decision record

Required element	Minimum content
Object and baseline	Design/process identity, variants, article pedigree and production representation.
Supported envelope	Environments, loads, duty, duration/life, interfaces and relevant combinations.
Evidence basis	Requirement states, accepted reports, models, uncertainties and review record.
Restrictions	Exclusions, unresolved departures, use limitations and acceptance obligations.
Continuing validity	Change triggers, surveillance, requalification rules and eligible authority.
Required evidence: Complete qualification dossier and an independently reviewed, bounded decision.	
Decision control: A favorable individual test result cannot substitute for a complete qualification argument.	

19 Acceptance, screening and delivery evidence

19.1 Acceptance purpose and plan

The acceptance plan shall identify the individual article or lot, manufacturing baseline, required checks, sample selection where used, test conditions, decision rules and release authority. It shall explain how the activities detect relevant workmanship or production variation within the qualified design.

Acceptance shall not be used to claim that untested design margins have been demonstrated. Screening intended to reveal defects shall have a technical basis for stress and duration and shall consider damage or life consumption. Screening yield alone does not establish field reliability.

19.2 Unit and lot decisions

For individual acceptance, results shall be traceable to the exact serial number and configuration. For lot acceptance, the population, sampling plan, defect classification, acceptance/rejection rule and excluded units shall be explicit. The report shall distinguish tested units from untested units covered by a statistical decision.

Rework, repair, replacement, resampling and re-presentation shall preserve the original disposition and follow defined rules. Removing failed units and presenting the remainder as an unchanged original sample is prohibited. The receiving authority shall be informed of relevant departures.

19.3 Installation and commissioning

Installation and commissioning checks shall address configuration, interfaces, software loads, transport damage, utilities, environmental conditions, safeguards and integrated function. Factory evidence may be reused only where the site conditions and remaining interface work are reconciled.

A passed factory test shall not automatically authorize site operation. The receiving organization shall confirm its own readiness, permissions and operational constraints. Outstanding acceptance conditions

shall be linked to the functions or activities they block.

19.4 Delivery and preservation

The delivery package shall identify the article or lot, accepted baseline, qualification reference, acceptance results, open departures, restrictions, consumed life, preservation and storage conditions, and future inspection or reactivation obligations.

The organization shall preserve chain of custody and communicate conditions that can invalidate acceptance after testing. Shipment, storage beyond a defined interval, damage, unauthorized modification or missing protection shall trigger the applicable reassessment.

Required evidence: Acceptance plan, serial/lot-level results, disposition of rework and a complete delivery package.

Decision control: Administrative shipment approval shall not convert unresolved technical acceptance into PASS.

20 Thermal, climatic, pressure and space-environment testing

20.1 Environment derivation

The test profile shall identify the relevant environments over transport, storage, operation and recovery, including temperature, pressure, humidity, fluid exposure, contamination, radiation or other influences where applicable. Profile selection shall be linked to the requirement and failure mechanisms.

The programme shall define operating modes, power dissipation, mounting, heat paths, pressure boundaries and exposed surfaces. A worst case for one mechanism may be benign for another. Combined or sequential environments shall be assessed for relevance rather than selected by a blanket maximum rule.

20.2 Thermal and climatic conditions

Thermal tests shall distinguish chamber air, fixture, article surface and critical internal temperatures. Stability and dwell shall be defined using the quantity relevant to the claim. Ramp rate, gradients, powered state, functional checks and recovery shall be controlled and recorded.

Humidity, condensation, icing, moisture ingress, corrosion and fluid effects shall be considered where applicable. Conditioning and post-exposure inspection shall avoid concealing effects through unrecorded drying, cleaning or repair. The method shall state whether the test evaluates immediate function, latent damage or both.

20.3 Pressure, vacuum and leakage

The specification shall identify absolute or differential pressure, reference conditions, medium, ramp, stabilization, measurement locations and allowed leakage where relevant. Thermal-vacuum work shall address heat transfer, sensor behavior, outgassing or contamination and functional modes appropriate to the mission.

Leak measurements shall define the measurand, units, test medium, temperature, pressure differential, stabilization and method sensitivity. A leak rate measured under one condition shall not be converted to another without a justified model. Pressure-test safety shall follow the approved facility-specific controls.

20.4 Radiation and mission-specific exposures

Where radiation or other mission-specific exposures are required, the programme shall define the relevant mechanism, article technology, exposure quantity, rate or spectrum, operating state, monitoring and post-exposure observations. Different degradation or transient mechanisms shall not be treated as interchangeable evidence.

The qualification argument shall identify shielding, geometry, duty, recovery and lifetime assumptions. Tests shall be performed only by competent authorized facilities under their applicable protective arrangements. This standard supplies evidence controls and does not prescribe hazardous-source operating instructions.

Required evidence: Mechanism-based environmental profile, mapped achieved conditions, functional monitoring and post-exposure disposition.

Decision control: An unspecified article condition, exposure quantity or stability rule prevents closure of the dependent environmental requirement.

21 Vibration, shock, acoustics and transport dynamics

21.1 Dynamic profile and coordinate basis

The programme shall define dynamic environments from the relevant lifecycle and interfaces. It shall state axes, coordinate systems, frequency range, amplitude or density units, duration, waveform or statistical description and article operating states. Shock response metrics shall identify their processing assumptions.

Random, sinusoidal, transient and acoustic environments shall retain their distinct physical meanings. Equal RMS values do not establish equivalent frequency content or damage potential. A transport profile shall address packaging and restraint in the condition actually claimed.

21.2 Control and response measurement

The plan shall define control and response sensors, mounting, calibration, bandwidth, channel validity, limit channels and the relation between fixture input and article response. Sensor or fixture mass loading shall be evaluated where significant.

Control tolerances, response limits, notching or limiting rules shall be established before the run. Any reduced input shall preserve the rationale and identify the resulting coverage. An unreported notch or control dropout shall not be hidden by a satisfactory overall RMS value.

21.3 Fixture interaction and sequence

The fixture shall be evaluated for resonances, load transfer, stiffness and interface behavior relevant to the test band. Pre- and post-test checks shall identify shifts or damage that could change interpretation. Axis sequence, cumulative exposure and functional monitoring shall be justified.

Resonance searches and diagnostic runs shall be distinguished from qualification exposure. The programme shall record which time and amplitudes count toward the formal requirement. Repeated exposure after an anomaly shall consider cumulative fatigue and configuration changes.

21.4 Result interpretation

The analysis shall preserve spectra, time histories or other data needed to establish achieved input and article response. It shall identify windowing, averaging, resolution, clipping, nonstationarity and uncertainty relevant to the criterion.

A valid input spectrum does not establish functional survival if the required response monitoring was absent or invalid. The report shall address physical condition, functional checks, anomalies and any constrained input. Claimed qualification shall remain limited to demonstrated or otherwise justified conditions.

Required evidence: Dynamic profile, fixture assessment, valid control/response records and complete exposure accounting.

Decision control: Unresolved control loss, hidden input limitation or invalid critical response monitoring prevents an unqualified conclusion.

22 Structural, fatigue, durability and mechanism verification

22.1 Loads and boundary representation

The specification shall define load cases, combinations, coordinate systems, application points, constraints, rate, temperature, pressure and relevant operational conditions. The test arrangement shall reproduce or justify the load paths and constraints that control the failure mechanisms.

Applied and reacted loads shall be reconciled where necessary. Local fixture effects shall be distinguished from article behavior. Measured strain, displacement, force or other response shall have suitable location, range, bandwidth and uncertainty.

22.2 Static strength and functional integrity

The programme shall state the purpose of each load stage, allowable deformation or damage, functional checks, inspection and criteria for continued loading. Protective limits shall be separate from qualification targets. Permanent change shall be recorded and assessed against the declared criterion.

The conclusion shall distinguish no observed failure, no detected damage, acceptable deformation and demonstrated margin. These are different claims. A test that stops before the required condition has not demonstrated the omitted portion solely because earlier stages passed.

22.3 Fatigue and durability

The fatigue or durability plan shall identify the representative spectrum, sequence, cycles, load interaction, environment, scatter treatment, inspection intervals and life interpretation. Accelerated sequences shall be justified for mechanism fidelity and shall not ignore sequence or frequency effects where material.

The article history shall record all prior exposure, repairs and interruptions. Damage models, cumulative-life calculations and extrapolations shall disclose assumptions and validation. A qualification test's consumed life shall be considered before any later service use.

22.4 Mechanisms and interfaces

Moving or deployable mechanisms shall be evaluated over relevant loads, alignment, temperature, lubrication, wear, electrical supply and control conditions. Performance criteria shall address the required function, timing, force, position, repeatability and degraded behavior where applicable.

Post-test inspection shall address latent damage and interface degradation with suitable detection capability. An absence of visible damage shall not substitute for a required internal or nondestructive examination. The final disposition shall identify remaining life assumptions and maintenance obligations.

Required evidence: Load and life rationale, valid boundary conditions, measured response, inspection results and consumed-life accounting.

Decision control: An unrepresented critical load path or unsupported life extrapolation blocks the associated structural qualification.

23 Electromagnetic, electrical and interface compatibility

23.1 Scope and configurations

The programme shall identify electromagnetic emissions and susceptibility, electrical supply behavior, bonding, grounding, shielding, interfaces and installation conditions relevant to safety, function and coexistence. It shall define operating modes, loads, harness lengths and routing, software state and connected equipment.

A benign laboratory configuration shall not replace the installation configuration without an effect assessment. The test shall identify simultaneous operating states and interactions that may be more demanding than isolated equipment operation.

23.2 Measurement and exposure arrangement

The method shall specify the relevant frequency or time domain, quantity, units, geometry, reference plane, coupling route, measurement chain and uncertainty. Background influences and facility characteristics shall be measured or otherwise controlled where they affect interpretation.

The plan shall identify control and monitoring points and the intended article exposure. The nominal generator setting alone shall not establish the actual exposure at the relevant interface. Calibration and verification shall cover the used arrangement and range.

23.3 Functional criteria and monitoring

Before testing, the programme shall define acceptable performance, prohibited behavior, recovery expectations, latent fault checks and required monitoring resolution. Intermittent resets, data corruption, unsafe outputs or silent degraded modes shall not be dismissed solely because normal function later returns.

The evidence shall identify the exposure, time, mode and observed behavior for each anomaly. Monitoring shall be capable of detecting the behavior of concern. A PASS cannot be based only on an operator's recollection that the equipment appeared normal.

23.4 Electrical power and compatibility

Power-quality and electrical-interface verification shall address the specified steady, transient, interruption, sequencing and recovery conditions, including interactions with protective devices and energy storage where applicable. The programme shall distinguish test-source capability from article input actually achieved.

Changes to harnesses, grounding, filters, firmware, supply architecture or connected loads shall trigger an assessment of qualification validity. A component-level compatibility result shall not automatically establish installed-system compatibility.

Required evidence: Configuration and coupling definition, achieved exposure, uncertainty, continuous functional observations and anomaly disposition.

Decision control: Invalid exposure characterization or inadequate monitoring prevents closure of the relevant compatibility requirement.

24 Propulsion, energy storage, pressure systems and hazardous interfaces

24.1 Evidence and safety boundary

The programme shall define the equipment, function, operating envelope, stored energy, interfaces, failure consequences and qualified test facility. Hazardous testing shall use approved system-specific engineering procedures, competent personnel and applicable permissions. AF 9300 does not provide instructions for initiating hazardous reactions or destructive energy release.

The safety assessment shall address credible failures, containment, isolation, remote monitoring, emergency response and restoration. The qualification argument shall distinguish evidence gathered under laboratory protection from protection available in the intended installation.

24.2 Performance and condition

The specification shall define the performance quantities, environmental conditions, initial state, conditioning, duty and measurement locations. For energy storage, state history and relevant aging or conditioning shall be recorded. For propulsion or pressure systems, inlet/outlet and supporting-system conditions shall be identified as applicable.

Results shall be normalized only through a justified model with stated limits and uncertainty. A comparison between tests with different initial condition, duty, fluid, supply or thermal state shall disclose those differences and their effect.

24.3 Failure detection and post-test condition

Monitoring shall detect the required adverse behavior and preserve its chronology. Protective intervention shall be recorded with its trigger and effect on exposure. A test terminated by protection shall be evaluated against the original purpose; it shall not automatically become a successful demonstration.

Post-test inspection, residual energy control, quarantine and return-to-service decisions shall follow the competent facility's approved arrangements. Latent damage and delayed effects relevant to the claim shall be addressed through justified observation and inspection.

24.4 Integration and qualification transfer

Evidence from an isolated component shall be reconciled with installation interfaces, thermal paths, control software, protective devices, ventilation or containment and maintenance. Family qualification shall address the mechanisms affected by scale, packaging and supplier or process differences.

An accepted test departure shall not waive an independently binding safety condition. A qualification decision shall identify operating restrictions, monitoring, inspection and requalification triggers needed to preserve its basis.

Required evidence: Approved facility-specific safety basis, controlled initial condition, valid performance/behavior records and bounded integration claim.

Decision control: An unresolved hazardous interface or invalid initial-state record prevents the affected test or qualification decision.

25 Materials, manufacturing processes and nondestructive evaluation

25.1 Material and specimen pedigree

The programme shall identify material specification, source, batch, manufacturing route, heat treatment, orientation, location, conditioning and specimen preparation where they affect the result. Sampling shall represent the claimed material or process population, including relevant variability and critical features.

Machining, surface preparation or extraction shall not alter the property under evaluation without assessment. Coupon results shall not automatically establish the behavior of a full structure with different geometry, residual stress, defects, interfaces or process history.

25.2 Process qualification

Process qualification shall define equipment, tooling, software, input materials, operating window, environmental conditions, operator competence, inspection and acceptance criteria. It shall identify which process variables are essential and the evidence supporting their allowed ranges and interactions.

Qualification of one combination shall not authorize all combinations inside a rectangular range unless the interaction argument is supported. Transfer to another site, machine, tool, supplier, software baseline or material source shall be assessed under Clause 30.

25.3 Nondestructive evaluation capability

NDT methods shall be selected for the relevant material, geometry, surface, access, defect types, locations, orientations and required detection or sizing capability. Reference artifacts and validation specimens shall be suitable for the intended claim and their limitations shall be documented.

Personnel shall be authorized for the actual technique and task. The procedure shall define setup, calibration or reference checks, coverage, interpretation, recording and reporting. No indication shall not be represented as proof that no defect exists; the demonstrated detection boundary and inaccessible regions shall be reported.

25.4 Interpretation and release

The report shall distinguish material property, process consistency, defect indication, defect characterization and conformity with a defined criterion. Statistical allowables or population claims require a suitable sampling and analysis basis; a mean coupon value is not a guaranteed lower bound.

Disputed indications, destructive confirmation, reinspection and repair shall retain linkage to the original result. A repaired object requires assessment of the repair baseline and any affected qualification or acceptance evidence.

Required evidence: Material/process pedigree, sampling rationale, method capability, inspection coverage and criterion-level disposition.

Decision control: Unknown critical pedigree or unvalidated detection capability prevents the associated material or process claim.

26 Software, programmable systems, AI and automated test systems

26.1 Baseline and requirement coverage

The programme shall define software, firmware, programmable hardware, configuration parameters, libraries, models, training or evaluation data, toolchain and execution environment relevant to the claim. Reproducible builds or equivalent controlled identity shall link the tested baseline to the delivered baseline.

Verification shall address functional requirements, interfaces, timing, resource use, error handling, degraded modes and safety or security interactions where applicable. A source-code coverage percentage shall not substitute for requirement, state, interface or adverse-case coverage.

26.2 Test design and independence

Tests shall include nominal, boundary, invalid-input, state-transition, interrupted-operation and recovery conditions appropriate to the system. Expected outcomes shall be defined independently enough to detect common errors between the implementation and test oracle.

Simulation, software-in-the-loop and HIL evidence shall state which real interfaces and timing are represented. A simulated sensor or environment may conceal physical limitations. Integration testing shall address the differences between the surrogate and the operational environment.

26.3 AI and data-dependent behavior

An AI-related claim shall identify the operational domain, intended task, performance metrics, relevant populations, error consequences, data provenance and limitations. Training, tuning and evaluation data shall be separated or their dependence explicitly accounted for. Leakage and repeated tuning to the evaluation set shall be controlled.

Performance shall be examined across material operating conditions and failure modes, including uncertainty, distribution shift and out-of-domain behavior. An aggregate score shall not hide an unacceptable subgroup or safety-critical error. Online learning or model replacement shall trigger the applicable change and qualification controls.

26.4 Automated test and cybersecurity interfaces

Automated test equipment shall validate channel mapping, units, limits, sequence, interlocks, data persistence, report generation and failure handling. The system shall detect missing or stale data, loss of communication, interrupted execution and invalid test configuration.

Cybersecurity measures relevant to evidence or safe execution shall be tested for their intended function. Access compromise or an untrusted update shall trigger assessment of affected data and decisions. A secure data transfer does not by itself establish the technical validity of its contents.

Required evidence: Controlled digital baseline, requirement and adverse-case coverage, suitable oracle, data provenance and automation validation.

Decision control: An untraceable software/model baseline or contaminated independent evaluation basis blocks the corresponding qualification claim.

27 Human factors, operational validation and field trials

27.1 Intended use and scenarios

The validation plan shall define users, tasks, interfaces, operating context, workload, training, maintenance and environmental conditions. It shall identify success criteria and adverse behaviors relevant to the intended use. Verification of individual functions shall not be substituted for validation of the integrated task.

Field and flight trials shall have the actual permissions, competent operational authority and protective arrangements required for the activity. AF 9300 evidence approval does not authorize a flight, launch, public trial or exposure of a person to an uncontrolled hazard.

27.2 Participants and representativeness

Participant selection, experience, training, fatigue, accessibility and relevant variation shall be justified for the claim. Human-participant activities shall follow applicable consent, privacy and ethical-review requirements. The programme shall avoid collecting unnecessary identifying or sensitive information.

A demonstration by the design team shall not automatically represent routine users. Observer influence, learning effects, repeated trials and scenario familiarity shall be considered. Simulated emergencies shall not introduce an unjustified real hazard.

27.3 Observation and interpretation

The method shall define task outcomes, timing, errors, recovery, workload indicators and qualitative observations appropriate to the question. Measurements shall be interpreted with their limitations; a convenient proxy shall not be asserted to establish a broader human-performance claim without evidence.

The report shall retain unsuccessful tasks, interventions, near misses and excluded observations. Good average performance shall not conceal an unacceptable failure in a critical scenario. Any inference beyond tested users and conditions shall be justified and bounded.

27.4 Operational evidence and continuing validation

Operational records may support validation when their provenance, configuration, exposure and completeness are adequate. Absence of reported events is not evidence of complete observability. The programme shall assess reporting bias, missing exposure and changes in use.

New tasks, environments, user populations, automation behavior or maintenance arrangements shall trigger an assessment of validation coverage. A validated concept shall not remain unconditionally valid after material changes to the real operating system.

Required evidence: Intended-use statement, representative scenarios/participants, protected observations and scope-limited validation conclusion.

Decision control: Missing operational permission or an unsupported critical human-performance assumption prevents the affected trial or validation claim.

28 External providers, witnessing and evidence reuse

28.1 Provider selection and flow-down

The receiving organization shall assess the provider's competence for the actual method, range, uncertainty, site, equipment, software, hazards and reporting role. A general corporate statement or an unrelated approval shall not establish capability for the contracted scope.

The agreement shall define requirements, baselines, methods, decision rules, access, witnessing, raw-data retention, subcontracting, confidentiality, anomaly notification, report amendments and change control. The receiving organization shall retain responsibility for its own use of supplied evidence.

28.2 Witnessing and remote activity

Witness plans shall identify purpose, hold points, competence, independence, access and records. A witness signature shall state what was observed and shall not imply review of unobserved setup, data or later processing. Remote witnessing shall address identity, visibility, time synchronization, recording and communication limitations.

If required observation is unavailable or interrupted, the effect on the evidence shall be assessed. An authenticated video feed cannot replace a measurement that was not made. Restricted evidence shall have a suitable authorized review route or the dependent claim shall remain limited.

28.3 Reuse and equivalence

Reused evidence shall be assessed for source credibility, configuration, environment, method, uncertainty, anomalies, age, data availability and intended decision. The receiver shall identify similarities, differences and unclosed gaps against the current requirement.

Reports shall not be reused solely because a product name or test title matches. Where the original raw data are unavailable, the programme shall assess whether the remaining record is sufficient for the reliance and consequence; limitations shall be explicit.

28.4 Provider change and adverse information

Providers shall notify relevant changes, invalid results, equipment faults and report withdrawals according to agreed clocks. The receiving organization shall maintain traceability to affected requirements, articles, qualification statements and deliveries.

A supplier's corrected report shall not silently replace the previous version. The receiving review shall determine whether recalculation, additional testing, restriction, notification or withdrawal is necessary. Commercial acceptance shall remain separate from technical acceptance.

Required evidence: Scope-specific provider evaluation, flow-down agreement, witness record and evidence-reuse assessment.

Decision control: Unsupported provider capability or unresolved material reuse gaps prevent acceptance of the affected evidence.

29 Test reports, qualification statements and truthful claims

29.1 Report content

A report shall identify its unique code, status, issuer, customer, article or population, configuration, purpose, requirement and method baselines, facility, dates of activity, personnel, conditions, results, units, uncertainty, decision rule, anomalies, deviations and limitations. It shall identify subcontracted or customer-supplied information and its treatment.

Results shall be traceable to the accepted data and calculations. The report shall distinguish observations from interpretations and opinions. Opinions shall identify their basis and eligible author. A report shall not imply that untested conditions or items were examined.

29.2 Conformity and qualification statements

A conformity statement shall identify the exact criteria and results to which it applies. Where only a subset was evaluated, the subset shall be explicit. A qualification statement shall additionally define the supported envelope, configuration family, restrictions, assumptions and continuing-validity conditions.

The organization shall not imply AF approval, accreditation, certification or recognition through use of a template or reference to this manuscript. Such a claim requires the applicable actual authorization and scope. A laboratory result does not create operational permission.

29.3 Review and issue

Before issue, an eligible reviewer shall check identity, completeness, technical basis, units, uncertainty, state consistency, approval authority and intended recipients. The issuer shall ensure that the report's conclusion agrees with the requirement matrix and anomaly dispositions.

Reports shall have controlled issue status and a means to distinguish current from superseded or withdrawn versions. Draft results provided for planning shall be clearly identified and protected from unintended final use.

29.4 Amendments and withdrawal

An amendment shall identify the original report, reason, changed information, authorizing review and effect on the conclusion. The original shall remain recoverable. A withdrawal or material correction shall be communicated to known affected recipients with the required action and scope.

The organization shall track dependent qualification, acceptance and operational decisions where their use is known or contractually controlled. Correcting a typographic error and correcting a result that changes conformity shall have appropriately different impact reviews.

Required evidence: Reviewed report, traceable statement of scope, controlled issue history and notifications for material changes.

Decision control: A report shall not be issued with a favorable conclusion inconsistent with its accepted data or unresolved mandatory findings.

30 Change, qualification validity and requalification

30.1 Change identification

The organization shall identify changes to requirements, design, materials, manufacturing process, supplier, site, software, data, tools, facility, fixtures, methods, measurement chain, duty, environment and interfaces. New knowledge and adverse operational experience shall also be treated as potential changes to the evidence basis.

Changes shall have an owner, old and new baseline, rationale, affected population and implementation status. Individually minor changes shall be reviewed for cumulative effect. The label minor shall not substitute for an effect analysis.

30.2 Impact and bridging analysis

The assessment shall trace each change through failure mechanisms, requirements, assumptions, article representation, accepted evidence, qualification envelope, acceptance tests and issued claims. It shall identify what remains valid, what is invalidated and what additional evidence is needed.

Bridging evidence shall address the actual difference and its uncertainty. A statement that the change is equivalent shall include a mechanism-based argument and eligible review. Unassessed differences shall remain HOLD rather than inheriting the prior status.

30.3 Requalification programme

The programme shall define partial or full requalification, selected articles, regression scope, interactions, safety, acceptance criteria and independent review. Partial requalification shall justify the unaffected remainder and any shared dependencies. A repaired test setup and a changed product may require different work.

During the transition, the organization shall control which configurations may be tested, delivered or represented as qualified. Mixed baselines, rollback and temporary conditions shall have explicit rules. Previous qualification shall be suspended where its essential basis is no longer supported.

30.4 Reinstatement and continuing status

The qualification authority shall reinstate or replace the claim only after the required evidence is accepted and affected findings are dispositioned. The new statement shall identify the current baseline, envelope, restrictions and superseded outputs.

Qualification validity shall be reviewed on defined events and intervals appropriate to the programme. No arbitrary universal validity period is imposed by this standard. Continuing validity depends on the maintained evidence, configuration and conditions, not merely a calendar date.

Required evidence: Change impact matrix, bridging/requalification plan, accepted results and updated claim status.

Decision control: A changed configuration shall not inherit qualification by default when the effect on the original basis is unresolved.

31 Assurance of testing capability and corrective action

31.1 Internal assurance

The organization shall evaluate its implementation through representative case review, observation, data reproduction, equipment and method checks and requirement-level audits. Sampling shall include adverse runs, retests, outsourced work, different sites or shifts, digital failures and withdrawn or amended reports as relevant.

The evaluation shall consider whether the controls work in practice, not merely whether templates exist. Reviewers shall have competence and independence appropriate to the consequence. Findings shall remain traceable to actual criteria and evidence.

31.2 Performance and trend review

Indicators shall have defined purpose, denominator, source, period, data quality, owner and response threshold. Useful subjects include invalid runs, unexpected control excursions, overdue critical checks, unresolved anomalies, report corrections, method performance and requalification backlogs.

A low reported failure rate can reflect inadequate detection or suppressed reporting. Management shall review exposure, difficulty and changes in the work before interpreting trends. Indicators shall support decisions and shall not replace technical case review.

31.3 Nonconformity and effectiveness

A nonconformity shall receive containment, impact review, causal analysis, corrective action, assigned owner and due condition. The assessment shall identify affected historical results and current work. Immediate correction of a document does not necessarily address the cause of an invalid result.

Effectiveness criteria and observation period shall be defined before closure. Closure shall confirm the intended outcome, the affected population and any residual limitations. A material independent finding shall not be closed solely by its original author.

31.4 Management review and continuity

Management review shall address capability, competence, independence, resources, facility and equipment performance, data integrity, supplier behavior, complaints, adverse results, corrective action and continuing qualification status. Decisions shall identify owners, resources, deadlines and follow-up.

Continuity arrangements shall preserve essential records, technical knowledge and control of open work during personnel, system or facility changes. The organization shall be able to retrieve and explain the basis of a retained report throughout its required retention period.

Required evidence: Representative assurance cases, indicators with denominators, corrective-action effectiveness and management decisions.

Decision control: An unresolved systemic loss of validity shall restrict affected work and claims until a competent review establishes their basis.

32 Publication, interpretation and implementation control

32.1 Publication identity

Aerospace Federation controls the proposed AF 9300 publication identity. FIRST EDITION identifies the intended edition of this manuscript. Publication approval, effective date, consultation completion and institutional adoption are separate decisions and are not pre-entered by document preparation.

The controlled publication record shall identify the approved text, decision authority, technical review, consultation disposition, legal and governance review as applicable, implementation transition and authorized release. Annex P provides the proposed control structure.

32.2 Interpretation and amendment

An interpretation shall clarify an existing requirement within its authority and shall not silently add, remove or relax a requirement. A substantive change shall use the controlled amendment process with impact assessment, review, transition and identification of affected supporting documents.

Questions shall identify the clause, scenario and ambiguity. The response shall record the authorized interpretation and whether a publication change is needed. Local organizations shall not represent their own interpretation as an AF-wide ruling without authorization.

32.3 Local adoption and claims

An adopting organization shall identify its scope, accountable roles, local criteria, procedures, evidence systems and effective use. Local adoption shall not imply AF recognition. The organization shall demonstrate actual implementation before claiming conformity with the stated requirement set.

The supporting document set supplies implementation models and blank records. It does not contain fabricated applicants, signatures, observations, approvals or test results. Filled examples in the standard shall remain clearly identified as synthetic instructional material.

32.4 Maintenance and access

The publisher shall maintain document identity, approved history, interpretation records, change notices and withdrawal information under its adopted governance. Users shall have a means to identify the applicable controlled edition and supporting-document relationship.

A withdrawn or superseded requirement basis shall remain traceable for historical decisions. A new publication shall not silently rewrite the conditions under which an earlier result or qualification was issued. Transition obligations shall be explicit.

Required evidence: Publication dossier, controlled interpretation/change records and local adoption baseline.

Decision control: Document preparation or template completion shall not be represented as a completed publication approval or conformity decision.

Annex A - Applicability and responsibility closure

Status: Normative within the proposed AF 9300 requirement set.

A.1 Selection procedure

The scope owner shall list actual activities, sites, objects, lifecycle phases, outsourced functions and intended claims. For every activity below, the owner shall record applicable or proposed N/A, responsible parties, evidence and approving reviewer. A responsibility retained through a supplier or interface remains within the assurance boundary.

Table A-1. Activity-triggered application

Activity or reliance	Primary clauses	Boundary to close
Programme ownership or evidence procurement	1-6, 28-32	Intended claim, requirement ownership and retained acceptance authority.
Physical testing	7-16	Article, method, facility, measurements, safe execution and interpretation.
Model or analysis reliance	6, 15-17	Intended use, verification, validation, uncertainty and domain.
Design or process qualification	18, 30	Envelope, mechanisms, representative articles and continuing validity.
Production, lot or site acceptance	7, 16, 19	Population, serial identity, sampling and release boundaries.
Thermal, climatic, pressure or space exposure	20	Local achieved environment and relevant mechanisms.
Vibration, shock, acoustic or transport exposure	21	Spectrum/time history, fixture, axes, response and cumulative exposure.
Structural, fatigue or mechanism testing	22	Load path, sequence, damage, life and inspection.
Electromagnetic or electrical compatibility	23	Installation, coupling, modes and observed behavior.
Energy, propulsion or hazardous-system testing	24	Competent facility, specific safety basis and integration assumptions.
Material, manufacturing-process or NDT evaluation	25	Pedigree, process window, sampling and detection capability.
Software, AI or automated test reliance	12, 17, 26	Digital baseline, data, oracle, domain and prohibited transitions.
Human or operational validation	27	Intended use, participants, permission and representativeness.

A.2 Multi-party boundary

A responsibility matrix shall name the requirement owner, article owner, method owner, facility owner, test director, data custodian, reviewer, qualification authority and receiving operational authority. It shall identify handovers and acceptance criteria on both sides of each essential interface.

A party may perform several roles, but a missing role shall not be inferred from the contract title. Where responsibility is disputed, the affected work or claim remains HOLD until a documented allocation is accepted by the eligible parties.

A.3 Scope changes

Changes in article, intended use, technology, site, population or evidence route shall trigger a review of applicability. The prior matrix shall remain recoverable. A previously justified N/A shall be reopened when its activity or retained responsibility becomes present.

Annex B - Mandatory programme parameters and common record payload

Status: Normative within the proposed AF 9300 requirement set.

B.1 Parameter rule

Each applicable parameter shall have an ID, definition, value or controlled reference, unit, technical basis, owner, approver, baseline and review trigger. Before a dependent decision, the responsible authority shall confirm that no essential value is unresolved. Values may differ across objects or phases; such differences shall be explicit.

Table B-1. Mandatory parameter schedule

ID	Parameter	Required basis or distinction
P01	Object and configuration	Hardware, software, data, interfaces and evaluated level.
P02	Intended conclusion	Verification, validation, qualification, acceptance or capability.
P03	Requirement baseline	Exact source, version and independently evaluable conditions.
P04	Applicability and retained duties	Activity triggers, sites, interfaces and approved N/A.
P05	Qualification/operating envelope	Environment, load, duty, life, combinations and exclusions.
P06	Assurance depth	Consequence, novelty, uncertainty and independent review.
P07	Article philosophy	Dedicated, production-representative or combined-use rationale.
P08	Population and sampling	Selection, independence, size and limits of inference.
P09	Article preparation and history	Conditioning, custody, prior exposure and consumed life.
P10	Verification methods and levels	Test, analysis, inspection, demonstration and remaining gaps.
P11	Method domain and validation	Performance characteristics and demonstrated limitations.
P12	Facility/fixture boundary	Usable capability, mapping, interfaces and interactions.
P13	Measurement chain	Channels, ranges, corrections, references and time basis.
P14	Calibration/check intervals	Stability, use, consequence and out-of-tolerance response.

ID	Parameter	Required basis or distinction
P15	Uncertainty model	Contributions, dependence, distributions and coverage.
P16	Conformity decision rule	Boundaries, equality, guard bands and indeterminate region.
P17	Test inputs and tolerances	Commanded target versus achieved article condition.
P18	Exposure accounting	Ramp, stability, dwell, cycles, interruptions and recovery.
P19	Acquisition performance	Bandwidth, filtering, sample rate, timing and saturation.
P20	Processing rules	Corrections, filtering, exclusions, algorithms and precision.
P21	Safety and protective limits	Hazards, barriers, trips, stop rules and actual permission.
P22	Readiness and restart criteria	Non-compensable prerequisites and eligible authority.
P23	Competence and authorization	Method/range/task scope, supervision and currency.
P24	Anomaly and retest rules	Notification clocks, quarantine, investigation and repeat scope.
P25	Statistical claims	Population, model, confidence, stopping and censoring rules.
P26	Model credibility	Intended use, validation domain, discrepancy and sensitivity.
P27	Qualification decision	Required evidence, envelope, restrictions and decision authority.
P28	Acceptance plan	Serial/lot scope, sampling, re-presentation and release rules.
P29	Supplier/witness controls	Flow-down, access, sub-tier work and observation limitations.
P30	Reports and statements	Required content, authorized issue and claim wording.
P31	Change/requalification triggers	Essential variables, bridging and status suspension.
P32	Data retention and recovery	Duration basis, access, formats and semantic reconciliation.
P33	Assurance schedule	Capability checks, audits, management review and events.

ID	Parameter	Required basis or distinction
P34	Notification and correction clocks	Start event, duration/unit, recipient and escalation.
P35	Publication/adoption status	Current authority, effective use and controlled history.
P36	Unresolved dependencies	Owner, blocked decision, interim protection and closure test.

B.2 Common payload

Every significant record shall identify itself and its template separately, the object and baseline, purpose, originating requirement, owner, date/time basis, evidence links, state, reviewer, eligible decision and change history. An empty field means unresolved or unused as explicitly indicated; it does not mean PASS or approved N/A.

Equivalent digital records are permitted when the complete payload, relationships, access controls and history are maintained. Typed names are recorded identities and shall not be represented as authenticated signatures without an actual supporting approval mechanism.

B.3 Cross-record consistency

The same article, requirement and report shall retain stable identity across systems. A record transfer shall preserve predecessor/successor links, original observations, accepted purpose, withdrawn status and restrictions. The receiving system shall detect conflicting baselines and shall not silently prefer the most favorable state.

Annex C - Verification matrix and requirement closure

Status: Normative within the proposed AF 9300 requirement set.

C.1 Minimum matrix columns

Table C-1. Requirement record

Field	Minimum content
Requirement	Stable ID, exact condition, source baseline and owner.
Applicability	Applicable or approved N/A with rationale and reviewer.
Object	Article/design/process/population, configuration and phase.
Method	Method, verification level, specification and planned evidence.
Criterion	Value/rule, units, tolerance and uncertainty decision rule.
Execution	Actual run or analysis IDs and relevant deviations.
Evidence	Accepted report/data identity, validity and limitations.
Evaluation	PASS, FAIL, HOLD or approved N/A with condition-level reason.
Review	Reviewer competence, independence and closure authority.
Continuity	Open actions, assumptions, change triggers and affected outputs.

C.2 Closure logic

A requirement shall be PASS only when every applicable subcondition is demonstrated, the evidence is valid for the specified object and no unresolved condition defeats the conclusion. If any subcondition is FAIL, the composite cannot be PASS. If none is FAIL but a required condition remains unresolved, the composite is HOLD.

N/A shall be determined independently of outcome. A requirement with an unavailable test facility remains applicable if its activity is present. A concession shall be linked as a separate record and shall not overwrite the original FAIL or HOLD.

C.3 Evidence reuse and duplication

A report may support multiple requirements when its accepted scope covers each. The matrix shall identify the actual result or section used, not only the report title. Evidence copied into several folders remains one source; its shared dependencies shall not be mistaken for independent confirmation.

C.4 Completeness review

Before qualification, the reviewer shall reconcile the matrix against the full controlled requirement baseline, including invoked tables, interfaces and normative annexes. Deleted, changed and newly derived conditions shall be accounted for. A count of uploaded reports is not a coverage assessment.

Annex D - Programme plan and test specification payload

Status: Normative within the proposed AF 9300 requirement set.

D.1 Programme plan

Table D-1. Plan content

Element	Required declaration
Purpose	Intended conclusions, objects and recipient decisions.
Strategy	Verification levels/methods, qualification philosophy and acceptance boundary.
Scope	Applicable requirements, technical modules, sites and interfaces.
Articles	Pedigree, sampling, representativeness, sequence and disposition.
Resources	Facility, fixture, equipment, people, tools and external providers.
Assurance	Reviews, witnesses, validity checks and independent decisions.
Safety	Hazard assessment, permissions, protective functions and emergency interfaces.
Evidence	Acquisition, processing, uncertainty, retention and report architecture.
Control	Milestones, dependencies, change rules and non-compensable gates.

D.2 Test specification

The specification shall identify the test purpose and requirement links; article baseline; setup and interface definition; initial condition; required inputs, units and tolerances; operational modes; sequence; stability and dwell rules; functional observations; pre/post inspections; uncertainty and decision rule; stop and anomaly conditions; and report deliverables.

An executable procedure may reference controlled specifications, but the operator shall have unambiguous values and steps available at the point of use. Conflicting references shall be resolved before start. The procedure shall identify which parameters may be adjusted during execution and the authority and record required for adjustment.

D.3 Hold points and witnesses

Each hold point shall identify the condition to be checked, required evidence, eligible release authority and consequence of absence. Witnesses shall record the exact activity observed and any limitation. A missed mandatory witness point shall receive a technical disposition before its evidence is accepted.

D.4 Plan closure

Completion shall reconcile planned versus executed work, achieved conditions, omitted steps, anomalies, data inventory, article disposition and open requirement states. A schedule entry marked complete shall not substitute for this reconciliation.

Annex E - Article pedigree, sampling and custody

Status: Normative within the proposed AF 9300 requirement set.

E.1 Pedigree and chain of custody

Table E-1. Article record

Group	Required information
Identity	Name, serial/batch, quantity, configuration and evaluated level.
Origin	Manufacturer/source, material/process history and supplied declarations.
Digital baseline	Software, firmware, parameters, data and build identity where relevant.
Prior state	Storage, transport, aging, exposure, repairs and consumed life.
Selection	Population, selection method, sample role and replacement rules.
Preparation	Conditioning, modification, instrumentation and controlled interventions.
Custody	Receipt, location, access, transfers, seals or equivalent identity controls.
Final state	Damage, post-test checks, quarantine, permitted use and return/disposal.

E.2 Sampling decision

The sampling record shall distinguish design representativeness from statistical representation of a manufacturing population. A deliberately selected worst-relevant design article may be appropriate for a mechanism argument but shall not be described as a random production sample.

The plan shall identify independent units and dependence within batches, tools, material heats or software builds. Any substitution shall retain the identity and outcome of the original item and a rationale showing how the substitution affects inference.

E.3 Configuration reconciliation

A tested-as/claimed-as comparison shall list every material difference and classify its effect on requirements, mechanisms, uncertainty and supporting evidence. The technical authority shall approve the additional work or bounded equivalence argument. An unresolved difference shall remain linked to the blocked claim.

E.4 Preservation boundary

After testing, the custodian shall state whether the article is suitable for further testing, requires inspection or repair, is restricted to development use, is quarantined or is destroyed. No assumption of service suitability shall follow merely from completion of a qualification campaign.

Annex F - Method, facility and measurement capability dossier

Status: Normative within the proposed AF 9300 requirement set.

F.1 Capability statement

The capability dossier shall identify the method, measurand or observation, article classes, ranges, environments, facility/fixture, measurement chain, software, personnel and intended decision use. It shall distinguish demonstrated capability from planned or nominal equipment capability.

Table F-1. Demonstration matrix

Characteristic	Suitable evidence to select and justify
Working range and sensitivity	Reference inputs and boundary challenges across the intended domain.
Repeatability and reproducibility	Controlled repetitions and relevant operator/site/fixture variation.
Bias and correction	Suitable reference or independent comparison with uncertainty.
Dynamic response	End-to-end timing/bandwidth challenge appropriate to the phenomenon.
Robustness	Deliberate controlled variation of influential method conditions.
Detection capability	Representative features, adverse cases and documented missed/false indications.
Uncertainty	Complete model, significant contributions and dependence.
Software reliance	Known-answer, boundary, missing-data and failure-state tests.
Facility interaction	Loaded mapping, fixture behavior and relevant background checks.

F.2 Acceptance and limitations

The technical authority shall approve performance criteria before evaluating capability data. The dossier shall record failed or inconclusive demonstrations and the resulting restriction. Capability shall not be declared solely by averaging successful and unsuccessful challenges.

The statement shall identify unavailable conditions, unvalidated extrapolation and the method of controlling users against exceeding the demonstrated scope. A restricted capability may support a correspondingly restricted task; it shall not be marketed as unrestricted competence.

F.3 Continuing capability

The owner shall set check intervals and event triggers based on stability, change, use and consequence. Unfavorable check results shall initiate protection and historical impact assessment. Return to use shall require evidence that the affected capability has been restored.

Annex G - Uncertainty budgets and decision-rule records

Status: Normative within the proposed AF 9300 requirement set.

G.1 Budget minimum content

Table G-1. Uncertainty entry

Field	Required content
Input quantity	Definition, symbol, unit and role in measurement model.
Estimate and correction	Value, origin and applied correction with sign.
Standard uncertainty	Numerical value and derivation, including distribution or statistical basis.
Sensitivity	Transformation to the output quantity, including units.
Dependence	Correlation/covariance or justified independence; shared references identified.
Coverage	Combined model, effective limitations and interval or factor choice.
Validity	Range, environment, method baseline, reviewer and update triggers.

G.2 Decision-rule payload

The rule shall identify specification interval and inclusion of boundaries; acceptance, rejection and indeterminate regions; uncertainty quantity used; guard band if any; rounding policy; risk interpretation; and authority. The report shall identify the rule by controlled code or reproduce its essential conditions.

Where a customer requests a different rule, the laboratory shall establish that it is technically defined, permitted within binding conditions and communicated to the responsible recipient. The difference from any previous rule and its effect on conclusions shall remain visible.

G.3 Boundary and arithmetic checks

The implementation shall be challenged at values just below, at and just above each relevant boundary. It shall handle missing uncertainty, invalid units, negative uncertainty, unsupported range and unrounded values appropriately. Rounding shall be applied for reporting after the decision unless the approved rule explicitly requires otherwise.

G.4 Reassessment

Changes in instrument, range, fixture, correction, environment, processing or method performance shall trigger a review of the budget and rule. Where the updated uncertainty can alter a previous conclusion, the owner shall identify affected results and evaluate notifications or corrected reports.

Annex H - Data package and digital workflow validation

Status: Normative within the proposed AF 9300 requirement set.

H.1 Evidence package

Table H-1. Data package layers

Layer	Minimum preserved content
Context	Run, requirement, article, procedure and facility identities.
Acquisition	Native observations, channels, units, settings, time basis and event log.
Quality	Pre/post checks, saturation, dropout, validity and achieved-condition findings.
Processing	Tools, code, parameters, corrections, exclusions and repeatable transformations.
Result	Derived values, uncertainty, criterion comparison and accepted scope.
Decision	Reviewer, requirement state, qualification/acceptance link and restrictions.
History	Original versions, amendments, withdrawals and transfer/recovery trail.

H.2 Prohibited transitions

The system shall not turn a missing value into zero or PASS, a collected dataset into accepted evidence without required review, an aborted run into completed exposure without disposition, a withdrawn report into current evidence through restoration, or an unresolved anomaly into closed because a retest passed.

It shall prevent unauthorized editing of approved criteria and preserve the basis of every decision. Administrative override, if technically permitted, shall identify authority, reason and scope and shall not bypass independently binding requirements.

H.3 Validation scenarios

The validation shall challenge wrong article ID, stale software, unit mismatch, swapped channels, clock discontinuity, saturated sensor, incomplete transfer, invalid signature, duplicated record, missing attachment, out-of-range input and failed recovery as relevant. Expected safe or protective outcomes shall be defined before the test.

H.4 Recovery acceptance

Recovery shall reconcile identities, links, raw and derived content, approvals, adverse results and current states. A restored report that no longer agrees with its anomaly or qualification register shall remain restricted until the conflict is resolved. The recovery decision shall identify the verified scope and outstanding limitations.

Annex I - Test readiness, hold points and restart

Status: Normative within the proposed AF 9300 requirement set.

I.1 Readiness gate

Table I-1. Non-compensable readiness checks

Check	Required evidence	If unresolved
Object	Correct article, configuration, initial state and pedigree	HOLD start.
Method	Approved specification/procedure and applicable values	HOLD affected steps.
Facility	Suitable configuration, fixture and current capability	HOLD affected work.
Metrology/data	Valid chain, checks, timing, acquisition and storage	HOLD decision-relevant work.
People	Competence, task authorization, command and handover	HOLD activity requiring missing capability.
Safety	Effective barriers, stop rules, emergency interfaces and permission	No start; protect the area/object.
Criteria	Defined requirements, uncertainty rule and observation plan	No formal closure from unspecified criteria.
Open items	Owner, impact, restriction and eligible disposition	No automatic carry-forward as accepted.
Witnessing	Required witness/hold-point arrangements	HOLD the specified point.

I.2 Bounded release to test

The release record shall state the authorized run or steps, configuration, limits, conditions, responsible director, required concurrence, validity and invalidation triggers. It permits only the declared test activity; it is not an operational release of the article or a qualification decision.

A conditional release shall identify the condition and demonstrate that it does not relax an essential safety or validity prerequisite. An unresolved no-go item shall not be accepted through a weighted readiness score.

I.3 Restart after interruption

The restart review shall identify the interruption, resulting article/facility state, exposure already accumulated, data continuity, cause and corrective work. It shall determine whether the original procedure and readiness basis remain applicable or require replacement.

The reviewer shall define the required repeats, inspections and additional observations. Resuming at the next displayed software step without reconciling the real physical state is prohibited where that state affects safety or validity.

Annex J - Anomaly, deviation and retest dossier

Status: Normative within the proposed AF 9300 requirement set.

J.1 Event record

Table J-1. Minimum anomaly payload

Element	Content
Identity and chronology	Event ID, run, article, time basis and exact step/condition.
Observation	What was observed, by which channel/person, and retained raw evidence.
Immediate response	Pause/abort/protection, notifications and resulting condition.
Classification	Article, facility, measurement, procedure, mixed or unresolved cause.
Investigation	Facts, hypotheses, comparisons, uncertainty and affected population.
Disposition	Evidence retained/rejected/restricted, requirement states and authority.
Retest	Purpose, changed baseline, scope, criteria and prior exposure effects.
Closure	Verified cause/action, accepted evidence, reviewer and remaining limitations.

J.2 Deviations

A planned deviation shall be agreed before execution by eligible authorities. An unplanned departure shall be recorded when recognized and shall receive a validity and safety assessment. Neither type shall silently modify the original requirement or make a prohibited activity permissible.

The record shall distinguish a departure from the test method, a product nonconformity and a customer concession. Each has a different effect on evidence and claims. Report wording shall preserve those distinctions.

J.3 Retest justification

A retest may investigate cause, replace demonstrably invalid data, verify corrective action or assess a changed design. Its purpose shall be explicit. It shall identify whether the original failure remains applicable, whether a new baseline is being tested and what additional qualification work the change creates.

A rule allowing the most favorable of several unexplained runs is prohibited. Where repeated tests form an approved statistical plan, all included outcomes and the predeclared analysis shall be retained.

J.4 Closure and historical impact

Closure shall identify the cause or explicitly remaining uncertainty, the affected evidence, verified action, resulting requirement state and independent review where required. A systemic cause shall trigger examination of similar articles, methods, facilities or issued reports.

Annex K - Test report and statement content

Status: Normative within the proposed AF 9300 requirement set.

K.1 Report architecture

Table K-1. Report content checklist

Section	Required content
Identity	Unique report ID, issue status, issuer, customer and activity dates.
Purpose/scope	Intended conclusion, object/population and explicit limits.
Baselines	Requirements, article, method, procedure, software and relevant changes.
Setup	Facility, fixture, instruments, locations, conditions and external providers.
Execution	Actual runs, achieved exposures, interruptions and pre/post condition.
Results	Values/observations, units, uncertainty, processing and evidence references.
Decisions	Agreed rule, individual conformity states and accepted purpose.
Departures	Anomalies, deviations, concessions, missing work and consequences.
Authority	Technical review, authorized issue and limits of the issuer's authority.
Continuity	Attachments, amendments, withdrawal route and retention references.

K.2 Statement patterns

A factual result statement shall name the article, method and measured conditions. A conformity statement shall additionally name the exact criteria and decision rule. A qualification statement shall identify its supporting dossier and the qualified design or process envelope.

A statement such as tested to AF 9300 shall not be used to imply that every technical environment or performance level in an aerospace application was tested. AF 9300 defines evidence and process requirements; the actual product requirements and test profile remain part of the declared basis.

K.3 Partial and restricted results

A report containing partial work shall state which requirements and conditions were not evaluated. Invalid or withdrawn results shall remain distinguishable from valid failures. A restricted statement shall explain the restriction in the conclusion, not hide it solely in an attachment.

K.4 Amendment record

The amendment shall identify old/new report status, changed fields, reason, technical impact, reviewer, authorized issuer and recipients notified. The original evidence shall remain retained. A result-changing amendment shall trigger assessment of dependent decisions and claims.

Annex L - Qualification and acceptance decision packages

Status: Normative within the proposed AF 9300 requirement set.

L.1 Qualification package

Table L-1. Qualification decision inputs

Input	Acceptance question
Requirement matrix	Are all applicable conditions explicitly dispositioned?
Envelope and mechanisms	Do the combined methods cover the actual design/process use?
Articles and configurations	Are tested-as/claimed-as differences closed or bounded?
Valid evidence	Are methods, achieved conditions, data and uncertainties acceptable?
Anomalies/departures	Are causes, changes, restrictions and original failures visible?
Independent review	Is the review competent, sufficiently independent and complete?
Continuing controls	Are essential production, acceptance, maintenance and change controls assigned?

L.2 Decision outputs

The decision shall identify qualification status; exact baseline and family members; supported environments, loads, duty and life; included combinations; exclusions; evidence dossier; assumptions; restrictions; acceptance obligations; requalification triggers; and eligible authority.

QUALIFIED WITHIN SCOPE is permissible only for the explicitly supported scope. An authorized departure shall be visible and shall not be described as full compliance with the unchanged original requirement. A material unresolved essential condition prevents that part of the claim.

L.3 Acceptance package

The acceptance decision shall identify serial numbers or lot boundary, applicable production baseline, qualification reference, acceptance plan, actual results, rework or repair, sampling inference, restrictions and delivery conditions. It shall identify the receiving authority and any remaining site/operational checks.

L.4 Suspension and withdrawal

The authority shall suspend or withdraw a claim when its essential basis is invalidated or cannot be supported. The record shall identify affected configurations, reports and recipients, protective action and conditions for reassessment. Expiry of a local administrative date and technical invalidation shall remain distinguishable.

Annex M - Change, bridging and requalification matrix

Status: Normative within the proposed AF 9300 requirement set.

M.1 Impact fields

Table M-1. Change assessment

Field	Required content
Change	Old/new baseline, purpose, owner and implementation date/status.
Population	Articles, lots, sites, software loads and prior outputs affected.
Mechanisms	Altered loads, environment, interfaces, materials, logic or human behavior.
Evidence	Previous results/models affected and dependencies shared with unchanged parts.
Gap	Conditions no longer demonstrated and decisions blocked.
Bridging	Mechanism-based equivalence and evidence sufficient for the difference.
Requalification	Tests/analyses, articles, sequence, criteria and independent review.
Transition	Mixed configurations, restrictions, rollback and communication.
Closure	Accepted evidence, current claim, superseded outputs and monitoring.

M.2 Essential variables

The programme shall define essential variables appropriate to the discipline. They may include geometry, material/process, software, data distribution, fixture, supplier, site, thermal path, harness, protective function, duty or operational domain. A change outside a demonstrated range shall trigger a documented review.

M.3 Partial requalification

The technical authority shall justify why omitted work remains valid. The argument shall consider interactions and common dependencies, not only the local changed feature. A new adverse result can invalidate a broader qualification basis even if the formal change was narrow.

M.4 Transition closure

Before the changed configuration is represented as qualified, the authority shall reconcile the current matrix, reports, acceptance instructions, supplier controls, records and public statement. Superseded results shall remain retrievable with their original scope and historical validity.

Annex N - External provider and witnessed-evidence acceptance

Status: Normative within the proposed AF 9300 requirement set.

N.1 Provider capability review

Table N-1. Scope-specific provider review

Topic	Required evidence
Technical scope	Actual methods, ranges, quantities, environments and uncertainty.
Resources	Competent personnel, current equipment/facility and validated tools.
Governance	Responsibility, impartial review, subcontracting and issue authority.
Evidence access	Raw/processed records, anomalies, retention and controlled review routes.
Communication	Change, invalid result, safety event and report-amendment obligations.
Continuity	Recovery, exit arrangements and access to retained historical evidence.

N.2 Witness record

A witness shall identify their role, competence, independence, activity observed, article/setup identity, time, hold points released and limitations. Remote witnessing shall additionally identify the observation technology, continuity, identity controls and any unavailable view or measurement.

N.3 Receiving acceptance

The receiver shall compare supplied evidence with the contracted requirement, configuration, method, uncertainty, decision rule and actual scope. Unresolved gaps shall remain linked to the affected claims. A supplier's favorable statement is not a substitute for this review.

N.4 Invalid evidence notification

The agreement shall define the starting event, time unit, recipient and escalation for material notifications. On receiving adverse information, the owner shall identify dependent reports, qualification statements, accepted articles and ongoing work and determine necessary protection or correction.

Annex O - Assurance findings and capability evaluation

Status: Normative within the proposed AF 9300 requirement set.

O.1 Evaluation plan

The plan shall define the evaluated scope, criteria, sites, methods, team competence, independence, sample rationale, access, observation points and intended decision. It shall include a complete case trail and challenge adverse or uncertain conditions relevant to the work.

Table O-1. Evaluation evidence routes

Route	What to examine
Requirement to report	Criterion, article, valid observations and authorized conclusion.
Raw data to result	Reproducible processing, units, uncertainty and retained adverse data.
Equipment fault to impact	Last valid condition, affected reports and justified notification.
Anomaly to retest	Cause, changed baseline, original disposition and genuine closure.
Change to qualification	Affected mechanisms, bridging, new evidence and status control.
Recovery to continued use	Record identity, relationships, approvals and withdrawn states.

O.2 Findings

Each finding shall identify the criterion, objective evidence, scope, consequence, current protection, owner and closure test. Findings shall not be weakened merely to obtain a favorable summary. Unavailable evidence shall be reported as a limitation or HOLD as appropriate, not interpreted as absence of a problem.

O.3 Corrective action and effectiveness

The organization shall distinguish containment, correction, causal action and verified effectiveness. The effectiveness review shall address the affected population and potential recurrence. A document edit alone is insufficient where the underlying cause involves competence, equipment, software or incentives.

O.4 Continuing capability and complaints

Capability decisions shall identify scope, restrictions and review triggers. Complaints and appeals shall have accessible receipt, competent review, conflict controls, reasoned disposition and protection of relevant evidence. An appeal shall not automatically suspend necessary protective action or restore unsupported technical status.

Annex P - Publication and local adoption controls

Status: Normative within the proposed AF 9300 requirement set.

P.1 Publication dossier

Table P-1. Proposed publication-control record

Element	Required record
Identity	AF 9300 title, FIRST EDITION, exact text and controlled file identity.
Authority	Eligible publication decision maker and governance basis.
Technical review	Competent reviewers, conflicts, issues and dispositions.
Consultation	Applicable consultation process, comments and reasoned responses.
Validation planning	Identified implementation trials and unresolved technical questions.
Decision	Actual approval, conditions, effective date or rejection; no prefilled outcome.
Transition	Supporting-set alignment, communication and user implementation conditions.
Maintenance	Interpretations, changes, withdrawal and preserved history.

P.2 Current manuscript boundary

This delivery is prepared for review. It does not assert that the publication dossier is complete, that consultation has occurred, or that a competent authority has approved implementation. Local organizational adoption shall be recorded separately from Federation publication approval.

P.3 Local adoption dossier

The adopting organization shall identify its scope, role holders, approved parameters, methods, operating procedures, evidence systems, training, pilot case and readiness. It shall demonstrate a complete trace from requirement to bounded decision, including at least one adverse or uncertain condition.

P.4 Controlled maintenance

Changes shall preserve stable identity, history and the requirements under which earlier decisions were made. An interpretation that changes a requirement shall be handled as a substantive change. Claims of recognition or publication approval shall identify actual authorization rather than infer it from document possession.

Annex Q - Reproducible quantitative examples

Status: Informative. All numbers, objects and criteria in this annex are synthetic. They are instructional examples, not default test levels, qualification margins, acceptance limits or evidence from an actual product.

Q.1 Combining an uncertainty budget

An illustrative measurement model adds four independent, zero-mean uncertainty contributions after applying known corrections. Repeated observations have standard deviation 0.60 units and nine independent observations are averaged. Calibration gives expanded uncertainty 0.80 units with factor 2. Resolution is 0.10 units. Residual drift is bounded by plus or minus 0.30 units with a rectangular distribution.

Table Q-1. Example standard uncertainty components

Contribution	Conversion	Standard uncertainty
Repeatability of mean	0.60 / sqrt(9)	0.20000 units
Calibration	0.80 / 2	0.40000 units
Resolution rounding	0.10 / sqrt(12)	0.02887 units
Residual drift	0.30 / sqrt(3)	0.17321 units

$$u_c = \sqrt{0.20^2 + 0.40^2 + 0.02887^2 + 0.17321^2}$$

$$u_c = 0.48045 \text{ units}; U = 2 * u_c = 0.96090 \text{ units}$$

The factor 2 is an assumed reporting choice for this example, not an automatically exact coverage probability. The calculation assumes independence and an adequate additive model. Shared calibration effects, influential nonlinearity or a different distribution would require a revised calculation. Averaging reduces the independent repeatability contribution; it does not divide the shared calibration contribution by sqrt(9).

Q.2 Correlation changes the result

Two input contributions to the same output have standard uncertainties 0.40 and 0.30 units, with unit sensitivities. If independent, the combined value is 0.50 units. With correlation coefficient 0.60, the covariance term is material.

$$u_c^2 = 0.40^2 + 0.30^2 + 2 * (0.60) * (0.40) * (0.30)$$

$$u_c = \sqrt{0.394} = 0.62769 \text{ units}$$

The correlated result is about 25.5% larger than the independent result. The correlation must arise from a justified common influence or data model; it must not be selected to force a desired outcome. For several inputs, the covariance model must be mathematically consistent and physically defensible. Listing instruments separately does not establish independence.

Q.3 A three-state upper-limit decision

The synthetic specification is y no greater than 100.00 units, with equality permitted. The agreed illustrative rule accepts when the complete interval is at or below the limit, rejects when the complete interval is above it, and otherwise reports indeterminate. Expanded uncertainty is 1.00 unit for these examples.

Table Q-2. Uncertainty-aware outcomes

Measured y	Interval y +/- U	Outcome
97.90	96.90 to 98.90	Conforming / PASS, subject to valid evidence.
99.60	98.60 to 100.60	Indeterminate / HOLD.
101.20	100.20 to 102.20	Nonconforming / FAIL.
101.00	100.00 to 102.00	Indeterminate: the interval touches the permitted boundary.

Accept if $y + U \leq 100.00$

Reject if $y - U > 100.00$; otherwise HOLD

A different agreed rule can produce a different decision and must be identified. The example does not claim a particular consumer-risk probability without an appropriate statistical model. Decisions use unrounded values; reported rounding must not change the outcome.

Q.4 Zero-failure independent-demand demonstration

Suppose independent identically distributed Bernoulli demands all succeed, the success probability is constant, the number n is fixed in advance and the claim concerns that defined demand population. With zero failures, a one-sided exact lower confidence bound on success probability is obtained from $R_L^n = \alpha$.

$$R_L = \alpha^{(1/n)}$$

$$n_{\text{required}} = \text{ceil}(\ln(\alpha) / \ln(R_{\text{target}}))$$

Table Q-3. Zero-failure sample sizes at 95% one-sided confidence

Target success probability	α	Minimum independent successes
0.90	0.05	29
0.95	0.05	59
0.99	0.05	299
0.999	0.05	2995

For 300 independent successes, R_L is approximately 0.990064. This is not proof of perfect reliability. Repeated demands on a changing or dependent system do not automatically satisfy the assumptions. A production-population claim also needs a sampling basis appropriate to that population. Failures, optional stopping or changed conditions require the corresponding analysis rather than this zero-failure formula.

Q.5 Zero-failure exposure under a constant-rate model

For a Poisson failure process with constant rate λ and total valid exposure T , the probability of zero failures is $\exp(-\lambda T)$. A one-sided upper rate bound after zero failures is:

$$\lambda_U = -\ln(\alpha) / T$$

$$T = 10000 \text{ h, } \alpha = 0.05: \lambda_U = 0.000299573 \text{ per h}$$

To demonstrate an upper rate no greater than 0.0001 per hour at the same confidence with zero failures, the model requires at least 29957.323 hours of valid exposure, rounded upward as appropriate to the exposure resolution. This is exposure accounting under a constant-rate assumption, not a

universal test requirement.

Wear-out, changing stress, common causes, repair effects and incomplete detection can invalidate the model. The tested population and exposure conditions remain part of the claim. A failure-free chamber campaign does not establish the same rate in unrelated field conditions.

Q.6 PSD integration and RMS

For an illustrative one-sided acceleration PSD, assume a flat density of $0.020 \text{ g}^2/\text{Hz}$ from 20 to 100 Hz and $0.010 \text{ g}^2/\text{Hz}$ from 100 to 200 Hz, with zero outside the stated band. The mean-square acceleration is the area under the PSD.

$$a_{\text{rms}}^2 = 0.020 \cdot (100 - 20) + 0.010 \cdot (200 - 100) = 2.60 \text{ g}^2$$

$$a_{\text{rms}} = \sqrt{2.60} = 1.61245 \text{ g}$$

Table Q-4. Band contributions

Band	Density	Mean-square contribution
20-100 Hz	$0.020 \text{ g}^2/\text{Hz}$	1.60 g^2
100-200 Hz	$0.010 \text{ g}^2/\text{Hz}$	1.00 g^2
Total	Defined one-sided profile	2.60 g^2

This arithmetic does not establish an appropriate qualification environment. Different spectra can have the same RMS but excite different structural responses. Real spectra need appropriate integration of their actual shape, processing, units and frequency resolution.

Q.7 Decibels, amplitude and power

For compatible amplitude quantities with a common reference and the appropriate physical relationship, an amplitude ratio uses $20 \cdot \log_{10}(A_2/A_1)$. A power ratio, including a PSD ratio in compatible units, uses $10 \cdot \log_{10}(P_2/P_1)$.

$$\text{Amplitude ratio at } +6 \text{ dB} = 10^{(6/20)} = 1.99526$$

$$\text{Power or PSD ratio at } +6 \text{ dB} = 10^{(6/10)} = 3.98107$$

Multiplying an amplitude by 6 because the increase is 6 dB is incorrect. Doubling a PSD increases RMS by $\sqrt{2}$ over an unchanged band. The reference, impedance assumptions where relevant, and bandwidth must be stated. These relationships are mathematical conversions, not prescribed qualification margins.

Q.8 Exposure accounting after a control excursion

A synthetic specification requires 120 minutes of valid dwell after all defined article stability conditions are satisfied. A run log contains 18 minutes of approach, 52 minutes of valid dwell, 9 minutes outside tolerance and 68 further valid minutes after the required recovery check.

$$\text{Valid accumulated dwell} = 52 + 68 = 120 \text{ min}$$

$$\text{Elapsed time in the listed sequence} = 18 + 52 + 9 + 68 = 147 \text{ min}$$

The 120-minute arithmetic closes the duration only if the approved specification permits accumulation across the interruption and the excursion does not invalidate the article or mechanism. If uninterrupted dwell was required, the two segments cannot simply be added. The 9-minute excursion requires an anomaly disposition even when sufficient valid dwell is later achieved.

Q.9 Guarded performance margin

A synthetic upper performance limit is 50.0 units. A valid result is 47.8 units with expanded uncertainty 1.2 units under the agreed interval rule. A conservative distance from the upper interval endpoint to the limit is:

$$M = \text{limit} - (y + U) = 50.0 - (47.8 + 1.2) = 1.0 \text{ unit}$$

The result has positive guarded distance for this criterion. It does not establish an input qualification margin, a reliability probability or a reserve against every failure mode. If U grows to 2.5 units after a justified uncertainty review, M becomes -0.3 units and the example rule no longer establishes PASS. Historical results near the boundary may therefore need reassessment after a metrology change.

Q.10 Illustrative cumulative-damage accounting

Assume, solely for arithmetic illustration, a linear damage model with two validated constant-amplitude reference lives: N1 = 20000 cycles and N2 = 10000 cycles. The article receives n1 = 4000 and n2 = 1000 cycles.

$$D = n1/N1 + n2/N2 = 4000/20000 + 1000/10000 = 0.30$$

The number 0.30 is the output of the assumed model. It is not proof that exactly 30% of real life has been consumed or that 70% remains. Sequence effects, scatter, mean load, environment and competing mechanisms can defeat this interpretation. A life claim requires a validated model, applicable data and the approved reliability/uncertainty treatment. The original exposures shall remain in the article history regardless of the model used.

Q.11 Model residuals and a local acceptance criterion

A synthetic validation dataset contains four observed outputs [100, 110, 90, 100] and predictions [101, 108, 93, 98]. Residuals, prediction minus observation, are [1, -2, 3, -2].

$$\text{Mean residual} = (1 - 2 + 3 - 2)/4 = 0$$

$$\text{RMSE} = \sqrt{(1^2 + (-2)^2 + 3^2 + (-2)^2)/4} = 2.12132$$

$$\text{Maximum absolute residual} = 3 \text{ units}$$

A zero mean residual does not imply accurate prediction at each condition. If the predeclared local criterion is an absolute residual no greater than 2 units, the third condition fails even though the mean bias is zero. Reference measurement uncertainty, domain coverage and data independence still require assessment. This example supports no claim beyond the synthetic dataset.

Q.12 Capability and coverage metrics without compensating scores

A programme has 80 applicable requirement conditions: 70 PASS, 3 FAIL and 7 HOLD, with 10 additional approved N/A conditions outside the applicable denominator. Its applicable PASS fraction is 70/80 = 87.5%. Counting N/A as PASS would misleadingly produce 80/90 = 88.9%.

The useful report gives all state counts, the denominator, critical conditions and their consequences. Neither percentage authorizes qualification while an essential condition is FAIL or HOLD. A coverage indicator is a management view of work, not a substitute for criterion-level technical decisions.

Annex R - Integrated worked cases and decision trails

Status: Informative. The cases are synthetic. Names, observations and decisions illustrate the method and do not record actual tests, customers or approvals.

R.1 Thermal exposure with incomplete article stability

A controller is scheduled for a thermal qualification dwell. The chamber display reaches the target, but an internal monitoring channel remains outside the predeclared stability band. The operator begins the dwell clock from the chamber indication and later obtains a satisfactory functional check.

Table R-1. Required reasoning

Question	Case disposition
Was the exposure demonstrated?	No: the required article condition, not just chamber air, controls dwell start.
Are the observations useless?	No: retain them as actual observations with their conditions and limitations.
Can the requirement be PASS?	Not from this run alone; required stable exposure is unresolved.
What closes the gap?	A technically justified disposition and appropriate additional exposure after valid stability, with prior exposure effects assessed.

The report records the actual temperature histories and the incorrect clock start. A later valid run may close the exposure requirement, but it does not erase the first event or remove the need to correct the procedure or automation that allowed it. The qualification dossier identifies both runs and the reason the second provides the formal evidence.

R.2 Vibration response channel clips while control remains valid

A random vibration run achieves the specified input PSD. A critical response channel clips during a short high-response event. The overall input RMS and post-test functional check are within their criteria.

The input record can remain valid while the response evidence is invalid for the peak-dependent requirement. The reviewer separates these conclusions. Reconstruction from a clipped waveform cannot simply assert the missing peak. The anomaly review considers instrument range, mounting, fixture interaction and possible article damage.

A repeat plan changes the measurement range, validates the chain and addresses cumulative exposure and article condition. If the article has changed, the new baseline and its representativeness are recorded. A successful repeat does not justify an unqualified statement that the original critical response was acceptable.

R.3 Calibration drift affects previously issued reports

A force measurement chain fails a scheduled check. The error is in a direction that could make some previously reported forces appear lower than they were. Two reports had wide decision margins; a third was close to the upper acceptance boundary.

Table R-2. Retrospective impact route

Step	Required action
Establish interval	Use prior valid checks, stability history and use conditions to bound possible affected work.

Step	Required action
Reconstruct error	Evaluate magnitude, direction, uncertainty and whether a time-dependent bound is defensible.
Re-evaluate conclusions	Recalculate the affected decisions under the original agreed rule.
Protect and notify	Restrict uncertain results; inform affected recipients and assess dependent qualification.
Restore capability	Repair/calibrate/check the chain and authorize its demonstrated scope.

The two wide-margin reports may be retained only if the reconstructed bounds support their original conclusions. The near-boundary report remains HOLD or is corrected according to the evidence. The laboratory does not simply change the calibration due date or assume that every prior report is unaffected.

R.4 A tuned simulation predicts its own calibration data

A thermal model is adjusted until it matches the same observations later presented as validation. The plots show close agreement, but no independent conditions have been reserved and critical boundary states were not represented.

The reviewer accepts the plots as calibration evidence and identifies the predictive-validation gap. The model-use statement limits current reliance to the demonstrated conditions. An independent challenge is planned using relevant additional data and predeclared error metrics, with measurement uncertainty and model discrepancy considered.

The programme may continue development using the model with its limitations, but it cannot use the attractive fit alone to close untested qualification conditions. A separate validation record names the independent observations and the domain actually supported.

R.5 A supplier change affects qualified electronics

A supplier proposes a replacement component with the same nominal electrical function. Its package, thermal behavior and firmware interface differ. The existing equipment passed environmental and compatibility testing before the change.

The change review traces the differences to heat paths, mounting dynamics, electrical transients, software timing and failure detection. It identifies unaffected evidence with reasons and defines focused regression and additional environmental work for the affected mechanisms. The changed equipment does not inherit the prior qualification by part-number substitution alone.

The final decision states the new configuration and the evidence bridging the unchanged portions. Production acceptance instructions and the qualification register are updated together. Until the affected gaps close, the changed configuration is not represented as fully qualified within the old envelope.

R.6 Lot acceptance confused with design reliability

A production lot is sampled for an acceptance check. All sampled units pass. The marketing summary proposes the statement that the design has a very high field reliability and that every item in the lot was individually tested.

Both proposed extensions exceed the evidence. The acceptance report identifies the lot, sampling plan, tested units and population-level decision under that plan. It does not claim individual observation of untested units. The design reliability claim would require an appropriate definition of failure, exposure, population, conditions and statistical model.

The technical reviewer corrects the scope of the statement before issue. The retained record distinguishes the valid lot-acceptance decision from the unsupported reliability and individual-test

claims.

R.7 Automated test software treats missing data as success

An automated test loses communication with a sensor. Its script converts the absent value to zero, compares zero with an upper limit and prints PASS. The screen and report appear normal.

The evidence is invalid for the affected criterion. The investigation identifies all runs using the faulty software path, preserves raw logs and checks whether the missing-data condition occurred. The software is corrected to distinguish absent, invalid and measured zero, and is challenged at boundaries, communication loss and recovery.

A new software release does not automatically restore old reports. Historical impact is evaluated against actual run evidence. Reports whose necessary observations cannot be recovered remain restricted, withdrawn or retested as justified. The case demonstrates why a complete run and a formatted report are not proof of valid verification.

R.8 Remote witnessing with an unobserved configuration change

A remote witness observes the displayed test sequence but the connection is lost during an equipment change. On reconnection, the article identifier is visible but a relevant harness configuration is not independently confirmed.

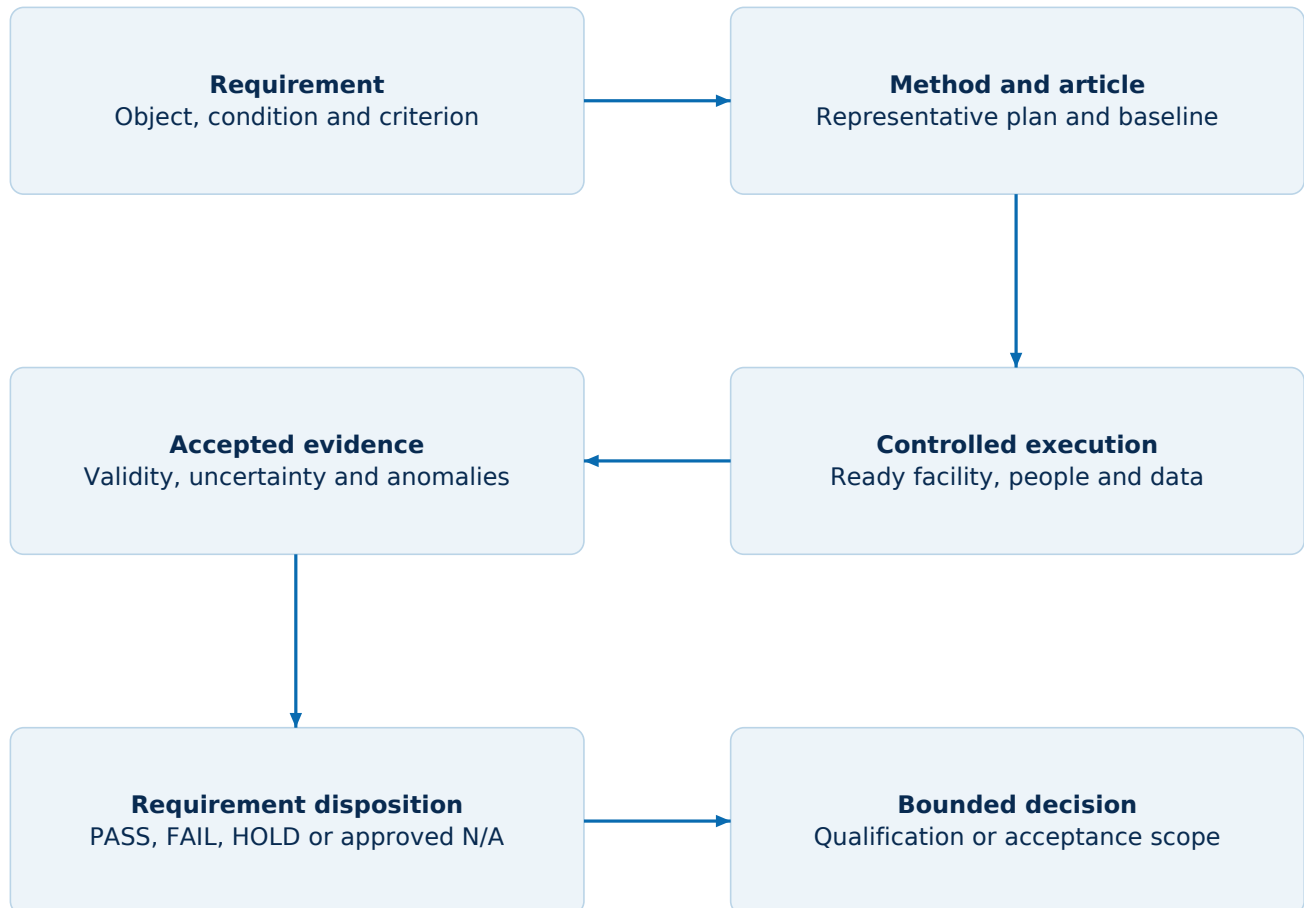
The witness record states the observed interval and limitation. The receiving reviewer requires additional configuration evidence or an appropriate repeat; the witness does not sign a statement covering the unobserved change. If suitable contemporaneous records establish the state, they can be reviewed on their merits.

The result is neither automatically rejected nor automatically accepted because the meeting recording exists. The conclusion follows the demonstrated configuration and the evidence needed for the particular claim.

Annex S - Evidence and decision diagrams

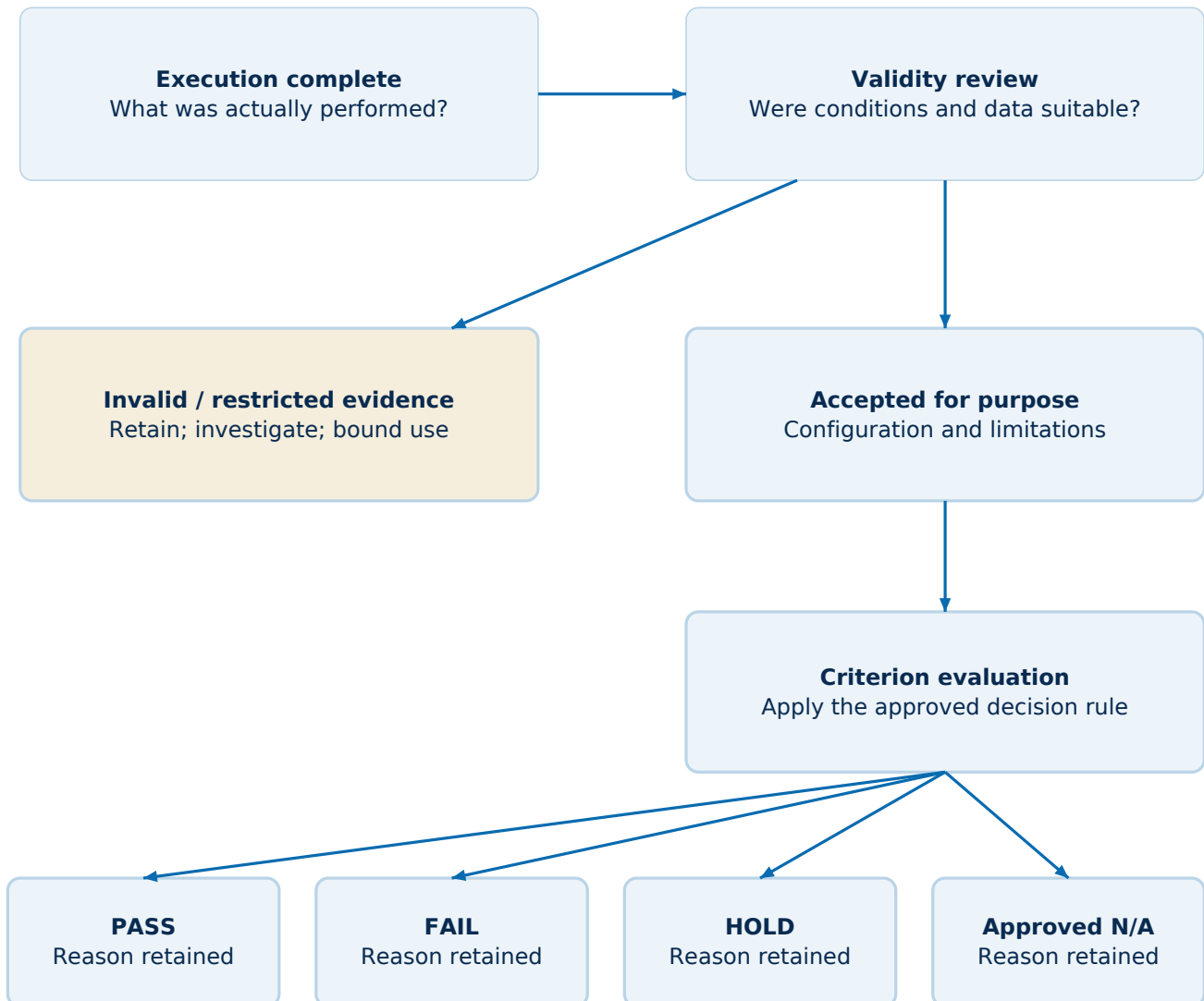
Status: Informative. The diagrams summarize relationships; the full clauses and normative annexes control.

S.1 Requirement-to-result chain



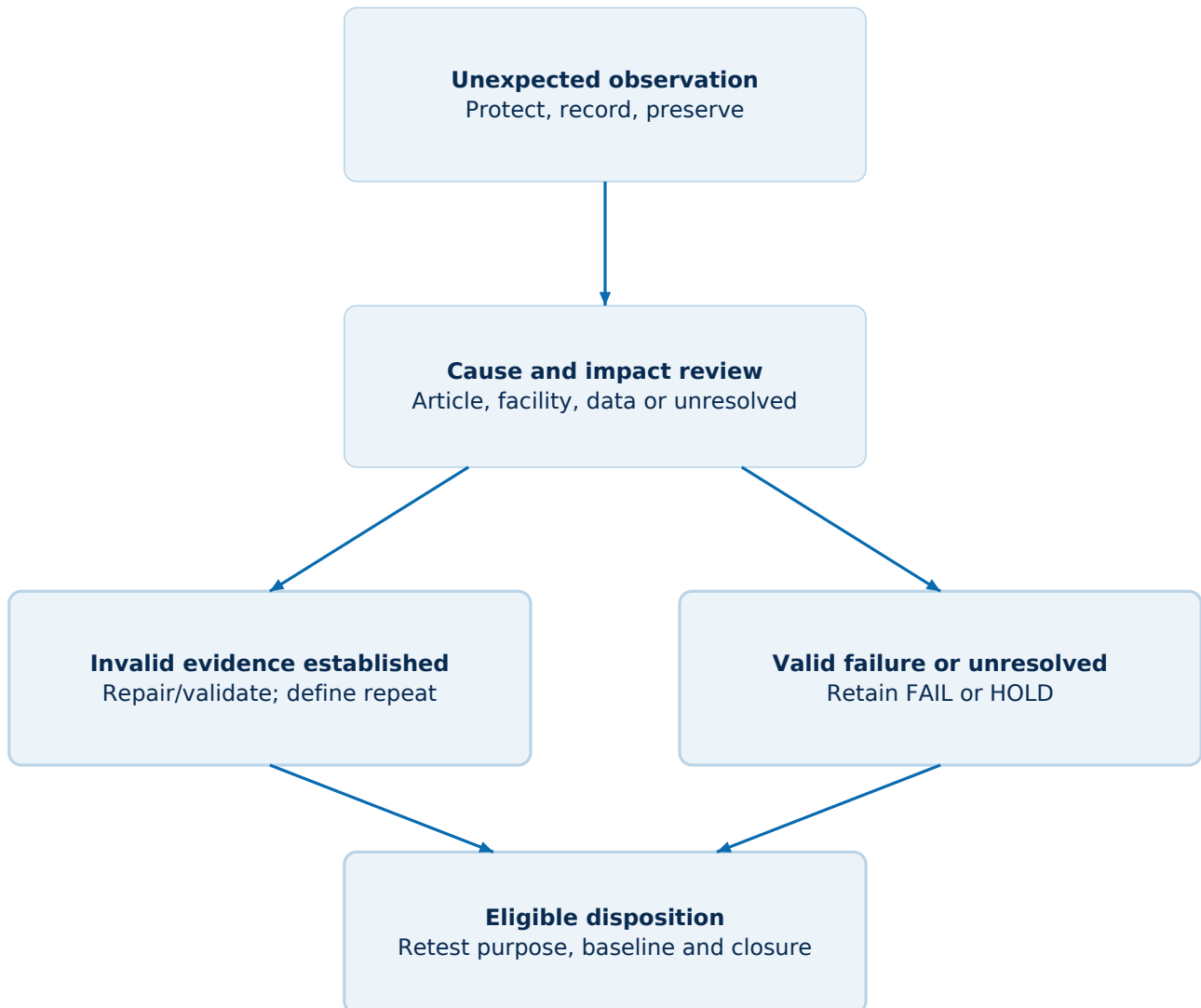
Every transition preserves object identity, configuration and purpose. The final decision can be reopened by changed conditions, invalid data or new adverse evidence.

S.2 Separate execution, evidence and requirement states



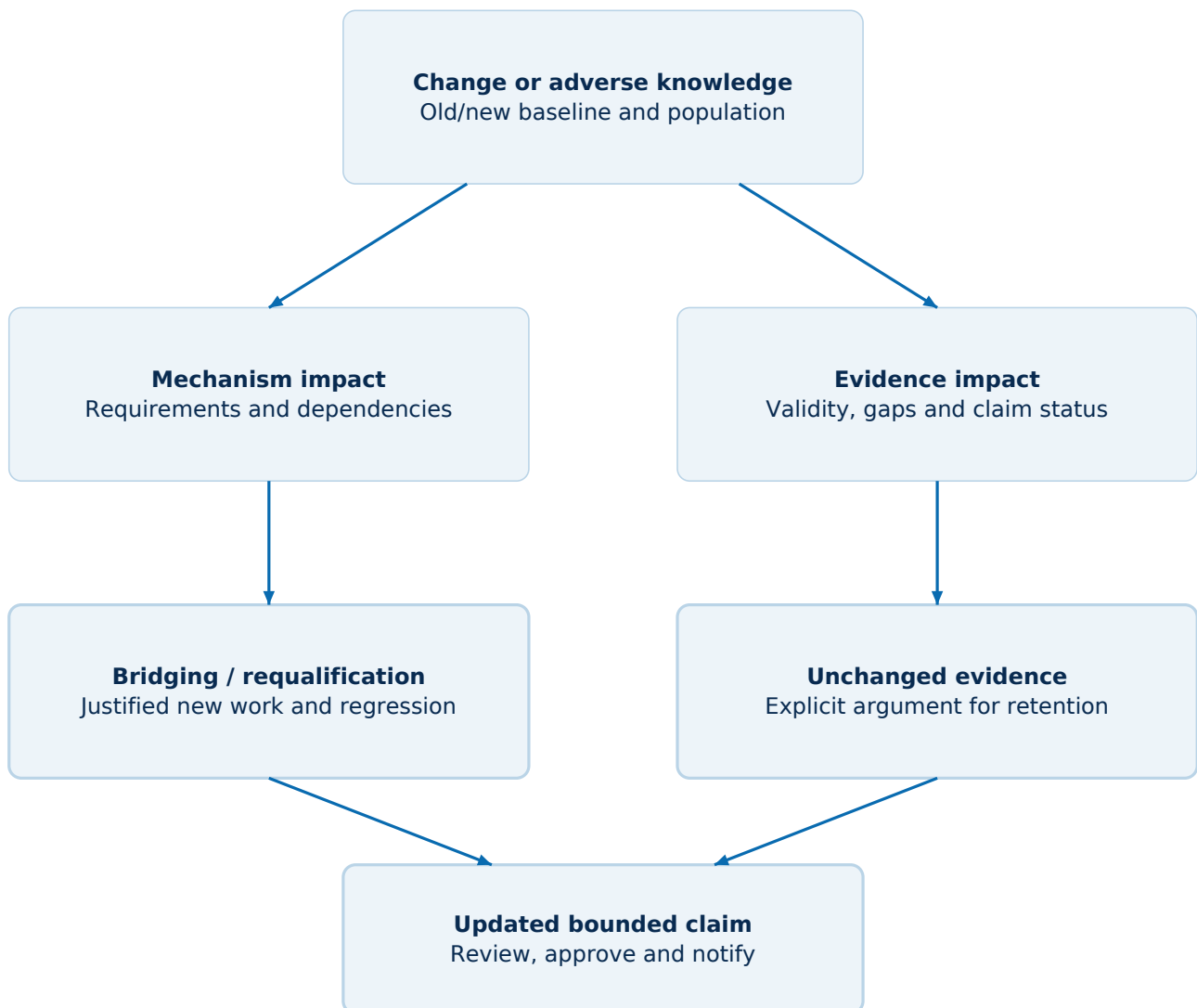
Completion means that the planned execution reached its recorded end. It does not mean that the data are valid or that the requirement passed.

S.3 Anomaly and retest disposition



Retest has a declared purpose and retains the original outcome. Only an eligible evidence review and requirement decision can close the resulting gap.

S.4 Change and qualification continuity



The unchanged part of a qualification remains usable only where its dependencies and assumptions are still supported. Partial requalification requires an argument for the omitted work.

Annex T - Activity-based implementation routes

Status: Informative. Each route supplements the common controls and is selected by actual activity or retained responsibility.

T.1 Laboratory or test facility

Define method and facility capability, measurement traceability, validated acquisition/processing, personnel authorization and safe operating boundaries. Use Clauses 4-15, 28-31 and Annexes F-K. Demonstrate one complete case from customer requirement through actual raw data and uncertainty to a reviewed report.

A broad laboratory title does not establish every range or discipline. The capability statement should identify tested article classes, ranges, uncertainties and limitations, including subcontracted work.

T.2 Design and qualification authority

Establish the requirement baseline, article philosophy, environmental and lifecycle envelope, mechanism coverage and qualification decision rules. Use Clauses 5-7, 16-18, 29-30 and Annexes C-E, L-M. Reconcile the tested configuration with the claimed design and its variants.

The decision should identify production and acceptance controls needed to preserve the design basis. It should not substitute for the receiving operator's permissions or readiness.

T.3 Space system or mission hardware

Select the common controls and applicable thermal/vacuum, dynamic, structural, electrical, digital and hazardous-interface modules. Define mission phases, ground processing, launch interfaces, long-duration assumptions, irreversible transitions and end-of-life conditions relevant to the actual object.

Qualification should identify the phase-specific envelope and the limits of ground simulation. Unrepresented microgravity, radiation, contamination or integrated mission effects require a justified evidence strategy and remain explicit limitations until addressed.

T.4 Aviation, UAS or operational trial

Define aircraft/system baseline, intended operations, ground and air interfaces, operational domain, human supervision and actual trial authority. Select relevant environmental, structural, electrical, software and human validation modules. Record the difference between bench, ground, simulated and flight evidence.

A software or HIL test does not alone validate the complete operational system. The operational trial must have the required permissions and protective controls independently of the AF 9300 evidence process.

T.5 Maintenance and ground-support equipment

Define the maintenance task or support function, technical-data baseline, tooling, measurement and acceptance criteria. Record condition before intervention, work performed, parts/software changes and required independent checks. Use Clauses 7-15, 19, 25-26 and 30 as applicable.

A post-maintenance functional check can support the defined acceptance task but does not necessarily re-establish design qualification after a material configuration change. The return-to-service authority remains separately defined.

T.6 Manufacturing or special-process qualification

Define essential process variables, equipment, material, tooling, competence, inspection and the allowed operating window. Use Clauses 7-11, 16, 18-19, 25 and 30. Sampling and destructive/NDT evidence should represent the actual process population and critical features.

Transfer to another machine, site or material source requires an effect assessment. A coupon result should not be generalized beyond the represented geometry and process without a technical basis.

T.7 Software, AI or automated test provider

Control the digital baseline, intended domain, requirement and adverse-case coverage, oracle, data provenance, toolchain and update process. Use Clauses 6, 12, 15-17, 26 and 30. Demonstrate failures such as missing data, interrupted execution and invalid state transitions.

Qualification is bounded by the tested and otherwise validated domain. New model weights, datasets or adaptive behavior require a change assessment rather than automatic inheritance of earlier results.

T.8 Supplier and external evidence recipient

Define the evidence needed, provider capability, contract flow-down, witness points, access and notification duties. Use Clause 28 and Annex N. Review incoming reports for the exact configuration, method, uncertainty, criteria and limitations.

The receiving organization retains responsibility for deciding whether the evidence supports its own claim. A supplier's report and the receiver's qualification decision are distinct records.

Annex U - Interpretation questions and boundary examples

Status: Informative. Answers summarize this proposed standard and do not create external permissions or AF recognition.

U.1 Does a completed test mean PASS?

No. Execution status, evidence validity and requirement disposition are separate. A completed run may produce valid failure data, invalid data or an indeterminate result. Apply Clauses 0, 11, 14 and 15.

U.2 Can acceptance testing replace qualification?

Only where an explicitly justified combined strategy demonstrates all qualification and acceptance needs, including margins, representativeness and consumed life. Routine acceptance screening alone does not demonstrate the untested design envelope.

U.3 Is calibration sufficient to validate a method?

No. Calibration supports part of the measurement chain. The complete method also depends on setup, specimen, environment, software, operator, bandwidth, uncertainty and its ability to resolve the intended condition.

U.4 Is a result inside the nominal limit automatically conforming?

Only under the approved decision rule and valid evidence. The rule must state how uncertainty and equality are treated. A result can be inside the nominal limit yet remain indeterminate under an interval rule.

U.5 Can a failing run be discarded after a successful retest?

A valid failure remains in the record. A retest can investigate, verify a correction or replace demonstrably invalid evidence, but its purpose and effect must be explicit. It cannot erase the original chronology.

U.6 Can a model replace a physical test?

A model may support a requirement where the method allocation and credibility evidence are suitable for the intended use. The programme must identify the validation domain, uncertainty, mechanisms and remaining gaps. Convenience is not a substitution basis.

U.7 Are zero failures proof of perfect reliability?

No. A finite zero-failure result supports only a model-dependent bound with a stated population, exposure and confidence interpretation. Independence, stable conditions and complete observation matter.

U.8 Does a qualification transfer to a similar product?

Only after an explicit difference and mechanism assessment demonstrates coverage or identifies and closes additional work. A shared name, appearance or supplier does not establish equivalence.

U.9 Can a supplier or remote witness issue the final qualification?

Only if that party actually holds the defined authority and has the required evidence and competence. A supplier report or witness signature is not by itself the programme's qualification decision.

U.10 Can N/A be used when testing is unavailable?

No. N/A concerns absent activity or responsibility. An applicable requirement with unavailable evidence remains unresolved and normally produces HOLD for its dependent decision.

U.11 Does the standard impose one validity period?

No universal calendar period is imposed. The programme defines review conditions and intervals. Material changes, invalid evidence or unsupported assumptions can require immediate reassessment before a scheduled review date.

U.12 Are the example numbers mandatory?

No. Annex Q and the filled cases are informative. Actual limits, margins, sample sizes and intervals require the programme's approved technical basis. Annex B identifies the parameters that must be completed.

Annex V - Navigation and implementation crosswalk

Status: Informative. This crosswalk locates related controls and does not replace requirement-level evaluation.

V.1 Requirement families

Table V-1. Core route map

Need	Main clauses	Normative annexes
Define purpose, object and responsibility	0-5	A-B, D, P
Establish requirement-level coverage	6	C
Preserve representative articles and populations	7, 16	E
Demonstrate method, facility and measurement capability	8-10	F
Apply uncertainty and valid decisions	11, 15	G
Preserve digital evidence and workflow meaning	12, 26	H
Authorize safe, controlled execution	13-14	I-J
Support statistical and modeled claims	16-17	C, F-G
Qualify a design/process and accept an item/lot	18-19	L
Apply technical discipline controls	20-27	A, D-F
Accept external evidence	28	N
Report and communicate bounded conclusions	29	K-L
Maintain qualification through change	30	M

Need	Main clauses	Normative annexes
Verify capability and corrective action	31	O
Control publication and local adoption	32	P

V.2 Practical order of implementation

First define the object, responsibility and intended conclusion. Complete the applicable parameters and requirement matrix. Establish the article and method basis. Demonstrate facility, metrology and digital capability. Approve safety and readiness. Execute with actual condition and anomaly records. Review data, uncertainty and individual requirement outcomes. Make the eligible qualification or acceptance decision and maintain it through change.

The sequence is iterative: new evidence may reopen the requirements, method or article choice. The record should show why the iteration occurred and how it changed the claim, rather than hide the earlier uncertainty.

V.3 Completeness questions

Can another competent reviewer identify the exact object and repeat the reasoning from raw observations to the conclusion? Are all relevant conditions, uncertainties, adverse results and differences visible? Is each authority eligible for its particular decision? Does the current configuration still satisfy the assumptions on which the statement depends?

A credible AF 9300 implementation answers these questions with maintained evidence. Document quantity, attractive formatting and a favorable completion score do not supply the answers by themselves.