LANDING.AERO

LANDING.AERO / RESEARCH & PRACTICAL GUIDANCE

Part 121 Crew Qualification Tracking: Records to Rosters

> LANDING.AERO is a Montreal software studio that builds custom, AI-assisted software for flight operations: operations tools, data integration, workflow automation and dashboards designed around how an airline, charter operator or flight department actually works.

Published by LANDING.AERO · 2026-10-13 · part 121 crew qualification tracking · crew qualification records · crew scheduling integration · pilot currency · airline training records · electronic recordkeeping · aqp · qualification reconciliation · flight operations software

Original article: https://www.landing.aero/articles/en/part-121-crew-qualification-data-roster-integration

In this article

1. Executive Summary
2. Introduction and Background
3. Key Changes in the Record-to-Roster Handoff
4. Implementation Considerations and Process Changes
5. The Source-Record to Roster-Status Contract
6. Exception Cases and Roster Validation
7. Vendor and API Evaluation: Configure, Buy or Build
8. Audit Export and Authorized Human Review
9. Data Analysis and Evidence
10. Implications and Future Directions
11. Conclusion

Executive Summary

Part 121 crew qualification tracking should connect a governed compliance record to an assignment-specific, reviewable status. Under the United States Federal Aviation Administration (FAA) rule, certificate holders must maintain current records covering checks, aircraft and route qualifications, training, required physical examinations, and flight, duty and rest information for crewmembers and domestic/flag dispatchers. The official annual edition corroborates that obligation. (www.ecfr.gov) (www.govinfo.gov) A roster-facing status is a derived view of that evidence. It should identify its source, scope, effective period, certification and revision; a green dashboard does not authorize an assignment.

The clocks are heterogeneous. The ordinary pilot recency rule generally requires **three takeoffs and landings within the preceding 90 days**, with type-specific and simulator provisions. (www.ecfr.gov) (www.govinfo.gov) Calendar-month training/check rules and approved **Advanced Qualification Program (AQP)** arrangements need their own mappings rather than a common expiry formula. FAA describes AQP as a voluntary, data-informed alternative to traditional requirements. (www.faa.gov) **Advisory Circular (AC) 120-78B**, issued **December 11, 2024** and listed as active when researched, addresses electronic signatures, records and manuals; its guidance does not itself have the force of law. (www.faa.gov) (www.faa.gov) The operator must examine its actual authorizations, approved program and controlled procedures.

Existing products already advertise relevant capabilities: **ProDIGIQ** describes a central training/qualification repository, **AIMS** describes training-record updates and expiry recalculation, and **CAE** advertises training-management application programming interfaces (APIs). (www.prodigiq.com) (www.aimsairlinesoftware.com) (www.cae.com) Public documentation is evidence for an evaluation, not proof that purchased modules exchange complete, certified data. The recommended sequence is to configure an existing handoff, assess a supported connector or packaged module, and commission a narrow interface only for a demonstrated residual gap.

The practical deliverables are a field-level contract, exception ownership, and reproducible reconciliation. This report's **hypothetical example** compares **2,000 crew-category pairs**, finds **30 mismatches**, and calculates **1.5%**; these are invented inputs illustrating arithmetic, not a benchmark or safety threshold. Separately track

stale data, missing records and unresolved restrictions. Retain medical details and assessment evidence under controlled access, while exposing only necessary status to scheduling, consistent with security guidance concerning sensitive personal data. (cheatsheetseries.owasp.org) Keep the **Pilot Records Database (PRD)** separate: FAA describes its records as a hiring aid, not a live crew-assignment interface. (www.faa.gov)

Introduction and Background

This report addresses **United States Part 121 operators** deciding whether qualification evidence reliably reaches crew scheduling. It does not calculate flight/duty limits or extend United States rules to another jurisdiction. The current electronic Code of Federal Regulations (eCFR) page retrieved for this research displayed Title 14 as up to date through **October 8, 2026**; the report's publication date is October 13, 2026. That distinction prevents a publication date from masquerading as a verified regulatory update. (www.ecfr.gov)

Three concepts need separate definitions. The **source record** preserves the event and its supporting evidence. A **qualification status** translates that record under an applicable rule and approved program. A **roster decision** tests the status against the proposed aircraft, duty position, route and assignment time. Section 121.415 links proficiency to airplane, crewmember position and type of operation, making a single person-level label inadequate for this analysis. (www.ecfr.gov) The proposed architecture therefore carries context with the status and leaves assignment decisions within the operator's authorized processes.

The distinction is commercially relevant. **Crewdox** advertises ready-to-use integrations, and **Lufthansa Systems** describes integration between NetLine Crew and NetLine Ops ++. (www.crewdox.com) (www.lhsystems.com) Those offerings give buyers concrete alternatives to a new interface. **LANDING.AERO** describes custom applications built around an operator's workflow rather than an off-the-shelf suite. Its relevant role here is an optional builder of the remaining integration, not a packaged training-record or scheduling product. (www.landing.aero)

The central question is consequently narrower than selecting an entire crew platform: can the receiving roster explain which certified evidence supports each required qualification, how current that evidence is, and who owns an unresolved exception? The following matrices and test protocol are recommendations for answering that question. They do not replace the operator's approved training program, operations specifications or manuals.

Key Changes in the Record-to-Roster Handoff

The changes below are proposed changes to data handling, not a claim that a new regulation took effect on the publication date.

From a completion flag to certified evidence

A completed lesson, submitted simulator form and certified proficiency result should not be treated as interchangeable integration inputs. Section 121.401(c) requires the responsible instructor, supervisor, check pilot or check flight engineer to certify proficiency and knowledge upon completion of the training or check, with certification forming part of the record. (www.ecfr.gov) Its computerized-entry provision requires identification of

the certifying person but does not require that person's signature in the computerized entry. (www.law.cornell.edu) Electronic-signature requirements should therefore be assessed against the actual record and applicable setup rather than invented as a universal extra requirement.

Packaged products can support this distinction. AIMS describes training managers viewing and certifying completed instructor assessments; Comply365 describes managing qualifications and conducting evaluations through web and mobile interfaces. (www.aimsairlinesoftware.com) (comply365.com) Ask each supplier to demonstrate the transition from submitted assessment to accepted record and then to consuming roster status. A screen labelled “complete” needs a documented meaning.

From one expiry field to scoped eligibility

An expiry date cannot express every relevant condition. Section 121.441(e) restricts use of a pilot unable to demonstrate satisfactory proficiency-check performance until satisfactory completion of a proficiency check. (www.ecfr.gov) Similarly, the medical-deficiency prohibition in §61.53 can apply while the stored medical certificate remains within its date-based validity. (www.ecfr.gov) The recommended status model includes result, restriction and review state alongside effective and expiry dates.

Route knowledge is also contextual. Section 121.443 requires a system acceptable to the Administrator for the specified information and showing compliance with §121.445; the operator must ensure the pilot in command can use relevant route and airport information. (www.ecfr.gov) (www.law.cornell.edu) A route change should trigger a context-specific check, not merely reuse a fleet-wide “qualified” flag.

From successful delivery to verified consumption

An API response alone does not show that the roster consumed the intended record. Leon documents a one-way push workflow and instructs integrations to send the complete certificate record each time. (apidoc.leonsoftware.com) (apidoc.leonsoftware.com) Its crew-planning documentation also states that discrepancies between systems are not reconciled automatically. (wiki.leonsoftware.com) These are documented behaviors to test, not adverse conclusions about the product.

A recommended acceptance chain is:

- **Source acceptance:** confirm the event has reached its required certification state.
- **Status derivation:** record the applicable qualification scope and rule version.
- **Delivery acknowledgement:** preserve the accepted payload identity and revision.
- **Roster readback:** compare what the scheduler actually sees with the expected status.
- **Exception resolution:** record the authorized owner's decision and its supporting evidence.

CloudEvents provides a useful engineering convention: source plus event identifier distinguishes an event, and identical combinations can identify duplicates. (github.com) (github.com) That convention does not determine which revision of a qualification is operationally applicable.

Implementation Considerations and Process Changes

Begin with an operator-controlled **qualification catalog**. For each category, document the applicable rule, approved training pathway, aircraft and duty-position scope, source authority, expected evidence and authorized decision role. Section 121.401 requires initial and final FAA approval of the training program before implementation. (www.ecfr.gov) A software configuration should reflect that approved program rather than create a parallel definition of qualification.

For a traditional training pathway, distinguish training completion from later operating experience. Section 121.434 requires operating experience, cycles and consolidation to follow satisfactory completion of the appropriate ground and flight training. (www.ecfr.gov) An interface that promotes a classroom result directly to unrestricted operational status would miss that dependency. Vendor course deadlines are a separate feature: Scandlearn describes availability, expiration dates and completion deadlines for courses. (scandlearn.com) As a packaged example of prerequisite handling, Crewdox describes preventing initiation of a line check until line training is successfully finished. (www.crewdox.com)

For AQP, inspect the actual **Qualification Standards Document** and approved curricula. Section 121.901 requires approval of each proposed curriculum, while §121.909 distinguishes indoctrination, qualification and continuing-qualification curricula and identifies which applicable requirements the program replaces. (www.ecfr.gov) (www.ecfr.gov) Requirements not specifically addressed by AQP continue to apply. (www.ecfr.gov) A generic “AQP enabled” switch is therefore insufficient evidence that the correct eligibility logic has been configured.

FAA's AQP advisory description explains the shift from programmed hours to proficiency-based training and evaluation. (www.faa.gov) The integration should carry the approved pathway identifier and the evidence supporting its conditions. It should not transfer aggregate training-program analytics as if they were an individual's qualification decision.

Assign process ownership before selecting transport technology:

- **Training management:** owns the approved category definitions, prerequisite map and accepted results.
- **Certifying personnel:** identify and certify the records for which they are responsible, following the applicable rule and procedure. (www.law.cornell.edu)
- **Chief pilot or designated qualification authority:** resolves scope questions and operational restrictions within assigned authority.
- **Medical-status owner:** supplies the permissible operational status and controls access to supporting documents.
- **Crew scheduling:** evaluates the proposed assignment against the current status and escalation procedure.
- **Information technology (IT)/data staff:** operate delivery, validation, access control and reconciliation without substituting technical acknowledgement for qualification approval. Access tests should include the event logs themselves. (cheatsheetseries.owasp.org)

Electronic-record setup deserves a separate review. Section 121.683(c) permits computer record systems approved by the Administrator. (www.law.cornell.edu) AC 120-78B describes the Part 121 A025 authorization process, including the system-description manual, application and demonstration. (www.faa.gov) Neither a vendor's product page nor this report establishes the operator's authorization. Inspect the actual operations specification, system-description manual and change procedures before altering the governed record system or its relevant interfaces.

Finally, define the **fallback process** in operational terms. When data cannot be verified, scheduling needs a visible review state, an owner and an approved way to obtain the source evidence. CAE advertises offline training/assessment collection, so buyers should explicitly test how locally captured records become certified and synchronized records. (www.cae.com) Offline capability and final roster availability are separate acceptance questions. Comply365 also describes evaluations through web and mobile interfaces, another reason to demonstrate the accepted record state rather than infer it from the device used. (comply365.com)

The Source-Record to Roster-Status Contract

The recommended contract is deliberately smaller than a complete training database. It transfers what scheduling needs to evaluate a proposed assignment and retrieve evidence. ProDIGIQ's distinction between a qualification repository and exportable reports illustrates why a report export should be inspected field by field rather than assumed to be an operational interface. (www.prodigiq.com) (www.prodigiq.com)

Table 1 maps source authorities to a recommended roster-facing payload. “Recommended” identifies design choices here, not additional statutory fields. The categories originate in the compliance-record obligation; the payload structure is this report's synthesis. (www.govinfo.gov)

Source/category	Record and crew identity	Recommended status fields	Approval/revision/evidence	Consumer and exception path
Governed training event	Source-system identifier (ID), record ID, stable crew ID, qualification-category ID	Completion result, effective/expiry dates, entered date, aircraft and duty-position scope	Certifier identity, certification state, revision, evidence link. (www.law.cornell.edu)	Roster status service; uncertified result to training owner
Check result	Check-record ID, crew ID, check category	Passed/unsatisfactory/pending, occurrence time, applicable period	Authorized check role, result revision, prior-record reference	Crew scheduler; changed assessment to qualification authority
Aircraft/route/airport qualification	Approved-program reference, crew ID, scope ID	Applicable aircraft, position, route/airport and conditions, validity	Approving role, rule/program version, evidence reference	Assignment validator; changed itinerary to route-qualified reviewer
Medical status	Restricted source reference, crew ID	Required operational class/status, assessed validity boundary, restriction indicator	Authorized status owner, revision, controlled evidence pointer	Scheduler receives minimum necessary status; medical review through restricted channel

Source/category	Record and crew identity	Recommended status fields	Approval/revision/evidence	Consumer and exception path
Operating-experience prerequisite	Experience record and crew ID, pathway/category	Required stage, accepted accomplishment, remaining prerequisite	Certifying role, accepted revision, supporting record	Training and scheduling; incomplete prerequisite to qualification owner
Interface/reconciliation record	Source event ID, record ID, crew/category pair, consumer ID	Sent time, acknowledged time, readback time, last verified time	Payload version, status revision, reconciliation outcome; event identity can use source plus ID. (github.com)	IT/data queue plus named operational exception owner

The critical separation is between **when the event occurred**, **when it became applicable**, and **when it was entered or received**. Request for Comments (RFC) 3339 supplies a representation of an instant, not rules for qualification periods. (www.rfc-editor.org) (www.rfc-editor.org) The Open Worldwide Application Security Project (OWASP) publishes the logging guidance used here. (owasp.org) Its logging guidance explicitly distinguishes event time from logging time, which matters for intermittently connected devices. (cheatsheetseries.owasp.org) Store those meanings in separate fields rather than forcing them into a single “last updated” timestamp. RFC 3339 defines numeric offsets as local time minus Coordinated Universal Time (UTC); document that convention explicitly when exchanging timestamps. (www.rfc-editor.org)

Medical evidence requires selective disclosure. The class and duration depend on the privileges and circumstances in §61.23; a generic document-expiry flag should not substitute for that determination. (www.ecfr.gov) OWASP identifies sensitive personal data, including health information in its examples, as information ordinarily excluded from direct logging. (cheatsheetseries.owasp.org) The recommended roster payload therefore exposes the status needed for the assignment while keeping diagnostic material and supporting medical documents within the restricted source process.

Document these additional contract rules:

- **Null meaning:** distinguish not applicable, missing evidence, unknown and intentionally withheld.
- **Scope matching:** require a declared match to aircraft, duty position and relevant route/airport conditions.
- **Date semantics:** name the rule for calendar boundaries, timezone and effective-period evaluation.
- **Revision semantics:** identify what supersedes an earlier accepted status and how corrections propagate.
- **Evidence access:** require a controlled link or record locator that authorized reviewers can actually open.
- **Consumer behavior:** specify whether invalid or stale inputs create a block, review queue or other approved response.

OpenAPI can describe input/output data types, but its specification notes that format validation varies by implementation. (spec.openapis.org) (spec.openapis.org) A timestamp schema therefore needs executable boundary tests. A syntactically valid payload can still contain an unsupported qualification scope.

Exception Cases and Roster Validation

Agree the exception suite before acceptance. Test that changed, incomplete and delayed evidence reaches the correct reviewer. Exercise the packaged connector first, then resolve demonstrated gaps.

Use these **hypothetical test scenarios** in a controlled environment:

- **Late simulator result:** the event occurs before its digital entry. Keep occurrence, certification and receipt times distinct. Demonstrate that the roster cannot infer accepted completion from a queued draft. OWASP's event/logging distinction supports retaining separate clocks. (cheatsheetseries.owasp.org)
- **Corrected assessment:** an accepted record receives an authorized correction. Preserve the earlier revision, propagate the replacement, and show which assignments require review. AC 120-78B addresses continued integrity during record transfers. (www.faa.gov)
- **Expired medical status:** evaluate at the proposed assignment time, not solely at roster-publication time. Separately exercise a restriction on an unexpired certificate because §61.53 addresses known medical deficiency independently of a date field. (www.ecfr.gov)
- **Route change:** substitute an itinerary requiring different route/airport evidence. Demonstrate that the validator requests the applicable source status. Route-information knowledge is an explicit operator responsibility in §121.443. (www.law.cornell.edu)
- **Temporary restriction:** apply a controlled restriction to an otherwise date-valid status. Verify visible escalation and authorized restoration. Use the operator's documented review procedure for the restriction, its scope and its removal.
- **Duplicate identity:** send similar names, a changed email address and a duplicate event. Keep person matching distinct from event deduplication. Leon's documented workflow matches solely on work email; CloudEvents addresses duplicate event identity through source and ID. (apidoc.leonsoftware.com) (github.com)
- **Offline queue:** capture training locally, deliver it late, then replay a previously accepted event. Confirm that the current revision survives replay and that pending records remain visibly pending. CAE's advertised offline collection makes this an explicit procurement test. (www.cae.com)

The test suite should also distinguish **recency restoration** from routine accrual. Section 121.439(b) describes check-pilot supervision for restoration, and the current official text requires the observing check pilot to certify proficiency and qualification under paragraph (e). (www.law.cornell.edu) (www.ecfr.gov) Raw takeoff/landing counts should not silently replace that required pathway.

For every scenario, require a record of input evidence, expected status, receiving status, exception owner and resolution. OWASP recommends recording when, where, who and what for an event. (cheatsheetseries.owasp.org) Apply that structure to the integration audit trail without copying sensitive assessment narratives into routine technical logs.

Acceptance should include **readback from the scheduling consumer**, not only inspection of the integration's own cache. AIMS advertises automatic legality and coverage checks during manual assignment; procurement tests should observe the checks in the receiving workflow. (www.aimsairlinesoftware.com) Leon documents that imported endorsements and expiry dates drive crew planning; verify the actual receiving representation and the assignment checks using it. (wiki.leonsoftware.com) FlightStratix advertises roster checks against

qualification, document status, recency and availability, but positions the product for private aviation teams. (flightstratix.com) (flightstratix.com) Its page demonstrates a capability category, not verified suitability or approval for a particular Part 121 airline. Comply365's automated qualification-tracking description is likewise a starting point for a demonstration of applicable fields and rules. (comply365.com)

A test passes when the observed behavior matches the operator's documented expectation and the exception reaches the authorized owner. CloudEvents identifies duplicates; it does not decide qualification validity. (github.com)

Vendor and API Evaluation: Configure, Buy or Build

Start with the deployed system's licensed modules, supported connections and data rights. NetLine Crew's described qualification monitoring is a reason to examine configuration before assuming the operator needs a separate dashboard. (www.lhsystems.com) Public feature descriptions indicate what to investigate; they do not establish a complete contract between an operator's source and consumer. **Comply365** advertises automated qualification tracking, while **Scandlearn** describes course availability, expiration dates and completion deadlines. (comply365.com) (scandlearn.com) Neither description alone answers whether the crew roster receives the accepted record revision for an assignment's specific scope.

Table 2 compares implementation paths and representative documented capabilities. It is a procurement map rather than a product ranking. Products serve different operational segments, and the custom option addresses an interface gap rather than replacing a crew-management suite.

Path or example	Publicly documented capability	Evidence to request before selection
Configure existing AIMS modules	Training assessment submissions update records and recalculate expiry dates. (www.aimsairlinesoftware.com)	Demonstrate certification, event correction, prerequisite scope and receiving roster readback.
Use ProDIGIQ repository/export capabilities	Standard/custom report creation and export are advertised. (www.prodigiq.com)	Inspect actual fields, supported transport, revision handling and whether exports serve the intended operational consumer.
Assess CAE's supported training interface	Third-party integration APIs are advertised. (www.cae.com)	Obtain supported operations, field definitions, authentication, applicable module rights and correction behavior.
Assess a Crewdox packaged connection	Training-data synchronization with Leon is advertised. (www.crewdox.com)	Confirm licensed endpoints, direction, authoritative source, prerequisite state and operator acceptance tests.
Inspect Leon's documented certificate workflow	One-way push of complete certificate records is documented. (apidoc.leonsoftware.com)	Verify crew matching, supplied expiry semantics, replacement behavior and reconciliation responsibility.
Assess integrated NetLine capabilities	NetLine Crew describes qualification monitoring and integration with NetLine Ops ++. (www.lhsystems.com) (www.lhsystems.com)	Demonstrate the specific source-to-roster path and review handling in the proposed configuration.

Path or example	Publicly documented capability	Evidence to request before selection
Commission a narrow custom interface, including LANDING.AERO as a builder	The studio describes bridges between legacy systems and modern applications, built to the operator's workflow. (www.landing.aero)	A scoped interface contract, source/consumer access, acceptance evidence, ownership and maintainable support arrangements.

The recommended buying sequence follows the gap. Configure when the deployed software exposes and consumes the necessary governed fields. Buy a supported connector or module when it closes the demonstrated gap. Build only when source and consumer access are available but an essential handoff remains unsupported or unreliable under the agreed tests. LANDING.AERO's first-party description supports a custom flight-operations role; it does not establish a pre-existing connector to any vendor listed here. (www.landing.aero)

Request concrete answers rather than accepting “API available”:

- **Field access:** can the operator export accepted results, certifier identity, scope, revision and evidence references?
- **Direction:** which system owns the record, and which endpoint changes the consuming status?
- **Identity:** what immutable person key exists, and how are merges or changed contact details handled?
- **Replacement:** is an update partial or a full-record overwrite? Demonstrate the receiving behavior using a corrected accepted record.
- **Expiry authority:** does the consumer calculate validity or require it from the source? Leon documents that its certificate workflow does not calculate expiry from the definition's validity period. (apidoc.leonsoftware.com)
- **Change discovery:** what supported event, polling or export method identifies accepted changes and corrections?
- **Security:** what read/write permissions, credentials and evidence-access restrictions apply? OpenAPI documents security requirements at API and operation levels. (learn.openapis.org)
- **Reconciliation:** who compares consumed statuses with the authoritative source and resolves discrepancies? Do not assume this responsibility is automated. (wiki.leonsoftware.com)

An **OpenAPI description** is useful for documenting the Hypertext Transfer Protocol (HTTP) interface, but neither the schema nor a successful request proves a qualification decision. (spec.openapis.org) Require demonstration data, operator-specific mappings and observable consumer behavior before approving the handoff for production use.

Audit Export and Authorized Human Review

An audit export should reconstruct why a status existed at the time of a decision. The proposed export includes the source record locator, accepted result, qualification scope, certifier identity, applicable program/rule version, effective period, status revision, delivery/readback evidence and exception disposition. AC 120-78B treats a record as preserving evidence and addresses record preservation and controlled access.

(www.faa.gov) The export design is a recommendation for traceability, not a claim that the circular prescribes this exact payload. Crewdox describes source updates from forms, attendance and completed e-learning; an audit export should retain which accepted source event produced the status. (www.crewdox.com)

Keep the **record audit trail** distinct from the **technical delivery log**. The former explains certification and controlled changes; the latter explains transmission, errors, receipt and reconciliation. OWASP's when/where/who/what guidance supports useful technical logs, and its access-control guidance supports testing who can read them. (cheatsheetseries.owasp.org) (cheatsheetseries.owasp.org) Logs need enough information to diagnose a mismatch without becoming a broadly accessible copy of medical or assessment evidence.

A minimum role demonstration should cover:

- **Authorized entry:** demonstrate who can submit, certify or correct an event and how their identity appears in the governed record. (www.law.cornell.edu)
- **Operational review:** demonstrate who can determine the scope of a qualification or apply/remove a restriction under operator procedures.
- **Scheduling consumption:** demonstrate the exact status available for a proposed assignment, including pending or stale conditions.
- **Technical intervention:** demonstrate that retrying delivery cannot change the underlying assessment or certify an event.
- **Audit retrieval:** demonstrate that an authorized reviewer can retrieve the cited evidence and earlier revision when required.

API permissions should also be documented for each operation, following the distinction OpenAPI makes between global and operation-specific security requirements. (learn.openapis.org)

Retention must be sourced by record category. The **six-month** minimum in §121.683(a)(2) concerns the specified release-from-employment or physical/professional-disqualification action records; it is not a universal retention period for all crew training evidence. (www.govinfo.gov) Do not use that number as a system-wide purge rule. Establish the operator's retention schedule from applicable requirements, approvals and controlled procedures.

Keep PRD work on its own track. FAA describes PRD reviewing access as dependent on pilot consent and describes the developer API in terms of reporting pilot records. (www.faa.gov) FAA's AC 120-68J description limits those records to use as a hiring aid. (www.faa.gov) A PRD submission or retrieval therefore should not be presented as a substitute for the carrier's current qualification records and assignment checks.

The human boundary is explicit: the interface transports accepted evidence and evaluates configured conditions; authorized personnel certify results, interpret applicable approvals and resolve exceptions within their roles. An artificial intelligence (AI) assistant may help prepare a field mapping or summarize a discrepancy, but this report recommends no autonomous certification, medical determination or operational release from a generated answer. The controlling evidence remains the governed source record.

Data Analysis and Evidence

This research established regulatory timing differences and documented vendor capabilities, not an independently measured benchmark for source-to-roster accuracy or latency. The quantitative core therefore separates **sourced regulatory examples** from a **reproducible hypothetical calculation**. None of the following figures is an acceptable universal software expiry rule.

Table 3 summarizes selected timing provisions relevant to data modeling. The table intentionally preserves applicability conditions rather than compressing them into one “expires after” column.

Category and pathway	Sourced timing example	Consequence for the interface
Ordinary pilot takeoff/landing recency	Generally at least **three** takeoffs and landings in type within the preceding **90 days**, including the rule's approved-simulator provisions. (www.ecfr.gov)	Evaluate a rolling period, type and qualifying events; handle restoration separately.
Ordinary pilot-in-command line check	A passed line check in one of the types to be flown within the preceding **12 calendar months**. (www.ecfr.gov)	Preserve passed result, type coverage and calendar-month semantics.
Ordinary pilot-in-command proficiency	Type-specific proficiency check within **12 calendar months**, plus a check or approved simulator course within **six calendar months**, under the applicable provisions. (www.ecfr.gov)	Model the linked conditions rather than one annual check date.
Traditional recurrent training	Section 121.433(c) generally uses **12 calendar months**, with an additional **six-calendar-month** recurrent-flight-training condition for pilots in command and specified substitutions/exclusions. (www.ecfr.gov)	Apply the actual approved pathway and related paragraphs, not a universal duration.
AQP continuing qualification	Initial cycle no longer than **24 calendar months**, with two or more equal evaluation periods; a warranted, subsequently approved extension may reach **36 calendar months**. (www.ecfr.gov)	Store the approved cycle and evaluation-period conditions; never treat cycle length as continuous unconditional eligibility.

These provisions explain why an integration needs a category-specific rule map. For recurrent training and checks covered by §121.401(b), satisfactory completion in the calendar month before or after the required month can be treated as completion in the required month. (www.law.cornell.edu) (www.ecfr.gov) AQP has its own due-month provision. (www.ecfr.gov) RFC 3339 does not define such periods, so timestamp standardization cannot determine their legal meaning. (www.rfc-editor.org)

Reconciliation calculation (Hypothetical Example)

Assume a test snapshot contains **500 crew members** and **four compared qualification categories** per crew member, producing **2,000 compared crew-category pairs**. Assume **30 pairs** disagree on active status. All inputs are invented for this demonstration:

Mismatch rate = mismatched active-status pairs / compared crew-category pairs = 30 / 2,000 × 100 = 1.5%.

This is an author calculation, not an observed airline result or a safety threshold. A low aggregate rate could still conceal a consequential mismatch. Compare the same effective time, scope and accepted revision, and inspect every discrepancy according to operator procedures.

Recommended companion measurements are:

- **Coverage:** compared pairs divided by expected applicable pairs, with exclusions disclosed.
- **Staleness:** age since the last verified source-to-consumer agreement, distinct from age since delivery.
- **Latency:** elapsed time between accepted source certification and confirmed consumer availability.
- **Direction:** source qualified/consumer unqualified versus source unqualified/consumer qualified.
- **Identity exceptions:** records whose crew or category mapping remains unresolved.
- **Correction propagation:** outstanding superseded revisions in the consuming roster.
- **Review backlog:** unresolved exceptions by owner, age and next operational decision.

The protocol should report missing pairs separately rather than silently omitting them from the denominator. CloudEvents event identity can support repeatable deduplication, and OWASP's separate event/logging timestamps support delay analysis. (github.com) (cheatsheetseries.owasp.org) Neither establishes an allowable mismatch percentage or reconciliation interval; those remain controlled acceptance and operational decisions. The logging framework records the event context, while the operator defines how discrepancies are classified and escalated. (cheatsheetseries.owasp.org)

Implications and Future Directions

The most useful next step is a **bounded demonstration using the operator's actual systems**. Trace a representative accepted record through its fields, certification state, API/export, consuming roster and evidence retrieval. Repeat the trace for a correction, a restriction and a delayed delivery. The output should be a gap statement precise enough to configure a module, procure a connector or commission an interface.

Vendor documentation already shows a range of starting points. Crewdox describes training records updating from forms, attendance and completed e-learning; ProDIGIQ advertises configurable training/qualification alerts; FlightStratix exposes published rosters and document-expiry information to crew. (www.crewdox.com) (www.prodigiq.com) (flightstratix.com) These capabilities should shorten the discovery question to what evidence moves, under whose authority, with what scope and revision. They do not remove the need to inspect the specific deployment.

A useful development direction is to separate **stable event transport** from **operator-controlled qualification interpretation**. CloudEvents defines an occurrence timestamp and event identity; OpenAPI describes interface data types. (github.com) (spec.openapis.org) Those technical conventions can make a handoff more explicit while leaving FAA requirements and the approved training pathway visible in the mapping.

Another priority is **restricted evidence access with operationally useful status**. Test that scheduling can see the applicable status and responsible reviewer without receiving unnecessary health information. OWASP's sensitive-data and event-log access guidance supports that separation. (cheatsheetseries.owasp.org) (cheatsheetseries.owasp.org) The same discipline helps keep an operational dashboard from becoming an uncontrolled duplicate of the governed record system.

Custom development should follow these demonstrations, with a small scope and clear ownership. It should solve the missing handoff, not quietly acquire authority to certify training, determine medical fitness or approve assignments. Future automation is most defensible when it makes provenance, disagreement and review visible. The operator's approved procedures remain the basis for action.

Conclusion

Part 121 crew qualification tracking is best evaluated as an evidence chain. The governed record establishes what was completed, checked and certified. A qualification status expresses the applicable scope, period and restrictions. The roster evaluates that status against a proposed assignment within the operator's approved process. Treating those stages as one green flag obscures the evidence and the decision owner.

The procurement decision should follow demonstrated requirements. First configure the available training and crew-system capabilities. Then assess supported modules and connectors against the field contract and exception suite. Build a narrow interface only when required source and consumer data are available and a specific residual handoff remains unresolved. A product page or an API endpoint is the beginning of that evaluation, not its acceptance evidence.

The practical acceptance package is a qualification catalog, source-to-status matrix, scope and date definitions, correction/replay tests, consumer readback, restricted audit retrieval and named exception ownership. Reconciliation should compare like-for-like crew-category pairs and separately report coverage, stale evidence and unresolved restrictions. Its figures should be treated as diagnostic evidence rather than operational permission.

Authorized human review remains essential wherever the evidence, rule application or approved pathway requires judgment. The interface should make that review easier to perform and reconstruct. A useful roster-facing status answers what supports it, when it applies, what limits it, and who must resolve uncertainty. It does not authorize an assignment on its own.

Source links

Links cited in this article, in order of first appearance. Full addresses are provided for readers using extracted text.

1. https://www.ecfr.gov/current/title-14/chapter-I/subchapter-G/part-121/subpart-V/section-121.683
2. https://www.govinfo.gov/content/pkg/CFR-2026-title14-vol3/pdf/CFR-2026-title14-vol3-sec121-683.pdf
3. https://www.ecfr.gov/current/title-14/chapter-I/subchapter-G/part-121/subpart-O/section-121.439
4. https://www.govinfo.gov/content/pkg/CFR-2026-title14-vol3/pdf/CFR-2026-title14-vol3-sec121-439.pdf
5. https://www.faa.gov/training_testing/training/aqp
6. https://www.faa.gov/regulations_policies/advisory_circulars/index.cfm/go/document.information/documentID/1043396
7. https://www.prodigiq.com/airlines/advanced-qualification-program/records-and-qualification-tracking-module/
8. https://www.aimsairlinesoftware.com/crew-management
9. https://www.cae.com/civil-aviation/aviation-software/flight-operations-solutions/training-management
10. https://cheatsheetseries.owasp.org/cheatsheets/Logging_Cheat_Sheet.html

11. https://www.faa.gov/regulations_policies/advisory_circulars/index.cfm/go/document.information/documentID/1039941
12. https://landing.aero/articles/en/part-117-vs-part-135-duty-time-data
13. https://www.ecfr.gov/current/title-14/chapter-I/subchapter-G/part-121/subpart-N/section-121.415
14. https://www.crewdox.com/trainingrecords
15. https://www.lhsystems.com/solutions/operations-control-center/netline-crew
16. https://www.landing.aero/
17. https://www.ecfr.gov/current/title-14/chapter-I/subchapter-G/part-121/subpart-N/section-121.401
18. https://www.law.cornell.edu/cfr/text/14/121.401
19. https://comply365.com/training-management/
20. https://www.ecfr.gov/current/title-14/chapter-I/subchapter-G/part-121/subpart-O/section-121.441
21. https://www.ecfr.gov/current/title-14/chapter-I/subchapter-D/part-61/subpart-A/section-61.53
22. https://www.ecfr.gov/current/title-14/chapter-I/subchapter-G/part-121/subpart-O/section-121.443
23. https://www.law.cornell.edu/cfr/text/14/121.443
24. https://apidoc.leonsoftware.com/standard-workflows/crew_certificates_sync_quide/
25. https://wiki.leonsoftware.com/wiki/crew-training-qualifications-endorsements
26. https://github.com/cloudevents/spec/blob/main/cloudevents/spec.md?plain=1
27. https://www.ecfr.gov/current/title-14/chapter-I/subchapter-G/part-121/subpart-O/section-121.434
28. https://scandlearn.com/evolve
29. https://www.crewdox.com/coursemanagement
30. https://www.ecfr.gov/current/title-14/section-121.901
31. https://www.ecfr.gov/current/title-14/section-121.909
32. https://www.ecfr.gov/current/title-14/section-121.903
33. https://www.faa.gov/airports/resources/advisory_circulars/index.cfm/go/document.information/documentNumber/120-54A
34. https://www.law.cornell.edu/cfr/text/14/121.683
35. https://www.faa.gov/documentLibrary/media/Advisory_Circular/AC_120-78B_FAA_Web.pdf
36. https://www.rfc-editor.org/rfc/rfc3339.html
37. https://owasp.org/about
38. https://www.ecfr.gov/current/title-14/chapter-I/subchapter-D/part-61/subpart-A/section-61.23
39. https://spec.openapis.org/oas/v3.1.2.html
40. https://www.law.cornell.edu/cfr/text/14/121.439
41. https://flightstratix.com/crew-management
42. https://www.crewdox.com/integrations
43. https://www.landing.aero/about/
44. https://learn.openapis.org/specification/security.html
45. https://www.faa.gov/regulations_policies/pilot_records_database
46. https://www.ecfr.gov/current/title-14/chapter-I/subchapter-G/part-121/subpart-O/section-121.440
47. https://www.ecfr.gov/current/title-14/chapter-I/subchapter-G/part-121/subpart-O/section-121.433

48. https://www.ecfr.gov/current/title-14/section-121.915

THE PUBLISHER

About LANDING.AERO

LANDING.AERO builds custom software for aviation operations teams at airlines, charter operators and flight departments. It is based in Montreal.

What it builds

Operations tools that reduce manual steps in day-to-day flight operations; integration of existing systems and data sources into one operational picture; workflow automation; real-time operational dashboards; bridges between legacy systems and modern applications; and mobile apps for staff in the field. Each application is designed around the operator's own workflows rather than sold as an off-the-shelf platform.

How it works

Work starts with discovery of the operator's workflows, continues with iterative development alongside the operator's team, and includes integration with the tools already in use and ongoing support.

Its own tools

LANDING.AERO also publishes small tools for aviation professionals, including UTC Alarm, which sets alarms in Zulu time, and NOTAM Notifier, announced for NOTAM change alerts on chosen airports.

Visit

See LANDING.AERO and its projects.

Articles published here explain general practice and cite their primary sources, naming the jurisdiction of any rule they describe. They are not operational, regulatory or legal advice, do not replace an operator's approved procedures or manuals, and requirements change.

Website: https://www.landing.aero

This article is educational. Verify consequential medical, legal, financial, regulatory and technical decisions with appropriate professionals and the cited primary sources. Company services are described separately from the article's research findings.