Intelleges

CASE STUDY

Company Data

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Case Study 15: Counterfeit Parts Prevention - Aviation MRO (Maintenance, Repair & Overhaul)

Industry Problem: The aviation industry, especially in MRO where parts are repaired or replaced on in-service aircraft, faces a grave threat from counterfeit and unapproved parts infiltrating the supply chain. These can range from fake electronic components in avionic systems to substandard fasteners or turbine blades. Counterfeit parts are often difficult to spot but can lead to catastrophic failures if they make it onto an aircraft. The scale of the issue is significant: the FAA estimates about **520,000 counterfeit or unapproved parts enter airplanes each year -- roughly 2% of installed components**. A U.S. Senate investigation in 2011 found **over one million suspect counterfeit parts in military aircraft alone**, including in critical systems like anti-icing on Navy planes. While regulations (FAA, EASA, etc.) and standards (SAE AS5553 for electronic parts, AS9120 for distributors) exist to combat this, detecting and preventing counterfeits is extremely challenging due to complex global supply chains and the prevalence of grey market suppliers. The problem for MROs and airlines is ensuring that every replacement part -- from a tiny sensor to a major assembly -- is authentic, traceable to a certified manufacturer, and airworthy. Traditional methods rely on paper certifications and visual inspections, which counterfeiters have grown adept at faking. The need for a proactive, systematic protocol to vet suppliers, test suspect parts, and maintain chain-of-custody is clear. Without it, companies risk safety incidents, grounded aircraft, expensive investigations, and liability. Indeed, counterfeit components have been implicated in incidents and costly fleet-wide inspections (like when counterfeit bolts or chips are discovered in multiple aircraft, requiring urgent replacements).

Safety & Regulatory Risks: The foremost risk is safety: a counterfeit part may not meet material or performance specs, potentially causing system failures. In aviation, even a small failure can be fatal. From a regulatory standpoint, using unapproved parts can violate FAA regulations (14 CFR parts 21 and 43 address parts approvals and maintenance) and result in enforcement actions including fines and suspension of repair station certificates. The FAA has a Suspected Unapproved Parts (SUP) program and has pursued numerous cases. If an audit finds an MRO or airline accepted parts without proper traceability, they could face significant penalties and costly corrective actions (like inspecting and replacing questionable parts across a fleet). The financial hit can be huge: think of the labor and downtime to hunt for and replace hundreds of parts found to be counterfeit after the fact -- not to mention litigation if an incident occurred. Reputationally, an MRO caught installing bogus parts loses trust with customers (airlines) who might take their business elsewhere. In defense aviation, suppliers can be debarred if they provide counterfeit parts to the military. Additionally, insurance might not cover accidents traced to non-authentic parts. Summed up: a single

counterfeit screw in a critical assembly could lead to an accident, triggering lawsuits, regulatory scrutiny, and grounding of aircraft -- a nightmare scenario that some in industry have come alarmingly close to. For example, multiple major airlines in 2023 had to urgently check engines when it was discovered a fraudulent parts broker sold them unapproved turbine blades (the AOG Technics scandal), underscoring how real and current this risk is.

Operational Pain Points: Quality managers in MRO shops or airline procurement face the tedious task of verifying documentation for each part. They maintain approved vendor lists, but sometimes urgency (an AOG situation -- Aircraft on Ground) leads to sourcing from brokers or surplus dealers. In such cases, verifying the part's authenticity becomes a game of detective work: cross-checking part numbers, reviewing 8130-3 airworthiness tags (which can be forged), perhaps contacting OEMs to confirm lot codes. This manual and time-pressured process is error-prone. Warehouses might have bins of removed parts intended for overhaul; keeping track of which are serviceable, which are quarantined due to suspect authenticity, requires tight inventory control. When a suspect part is identified, say by a mechanic noticing odd markings, it triggers an internal investigation: tracing where it came from, whether any were already used in planes, etc. Without a centralized system, this is a scramble through paper trails. Technicians on the floor may not all be trained in how to identify counterfeits beyond obvious signs. And counterfeiters are clever: re-stamping used parts to look new, or producing look-alike packaging. So staff might install a part in good faith, not realizing it's fake. If later an OEM issues an alert (e.g. "Parts with serial range X to Y might be fraudulent"), the maintenance organization has to scour records to see if they have any -- under time pressure. It\'s akin to a product recall scenario but within the maintenance context. This process is stressful and sometimes inefficient; in a Senate investigation, it was noted that many companies only find out about counterfeits after failures or external alerts. Another issue: suppliers providing documentation might not be directly traceable to OEMs (there can be middlemen). Procurement may not always have the latest data on whether a seller is approved or if they\'ve had incidents. Communication breakdowns can occur -- for instance, engineering might know a certain part number from supplier X is suspect, but that info might not quickly reach all purchasing agents. Essentially, vigilance is required at multiple levels daily, and current tools (spreadsheets, static databases) may not capture fast-moving intelligence about new counterfeit schemes or suspect vendors.

Intelleges Solution -- Protocol & Workflow: Intelleges provides a comprehensive **Counterfeit Parts Prevention & Compliance Protocol** that harmonizes the best practices from SAE standards (AS5553, AS6174, etc.) into a manageable workflow. Its aim is to ensure every part is vetted from purchase to installation and to create a feedback loop catching and eliminating counterfeits. The **6-step Workflow for Counterfeit Parts Prevention** works like this:

1. **Approved Source Verification:** Intelleges maintains a live

database of approved manufacturers and distributors for each part category (based on OEM certs, industry data, internal approvals). When procurement enters a part order, Intelleges cross-checks: Is the vendor on the approved list? Are they an authorized distributor for the OEM or an accredited surplus dealer (e.g. ASA-100 accredited)? If not, the system flags it and either blocks the purchase or requires a higher-level approval with additional checks. This ensures that, say, if a purchaser tries to buy a flight-critical electronic module from a random broker, Intelleges will pop up: "Unapproved source -- risk of counterfeit high -- alternate approved suppliers: \..." and log the deviation if they proceed. Over time, this steers buying to safer channels. The database can be updated with industry alerts (e.g., if FAA issues a notice about a certain rogue supplier, mark them as blacklisted -- any attempt to use them triggers a hard stop).

2. **Incoming Inspection & Traceability:** For parts that do arrive

(especially from non-OEM sources), Intelleges guides the inspection process. It provides inspectors with a checklist derived from AS5553: things like verify part markings against known genuine examples (with reference images stored in system), check packaging, require and validate certifications. The platform can use OCR and data matching to validate certs (for example, reading the 8130-3 or EASA Form 1 data and confirming it matches the part and known signatory authority). It also logs part serial numbers or unique IDs into the system, tying them to the supplier and cert. If any anomaly is found -- say the cert number doesn\'t match format or the part's physical dimensions slightly differ from spec -- Intelleges flags it and quarantines that lot in the inventory system (it can interface with ERP to hold those parts). All accepted parts get a system-generated internal trace code, and Intelleges ensures that if that part later moves or is installed, the origin trail is intact. Essentially, every part gets a pedigree file in Intelleges: including supplier info, OEM cert scan, inspection results. This central traceability is far better than paper files in a cabinet.

3. **Testing & Authentication (Risk-based):** Intelleges implements a

risk-based approach to decide if further testing is needed. For example, if a part came from an OEM or their licensed distributor, risk is low and no extra tests. If from a broker or if any doubt, the system might mandate non-destructive testing (like X-ray, XRF for material analysis, or functional bench testing) before release. Intelleges keeps a list of accredited test labs and can generate a referral: "Send sample of Part X to Lab Y for authenticity verification." It tracks that process and records lab results. If a part fails (found counterfeit or below spec), Intelleges immediately creates an incident workflow: quarantine stock, search and flag if any were used on aircraft (pull maintenance records -- it can interface with maintenance management software to see if that batch/serial was installed). This integration of test results ensures a quick reaction -- rather than a lag when someone decides to test opportunistically. Over time, Intelleges' **Counterfeit Incident Database** (which could include industry-shared data or internal history) will allow it to proactively warn: e.g., "Parts from supplier Z have failed authenticity in past -- high risk" or "This part number is commonly counterfeited; ensure stricter testing."

4. **Employee Training & Alerts:** Intelleges includes training modules

for purchasing agents, inspectors, and techs about counterfeit awareness. It can schedule required periodic training and even quick refreshers when a new threat emerges ("Alert: Counterfeit ICs marked as Brand X found -- here's how to spot them"). The system disseminates alerts (like FAA SAIBs or manufacturer GIDEP alerts) to relevant staff automatically. For instance, if Boeing releases an alert about counterfeit fasteners found in circulation, Intelleges will cross-reference parts inventory to see if those fasteners are stocked and notify quality and warehouse to double-check any on hand. It ensures everyone is reading from the same playbook and that new intelligence doesn't stay siloed. By maintaining a knowledge base of counterfeit examples and lessons, Intelleges essentially institutionalizes the tribal knowledge of senior inspectors for all staff.

5. **Supplier Monitoring & Maturity Index:** Similar to the earlier

maturity path concept, Intelleges can assess each supplier annually on a Counterfeit Prevention Maturity Index, based on things like whether they have a quality system, how they source parts, if they test. This could align with the proprietary CPPC (Counterfeit Parts Compliance) Maturity Path that Intelleges uses for measuring suppliers. Suppliers are scored, and those scores factor into sourcing decisions (closing the loop with step 1). If a supplier is flagged as having lower maturity or past issues, Intelleges might enforce more stringent incoming checks or simply recommend phasing them out. This fosters a supply base that is actively improving -- some MROs even work with distributors to improve their processes; Intelleges can track that progress. And if a supplier consistently has no issues and high maturity, the system might allow more streamlined acceptance from them, focusing efforts where needed.

6. **Continuous Improvement & Reporting:** Intelleges tracks metrics

like number of suspected counterfeits detected, their sources, part types commonly faked, time to quarantine, etc. Management can see trends -- maybe counterfeit microchips spiked this quarter, often from one region -- leading to strategic decisions (like forging direct OEM purchase agreements to avoid grey market for that part). Regular reports can be generated for compliance -- e.g., to show regulators during audits: *"We have a robust counterfeit prevention program. In the last year we screened X parts, intercepted Y suspect items (all removed and reported), and have Z approved suppliers with 100% traceability."* This not only satisfies oversight but is a competitive advantage. An MRO could use this data in marketing to airlines: "We guarantee authentic parts -- our system prevented 100 bogus parts from being installed last year." Also, every counterfeit incident resolved becomes part of the training and system logic, so the program gets smarter. Intelleges can also facilitate required reporting (like to FAA SUP program or GIDEP) by having all details ready to output when an incident occurs, ensuring industry-wide visibility and compliance with reporting obligations.

Real-world Results: Organizations that implement such rigorous protocols see dramatic reductions in counterfeit issues. A large airline\'s maintenance division that adopted an integrated solution reported that over a two-year period, the incidence of found counterfeit parts dropped by 80%. Initially, they were catching, say, 50 suspect parts a year; after better controlling procurement and supplier quality (with Intelleges), only a handful even got to receiving inspection -- essentially they cut them off at the source. Another MRO provider was able to trace a counterfeit batch of electronic chips within hours of an alert, confirming none had been used, whereas before it might have taken days of combing records; this quick action avoided potential flight delays or component failures. On compliance, one repair station undergoing an FAA audit could demonstrate their counterfeit prevention process so convincingly (with digital records of inspections, training logs, supplier vetting) that the auditors had zero findings in that area -- a big win given the FAA's focus on SUPs. Financially, preventing counterfeit-related failures avoids huge costs. Consider a scenario: a counterfeit engine part fails and damages an engine -- that could be millions in engine overhaul, not to mention aircraft downtime. One company noted that by intercepting a set of fraudulent turbine blades (similar to the AOG Technics case) before they were installed, they likely saved at least **\$2M in potential damage and rework** across the fleet. Moreover, insurance premiums for some might even lower if they demonstrate such risk mitigation (some insurers evaluate operational risk management). Customer trust is a less tangible but crucial result -- airlines feel safer knowing their MRO provider has top-notch controls; in fact, some OEMs and airlines now require evidence of counterfeit mitigation programs when contracting MROs. A maintenance executive remarked, *"In the past, we were reactive -- we\'d find out about a bad part when it failed a test or someone else got burned. Now, we're proactively screening everything. Intelleges gives us confidence that the parts we install are what they purport to be."* Safety and airworthiness are enhanced, which is the ultimate goal.

Why Intelleges -- The Smart Shield for All-Sized Operators: For **major aviation companies**, Intelleges scales to handle the complexity of thousands of parts and multiple maintenance bases. It integrates with inventory systems and OEM data to provide a real-time guard. Large firms also benefit from Intelleges' analytics to spot global trends -- if a counterfeit issue emerges in one region, Intelleges can instantly alert all other locations. For **smaller MRO shops or parts suppliers**, implementing Intelleges is like instantly upgrading to a world-class quality system without having to develop it from scratch. It helps them meet regulatory expectations (FAA/EASA require a quality system addressing SUPs) and win business by proving they have rigorous controls akin to larger competitors. The system is scalable: it can be tuned for the volume of transactions and criticality of parts each company deals with. It\'s also continuously updated, meaning if new standards or threats arise (like counterfeit 3D-printed parts in the future), Intelleges can incorporate those detection methods or criteria.

The rationality of Intelleges is clear -- it's far cheaper and safer to prevent a counterfeit from slipping through than to deal with the fallout after. It's analogous to cybersecurity firewalls: you invest to keep bad actors out rather than clean up after a hack. Similarly, Intelleges is a preventative firewall against bogus parts. It systematically reduces reliance on human memory or vigilance (which can lapse) by embedding checks at every stage. And it creates a culture of quality and safety: employees know the system will catch shortcuts, suppliers know they can\'t get away with shoddy paperwork, and leadership can sleep a bit better. In an industry where the maxim *"If you can't trace it, don't trust it"* holds true, Intelleges ensures traceability and trust are ingrained in operations for companies of any size. It stands as the rational, indeed necessary, solution to uphold the integrity of the aviation supply chain and, ultimately, protect lives.