

By James Careless

Combating Counterfeit and Fraudulent Aircraft Parts: An AVM Roundtable

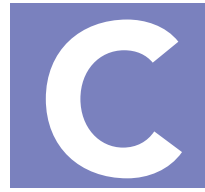




Jason Dickstein,
MARPA



Roei Ganzarski,
Alitheon



ounterfeit and fraudulently documented aircraft parts pose a direct safety threat to aviation maintenance, aircraft operators, and passengers. When detected after widespread usage, a poor-quality counterfeit bolt can ground an entire fleet. When undetected, it can cause a catastrophic mid-air failure.

Aviation Maintenance magazine recently sat down with two industry experts to discuss the threat of counterfeit and fraudulent aircraft parts, the vulnerabilities in today's supply chain, and the technologies aiming to solve the problem.

Roei Ganzarski is CEO of Alitheon. His company utilizes patented optical AI technology to capture the inherent microscopic surface details of physical items, creating an unforgeable digital "fingerprint" that protects the aviation supply chain from counterfeit and fraudulent parts. "Our patented system, FeaturePrint, gives every physical item a unique digital identity — the equivalent of a fingerprint for things — using nothing more than a standard camera," he said.

Jason Dickstein is president of the Modification and Replacement Parts Association (MARPA) and general counsel with the Aviation Suppliers Association. MARPA is a non-profit trade association representing manufacturers of FAA-approved aftermarket aircraft parts.

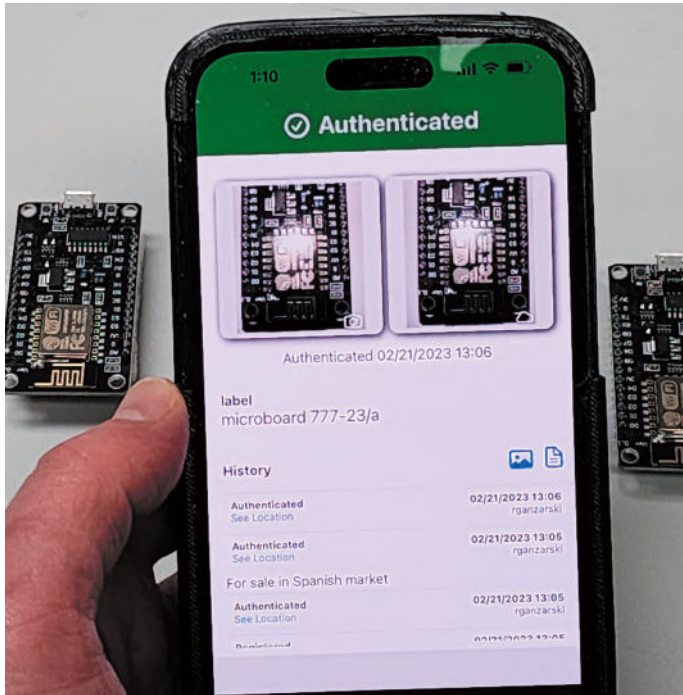
Aviation Maintenance: What are counterfeit aircraft parts? When we use the term, what are we referring to?

Roei Ganzarski: I would first like to expand this question to fraudulent parts, because the broader framing matters. Fraudulent parts include counterfeit parts, but also grey market parts.

Counterfeit parts, which are often called fake parts, are made to look like the original but are not actually produced by the original manufacturer. They are made with the intent of deceiving the buyer into believing they are receiving an original part. On the other hand, grey market parts are authentic parts made by the original manufacturer but sold illegally or against company policy. Examples include parts that have passed their certified shelf or service life and are resold with paperwork representing them as new, authentic parts that have been stolen, and quarantined parts placed back into circulation, whether intentionally or unintentionally.

The distinction and expansion are important because the industry conversation tends to fixate only on counterfeits — parts that are visibly fake — while grey market parts often pose an equal or greater risk. A counterfeit bolt may fail because it was never built to spec, but a grey market part can fail for subtler, harder-to-detect reasons. It may have exceeded its certified life, been exposed to conditions that compromised its integrity, been pulled from a scrapped aircraft, or been diverted from a use case it was never qualified for. The part itself is genuine, so traditional inspection, paperwork review, and even material analysis can all check out, yet the part is still unfit for service. In many cases, a grey market part might come with fake or manipulated paperwork, whether printed or digital.

A potentially useful way to understand the difference and the complexities that go with it is to think about identity fraud involving people rather than parts. A standard counterfeit part is like someone claiming to be me using a fake ID, where the document itself is forged. A stolen or diverted grey market part is like someone claiming to be me using my real ID. The credential



Alitheon's FeaturePrint uses an optical AI technology to capture the inherent microscopic surface details of physical items, creating an unforgeable digital "fingerprint." Alitheon image.

is genuine and was issued by the real authority, but the person presenting it isn't the person it belongs to. Every check on the document itself will pass, because the fraud lives in the gap between the credential and the individual holding it.

Then you have a grey market part that is authentic but the wrong individual, which is like my identical twin brother claiming to be me using his own real ID. He is exactly who his ID says he is, so the document is real, the person is real, and they match, but he is still not me. If you needed me specifically, accepting him would be a failure.

A sophisticated counterfeit paired with an authentic individual is like my identical twin brother claiming to be me using a high-quality fake ID. The document is forged, but well enough that cursory checks pass, and because the person looks like the individual named on the ID, even a careful human reviewer has nothing obvious to flag.

Finally, an authentic part with a falsified history is like my identical twin brother claiming to be me using my real ID. Now the deception is complete on every conventional axis. Document checks pass, visual inspection passes, and the only thing that fails is the one check almost no system performs: asking if this is the specific individual the credential was issued to.

Traditional anti-counterfeiting is built to catch the first case, and most paperwork-based supply chain controls can catch the second. But the other cases defeat almost every layered defense except deep forensic examination of the document. Catching them requires the ability to verify the specific individual, not the category they belong to or the paperwork they present. That is the gap fraudulent parts exploit. From a detection standpoint, grey market parts are often the harder problem, because the adversary isn't trying to imitate authenticity — they already have it.

Jason Dickstein: First, it's important to recognize that a lot of people call bad parts of all sorts counterfeit when, in fact, counterfeit has a fairly specific meaning under the law.

Under the Lanham Act, if you have created something that causes confusion, deceit, or mistake by using a likeness, trademark, or other mark of someone else, then you have created a counterfeit and violated the trademark rights of the other party. So, if I build a part and I say it's a Boeing part, but I built it and Boeing didn't, that is counterfeiting. Similarly, if I build a part and I spell it B-O-W-I-N-G, that is likely to be a Lanham Act violation as well because it is confusingly similar to the name Boeing. Ultimately, the metric that gets used by the courts is whether there is a likelihood that you're going to create confusion, deceit, or mistake as to relevant facts such as the source or nature of the part.

We saw a fairly dramatic drop-off in counterfeiting after the FAA implemented AC 00-56, the voluntary industry distributor accreditation program, which basically resulted in companies seeking a measure of traceability. Interestingly enough, we have seen situations like the AOG Technics case where it turned out at least some of the parts were stolen and they created fraudulent documentation. It seems they were passing off the parts as what the parts actually were, but they were just trying to inhibit the traceability in order to avoid anyone finding out that the parts were stolen. So, there you've got an issue where the parts weren't necessarily counterfeit, but they were stolen and the documentation was fraudulent.

Aviation Maintenance: How serious is the counterfeit and fraudulent parts problem?

Roei Ganzarski: I believe this is very serious. Have hundreds of people died from this? Not that we know of. Do we need to wait for that to happen? I don't think so, and I really hope not. There are many well-documented cases just from the last few years that show the scale of the issue.

The AOG Technics case involving CFM56 engine parts in the U.K. is the largest aviation parts fraud case of the decade. The sole director, Jose Alejandro Zamora Yrala, was sentenced to prison after selling approximately 60,000 aircraft engine parts accompanied by forged Authorized Release Certificates created on his home computer. These parts went into engines that power the Boeing 737NG and Airbus A320ceo families, affecting airlines including American, United, Delta, Southwest, TAP Air Portugal, Virgin Australia, Ryanair, and Ethiopian Airlines. The estimated cost to the industry exceeded \$50 million.

In 2024, counterfeit titanium was discovered in Boeing 737 Max, 787 Dreamliner, and Airbus A220 aircraft built between 2019 and 2023. The material entered the supply chain through forged certificates of conformity from a Chinese supplier, and the fraud only came to light when Italian parts supplier Titanium International Group discovered small corrosion holes and questioned the paperwork. Also in 2024, executives at Sofly Aviation Services in the U.S. pleaded guilty to purchasing "as removed" aircraft parts and reselling them to Canadian airlines and a U.S. Department of Defense contractor using forged FAA Form 8130-3 and EASA Form 1 certificates.

We have also seen major issues with life-safety systems. In 2023, the FAA warned of counterfeit Rockwell Collins Traffic Collision Avoidance System transmitters being sold by a company in Moscow and distributed through U.S. brokers. The units had

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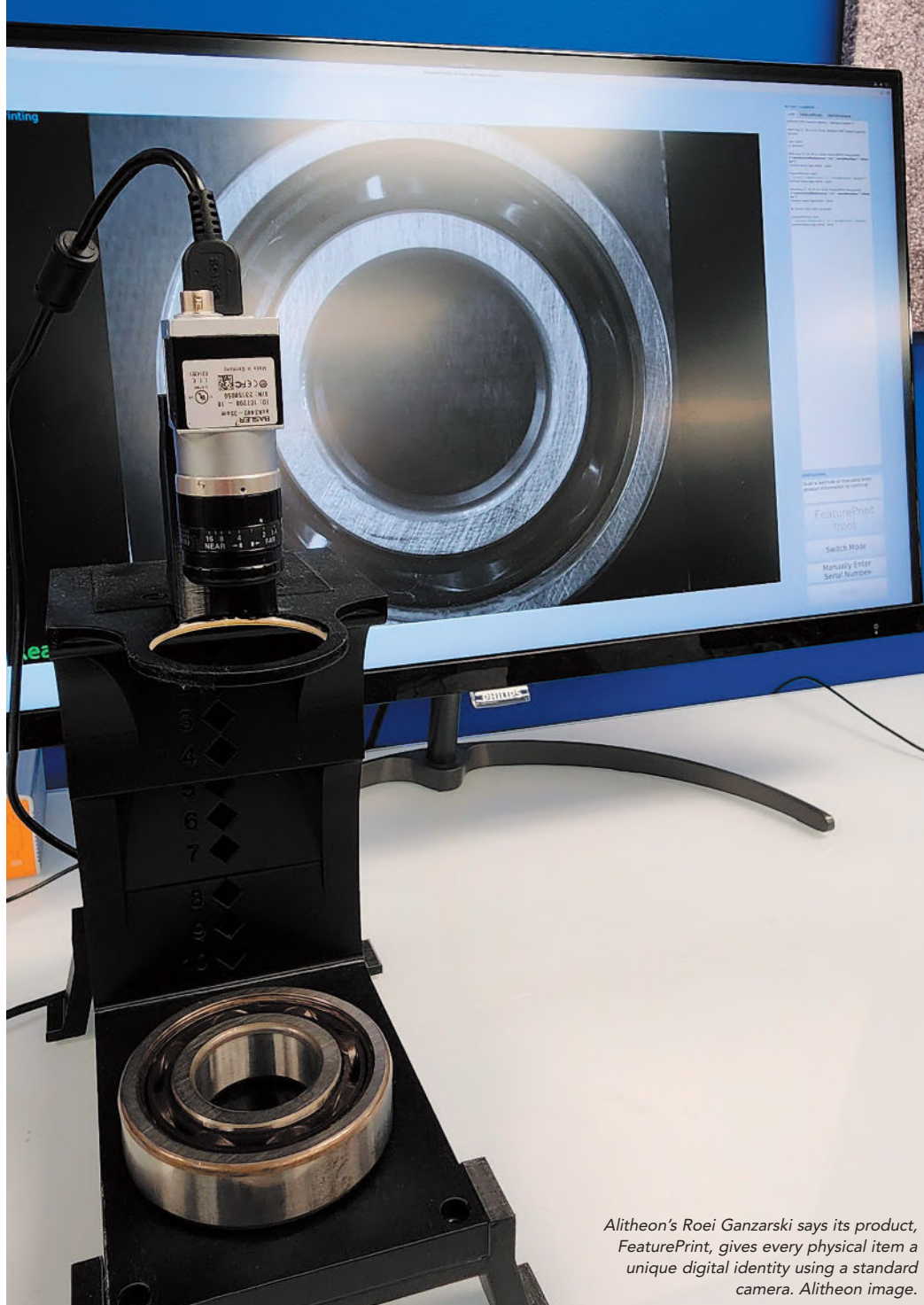
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Alitheon's Roei Ganzarski says its product, FeaturePrint, gives every physical item a unique digital identity using a standard camera. Alitheon image.

been physically altered with counterfeit outer housings and forged identification plates, and when tested by the FAA, they were entirely inoperable. On the military side, a man in Miami was sentenced to federal prison in 2024 for running a massive counterfeit-trafficking operation, importing tens of thousands of low-quality networking devices from China and Hong Kong, relabeling them as genuine Cisco products, and selling them for use in the support platforms of U.S. fighter jets.

Other cases include an Italian investigation into the disappearance of €17 million in military aircraft parts diverted through forged "out-of-use" certifications, and a Russian sanctions-evasion parts pipeline where airlines purchased at least \$1.2 billion in aircraft parts through deliberately obscured supply chains. We even see general aviation affected, like the case where Southern Aero produced and sold articles for Franklin Aircraft Engines without FAA approval for over a decade. Additionally, EASA has issued multiple notifications regarding aircraft manufacturer identification data plates being reported missing or stolen from in-service Airbus aircraft. Each plate carries the unique

identity of a specific airframe, and a stolen one could be affixed to another aircraft to fraudulently inherit that airframe's certified history.

Jason Dickstein: Anytime you've got someone committing parts fraud, they're probably going to have fraudulent documentation. The good news is that, in the grand scheme of things, there is relatively little fraud. There's not zero fraud, but the industry has gotten pretty good at detecting it.

I actually found myself helping the Nassau prosecutor's office in New York investigate a case where they weren't sure what to make of the paperwork, but they were pretty sure something was wrong. They sent over a copy by fax machine, and I happened to know some of the people who had signed the documents on a personal level. I called one of them up, gave him the work order number, and asked if he had provided the document to the company in question. He pulled up the work order and said it was absolutely incorrect. Using that method, I was able to figure out where there was a string of genuine documents and where the disconnect happened. Historically, that is exactly what quality assurance professionals in aviation do when something doesn't feel right.

That is the beauty of the FAA's AC 00-56 system; it requires companies to retain traceability documents, which allows quality professionals and government investigators to track backwards. We will never get rid of fraud completely because there are people who don't understand enough about aviation to realize what protections we have in place, but authorities have developed fairly robust systems to catch these things.

Aviation Maintenance: How do counterfeit and fraudulent parts get into the supply chain?

Roei Ganzarski: Fraud succeeds because verification in aviation today is overwhelmingly about documents, not about parts. The supply chain inspects paperwork to confirm the part is what it claims to be, but the paperwork itself is the easiest thing to fake, alter, or steal. Whether the fraudster is forging a Form 1, forging a certificate of conformity, stripping out an out-of-use record, or counterfeiting an identification plate, every documented case is fundamentally a paperwork or proxy attack.

There are several structural vulnerabilities in aviation that make this possible. First, most fraud is caught reactively, usually when a part physically fails or visibly differs from expectations, not proactively at receipt. For example, AOG Technics ran for over four years before discovery, and the titanium fraud spanned four years of production. A maintenance organization receiving a part with an apparently valid release tag typically doesn't contact the named issuer to verify. The exceptions, like the TAP Air Portugal technician who broke the AOG case, are exceptions precisely because that level of scrutiny isn't standard.

Furthermore, a part may change hands four or five times between the manufacturer, authorized distributor, broker, MRO, and operator. Each handoff offers an opportunity to substitute documentation without anyone having visibility into the full history. EASA has explicitly noted that suppliers and brokers are not regulated the way manufacturers and maintenance organizations are, and AOG Technics existed entirely in that gap. Finally, post-pandemic parts shortages, sanctions, aging fleets with discontinued production lines, and high-priced parts all create environments where buyers are willing to accept parts whose provenance they can't fully verify.

Jason Dickstein: When it happens, it's very serious because any part that is not provably airworthy is a risk, and it's the sort of risk that we don't want to take in the aviation industry.

Aviation Maintenance: What impact do counterfeit parts have when they end up in aircraft?

Roel Ganzarski: The impacts are layered, and they cascade. Safety sits at the center and dominates the conversation. Fraudulent parts can kill people, as we saw in the 1989 Partnair Flight 394 crash where counterfeit bolts attaching the vertical stabilizer wore down progressively until the tail broke off in flight. Fraudulent parts compromise safety through premature or unpredictable failure, defeating safety systems like TCAS units, and compromising predictive maintenance data. When a part's history is fabricated, every downstream maintenance decision is being made on false information. It also creates fleet-wide exposure, forcing emergency inspections and groundings across multiple continents.

When fraudulent parts are discovered, the immediate financial impact is severe. Emergency groundings can cost an airline \$250,000 or more per day per aircraft in lost capacity. Replacement parts must be sourced urgently, and MRO providers must divert entire teams away from scheduled maintenance to trace part histories and perform destructive testing. The U.K. Serious Fraud Office estimated AOG Technics cost the industry approximately \$50 to \$53 million. A recent ProvenAir blog stated that a recent Reuters analysis estimated the global financial burden of counterfeit aviation parts exceeded \$2 billion over three years.

The indirect financial costs often exceed the direct ones. Aircraft with incomplete or unverifiable maintenance records lose significant value during sales or lease returns. Lessors



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routinely refuse asset redelivery if back-to-birth documentation cannot be produced for every installed component, meaning a single suspect part can stall a multi-million-dollar transaction. There are also insurance complications, warranty voids, severe legal liability exposure, and massive productivity losses across the supply chain.

Beyond finances, aviation runs on trust, and a single fraud case damages trust at every layer, from passenger anxiety to media scrutiny. It triggers regulatory responses that create additional cost and complexity industry-wide. There are also ESG impacts, as premature parts failures increase fuel burn and disrupt end-of-life recycling, while counterfeit networks are frequently associated with organized crime and labor abuses. Finally, for military aviation, counterfeit components create operational readiness issues and strategic exposures, as counterfeit electronics can carry compromised firmware or hidden backdoors.

Jason Dickstein: The real serious cases of counterfeiting and fraud, luckily, are not frequent and are usually caught. That having been said, look at the recent massive theft in Spain. A dozen sea containers of parts that had been identified to be scrapped were intercepted by someone with credentials that made them seem like the target scrapping facility. It appears to be a highly organized criminal activity.

Any theories about who did this involve someone actually stealing those parts to use them. If they try to use those parts, they are going to have to create fraudulent documentation. They

may be engaging in a Lanham Act violation if they claim parties have done overhauls on the parts. You've got parts that may be genuine, but they have been used to a point where they are no longer safe for further use, which is why they were scheduled for mutilation. That is the sort of thing that I personally find very scary.

On the spectrum of counterfeiting, you can have parts that are completely unapproved, made of the wrong materials, and untested by the FAA or EASA. A part like that could fail prematurely. If it is a trim part on an interior, it might not impact safe flight and landing, but if you've got an engine part or a landing gear part, the failure could be catastrophic.

Aviation Maintenance: Finally, what can be done to identify and track counterfeit parts? Do solutions such as blockchain and digital traceability help?

Roei Ganzarski: Before answering what works, it's worth being honest about three technology categories currently being marketed that have fundamental limitations.

The dominant approach today relies on proxies, which means attaching something to the part like a QR code, barcode, RFID tag, or hologram. The fatal weakness is that every proxy is not the part itself. Anything that can be added to a part can also be removed from it, damaged, worn off, transferred to a different part, or faked outright.

The second category is machine learning. While powerful, it

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works at the class level, not the individual level. It can tell you with high confidence that an object is a CFM56 high-pressure turbine blade, but it cannot tell you that it is specifically serial number 7724-A.

The third category is blockchain. Blockchain is genuinely an excellent technology for creating tamper-resistant records of digital data, but it does absolutely nothing to verify the physical part itself. It relies entirely on whatever physical proxy connects the digital record to the physical object. A perfectly secured digital record of a lie is still a lie.

The same problem existed for human identity until relatively recently. ID cards and passports could be forged, and even with holograms, the document was just a proxy for the person. The solution was to stop verifying the proxy and start verifying the person through biometrics. Fingerprints and facial geometry work because they are not added to the person; they are inherent, unique, and cannot be transferred to someone else, unless you are a fan of Tom Cruise in Mission Impossible.

We built FeaturePrint because the aviation industry needs the same capability biometrics gave human identity verification. FeaturePrint uses machine-vision algorithms and a standard camera to capture and analyze the microscopic surface characteristics that every manufactured object inherently possesses. No two parts have identical surface micro-geometry, which is exactly why manufacturing tolerances exist.

We don't add this signature to the part. We don't engrave it or stamp it. It's already there. We simply read what's already there and convert it into a digital identity that can be verified later, anywhere, by anyone with a camera. This anchors the digital record to the physical object itself, so the cryptographic ledger and the physical reality cannot drift apart.

Jason Dickstein: Today we have robust inspection systems. We rely upon traceability, and people in the industry know each other well enough to feel comfortable calling each other when documentation doesn't look right. At the MRO level, installers also have obligations under FAR 43.13 to examine the part and confirm that it will return the aircraft to a condition at least equal to its original condition.

As we move from what we are doing today to what we could be doing tomorrow, digital documentation schemes are receiving a lot of scrutiny. If you've got a serialized part, you have a blockchain representation of that serial number. Using a blockchain mechanism, there is essentially a record that is off the chain and hashed to create a digital map. The hash becomes a part of the blockchain record, and if the data changes maliciously, the hash tells you that the data is no longer reliable. Normal change mechanisms add an additional record to the blockchain saying the record has changed and providing a new hash, allowing for a full traceability record.

The Chinese already have a system right now where you can

The industry is making progress in combating the counterfeit and fraudulent parts issue. The Aviation Suppliers Association is part of the Aviation Supply Chain Integrity Coalition. They are sharing ideas and progress on digital documentation. They are also active with the Maintenance Management Team, which includes the FAA, EASA, Transport Canada and ANAC Brazil. Those four authorities have examined their regulations to make sure they don't inhibit the sharing of digital documentation.



add parts to the blockchain when they are removed from a registered aircraft by a CCAR 145 entity. Disassembly facilities and repair stations seem willing to do this. For manufacturers, it is such a big undertaking that it is a little bit scary, but Boeing is already working with digital 8130s and venturing into this space. There are multiple projects out there, including AeroXchange, GA Telesis with their Wilbur project, and BlockAero, which is actually doing the programming on the database for the Chinese government's approach.

Jason Dickstein: I've talked rather lovingly about the blockchain approach, but the problem is that you need some way to uniquely identify the digital record to the physical part. When you have a serialized part, you can do that. However, there are an awful lot of unserialized parts in the system, and we don't yet have a universally good way to link them to digital records.

One of the approaches being investigated is basically having a picture of the part to identify unique features or flaws. There are two problems you run into with that approach. One problem is that you have to be photographing and imaging the part from the exact same angle, or else it looks different. Another problem is that the resolution of the cameras has to be sufficient to identify differences that may be measured in the thousandth or ten-thousandth of an inch, which makes it a somewhat expensive approach. Still, companies are investigating ways to make that work under current technologies. If you look at what was stolen in Spain, roughly 90 percent of the stolen parts were unserialized, which highlights why we need a way to digitally identify them.

All this being said, we are making progress as an industry. The Aviation Suppliers Association is part of the Aviation Supply Chain Integrity Coalition, where we are sharing ideas and progress on digital documentation. We are also active with the Maintenance Management Team, which includes the FAA, EASA, Transport Canada, and ANAC Brazil. Those four authorities have examined their regulations to make sure they don't inhibit the sharing of digital documentation, and the next step is to do a similar project with guidance materials. We recognize that digital documentation is going to be the future, and we are trying to make sure that the regulatory authorities are prepared to support that. **AM**