

# Analysis of aircraft maintenance

[Environment](#), [Air](#)



As everyone knows, nowadays aircraft has become the most important transportation for everything. But the most important is people who are travelling with aircraft. The lives of the people on the aircraft are important. Each and every airlines in this world today, are trying to convince people that they are the safest airliner, but the main question is, are they really safe as what they mentioned? Aircraft maintenance activities are generally divided into two categories, which are, working on-aircraft and working off-aircraft. Working on-aircraft is when the technician or the engineer has to troubleshoot, repaired, overhauled and changing parts. While working off-aircraft is when there is any parts on the aircraft been removed and need to be checked separately from the aircraft, for example aircraft battery check, which needs to be removed and taken to battery shop in order to continue inspection or charging.

Normally, every approved maintenance organization must have store department that use to receive and issue every parts, component and appliances. For that reason, this store department must comply with storage regulations as stated in approved maintenance organization requirements such as EASA Part 145. A. 42 and CAA CAP 562 Civil Aircraft Airworthiness Information and Procedures (CAAIP) recommendations.

Aircraft is not like other transportations, everything parts that being installed on the aircraft must be genuine, neither like car, it can use a fake parts in order to safe cost. But aircraft is nothing close to that. If fake or bogus parts are being used on the aircraft, every person lives on that aircraft are in jeopardy. But today, the news of civil aviation authority and aircraft manufacturers are working hard tracking down and eliminate counterfeit

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parts as well as tracing aircraft parts which are lacks of documentation are all over the world.

In this assignment a research, analyse, and critically evaluate of maintenance practices in a civil commercial aircraft environment, concerning the use and control of genuine and non-genuine (bogus) spare parts for aircraft use will be carried out.

## **TERMS AND DEFINITIONS**

These terms and definition is taken from FAA unapproved parts investigation in accordance with the source from FAA (2011) and M. Mohamad (2003).

**BOGUS PARTS:** Describe several parts categories, ranging from properly manufactured parts lacking required documentation to defective and deliberately counterfeited parts. Under FAA regulations, all aircraft

**UNAPPROVED PARTS:** parts manufactured without FAA approval (specifically FARs Part 21. 305 or repaired under the terms of Part 43) are unapproved parts. This catchall classification includes counterfeit parts, stolen parts, production overruns sold without authorization, parts in exceedance of their time limits, approved parts improperly returned to service, and fraudulently marked parts, or parts which have no traceability.

**COUNTERFEIT PARTS:** Parts made of inferior properties.

**APPROVED PARTS:** production standards (FAR 21. 305). They can be approved under a Parts Manufacturer Approval (PMA), under Technical

Standard Orders (TSOS), in conjunction with type certification procedures through FAA administration approval, or by conforming to recognized Industry specifications.

LIFE-LIMITED AND TIME-EXPIRED PARTS: Aircraft parts that have predetermined service lives become “timed out” and no longer serviceable after exceeding these prescribed limits. Illegal use of scrapped, time-expired critical parts, which do not have to be destroyed prior to disposal or sale as scrap, has been linked to several fatal aircraft accidents.

## **APPROVED MANUFACTURER**

There are a few things an organisation must look in before making parts order. This is to prevent from making order from fake manufacturer. The organisation must make sure the part from the manufacturer is approved by FAA or EASA under 14 CFR Part 21 and EASA Part 21. An approved part manufacturer must be certified as FAA-PMA (FAA-Part Manufacturer Approval) or EASA Production Organisation Approval (POA). According to the FAA web page under Suspected Unapproved Part (SUP) Program (FAA, updated 19 December 2008), the buyer or any organization who want to order parts can refer all the current approved PMA from the FAA database.

According to CAA CAAIP Part 1 Leaflet 1-6 (2006: 1), unapproved aircraft parts or materials classified if:

Parts or materials not conform to an approved type design.

Parts or materials fail to conform to declared specification or accepted industry standard (standard parts).

Parts or materials marked by unauthorised source with false documentation.

Parts not been maintain, overhauled or repaired in accordance with the requirements of approved airworthiness data and/or statutory requirements, or by persons not authorised to perform and certify those functions.

Parts that directly shipped to the end user by manufacturers, suppliers or distributors who do not hold appropriate production approvals and not been authorised to make the direct shipment to user by Type Certificates holder.

While for an approved parts buyer were advised and recommended to follow the minimum procedures prior to place any order of aircraft parts which According to FAA Advisory Circular AC 21-29C (2008: 1) has mentioned the term of “ approved parts are produced in accordance with the means outlined in Part 21”. The procedures that the buyer needs to follow are as below.

Identify the distributors and/or suppliers including their documentation system and receiving inspection system meet the traceability of parts to an FAA approved source.

Evaluate and cross-checked to unfamiliar distributors and/or suppliers in order to prevent from putting the aircraft parts into risk condition.

Identify the significant reduce of price than the priced quoted by other distributors and/or suppliers of the same part.

Identify the delivery schedule offered to other distributors and/or suppliers (when the stock of a like item is exhausted). Usually the bogus manufacturer offer shorter delivery.

Sales quotes or discussions from unidentified distributors that create the perception that an unlimited supply of parts, components, or material is available to the end user.

A bogus distributor and/or supplier's inability to provide substantiating documentation that the part was produced in accordance to an FAA approval, or inspected, repaired, overhauled, preserved, or altered in accordance with the CFR.

Any parts, components or appliances that need to be released must have come with Statement of Conformity or Authorised Release Document which signed and stamped by an authorised personnel from the approved manufacturer. Besides all the above, the approved manufacturer must also include or have Export Certificates of Airworthiness stated under 14 CFR Part 21 Subpart L - Export Airworthiness Approval by releasing FAA Form 8130-3 Airworthiness Release Tag for export.

Advices from the authorities, have mentioned clearly to the buyer to put extra caution on choosing the aircraft part dealers and before attempting any purchase order. On 21st January 1992 the FAA had issued an Airworthiness Directives AD 91-24-14 (Transport Airplane Directorate Designee Newsletter, 1992: 10), about the incident of Pratt & Whitney JT8D series turbofan engine regarding the bogus 4-1/2" bearing seal spacer found

by United Airline mechanic during routine maintenance inspection. The FAA had find out that bogus spacer was contributed to engine bearing seal deterioration and cause the engine failure which can put the flight jeopardy.

Therefore all the buyer and part manufacturers must be alert on recommendation of the authority in terms or avoiding bogus part or fake part to be used on aircraft.

## **COMPONENTS DELIVERY**

Choosing the approved part manufacturer is one thing. The other crucial part that any organization or part manufacturers need to look into is the components delivery. Whenever order is placed, it must be distributed by the standard couriers that have good reputation in delivering goods. The organisation or part manufacturers must make sure the components distributor or courier is recommended by both parties in order to confirm the security of the components delivery. In accordance with CAAIP (2009: 6) Part 1 Leaflet 1-12 The Acceptance of Aircraft Component under point 5: Distributor, “ the aircraft component distributors are not required to be approved by the CAA”. The components distributor also cannot raise the Authorised Release Document, not required to provide any technical expertise to confirm the status of the aircraft components.

So, any component received from the distributor, it is the storage department which is end user who is responsible to request the Authorised Release Document that release by approved organisation and establish the acceptability of the components itself before any installation of the part to the aircraft can be made. There is also Other thing that can happen such If

the original distributor doesn't want to pass the component's documents to end user, if this happened it is acceptable if another distributor endorsed the original distributor's documentation according to reference number given.

“ Authorised Release Documentation of the aircraft component is on file, Ref. No. # # # # and will be made available to the end user upon request from that end user” (CAAIP Part 1 Leaflet 1-12, 2008: 6)

A further advice by CAA CAAIP Part 1 Leaflet 1-6 (2006: 1), if the parts are delivered by direct shipment from manufacturer, it has got to have an authorisation letter by the Type Certificates holder to do so. If any parts are shipped to the end user by direct delivery from the manufacturers, who do not hold appropriate production approval, it will then be declared as bogus parts or unapproved parts.

In accordance to Advisory Circular 00-56A (2002: 12), the distributor must have Distributor's Certification Letter in order to improve the eligibility of the aircraft parts and products for installation to type-certificated products. This organisation is part of FAA agency that works to conform and audit the quality system of the distributor accordance to FAA recommendation.

By doing this, the security of the parts delivery will be achieved in order to reduce the bogus part usage.

## **ACCEPTANCE OF PARTS**

Following to the store requirements, the organization must show how they going to guarantee that all the parts received are genuine (ICAT Module 10: 63). For that reason the organization must ensure all the parts are from



approved source that has traceability and history. In 1992, according to the bogus part cases, FAA had mentioned to the aviation communities to be alert on current issue in Aviation Maintenance Alerts (FAA, updated on 25 April 2008).

The purpose of this maintenance alert is to share any information about the current maintenance experiences especially about the bogus parts usage in order to improve aeronautical product durability, reliability and safety. Now days lot of bogus parts that looks similar to original parts. So the organisation need to be alert on this kind of situation in order to make sure only approved parts are install or use on the aircraft.

## **STORE**

As an approved organisation, there are two types of store must be existed which are quarantine store and bonded store. Both storage stations must be separated in order to prevent from mixing up the serviceable and unserviceable items. Further explanations of both stores are as below.

Bonded store - In this storage area, all the parts are ready to be installed to the aircraft and being monitored on its shelf life and eligibility. Some organisation has placed the approved parts under their own storage reference. This way is easy to keep track the parts eligibility and all the documents can be managed in a better way. If any of the parts are issued from this storage area, it is the responsibility of the mechanic or the engineer to check the parts and appropriate documents in order to confirm

its airworthiness before installed to the aircraft. This maintenance practice can help reduce the bogus parts from being used.

Quarantine store - All new materials which have been received from the distributor must be placed in the quarantine store first, at which time the stores inspectors will check that all items are received. Below are the procedures that need to be carried out by the store inspectors.

The inspector must confirm the specification and the drawing requirements.

Inspector must inspect in order to ensure the goods received are free from damage or corrosion

Inspector must also noticed that the items are received with sufficient time left to enable the item to be stored for a reasonable period in the case of shelf life item

The store inspector must ensure the items received are accompanied by necessary airworthiness certificate

When all these procedure has been carried out and the store inspectors are satisfied, that the incoming spares are fully airworthy they will then produce a good receipt number to the item for company internal identification and traceability. All items with the serviceable tag are sent to the bonded store. Parts which are considered to be airworthy will stay in quarantine store until instructions are received for their handling.

## **IDENTIFY AND HANDLING BOGUS PARTS**

According to Federal Aviation Administration (FAA) system surveillance and analysis division, every organisation or distributor should create procedures before purchasing parts in order to find qualified suppliers authorized to make or move FAA approved parts. The following criteria can help identify and screen out potential SUPs suppliers:

1. Lowball prices – if the price quoted or advertised is significantly lower than the price from other suppliers of the same part;
2. Suspiciously fast service – if the delivery schedule for an out-of-stock part is significantly shorter than from others;
3. Data shortage – if the supplier seems unable or unwilling to substantiate conformity of the part;
4. Papertrail shortage – if the supplier seems slow, or unable to document FAA approval for the part.

If any of these types of situations arise, organization or distributor should:

Inspect product containers for damage, another supplier's name, or no markings at all;

Crosscheck purchase orders with the delivery receipts for proper part number or component history card;

Develop a system for tracking the shelf or service life of parts so as not to inadvertently use a part with an expired life limit;

Verify that part identification markings aren't altered or otherwise tampered with – things like a serial number stamped over, an improper label, a missing label or a serial number stamped at a spot different than usual;

Inspect parts for visual defects or abnormalities, such as altered or unusual surface finishes, the absence of, or variation in, required plating, any evidence of prior use, new paint, old scratches, pitting, corrosion or any sign of an attempted repair;

Audit your supplier to ensure they establish and maintain the quality requirements specified in the purchase order.

The CAA and FAA will exchange this report and work together in order to trace the unapproved manufacturers. This report will support the users to be more concern about the non-genuine parts besides helping the authorities to prevent from the non-genuine parts to be installed or used for aircraft.

## **FAA RULES AND REGULATIONS.**

### **1. FAA Part 21 Section L – Export Airworthiness Approval**

This approval is issued for new or used aircraft manufactured according to Subpart F and G meet the airworthiness requirements outlined in Subpart H.

An export airworthiness approval for an aircraft is issued in the form of an export certificate of airworthiness. This certificate does not authorize operation of that aircraft. The FAA prescribes the form and manner in which an export airworthiness approval for an aircraft engine, propeller, or article is issued.

Under this subpart also provide the responsibilities for the exporters which all documents specified must be forwarded to the country or jurisdiction. The products and articles must pack and preserve as necessary in order to protect it against corrosion and damage during transit or storage and also must be in effective state on duration of delivery.

## **2. Advisory Circular 00-56A: Voluntary Industry Distributor Accreditation Program**

This advisory circular provides information about the system of accreditation of civil aircraft parts distributors by the FAA. The information in this AC has been revised in order to meet current changes in regulatory requirements and industry practices thus to improve the ability of certificated person to establish the eligibility of parts and products for installation on type-certificated products.

Under this AC also provide the guideline for the aircraft parts distributors to be accredited thus reducing the problem of non-genuine aircraft parts in delivery system. All the accredited distributors will be given a certification letter or certificate approved by Accreditation Organisation.

## **3. Electronic use of the Authorised Release Certificate, FAA Form 8130-3, Airworthiness Approval Tag**

According to FAA Order 8130. 21G (2009: 5-1), under this topic the FAA provide guidance on acceptance and use of the electronic exchange FAA Form 8130-3 use of such electronic documentation for aircraft products and articles.

This electronic FAA Form 8130-3 and other corresponding EASA and TCCA forms offer several advantages over the current paper format. FAA also provides information in procedures for use of this electronic 8130-3 Form. The authorised person must follow all the guidelines and notify their geographic FAA office before implementing the electronic form according to chapter 2, 3 and 4 of this order. Basically the issuances of the form must be in paper format in accordance with the appropriate chapter of this order.

This order also provides sample of the necessary electronic 8130-3 Form as attached in the appendix.

## **CONCLUSION**

Even though many preventive actions has been taken by the authorities to remind part manufacturers and aircraft companies how dangerous bogus parts are, but still there are a lot of non genuine parts being sold in the market. It is not only the part manufacturers fault, but as well as the aircraft company, who is trying to cut down cost on maintenance services due to the economy problem. As a result they decided to buy bogus or non genuine parts from the part manufacturer. So, are all the aircraft in the world are saved to travel with? Are the passengers lives or safety comes first? Or are the only thing they can think of is about losing money on using genuine aircraft parts.