

Kansas City Flight Standards Office

Airworthiness Facts

Date FY21 2nd Quarter



Federal Aviation
Administration

Airworthiness Section

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More IA Information:

IA RENEWAL.

This is information we all know, but worth repeating. March is getting closer and we need to talk about the application requirements. For your convenience, we have attached a copy of the following documents to aid in your renewal process.

- [FAA Form 8610-1](#)
- [Pilots Bill of Rights](#)

The Flight Standards District Office will accept applications for renewal during the month of March, of odd years and must comply with the following requirements:

- 1) Show evidence and/or the applicant's ability to meet the requirements of § [65.91\(c\)\(1\) through \(4\)](#).
- 2) Show evidence that the applicant meets the requirements of § [65.93\(a\)](#) for both the first and second year. This is accomplished with other documentation:
 - An activity sheet or log; (of your own design)
 - Training certificates; and/or
 - Oral test results.

Renewal Instructions:

Complete two originals of Federal Aviation Administration (FAA) Form 8610-1, Mechanic's Application for Inspection Authorization and completed one copy of the Pilot Bill of Rights for Mechanics along with any other document (Activity Sheets, Training Certificates, or Oral Testing Results) to show evidence that you meet the requirements of § [65.93\(a\)](#) for both the first and second year. Along with you Inspection Authorization Card (FAA Form 8310-5). In addition, forward them to your local Flight Standards District Office (see [FAA.Gov](#) for your local office address).

Eligibility; Yes, let us talk eligibility.

To be eligible for renewal of an IA for a 2-year period, the applicant must show evidence of at least one:

- 1) Performing four annual inspections during each 365-day period prior to March 31 of each year, for eight annuals prior to the renewal date.
- 2) Performing or supervising, and approving at least one progressive inspection in accordance with the standards prescribed by the Administrator during each 365-day period.

For the purposes of IA renewal, a progressive inspection under 14 CFR part [91](#), § [91.409\(d\)](#) is a complete inspection on one identified aircraft.

NOTE: An inspection program required under § [91.409\(e\)](#) is not a progressive inspection and is not acceptable as IA activity. Partial inspections such as phases or events on more than one aircraft are also not acceptable as IA renewal activity.

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3) Successful completion of an 8-hour refresher course, acceptable to the Administrator, for each 12-month period preceding the renewal application.

Inspectors will review the proof of attendance at renewal time to ensure that both the training organization and the IA have met the appropriate requirements.

A FAASTeam Program Manager organized training and any training of a technical nature conducted by a manufacturer is acceptable to the Administrator and in compliance with this policy.

4) Passing of an oral test given by an aviation safety inspector (ASI) in accordance with [§ 65.93](#) to ensure that the applicant's knowledge of regulations and standards is current.

If an IA holder does not meet the renewal requirements at the end of the first year, the holder must take and pass an oral test prior to exercising the privileges of their certificate in the second year.

So let us talk about Actively Engaged.

"Actively engaged" means having an active role in exercising the privileges of an A&P Mechanic Certificate in the maintenance of civil aircraft. Applicants who inspect, overhaul, repair, preserve, or replace parts on aircraft, or who supervise (i.e., direct and inspect) those activities, are actively engaged. The ASI may use evidence or documentation presented by the applicant showing inspection, overhaul, repair, preservation, or replacement of parts on aircraft or supervision of these activities. This evidence or documentation, when required, could include records showing performance or supervision of aircraft maintenance, return-to-service documents, and/or copies of maintenance record entries to

determine the type of maintenance activity performed, considering any special expertise required.

As stated in the last Information Letter, at the current time, we cannot count on live IA Seminars for our IA Renewal requirements and we have to look ahead and prepare for changes.

For your information, I have included a list of free courses from FAASafety.Gov. If you complete any of the courses they can be applied IA renewal credits, (*see Appendix 2*) these courses are located on [FAASafety.Gov](#) (you must log in if you take a course and want credit).

FAASteam Topic of the Quarter; Engine Failure, After Maintenance Cylinder Torque:

The discussion this quarter is cylinder attachment failure, which is rather spectacular because there is enough energy in combustion to send the cylinder through the cowlings. Of course, the engine tends to run poorly afterward, which usually happens at the most inconvenient time for the pilot. It causes them to try to park the airplane in odd places.

So let us ask the question, why do beefy cylinder attachments fail?

Well, it is due to inadequate torquing procedures that can cause the torque to be less than optimum.

So, can you tell when the engine is getting ready to spit a cylinder? Sometimes they start to leak oil, so oil leaks are useful clues. We can prevent the issue by torquing cylinders following the manufacturer's service instruction. This is time-consuming, and time is money, but accidents are more costly.

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Data analysis shows use that cylinder attachment and through-bolt failure are a significant cause of engine failure. By filtering National Transportation Safety Board (NTSB) Data through the FAA's Safety Performance Analysis System (SPAS) this allows us to look up things like accidents caused by engine failures due to maintenance error. If we check for Maintenance issues, in Aircraft, Power plant, Incorrect Service/Maintenance, and we filter the NTSB Database to show engine failures caused by maintenance mistakes. It provides a list of 181 accidents covering all injury types.

Next, we review the 181 accident reports. We reduce the causal factors to one or two words, so we can sort to determine the top maintenance mistakes that cause engine failures.

Cylinder attachment and through-bolt torque are the top two maintenance induced accident causes, closely followed by engine control cables, loose "B" nuts, and magneto parts coming adrift.

One example of engine failure is a father and his two daughters had the number one cylinder made a break for freedom. Happily, Dad got the airplane back to the airport. This outcome is not very typical. However, it is surprising how often this happens.

Please when you have, a chance look at the NTSB Database. It is a quite interesting read, and terms like "through-bolt failure" are easy to search.

However, in this article, we are talking about cylinder hold down and case through-bolt torque. Every engine manufacturer has a torque sequence to ensure technicians properly torque through bolts and cylinder hold-down

bolts. We want to encourage everybody to follow the instructions.

Before we start let's review few Definitions-

Torque - Torque is the "turning" or "twisting" force, and differs from tension created by a straight pull. However, we use torque to create tension.

Tension - The thread angle in the bolt converts the rotational force applied into tension (or stretch) in the bolt shank. The amount of tension created in the bolt is critical.

Preload - The tension created by torquing a fastener that holds assembled parts. Having sufficient preload is the key to a reliable and robust joint that will not loosen, fail from fatigue, or shift under the load. For a bolted joint to be stable under vibration, the preload on the fasteners must be greater than the maximum pressure pulling the joint apart. If the bolt's tension is greater than the peak pressure pulling the joint apart, it will not separate or subject the bolt to repetitive stress cycles.

So what is the difference between fatigue failures and instantaneous failures? Fatigue failures are latent in that they take time to propagate. The latent nature of fatigue failure is that it usually waits to strike until the most inconvenient time to show up. It means fatigue failures, generally causing accidents as opposed to being a result of the mishap.

Investigators can determine by the fracture surface if a particular fastener caused the accident. A crack "inches" across the fastener causing "Beach Marks" until finally, the fastener has lost enough strength and instantaneously fails; this leaves a 45-degree

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shear lip. That is a fatigue failure. Fatigue failure is the failure caused by under torquing.

Instantaneous failure is stretching, bending, and various types of mangling. The forces of the accident cause instantaneous failure.

Let us look at a NTSB Case file.

NTSB Case Number: ERA18LA195

Analysis: The commercial pilot was conducting an aerial application flight. He stated that while maneuvering at 1,500 ft., he heard a “deep knock” in the engine; the entire windshield became covered with oil, and the engine lost power. The pilot made a forced landing to a service road, during which the airplane struck a barbed-wire fence with the right wings before coming to rest in a field. Post-accident examination of the engine revealed the No. 2 cylinder had separated from the cylinder mounting deck. Two fractured sections of the left crankcase that included part of the No. 2 cylinder bore; were in the engine cowling. All but one of the No. 2 cylinder base studs and through-bolts remained in the cylinder bore; and were fractured. The fractured surfaces exhibited signatures consistent with fatigue. The fatigue failure of the No. 2 cylinder studs and through bolts and the fracture of the crankcase led to the loss of engine power.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be:

Fatigue failure of the No. 2 cylinder studs/through bolts and the fracture of the crankcase, which resulted in a total loss of engine power.

When one bolt fails, it puts more stress on the others until they all fail. This sequence does not mention what initiated the failure. The NTSB says, “Fatigue failure of the No. 2 cylinder studs/through bolts and the fracture of the crankcase”. However, it probably happens quite quickly/instantly once a through bolt fails.

So what do we do about issues like this? We follow the manufacturer’s process. The problem is that friction makes it challenging to translate torsion to tension in a repeatable manner. Maintenance personnel should reference the manufacturers’ parts and service manuals for the correct process, hardware, and torque, for proper assembly. It is essential to follow the manufacturers’ torque process so that the finished product is safe.

Cylinder hold-down nuts, connecting rod hardware, case halves, through bolts all require a specific process and specific hardware. Service instructions are available online free, most service information has the requirement to torque both sides of the engine. It seems somewhat redundant but necessary if you want the cylinder to remain installed. There is a bit of friction between the case and through-bolts, enough to change the torque value. The torqueing sequence is complex, so it is vital to follow the instruction. Even if it means taking off the opposite cowling and cooling baffles. It is so much better to eat some flat rate than cause a crash.

Here is a quote from the Lycoming Service Instruction. This is the section on replacing one cylinder. They are very forthright about torquing both sides of the engine.

Why is this important? Through-bolts tend to loosen on the side of the engine opposite the cylinder that is installed. The through-bolt land has a very tight fit in the crankcase so

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that the through-bolt can act as the locating dowel for the engine's main bearings. When a technician removes a cylinder, the through-bolt tends to slip towards the opposite cylinder. This movement reduces the preload of the through-bolt. Since we use a torque wrench to measure preload, the friction between the through-bolt and the case is sufficient to affect the torque reading and the preload. This slippage may well cause the preload to be under the requirement, and the through bolt will fail in fatigue.

2020/09-16-203(I) PP Original Author: Guy Minor (09/16/2020)

Notice of Proposed Rules

Airworthiness Directives:

Notice of Proposed Rule Making, is your chance to make a difference and stay informed on future changes, yes if you go through the process you can make a difference.

This link is for Proposed Rules Airworthiness Directives;

http://rgl.faa.gov/Regulatory_and_Guidance_Library/rgADNPRM.nsf/MainFrame?OpenFrameSet

New Airworthiness Directives:

This link is for Airworthiness Directives, for all aircraft.

http://rgl.faa.gov/Regulatory_and_Guidance_Library/rgAD.nsf/MainFrame?OpenFrameSet

Service Difficulty Program:

When a system, component or part of an aircraft (power plants, propellers, or appliances) functions badly or fails to operate in the normal or usual manner, it has malfunctioned and should be reported. In addition, if a system, component, or part has a flaw or imperfection, which impairs function or which may impair future function; it is defective and should be reported. While at

first sight it appears this will generate numerous insignificant reports, the Service Difficulty Program design is to detect trends. Any report can be very constructive in evaluating design or maintenance reliability.

These reports are filed electronically or by paper. For electronic go to <https://av-info.faa.gov/sdrx/>. For paper submission, the form is available to download at http://www.faa.gov/documentLibrary/media/Form/FAA_8010-4_7-19.pdf, you may have to cut and paste this Link into your browser.

Service Airworthiness Information Bulletins:

This is good information that does not rise to level of an Airworthiness Directive.

http://rgl.faa.gov/Regulatory_and_Guidance_Library/rgSAIB.nsf/FrameSet?OpenPage

Kansas City Flight Standards Office Information:

To include Designees, Airworthiness Representatives, Designated Mechanic Examiners, and Designated Parachute Rigger Examiners information.

Current Link:

https://www.faa.gov/about/office_org/field_offices/fsdo/mci/

Next Quarter: TBD

Airworthiness Facts are published quarterly and available via email only. If you would like to receive Airworthiness Facts, contact the Kansas City FSDO FAAS Team Program Managers

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Appendix 1

IA Renewal Paperwork,



FAA_Form_8610-1.pdf



IA PBR.pdf

Appendix 2

Free IA Renewal Courses available on- line at
FAA Safety.gov.

To enroll, you must sign up at:

FAASafety.gov,

Under Welcome Guest - New to FAA

Safety.gov - Create an Account. Fill in the
requested information –

If you are already enrolled: LOGIN TO
YOUR ACCOUNT.

Once you are logged in – go to Courses –
toward the bottom of the page select
“Available Courses” – Show AMT Courses –
Under the “Credit” column select the AMT
courses that show - (↑ Also accepted for IA
Refresher Training) and list cost as free.

Below is a list of the free IA Approved
courses that are 1 hour or 2 hours long. After
successfully complete 8 hours of training
follow the instruction for obtaining your
certificate for each one. Retain those
certificates and submit with your renewal
paperwork in March.

If your employer is, a Part 145 Repair Station
or a Part 135 operator, they may participate in
the AMT Program, and you must take the
2020 AMT Core Training course and
complete 12 hours of training, will apply
toward their Diamond Award.

One-Hour Courses;

Course ID

ALC-498 Aircraft Exhaust Systems
(AMT Core Course 2018) Free FAA
Safety Team 1 Hour Total for AMT & IA

ALC-180 Aircraft Maintenance
Documentation for AMT's Free
FAA Safety Team 1 Hour Total for AMT
& IA

ALC-107 Dirty Dozen - Human Error in
Aircraft Maintenance Free FAA Safety
Team 1 Hour Total for AMT & IA

ALC-37 Failure to Follow Procedures –
INSPECTIONS Free FAA Safety
Team 1 Hour Total for AMT & IA

ALC-67 Failure to Follow Procedures –
Installation Free FAA Safety
Team 1 Hour Total for AMT & IA

ALC-445 Failure to Follow Procedures –
Rationalizations (CC) Free FAA Safety
Team 1 Hour Total for AMT & IA

ALC-258 Human Factors Primer for
Aviation Mechanics Free FAA
Safety Team 1 Hour Total for AMT &
IA

ALC-592 Maintenance Error (2020 AMT
Core Training) Free FAA
Safety Team 1 Hour Total for AMT &
IA

ALC-409 PAUSE for Safety (AMT Core
Course 2015) Free FAA
Safety Team 1 Hour Total for AMT &
IA

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ALC-529 Proper Torque (AMT Core
Course 2019) AFS-850 Free
National FAASTeam 1 Hour Total for
AMT & IA

ALC-534 The Buck Stops with Me
Free Dr. Bill Johnson 1 Hour Total
for AMT & IA

ALC-587 Wiring and Electrical - AFS-
850 Free National
FAASTeam 1 Hour Total for AMT & IA

ALC-117 Working Healthy - 8 Steps for
Protecting Your Health Free FAA Safety
Team 1 Hour Total for AMT & IA

ALC-269 The Impact of Tire Maintenance
on Aircraft Safety Free Michelin
Aircraft Tire 1 Hour Total for AMT & IA

ALC-299 Rolls Royce M250/RR300
Basic Vibe. Analysis (12888) Free Rolls
Royce Corp. 1 Hour Total for AMT &
IA

ALC-300 Rolls Royce M250/RR300 Fuel
Sys. Training (AM13413) Free Rolls
Royce Corp. 1 Hour Total for AMT &
IA

ALC-298 Rolls Royce RR300 Gas Path
Cleaning (GL13650) Free Rolls
Royce Corp. 1 Hour Total for AMT &
IA

ALC-301 Rolls Royce RR300 Lubrication
Sys Training (AM13720) Free Rolls Royce
Corp. 1 Hour Total for AMT & IA

Two-Hour Courses

ALC- 174 Fatigue Countermeasure
Training Free
FAA Safety Team 2 Hours Total for
AMT & IA

ALC- 327 Maintenance Error Avoidance
(Core Course 2014) Free FAA Safety
Team 2 Hours Total for AMT & IA

ALC-457 Reducing Maintenance Related
Engine Failures (CC2017) Free FAA
Safety Team 2 Hours Total for AMT & IA