



A Most Vulnerable Spot *The Importance of Proper Torque*



The so-called little things in life can make a big difference, especially in the realm of aircraft maintenance. One such item is the application of proper torque, an increasingly important safety topic in aviation maintenance. From 2009 to 2015, over 45 aircraft incidents and accidents resulted from improper torque applied to engine fasteners during maintenance, resulting in a loss of propellers, internal engine damage, and powerplant failures. It's no exaggeration to say that in many cases, it's a case of do or die.

"Torque procedures are a critical component of your maintenance process," says Jim Hein, former airworthiness lead for the FAA Safety Promotion Program Office (SPPO). "It is essential for maintenance technicians to determine what torque is required

for each application and then properly apply that amount of torque to ensure the integrity of the aircraft and help prevent fatal GA accidents."

So what is torque, and why is it so important?

The Fundamental Things Apply: Torque 101

Torque is the specified force (the tightening down) that you need to apply to fasteners (nuts, bolts). It is not a finger-tight feeling that you've turned it just enough. Torque is the specific range, as prescribed in the aircraft's maintenance manual, for the twisting, turning force needed to create the proper tension. The tension you create is what makes fasteners perform the way the engineers intended.

You Must Remember This

An important rule is to use a calibrated torque wrench every time you torque your fasteners.

Here's why. If you don't apply the proper torque force per the manual, fasteners can fail, the nut and bolt threads can strip, and the fastening hardware can loosen.

During the aircraft's design process, the aerospace engineer selects the particular fasteners that can withstand the various vibrations and fluctuations in loads, pressures, and temperatures that the aircraft may experience. The engineer also specifies the foot-pound rating for proper torque on those fasteners, as well as the required lubricants that will allow the fasteners to turn and create the proper tension. You can find these specifications in the aircraft maintenance manual.

The engineers designed the ratings for that particular aircraft, engine, or application. If the manual provides a different torque rating than what you're used to applying, for example, don't just torque by instinct. You have to use the torque specified in the manual. If you apply the wrong torque, your fasteners will not work.

If you apply too much torque, you could stress and overstretch the fastener, which will cause it to fail. If you under-torque it, the fastener will not attach properly and will loosen over time causing fretting wear and tear, and early fastener failures.

Another critical rule is to avoid distractions. If you do get distracted when you're doing a fastening job, STOP. Go back three steps to re-inspect your work.



Torque Best Practice — Use Torque Seal to verify at a later time/date that you have completed the application of torque to the fastener.

Torque Turning Point

To help prevent fatal GA accidents due to failure of the powerplant system, the General Aviation Joint Steering Committee (GAJSC) examined National Transportation Safety Board (NTSB) reports that included system component (powerplant) failure as a causal factor. An in-depth study of six fatal accidents, where inadequate bolt torque led to powerplant failures or loss of propellers, led the GAJSC System Component Failure-Powerplant (SCF-PP) Working Group to determine that this is a critical maintenance safety topic that is often overlooked. As a result, the GAJSC SCF-PP Working Group developed a maintenance safety enhancements program aimed at mitigating the risk of improper torquing techniques and increasing awareness about the importance of proper torque.

As part of this effort, the FAA Safety Program Promotion Office is developing an Airworthiness Topic of the Quarter for fiscal year 2018, along with a new online course on proper torquing techniques that will be available beginning January 1, 2019. Check out www.faasafety.gov/AMT/amtinfo for details.

On That You Can Rely

In upcoming issues, *FAA Safety Briefing* will address the GAJSC maintenance safety enhancements to educate the maintenance community about powerplant and component failures, the third ranking cause of fatal GA accidents. Future topics will include proper torquing techniques, mitigating V-band clamp failures, new service difficulty report (SDR) processes, maintenance placards, A&P education/training, ignition systems, and education and outreach.

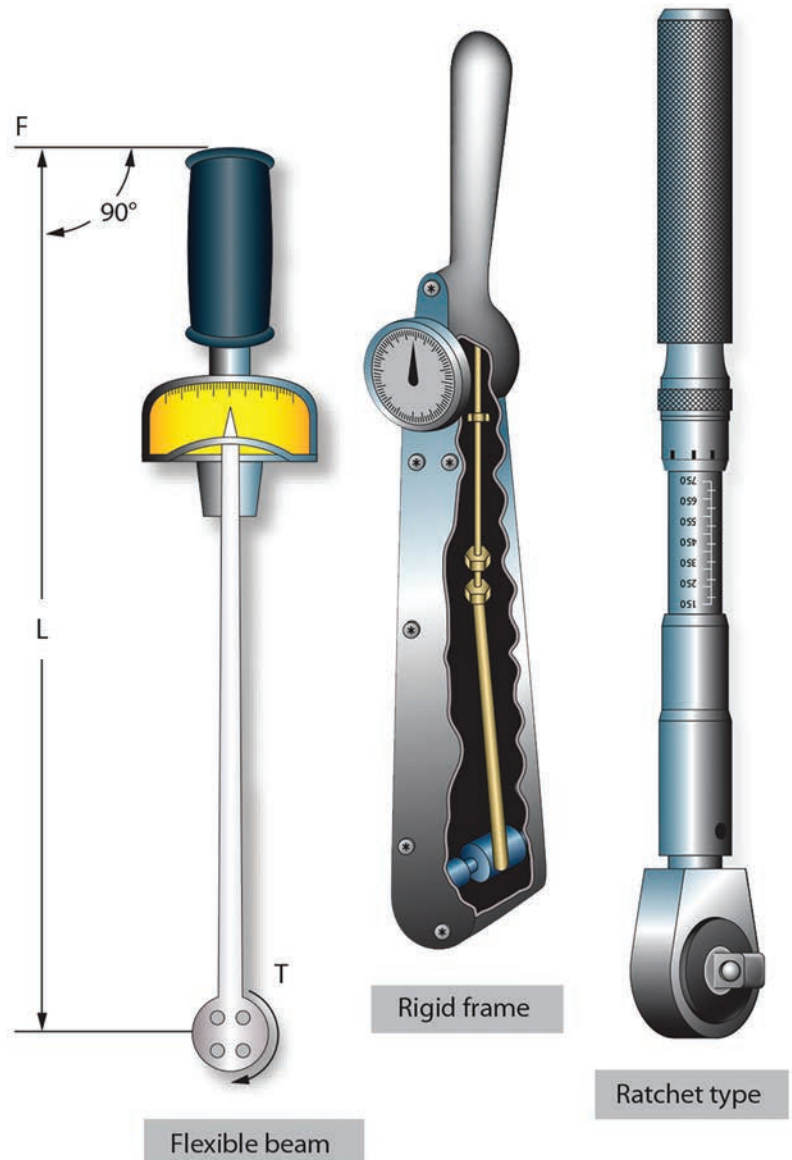
Learn More

National Transportation Safety Board Safety Alert, Take Time to Torque

[ntsb.gov/safety/safety-alerts/Documents/SA_056.pdf](https://www.ntsb.gov/safety/safety-alerts/Documents/SA_056.pdf)

FAA Torque Values – AC 43-13, Acceptable Methods, Techniques, and Practices — Aircraft Inspection and Repair, Section 3

bit.ly/2LqQXEp



Basic formula $F \times L = T$

F = Applied Force

L = Lever length between centerline of drive and centerline of applied force (F must be 90° to L)

T = Torque

Common Torque Wrenches

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