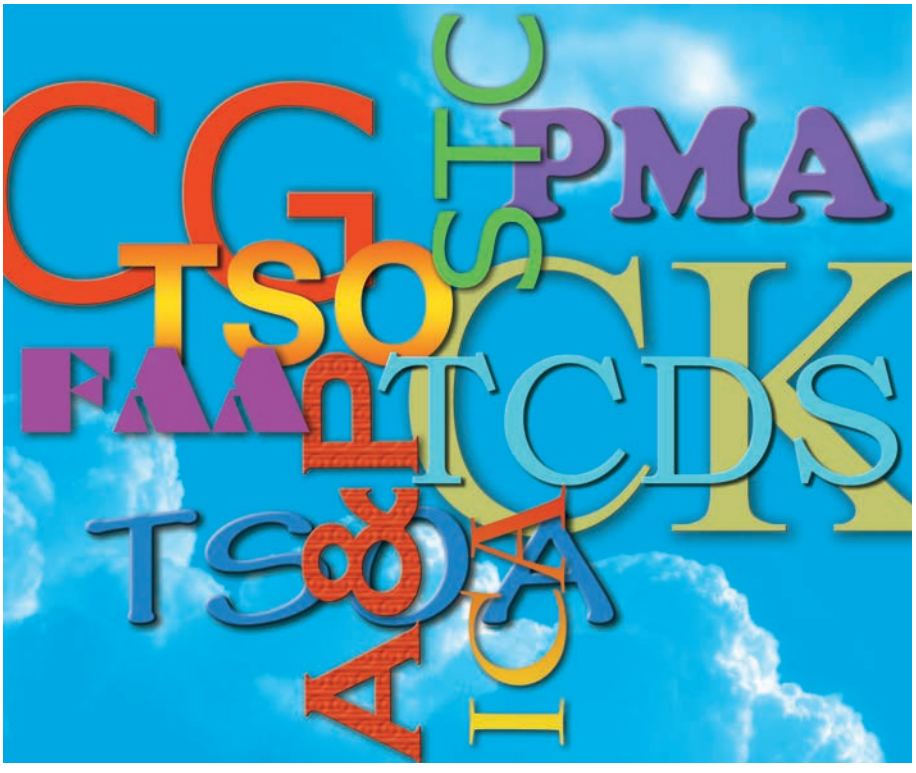
Aviation Terms

Part 1



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Welcome back, my faithful students.

It looks like we will be continuing our interrupted Martin Mars story in another session. I am sure when the fire season slows down we will get the opportunity to finish up with our interviews of the pilots and mechanics, and get a close-up view of these beautiful aircraft. However, while we are waiting, how 'bout we review our knowledge of aviation language. I know this might sound a little boring, but think about it: We confidently use these terms and acronyms every day, assured that we absolutely know their meaning until somebody questions us about a term. What brought this to my attention was when the love of my life asked me to explain what it meant when an article that was installed on an aircraft was installed under a TSO. "What is a TSO?" she asked. "A Technical Standard Order" I said. "That's nice, but really what is it?" she asked. I knew but couldn't really explain it. Hmm, this is not a good thing. Not knowing this term well enough to explain it was not going to do, so not only did her question cause me to look up the term so that I could properly explain it to her, but my shortage of knowledge about this term also gave me the idea for today's lesson. Just how proficient are we in this language of aviation terms and acronyms? Well, let's find out. And whad'ya say we start with the definition of TSO and go from there. Also, you can expect that today we will also have plenty of cocktail knowledge (CK) presented as well. So grab some coffee and let's get started.

A Technical Standard Order (TSO) is a minimum performance standard issued by the United States Federal Aviation Administration for specified materials, parts, processes, and appliances used on civil aircraft. Articles with TSO design approval are eligible for use on the United States type certificated products. Receiving a TSO authorization (TSOA) gives both design and production approval. So our first question for today is, does receiving a TSOA or a letter of TSO design approval necessarily convey approval for installation into or on an aircraft? I will let you ponder this for a while as we investigate the terms type certificate (TC) and supplemental type certificate (STC). A type certificate (TC), is awarded by aviation regulat-

ing bodies to aerospace manufacturers after it has been established that the particular design of a civil aircraft, engine, or propeller has fulfilled the regulating bodies' current prevailing airworthiness requirements for the safe conduct of flights under all normally conceivable conditions (military types are usually exempted). Aircraft produced under a type certified design are issued a standard airworthiness certificate. The TC normally includes the type design, the operating limitations, the type certificate data sheet (TCDS), the applicable regulations, and other conditions or limitations prescribed by the regulating authority. The TC is the foundation for other approvals, including production and airworthiness approvals. TCs are normally issued for airframes, engines and propellers.

A production certificate (PC) entitles the holder of a TC to produce that product under the watchful eye of the regulatory authority. Any person may apply for a production certificate if that person holds, for the product concerned, a current type certificate, a supplemental type certificate, or rights to the benefits of that type certificate or supplemental type certificate under a licensing agreement. A PC cannot be transferred.

Now, once an aircraft has obtained its TC and the manufacturer can produce it under its PC, it is eligible to receive its airworthiness certificate. An airworthiness certificate is only issued to an aircraft that is properly registered and was found to conform to its type certificate data sheet (TCDS) and be in a condition for safe operations. The airworthiness certificate is valid and the aircraft may be operated as long as it is maintained in accordance with the rules issued by the FAA.

The holder of the TC and PC of any product or aircraft must provide instructions for continued airworthiness (ICA). There will be more about these instructions in just a minute; sit tight.

OK, so what exactly is a supplemental type certificate? A supplemental type certificate (STC) is issued by the aviation authority approving a product (aircraft, engine, or propeller) modification. The STC defines the product design change, states how the modification affects the existing type design, and lists serial numbers for which the STC is effective. It also identifies the certification basis listing specific regulatory compliance for the design change. Information contained in the certification basis is helpful for those applicants proposing subsequent product modifications and evaluating certification basis compatibility with other STC modifications.

All right, so what was your answer regarding a component with a TSO? If you said "NO" you are correct. An item that has a TSO does not automatically get approval for installation. Installation approval must come as a separate action from the regulatory authority.

OK, how 'bout the term ICA? Well an ICA is instructions for continued airworthiness, and these are the methods, techniques and practices for performing maintenance, preventive maintenance and alterations which are provided by the design approval holder or its component manufacturers, and are considered acceptable to the administrator under section 43.13(a). As you may or may not know, there has been quite a discussion on the difference between ICA information and that which the design approval-holder considers proprietary. The FAA reconfirmed the proceeding definition of ICA, much to the consternation of some major design approval holders, and that will be a subject for another day.

So, we have talked about TC and STC holders. But what about those folks who provide components under a parts manufacturer approval (PMA). And what is a PMA product anyway? Well, as I am sure you already know, it is generally illegal in the United States to install replacement or modification parts on a certificated aircraft without a PMA (although there are a some exceptions to this general rule, including parts manufactured to government or industry standards, parts manufactured under technical standard order authorization [TSOA], parts manufactured for experimental aircraft, etc.) Thus, PMA-holding manufacturers are permitted to make replacement parts for aircraft, even though they may not have been the original manufacturer of the aircraft. Application for a PMA is usually a two-

step process. First, the manufacturer-applicant must demonstrate to the FAA that the design meets the requirements of the FAA's safety regulations and standards. This can be demonstrated in a number of ways:

1. The applicant may rely on a licensing agreement with another approved manufacturer who has already obtained approval of the design in question.
2. The applicant may use comparative analysis to show that the parts it makes are the same (in all relevant airworthiness characteristics) as other parts that are already approved.
3. The manufacturer may rely on qualitative analysis to show through test and computation that the part directly meets the FAA's safety standards.

Today, because of a complexity of issues, the trend is to use a variety of techniques in combination in order to obtain approval of most components, relying on the techniques that are most accurate and best able to provide the proof of airworthiness desired.

The second step in the application process is to seek FAA approval of the manufacturing quality assurance system (known as production approval). Production approval will be granted when the FAA is satisfied that the system will not permit parts to be distributed until they have been verified to meet the requirements of the approved design. As design approval holders, PMA companies must also provide ICA for their components.

Now, what is a 100-hour inspection? You know the answer to this one, right? Are you sure? A 100-hour inspection is an inspection identical in scope to an annual inspection, conducted every 100 hours of flight on aircraft under 12,500 pounds that are used to carry passengers for hire.

An annual inspection is required once every 12 calendar months. This inspection is identical to the 100-hour inspection in scope and detail, but must be performed by a licensed Airframe and Powerplant (A&P) mechanic with Inspection Authorization (IA). This inspection shall not be overflown.

Line maintenance: we all know what that is right? Or do we? Well, in official regulatory parlance, line maintenance is the maintenance that is performed on an aircraft before a flight to ensure that the aircraft is safe for the intended flight. Line maintenance may be scheduled or unscheduled, and may include:

1. Troubleshooting

2. Defect/discrepancy correction

3. Replacement of a component, possibly using external test equipment. Components include engines, engine modules, fuel systems, propellers, rotor systems, and avionics. Test equipment would include propeller balancing equipment, or rotor tracking equipment.

4. Minor repairs and modifications which do not require extensive disassembly and can be accomplished simply.

5. Visual inspections that will detect the obvious discrepancy

How 'bout datum? An aircraft datum line is an imaginary vertical plane or line from which all horizontal measurements of arm are taken, generally for balance purposes. Once the datum has been selected, all moment arms and the location of CG range are measured from this point and the weight and balance may be calculated.

And while we are in this area, here are some more terms that I am sure you know; but could you explain them if asked?

Center of Gravity (CG)
CG limits are specified longitudinal (forward and aft) and/or lateral (left and right) limits within which the aircraft's center of gravity must be located during flight. The CG limits are indicated in the airplane flight manual. The area between the limits is called the CG range of the aircraft.

Weight and Balance
When the weight of the aircraft is at or below the allowable limit(s) for its configuration (parked, ground movement, take-off, landing, etc.) and its CG is within the allowable range, and both will remain so for the duration of the flight, the aircraft is said to be within weight and balance. Different maximum weights may be defined for different situations; for example large aircraft may have maximum landing weights that are lower than maximum take-off weights either due to structural constraints and or because some weight is expected to be lost as fuel is burned during the flight.

The CG may change over the duration of the flight as the aircraft's weight changes due to fuel burn. As long as the CG remains within the allowable limits or within its weight and balance range, all is OK.

Reference Datum
The reference datum is a reference plane that allows accurate and uniform measurements to any point on the aircraft. The location of the reference datum is established by the manufacturer and is defined in the aircraft flight manual.

The horizontal reference datum is an imaginary vertical plane or point, arbitrarily fixed somewhere along the longitudinal axis of the aircraft from which all horizontal distances are measured for weight and balance purposes. There is no fixed rule for its location, and it may be located forward of the nose of the aircraft. For helicopters, it may be located at

the rotor mast, the nose of the helicopter, or even at a point in space ahead of the helicopter. While the horizontal reference datum can be anywhere the manufacturer chooses, most small training helicopters have the horizontal reference datum 100 inches forward of the main rotor shaft centerline. This is to keep all the computed values positive. The lateral reference datum is usually located at the center of the helicopter.

Arm

The arm is the chordwise (fore-and-aft) distance from the datum to any point on the aircraft.

Moment

The moment is a measure of force that results from an object's weight acting through an arc that is centered on the zero point of the reference datum distance. Moment is also referred to as the tendency of an object to rotate or pivot about a point (the zero point of the datum, in this case). The further an object is from this point, the greater the force it exerts. Moment is calculated by multiplying the weight of an object by its arm.

And now my faithful students, once again the subject has become more long-winded than anticipated, so it will have to be continued in the next issue. Sorry 'bout that, but go ahead and use the preceding CK to the best of your ability now, and as always, remember even the best pilot can't fly until you say it is OK to fly.

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