

Two Essential Steps

Doing independent inspections the right way / by Michael Adam



The integrity of aircraft control systems is vital to the safety of the aircraft and its occupants. In an effort to reduce accidents and improve the safety of aircraft, regulatory requirements have a special inspection process often referred to as a “Dual Inspection” or an “Independent Inspection”.

First of all, you need to know that this is not a regulatory requirement for amateur built aircraft. For Aircraft Maintenance Engineers and certified aircraft this is a CARs requirement as per Part V - Standard 571 – Table of Work, item (d). The main point of this article is to make you aware of the independent inspection process so that you can use it to increase your safety and reduce your human induced errors.

This inspection is basically a second set of eyes to check certain work performed on an aircraft. There are 2 Essential Steps to determining if an independent inspection is required, and this is determined by answering the following two questions. If you answer yes to either of these questions, it would be appropriate to carry out an independent check.

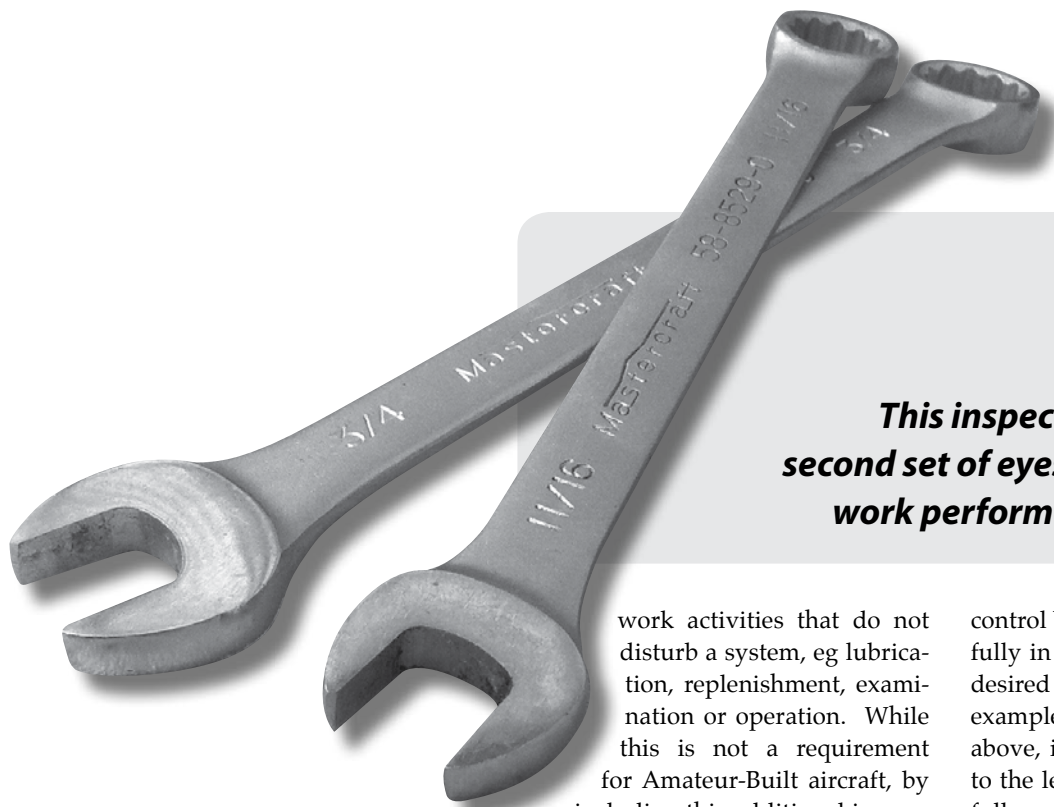
Does the work performed cause a disturbance in the *Flight Controls*?
Does the work performed cause a disturbance in the *Engine Controls*?

It's as simple as that. However to become crystal clear on exactly what these two questions are asking, we first need to define what exactly is meant by Engine and Flight Controls, and what is a Disturbance?

“Engine and Flight Controls” can be defined as to include all controls by which the propulsive force or flight path of an aircraft can be altered.

“Disturbance” of an aircraft system will occur when maintenance work involves disconnection, replacement, connection or assembly of any element in that system, and may also occur when such a system is adjusted. It does not include adjustment of travel stops, and simple adjustments outside of the control system. The removal of co-pilot control wheels or sticks, and rudder pedals that have been designed for rapid replacement without the use of hand tools, is also exempt from the need for two inspections.

An independent inspection is not required following maintenance



This inspection is basically a second set of eyes to check certain work performed on an aircraft.

work activities that do not disturb a system, eg lubrication, replenishment, examination or operation. While this is not a requirement for Amateur-Built aircraft, by including this additional inspection process to your work habits, you can significantly improve your own safety.

The Inspection Process

The inspection calls for the work accomplished to be inspected for correct assembly, locking, sense of operation and range of operation. Correct assembly of the system is self explanatory.

Locking (for example) refers to the attachment hardware being correctly installed and in safety, or torqued as required, and cable guards are correctly installed on pulleys.

Sense of Operation refers to the control being inspected that it moves in the desired direction for the desired outcome. For example, if you move the control stick to the left, the left-hand aileron goes up and the right-hand aileron goes down, or when the throttle lever is moved to full forward that the arm on the carburetor / fuel injection servo also moves toward full throttle.

Range of Operation refers to the

control being inspected that it moves fully in all desired directions for the desired outcome. Using the same example as for sense of operation above, if you move the control stick to the left, the left-hand aileron goes fully up (to the aileron stop) and the right-hand aileron goes fully down (to the aileron stop) and they move fully through their range of operation in the opposite direction. Or when the throttle lever is moved to full forward that the arm on the carburetor / fuel injection servo also moves fully in the forward range of travel (to the stop), and that the throttle also moves fully through the range of operation in the opposite direction.

The Signing Process

This inspection process requires two signatures however the roles of the two signatures are quite distinct.

The primary signature is by the builder/owner signing for the satisfactory completion of the work performed.

The signature of the person performing the independent check attests to the satisfactory completion of a "quality assurance" inspection. The secondary signature is not a final approval of the work; instead, it indicates that an independent review of the work has been completed, and

that no deficiencies have been found. The person who is undertaking the role as the independent inspection responsibility must be suitably qualified to do so. At the very least, in the case of homebuilt aircraft should be another pilot.

The following is a summary of points to consider when inspection aircraft control systems that have been disturbed by maintenance activities. This is not to be a comprehensive list. When checking control systems that have undergone maintenance, the person signing for the work performed and the person signing the independent

check should consider the following points independently.

All those parts of the system that have actually been disconnected or disturbed should be inspected for correct assembly and locking.

The system as a whole should be inspected for full and free movement. This check should take into account the effects of airframe flexing in flight, the effects of occupants, cargo and baggage, and the full range of positions or other moveable items (e.g. ensure that full rudder deflection does not interfere with elevator up travel, and vice-versa)

With cables tensioned, and the primary control stops in contact, there should be adequate clearance at the secondary stops.

The range of movement of the controls should be as specified in the aircraft plans or in the aircraft manufacturer's instructions.

The operation of the control

system as a whole should be observed to make absolutely certain that controls (including, in the case of flying controls, each individual control surface) are operating in the correct sense (i.e. that the flight control surfaces respond in a direction consistent with the desired intent of the control input). This check is the single most critical part of the entire procedure, and there can be no excuse for not completing it correctly.

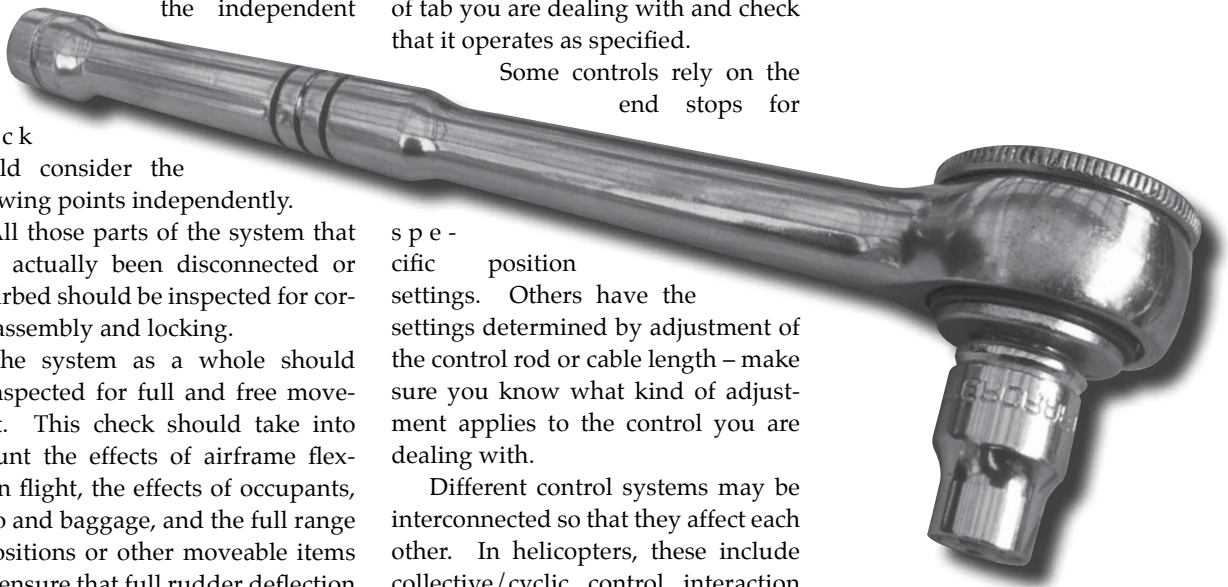
Trim tabs, balance tabs, anti-balance tabs, spring tabs and servo tabs all have distinctly different characteristics. Make sure you know what kind of tab you are dealing with and check that it operates as specified.

Some controls rely on the end stops for

specific position settings. Others have the settings determined by adjustment of the control rod or cable length – make sure you know what kind of adjustment applies to the control you are dealing with.

Different control systems may be interconnected so that they affect each other. In helicopters, these include collective/cyclic control interaction and linkages between the collective and power controls. In airplanes, they include rudder/aileron and nose-wheel-steering/rudder interconnections. Flap position may be designed to alter the operation of spring tabs or spoilers, or to modify the range of aileron movement. All these interactions must be checked through the full range of the applicable controls.

continued on page 34



When working on systems that are equipped with position indicators, determine if the work has affected their operation and, if so, observe the operation of the indicators to ensure they correspond with the actual control positions.

On completion of the independent check, all tools and measuring devices, including protractors, inclinometers, tension meters and rigging pins should be removed and accounted for. All access panels should then be replaced, after which a final check for full and free movement should be carried out.

Both of the people who are providing signatures must separately decide on the extent of the inspection to be carried out, depending on the type of

control and the nature of work performed. The independent check need not cover to the same range of detail as the check leading to the primary signature. However, as a minimum, it must include an inspection for correct assembly and locking of any parts of the system disturbed by the maintenance performed, and operational check for proper sense and range of operation.

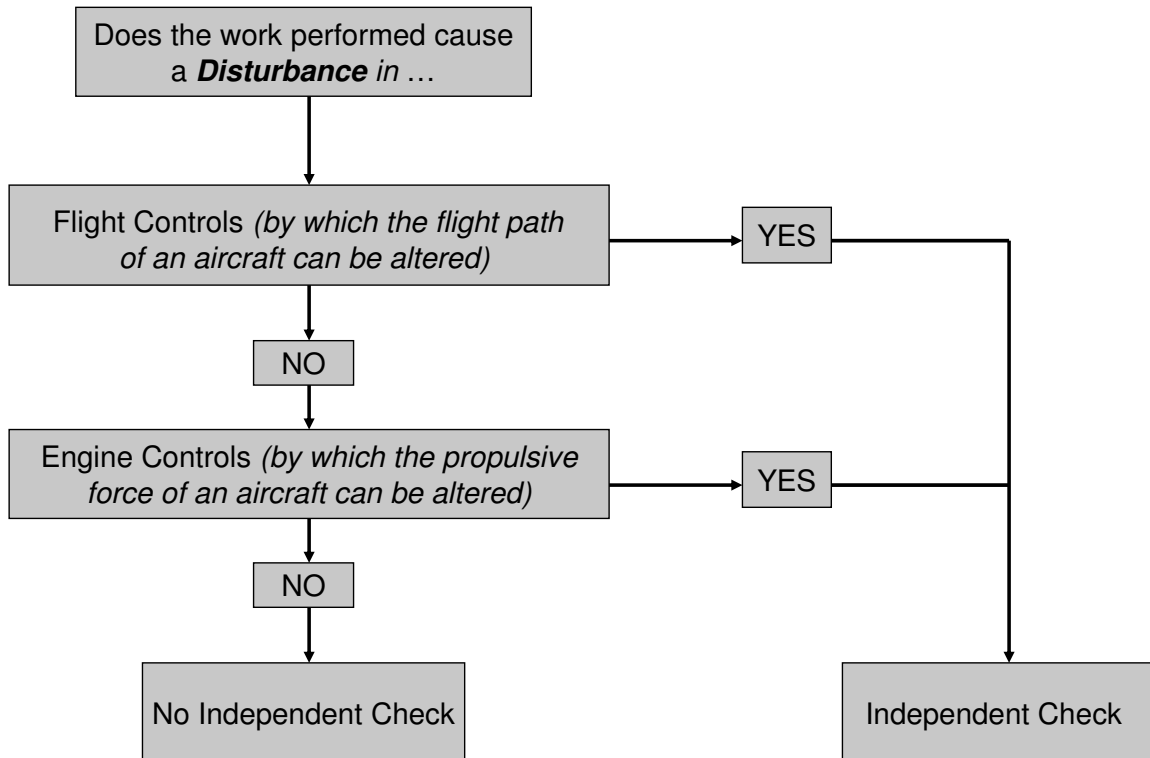
When checking the controls for

sense of operation, the best approach is to visualize the aerodynamic and other forces action on the controls and mentally follow the resultant chain of events.

For example, in the case of an elevator control, this method would involve the following thought sequence "Let's see, stick back, control surface moves up, that will tend to push the tail down, which brings the nose up, so the aircraft climbs –

If we would all take the time to give these tasks the attention they deserve, regardless of how simple it may appear control-rigging accidents could be completely eliminated.

INDEPENDENT CHECK FLOW CHART





Your RAA Mailing Crew: Pictures taken by David James at last labeling session. Left to right: Dave Evans, Ron Seyffer, David James, Ed Martin, Eugene Bemus with his wife Gloria and Jim Mantyla. Absent: Jim and Eileen O'Loan, Lawrence Shaw

system checks OK" and repeat for the opposite direction. While this may seem simplistic, it has the very real advantage of reducing the task to its absolute basics, and may just detect an error that would be overlooked in a more sophisticated procedure.

Making the Log Entry

When making the maintenance entries in the Journey log book and Technical log books the person making the primary signature will include the work that disturbed the engine or flight control in the log entry, and sign for their work.

The secondary entry for the independent inspection can be entered in the log books as follows:

"Independent inspection for cor-

rect assembly, locking and sense of movement for (insert a clear description of the system, i.e. right-hand aileron) satisfactorily completed", and this statement will be followed by the person signing the secondary signature, followed by their pilot license number and date of the entry.

The Final Word

If you are concerned about liability issues with having someone else signing your log book, or if you are concerned about the liability of signing someone else's log book, remember that this is not a regulatory requirement for amateur built aircraft and no log book entry is required.

Whether you decide to make this entry in your log book or not is your

choice, however, the main point of this article is to make you aware of the independent inspection process so that you can use it!

These kinds of errors in the assembly of control systems that lead to accidents can often be very simple, so much so that, with hindsight, it can be difficult to see just how the oversight could have occurred. These are simple human errors and among all the problems that are encountered in aviation, these are among the most avoidable. If we would all take the time to give these tasks the attention they deserve, regardless of how simple it may appear control-rigging accidents could be completely eliminated. ¶

Additional reference: Transport Canada Airworthiness Notice C010.