

# FLAP TROUBLESHOOTING

by Rick Wheldon

**E**arlier this year, there was a discussion among some MU-2 operators about the flap system. Therefore, in the previous issue of this magazine, I wrote about various potential failure modes and techniques for recognizing and addressing those failures. I would like to continue that discussion by investigating the proper rigging of your flaps, how to check whether your flaps are operating properly, and how to troubleshoot if you suspect your flaps are out of rig.

I'll begin with the same caveat as before – the flaps are an extremely reliable system. To my knowledge, there has been only one accident attributable to the flap system, and that was caused by a tragic error on the part of a mechanic who incorrectly installed a center torque tube. I myself have never experienced a

flap malfunction.

In the previous article, we addressed broken torque tubes and flex shafts. Beyond those issues, other flap problems are easily manageable by the pilot. Most involve some degree of flap roll, where extension and/or retraction cause the airplane to roll one direction or the other, requiring that the pilot add some spoiler and re-trim. Some flap roll problems involve excessive wear on the flap jackscrews and/or jack nuts. Poor flap rigging can also be caused when a mechanic takes shortcuts in the rigging process. Rigging the flaps must be done in a set sequence of steps which are detailed in the Maintenance Manual, and shortcuts by an inexperienced mechanic will more often than not result in poor flap operations. If you are not sure about the qualifications of your

maintenance provider, by all means take your airplane to a Mitsubishi Authorized MU-2 Service Center.

Looking at the MU-2 flap system, there are 3 jackscrews on each wing, driven by an electric flap motor and a combination of torque tubes and flex cables (Fig. 1). The center “main” flap jackscrew is the largest (Fig. 2), and it performs most of the work. The inboard and outboard jackscrews mostly control alignment.

Let's say that your airplane rolls left or right whenever the flaps are extended from 5° to 20°. You shouldn't have to live with that, but what should you do about it?

First, call your maintenance provider and decide together on a plan of action. A test flight to gather data definitely should be part of your plan. On the test flight, stabilize and

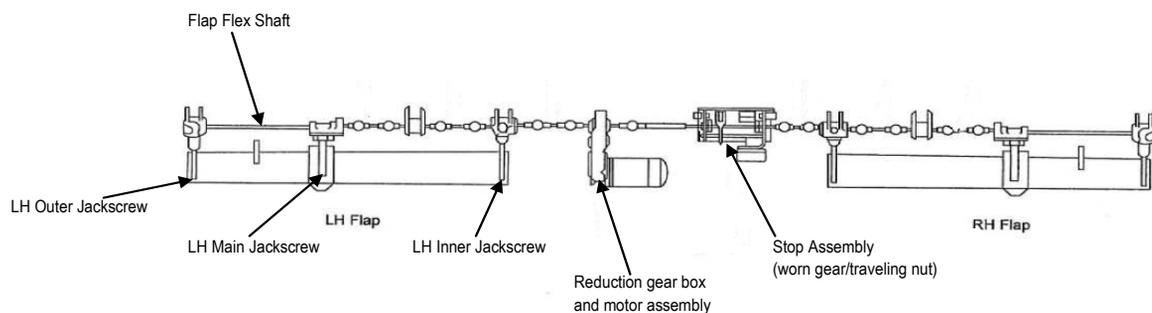


Figure 1, Flap System

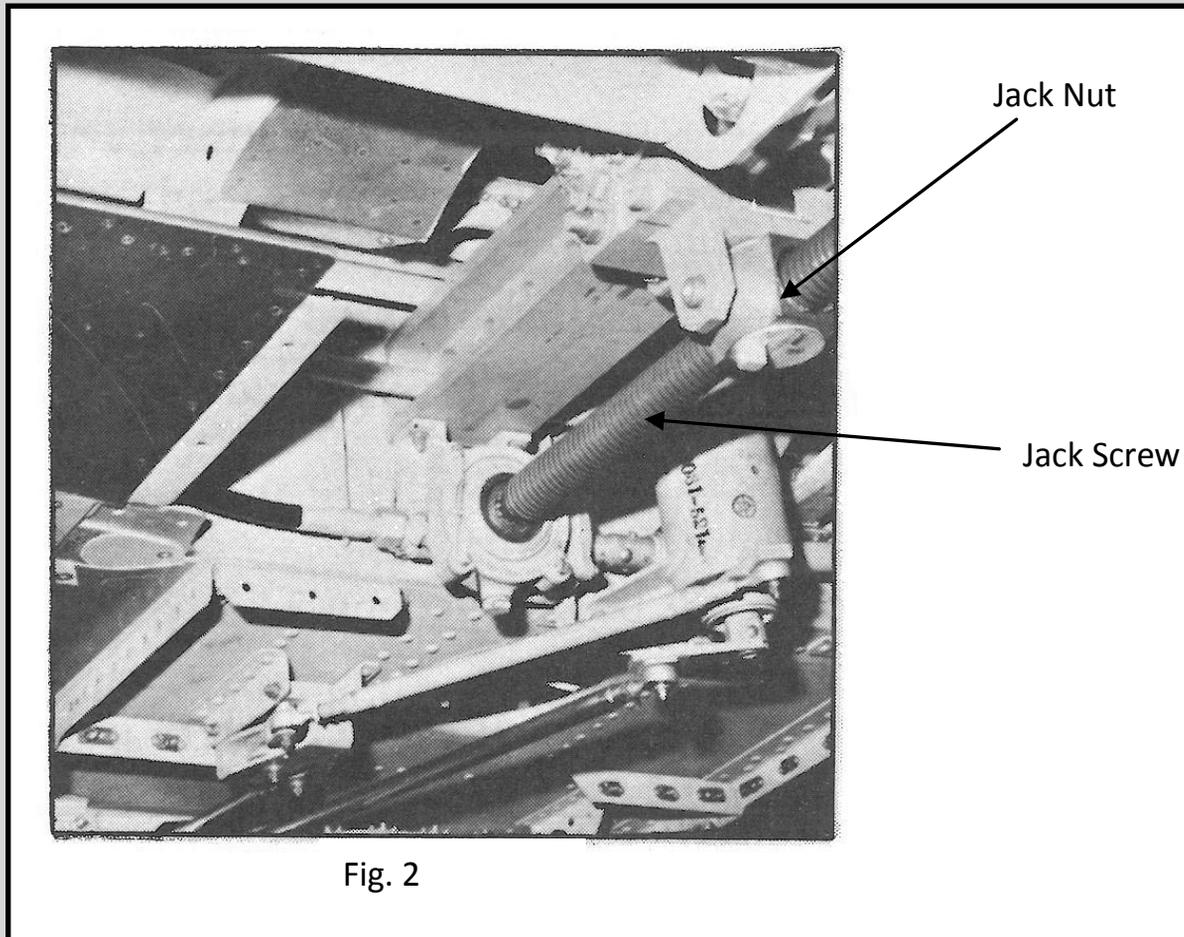


Fig. 2

trim the airplane at the maximum speed for the first notch of flaps. Carefully note and record the trim positions. Without using spoilers, select flaps 5°. If the airplane rolls, note how quickly (i.e., rolls 10° left in 3 seconds.) Now, re-trim and record the new trim settings, then slow to the next flap speed and stabilize the aircraft. Repeat the test as you select flaps 20° and 40°. Finally, repeat the tests again during the flap retract cycle. You should end up with six sets of data. Your data will provide maintenance with an idea of which flap is extending farther out, and how much farther.

What will maintenance do? The first step will be to check the tolerances on your jackscrews and jack nuts. You can get a good idea of the condition of your jackscrews and jack nuts during your preflight, when you grab the flap trailing edge (flap extended to 5° or 20°) and push it up and down. An excessive amount of play indicates that the jackscrews and or jack nuts may be excessively worn. If so, no amount of rigging will correct the problem, and the worn parts should be replaced. Most likely, if there is excessive play, the culprit is the main (center) jackscrew or jack nut,

because those carry the highest load during flap operations. Main jack nuts are checked during inspections by dropping the flaps to 40° and checking for free play at the trailing edge. Maximum movement is 7mm. If this free play is excessive, the jack nuts will have to be removed and checked further.

Main jackscrew wear is usually greatest at 20° flap extension, since this flap selection is most commonly used for takeoffs and landings. To check jackscrew wear, with the flaps at 40°, look just forward of the main jack nut. This is where the

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jack nut would ride when 20° flaps are selected. If the width of the top of the jackscrew thread is less than 1.5mm, the jackscrew is excessively worn. Note that while jackscrew wear is most likely to be excessive at 20°, the entire jackscrew should be inspected.

If the jackscrew wear is found to be within limits, then your flaps can be rigged out. Maintenance will put protractors on each flap and check deflections at all positions. While the rigging process is beyond the scope of this article, suffice it to say that adjustments may be made to the flaps to

eliminate the rolling effect with flap movement.

One final reminder is that, since jackscrew and jack nut wear is such a major factor in flap operations, it follows that an operator would be prudent to minimize that wear through regular lubrication. The MU-2 inspection program calls for lubrication every 100 hours or 12 months, whichever comes first. Cutting back on your lubrication schedule could be penny wise and pound foolish.

Your MU-2 can, in fact, have per-

fect flap rigging. I have been fortunate to be involved with the MU-2 Limited Edition program since its inception. Part of that program was the replacement of wear items. The jack nuts and jackscrews on the LE were replaced with new parts, and the airplane was rigged to near perfection. The flaps performed like the new factory airplanes I flew in the 1980s. The lesson here is that a rolling moment caused by flap extension can be fixed. You don't have to live with it, and it sure makes flying more fun when you do not have to deal with flap roll.

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