CASE STUDY

Diagnosing Defective Hydraulic Actuators on a Boeing 737 Leading Edge Flap Transmission using the UL101 Aviation Troubleshooter Kit (p/n B00033; Boeing Tool Tag SPL-1473)

Scenario

A North American passenger airline had an incident resulting in significant AOG down-time on a Boeing 737-700. A leading edge flap was slow to respond, indicating multiple failure in the hydraulic motor actuators on the flap's transmission. The aircraft was removed from service and placed on AOG. Current methods for addressing this issue were unable to diagnose which specific components were causing the slow response time.

Using the UL101 receiver with a solid probe, an aircraft technician can quickly listen to the ultrasonic output of each hydraulic component. The UL101 demodulates ultrasound at 40 kHz (+/- 1.5 kHz) into the audible range, producing an audible signal that can be heard through noise-attenuating headphones or visually displayed with software.

Failure modes in hydraulic actuators include external/internal leakage, blockages, and fluid by-pass. Each of these modes produce friction, impacts, and turbulence, and therefore, a strong ultrasonic signature. While external leakage is simple to detect with a visual inspection, internal modes of failure are often difficult to diagnose, resulting in long troubleshooting times and significant AOG delays. Often, the solution requires replacement of all the hydraulic actuators in the transmission when the faulty components cannot be individually diagnosed.

ROI in a Single Event

The chart to the right shows an incident that occurred prior to the operator's acquisition of the UL101 ("Before"). After an extensive AOG down-time, the operator was unable to diagnose the specific components that had caused the slow response. The decision was made to replace all eight actuators in the LE flap transmission.

	BEFORE	AFTER
Hourly Labor Rate	$60.00	$60.00
Technicians	4	4
Hours	96	36
Labor Cost	$23,040.00	$8,640.00
Component Cost (avg.)*	$12,000.00	$12,000.00
Total Components	8	3
Total Materials	$96,000.00	$36,000.00
Total Cost	$119,040.00	$44,640.00
Total Savings	$74,400.00	
ROI (single incident)	1,078%	

The "After" column demonstrates the operator's estimate of savings had the UL101 been available and applied to the event. In addition to a drastic reduction in troubleshooting time, the ability to diagnose the fault modes of specific components would have resulted in a significant cost savings of over 60%. Because application of the UL101 to this event would have paid for the acquisition of a single unit ten times over, the operator chose to acquire ten UL101 Aviation Troubleshooter kits for use at overnight hangars. The figures above do not include cost associated with the airline's lost flight time due to the unavailability of the AOG aircraft.

INDUSTRY
Commercial Aviation

CTRL EQUIPMENT
UL101 Aviation Troubleshooter (p/n B00033)

PART NUMBER
CTRL Part No. B00033 / Boeing Tool Tag SPL-1473

410.876.5676 phone • 877.287.5797 toll free (US & Canada) •
410.848.8073 fax • info@ctrlsys.com • www.ctrlsys.com