

Foil in the Brake Valve Inlet Filters

Transportation

CLIENT

Global services provider operating a fleet of aircraft.

CHALLENGE

When reports of “spongy” parking brakes on cargo planes began, it was not a threat to safety or service. But with growing frequency, maintenance checks revealed what appeared to be pieces of foil in the filters that keep the hydraulic fluid clean. The foil particles trapped in the filter almost blocked the flow of hydraulic fluid, causing the brakes to feel spongy. Early speculation that contract maintenance crews were introducing the foil by not using proper sealing caps during maintenance checks proved to be wrong: the cause of the clogging remained unknown.

SOLUTION

Unscheduled maintenance in response to complaints about the brakes was driving up operating costs. After days of troubleshooting failed to find root cause, the problem was referred to the company’s own Kepner-Tregoe rational process experts, Program Leaders (PLs) who are certified to teach and facilitate KT Problem Solving & Decision Making, a structured approach to rapid issue resolution. They quickly developed an effective problem statement and examined the “IS” and “IS NOT” data. It became apparent that they needed to know where else this was happening in the world.

Contacting other aircraft owners, the PLs learned that another company had experienced the same problem in the same model plane. Pieces of laminated aluminum shims, used within the brake manifold, had flaked off into the hydraulic fluid due to age and hydraulic pressure. The problem had been corrected successfully by replacing the shims with one-piece steel shims.

RESULTS

A research engineering firm examined the particles for the PLs and verified that the aging shims were the cause of the problem. The aircraft manufacturer was informed and proceeded to notify other owners of this aircraft about the problem and solution.



SCORECARD

- Quickly resolved a costly, on-going problem
- Eliminated complaints of spongy brakes
- Restored confidence in contract maintenance crews
- Enhanced communications and relationships with aircraft manufacturer
- Eliminated the need for similar investigations at other airlines
- Revenue spiked by 30% within two years after the acquisitions

(continued)



Problem Analysis

PROBLEM STATEMENT: Brake Valve Inlet Filters are Clogged

SPECIFY THE PROBLEM	IS	IS NOT
WHAT		
<i>What object?</i>	Filters of brake Control valve for this model aircraft	Other filters Other aircraft types
<i>What deviation?</i>	Has bits of foil	Metal shavings, paste, dirt
WHERE		
<i>Where (geographically)?</i>	Hydraulic systems; 1&3 in main wheel wells	Hydraulic system 2 or Upstream filters
<i>Where else in the world (other companies, etc.) is this occurring?</i>	One other carrier	All carriers
<i>Where on object?</i>	Outside of filter	Inner parts of filter, outside of valve
WHEN		
<i>When first?</i>	March 24	Prior to March 24
<i>When since?</i>	Continuous	Sporadic
<i>When in the lifecycle?</i>	During C checks	A, B checks, routine MX
EXTENT		
<i>How many objects?</i>	7-50	Less than 7
<i>What is the size?</i>	Small (1/8 inch)	Large, irregular foil rectangles
<i>Is there a specific shape?</i>	Identifiable shape	Irregular, random shapes
<i>How many deviations?</i>	One (foil)	More than one
<i>What is the trend?</i>	Increasing	Stable, improving