

Hicks Michael

From: [REDACTED]
Sent: Thursday, July 14, 2022 9:16 AM
To: Hicks Michael
Subject: Re: N93AB Bench Check of Trim Actuator cylinder

[CAUTION] This email originated from outside of the organization. Do not click any links or open attachments unless you recognize the sender and know the content is safe.

While reviewing the information regarding the trim actuator I was actually handling the o-ring from the piston that I had measured and the new ring that was a reference and notice that the o-ring from the actuator was noticeably harder than the new part. I reinstalled the o-ring that was in service at the time of the accident on to the piston and then inserted the piston into the cylinder by hand. The fit seemed looser than normal with little apparent resistance when pushed into the cylinder. Capped the cylinder outlet and again the piston exhibited no resistance to compression. Installed a new o-ring on piston and the fit exhibited more resistance and could not be pushed by hand into the cylinder due to compressive resistance.

Contrary to the findings of plumbing the cylinder into an equivalent system to that expected in flight it appears that the hardened o-ring, even with reasonable dimensions, could leak under flight conditions. The hydraulic simulation during which the cylinder retained pressure and position for days, did not include the restrictors which provide an acceptable rate of trim travel for flight operations. An o-ring can sometimes be "forced" to seal on a piston in a cylinder with a quick application of pressure which our shop simulation apparently provided. The restrictors in the aircraft apparently provided a flow capable of moving the trim surface, but not "forcing" the o-ring into a complete seal in the cylinder. Without a complete seal the flight load on the trim system would cause a bleed toward a neutral position.

Even though the shop simulation of the actuator held position and pressure, and the trim system appeared to be holding a position while in contact with the ground post accident, neither of these observations may have accurately reflected the actual flight situation.

It is very likely that the pilot of N93AB while dealing with the realities of a high density altitude take-off, may also have needed to deal with a trim that was not holding its required take-off position.

[REDACTED]

[REDACTED]
Amphibians Plus LLC
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

-----Original Message-----

From: Hicks Michael [REDACTED]

To: [REDACTED]

Sent: Wed, Jul 13, 2022 4:31 pm

Subject: FW: N93AB Bench Check of Trim Actuator cylinder

Hello [REDACTED] (*following up on the requested items per our conversation 23JUN2022*),

Below are the details that you provided for the examination of the trim actuator cylinder and the trim valve. Please add to the document/email, your process, and findings regarding the examination of the internal components of the actuator. Please provide the maintenance manual description of the Reverse Trim characteristics. Finally, I would appreciate your analysis, based on the facts, conditions, and circumstances during the accident flight, specifically touching on the flight envelope given the atmospheric conditions that existed during the takeoff, which resulted in an accident.

If I can provide any clarification at all, please advise, and I will provide.

Respectfully,



MICHAEL A. V. HICKS

National Transportation Safety Board

Air Safety Investigator

Phone: [REDACTED]

From: Hicks Michael

Sent: Thursday, June 23, 2022 1:54 PM

To: [REDACTED]

Subject: RE: N93AB Bench Check of Trim Actuator cylinder

Hello [REDACTED]

Below are the details that you provided for the examination of the trim actuator cylinder and the trim valve. Please add to the document/email, your process and findings regarding the examination of the internal components of the actuator. Finally, I would appreciate your analysis, based on the facts, conditions, and circumstances during the accident flight, specifically touching on the flight envelope given the atmospheric conditions that existed during the takeoff, which resulted in an accident.

If I can provide any clarification at all, please advise, and I will provide.

Respectfully,



MICHAEL A. V. HICKS

National Transportation Safety Board

Air Safety Investigator

Phone: [REDACTED]

From: [REDACTED]
Sent: Wednesday, April 6, 2022 5:54 AM
To: Hicks Michael [REDACTED]
Subject: N93AB Bench Check of Trim Actuator cylinder

[CAUTION] This email originated from outside of the organization. Do not click any links or open attachments unless you recognize the sender and know the content is safe.

Michael,

Following is my report of the results of the Bench Check of the Trim Actuator that I performed.

Bench Test of Trim Actuator cylinder and Trim Selector Valve from N93AB.

To determine actual pressures a 1981 Lake LA4/200 Amphibian was flown with the pressure gages "Tee'd" into the up and down trim lines between the trim restrictors and the trim cylinder. The aircraft was loaded to 2570 lbs with a Center of Gravity (CG) of 103.8. With this loading, trim had approximately 20 degree tab up and a differential pressure across the trim cylinder of 145 psi in level flight. This resulted in 1.1 inches of unthreaded shaft exposed.

Trim actuator cylinder has an ID of 1.125 inches with an area of .994 square inches resulting in an actual rod load of 145 psi x .994 sq in = 144 lbs.

Subject selector valve and trim actuator were plumbed from a bench source of hydraulic pressure and return to allow up/down actuation of trim cylinder.

To load actuator same as flight load, it was suspended cylinder down and 140 lbs of weight suspended from the cylinder. Rod was moved hydraulically to have 1.1 inch exposed. Cycled rod position +/- .75 inches from the this position then set actuator at 1.1 inch exposed. Actuator and selector maintained this position for an initial 24 hour period. Two weeks later, positions appeared identical.

Conclusion

The trim actuator cylinder and the trim selector valve appeared to have no internal leakage allowing it to move with the trim sector set to its neutral or "off" position.

[REDACTED]
Amphibians Plus LLC
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]



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