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26 January 1999
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Mr. John Clark, AS-2T
National Transportation Safety Board
490 L'Enfant Plaza East, SW
Washington, DC 20594

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Subject: Maximum Slide Load - USAir 737-300 N513AU Accident near Pittsburgh, Pennsylvania - 08 September 1994

Reference: Meeting RPCU Secondary Slide Cracking, 03 December 1998

Dear Mr. Clark:

During the reference meeting, you requested us to confirm the reason for the 200 pound maximum load for the secondary slide in the 737-300 main rudder power control unit (RPCU). We have also provided below our description of the maximum load for the primary slide.

The following is a description of the maximum load that may be applied to primary and secondary slides of the 737-100, -200, -300, -400 and -500 (or Classic airplanes) RPCU during failure mode operation (i.e., a jam of either the primary or secondary slide). These loads are only encountered during failure mode operation. During normal operation the maximum load applied the primary and secondary slides will be limited to approximately 1.5 and 12 pounds, respectively.

These descriptions assume that the jammed slide is being commanded opposite the direction it was commanded when the jam occurred. For example, if the secondary slide was commanded in the left rudder direction when it became jammed (due to FOD for example), the feedback loop, and eventually the pilot, would be applying a right rudder command to clear the jam.

Primary Slide

The maximum load that can be applied to the primary slide during a failure mode condition (a jam of the primary slide) is dependent upon the compliance (stiffness) of the primary input crank.

A jam of the primary slide will reduce the total allowable travel of the RCPU's internal linkages. With reduced internal travel, the secondary slide and centering fork will bottom out (become travel limited) prior to the input crank assembly contacting the external manifold stops. This causes the external input loads (pilot and/or feel-and-centering unit) to be applied directly to the jammed primary slide through the primary input crank and primary internal summing lever.

However, the internal cranks and linkages of the primary load path are not infinitely stiff and as the external load is applied the mechanism will comply. This compliance allows the input crank assembly to finally contact the external manifold stop and limit the load being transmitted to the jammed slide. In the case of the primary slide, the primary input crank has the greatest amount of compliance and limits the transmitted load to approximately 40-50 pounds (depending upon actual PCU tolerances).

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Secondary Slide

The maximum load that can be applied to the secondary slide is similar to the primary slide. However, the secondary input crank is larger in diameter than the primary input crank and has much less compliance. Therefore, a much greater load is required to produce enough compliance to make the input crank assembly finally contact the external manifold stop. As such, the load transmitted to the jammed secondary slide is approximately 180-200 pounds (depending upon the actual PCU tolerances).

If you have any questions, please do not hesitate to call.

Very truly yours,

[redacted]

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[redacted]

cc: Tom Haueter, AS-10
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