

3. RECOMMENDATIONS AND CORRECTIVE ACTION

In a letter to the Administrator of the FAA dated July 25, 1967, the Board made the following recommendations:

- (1) That a fireproof barrier of appropriate width be provided at the top fuselage skin between Fuselage Stations 936 and 958 in order to provide effective isolation of the vertical fin, particularly the area aft of the rear spar wherein is located electrical circuits, hydraulic lines and mechanical devices for directional and longitudinal control.
- (2) That the aluminum alloy wall separating the hydraulics bay and the airframe plenum chamber be replaced with a suitable fireproof material.
- (3) That inflight use of the APU be restricted as a precautionary measure until such time as the suitable barriers recommended above are provided.

The Administrator, in his written response of August 15, 1967, to the Board's recommendations, noted that the FAA was working with the manufacturer and the Air Registration Board (ARB) concerning the leakage and drainage of hydraulic fluid in the BAC 1-11. The Administrator's letter then continued as follows:

"We have confirmed that U. S. operators of BAC 1-11 aircraft have complied with the campaign alerts issued by the British Aircraft Corporation, including the removal of the sound proofing material from the auxiliary power unit air inlet plenum chamber, thus eliminating material from that area which might support combustion.

In addition, we have agreement of the U. S. operators to voluntarily prohibit in-flight use of the APU until such time as suitable installation modifications are completed. They have agreed that the APU will be shutdown prior to takeoff and will not be restarted until after landing. It is intended that this restriction on the APU would be lifted at such time as approved modifications are developed to provide a fire proof barrier isolating the APU plenum chamber." 40/

By Airworthiness Directive (AD) No. 68-1-1, effective January 3, 1968, 41/ the FAA prescribed a number of measures designed to prevent heat damage or possible fire in the airframe plenum chamber of the APU. The AD required that, if use of the APU on the ground was to be continued, the following steps are to be taken:

- (1) Visually check the fiberglass surround on the plenum chamber intake for evidence of heat discoloration and, if such evidence is present, replace the nonreturn valve with a serviceable valve or a modified valve. 42/
- (2) Install a placard in the cockpit specifying (a) that the APU air delivery valve shall be closed when starting an engine

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40/ Mohawk Airlines had accomplished these measures (i.e., removal of blankets and inflight shutdown of APU) in early July on its own initiative.

41/ This directive was published in the Federal Register (33 F.R. 10) as Amendment 39-538.

42/ The modification to the nonreturn valve includes the addition of a flange to the backface of each valve flap (i.e., the side opposite to the setting face), which substantially increases the resistance of the flap to distortion. The depth of each flange is varied so that when the flaps are opened, contact is made along the entire length of the two flanges, thus reducing the distortion caused by forces produced by the rapid opening of the valve. In addition, the valve spring has been strengthened and a sleeve fitted to keep the spring from contacting the main spindle, thus avoiding wear between those two parts. Finally, the valve has been fitted with a stop device to insure that the two flaps cannot fall over or close on one side.

from external supply or by cross-feeding air from an operating engine, and (b) that the air delivery valve be closed and the APU shutdown for takeoff and flight operations.

- (3) Remove all airframe plenum chamber acoustic linings. <sup>43/</sup>

The AD further required, as a condition precedent to the operational use of the APU in flight, that the following items be accomplished: <sup>44/</sup>

- (1) Replace the nonreturn valve with a modified valve.
- (2) Perform the following structural modifications:
  - (a) Install additional fireproof, stainless steel skin over the existing light alloy outer skin on top of the fuselage, between Fuselage Stations 936 and 958, in order to isolate the airframe plenum chamber from the vertical fin.
  - (b) Replace the light alloy wall separating the airframe plenum chamber from the hydraulic compensator bay with a stainless steel wall, enlarging the hydraulics bay in the process.

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<sup>43/</sup> The AD also provided that, as an alternative to the above three items, use of the APU on the ground could be continued if the items prerequisite to inflight APU operation were accomplished within 50 hours time in service after the effective date of the AD.

<sup>44/</sup> One of the items listed in the AD, which has no apparent connection to the circumstances pertaining to the subject accident, has been omitted from the list set forth below.

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- (c) Modify the hydraulic compensator drain box and the drain outlet:
- (d) Install a revised spring loaded door in the bulkhead at FS 936 (forward wall of plenum chamber).
- (3) Install sealing plates around the control guard, located above the rudder power control units, and over the hole in the vertical fin rear spar, in order to restrict airflow into the vertical fin.
- (4) Install an additional bimetallic temperature sensor in parallel with the existing mercury sensor in the circuitry which controls the electrically actuated primary temperature valve located in the low pressure bleed flow duct to the heat exchanger. <sup>45/</sup>
- (5) Revise the airplane flight manual to assure that at no time is air from either engine and from the APU being delivered simultaneously into a common duct. <sup>46/</sup>

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<sup>45/</sup> The AD further provided that items (1) through (4) listed above should be accomplished in accordance with the appropriate BAC Service Bulletins, later ARB approved issues, or FAA approved equivalents.

<sup>46/</sup> The AD noted that item (5) was covered by BAC Flight Manual Advance Amendment Bulletins.

The Safety Board believes that the corrective measures heretofore taken, as described above, should prevent similar accidents in the future in this type aircraft from this cause.

BY THE NATIONAL TRANSPORTATION SAFETY BOARD:

/s/ JOSEPH J. O'CONNELL, Jr.  
Chairman

/s/ OSCAR M. LAUREL  
Member

/s/ JOHN H. REED  
Member

/s/ LOUIS M. THAYER  
Member

/s/ FRANCIS H. McADAMS  
Member