



## AIR LINE PILOTS ASSOCIATION, INTERNATIONAL

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December 10, 2008

Mr. Bill English  
National Transportation Safety Board  
490 L'Enfant Plaza East, SW  
Washington, DC 20594

Dear Mr. English,

In accordance with the Board's rules, the Air Line Pilots Association, International (ALPA) submits the attached comments and conclusions concerning the accident of a Boeing MD-10-10F airplane operating as Federal Express (FedEx) Airlines Flight 630. This event occurred on July 28, 2006.

The following narrative contains a synopsis of ALPA's analysis of the facts surrounding the event based upon the information obtained through the NTSB's investigation. ALPA's suggested Safety Recommendations are included and are based upon these facts.

### CONDUCT OF THE INVESTIGATION

First, ALPA would like to offer our appreciation to the NTSB for a thorough and well-run investigation. The level of detail that went into this investigation, in our opinion, went a long way in identifying the cause of the failure and correctly determining corrective actions.

### BRIEF HISTORY OF FLIGHT

On July 28, 2006, about 1125 central daylight time, FedEx Express (FedEx) flight 630, a Boeing MD-10-10F (MD-10), N391FE, experienced a failure of the left main landing gear immediately after touching down on runway 18R at Memphis International Airport (MEM). After the gear collapsed and the left wing came in contact with the runway, a fire developed on the left side of the airplane. The airplane continued down the runway and came to rest on the left side of the runway. The two flight crewmembers received minor injuries during the evacuation, and the only non-revenue FedEx pilot on board was not injured. The post-crash fire substantially damaged the airplane's left wing and a majority of the left side of the fuselage. Flight 630 was being operated from Seattle-Tacoma International Airport (SEA), Seattle, Washington to MEM under the provisions of 14 *Code of Federal Regulations* (CFR) Part 121. The flight was conducted on an instrument flight rules (IFR) flight plan.

## **SIGNIFICANT FINDINGS / CORRECTIVE ACTIONS**

### **Failure Mechanism**

Post accident, on scene examination of the aircraft found the outer cylinder of the left main landing gear fractured. It was later determined during the course of the investigation that this failure originated in the air filler valve boss on the aft side of the outer cylinder. Metallurgical analysis identified that this failure was ultimately caused by the presence of stray and unintended nickel plating deposits in the air filler valve hole (bore) which reduced the overall fatigue strength of the base metal in the outer cylinder thus causing a weakness in the material.

As a result of this investigation and the findings thus far, in May of 2008, the FAA issued a Final Rule (2007-NM-328-AD; effective; June 6, 2008) for certain McDonnell Douglas Model DC-10-10, DC-10-10F, DC-10-15, and MD-10-10F airplanes. This Airworthiness Directive (AD), required inspections and corrective actions on the main landing gear shock struts for the affected aircraft. The AD called for repetitive inspections to check for the presence of stray nickel or chrome plating deposits on the air filler valve bore. While the corrective actions called for in the AD (inspections and removal of residual nickel) were valid, ALPA felt that the interval between inspections was too lengthy and, due to the severity of a failure of this nature, ALPA recommended it be shortened to less than 24 months for aircraft whose landing gear cylinders had accumulated less than 7,200 flight cycles at the time of the AD issuance. Unfortunately in our opinion, for a portion of the affected fleet the inspection interval continues to be 24 months.

### **Brake and Anti-Skid Modifications**

The investigation determined that of the 15 FedEx MD-10 airplanes equipped with the carbon brake system, several were found to have occasional pilot reports of unacceptable brake grabbing, aircraft pulling to the left or right during braking, excessive pedal travel to obtain braking, and aircraft shuddering (shaking) during braking. The investigation determined that these reports could have been due to several factors: 1) delayed brake action at the wheel in relation to initial brake application by the pilot; 2) a combination of braking torque from manual braking and antiskid activation; and 3) brake fluid contamination resulting in internal brake component malfunctions.

Because of this accident and the braking system reports above, an in-service evaluation was initiated on the part of the investigative activity. Several modifications were made to the ISE aircraft to correct these anomalies. As a result, several modifications were made to the MD-10-10F braking system. These modifications include; brakes were removed and replaced and brake hydraulic systems were flushed to ensure any contamination was removed from the system, antiskid manifold return line filters were removed to allow any contamination to flow to the hydraulic system filters versus remaining within the anti-skid system; the dual

brake control valve was modified to reduce the lag between pedal input and brake application; and the anti-skid module was modified to change the brake inlet pressure response. To date, line operations indicate that these modifications appear to have made progress towards alleviating the braking system reports noted above.

## PREVIOUS GEAR COLLAPSE EVENT

On December 18, 2003, a FedEx MD-10-10F, operating as FedEx Flight 647, experienced a failure of the right main landing gear while landing at MEM (NTSB #DCA04MA011). The right main landing gear collapsed after touchdown on runway 36R, and the airplane veered off the right side of the runway. After the gear collapsed, and as the aircraft continued down the runway, a fire developed on the right side of the airplane. It was found that the fracture of the right main landing gear of this airplane initiated from the same air filler valve bore hole location as Flight 630. The final report for FDX 647 states in its Conclusions; “*10. The excessive vertical and lateral forces on the right main landing gear during the landing exceeded those that the gear was designed to withstand and resulted in the fracture of the outer cylinder and the collapse of the right main landing gear.*”

While there are significant differences documented between the sink rates<sup>1</sup> of these two aircraft, the failures after touchdown are nearly identical. While ALPA will stipulate that in the FDX 647 event, the right main landing gear contacted the runway at a descent rate that exceeded the structural limits of the landing gear, we must highlight the similarities between the Flight 630 and Flight 647 failure mechanisms. It is well-documented in the FDX 647 factual record<sup>2</sup> that there was the presence of nickel in the right main landing gear air filler valve bore. However, the only mention of nickel in the final NTSB final report for that event states; “*... no significant deviations from drawing requirements were found<sup>76</sup>.*” The footnote goes on to elaborate; “*Nickel deposits were found on the shock strut chamber pressurization/check valve hole surface, which is unusual but not considered contributory to the event.*” ALPA submits that, as a result of this most recent investigation and the findings determined as a part of this investigation, the presence of nickel played a significant role in the FDX 647 event and must be considered “contributory”. ALPA strongly urges the NTSB to amend the Flight 647 final report to include the presence of nickel as a contributory finding of cause.

## FINDINGS AND SAFETY RECOMMENDATIONS

### Findings

1. There were no issues found with the operation of the aircraft on the part of the flightcrew.

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<sup>1</sup> 2-3 feet per second for FDX Flight 630 of July 2006 and ~14 feet per second for FDX Flight 647 of December 2003

<sup>2</sup> Materials Laboratory Factual Report, Report No. 04-031, March 31, 2004

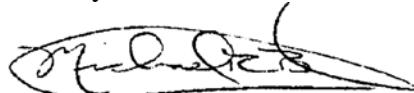
2. There were no issues found with the operating procedures for the aircraft on the part of the manufacturer or the operator.
3. The failure of the left main landing gear was precipitated by stray and unintended deposits of nickel found in and around the air filler valve on the left main landing gear cylinder.
4. The presence of nickel in and around the air filler valve reduced the fatigue strength of the base metal found in the landing gear cylinder.
5. An in-service evaluation of a FedEx MD-10-10F resulted in modifications to the brake control valve and anti-skid module that are intended to alleviate braking system operation write-ups identified during the investigation.
6. Finite Element Model analysis using data obtained from the in-service evaluation showed that for all of the landing conditions experienced during the evaluation, the stress in the air filler valve hole was much higher than anticipated during the design of the outer cylinder.
7. The presence of stray and unintended nickel played a significant role in the overall failure of the left main landing gear cylinder.

### **Safety Recommendations**

1. The FAA should shorten the inspection interval (24 months) called out in Airworthiness Directive (2007-NM-328-AD) for those aircraft whose landing gears have accumulated less than 7,200 flight cycles.
2. The NTSB should amend their final report for FDX Flight 647 (NTSB #DCA04MA011) to include the presence of nickel in the right main landing gear air filler bore as a Contributory Cause.

ALPA appreciates the opportunity to participate in this investigation and hopes that the attached Findings and Safety Recommendations will be of assistance as the NTSB concludes this investigation.

Sincerely,



Captain Mike Bender  
ALPA Accident Investigation Board  
ALPA Coordinator