Docket No. SA-521

Exhibit No. 17-A

NATIONAL TRANSPORTATION SAFETY BOARD

Washington, D. C.

Maintenance Inspection Group Chairman's Factual Report

(13 Pages)

NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Washington, D.C. 20594

July 26, 2001

Maintenance Inspection of Tennessee Technical Services (TTS)
Smyrna, Tennessee

DCA00MA026

A. ACCIDENT

Location: Rancho Cordova, California

Date: February 16, 2000

Time: 1950 Pacific Standard Time (PST)

Aircraft: Douglas DC-8-71F, N8079U, Emery Worldwide Airlines, Flight 17

B. MAINTENANCE INSPECTION GROUP

Chairman: Frank McGill
National Transportation Safety Board
Washington, D.C.

Member: Kevin Pudwill
National Transportation Safety Board
Washington, D.C.

Member: Bruce Robbins
Emery Worldwide Airlines
Vandalia, Ohio

Member: Jim Bailey
Tennessee Technical Services
Smyrna, Tennessee

C. SUMMARY

On February 16, 2000, at 1951 Pacific Standard Time (PST), a Douglas DC-8-71F, N8079U, registered to and operated by Emery Worldwide Airlines (EWA) as flight 17 for the 14 Code of Federal Regulations (CFR) part 121 scheduled cargo service from Sacramento, California, to Dayton, Ohio, crashed shortly after takeoff from Mather Field, Rancho Cordova, California. Visual meteorological conditions prevailed and an instrument flight rules (IFR) flight plan was filed. Impact forces and a post-crash fire destroyed the airplane. The three crewmembers were fatally injured.

On February 27, 2001, the Maintenance Inspection Group met in the Tennessee Technical Services, L.L.C. hangar facility located at Smyrna Airport, Smyrna, Tennessee, to begin a site inspection of the FAA approved repair station.

The facility had performed the last "D" Check on airplane N8079U in November 17, 1999. After an initial review of records of the accident airplane and training records of maintenance personnel, the Maintenance Inspection Group conducted interviews with the General Manager, Vice President of Maintenance, Manager of Planning, and the Lead Maintenance Technician and two of the Inspectors that signed the completed work card for the installation of the right elevator tabs. General measurements of column control and flight control surface movements were measured from other Emery DC-8 airplanes that were at the facility for repair. Procedures and techniques were observed from other elevator maintenance activities.

On February 28, 2001, the Maintenance Inspection Group completed the inspection and departed the facility.

D. DETAILS OF THE INSPECTION

1. Repair Station Certificate

Tennessee Technical Services (TTS), LLC, Smyrna, Tennessee, is an FAA approved Part 145 Repair Station; Air Agency Certificate Number T64R1640 was issued on May 29, 1998. It was reissued on January 26, 2000, with the following ratings: Limited Airframe, Powerplant, Accessories, Radio, Instrument, Non-Destructive Testing, and Specialized Service. TTS also has Joint Aviation Authority (JAA) JAR-145 Acceptance Certificate reference number JAA.5267 that was issued August 30, 2000, with the same scope of acceptance as the FAR 145 repair station Air Agency Certificate.

TTS currently operates from a hangar that will accommodate four DC-8 airplanes, and a separate building that overhauls flight controls and other components. As of March 1, 2001, 173 airplanes have had maintenance performed at the facility. Ninety-nine of these airplanes, which were operated by Emery Worldwide Airlines (EWA), had heavy maintenance checks, special maintenance services, or off-base support performed.

Airframe authorization is limited to inspection, maintenance, modification and alteration of the airplanes listed below, including A. B, C, D, and E maintenance checks, excluding spray

painting within the hanger area. All work is to be accomplished in accordance with the customer's Part 121 requirements for continuous airworthiness per Part 145.2, manufacturer's current technical data, or other data acceptable to the administrator. The repair station's aircraft capabilities listing is as follows:

AIRPLANE MAKE	MODEL	SERIES
Douglas	DC-8	50
Douglas	DC-8	60
Douglas	DC-8	70
Canadair	CL-44-D4	Guppy
Boeing	B 727	100
Boeing	B 727	200
Douglas	*DC-10	10
Douglas	*DC-10	30

* Excludes A, B, C, and D check inspections.

2. Airplane N8079U Information

TTS began a "D" Check inspection on the airplane in August 27, 1999. The check was completed on November 17, 1999. The airplane was in maintenance service for 82 days. The planned inspection was initially set at 75 days. There were 2,173 nonroutine repair tasks generated by the inspection requirements: totaling 23,756 man-hours of performed maintenance. Flaps, ailerons, rudder, elevators/tabs were replaced with overhauled units.

The airplane was manufactured in July 1968, and converted to a freighter in 1993. The serial number was 45947, fuselage number was 341, and effectivity number was UA079. United Airlines had been one of the previous operators of the airplane. As one of the previous operators, the United AirLines (UAL) DC-8 Maintenance Manual and the UAL Illustrated Parts Catalog (IPC), series 60/70, were included in the list of FAA approved maintenance manuals for the airplane.

3. Emery Worldwide Airlines Maintenance Manuals

EWA manages control of its Continuous Airworthiness Maintenance Program (CAMP) by the use of a FAA approved/accepted maintenance manuals system. CAMP also consists of the Reliability Program, Inspection Program, and Time Limits manuals. Maintenance manuals covering other requirements to support the EWA CAMP are: Maintenance Policies and Procedures (TTS had revision 23), weight and Balance, EWA Aircraft Maintenance manual, Fueling Manual, and the Minimum Equipment List. Together, these manuals make up the EWA CAMP and programs covering other maintenance in compliance with FAR 121 and 43.

The following manuals are incorporated into the EWA Maintenance Manual by reference and through the authority of FAR 43.13 (a).[1] EWA will utilize the following Douglas Aircraft

[1] See Attachment 17-B, Maintenance Manuals.

Maintenance manuals, previous Operators' manuals, and FAA approved Supplemental Type Certificate (STC) and Original Equipment Manufacturer (OEM) manuals:

Douglas Manuals (DC-8)

(a) Douglas Aircraft Maintenance Manual, 60 and 70 series (Microfilm)

(b) Aircraft Structural Repair Manual (SRM), (Microfilm).

(c) Douglas Aircraft Overhaul (O/H) Manual, (Microfilm).

(d) Douglas Aircraft Illustrated Parts Catalog (IPC), 60 and 70 series. (Master) (Microfilm)

(e) Douglas Temporary Revision for 60 Series Maintenance Manual.

(f) Douglas Temporary Revision for IPC, O/H, SRM, and 70 series Maintenance Manual.

Previous Operators (DC-8)

(a) United Airlines (UAL) Maintenance Manual for 60/70 series, (Microfilm).

(b) UAL IPC for 60/70 series, (Microfilm).

(c) Scandinavian Airlines System (SAS) Maintenance Manual for 63 series, (Microfilm)

(d) SAS IPC for 63 series, (Microfilm).

(e) Flying Tigers Maintenance Manual for 60 series, (Microfilm).

(f) Flying Tigers IPC for 60 series, (Microfilm).

(g) Aircraft Wiring Manual for applicable aircraft. Revision to this manual will be published/revised by EWA, (Hard Copy and/or Microfilm).

STC and OEM Manuals

There are 18 of these manuals listed by ATA coding in the EWA Maintenance Policy and Procedures Manual.

4. Workscope information for N8079U "D" Check

Maintenance workscope information supplied by EWA to TTS for N8079U "D" Check was reviewed. The check included: fleet campaign directives (FCDs) and other special

inspections, airworthiness directives (ADs), components that were due time change re-certification, powerplant tasks, and STC modifications to expand the parameters of the DFDR.

Amendments to the workscope package sent by EWA to TTS included revision 5, dated September 14, 1999, stated that the flight controls for N8079U would be a combination of exchanged units and quick turned units. Some of the following instructions from the revision included:

The following parts were on hand at TTS: right hand (RH) elevator with tabs, manufacturer's part number (MPN) is 5644420-XXX, and left hand (LH) elevator with tabs, manufacturer's part number is 5644420-XXX.

MPN	DESCRIPTION
5644420-XXX	Elevator L/H w/Tabs
5644420-XXX	Elevator R/H w/Tabs

Note: *TTS received the following parts for N8079U on September 9, 1999, from Willis Aeronautical Services, Tempe, Arizona:*

RH elevator, MPN: 5644420-506, SN: CCI-092

RH elevator geared tab, MPN: 5702579-4, SN: CCI-096

RH elevator control tab, MPN: 564444-2, SN: CCI-093

5. Parts Receiving Policy

From TTS's "Repair Station Inspection Procedures Manual," the following items were noted:

(a) Parts, components, and materials received from an FAR part 121 or 125 operator for use on their airplane will be received by TTS using the operator's approved procedures for receiving inspection.

(b) Any parts found to be unserviceable for any reason will be tagged and will be carefully segregated and secured in the stock and storage areas.

(c) Any repaired or overhauled components received from an FAA certificated repair station require a receiving inspection for shipping damage, traceability of life limits, if applicable, and traceability of overhaul record and or maintenance release tag before being returned to service. Repaired or overhauled components that are received from other than an FAA certified repaired station, may not be used on an airplane and must be returned to the vendor.

(d) Any maintenance operations, which, if improperly performed, could be critical to the safe flight of an airplane, will be given a required inspection. A qualified inspector

familiar with the necessary inspection methods, techniques, and equipment to perform the inspection will be assigned to determine the quality of airworthiness of the article involved. When work is performed for an operator under the continuous airworthiness requirements of FAR 121 and 125, the required inspection items (RII) specified by the operator will be maintained as RII items. The operator must designate the repair station's inspection personnel for RII capability for their airplanes.

Note: *The Maintenance Inspection Group noted the list of TTS authorized inspectors that EWA accepted to perform Airworthiness Release and Required Inspection items on EWA DC-8 type airplanes, and Receiving Inspection on parts/materials, in accordance with EWA's Maintenance Policy and Procedures Manual. These are the only inspectors that could be used on EWA airplanes without prior approval from EWA Quality Control. At the time of the "D" Check inspection of N8079U in 1999, there were 20 inspectors listed.*

6. Training Records

The Maintenance Inspection Group reviewed the training records of eight mechanics that performed work on the elevator areas of N8079U during its last heavy check, including taskcards 3402D, 3504D, and 3506D. No discrepancies were noted.

7. Emery Inspection Work Card Package

The Emery Worldwide Airlines "D" Check index work card package sent by EWA to TTS for N8079U was reviewed. Elevators, tabs, and elevator control-tab rods were sent to other contractors for overhaul. The package is composed from the following "D" Check card indexes:

(a) "D" Check index cards for DC-8 50/60 series, from Emery's Inspection Program Manual- Volume III, dated November 15, 1995, revision 17.

(b) "C" Check index cards for DC-8 50/60 series, from Emery's Inspection Program Manual- Volume II, dated October 18, 1996, revision 19.

(c) "C" Supplemental Check index cards for DC-8-70 series, from Emery's Inspection Program Manual included-- Volume II, dated January 15, 1995, revision 16; October 18, 1996, revision 19; and January 15, 1995, revision 16.

The work package included the following task cards pertaining to the right elevator:

3402D Right Elevator and Tabs Hinge Eyebolt/Bearing Replace:

Use kit # 6003401 to remove and replace the right elevator hinge eyebolts/bearings, control tab hinge eyebolts/bearings, and the geared tab hinge eyebolts/bearings. There were three separate steps to be performed/signed by a mechanic, and one step for an inspector to verify/sign for proper accomplishment.

The check completion date listed on the card was October 14, 1999. The contents of the kit were not listed; there were no part numbers or references for replacement parts. There was no requirement to list the date when each task on the card was actually performed, and no dates were denoted.

3502D Install Right Elevator Tabs:

There were four separate steps to be performed/signed by a mechanic and an inspector, and one step for a final inspector to verify/sign the installation and security of the control tab and geared tab to the elevator.

The check completion date listed on the card was October 14, 1999. There was no requirement to list the date when a particular task was actually performed, and no dates were denoted.

The card states: Use applicable DC-8 M/M, Chapter 27, when performing this card. There are no drawings, references in the M/M about a specific direction for installing the pushrod attachment bolt when connecting the pushrod to the tab crank fitting. This information, including hardware description requirements, was not located in the IPC. This information was available in the OHM.

Note: *Once the pushrod fairing covers the tab crank fitting connection, the hinge bolt assembly is no longer visible.*

3504D Install Right Elevator Assembly (2 pages):

There was one step for an inspector to verify/sign that it was acceptable to install the elevator assembly to the horizontal stabilizer, and nine separate steps for a mechanic to perform/sign the installation. The 11th step required an inspector to check the elevator assembly for proper installation and security. The 12th step required the mechanic to rig the right-hand elevator assembly per DC-8 M/M, chapter 27, and an inspector to verify/sign the elevator rigging. Note: The rigging procedures (elevator and tab- adjustment/test) are accomplished with the stabilizer/elevator attached to the airplane.

The check completion date listed on both cards was November 4, 1999. There was no requirement to list the date when a particular task was actually performed, and no dates were denoted. Database time cards taken from work card 3504D indicated that 19 mechanics performed work tasks on that particular card.[2] However, what each mechanic actually did to complete the task card is unknown. The first mechanic began work on September 27, 1999, and the last mechanic finished on November 2, 1999.

A note depicted on the card states: Use applicable DC-8 M/M, Chapter 27, when performing this card.

3506D Functionally Check Right Elevator and Tab:

[2] See Attachment 17-C, Work Order Descriptions for Time Cards.

There were seven separate steps to be performed/signed by a mechanic and an inspector to functionally check the right elevator and tab.

The check completion date listed on the card was October 14, 1999, which was before the installation date of task card 3504 (Install Right Elevator Assembly), dated November 4, 1999. The functionally check of the right elevator and tabs are denoted on 3506D, which is of course after the installation of the elevator and tabs. The final rig check is picked up again on card 3504D, and is the last step to be accomplished, "Rig R/H Elevator Assembly per DC-8 MM Chapter 27." There was no requirement to list the date when a particular task was actually performed, and no dates were denoted.

A note depicted on the card states: Use applicable DC-8 M/M, Chapter 27, when performing this word card. (This card to be worked in conjunction with 3504D).

3601D L/H and R/H Horizontal Stabilizer and Elevator Close:

There was one step for an inspector to verify the inspection areas before closure, then 2 steps for a mechanic to perform/sign for the work. An inspector completed the final installation inspection.

The check completion date listed on the card was October 26, 1999. There was no requirement to list the date when a particular task was actually performed, and no dates were denoted.

8. McDonnell Douglas All Operator Letter (AOL) for all series DC-8 airplanes

AOL 8-1112C, dated April 25, 1996, and addressed as "Flight Control Surface Interchangeability" was general information by TTS from Emery. Over a period, operators had expressed interest in information on this subject. The following references were used by Douglas to support this letter:

(a) Douglas Service Bulletin (SB) 57-61, revision 3, dated July 23, 1971.

(b) SB 57-77, revision 1, dated October 9, 1970.

(c) SB 27-150, revision1, dated July 20, 1964.

(d) SB 57-8, revision 1, dated March 6, 1961.

(e) AOL 8-1112B, dated July 3, 1990.

Douglas stated that the following might be used to determine the acceptability of a flight control surface on a particular aircraft.

Note: *Any reference to aircraft model or series includes both the passenger and freighter versions of those series and models (except as noted), but may not include aircraft converted to freighters. N8079U was converted to a freighter.*

Elevators:

All elevators are interchangeable provided:

(a) Elevator is balanced per SRM for correct series and tab condition.

(b) Aircraft empty weight and Center of Gravity (CG) is adjusted in the weight and balance records.

(c) Push rods are changed per reference [c], if using PN 5644420-1/-2, or -501/-502, elevator assemblies.

9. DC-8 Sixty Series Maintenance Manual

Elevator Control Tab- Maintenance Practices

Section 27-30-2, code 1, dated July 15, 1967, pages 201-204, and page 205, dated October 1, 1969 were reviewed. These practices listed tooling and procedures for removal/installation of the elevator control tab. However, there is no guidance to determine if there is a specific direction for installing the pushrod attachment bolt to connect the pushrod tube to the tab crank fitting, in this document.

Section 20-16-0, code 1, page 207, dated January 1, 1967, was reviewed. This page listed the torque values for low-tension nuts that fit various bolt sizes.

Note: *TTS used Code 1[3] as the Maintenance Manual Chapter 27-30-2 effectivity[4] for maintenance practices of United Air Lines (UAL) N8079U, per page 5, contents-27, code 1, dated October 1, 1969.*

Introduction-i, code 1, of the DC-8 Sixty Series MM states:

"The configuration of each DC-8 airplane is tailored to the needs of the customer, and MMs are then "customized" so that appropriate maintenance data is furnished. Identification and control of the customized material is accomplished through code numbers, which are located within the pagination block on the lower outside corner of each page. For example, a "Code 3" assignment to a subject in the manual means simply that the information is

[3] Code 1 is a customer airline code designated for DC-8 airplanes that were originally customized for United Air Lines, and is used for airplanes N8070U to N8083U.
[4] Effectivity indicates the applicability of items, materials, and/or technical data to a type, series, model, or individual item.

applicable only to those airplanes for which this manual is written. Codes 1 and 2 on the subject will have been assigned to other customers' configurations.

When configuration differences occur within the block of airplanes covered by this manual, the differences will be identified, where possible, by symbols and footnotes. However, should the configurations vary so greatly that the maintenance data within an individual subject becomes unyielding and difficult to use, the different material will be furnished in an additional code of that subject."

The Maintenance Inspection Group did not note any references of currency revision dates listed in any of the maintenance manuals supplied by Emery and used by TTS. TTS's copy of Emery's Maintenance Policy and Procedures Manual (issue number 183, revision 23, inserted July 24, 2000, with temporary revision record number 7, inserted August 1999) also did not list the latest revision for each DC-8 maintenance manual.

10. DC-8 Illustrated Parts Catalog

The Maintenance Inspection Group reviewed the following sections of ATA 27-30 (elevators) of the Douglas Aircraft DC-8 Illustrated Parts Catalog (IPC): 27-30-0, 27-30-1, 27-30-6, and 27-30-7 for usage code UA079.

United Airlines DC-8 IPC 27-30-01-20 (Control Installation-Elevator Flight), page 1, dated February 5, 1987, and pages 2-4, dated August 2, 1991, were reviewed for usage code UA079.

United Airlines DC-8 IPC 27-32-06 (Figure 1001, Elevator Control Tab-Removal/Installation), page 1001-1002, dated May 20, 1988, were reviewed for usage code UA079.

11. DC-8 Overhaul Manual

Douglas Overhaul Manual, Elevator Assembly 27-16-1, dated May 1, 1966, pages 1-23, for PN 5644420-1, -2, -501, -502, -503, -504, -505, -506, -507, -507, and -508 were reviewed. Elevator assembly drawing from 27-16-1, pages 13-14, dated February 1, 1966, shows the installation direction of the hinge bolt, washer, nut, and cotter pin attachment for connecting the pushrod tube to the tab crank fitting. The OHM was the only manual that the Maintenance Inspection Group found that indicated a specific direction for inserting the pushrod attachment bolt to the control tab assembly.

12. Overhaul of Right Hand Elevator, Geared Tab, and Control Tab

(a) The RH elevator, PN: 5644420-506, SN: CCI-092 (note, this is not a Douglas SN, EWA Component Control Sheet [November 17, 1999] listed the part's SN as HAC 068 when it was taken off and CCI-092 when it was put back on) was inspected and overhauled in accordance with DC-8 OHM, as per attached work

order (WO) 852810327 on April 20, 1999, with FAA form 8130-3, by Complete Controls, Inc. (CCI) 850 E. Teton Road, Suite 8, Tucson, Arizona, 85706. No modifications, service bulletins (SBs), or Airworthiness Directives (ADs) were performed. The unit was received by CCI on August 30, 1998, from customer Willis Aeronautical Services, Tempe, Arizona.

Per DC-8 OHM 27-16-1, page 1, dated May 1, 1966, Douglas Drawing Number 5644420-506, the description of the elevators is as follows: The elevators are aerodynamically and mass balanced. There are no weights installed in the outboard section of the elevator. Balance weights are installed in the section between the elevator hinges. The nose cap of the leading edge of the elevator is removable for weight replacement, and viscous dampers are installed in each elevator leading edge section to prevent surface flutter.

Per DC-8 OHM 27-16-1, page 10, "elevator assembly- fits and clearances," dated February 1, 1965, the inboard hinge bolt that connects the pushrod tube to the control tab crank fitting is denoted as index number 136, PN: NAS464P5L-12.

Per DC-8 OHM 27-16-1, pages 13-14, elevator assembly figure 2, dated February 1, 1965, and page 17, dated April 1, 1970, the bolt is denoted as index number 136, PN: NAS464P5L-14, with nomenclature stating that this bolt replaces NAS464P5L-12 for all usage codes.

Per DC-8 OHM 27-17-0, pages 2-4, "elevator flight controls- fits and clearances," the bolt is denoted as index number 24, PN: NAS464P5L-12.

Per DC-8 IPC 27-30-1, figure 20, pages 1-2, "elevator flight control," dated March 1, 1969, pages 3-6, dated September 1, 1973. Page 4, index number 73 denoted PN: NAS464P5L-12. Page 4, index number 75 denoted PN: NAS464P5L-14.

The Maintenance Inspection Group reviewed the attached shop findings and corrective actions. TTS received and inspected the overhauled unit on September 9, 1999.

(b) The elevator geared tab, PN: 5702579-4, SN: CCI-096 (note, this is not a Douglas SN, EWA Component Control Sheet [November 17, 1999] listed the part as not having a SN when it was taken off.) was inspected and overhauled in accordance with DC-8 OHM, as per attached WO 852810334 on December 4, 1998, with FAA form 8130-3, by CCI. The unit was received by CCI from Aerofund Financial, San Jose, California, on August 31, 1998, and shipped to Willis Aeronautical Services on December 4, 1998. No modifications, SBs, or Ads were performed. The geared tab was weighed per SRM 51-4-5 to be 11.22 pounds, which is inside the recommended limits. The geared tabs are also interchangeable and are not mass balanced, per DC-8 OHM 27-16-1, page 1, dated May 1, 1966.

The Maintenance Inspection Group reviewed the attached shop findings and corrective actions. TTS received and inspected the overhauled unit on August 20, 1999.

(c) The elevator control tab, PN: 564444-2, SN: CCI-093 (note, this is not a Douglas SN, EWA Component Control Sheet [November 17, 1999] listed the part as not having a SN when it was taken off.) was inspected and overhauled in accordance with DC-8 OHM, as per attached WO 852810335 on November 19, 1998, with FAA form 8130-3, by CCI. The unit was received by CCI Aerofund Financial, San Jose, California, on August 31, 1998, and shipped to Willis Aeronautical Services on November 17, 1998. No modifications, SBs, or ADs were performed. The control tab was weighed and balanced per DC-8 SRM 51-4-5. The results were: 28.49 pounds and moment 7.5 inch pounds, which are inside the SRM recommended limits. The control tabs are balanced for prevention of flutter and are interchangeable, per DC-8 OHM 27-16-1, page 1, dated May 1, 1966.

The Maintenance Inspection Group reviewed the attached shop findings and corrective actions. TTS received and inspected the overhauled unit on September 9, 1999.

13. EWA's Fleet Campaign Directives

The Maintenance Inspection Group reviewed the two Fleet Campaign Directives that EWA issued for their DC-8 fleet.

A27-7, original revision, issued on February 16, 2001, titled "Elevator Push/Pull Rod End Bolt Installation Inspection," was sent to TTS from EWA on February 21, 2001.[5] The complete fleet was to be completed by February 26, 2001. There was a figure of the elevator control tab taken from United Airlines' Illustrated Parts Catalog (27-32-06-page 1001) four-page directive for pictorial purposes. Work instruction number five stated, "inspect aft end of elevator pushrod, connected to elevator control tab, and verify that the bolt, washer, nut, and cotter pin are installed correctly." TTS never performed this directive on an EWA airplane.

A27-8, revision 1, issued on March 22, 2001, titled "Elevator Push/Pull Rod End Bolt Installation Inspection and Clearance Check," was sent to TTS from EWA on March 26, 2001.[6] They never received the original directive. This directive was an eleven-page task, which included five pages of illustrations. The complete fleet was to be completed by April 12, 2001. TTS performed this directive on one EWA airplane (N105WP).

TTS never received from EWA any information concerning the results of the directives.

[redacted]

Frank McGill
Maintenance Inspection Group Chairman

[5] See Attachment 17-D, Fleet Campaign Directive A27-7, Original.
[6] See Attachment 17-E, Fleet Campaign Directive A27-8, Revision 1.

List of Attachments

Number of Pages