NATIONAL TRANSPORTATION SAFETY BOARD
OFFICE OF AVIATION SAFETY
WASHINGTON, D.C. 20594

March 16, 2004

Aircraft Maintenance and Records Group Factual Report

NYC03MA183

A: ACCIDENT

Location:	Yarmouth, Massachusetts
Date:	August 26, 2003
Time:	1529 Eastern Standard Time
Aircraft:	Colgan Air, Flight 9446, Beech 1900D, N240CJ

B: AIRCRAFT MAINTENANCE AND RECORDS GROUP

Group Chairman:	Stephen M. Carbone National Transportation Safety Board Washington, D.C.
Member:	Eric West Federal Aviation Administration Washington, D.C.
Member:	Robert Moorhead Colgan Air Inc. Manassas, Virginia

C: SUMMARY

On August 26, 2003, at 1540 eastern daylight time, a Beech 1900D, N240CJ, operated by Colgan Air Inc. as flight 9446 (d.b.a. US Airways Express), was substantially damaged when it impacted water near Yarmouth, Massachusetts. The certificated airline transport pilot and certificated commercial pilot were fatally injured. Visual meteorological conditions prevailed for the flight that departed Barnstable Municipal Airport (HYA), Hyannis, Massachusetts; destined for Albany International Airport (ALB), Albany, New York. An instrument flight rules flight plan was filed for the repositioning flight conducted under 14 CFR Part 91.

On August 27, 2003, the Aircraft Maintenance and Records Group convened at the Colgan Air maintenance facility in Barnstable, Massachusetts, to interview maintenance personnel who worked on the tab actuators and trim tab control system of the accident airplane. On August 28, 2003, the Aircraft Maintenance and Records Group met at the Colgan Air corporate office in Manassas, Virginia, to examine the Colgan Air maintenance program and the airplane records of N240CJ. This facility houses the Maintenance Control, Training, and company officers for Colgan Air. The Aircraft Maintenance and Records Group completed the examination of the records on August 29, 2003.

The Aircraft Maintenance and Records Group Chairman performed a review of airworthiness directives, maintenance programs, weight and balance, supplemental type certificates, maintenance discrepancies, service difficulty reports, and contracts.

All interviews are attached to Appendix A of this report.

D: DETAILS OF INVESTIGATION

1.0 Aircraft History

Per Federal Aviation Administration (FAA), Civil Aviation Registration records, the Raytheon Aircraft Company sold the accident aircraft, serial number UE-40, to Champlain Enterprises, Inc, operating as CommutAir on March 29, 1993.

On October 10, 2000, the aircraft was sold back to Raytheon Aircraft. For twenty-eight months the aircraft was kept at the Raytheon Aircraft facility in Wichita, Kansas awaiting sale.

The aircraft was leased to Colgan Air, Incorporated (Colgan Air) by Raytheon Aircraft Credit Association of Wichita, Kansas, on January 3, 2003 for a period of 84 months, through a lease contract. The aircraft entered service for Colgan Air on January 4, 2003 with the registration number, N240CJ.

1.1 Aircraft Summary

FAA Registration Number:	N240CJ
Manufacturer Serial Number:	UE-40
Manufacturer Line Number:	40
Original Delivery Date:	March 29, 1993

Total Hours at Time of Accident: 16,503.5 hours
1,219.1 hours generated by Colgan.

Total Cycles at Time of Accident: 24,637 cycles
1,765 cycles generated by Colgan.

2.0 Aircraft Maintenance

2.1 Maintenance Summary Program - Raytheon BE 1900D

As per the Colgan Air Maintenance Program Manual (MPM), Colgan Air has a Continuous Airworthiness Maintenance Program (CAMP). The CAMP is broken down into a series of checks and inspections, which incorporates guidance from the Beech 1900D Airliner Maintenance Manual. As stated in the Colgan Air General Maintenance Manual, Volume Ten, Colgan Air is responsible for revising the MPM and CAMP.

Colgan Air utilizes a Continuing Analysis and Surveillance Program (CASP) as per Federal Aviation Regulation (FAR) 121.373. This program requires Colgan Air to examine the maintenance and inspection program.

The various inspections performed on the aircraft in the Colgan fleet are: Preflight Inspections, Routine Inspections, Detail Inspections, and Structural Inspections.

The Preflight Inspection is accomplished every four (4) flight-days. The inspection is performed according to workcard #05-20-07.

The Routine Inspection is accomplished every eight (8) flight-days. The inspections are conducted per workcard #05-20-00. Routine Inspections are performed in conjunction with the Detail Inspections.

The Detail inspections are broken down into six different phases. Subsequent phases are accomplished every 220 flight-hours. The completion of Detail One through Six is one full cycle. Only a subset of the aircraft's components is inspected each phase, resulting in the complete aircraft being inspected within the 1320 flight-hour cycle. The following is a list of specific major component areas covered under each phase:

First	Workcard #05-20-01	Wings
Second	Workcard #05-20-02	Powerplant and Nacelles
Third	Workcard #05-20-03	Flight Compartment/Cabin
Fourth	Workcard #05-20-04	Environmental Systems/Nose
Fifth	Workcard #05-20-05	Landing Gear
Sixth	Workcard #05-20-06	Aft Fuselage/Empennage

The checks and inspection times can be exceeded by the use of an Extension Authorization form. Preflight inspections can be extended by one flight day, Routine checks can be extended by two flight days, and Detail checks can be extended by 10% of the inspection interval.

Breakdown of Colgan Air's Maintenance Program (attachment 1):

Preflight Inspection:	Every four (4) Flight-Days
Routine Inspection:	Every eight (8) Flight-Days and with Detail Check
Detail Check:	Every 220 Flight-Hours
Structural Check:	As set forth by the manufacturer
Engine Program:	Continuous Airworthiness Maintenance Program.

Each inspection phase of the Detail Inspection also includes General Service Items and Operational Inspection Procedures that require functions necessary to guarantee the aircraft's continued airworthiness.

Structural inspections are performed in accordance with guidelines set down by the manufacturer (attachment 2). The inspection schedule is:

A Check:	12,000 flight-hours
B Check:	15,000 flight-hours
C Check:	18,000 flight-hours
D Check:	17,500 flight-hours
E Check:	20,500 flight-hours
F Check:	24,000 flight-hours
G Check:	30,000 flight-hours

The previous checks for aircraft N240CJ were accomplished as follows:

Preflight Inspection:	August 23, 2003 Flight Hours: 16,499.1 Cycles: 24,627
Routine Inspection:	August 24, 2003 Flight Hours: 16,503.5 Cycles: 24,637
Detail Inspection:	
Check 6:	August 24, 2003 Flight Hours: 16,503.5 Cycles: 24,637
Check 5:	July 15, 2003 Flight Hours: 16,287.8 Cycles: 24,340
Check 4:	June 6, 2003 Flight Hours: 16,079.5 Cycles: 24,052
Check 3:	April 29, 2003 Flight Hours: 15,889.1 Cycles: 23,773
Check 2:	March 18, 2003 Flight Hours: 15,653.1 Cycles: 23,476
Check 1:	February 6, 2003 Flight Hours: 15,470.5 Cycles: 23,142
Structural Check:	March 22, 2003 Flight Hours: 15,706 Cycles: 23,493

2.2 Weights and Balance Summary

An aircraft weigh is done every three years or when the aircraft is repainted. The aircraft was last weighed December 17, 2002 in Bethany, Oklahoma (attachment 3).

Empty Weight	10,300 pounds
Empty Weight Arm	282.1 inches
Basic Empty Weight	10,370 pounds
Basic Empty Weight Arm	282.3 inches
Basic Empty Weight Moment	2,927,460.4 inch-pounds

A Revised Weight and Balance sheet was filed for installation of the Digital Flight Data Recorder Upgrade Kit on December 20, 2002, in Bethany, Oklahoma.

New Weight added	6.7 lbs. at 282.3 inches
New Basic Empty Weight	10,376.7 pounds
New Basic Empty Weight Arm	282.3 inches
New Basic Empty Weight Moment	2,930,240.9 inch-pounds

2.3 Engines: PT6A-67D

SECTION	SERIAL NUMBER	INSPECTION/ OVERHAUL FREQUENCY (HOURS)	LIMIT (CYCLES)	HOURS at LAST OVERHAUL/ INSPECTION	CYCLES at LAST OVERHAUL/ INSPECTION	DATE of LAST OVERHAUL/ INSPECTION
#1 GAS GENERATOR OVERHAUL	114052	8000	N/A	12125.5	19726	10.25.00
#2 GAS GENERATOR OVERHAUL	114111	8000	N/A	14942.2	21731	10.30.00
#1 HOT SECTION INSPECTION	N/A	4000	N/A	14007.9	21889	N/A
#2 HOT SECTION INSPECTION	N/A	4000	N/A	14942.2	21731	N/A
#1 POWER SECTION OVERHAUL	114052	8000	N/A	12287.6	19947	10.25.00
#2 POWER SECTION OVERHAUL	114111	8000	N/A	14942.2	21731	10.30.00

At the time of the accident:

#1 Engine Part Number: P&W PT6A-67D Serial Number: PCE-114052

GAS GENERATOR:	Hours:	15,245.5	Cycles:	23,662
POWER SECTION:	Hours:	15,407.6	Cycles:	23,883

#2 Engine Part Number: P&W PT6A-67D Serial Number: PCE-114111

GAS GENERATOR:	Hours:	15,245.5	Cycles:	23,662
POWER SECTION:	Hours:	15,407.6	Cycles:	23,883

2.4 Engine Monitoring System

Per the Colgan Air MPM, the engines are part of the Engine Continuous Airworthiness Maintenance Program (CAMP) (attachment 4). The CAMP is based on the life cycle limits of the rotating components. Pratt and Whitney Canada Service Bulletins and engine teardown data determine these limits. The CAMP consists of fixed hour and cycle limits at which the Power Section and Gas Generator Modules will be overhauled. These overhauls are performed at the Pratt and Whitney Canada Overhaul Service Center or at a Pratt and Whitney Canada PT6A-67D authorized Certified Repair Station.

2.5 Propellers

At the time of the accident:

 # 1 Propeller: Part Number: HC-E4A-3I Serial Number: HJ-123A

Time Since New:	9871.0 hours
Time Since Major Overhaul:	2483.5 hours

#2 Propeller: Part Number: HC-E4A-3F Serial Number: HJ-88A

Time Since New:	15,906.4 hours
Time Since Major Overhaul:	109.8 hours

Per the Colgan Air MPM, the propellers are maintained under an approved Colgan Air CAMP program. The program provides guidelines for maintenance items and requirements to inspect, service, and replace life limited components. Overhauls are performed in accordance with the Hartzell 143 Overhaul Manual.

2.6 Aircraft Status

2.6.1 Minimum Equipment List (MEL)

Per Colgan Air records, there was one open MEL item at the time of the accident: *Flight Data Recorder Inoperative (Elevator Trim Tab Parameter)*. An "A" category item due to be repaired by August 29, 2003.

2.6.2 Aircraft Condition Report

Per the records supplied by Colgan, the Aircraft Condition Reports were reviewed. No open items were found.

2.6.3 Supplemental Type Certificates

Supplemental Type Certificates[1] (STC), supplied by Colgan were reviewed.
One Supplemental Type Certificate, #SA00968NY, was recently issued. This STC authorized the installation of a Flight Data Recorder and sensors.

2.6.4 Airworthiness Directive (AD) Summary and Service Bulletins (SB)

Colgan Air provided AD and SB summaries, which were reviewed. All listed Airworthiness Directives and Service Bulletins have been complied with.

Four AD/SB items are of note:

AD 2002-23-11: Prevent Balance Weight Attachment Screws from Becoming Loose, Which Could Restrict Elevator Movement. The item was complied with as a Service Bulletin #27-3187R1 on December 19, 2002. No defects were noted (attachment 5).

AD 99-09-15: Flight Controls – Inspection for Control Column Interference with Wiring Behind the Instrument Panel. This was accomplished on July 6, 1999 (attachment 6).

AD 2003-09-12: Replacement of Missing Rivets. This AD was not accomplished, but required accomplishment by June 27, 2004 or 1200 hours time-in service from June 27, 2003. The accident aircraft never reached these two compliance points.

AD 2003-04-26: Inspection of AC Inverter and Modification of Inverter and Inverter Wire Shield. This AD was not accomplished, but required accomplishment by October 21, 2003. The aircraft never reached the compliance date.

[1] The FAA issues Supplemental Type Certificates. They authorize a major change or alteration to an aircraft, engine, or component that has been built under an approved Type Certificate.

Emergency AD 2003-03-18: Elevator Rig Check. This Emergency AD was accomplished as part of a Fleet Campaign Directive (FCD) #1900-27-03-01 revision one, on January 31, 2003. *AD 2003-03-18: Elevator Rig Check.* A follow-up AD was accomplished on February 2, 2003 as part of FCD #1900-27-03-02.

2.6.5 Prior Related Discrepancies Involving N240CJ

August 25, 2003 – Right Tab Actuator replaced and Forward Trim Cable replaced.
August 24, 2003 – Left and Right Tab Actuators replaced.
July 9, 2003 – Removed and replaced Elevator Trim Tab Servo.
April 29, 2003 – Pitch Trim Chain re-tightened due to excessive slack.

2.6.6 Logbook Forms

The maintenance paperwork from January 2003 through August 2003 was reviewed for discrepancies specifically related to elevator or pitch control. No trends or discrepancies were noted.

2.6.7 Service Difficulty Reports[2]

The FAA Service Difficulty Reports were reviewed for the accident aircraft. No flight control maintenance trends or discrepancies were noted.

2.6.8 Major Repairs and Alterations

A review of the records for Colgan Air revealed one Major Repair on June 2, 1999. The previous owner, Champlain Enterprises, recorded this repair on a FAA Form 337[3]:

"Replaced damaged left Horizontal Stabilizer structural parts with new manufacturer supplied items duplicating original installation." The parts were used to repair the leading edge of the left horizontal stabilizer. Work was performed per the Structural Repair Manual 114-590021-9B7.

[2] A Service Difficulty Report (SDR) is a report of the occurrence or detection of each failure, malfunction, or defect as required by 14 CFR 121.703 and 121.704.

[3] A FAA Form 337 is used to record and document a major repair or a major alteration to an airframe, powerplant, propeller, or appliance. Block three of this form is used by an FAA Aviation Safety Inspector to approve data for a major repair or major alteration.

3.0 Colgan Air Incorporated

The Colgan Air Director of Quality Assurance stated that the carrier operates as a Part 121 Operator, a domestic air carrier operator, operating under certificate number NSVA 519S. Colgan Air operates nine Saab 340B aircraft and fifteen BE1900 aircraft. The BE1900 aircraft are divided into five "C" and ten "D" models. Colgan Air maintains a contract with US Airways to supply regional airline support. The aircraft are flown under the US Airways Express livery through line maintenance facility destinations in Connecticut, Maine, Massachusetts, New Hampshire, New York, Ohio, Pennsylvania, Rhode Island, Vermont, and West Virginia.

The Colgan Air General Maintenance Manual (GMM) states that Colgan Air operates three base maintenance facilities: Albany, New York; Hyannis, Massachusetts; and Manassas, Virginia. There is one Main Base Maintenance Facility[4], located in Manassas, Virginia in the Broad Run airport (HEF). The Manassas station is strictly fly-in scheduled maintenance and houses the home office.

By the GMM, Albany (ALB) and Hyannis (HYA) are considered Sub Base Maintenance Facilities[5]. ALB and HYA are also utilized as passenger destination cities, where the scheduled maintenance can be performed and passenger service is available.

Colgan Air employs its own maintenance technicians (MTS) that perform all the necessary scheduled and phase maintenance on its fleets. The training for these MTS is accomplished with both On the Job Training (OJT) and classroom familiarization training. The OJT tasks are compiled by aircraft model and broken down by Air Transport Association (ATA) chapter and sub-chapter. The classroom training for the 1900D is broken out into two phases: Phase One and Phase Two, each consisting of aircraft specific instruction.

[4] The Colgan Air GMM describes a Main Base Maintenance Facility: "adequate facilities support and personnel are available to accomplish major repairs and all scheduled and unscheduled maintenance and inspections. Alterations may be performed on aircraft and related equipment, within the limits of the facility".

[5] The Colgan Air GMM describes a Sub Base Maintenance Facility: "adequate facilities support and personnel are available to accomplish the work assigned by the Director of Maintenance. This work may include major repairs, all scheduled and unscheduled maintenance and inspections and alterations of aircraft and related equipment, within the limits of the facility".

Line Maintenance Facilities[6], or line stations, provide unscheduled maintenance support and the dispatch of revenue aircraft. Several line stations for Colgan Air utilize contract maintenance personnel for support. Contract maintenance communicates to Colgan Air through the Maintenance Control department for assignments, necessary paperwork, and/or instructions.

3.1 Hyannis Maintenance Facility

The Colgan Air GMM shows the HYA sub base maintenance facility is located at the Barnstable airport in Hyannis, Massachusetts. Phase (Detail) checks, Routine checks, and scheduled maintenance are accomplished in HYA as part of the Colgan Air maintenance program. The hangar has the equipment, parts, manpower, and tools to support the various scheduled maintenance performed there.

HYA is provided with one Quality Assurance (QA) inspector, 16 maintenance technicians (MTS), and three lead technicians/delegated QA inspectors (DQI) to perform the scheduled maintenance assigned to the station. Two maintenance supervisors are on-site to oversee the station and its operation.

The Director of Quality Control for Colgan Air stated that MTS and lead technicians (leads) are scheduled between three different shifts: one daytime shift, one afternoon shift and one nighttime shift. Each shift is covered seven days per week. The employees on the day and afternoon shifts work an eight-hour per day shift with five days on and two days off. The nighttime shift employees work a ten-hour per day shift with four days on and three days off. The supervisors work shifts that allow contact with all three shifts during the workweek.

The QA Inspector works an eight-hour per day shift for five days per week on a late evening shift and is supported by the three DQI inspectors. The DQI assumes the inspection duties for the QA inspector on his days off.

[6] The Colgan Air GMM describes a Line Maintenance Facility: “adequate facilities support and personnel are available to accomplish the work assigned by the Director of Maintenance. This work may include scheduled and unscheduled maintenance, inspections, checks, repairs, alterations, and adjustments in accordance with the directions of Colgan Air, Inc. procedures in this manual”.

4.0 Training

According to information provided by the Director of Quality Control (DQC) for Colgan Air, their training program is maintained in compliance with FAR 121.375. The Vice President of Maintenance (VPM) has the ultimate responsibility for training. The DQC reports to the VPM for all aspects of required training. The oversight of the DQC includes: assuring that training records are properly recorded, development of training and testing programs, and assuring that OJT is recorded in a timely manner.

As per the VPM, prior to and following the accident, a Maintenance Instructor (MI) was employed for maintenance training. His duties included training records documentation along with a Maintenance Administrative Assistant (MAA). The MAA was also responsible for training records documentation. In July 2003 the then current instructor left the company, a replacement was actively looked for. During the period when a full time instructor was not employed the DQC maintained personal oversight of the training program. Colgan found and hired a replacement instructor in early September 2003.

The DQC stated that Indoctrination training precedes an employee's start date and consists of Ground Handling and Airworthiness Release training. The employee is given a 16-hour introduction course on Colgan Air's paperwork, policies, safety, and procedures. The employee is required to demonstrate their knowledge with oral testing and a workbook. The MI conducts the indoctrination training at the HEF facility and re-qualifies the maintenance technician annually.

The aircraft systems training for the A&P mechanics, manager, leads, and QA Inspectors is accomplished through both formal systems training and OJT. Formal, or familiarization (FAM), training for the fleet is provided by the MI. FAM training for each aircraft is divided into two phases: Phase One and Phase Two.

According to the DQC, Phase One training is an eight-hour class that is predominantly classroom training. Some time is spent visiting an aircraft for hands-on familiarization. The MI provides instruction for the course, which is conducted at HEF. The course consists of the basic introduction and aircraft familiarization training. Differences between the BE1900 C and D are taught, to make the technician aware of physical dissimilarities between the two aircraft.

As attested to by the DQC, Phase Two is a 40-hour classroom-training course combined with hands-on instruction at the aircraft. The MI teaches the lessons, which is comprised of Systems training for each applicable Air Transport Association[7] (ATA) chapter. The course is designed to expand upon the lessons taught in Phase One, with differences training for the BE1900 C and D models.

[7] The Air Transport Association (ATA) has separated the various systems, structures, powerplant, and propeller components into numbered ATA chapters to simplify the referencing of aircraft parts, repairs, modifications, and inspections.

Previously trained MTS and/or lead, acting as instructors, provide OJT training to untrained technicians. This form of training is strictly hands-on using the manual as the guideline and controlled on the shop floor by the Lead technician. Each technician is provided with a workbook for each aircraft type.

The workbook's pages are divided in order by ATA chapter, sub-chapter, and task (attachment 7). As the technician completes a task, the instructor signs the technician off and a copy is made for the technician's training records. The technician's supervisor is responsible for assuring the records for each technician is current.

The DQC stated that Colgan Air maintains a computerized tracking system for training. Annual indoctrination and other required re-qualification training are followed by the computer. The technician's supervisor is alerted to necessary training for his reporting MTS. The MI oversees the computer tracking to assure it is complied with. A review of the MTS training records shows that the mechanics involved in this job had the proper training as defined by the FAA accepted Colgan Air Manual System.

5.0 Maintenance Performed

5.1 Detail Six

According to Colgan Air's maintenance records, on August 23, 2003, aircraft N240CJ underwent a Detail Six (D6) phase check (attachment 8) as part of its approved phase maintenance program using guidance from the Beech 1900D Airliner Maintenance Manual. The D6 check was performed at the Hyannis, Massachusetts (HYA) station beginning on August 23 at 1647[8].

The MPM states that the emphasis of the D6 check is on the empennage and aft fuselage, which includes visual inspections, lubrications, free play checks, engine borescopes, engine mount torque checks, servicing, operational checks, and cable tension checks.

The check was interrupted mid-stream (procedures for interrupting checks are contained in the GMM section 3.5.3) and the remaining work was deferred on August 24, 2003 at 0800. Ten revenue flight legs were conducted on Sunday August 24, and the D6 check was continued that night at 2030. The check was completed on Tuesday August 26, 2003 at 1100.

[8] 1647 – all times reported are in local military hours.

5.2 Unscheduled Maintenance

According to Colgan Air's maintenance records, on August 24, the maintenance technicians (MTS) performed workcard # 27-30-01 (attachment 9) as part of the D6 work package. Section two of this workcard requires a free play check of the elevator trim tab actuators. The MTS accomplished the 19 steps for this check and found both left and right elevator trim tab (ETT) actuators to have failed the check. Failure of the actuators by this check requires replacement before further flight. Two actuators were ordered and four MTS were assigned - two to each actuator - to replace them.

As per the BE1900D maintenance manual, replacement of the ETT Actuators requires accomplishment of all the manual procedures per the BE1900D maintenance manual (MM), 27-30-06 (attachment 10). Interviews were conducted with: a maintenance technician, who replaced the left actuator the first day and the right actuator the second day; the lead technician (LT) on duty; and the Quality Assurance (QA) inspector who performed the required item inspection (RII). Per the interviews, the maintenance manual procedures were followed.

According to the interviews, the MTS chose to omit step (c) of the *Elevator Trim Tab Actuator Removal* and step (i) of the *Elevator Trim Tab Actuator Installation*. Omission of these steps discounts nineteen maintenance steps required by the manufacturer's MM in the process of accomplishing the ETT actuator replacements. These steps guide the maintenance technician through the removal and installation of the elevator control surface(s) and are the MM procedures 27-30-02 (attachment 11).

As per interviews with the maintenance technician who replaced the actuators, the ETT system cables were not blocked[9] during the actuator replacements. According to MM 27-30-06, blocking is not a required step within the maintenance procedures. Blocking of cables is not referenced in Chapter 7 of Advisory Circular 43.13-1B as part of recommended best practices.

According to the interviews with the maintenance technician, the two ETT actuators were replaced and an operational check was conducted. In the process of performing operational checks, the ETT cable system seized. The maintenance technician took the pedestal panels loose to ascertain the problem with the cable system. The maintenance technician documented that the "Elevator trim tab cable fell off drum under pedestal" on Maintenance Work Order # 08477.

[9] Blocking is a practice, not a standard that maintains minimum pressure on a cable system. The pressure prevents the cables from coming off the system's pulleys and/or drums due to excessive slack. Blocking is accomplished in different ways and through several methods. Cable blocking, by assuring proper tension on the cable during maintenance, secures the integrity of the cable routing.

The maintenance technician discovered that the ETT forward cable became kinked[10] and ordered out a replacement cable. The necessary floorboards and access panels were opened to gain entry to the forward cable. The LT stated during an interview that management at Colgan Air had been in discussion with Raytheon Aircraft to determine if the part number of the right hand (R/H) ETT actuator was correct. It was found that the part number was incorrect and the R/H ETT actuator had to be replaced. This part was also ordered out under the correct part number.

The ETT actuator and forward cable were delivered to the hangar the following afternoon, August 25, 2003. That night two MTS were assigned to replace the recently installed R/H ETT actuator and two MTS were assigned the ETT forward cable change. The forward cable was replaced per MM 27-30-04 (attachment 12), while the R/H ETT actuator was replaced per MM 27-30-06. The steps (c) and (i), removal and installation of the right elevator, were omitted.

As per interviews with the two MTS that performed the forward cable replacement, the drum assembly was removed in the cockpit during the dayshift, prior to their assignment to the forward cable change. The turnover from day shift to night shift did not contain written turnover notes of explicit work performed. Non-routine discrepancies on the Detail check were open that indicated that work was not complete.

Per interviews, the two MTS did not use a lead wire[11] when routing the cable through the forward cable pulley system. Attaching lead lines as part of the cable replacement is addressed in MM 27-30-04. Step (g) states, “attach lead lines to the aft ends of the forward cables and properly identify them to facilitate reinstallation.” One of the maintenance technicians marked the topmost cable pulleys with a letter “T” to facilitate re-assembly. Following the re-assembly both MTS checked the routing of the forward cable by referring to MM 27-30-04, figure 201.

The BE1900D maintenance manual does not contain an Elevator Trim System Operational check. The MTS stated that testing of the system was based on what they determined to be proper tests for properly testing the system components.

[10] Kinked – the cable in this instance became caught between the forward drum and structure. When the cable was moved between the drum and structure, it became damaged and an imperfection was introduced into the cable, weakening the integrity of the cable.

[11] Lead wires are used to assure the proper routing of cables and electrical wiring when being removed during maintenance. A thin wire or string is attached to the cable and “follows” the cable as it is pulled out of the pulley system (electrical wire out of the conduit). The lead wire becomes a visual guide for the removed cable’s route and is attached to the replacement cable. It is then pulled back through the system to assure the replacement is properly routed back.

According to interviews with the QA inspector and the LT, the ETT system was re-checked following the cable replacement performed. The system had been run full up and down travel several times, both electrically and manually. The QA inspector performed the RII function and was present at both the tail and the cockpit pedestal during all phases of the operational checks. The QA inspector was satisfied with the performance of the ETT cable system and the two ETT actuators and complied with the RII functions of the job.

During interviews, the two MTS working the forward ETT cable stated there was no confusion in the handling of the cable drum or how the manual illustration was interpreted. The MTS admitted to winding the cable and installing the drum to agree with the depiction in the manual. They further stated that the job went normally and that the operational checks were good.

At the conclusion of the ETT system work, the D6 check was closed and the aircraft released for service on August 26th at 1100. After work on the ETT system, the AMM requires that a null check be performed on the Elevator Trim Tab sensor that provides data to the Flight Data Recorder (FDR) after cable rigging and tensioning. Because of time and the lack of availability of the vendor, who has the equipment and specialists to accomplish this task, the ETT parameter was deferred in the Aircraft Maintenance Logbook prior to flight in accordance with the Minimum Equipment List (MEL) 31-3, control number 8173.

Stephen Carbone
Aircraft Maintenance and Records Group Chairman