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

November 27, 2002

SURVIVAL FACTORS GROUP CHAIRMAN'S FACTUAL REPORT

A. Accident : DCA02MA054

LOCATION	:	Tallahassee, Florida
DATE	:	July 26, 2002
TIME	:	~0537 Eastern Daylight Time (EDT)
AIRCRAFT	:	Boeing 727-200, Flight 1478, N497FE
OPERATOR	:	Federal Express, Inc.

B. Survival Factors Group

Chairman	:	Mark H. George National Transportation Safety Board Washington, D.C.
Member	:	Courtney H. Liedler National Transportation Safety Board Washington, D.C.
Member	:	Alex Duron Airline Pilots Association Memphis, TN
Member	:	Kenneth Gilliam Federal Aviation Administration Orlando, FL
Member*	:	James Price Federal Aviation Administration Atlanta, GA
Member	:	Dallas Tucker Tallahassee Regional Airport Tallahassee, FL

Member	:	Michael Vroegop Tallahassee Fire Department Tallahassee, FL

* participation limited to group activities on 07/27/02.

C. Summary

On July 26, 2002, at approximately 0537 edt, a Boeing B-727-232, N497FE, operating as FedEx flight 1478, crashed into trees on short final approach to runway 9 at the Tallahassee Regional Airport (TLH), Tallahassee, Florida. The flight was operating under provisions of Title 14 Code of Federal Regulations Part 121, as a scheduled cargo flight from Memphis, Tennessee (MEM) to TLH. Night visual meteorological conditions prevailed at the time of the accident. The three flight crewmembers sustained serious injuries, and the aircraft was destroyed by impact and resulting fire.

D. Details Of The Investigation

1.0 Aircraft Configuration

The airplane cabin was configured for carriage of cargo on the main deck (Attachment 1). The flight deck was equipped with crew seats for the captain, first officer, and flight engineer. In addition, there were two jumpseats for observers situated on the left side of the cabin, in tandem, behind the captain's seat.

2.0 Crew Information

2.1 Cockpit Crew Interviews

Summaries of flight crew interviews are included in the Operations Group Factual Report.

3.0 Airplane Damage and Emergency Equipment

The flight deck furnishings showed extensive fire damage. The crew and observer seats were consumed by fire, except for the pedestals. The captain seat pedestal was displaced down, and left. The first officer seat pedestal was attached to the floor tracks, and the adjustment handle was partially operational. The engineer seat pedestal was unbent and connected to the floor track system. The forward and aft observer seat pedestals were intact and attached to their respective floor tracks. Two Pacific Scientific 5-point rotary belt buckles were found on the floor in the burned debris at the forward part of the cockpit. No other portions of restraint systems were found.

The left cockpit sliding window was fully open. The inside handle for the left cockpit sliding window was obscured by melted window material and was not observed. The exterior

operation handle for the left cockpit sliding window was extended and rotated 90 degrees from the normal closed and stowed position. The right cockpit sliding window was closed.

The 1L boarding door was open approximately 145 degrees from the closed position, and could not be closed due to interference from the ground. The exterior door handle was rotated approximately 90 degrees from the closed position. The interior door handle was in the closed position and could not be moved. The top and bottom "clamshell" panels on the 1L door were in the closed position. The 1R service door, the 4 window exits, the 2L and 2R doors, and the aft tailcone exit were not examined.[1] The evacuation slide cover on the 1L door was empty and undamaged. The floor structure in the area of the doorsill was missing. An evacuation slide was found approximately 135 feet away from the 1L door in the wreckage path. The evacuation slide was partially deployed from its pack, and was partially abraded. The girt bar was attached to the slide and bent approximately 3 degrees at its approximate center. The inflation bottle on the evacuation slide was discharged. A girt bar floor bracket was found adjacent to the slide in the wreckage path. The evacuation slide was marked:

Evacuation Slide Assembly
Air Cruisers Company
Belmar, NJ
P/N 22022696-26
S/N 6476971
Mfg 9/76 Slide Assembly
3/76 Slide Fabric
Boeing P/N 1081474-11G
Complies with TSO C-69

A portable oxygen bottle was found inside the airplane near the 1L door. The bottle was fire damaged and the label was destroyed. The bottle was discharged and the face mask and hose were missing.

4.0 Medical and Pathological

Medical records for the three crewmembers were obtained from Tallahassee Memorial Hospital (TMH), and are summarized below.

The captain sustained a closed fracture of the dorsal T-12 vertebra, closed dislocation of multiple cervical vertebrae, a closed fracture of nasal bones, open wounds of right hand, right knee, right lower leg, and right ankle, and multiple contusions.

The first officer sustained bilateral rib fractures, bilateral hemothoraces, left pneumothorax, bilateral pulmonary contusions, closed head injury, left shoulder strain, and multiple contusions and abrasions.

The flight engineer sustained a concussion with brief loss of consciousness, bruising and swelling of the forehead, slight erythema of the right conjunctiva, a non-displaced oblique

[1] All exits on FedEx cargo airplanes are disabled except the 1L and tailcone exits.

fracture of the distal aspect of the fourth proximal phalanx, a superficial laceration to the anterior perineum, and a contusion of the chest wall. The flight engineer was hospitalized for a period exceeding 48 hours.

4.1 Injury Table

Injuries	Flight Crew	Cabin Crew	Passengers	Other	Total
Fatal	0	0	0	0	0
Serious	3	0	0	0	3
Minor	0	0	0	0	0
None	0	0	0	0	0
Total	3	0	0	0	3

5.0 Airport and Emergency Response

5.1 Airport

5.1.1 Location

TLH is approximately 2,700 acres in size and is located in the city of Tallahassee, Leon County, Florida. The airport is positioned at 30°23'47.52"N and 84°21'01.25"W, at an elevation of 81 feet. TLH is certificated under Title 14 Code of Federal Regulations (CFR) Part 139.

The airfield consists of two precision instrument runways. Runway 9-27 is 8,000 feet long and 150 feet wide. Runway 18-36 is 6,066 feet long and 150 feet wide. Both runways are constructed of grooved asphalt and are accessible by parallel taxiways (Attachment 2 - Airport Layout Plan (ALP) dated January 22, 1995). Runways 36 and 27 have instrument landing system (ILS) approaches, and runways 9 and 18 have visual approaches. At the time of the accident, runway 18-36 was closed for construction. Notice to Airman (NOTAM) #02-47 was issued July 19, 2002 indicating the runway closure (Attachment 3).

The average runway gradient for runway 9-27 is -0.2 percent from the runway 9 threshold, and conversely, 0.2 percent from the runway 27 threshold. Runway 9-27 has an elevation of 49.0 feet mean sea level (MSL) at the runway 9 threshold, and 61.2 feet MSL at the runway 27 threshold. The high point for runway 9-27 is 70.5 feet MSL and is located approximately 2,325 feet from the runway 9 threshold. From the runway 9 threshold to the high point, there is an increase in elevation of 9.3 feet, which produces a runway gradient between these two points of 0.4 percent. From the runway 27 threshold to the high point, there is an increase in elevation of 21.5 feet, which produces a runway gradient between these two points that is also 0.4 percent.

According to Federal Aviation Administration (FAA) Advisory Circular (AC) 150/5300-13, *Airport Design*, "The maximum allowable longitudinal runway gradient at airports with Approach Categories C and D, is plus or minus 1.5 percent; however, the gradient may not exceed 0.8 percent in the first and/or last quarter of the runway length." Runway 9-27 at TLH did not exceed the FAA design criteria for runway gradient at the time of the accident.

The TLH ALP includes a note (#2) stating: "The existing longitudinal grade changes associated with the centerline of runway 9-27 exceed recommended surface gradient standards as provided in chapter 5 of FAA Advisory Circular 150/5300-13, *Airport Design*." When asked about this note, the TLH Capital Program Administrator explained that, "…the note on the ALP is in error, and should read that we [TLH] have a non-standard line of sight for runway 9-27, vice a non-standard longitudinal gradient." Also, the runway data chart on the TLH ALP lists the effective gradients (%) for runways 9 and 27 as "-0.2 percent" and "0.2 percent," respectively. TLH personnel explained that the published values actually reflect the *average* runway gradient instead of the *effective* runway gradient (emphasis added).

5.1.2 Airport Lighting

At the time of the accident, the TLH air traffic control tower (ATCT) closed daily between the hours of 2300 and 0600. During hours that the ATCT was closed, all runway, taxiway and approach lighting systems on the airfield were pilot controlled.[2] The runway inspection log (Attachment 4) indicated that the runway lighting was operational as of July 25, 2002, and the lighting activation log (Attachment 5) indicated that the airfield lighting was on at the time of the accident.

The lighting activation log indicated that runway 9 lighting systems had been activated at 04:37:42 local time (L) and all lights were on at 04:37:47L.[3] Examination of the computer that controlled the lighting log indicated that the computer time had not been adjusted for daylight savings time, and also, was 3 minutes and 16 seconds ahead of the time displayed on a global positioning system (GPS) receiver, producing a 56 minute, 44 second difference. Applying the difference as a correction factor to the time indicated on the activation log, the approximate time that the airport lights were activated was 05:34:26L, and all lights were on at 05:34:31L. The runway 9 precision approach path indicator (PAPI) was not specifically indicated on the lighting activation log. According to TLH electrical technicians, the runway 9 PAPI received electrical power from the circuit that powered the runway 9-27 high-intensity runway edge lights (HIRLs).

5.1.2.1 Runway 9-27 Lighting

Runway 9-27 was equipped with HIRLs, with in-pavement centerline lights and touchdown zone lights. Runway 27 had an ILS approach lighting system (ALSF-2), which was

[2] When the ATCT is closed, the field lighting can be activated by tuning the airplane radio to control tower frequency and "keying" the microphone. According to THL officials, 7 clicks of the microphone turn the system on to high intensity. The light intensity can then be reduced to low (3 additional clicks) or medium (5 additional clicks) intensity.

[3] The airfield lighting circuits are activated sequentially over a period of a few seconds.

owned and maintained by the FAA, and a PAPI. Runway 9 had runway end identifier lights (REILs) and a PAPI.

5.1.2.1.1 Runway 9 PAPI

The PAPI lighting system installed at the approach end of runway 9 was manufactured by ADB, ALNACO, Inc., a subsidiary of Siemens Airfield Solutions. It was a model L-880, style A, consisting of 4 identical light units mounted on the left side of runway 9, along a line perpendicular to the runway centerline, approximately 1000 feet from the runway 9 threshold. Each of the light units contained two 200-watt lamps, and optical apparatus to split the lamp beams horizontally into red (lower) and white (upper) beams, with a transition zone between the red and white beams of 3 minutes of arc at the beam center. The light units were individually positioned to project signals at prescribed angles above the horizontal, relative to a 3-degree glideslope. When energized, the light units operated at 100% intensity during daylight hours, and at 20% intensity during darkness. The day/night intensity settings were switched automatically by a photocell. Each light unit had an internal "tilt switch" to shut off the entire system if any of the units became misaligned.

According to a representative of Siemens Airfield Solutions, the red filters in the ADB PAPI systems conform to Military Standard (MIL-C-L5050) for "aviation red" coloring, as outlined in FAA AC 150/5345-28D. Siemans does not recommend periodic replacement of the filters, as they are expected to retain accurate coloring for the life of the PAPI system.

The runway 9 PAPI system had not been certified by the FAA at the time of the accident.[4] According to electrical technicians at TLH, the PAPI lighting system on runway 9 had been checked with the manufacturer-provided sighting tool "5 to 6 times" since its installation in 1996, and had not been found to be out of alignment during these inspections.[5]

On July 29, 2002, the FAA performed an after-accident flight inspection of the runway 9 PAPI system. The flight inspection report (Attachment 6) that was generated from the flight stated:

> There is no electronic glide path to this runway, and, at the time of this inspection, there was no reference data (lat/long) available for the PAPI's on this runway. Consequently, a PAPI angle was not determined through AFIS [automated flight inspection system]. This evaluation was conducted by flying one approach with on-path indications, and one approach at an angle consistent with the last box just turning red. On both approaches, the glidepath flown was well clear of the terrain and obstacles in the approach zone.

[4] There is no requirement for an airport to have FAA certification of a PAPI lighting system when an FAA-approved aiming device (e.g., Walker tool) is used to maintain the system. TLH uses an FAA-approved aiming device.
[5] No record or log of inspections of PAPI lighting systems is maintained at TLH.

Following the flight inspection, TLH obtained current survey data for the airport, provided it to the FAA, and a second flight inspection was performed on August 6, 2002. The flight inspection report from the second flight stated, "average PAPI angle at 2.90 degrees." [6]

On October 10, 2002, a ground inspection of the TLH runway 9 PAPI light units was conducted. In attendance were representatives from TLH airport and FAA Airways Facilities. TLH electrical technicians, using the manufacturer-supplied aiming tool in accordance with the manufacturer's instruction manual,[7] checked the settings for each of the light units. The observed settings were consistent with the recommended settings for a standard PAPI installation as specified in the ADB, ALNACO instruction manual.[8]

5.1.2.2.2 Effects of Surface Contamination on PAPI Lenses

In April 1983, the FAA published the results of a research project designed to assess the attributes of PAPI systems as compared to Visual Approach Slope Indicator (VASI) systems. The final report, *Evaluation of Precision Approach Path Indicator (PAPI),*[9] included collateral information describing PAPI signal anomalies that occurred as a result of moisture accretion on the surface of PAPI lenses. In field observations, the FAA found that, "the Belgian ADB PAPI units tended to form condensation on the exposed frontal surface of the lenses during high humidity conditions while the system was de-energized. Upon energization, diffusion and mixing of the projected colors created a broad 'pink' signal, which could not be easily interpreted."

Similarly, in controlled experiments in an environmental chamber, artificially applied condensate (steam) on the PAPI lenses produced "a uniform distortion of the projected signal that that was perceived as a pink overall signal." In both field and controlled tests, the FAA noted that "correct color signals" and "normal signal presentations" were evident when the lenses were clear of condensation. The FAA report concluded that the "transient false pink signals" could be eliminated by three methods: 1) energize system continuously; 2) energize system at least 30 minutes before flight operation; or 3) install heaters in close proximity to the lenses. The FAA does not address lens contamination in its PAPI guidance material.[10]

Transport Canada's (TC) Aerodrome Safety Circular No. 98-002, *Operation of Precision Approach Path Indicator (PAPI) Units*, advises aerodrome operators of the results of TC's PAPI testing program. The results indicate that ice, dew or frost on the PAPI front lens surface can affect the projected PAPI signal, producing false slope indications. The circular concludes that PAPI signal anomalies caused by lens contamination is a design problem, and asserts, "It is the

[6] FAA Order 8200.1, *Flight Inspection Handbook*, states: "precise measurement of the [PAPI] elevation angle cannot be made by flight inspection due to the various widths of the on-path indication of 0.25 degrees to 0.50 degrees. Initial settings are determined by ground adjustments and verified by flight inspection." The Order allows +/- .2 degree variation between flight inspection measurement and ground settings.
[7] ADB, ALNACO, Inc. Document No. 96A0136.
[8] Manufacturer recommended settings are: Unit 1 at 3°30'; unit 2 at 3°10'; unit 3 at 2°50'; unit 4 at 2°30' (unit 1 being closest to the runway edge, and each numbered unit proceeding outward to the next adjacent unit).
[9] DOT/FAA-RD-82/85, Bret Castle, 1983
[10] FAA Advisory Circular 150/5345-28D, *Precision Approach Path Indicator (PAPI) System*, details performance standards for PAPI installations.

responsibility of the PAPI manufacturers to come up with an satisfactory solution to this problem." The Safety Circular concludes by requiring aerodrome operators follow specific procedures to prevent PAPI lens contamination. The procedures include: continuous operation of the PAPI system; and, providing an adequate "warm up" period prior to use.

On August 16, 2002, a representative of Siemens Airfield Solutions was contacted by telephone to discuss the issue of PAPI lens contamination. The representative stated that, "the company was aware of TC's Aerodrome Safety Circular, however, since regulatory authorities do not require deicing or defrosting provisions for PAPI systems, such devices are not included as standard equipment in ADB PAPI systems." Siemans offers optional heating units that can be installed in the light units; however, according to the Siemens representative, "customers do not often request them." The Siemens representative emphasized that the standard units produce substantial heat, and will "burn off any traces of dew or frost within minutes." He said that Siemens recommends that the lighting units be activated a few minutes prior to using the system.

5.1.2.2 Runway 18-36 Lighting

Runway 18-36 was equipped with HIRL, but did not have in-pavement centerline or touchdown zone lights. Runway 18 had REILs and a visual glideslope indicator (i.e. PAPI). Runway 36 had an ILS approach lighting system (i.e. MALSR) being installed, which will be owned and maintained by the FAA. Runway 18-36 was closed for maintenance at the time of the accident, and all lights on runway 18-36 were deactivated.

5.1.2.3 Taxiway Lighting

All taxiways on the airport are equipped with medium intensity taxiway-edge lights (MITLs).

5.1.3 Airport Marking and Signage

Location and guidance signs and markings identify taxi routes, runway hold positions and taxiway centerlines throughout movement areas. All runways have precision instrument markings. All runway and taxiway markings were clear and visible at the time of the accident.

5.1.4 Obstructions

The annual airport certification inspection, conducted on June 20-21, 2002 by the FAA, found no obstructions to the Federal Aviation Regulation (FAR) Part 77 (Obstructions to Air Navigation) surfaces to any of the runway ends (Attachment 7), nor were any obstructions identified during the past three annual certification inspections.

Survey data of the runway 09 approach, taken during the onsite portion of the investigation, indicated that no obstacles penetrated either the FAR Part 77 approach slope or the PAPI obstacle clearance surface (Attachment 8).

As previously stated in section 5.1.2.1.1, the FAA flight inspection conducted on July 29, 2002, noted that the runway 09 PAPI glidepath was "well clear" of the terrain and obstacles in the approach zone.

5.1.5 Construction Hazards

There was an airport improvement project in progress at TLH near the runway 9 approach end at the time of the accident. NOTAM # 02-06, issued January 15, 2002, addressed the project. The project included re-grading the runway safety area (RSA) for the runway 36 approach end, and installation of a medium-intensity approach lighting system with runway approach indicator lights (MALSR). Also, a new fire hydrant was installed along the airport access road, between the RSAs for runway 9 and runway 36. Construction vehicles and equipment were located in a staging area outside of the airport operations area (AOA), behind a gated perimeter fence. At the time of the accident, no construction activity was underway and all construction equipment was in the staging area.

5.1.6 Airport Emergency Plan (AEP)

Under the TLH AEP, the ATCT is expected to perform specific tasks in the event of an airplane accident. One of these tasks is to "activate appropriate alarm systems." The TLH ATCT is closed daily from 2300 to 0600. There is no provision in the AEP for initial alert notification when the tower is closed.

5.1.7 Triennial Exercise

On January 29, 2001, TLH conducted a full-scale disaster drill as required by 14 CFR Part 139.

5.2 Emergency Response

5.2.1 Aircraft Rescue and Firefighting (ARFF)

Tallahassee Regional Airport maintained a 14 CFR Part 139.315 Index C ARFF facility on the airfield. The ARFF station was operated by the Tallahassee Fire Department (TFD), and was staffed 24 hours a day, seven days a week by three firefighters. The station maintained three primary crash trucks and one reserve crash truck (Table 1). The crash alarm was a buzzer inside the station that was activated by a switch in the air traffic control tower cab. In addition to the airport crash trucks, the TFD housed Engine Company 5 in the ARFF facilities. Engine Company 5 consisted of three full-time firefighters and one fire engine. The primary duty of Engine Company 5 was response to fire emergencies off-airport, however, it also responded to all airport fire emergencies.

Table 1. Vehicles Stationed at TLH

Vehicle	Radio Call Sign	Personnel	Agent Capacities	Additional Equipment
1994 International 4800	Airport 51 (AP51)	1	500 gal H2O, 50 gal AFFF[11], 500 lb Purple K	Bumper turret
1994 E-One P23	Airport 52 (AP52)	1	3300 gal H2O, 500 gal AFFF, 500 lb Purple K	Roof turret, bumper turret, FLIR
1996 E-One P23	Airport 53 (AP53)	1	3300 gal H2O, 500 gal AFFF, 500 lb Purple K	Roof turret, bumper turret, FLIR
1985 Walter	Airport 54[12] (A54, reserve)	1	1500 gal H2O, 500 gal AFFF	Roof turret, bumper turret
E-One 1250GPM	Engine 5 (E5)	3	500 gal H2O	

According to the radio log from the TFD dispatch center (Attachment 9) and statements from the ARFF crew, on July 26 at approximately 0539 EDT, a crash alarm was received at the TLH ARFF station. The station commander called the air traffic control (ATC) tower and asked for information. The controller told him there was a fire off the end of runway 09, but he did not know what the source was. At 0541, the station commander notified TFD dispatch to send additional fire equipment and TMHEMS to the airport. Firefighters reported seeing a large fire off the approach end of runway 9 before they left the station.

The crash trucks and Engine 5 responded from the ARFF station, and drove directly toward the fire. As they approached the scene, the ARFF trucks encountered a locked gate leading to airport property outside the AOA. The firefighter driving Airport 51 (AP51) used bolt cutters to cut the chain on the fence, and then opened the gate. Crash trucks AP52 (AP54) and AP53 proceeded through the gate and positioned themselves on the right side of the burning airplane, and began dispensing extinguishing agent. Engine 5 parked near the gate on the AOA side of the fence, and the lieutenant on board assumed command of the scene.

As AP51 positioned toward the nose of the airplane, the driver saw three men standing together, away from the airplane. He stopped his truck, administered first aid to the men, and at 0547 notified TFD dispatch of the three injured men. The men identified themselves as crewmembers from the crashed airplane, and told the firefighter that there were no others on board the airplane. One of the crewmembers gave the driver of AP51 a load manifest identifying hazardous materials onboard. The driver notified TFD dispatch of hazardous materials at 0548. A firefighter from Engine 5 led the crewmembers toward the gate, and was met by TMHEMS workers from an ambulance that was parked near the gate. The crewmembers were taken to the ambulance. AP51 positioned on the left side of the crashed airplane, and began dispensing agent. At 0556, a chief from Division 1 arrived at the scene, and assumed command at 0604.

[11] Aqueous film-forming foam

[12] At the time of the accident, Airport 52 was out of service awaiting preventative maintenance. Airport 54 was in use at the time, and used call sign “Airport 52.”

The crash trucks continued applying agent to the fire, periodically reloading their trucks with water and AFFF from the ARFF station and a water hydrant located on the airport perimeter road near the crash site. The fire was declared "under control" at 0752, and declared "out" at 0940. Firefighters continued to apply agent through crash trucks and hand lines for the next few hours to control smoldering debris.

In addition to the vehicles mentioned, the following TFD apparatus responded to the scene: Engine Companies 2, 4, and 5, Ladder Company T4, Tanker 1, Reserve Tanker 3, Brush 6, Air One, and Hazmat 2. A total of twenty-eight personnel from TFD responded to the accident. TFD estimated that 1,000 lbs. of Purple K, 2,100 gallons of AFFF, and 67,900 gallons of water were used in response to the crash.

At approximately 0542, Tallahassee Memorial Emergency Medical Services (TMHEMS) sent three ambulances to the scene. Vehicle M02 arrived at the scene at 0549 and transported one passenger to the hospital. Vehicle M03 arrived at 0555 and transported 2 passengers to the hospital (Attachment 10). Vehicle M05 arrived at the scene at 0634 and did not transport any passengers. In addition, TMHEMS also sent rescue vehicle R10, which arrived on scene at 0557.

Response logs from the Tallahassee Police Department (TPD)(Attachment 11) indicate that notification was made regarding the accident at 0541, and that, in total, 25 officers responded.

Transcripts of the 911 tapes from the Leon County Sheriff's Department indicate that the initial call reporting the accident was received at 05:37:55 (Attachment 12).

5.2.2 ARFF Training

Initial training for TLH ARFF crews is conducted by the TLH airport administration and ARFF personnel (Attachment 13). Recurrent training is conducted annually at the Jacksonville (JAX) Fire and Rescue Training Facility in Jacksonville, FL (Attachment 14). TLH ARFF personnel training records for calendar year 2002 are in Attachment 15.

5.2.3 Post-accident Critique

On September 3, 2002, TLH conducted an interagency post-accident critique of the emergency response resulting from the crash. Details of the critique will be added to this report when available.

5.2.4 Interviews

Charles Atkins - Firefighter and Emergency Medical Technician (EMT):

Charles Atkins had 17 years as a fireman, of which the last 1 ½ - 2 years had been at the Tallahassee Municipal Airport fire station. He was assigned to Engine No. 5 (E5), a landside fire truck.

He awoke at approximately 0530 to a bell and buzzer, which indicated an Alert 3 (airplane accident event). He "suited up" into structural bunker gear and a self-contained breathing apparatus (SBA) and departed the station. FF Atkins said the fire was visible from the ARFF Station. Enroute to the crash site, E5 stopped to assist Airport Truck No. 53 (AP53, a dedicated ARFF unit carrying water and agent) that was stuck in a ditch. E5 accessed the site at gate 26. He saw AP52 (AP54) applying agent, and Lt. Coe (AP51) administering triage to the airplane crew. Lt. Coe asked for assistance with the crew. FF Atkins heard a "pop" as he walked toward Lt. Coe, and he saw fire emerging from the nose section of the airplane. FF Atkins did not remember an odor of fuel, but did smell a "bad" odor. Upon approaching the area where the airplane crew was, he saw one crewmember seated on the ground, leaning against AP51, receiving oxygen. He asked another of the crewmembers if he could walk, and the crewmember said "yes." He assisted the crewmember to an area away from smoke. FF Atkins described the first crewmember as "bloody, walking well, and talking." He continued to assist with patient care until TMH EMS arrived. A "brush truck" arrived and was directed to the debris path of fire.

FF Atkins left the crewmembers and assisted in reloading trucks (AP53 and AP51) at the ARFF station. He said AP53 was reloaded with water several times before they needed to come back to the station for foam. FF Atkins said that the ARFF trucks "did a good job knocking down the fire," because upon returning to the scene, he noticed the fire had been suppressed "a great deal." Lt. Daniel was coordinating hand line use and instructed FF Atkins to help apply agent to "hot spots" with a hand line. This operation continued for several hours. He was on site until 1630.

FF Atkins drew a sketch of the crash site (including the airplane and gate 26 entrance) during the interview that indicated that as E5 pulled up to the site, AP51 was located at the nose (12 o'clock position) of the airplane, and AP53 was located at the right wing (3 o'clock position) of the airplane applying agent. Upon arrival at the scene, E5 was positioned just outside (off-airport side) of gate 26. The first ambulance on scene parked near E5.

He said this was the largest fire he had ever seen at the airport and "was nothing like the mock disaster drill."

Lieutenant Orell Brooks - Firefighter:

Lt. Brooks had 22 years as a fireman, of which the last three months had been at the Tallahassee Municipal Airport fire station. He was assigned to Engine 5 (E5), a landside fire truck.

The alarm sounded while Lt. Brooks was sleeping. He saw Lt. Coe on the tie-line with the tower. He looked out the window and saw a large plane on fire about 200 feet from the end of runway 9. Lt. Brooks said it was about 30 seconds from the time the buzzer sounded until his unit was in service. He responded in E5, which took a direct route to the scene without any delays. Lt. Brooks said he did not notice if the runway lights were on at that time. E5 was parked just outside of gate 26. AP51, AP52 (AP54), and AP53 also responded, and proceeded to the plane.

When he arrived on scene, he reported to TFD dispatch that they had a large airplane that was "fully involved." He was relieved to learn it was a FedEx plane, without a large number of people on board. Lt. Brooks then set up a command post. It is "standard operating procedure" for E5 to assume command/communication duties. He directed off-airport units, which TFD dispatch automatically sends in accordance with a predetermined protocol, to enter through gate 26. He advised all units to report to the staging area out side of the gate. "About five" off-airport units responded in addition to the ARFF units. He saw a "trail of fire" in the field that was continuous from the tree line to the airplane. The fire in the field was "low priority" since it did not pose an immediate danger. He told the ARFF crew to concentrate on the airplane. Lt. Coe told him there were explosives on board the airplane. He heard "pops," but no real explosion.

About ten minutes after Lt. Brooks arrived at the scene, the division chief arrived and assumed command. He briefed the Chief on the accident and went to assist with reloading the ARFF trucks with water and foam. The Chief assessed the site and field, and assigned brush trucks to assist with the field and tree fires. Lt. Brooks said the "real" AP52 arrived on the scene about 20 minutes after the initial response.

FF Lewis reported to him that three people were out of the airplane. A couple of ambulances had arrived on the scene; two were on the scene "real quick" and one remained at the fire station. A couple of the fire fighters assisted the crew to the TMH EMS units that were staged inside gate 26. All three crewmembers got into one unit. As soon as the crew was removed from the vicinity of the fire, he saw AP51 discharge agent.

The trucks were dispersing a lot of foam, but it was not having much effect. There was never a time that foam was not being applied to the airplane and the department never ran out of foam. The trucks hold 500 and 300 gallons of foam and powder is on all of the trucks. The Reserve unit AP52 (AP54) was not discharging very well. He said the knockdown occurred in "45 minutes to one hour." At daylight, about 1½ hours into the operation, "overhaul" began. Hand lines and ladders were used for interior work. Firefighters entered the airplane to work the debris and extinguish the interior fire with three or four people. He assisted in cutting the airplane to retrieve the black boxes.

He had received live fire burn training at Jacksonville, in eight-hour sections, and received other training in-house. Lt. Brooks had silver bunker gear.

Lt. Brooks said, "The operation went good. I think it was a first for everyone on the shift, and none of the guys froze up." He added, "Fighting fires like this is totally different from fighting structural fires."

Lieutenant Jerry Coe - Firefighter:

Lt. Coe had 17 years experience as a fireman, of which the last 2 ½ years had been at the Tallahassee Municipal Airport fire station. He was assigned to AP51, an ARFF fire truck.

Lt. Coe said he was "rudely awakened by the sound of impact" and then heard an odd sound that resembled "engines being powered-up." The bell sounded a short time later, and the

buzzer sounded shortly thereafter (about the time it took him to get out of his bed). The "tie-line" telephone to/from the ATCT had been ringing, but stopped. He called the ATCT back, and tower personnel advised him of a fire on the airport. The tower did not know what it was, but "there was something out there."

Lt. Coe put on his "silvers" and led the trucks out of the ARFF station in AP51. AP52 (AP54) followed AP51 out of the station, and AP53 was immediately behind AP52 (AP54). He said the runway lights were "on" when he left the ARFF station. The access road was hard to see in the dark. At one point, AP53 went around him and "led him on" to the site. At gate 26, he got out and used bolt cutters from his truck to cut the lock and chain on the gate. AP52 (AP54) drove through the gate. He got back into AP51 and drove though the gate behind AP52 (AP54). Lt. Coe drove toward the nose of the airplane, and saw the crewmembers standing together in the field. He drove up the right side of the airplane and parked the truck near the crewmembers. There was a trail of spot fires toward the wooded area, which "resembled the tire tread fires in the movie Back to the Future." Lt. Coe said the crewmembers looked "pretty good." They were walking and talking. He asked if they were all right, and the crewmembers said "yes." He began performing primary ABC's (Airway Breathing Circulation) on the crewmembers. While attending to the crewmembers, he overheard the older gray-haired crewmember say, "I thought I was at 500." Lt. Coe estimated the crewmember to be about 60 years of age and appeared to be in the worst condition. Another crewmember asked for ice for his hand. Lt. Coe did not ask the crewmembers if there were any others on board the airplane.

Lt. Coe asked the crewmembers if there was any hazmat on board the airplane. One of the crewmembers handed him a one-page manifest (Attachment 16). Lt. Coe called the TFD dispatch on the radio to inform them that a hazmat response was necessary. FF Dowdy of AP53 had expelled all of his agent at the fuselage and came over to assist Lt. Coe with the crew. Engine 4 (Lt. Shiver and crew) arrived on scene and took over care of the crew. Lt. Coe went back to AP51 and drove around the nose of the airplane to disperse agent. He positioned his truck on the left side of the nose since the fire concentration at the wing area had moved forward. The fuselage has burned through the crown in the center section. The cockpit was not on fire when he first got there, only the middle of the plane. The left door was open and being "knocked around" when he applied agent. He dispersed his first load through the open door, directly on the fire.

Lt. Coe said Division One arrived on the scene "pretty quickly," and took command of the scene. The fire continued to burn and large quantities of water were used. AP51 was refilled at a hydrant on the access road. His second and third loads of foam and powder were discharged through the same open door, as well as the open cockpit window forward of the door. He estimates it was between loads two and three that the fire was "knocked down."

Lt. Coe said he has not had 40 hours of formal ARFF training, but that he found the full-scale drill to be beneficial training. He said, "We did a good job. We made some mistakes, but overall, we did well."

David Dowdy – Firefighter and Driver/Operator of AP53:

David Dowdy had 14 years experience as a fireman, of which the last 4 ½ years had been at Tallahassee Municipal Airport fire station. He was the Driver/Operator assigned to AP53, an ARFF fire truck.

FF Dowdy said the shift was normal with the exception that AP54 was used as a backup for AP52. He awoke hearing a noise that sounded like a plane landing. He said, "It sounded like a thrusting engine and a loud noise." He started to go back to sleep, but within a minute of hearing the noise, the bell and buzzer sounded indicating a crash on the field. It rang six or seven times. He "dressed out" and, as the door came up, looked outside and saw the fire. He could not tell if it was inside or outside of the airport fence line.

As he was driving AP53 to the crash site, he remembered the retention pond construction, so he headed toward runway 36. To make a straight shot to the crash site, he drove across runway 36, through the dirt. As he came across a ditch, he got stuck "a little" and his wheels started spinning. He realized the traction control was no longer engaged and had to "lock traction back in." He recalled seeing the runway lighting on runway 36 and the lighted "X" were on. He saw that AP51 had stopped. He thought it was because something may have been blocking the truck or because he was looking for the service road. No one was familiar with the new service road alignment, and it was foggy and hard to see the black asphalt so they had difficulty finding the road. His truck was equipped with a FLIR unit, but it was out of service. He said, "FLIR would have been beneficial finding the road." Another ARFF truck also has FLIR, but it too, was out of service.

FF McCoy discharged water over the fence while Lt. Coe was trying to cut the gate with bolt cutters. The water did not reach the fire. AP52 (AP54) was the first unit through gate 26. FF Dowdy assumed that people were dead, since he saw no one at the scene. He used the entire load of foam, which he estimated took four to six minutes to empty. He said, "It seemed the truck was empty really quick." The initial agent application darkened the fire, but really didn't have the impact he expected.

He heard the Lt. Coe say, "Send me some help, I've got three pilots," over the radio. He was out of agent, so he headed toward AP51. He had to park AP53 in the field and run to AP51 to help with the crewmembers. He rendered care to one crewmember with heavy lacerations on his arms and a bloody white shirt. The crewmember told FF Dowdy he was having trouble breathing, so he put the crewmember on oxygen. This crewmember appeared to be in his early 60s. The other two crewmembers appeared to be in their late 30s or early 40s. One of the crewmembers asked "Who am I, and what happened?" This crewmember had dark hair, with lacerations on his head and multiple contusions. The third crewmember had lacerations and was in shock. FF Dowdy heard the older crewmember say, "I thought we were at 500," to the other two crewmembers, and then said, "Tell Joe not to talk to anyone until we are clear." Lt. Coe wanted to apply AP51's agent to the airplane, and asked the crewmembers if they could walk. One crewmember, who was leaning on the fire truck tire, said he didn't know if he could walk. FF Dowdy and two other firemen helped him, and the other two crewmembers, away from the truck to an ambulance. Prior to leaving the crewmembers, Lt. Coe handed FF Dowdy the

manifest and told him the pilot had given it to him. This was his first knowledge of hazmat being on board the airplane.

FF Dowdy heard there was a recently installed hydrant close by, so he refilled AP52 (AP54) there, then returned to the airplane. After the first refill, he was "scared to death" because he heard "explosions" and was aware of the hazmat on board. He said, "The fire had grown, and almost looked worse than at the initial response." He positioned AP51 in same location as he had for the initial response and attacked the area forward of the wing. After he dumped the second load of agent, the fire seemed to be diminishing.

He went back to the station to refill with both AFFF and water. He called his wife from the ARFF station, and she told him that it was "about 0730."

Upon returning to the scene, he was told to use AP51 to provide "safety cover" for the firemen using hand lines. It was pretty quiet, and he didn't hear a lot of radio communications while everyone was doing their jobs.

FF Dowdy said he had daily, monthly and annual training. Firemen would spray foam and dry chemical on monthly to quarterly basis, and they completed annual burn training in Jacksonville for the "139 requirements." The firemen also had familiarization training on each airplane that frequents the airport. He felt that training for airplane fire is nothing like an actual fire. The annual burn training at the Jacksonville facility is a small fuselage fire, which goes out immediately upon applying foam. In addition, he had airplane and hazmat training at the FedEx facility at TLH. He felt that the only way he could have been equipped for this incident was to have had more official fuselage training.

FF Dowdy believed the need for constant agent reloading took everyone by surprise. No one expected such reload factors (number of reloads and time to reload), and the firemen had not been trained for rapid reloads on the trucks. Two off-duty firemen heard about the crash on television and came in to help with reloading.

Chris Lewis – Firefighter and Driver/Operator of E5:

FF Lewis had 17 years experience as a fireman, of which the last 2 ½ - 3 years had been at the Tallahassee Municipal Airport. He was the Driver/Operator assigned to E5, a landside truck.

About 0520 he heard a noise and assumed it was a FedEx plane landing. A few minutes later, he heard the bell and buzzer sounding. Lt. Coe answered the red "crash" phone. On the way to the truck, he looked out into the field and saw fire off runway 9. He had "silvers" but opted for regular bunker gear.

He followed the ARFF units to the scene, by way of a new access road. FF Lewis noticed the runway lights were "on." Enroute, he saw AP53 stuck in the ditch. He stopped to assist and saw the truck's differential gear lock was disengaged. After engaging the gear, the wheels

stopped spinning and the truck was able to get out of the sand. The entire event took about 15 seconds to correct.

AP52 (AP54), AP51, and AP53, entered the gate in sequence. E5 parked on the AOA side of the gate, in a position that would not interfere with firefighting operations. Lt. Brooks set up command. Over the radio, he heard Lt. Coe say he had found three crewmembers and needed assistance. He did not hear anyone say that everyone was out of the airplane, but assumed everyone was out when he saw the three crewmembers standing outside of the airplane. He put on his SCBA (self-contained breathing apparatus) and walked up to AP51 to assist with the three crewmembers. FF Lewis explained that providing assistance and rescue is their primary duty.

The crew was visibly shaken and bloody. An older crewmember had a "nasty" cut on his forehead and was asking "where he was." One crewmember complained about his hand, which appeared to be swollen. FF Lewis went to get some ice, and saw the first TLH EMS ambulance arrive. Another TLH EMS ambulance arrived shortly thereafter. The EMS crew asked if they needed to pull up to the crew and he told the paramedics "No, they could walk." The TLH EMS unit was parked inside of gate 26. All three crewmembers were taken to the ambulance. Trucks AP52 (AP54) and AP53 were discharging agent at this time "and it didn't take but a minute to be bone dry."

While the crewmembers were being loaded into the ambulance, E4, Truck 4, E3, and Tanker 1 arrived. The 2,000-2,500 gallon tankers had both class A and AFFF foam. He saw the hazmat unit arrive as well, but was not sure when. Brush units had been dispatched at the same time as the hazmat unit. Everyone was ordered outside of the gate because of hazmat on board the airplane. He heard three low explosions.

He took E5 back to the ARFF station to assist with reloading the units. When he was returning to the scene, E5 got stuck about halfway between the station and the site, and needed a wrecker to pull it out of the sand. As AP53 headed back to the scene from refilling at the station, the crew caught a ride with them.

After AP52 (AP54) had applied one load, the pump malfunctioned, and the truck was taken out of service. The "real" AP52 was retrieved from the maintenance shop and placed in service. AP53 applied three or four loads before the "real" AP52 arrived. AP51 applied three or four loads. Using straight streams, "the fire did not go out real quick." FF Lewis reported, "The initial attack did not do much to darken the fire. The second attack started to knock down the fire, but it still was not knocked down. By the third load, there were only spot fires left."

A police officer gave him a ride back to E5 when the wrecker arrived to pull it out. He then drove E5 back to the scene, where he continued to stand-by for directions.

The tanker was pulled up to the airplane and he was directed to assist with hand line operations inside the airplane to control flare-ups. The firefighters began shooting the hand lines into the airplane, downward, and then they entered the airplane. The hand line operation went on for "a while." The fire in the main area was controlled, but fire was flaming up toward the cockpit.

After the fire was out, the NTSB and FAA arrived, and E5 assisted in the removal of the "black boxes." The hazmat team also went into the airplane to take samples to test for radioactive materials. FF Lewis said, "We had just enough reserve foam to get all the ARFF trucks back into service."

He said that during the response, police parked their cars on the access road, restricting and hindering the fire trucks' ability to get to the scene. He recalled a police unit had gotten stuck, and required the wrecker to pull it out prior to extricating E5. FF Lewis said that more live fire burn training is needed. TLH goes to Jacksonville for the annual live fire training. It is good but it is a tank fire, not an airplane fire, and needs to be more realistic. The mock disaster is good training but it is too predictable.

FF Lewis said the FedEx crash was the most fire he had ever seen in his career.

Chief Robert "Steve" Marks – Incident Commander:

Robert "Steve" Marks had 22 years as a fireman, all of which had been at the Tallahassee Fire Department. He was the Division Chief at Station 3, and assumed the role of Incident Commander when he arrived at the scene.

He heard the TFD dispatch center broadcast over the radio there was a plane down at the airport. Shortly after, TFD dispatch identified it as FedEx. He responded from Station 3, which is located at 3005 South Monroe Street, driving a Division 1 truck (Chevy Tahoe). He entered the airport at gate 37. The TLH EMS ambulance was directly behind him.

At the scene, he saw an airplane with fire showing at the mid-section, just behind the cockpit, and fire in the debris field behind the airplane. He saw the crewmembers walking away from the airplane. As the crewmembers walked past him, a firefighter handed him the manifest. He looked at the manifest and noted it was very general and did not includ specifics regarding types or amounts of hazardous materials. Lt. Coe told him there were only three crewmembers on board.
Chief Marks assumed command of the scene from Lt. Coe. Chief Marks called for a deputy chief, emergency management and special operations, and requested Tanker 3, Engine 2, and hazmat 2 to respond to the scene.

A FedEx employee (described as tall and thin) was on scene and explained the manifest to Chief Marks, specifically the locations of the hazmat on the airplane. The FedEx employee left the scene to get more details about the explosives on board. The hazmat team arrived on the scene and he gave them the manifest. The hazmat team was not able to provide information to firefighters about all of the hazmat or the "danger range" of the explosives. The FedEx agent returned and provided information about the "registered" items on board and quantities of hazmat. The FedEx employee also said there was hazmat located behind the cockpit as well. During the fire, he heard three explosions, described as "pops."

Chief Marks sent Engine 4 to extinguish the fires in the debris field. He directed the crew of Engine 5 to assist in the debris field since their truck was stuck in the sand inside the airport fence line, near the service road.

Chief Marks said AP52 (AP54) and AP53 were emptied and left the scene to refill. Many of the reloads were made at the hydrant on the service road. Chief Marks estimated that it took about 20 minutes to make a refill roundtrip. He decided to continue attacking the fire with ARFF trucks only. Chief Marks said he did not direct the ARFF vehicles about how or where to fight the fire. The first three loads of agent had little effect on the fire because they were not able to shoot into the fuselage, due to the angles and height. Because of safety considerations related to the hazmat on board, Chief Marks chose not to use hand lines initially.

He said that when the fourth load of agent was applied, the fire began to darken down. The crown of the airplane was gone and the agent had better penetration. Reloads of agent became more staggered and agent applications were more constant. After about seven or eight loads of agent, the firefighters began using hand lines from "city" (Tallahassee) tankers. One tanker was positioned near the right wing area and another on the left side of the cockpit area. He stated they were not able to extinguish the contents of the airplane, but it was not getting worse, so they started an "overhaul" mode. Chief Marks said that at 1030-1100 he notified TFD dispatch of a "fire-out."

Chief Marks thought that it would have been more effective if the ARFF crews had some type of mounted piercing nozzle to penetrate the fuselage. TLH ARFF has piercing nozzles on hand lines only. He thought that an elevated hose would have been of little use.

Randy McCoy – Firefighter and Driver/Operator of AP52 (AP54):

FF McCoy had 15 years as a fireman, of which the last three years had been at the Tallahassee Municipal Airport. He was the driver/operator assigned to AP52 (AP54), a dedicated ARFF fire truck.

He awoke at 0520 and heard an airplane landing (a familiar sound at this time of the morning). He dozed back off and was awakened again by the crash alarm sounding. He went straight to his assigned truck, and hit the bay door switches on his way. He saw a fire in a field southwest of the ARFF station. He put on his "silvers," got into AP52 (AP54), a Walter fire truck, and headed out of the station. Airport 51 led, then his truck, with AP53 behind him.

He drove AP52 (AP54) to the south end of taxiway A, cut across the field to the new service road and pulled up to gate 26. He did not recall seeing if the runway lights were on or off. He tried to apply extinguishing agent from inside gate 26 (airfield side) while the driver of AP51 cut the chain on the gate open. His agent did not reach the fire. He drove through gate 26 first and headed towards the airplane. He saw that the airplane was a FedEx cargo airplane. He told the dispatcher it was a FedEx airplane, fully engulfed. It was dark when he arrived at the site, and he noted no fog. He saw a line of spot fires leading to the trees.

He saw fires burning at the right wing root area and just aft of the cockpit. He did not remember if the 1L door was open and did not think the cockpit was on fire. He saw three ambulatory crewmembers up by the nose of the airplane. He had no further contact with the crewmembers. Via radio, FF McCoy asked if everyone was out of the airplane and was told "yes." He told AP53, via radio, to try to keep the cockpit cooled. His initial discharge was at the right side of the airplane, forward of the wing root. He said it took about 2 minutes to discharge the full load. He pulled his truck around the left side of the airplane, positioning near the 1L door. There was no fire in the cockpit. He stated, "We put a lot of foam on it and could not put it out."

He heard some small "pops" as the fire burned. He heard radio traffic say that there was hazmat on board. The Walter vehicle is very loud and he could not hear well.

FF McCoy refilled with water twice at the tanker, AP53. After his second refill, he could not build up adequate pressure on the turret nozzle to continue firefighting. He parked it away from the fuselage. He estimated that he had about 30 minutes of service from the truck before the pump quit. He went to AP53 and assisted in refilling the truck with water at the hydrant on the service road. He said that having the hydrant there was very useful. FF McCoy estimated it took four to five minutes to refill the truck, and that keeping water in the truck was the biggest problem.

He said that police cars were also a problem, causing traffic jams inside the gated area (airport side) and obstructing access to the site.

6.0 Survival Aspects

6.1 Evacuation

According to interviews with the cockpit crew, the captain, first officer, and flight engineer escaped the airplane through the left cockpit window.

Mark H. George

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Survival Factors Investigator

7.0 Attachments

1. Aircraft configuration
2. Airport Layout Plan
3. Notices to Airmen (NOTAMs)
4. TLH Runway Inspection Log
5. TLH Airport Lighting Activation Log

6. FAA Flight Inspection Reports
7. Annual Airport Certification Inspection Checklist and Letters of Correction for 2002
8. Runway Survey Data Plot
9. Tallahassee Fire Department Dispatch Log
10. Tallahassee Memorial Emergency Medical Services Log
11. Tallahassee Police Department Radio Log
12. Leon County Sheriff's Office of Emergency Management Log
13. Syllabus for TLH Airport Administration ARFF Training
14. Letter of Approval from FAA to Jacksonville Fire and Rescue Department
15. Training Records for TFD ARFF Personnel
16. Hazmat Documents
17. Photographs

References:

1. Airport Certification Manual, dated June 17, 1999
2. Airport Emergency Plan, dated July 5, 2001
3. Section 204, Visual Glide Slope Indicator (VGSI) of FAA Order 82001, dated 1/18/91
4. FAA Advisory Circular 150/5345-28D, Precision Approach Path Indicator (PAPI) System, dated 5/23/85
5. FAA Technical Center Report, *Evaluation of Precision Approach Path Indicator (PAPI),* DOT/FAA-RD-82/85, Castle, Bret, 1983.
6. Transport Canada Aerodrome Safety Circular No. 98-002, *Operation of Precision Approach Path Indicator (PAPI) Units*, 1998.
7. FAA NAFEC Technical Letter Report, *Precision Approach Path Indicator (PAPI) Environmental Tests*, NA-78-67-LR, Paul H. Jones, October 1978.