DOCKET No.: SA-519
EXHIBIT No. 7A

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

STRUCTURES GROUP CHAIRMAN'S FACTUAL REPORT

(16 Pages)

American Airlines Flight 1420
Little Rock, Arkansas
June 1, 1999

DCA99MA060

NATIONAL TRANSPORTATION SAFETY BOARD
Office of Aviation Safety
Aviation Engineering Division
Washington, DC 20594

December 7, 1999

STRUCTURES GROUP CHAIRMAN'S FACTUAL REPORT

A. ACCIDENT: DCA99MA060

Location: Little Rock Nat'l Airport (LIT), Little Rock, Arkansas
Date: June 1, 1999
Time: 2351 Central Daylight Time
Aircraft: American Airlines Flight 1420, N215AA
McDonnell Douglas DC-9-82 (MD-82)

B. STRUCTURES GROUP

Chairman: Kevin M. Pudwill
National Transportation Safety Board
Washington, DC

Member: William R. Fry
FAA (Flight Standards District Office)
Little Rock, AR

Member: David R. Blake
FAA (Technical Center)
Atlantic City, NJ

Member: Michael J. Kelly
Boeing (Long Beach Division)
Long Beach, CA

Member: Kurt L. Jones
American Airlines, Inc.
Tulsa, OK

Member: Robert M. Ruiz
American Airlines, Inc.
Fort Worth, TX

C. SUMMARY

On June 1, 1999, at 2351 Central Daylight Time (CDT), a McDonnell Douglas DC-9-82

(MD-82), N215AA, operated by American Airlines as flight 1420, regularly scheduled passenger service from Dallas /Fort Worth (DFW), Texas, overran the end of runway 4R (i.e. 040° Right) and collided with the runway 22L approach lighting system at the Little Rock National Airport, in Little Rock, Arkansas. The captain and 10 passengers sustained fatal injuries; the remaining 134 passengers and crewmembers onboard suffered various injuries.

The structures group convened on June 2, 1999 and was responsible for documenting the aircraft wreckage distribution and damage to the airframe.

D. DETAILS OF THE INVESTIGATION

1.0 Wreckage Distribution

The aircraft was found at rest on its belly and lower wing surfaces with the tail approximately 830 feet beyond the end of runway 4R. The fuselage had separated into three main sections and the left wing had been completely severed near its root and the wing tip. The nose landing gear and right main landing gear were both sheared from their attachments, whereas the left main landing gear had collapsed into its main gear wheel well.

Prior to the breakup, the aircraft struck several tubes extending outward from the left edge of the instrument landing system localizer array, located 411 feet beyond the end of the runway, passed through a chain link security fence, and down a rock embankment to a flood plane approximately 15 feet below the runway elevation. The aircraft collided with the structure supporting the runway 22L approach lighting system. Approximately 250 feet of the approach lighting system support structure and catwalk were destroyed during the accident.

The aircraft wreckage was located throughout the flood plane below the runway embankment described above. Wreckage was found up to 150 feet laterally from the centerline of the approach lighting system, and at distances approximately 500 to 850 feet from the end of the runway.

Refer to Attachment I for tabular and graphical data related to the aircraft wreckage distribution. Information referenced herein related to the airport fencing, embankment, and approach lighting system has also been included. The origin for the attached plot coincides with the end of runway 4R, at its centerline.

2.0 Structures

The following is an abbreviated description of the principal damage noted to the airframe. Refer to the photographs in Attachment II for additional clarification.

2.1 Fuselage

2.1.1 General

The fuselage was found separated into three main sections, hereafter referred to as

the forward, center and rear fuselage. The rear section of the fuselage; including the root of the left wing, the wing center section, the right wing, and empennage, was oriented on a magnetic heading of approximately 205° (i.e. rotated approximately 165° clockwise from the centerline of runway 4R, as viewed from above). The forward two sections of the fuselage remained essentially together, however were displaced from the rear fuselage by approximately 15 feet. The forward sections of the aircraft were oriented on a magnetic heading of approximately 115° (i.e. rotated approximately 75° clock wise from the centerline of runway 4R. The forward sections of the fuselage were found partially separated at fuselage station (STA) 579. The center section of the fuselage was found completely separated from the rear fuselage at approximately STA 788, i.e. just forward of the wing center section front spar. No fire damage was noted to the two fuselage sections forward of STA 788. However, the passenger cabin aft of STA 788 was totally consumed by fire.

Refer to Attachment III for a general description of the MD-82, including the fuselage station numbers and longeron locations referenced herein.

2.1.2 Forward Fuselage

The fuselage nose was found crushed rearwards, with circumferential buckling noted immediately beneath the cockpit windows and adjacent side panels. The entire lower fuselage beneath the floor line (i.e. longeron 18) was crushed and ripped open, between STA 37 and 200. The forward accessory compartment and the nose gear wheel well were completely destroyed.

The left windshield, and center windshield were found in position, however shattered. The right windshield and right side windows were found intact and undamaged. The windshield wipers were noted in an upright position. The left side windows and fuselage nose structure suffered severe impact damage.

The radome was found in small sections throughout the debris field and around the airport approach lighting system support column No. 1 (Refer to the attached Wreckage Distribution diagram). A five foot by six foot skin panel assembly from the lower fuselage nose was displaced aft and to the right of the fuselage several feet. Electrical wiring and avionics boxes were found mangled and displaced to the right of the fuselage nose, adjacent to the Electrical /Electronics compartment.

An eight foot section of the approach lighting system catwalk side support angles (i.e. angle iron, measuring 4 inches x 4 inches) was found protruding from the right side of the fuselage at STA 148, longeron 16 (i.e. immediately behind the co-pilot station). The angle iron extended outward and upward from the fuselage. The fuselage skin surrounding the approach lighting support structure was ripped and torn outward.

Large sections of the approach lighting system catwalk side support angles and steel decking were found imbedded beneath the cockpit flight deck. Sections of the catwalk structure punctured the left lower fuselage and were found at stations 120 and 148.

Additional catwalk structure was found protruding from the forward fuselage upper crown near STA 351. Considerable fuselage skin wrinkling and buckling was noted between stations 200 and 370, beneath longeron 18 right. The forward fuselage belly was severely crushed and torn open from the nose to STA 579. The windows along the entire right side of the forward fuselage section were found intact and undamaged.

Between STA 218 and 375, longeron No. 1 and the cabin floor, the entire fuselage skin was missing. The remaining edges were torn and jagged. Major deformation was noted around the entire perimeter. The left overhead bins were missing. The overhead electrical wiring was sagging into the cabin. The first class seating on the right side of the airplane was generally found in position and in fair condition. However, the left first class seats were torn from their seat tracks and missing. The floor structure was severely buckled laterally and longitudinally between STA 218 and 300. The floor boards were missing and /or heavily damaged along the left side of the fuselage. The lateral floor beams were buckled and bent upwards. The left inboard and outboard seat tracks were fractured at numerous locations throughout this region.

Between STA 375 and 588, from the crown to below the floor line, the entire left side of the fuselage was severely crushed, buckled aft, and sheared away (i.e. outboard) from the remaining airframe. The perimeter of the opening surrounding the damage was torn and jagged. The floor structure and entire belly, including the forward and mid cargo compartments, were destroyed. The approach lighting system support structural platform, identified herein as station No. 3, was found entangled and imbedded with the torn away airframe structure immediately adjacent to the fuselage.

Note: The station No. 3 platform, referenced above, measured approximately 4 feet long by 11 feet wide by 5 feet high. The platform base was manufactured from steel "C" channels, measuring 12 inches high by .25 inches thick, which supported a 1.0 inch steel decking and 3 foot perimeter fence assembled from 2.0 inch diameter steel poles. The platform was supported by four steel posts (i.e. columns) each measuring 5.0 inches in diameter by approximately 15 feet tall, and numerous additional sections of angle iron bracing /support structure. Further note that the No. 3 platform was similar in construction to the No. 7 platform, found directly in contact with the left horizontal stabilizer. Refer to the attached Wreckage Distribution diagram.

2.1.3 Center Fuselage

Along the left side of the fuselage, between STA 588 and 749, numerous dents, punctures, tears, and jagged openings were found in the upper fuselage skin (i.e. crown). Twisted sections of the airport approach lighting system support structure (i.e. steel angle iron, measuring 1.5 inches x 1.5 inches) were found entangled and protruding from the damaged areas of the fuselage crown. The passenger windows along this section of the fuselage remained intact. The left side of the fuselage was crushed inward just forward of STA 749, where the center fuselage had separated from the rear fuselage.

Along the right side of the fuselage, between STA 579 and 788, the windows were found intact and unbroken. The fuselage center section was found rolled left (view looking forward) approximately 45°. The right side of the fuselage was basically undamaged. However, the surfaces of the fuselage section in contact with the ground were crushed upwards. The fuselage was ripped and torn beneath the right static ports, aft of STA 598.

2.1.4 Rear Fuselage

The majority of the upper fuselage (i.e. above the left and right window belts) between STA 788 and the rear pressure bulkhead (i.e. STA 1338) was consumed by fire. The perimeter edges of the remaining fuselage skin panels and underlying frames appeared molten and sagged inward. The entire fuselage interior, including seat frames, cushions, sidewall panels, ceiling panels, and stowage bins, from STA 788 to STA 1338, and major portions of the rear pressure bulkhead itself, were consumed by post crash fire and /or heavily charred.

Between STA 788 and 886, between longeron No. 5 and No. 11 left, severe heat damage was noted on the remaining fuselage skin panels above the window belt area. The skin panels in this region sagged inwards between the frames and longerons, external paint was missing, and heavy sooting was noted. Below the window belt area paint discoloration, heavy fire, and sooting damage was noted.

Along the left side of the fuselage between STA 886 and 965, the remaining fuselage structure below the window belt region was found heavily burned, charred, and sooted. The remaining external paint scheme (i.e. red stripe) varied from partially discolored to completely darkened due to the fire and heat damage in this region.

Between STA 788 and 965, the left wing to body upper fairing sections were consumed by fire. The remainder of the wing to body upper fairing surfaces aft of STA 965 were structurally intact and exhibited no fire damage.

Between STA 965 and 1098, the remaining left fuselage skin panels from approximately longeron No. 11 to the floor line (i.e. longeron No. 18) suffered severe heat damage. The remaining skin edges were melted and curled inward. The external paint scheme was missing along the window belt (i.e. blue stripe) and discolored and /or completely missing below the windows (i.e. red stripe). Minor sooting damage was noted below these regions.

The cabin floor was burned and had sagged downward beginning at approximately STA 1085, along the right side of the fuselage. The damage to the floor widened as it extended aft to approximately STA 1260. The floor along the right side of the fuselage was completely consumed near the aft end of the rear fuselage and the resulting void extended downwards to the floor of the aft cargo compartment below.

The remaining fuselage shell at approximately STA 1136 was severed above and

below the aft galley service door, due to impact damage caused by contact with a runway approach lighting system (steel) support column, measuring 16.0 inches in diameter by 0.5 inches thick. Refer to the attached Wreckage Distribution diagram. The upright support column penetrated the aft galley door opening near the forward frame and passed through the lower threshold structure and upper forward corner opening. The fuselage skin assy below the door opening was crushed inward and torn between STA 1136 and 1155, immediately adjacent to the support column. The remaining fuselage skin above the aft galley door suffered severe heat damage and discoloration. The remaining fuselage skin panels and perimeter edges in this region were curled inward.

Between STA 1212 and 1271, the left fuselage shell above longeron No. 10 was consumed by fire. The edges of the remaining airframe were melted and sagged inward. No evidence of soot was noted on the adjacent external surfaces. However, the internal adjacent surfaces were heavily burned and charred. Between longeron No. 11 and No. 17 the fuselage skin suffered severe heat damage in several locations. Portions of the skin were consumed with moderate to severe external paint discoloration and blistering noted immediately adjacent to the consumed areas.

Between STA 1309 and 1338, the left fuselage skin suffered severe heat damage between longeron No. 1 and the upper surface of the pylon. The fuselage skin between these stations was consumed, the perimeter edges were melted, and sagged inward. No evidence of soot damage was noted on the adjacent external surfaces. However, the internal surfaces were heavily burned and charred.

The aft pressure bulkhead was melted through in two separate locations. One area measuring approximately 2 feet by 2 feet near its upper left corner, and a second area measuring approximately 8 inches by 1 foot in the lower left corner were completely consumed by the fire. The right side of the rear pressure bulkhead remained intact.

Two fire damaged portable oxygen bottles were found in the aft cabin. The bottles were still charged. Two burst aerosol cans, approximately 11 ounces in size, were found in the burned cabin debris. Numerous sodium chlorate oxygen generators were also found in the cabin debris. Several of the generators had melted through their steel containers.

The entire fuselage belly structure aft of the wings was crushed upwards.

No external damage was noted between STA 1338 and 1510, between the crown and the left pylon.

The passenger windows along the right side of the fuselage between STA 788 and 1079 were completely missing. The remaining airframe between STA 788 and 1098 was heavily burned between longeron No. 9 and No. 18 right. All edges of the remaining skin panels were burned and charred.

Between STA 1041 and 1120, minor fire and sooting damage was found on the

majority of the surfaces of the right wing to body fairing aft of the wing.

Between STA 1041 and 1271, between longeron No. 1 and No. 18 right, the entire fuselage shell (i.e. skin, frames, and longerons) was consumed by fire.

No external structural damage was noted to the right side of the fuselage between STA 1271 and 1338. However, sooting damage was noted between STA 1287 and 1322, between longeron No. 1 and longeron No. 8 right.

No structural damage was noted between STA 1338 and 1437, between longeron No. 1 and the right engine pylon. However, the fuselage skin was burned and sooted between STA 1361 and 1401, between the vertical stabilizer and the pylon.

Between STA 1174 and 1338, the entire lower fuselage shell was crushed and the right skin /frame assemblies between longeron No. 18 and No. 24 bent outward. The fuselage skin was torn open longitudinally along longeron No. 20 right, between STA 1250 and 1322. The skin panels above this region were heavily burned and /or sooted.

The tail section aft of the rear pressure bulkhead (STA 1338) was found at rest on the ground with the right lower surface skin panels torn away from their frames.

2.1.5 Tail Cone

The tail cone was found separated from the rear fuselage at frame STA 1510, with the forward edge displaced to the left and aft of the tail approximately one foot. The tail cone access door was found intact. Minor damage was noted on the tail cone lower surface, including a tear approximately two feet forward of the tail cone trailing edge. The tail cone slide was found intact and stowed in its slide container. The slide was attached to its tail cone deployment lanyard, however, had not been deployed.

Note: In lieu of the tail cone falling away from the rear of the fuselage when it separated, and thereby deploying the tail cone slide, the tail cone had actually been pushed upwards and made contact with the bottom of the rudder, due to the terrain found immediately beneath the tail.

2.1.6 Doors /Emergency Exits

2.1.6.1 Forward Entrance

The forward entrance door, located on the left side of the fuselage at STA 180, (i.e. just aft of the cockpit) was found heavily damaged and forced ajar in its structural opening. The upper forward corner and entire leading edge of the door was pushed inward. The lower half of the outer door suffered extensive impact damage. A section of the approach lighting system support structure (i.e. steel angle iron, measuring 4 inches x 4 inches) punctured the fuselage near the lower door hinge and extended inward and downward passing through the adjacent floor

structure. The door was wedged into its surrounding structure and could not be opened with considerable force.

2.1.6.2 Forward Galley Service

The forward galley service door, located on the right side of the fuselage across from the forward entrance door, was found intact and closed. Minor damage was noted to the fuselage structure surrounding the door, causing interference with the door. The upper forward corner and leading edge were displaced inward. The door interior and exterior handles were found rotated approximately 30° open. However, the door handles could not be rotated further in the open direction and the door could not be forced opened.

2.1.6.3 Emergency Exits

The right aft (overwing) emergency exit door, located at STA 916, was found approximately five feet outside of the fuselage, directly outboard and aft of its opening. The exit door was structurally intact and undamaged. No fire damage was noted. The internal exit door handle and associated latch were found in their open positions. The external handle was found in the closed and latched position.

Note: When the external handle is operated (i.e. unlatched) the spring loaded handle operates the door latch and internal handle. However, when the internal handle is operated, the door latch is released and the external handle unaffected.

The right forward (overwing) emergency exit door, located at STA 875, was found inside the fuselage, directly adjacent to its opening. The exit door was severely burned and found in two major pieces. The internal exit door handle and associated latch were found in their open positions. The external handle was found in the closed and latched position.

The left emergency exit doors, located opposite the right emergency exits, were found inside the fuselage directly adjacent to their respective openings. Both exit doors suffered heavy fire damage and were found in several pieces. The internal exit door handles and associated latches on both doors were found in their open positions. The external handles were found in their closed and latched potions.

2.1.6.4 Aft Galley Service

Portions of the aft galley service door, located on the left side of the fuselage at STA 1154, (i.e. just forward of the left engine) were found internal to the fuselage, immediately adjacent to its opening. The upper two thirds of the door was consumed by the fire. The remainder of the door, including the lower door gate and handle operating mechanism were recovered. The lower gate was deflected inward partially. The handle was found rotated approximately 30° towards the open position. The lower cam rollers (i.e. latches) were found partially opened.

2.1.6.5 Aft Cabin Door

The aft cabin door, located at the center of the rear pressure bulkhead, was found almost fully opened and severely burned. The top left corner was melted.

2.1.6.6 Cargo

The forward cargo door was found intact, however heavily damaged. The cargo door was pushed inward from its normally closed and faired position and was buckled longitudinally approximately 18 inches beneath its upper edge. The lower half of the door was crushed upwards along with the entire lower fuselage.

The mid cargo door was found intact, closed and secure. The door was creased horizontally at longeron 25. The aft lower corner was pushed inward from its closed and faired position approximately one inch.

The aft cargo door was found intact and attached to its upper forward hinge. The upper aft hinge assembly was completely burned away. The lower section of the cargo door was buckled and found folded inward along a longitudinal axis approximately 24 inches from its upper edge. The upper forward corner of the door was heavily burned and sooted.

2.1.7 Cargo Compartments

The forward and mid cargo compartments were severely damaged due to the crushing of the lower fuselage. However, the majority of the baggage recovered from these compartments was in good overall condition.

The aft cargo compartment (i.e. aft of the wing) was severely burned. The majority of the cargo recovered from the aft end of the cargo compartment was also severely burned. However, the forward section of the aft cargo compartment was in fair condition with heavy soot damage present on all surfaces. The cargo liners in the forward section of the compartment were basically intact and the associated cargo recovered from these areas approximately 50% burned, moderate to heavy damage.

2.2 Wings

2.2.1 Left Wing

The left wing was fractured and completely separated inboard near its root and outboard near the wing tip /aileron. The separated wing and wing tip were found immediately adjacent to the main wreckage in close proximity to their normal positions.

The main wing separated from the aircraft at approximately 15 feet outboard of the wing root chord as measured along the front spar, and approximately 8 feet outboard of

the wing root chord as measured along the rear spar. The upper surface of the wing torque box suffered heavy fire and heat damage characterized by sagging skin, charred edges and sooting. The fracture plane of the wing extended from the front spar (aft and inboard) towards the rear spar at an angle of approximately 45°, as measured in reference to the wing front spar.

The upper surface wing skin, along the fracture plane, was generally curled upward and inboard. The fracture surfaces in the skin terminated at the rear spar (approximately 6.5 feet from the fuselage) in a semi-circular pattern, which measured approximately 18 inches in diameter.

The lower surface wing skin along the fracture plane was generally curled downward and inboard. The rear spar web was peeled away from its upper and lower spar caps between the rear spar fracture (approximately 9.5 feet outboard of the fuselage) and the termination of the upper wing skin fracture surfaces. The rear spar web was pushed inboard and forward and formed into a semi-circular pattern matching the damage to the upper surface skin adjacent to the rear spar.

The center fuel tank (left) outboard rib, located just inboard of the wing fracture plane, was found separated from its upper and lower chords and the rear spar. The outboard surfaces of the center fuel tank rib were discolored and appeared darker near the upper surface of the wing. The upper (internal) surfaces of the center fuel tank were heavily sooted. However, the internal surfaces of the adjacent main fuel tank experienced no fire damage. The rear spar was heavily burned in this area. The adjacent fracture surfaces were all sooted and charred.

The main wing was located immediately adjacent to the inboard wing fracture plane described above. The separated wing was found rotated approximately 60° counter clockwise (as viewed from above) about its trailing edge, at the point of fracture. The general condition of the wing upper and lower surfaces was good. The left wing main fuel tank exhibited no fire damage. The rear spar, near the overall fracture of the wing, was damaged due to heat on its forward surfaces, as witnessed by dark paint discoloration. The rear surfaces of the rear spar, near the overall fracture of the wing, were heavily burned and sooted.

The wing tip and outer portions of the aileron were found approximately nine feet from the approach lighting system support column No. 6. Refer to the attached Wreckage Distribution diagram for the location of the support column. The outer wing had separated from the main wing approximately 11 feet inboard of the wing tip, as measured along the trailing edge. Ground cover (i.e. grass /hay) was found imbedded in two of the outer slat leading edge hinge attachment openings of the wing. The landing light was found in the deployed position and was heavily damaged due to impact.

2.2.1.1 Leading Edge and Slats

The left wing leading edge slats attached to the wing root section (i.e. inboard of

the main wing fracture) were found intact and in their extended position. No damage was noted to the leading edge of the wing or the slats in this area.

The left wing leading edge slats attached to the main wing were also found basically undamaged and in their extended position. However, the outboard slat suffered impact damage near the point where the outer wing and wing tip separated from the main wing.

2.2.1.2 Trailing Edge

Major sections of the left wing fixed upper and lower composite trailing edge panels were heavily burned and charred, in the wing root area inboard of the wing fracture plane described above. Minor damage was noted to the trailing edge panels outboard of the wing fracture plane, predominately on the lower surfaces.

2.2.1.3 Aileron /Tabs

The inboard 45 inches of the aileron and its control tab remained attached to the main wing, just inboard of the outer wing separation. The remainder of the aileron, including the trim tab, was found heavily damaged and in several sections near the runway approach lighting system support column No. 6, along with the separated wing tip.

2.2.1.4 Flight /Ground Spoilers

The left wing ground spoiler was fractured at mid span just inboard of its center actuator (i.e. coincident with the main wing fracture plane). The inboard half of the ground spoiler was heavily sooted on its entire upper surface. However, no sooting was noted to the outboard section of the spoiler. No damage was noted to either of the flight spoilers. The ground spoiler and both flight spoilers were found in their stowed positions.

2.2.1.5 Inboard /Outboard Flaps

The inboard flap separated at approximately 48 inches from the fuselage, coincident with the fracture plane of the wing. The inboard section remained attached to the remaining wing root and fuselage flap track. The flap was found in the fully extended position.

The outboard section of the inboard flap, attached to the separated main wing, was found severely wrinkled and punctured at numerous locations. The fracture plane was torn and jagged. Sooting was noted on the upper leading edge surfaces just outboard of the wing separation.

The outboard flap was found basically intact and remained attached to the main wing. The upper surface skin of the outboard flap was wrinkled and punctured at

several locations near its outboard end. A puncture /tear, measuring approximately 5.0 inches in the chordwise direction by 2.0 inches in the spanwise direction, was found near the inboard end of the flap, near its mid chord. The trailing edge was damaged along its full span. No fire damage was noted on the outboard flap. The flap was found in the fully extended position.

2.2.1.6 Fuel

Ninety-one (91) gallons of jet fuel were pumped from the main tank of the left wing. An additional 432 gallons of fuel were recovered from the environment immediately surrounding the crash site. Refer to Attachment IV.

2.2.2 Center Wing

The front spar of the wing center section was severely damaged due to impact forces and fire. The lower chord was completely burned away between the right side of the keel beam and approximately 16 inches to the left of the keel beam. The remaining lower chord was fractured at numerous locations. Major impact damage was noted on the right spar web, approximately 16 inches to the right of centerline (view looking forward), and along the lower chord near the keel beam. The damaged web was jagged and deformed aft. The slat drive mechanism was found deflected to the right of its normal centerline position and was pushed thru the damaged spar web section previously identified. The full height of the spar web was missing between the keel beam and 16 inches to the left of centerline. The remaining left spar web was pulled forward and away from the front spar.

The center wing fuel tank was completely dry. The inner surfaces of the fuel tank to the left of the wing centerline rib were discolored predominately near the upper surfaces of the tank, where the surfaces were sooted and browned. The lower internal surfaces of the tank were clean. However, the lower external surfaces of the wing center section lower skin were heavily charred and sooted immediately aft of the damaged front spar. The fire damage extended approximately three feet laterally and two feet aft from the centerline of the wing. The ground immediately forward of the damaged center section spar experienced heavy fire damage. The surrounding ground cover beyond this area was unburned.

An aluminum three phase power feeder cable for the No. 1 engine was routed through a floor beam on the left side of the fuselage immediately above the front spar damage noted above. All three conductors were melted approximately 8 inches forward of the spar. The insulation was completely burned off the conductors to a point approximately 6 inches aft of the separation. No arcing was visible on the conductors.

No melting was visible on any of the numerous steel flight control cables or copper electrical wires in the area forward of the front spar. Much of the insulation was burned off the copper wires in this area. However, no arcing damage was visible on any of the involved wires.

2.2.3 Right Wing

The right wing was found in good overall condition and attached to the fuselage. Negligible structural damage was noted to the right wing torque box structure (i.e. between the front spar and rear spar, root chord to tip, upper and lower surfaces). The wing tip was found intact. The right wing landing light, mounted on the lower surface of the wing tip, was found in the deployed position. The wing to fuselage upper fairing panels were found intact along their entire length. No fire damage was noted on any of the right wing surfaces.

The main landing gear rear spar attachment fitting was found undamaged and attached to the main landing gear trunnions, however separated from the rear spar. The lower two attachment bolts (i.e. common to the rear spar lower cap) were found protruding from the rear spar. The lower attachment bolts had failed in tension aft of the bolt shank in the threaded portion of each bolt.

2.2.3.1 Leading Edge and Slats

The leading edge slats were all found intact and attached to the wing. The slats were all found near their fully extended position. The fourth slat outboard was dented along the leading edge, near its inboard end. Minor damage was noted to the remaining slats.

The wing leading edge upper surface skin, forward of the front spar, was found torn just outboard of the inboard slat (i.e. front spar station Xfs 73). The damage extended approximately 16 inches in the chordwise direction and approx. 2 inches in the spanwise direction. The jagged edges of the tear were deformed inward. However, no damage was noted to the slat immediately forward of the leading edge damage. Note: The damaged leading edge skin noted above is concealed by the leading edge slat when retracted.

A narrow tear was also noted on the wing leading edge upper surface skin at Xfs 110. The tear began at the front spar and extended forward of the front spar approximately 9 inches in the chordwise direction. Miscellaneous shallow scrapes and indentations were found on the wing upper surface between the front spar and the leading edge of the wing and also on the adjacent slats between Xfs 95 and 128.

2.2.3.2 Trailing Edge

Sections of the upper surface fixed trailing edge panels near the wing root (i.e. above the main landing gear) were found missing and /or damaged. The remaining sections of the trailing edge were basically undamaged.

2.2.3.3 Aileron /Tabs

The right aileron was found intact and attached to the wing at its hinge points. The aileron moved freely about its hinges. The aileron trim and control tabs were found intact and undamaged.

2.2.3.4 Flight /Ground Spoilers

The right ground spoiler and flight spoilers were found attached to the wing. Although, the ground spoiler was found almost completely severed just outboard of its actuator hinge, no damage was noted to either of the flight spoilers. The ground spoiler and both flight spoilers were found in their stowed positions.

2.2.3.5 Inboard /Outboard Flaps

The right wing inboard flap was recovered in two major sections. Approximately 80% of the inboard section of the flap, including the inboard flap track assembly, were separated from the wing and were located immediately behind the wing. The outer half of the leading edge flap vane was also detached and was found just forward of the right wing.

The right wing outboard flap was found intact and with minor trailing edge damage along its entire span.

2.2.3.6 Fuel

One thousand and eight (1008) gallons of jet fuel were pumped from the main tank of the right wing. No indication of fuel leakage was noted from the right wing main tank.

2.3 Empennage

2.3.1 Horizontal Stabilizer

The left horizontal stabilizer was found basically intact and attached to the vertical stabilizer. Impact damage was noted on the leading edge nose skin approximately four feet inboard of the horizontal stabilizer tip. The damage was found just outboard of the anti-float access panel and measured approximately one foot in the spanwise direction by the full depth of the chord and extended in the chordwise direction from the leading edge skin to the front spar. The damaged stabilizer was found contacting a runway approach lighting system structural support column at station No. 7. Refer to the attached Wreckage Distribution diagram for the location of the support column. No further damage was noted on the horizontal stabilizer. The leading edge of the horizontal stabilizer was found approximately seven inches below its alignment marks noted on the vertical stabilizer.

The right horizontal stabilizer was found intact and attached to the vertical tail. No structural damage or fire damage was noted on any of the stabilizer surfaces, including

the leading edge, trailing edge, or stabilizer tip.

2.3.1.1 Elevator /Tabs

The left and right elevators and their associated tabs (i.e. control, geared, and anti-float tabs) were found intact and attached to the horizontal stabilizer. No structural or fire damage was noted on any of the surfaces of the elevators or their associated tabs. The left and right elevators were found deflected equally (trailing edge down). The trailing edge of the right elevator was aligned with its alignment marks on the vertical stabilizer.

2.3.2 Vertical Stabilizer

No structural damage was noted to any of the surfaces of the vertical stabilizer, including the dorsal fin, leading edge, upper fairings, trailing edge, or side skin panels. Likewise, no evidence of any fire damage or sooting was noted on any of the stabilizer surfaces.

2.3.2.1 Rudder /Control Tab

The rudder was found intact and attached to the vertical stabilizer as was the rudder control tab. No structural or fire damage was noted to any of the rudder or control tab surfaces. The rudder moved freely about its hinges; however, did rub slightly on the detached tail cone previously noted.

2.4 Nacelles /Pylons

2.4.1 Left Engine

No structural or fire damage was noted on the left engine nacelle /pylon.

2.4.2 Right Engine

No structural damage was noted to the right engine nacelle /pylon. However, sooting damage was noted on the upper surface of the pylon from approximately STA 1309 to the trailing edge.

2.5 Landing Gear

2.5.1 Nose Landing Gear

The nose landing gear (NLG) strut and attached wheel assembly was found protruding from beneath the right side of the fuselage belly at STA 340. The NLG trunnion support structure was found immediately adjacent to the right side of the fuselage nose. Both tires were found deflated and both inboard wheel halves were cracked. The nose wheel steering cylinders were found in the debris field.

2.5.2 Left Main Landing Gear

The trunnion support attach fitting was found attached to the rear spar and undamaged. The landing gear strut was attached to the fore and aft trunnion supports and the respective trunnion support bolts were intact. The left main landing gear retract actuator piston was separated from the actuator and its strut attachment, however was found in the debris field. The fixed upper brace was found attached and undamaged. The down lock over centering mechanism linkage was fractured and missing. The side brace was folded and intact. The shimmy damper was separated from the lower torque arm due to separation of the apex bolt nut and locking device. Note: The apex bolt was found in position (i.e. attached to the shimmy damper) and the threaded section of the bolt (i.e. inboard end with gear in the extended position) was stripped. The shimmy damper reservoir system was missing. The gear was found lodged in the wheel well with the piston /wheel assembly rotated 90° clockwise (view looking inboard) from its normally stowed position. The inboard wheel brake housing was fractured and several pieces were missing.

2.5.3 Right Main Landing Gear

The right main landing gear and its rear spar attachment fitting were found separated from the rear spar and at rest immediately aft of the right wing. The landing gear strut was intact and attached to its fore and aft trunnions as well as its piston /wheel assembly. The retract actuator piston was separated (i.e. pulled) from the actuator; however, remained attached to the landing gear strut. The fixed upper brace and side brace were in fair condition, however torn away from the wing. Both wheel assemblies were damaged due to impact.

E. LIST OF ATTACHMENTS

I. Aircraft Wreckage Distribution

II. Photographs of Wreckage

III. General Description of the McDonnell Douglas DC-9-82 (MD-82)

IV. Fuel Report, Heritage Environmental Services

[redacted]

Kevin M. Pudwill
Aerospace Engineer

[redacted]
12/7/99