Tailstrike on landing, Airbus A300-600R, February 6, 1997

Micro-summary: **This Airbus A300-600R encountered a tail strike during landing at St. Johns, Antigua.**

Event Date: **1997-02-06 at 1440 AST**

Investigative Body: **National Transportation Safety Board (NTSB), USA**

Investigative Body's Web Site: **http://www.ntsb.gov/**

Cautions:

1. Accident reports can be and sometimes are revised. Be sure to consult the investigative agency for the latest version before basing anything significant on content (e.g., thesis, research, etc).

2. Readers are advised that each report is a glimpse of events at specific points in time. While broad themes permeate the causal events leading up to crashes, and we can learn from those, the specific regulatory and technological environments can and do change. ***Your company's flight operations manual is the final authority as to the safe operation of your aircraft!***

3. Reports may or may not represent reality. Many many non-scientific factors go into an investigation, including the magnitude of the event, the experience of the investigator, the political climate, relationship with the regulatory authority, technological and recovery capabilities, etc. It is recommended that the reader review all reports analytically. Even a "bad" report can be a very useful launching point for learning.

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National Transportation Safety Board

FACTUAL REPORT
AVIATION

NTSB ID: DCA97LA027	Aircraft Registration Number: N41063
Occurrence Date: 02/06/1997	Most Critical Injury: None
Occurrence Type: Accident	Investigated By: NTSB

Location/Time

Nearest City/Place	State	Zip Code	Local Time	Time Zone	
ST JOHN ANTIGUA			1440	AST	

Airport Proximity: On Airport	Distance From Landing Facility:	Direction From Airport:

Aircraft Information Summary

Aircraft Manufacturer	Model/Series	Type of Aircraft
Airbus Industrie	A-300-600R	Airplane

Sightseeing Flight: No Air Medical Transport Flight: No

Narrative

Brief narrative statement of facts, conditions and circumstances pertinent to the accident/incident:

On February 6, 1997, at 1440 Atlantic standard time, N4106, an Airbus A300-600R, operated by American Airlines as flight AA699, was damaged on the underside of the lower fuselage when the tail section struck the runway surface during landing at V. C. Bird International Airport in St. Johns, Antigua. The extent of the airplane damage was substantial. The Captain, First Officer, seven flight attendants and 161 passengers were not injured. The flight, a scheduled CFR Part 121 operation from San Juan (SJU) to the Antigua (ANU), was uneventful until the landing event. Visual meteorological conditions prevailed and an Instrument Flight Rules (IFR) flight plan was filed.

In accordance with the International Standards and Recommended Practices of ICAO Annex 13, para 5.1, the state of occurrence, Antigua and Barbuda, in a letter dated February 11, 1997, delegated the accident investigation to the state of registry/operator, the United States of America, and the NTSB is responsible for the investigation and report.

The pilot/operator report dated February 14, 1997, submitted by the American Airlines Senior Administrator Flight Safety stated that the flightcrew reported that the Captain was the flying pilot during a VOR DME Rwy 07 approach to the airport. At about 2,500 feet msl., they maneuvered to avoid TCAS traffic which was visually sighted. At 1,000 feet, on the final approach with the landing runway in sight, the First Officer made the company procedural 1,000 foot verbal callout and the Captain brought the power above idle. The crew reportedly observed the flight to be slightly high at 1,000 feet; by 500 feet the crew felt that airplane was "in the slot" with the airspeed about 20 knots above the reference speed and decreasing. At about 200 feet the First Officer recalled that he advised the Captain that the airspeed was slightly low. In response, the Captain added power. The approach appeared normal to the crew until the automatic aural altitude call out began at 50 feet. The Captain sensed that the timing of the call outs from 30 feet down were slightly faster than normal. The Captain recalled that he initially flared at about 30 feet and reduced power to idle. In an effort to cushion the descent, he "deepened" the landing flare "just prior to touchdown." The touchdown was reported to be "firm" and resulted in a bounced landing. A second touchdown occurred in a higher than normal pitch attitude. A flight attendant reported to the Captain that she heard "a loud noise" upon landing and a post flight inspection revealed that a tail strike had occurred to the underside of the fuselage.

A brief description of the airplane damage provided by the Directorate of Civil Aviation for Eastern Caribbean States indicated 5 belly skin panels scraped through, buckled, and destroyed, all frames and stringers within the damage area buckled or sheared, 3 struts broken and a floor beam twisted. American Airlines specialized maintenance personnel performed a temporary repair in Antigua. An FAA ferry permit was issued and the airplane was flown, unpressurized, to the American Airlines maintenance facility in Tulsa, Oklahoma for complete repair and return to service.

American Airlines crew scheduling information indicated the Captain and First Officer had a

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Narrative (Continued)

scheduled duty period of 9 hours and 20 minutes on the day of the accident. During that period, in addition to the accident flight of about 40minutes, the crew logged 3.0 hours of flying time from JFK to SJU. The crew was not scheduled for duty during the 24 hour day previous to the accident. Prior to that non-duty day, both crew members attended 3 days of ground training.

American Airlines crew records indicated the Captain had over 19,000 hours of flying experience with 4,671 hours in the A300 airplane.

The American Airlines A300 Operating Manual, Techniques section, page 9 dated 8-14-95, contains a diagram describing the Landing Approach. It illustrates an airplane at 15 feet above the runway with a pitch angle of 5.9 degrees nose up. The American Airlines A300 Operating Manual, Techniques section, page 8 dated 8-14-95, contains a paragraph "Stabilized Approach Concept" as follows:

The stabilized approach concept requires that, before descending below the specified minimum stabilized altitude, the airplane should be- * in the landing configuration(gear down and final flaps), * on Approach Speed, * on the proper flight path at the proper sink rate, * and at stabilized thrust.

And these conditions should then be maintained throughout the rest of the approach. The minimum recommended stabilized approach altitudes are: * VFR - 500 ft. AFL * IFR - 1000 ft. AFL

In response to a Safety Board request for the weight and balance data for the accident flight, American Airlines Operations and Load Planning departments provided the following data; Landing weight 275,218 lbs. Landing CG: 27% Vref. Flaps20/139 KIAS; Flaps 40/128 KIAS Vapp.••Flaps20/145 KIAS; Flaps 40/134 KIAS

Although American Airlines company procedures require protection of the CVR from automatic erasure/overwrite following an accident, these procedures were not adhered to and the CVR was activated on the ground in Antigua. When the CVR was readout in the Safety Board's laboratory in Washington, D.C., the recorded conversation was found to be from maintenance personnel not pertinent to the accident.

The DFDR was read out in the Safety Board's laboratory in Washington, D.C. The data from the DFDR indicated the following:

At about 1000 feet radio altitude, the computed airspeed was 148 knots, the engines were at minimum thrust (30% RPM), and the pitch attitude was about 2 degrees nose down (sampled once each second).

At about 500 feet radio altitude, the computed airspeed was 143 knots, the engines were at minimum thrust (30% RPM), and the pitch attitude was about 1/2 degree nose up.

At about 100 feet radio altitude, the computed airspeed was 138 knots, the engines were at 50 to 60% RPM, and the pitch attitude was about 4 degrees nose up.

At about 30 feet radio altitude, the computed airspeed was 135 knots, the engines were at about 55% RPM, and the pitch attitude was about 6 degrees nose up.

At about 0 feet radio altitude, the computed airspeed was 124 knots, the engines were at 45 to 50% RPM, the pitch attitude was about 9 degrees nose up, and a vertical acceleration of 1.55 "g" was recorded. Landing gear air/ground indications (left, right, and nose landing gear strut compression sampled once each second), remained in the "air" position for the next 9 seconds.

During the 9 second interval, the radio altitude remained about 0 feet, the computed airspeed remained about 124 knots, the engines accelerated to between 60 and 80% and then decreased to 40 to

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Narrative (Continued)

50% RPM, the pitch attitude increased to 10.89 degrees nose up, a 2 "g" vertical acceleration was recorded, and the air/ground indications began to indicate "ground."

From the DFDR data, Safety Board performance engineers derived descent rates and flight path angles for the final approach. The calculations show for the 30 seconds prior to air/ground touchdown indications, that the airplane descent rate was from 1700 feet per minute (fpm) decreasing to about 1000 fpm. and the flight path angle was from 5.8 degrees decreasing to 2.7 degrees.

Shortly after the accident the flight crew members involved each received a proficiency check accomplished in the American Airlines training department. These checks were observed by an FAA operations inspector from the certificate management office. The checks were graded satisfactory and the crew members returned to their scheduled line flying duties.

In March 1998, the American Airlines A300 Fleet Support Team published A300 Briefing Bulletin No. 3, "Avoiding Tail Strikes." The context of the bulletin indicated that, "Deviation from normal landing technique is the most common cause of tail strike, especially: -Allowing the speed to decrease well below Vapp. -Holding the airplane off the ground for a smooth landing. -Flare started too high. -Failure to fly the nose gear on to the runway after touchdown.'

The stated purpose of Briefing Bulletin no. 3 was "to provide flight crews with information and operational guidelines concerning the avoidance of tail strikes." A bulletin is not intended to be a procedural document.

On May 1, 1998, The AA A300 Operating Manual, Chapter 10, TECHNIQUES, was modified to include a paragraph titled, "Tail Strike Avoidance." The operating manual change indicated that, "Deviation from normal landing technique remains the most common cause of tail strikes. Specifically: -Allowing Speed to Decrease Well Below Vapp on Short Final. -Holding the Airplane Off the Runway. -Flare Too High. -Failure to Fly the Nose Gear onto the Runway After Touchdown.'

On September 2, 1998, in response to queries from the Safety Board regarding further accident prevention efforts, the American Airlines Flight Safety department sent the following message to the Safety Board relative to the accident with AA flight 699 of February 6, 1997.

American Airlines has expressed to its crews a "no-fault go-around" policy. Phrases such as "If you don't like what's going on or the way things look-get out of town", authored by Captain Cecil Ewell, Vice President of Flight and Chief Pilot are used to communicate this policy to the pilot force via many avenues. We have these iterations in the Flight Deck Magazine, and briefing bulletins on various subjects that express this doctrine.

We are in receipt of a report from the Flight Safety Foundation, dated February-March, 1998, entitled DATA SUPPORT SAFETY ACTIONS RECOMMENDED BY FSF APPROACH-AND-LANDING ACCIDENT REDUCTION TASK FORCE. Paragraph 4 of this report suggests a need for a no-fault go-around policy such as American Airlines has, and further suggests "Companies should declare and support no-fault go-around and missed-approach policies."

In order to best accomplish the declaration of no-fault go-around as our policy, American Airlines will amend its operational manual system to include specific verbiage to communicate this concept as our policy. A decision as to the placement of this verbiage has not yet been made, i.e.; whether to include this in our Flight Manual Part One, the general operations manual, or to include it in each fleet's Airplane Operating Manual. It will be made in such a way that all pilots operating all of our fleet types will understand that no-fault go-around is the policy at American Airlines.

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Occurrence Type:	Accident

Narrative (Continued)

I will keep you advised as this process matures, and provide a copy of the final product as it relates to the A300 fleet for your files.

Thank you for your assistance.

/signed/ Senior Administrator Flight Safety

On August 15, 1999, American Airlines Flight Manual Part 1, for all flightcrew was modified to include the following, "Paragraph 5 Missed Approach, 5.1 General, American Airlines has a no-fault go-around policy, recognizing that a successful approach can end in a missed approach. Captains are required to execute/order a missed approach if the aircraft is not stabilized by 1000 feet AFL(IFR) or 500 feet AFL (VFR), or if in the pilot's judgement a safe landing cannot be accomplished within the touchdown zone, or the aircraft cannot be stopped within the confines of the runway."

Further, American Airlines Flight Operations Technical Information Bulletin Number 99-07, dated September 1999, titled " Landing Tail Strike Avoidance" was distributed to all flightcrew. Also, AA Flight Safety magazine Nov/Dec 1999 issue, published for all flightcrew contained two articles pertaining to this accident, "Avoiding Tailstrikes: Energy Management" and "A Tale of Two Tails".

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FACTUAL REPORT AVIATION

NTSB ID: DCA97LA027

Occurrence Date: 02/06/1997

Occurrence Type: Accident

Landing Facility/Approach Information

Airport Name	Airport ID:	Airport Elevation	Runway Used	Runway Length	Runway Width
ST JOHNS/V.C BIRD INTERNA	TAPA	62 Ft. MSL	7	9003	150

Runway Surface Type: Asphalt

Runway Surface Condition: Dry

Type Instrument Approach:

VFR Approach/Landing: Full Stop; Straight-in

Aircraft Information

Aircraft Manufacturer	Model/Series	Serial Number
Airbus Industrie	A-300-600R	506

Airworthiness Certificate(s): Transport

Landing Gear Type: Retractable - Tricycle

Homebuilt Aircraft?	Number of Seats:	Certified Max Gross Wt.	Number of Engines:
No	267	375800 LBS	2

Engine Type:	Engine Manufacturer:	Model/Series:	Rated Power:
Turbo Fan	GE	CF6-80C2A5	60100 LBS

- Aircraft Inspection Information

Type of Last Inspection	Date of Last Inspection	Time Since Last Inspection	Airframe Total Time
Continuous Airworthiness	02/1997	312 Hours	22804 Hours

- Emergency Locator Transmitter (ELT) Information

ELT Installed?	ELT Operated?	ELT Aided in Locating Accident Site?

Owner/Operator Information

Registered Aircraft Owner	Street Address	City	State	Zip Code
WILMINGTON TRUST	1100 NORTH MARKET ST.	WILMINGTON	DE	19890

Operator of Aircraft	Street Address	City	State	Zip Code
AMERICAN AIRLINES, INC.	4333 AMON CARTER BLVD	FORT WORTH	TX	76155

Operator Does Business As:

Operator Designator Code: AALA

- Type of U.S. Certificate(s) Held:

Air Carrier Operating Certificate(s): Flag Carrier/Domestic

Operating Certificate:

Operator Certificate:

Regulation Flight Conducted Under: Part 121: Air Carrier

Type of Flight Operation Conducted: Scheduled; International; Passenger Only

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FACTUAL REPORT AVIATION

NTSB ID: DCA97LA027

Occurrence Date: 02/06/1997

Occurrence Type: Accident

First Pilot Information

Name	City	State	Date of Birth	Age
On File	On File	On File	On File	56

Sex: M | Seat Occupied: Left | Principal Profession: Civilian Pilot | Certificate Number: On File

Certificate(s): Airline Transport

Airplane Rating(s): Multi-engine Land

Rotorcraft/Glider/LTA: None

Instrument Rating(s): Airplane

Instructor Rating(s):

Type Rating/Endorsement for Accident/Incident Aircraft? Yes | Current Biennial Flight Review?

Medical Cert.: Class 1 | Medical Cert. Status: Valid Medical--no waivers/lim. | Date of Last Medical Exam: 12/1996

- Flight Time Matrix	All A/C	This Make and Model	Airplane Single Engine	Airplane Mult-Engine	Night	Instrument Actual	Instrument Simulated	Rotorcraft	Glider	Lighter Than Air
Total Time	19000	4671								
Pilot In Command(PIC)										
Instructor										
Last 90 Days		95								
Last 30 Days		40								
Last 24 Hours		4								

Seatbelt Used? Yes | Shoulder Harness Used? Yes | Toxicology Performed? | Second Pilot? Yes

Flight Plan/Itinerary

Type of Flight Plan Filed: IFR

Departure Point	State	Airport Identifier	Departure Time	Time Zone
SAN JUAN	PR	SJU	1357	AST

Destination	State	Airport Identifier
ST. JOHNS	OF	ANU

Type of Clearance: IFR

Type of Airspace: Class C

Weather Information

Source of Briefing: Company

Method of Briefing:

National Transportation Safety Board

FACTUAL REPORT AVIATION

NTSB ID: DCA97LA027

Occurrence Date: 02/06/1997

Occurrence Type: Accident

Weather Information

WOF ID	Observation Time	Time Zone	WOF Elevation	WOF Distance From Accident Site	Direction From Accident Site
ANU	1440	AST	62 Ft. MSL	0 NM	0 Deg. Mag.

Sky/Lowest Cloud Condition: Scattered 2300 Ft. AGL

Condition of Light: Day

Lowest Ceiling: Broken 2800 Ft. AGL

Visibility: 10 SM

Altimeter: 29.00 "Hg

Temperature: 28 °C

Dew Point: 22 °C

Wind Direction: 80

Density Altitude: Ft.

Wind Speed: 17

Gusts:

Weather Condtions at Accident Site: Visual Conditions

Visibility (RVR): 0 Ft.

Visibility (RVV) 0 SM

Intensity of Precipitation: Unknown

Restrictions to Visibility: None

Type of Precipitation: None

Accident Information

Aircraft Damage: Substantial

Aircraft Fire: None

Aircraft Explosion None

Classification: U.S. Registered/Foreign Soil

- Injury Summary Matrix	Fatal	Serious	Minor	None	TOTAL
First Pilot				1	1
Second Pilot				1	1
Student Pilot					
Flight Instructor					
Check Pilot					
Flight Engineer					
Cabin Attendants				7	7
Other Crew					
Passengers				161	161
- TOTAL ABOARD -				170	170
Other Ground	0	0	0		0
- GRAND TOTAL -	0	0	0	170	170

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FACTUAL REPORT
AVIATION

NTSB ID: DCA97LA027

Occurrence Date: 02/06/1997

Occurrence Type: Accident

Administrative Information

Investigator-In-Charge (IIC)

ROBERT M. MACINTOSH

Additional Persons Participating in This Accident/Incident Investigation:

HAROLD A WILSON
EASTERN CARIB. STATES
ANTIGUA, OF

JOHN H DARBO
AMERICAN AIRLINES
FT WORTH, TX 76158

FRANCOIS GREMY
BUREAU ENQUETES ACCIDENT
PARIS, OF

JEAN DANEY
AIRBUS INDUSTRIE
TOULOUSE, OF