# EXECUTIVE SUMMARY

## AIRCRAFT ACCIDENT INVESTIGATION

## Beechcraft 1900C, UB37, N27RA

## Tonopah Air Force Auxiliary Airfield, Nevada

## 16 March 2004

On 16 March 2004 at 0401:50 PDT, a Beechcraft 1900C assigned to the Air Force Flight Test Center, Edwards AFB CA crashed on the Nevada Test and Training Range approximately seven miles southeast of Tonopah Air Force Auxiliary Airfield, Nevada. The mishap pilot and four passengers were fatally injured upon impact with the ground. The mishap aircraft was destroyed.

The mishap aircraft was flying a passenger transport mission, and was on the second of three flight segments. The aircraft took off at 0306L from home station transporting nineteen passengers and made an uneventful landing at the first stop over point. After discharging all but four passengers, the mishap aircraft took off at 0343L for Tonopah AF Auxiliary Airfield. Six and a half miles from the runway the mishap pilot reported the runway lights in sight, configured the aircraft and then initiated a visual circling maneuver to the right for a visual straight-in approach to runway 32.

During the descending turn, the mishap pilot most probably became incapacitated and was unable to continue flying the aircraft. Approximately halfway through the turn, the mishap aircraft began a gradual descent. At 0401:50L, three-fourths through the turn and approximately seven miles southeast of the airfield, the mishap aircraft impacted the ground. Upon impact the aircraft broke apart and released fuel that immediately engulfed the cockpit and cabin areas in fire and dense smoke. Escape and/or rescue of personnel from the mishap aircraft, given the prevailing conditions, was not possible.

There was clear and convincing evidence that the mishap pilot suffered incapacitation due to sudden cardiac death during the approach to land that resulted in the mishap aircraft impacting the ground. A substantially contributing factor was that the mishap pilot, in violation of federal policy and directives, willfully ingested inappropriate medications, suppressed significant medical information and deceived flight medical examiners in the presence of a deteriorating and dangerous health condition.

*Under 10 U.S.C. 2254(d), any opinion of the accident investigators as to the cause of, or the factors contributing to, the accident set forth in the accident investigation report may not be considered as evidence in any civil or criminal proceeding arising from an aircraft accident, nor may such information be considered an admission of liability by the United States or by any person referred to in those conclusions or statements.*

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# COMMONLY USED ACRONYMS & ABBREVIATIONS

| | |
|---|---|
| A/C | Aircraft |
| ACC | Air Combat Command |
| AF | Air Force |
| AFB | Air Force Base |
| AFFTC | Air Force Flight Test Center |
| AFI | Air Force Instruction |
| AFIP | Armed Forces Institute of Pathology |
| AFMC | Air Force Materiel Command |
| AFTO | Air Force Technical Order |
| AGL | Above Ground Level |
| AIMS | Airborne Integrated Management System |
| ASI | Advanced Security |
| ATIS | Automated Terminal Information Service |
| Aux | Auxiliary |
| AWOS | Automated Weather Observation System |
| ASCVD | Arteriosclerotic Cardio-Vascular Disease |
| C | Celsius |
| CA | California |
| CAD | Coronary Artery Disease |
| CFAR | Civil Federal Aviation Regulation |
| CFR | Code of Federal Regulations |
| CO | Carbon Monoxide |
| CVR | Cockpit Voice Recorder |
| DNIF | Duty Not Involving Flying |
| DoD | Department of Defense |
| DSN | Digital Switching Network |
| EAFB | Edwards Air Force Base |
| EGPWS | Enhanced Ground Proximity Warning System |
| ELT | Emergency Locator Transmitter |
| F | Fahrenheit |
| FAA | Federal Aviation Administration |
| FCC | Flight Control Computer |
| FCF | Functional Check Flight |
| FCIF | Flight Crew Information File |
| fpm | Feet per Minute |
| fps | Feet per Second |
| g | Force of Gravity |
| GPS | Global Positioning System |
| GS | General Schedule |
| HQ | Headquarters |
| IAW | In Accordance With |
| ILS | Instrument Landing System |
| IFR | Instrument Flight Rules |
| IP | Instructor Pilot |
| KCAS | Knots Calibrated Airspeed |
| Knots | Nautical Miles per Hour |
| L | Local Time |
| MA | Mishap Aircraft |
| mm Hg | Millimeters of Mercury |
| MP | Mishap Pilot |
| MSL | Mean Sea Level |
| NOTAMS | Notices to Airmen |
| NTTR | Nevada Test and Training Range |
| OC-ALC | Oklahoma City Air Logistics Center |
| Ops | Operations |
| PCL | Pilot Controlled Lighting |
| POH | Pilot's Operating Handbook |
| PW | Pratt and Whitney |
| RWY | Runway |
| SCD | Sudden Cardiac Death |
| S/N | Serial Number |
| SOF | Supervisor of Flying |
| SIB | Safety Investigation Board |
| TACAN | Tactical Air Navigation |
| TCAS | Traffic Alert and Collision Avoidance System |
| TTR | Tonopah Test Range |
| UHF | Ultra High Frequency |
| USAF | United States Air Force |
| VF | Ventricular Fibrillation |
| VFR | Visual Flight Rules |
| VHF | Very High Frequency |
| VMC | Visual Meteorological Conditions |
| VVI | Vertical Velocity Indicator |
| Z | Zulu, or Greenwich Meridian Time (GMT) |

The above list was compiled from the Summary of Facts, the Statement of Opinion, the Index of Tabs, and witness testimony (Tab V).

# SUMMARY OF FACTS

# BEECHCRAFT 1900C N27RA ACCIDENT

## Tonopah AF Auxiliary Airfield, Nevada

## 16 March 2004

## 1. AUTHORITY, PURPOSE, AND CIRCUMSTANCES

### a. Authority

On 31 March 2004, General Gregory Martin, Commander AFMC, appointed Brigadier General Chris T. Anzalone to conduct an aircraft accident investigation of the 16 March 2004 crash of a Beechcraft 1900C aircraft, serial number UB37, N27RA, on the Tonopah Test Range (TTR), Nevada. The investigation occurred at Tonopah Air Force Auxiliary Field, Nevada, from 6 April 2004 through 30 April 2004. Technical advisors were Mr. William Cavanaugh (Legal), Col (Doctor) Monique Ryser (Flight Surgeon), Dr James Miller (Human Factors), Lt Col James Bierstine (Pilot), Maj Margaret Fleming (Maintenance), Mr. Richard Gonzales (Security Liaison), and SSgt Patricia Soule (Recorder) (Tab Y).

### b. Purpose

This aircraft accident investigation was convened under Air Force Instruction (AFI) 51-503. The primary purpose was to gather and preserve evidence for claims, litigation, and disciplinary and administrative actions. In addition to setting forth factual information concerning the accident, the board president was also required to state his opinion as to the cause of the accident or the existence of factors, if any, that substantially contributed to the accident. This investigation was separate and apart from the safety investigation, which was conducted pursuant to AFI 91-204 for the purpose of mishap prevention. The report is available for public dissemination under the Freedom of Information Act (5 United States Code (U.S.C.) 552) and AFI 37-131.

### c. Circumstances

The accident board was convened to investigate the Class A accident involving a Beechcraft 1900C aircraft, UB37, N27RA which crashed on 16 March 2004 approximately 7 miles southeast of Tonopah Air Force Auxiliary Airfield on the Nevada Test and Range (NTTR) (Tab A-3). The mishap pilot (MP), Mr. David D. Palay, GS-14, and four passengers were fatally injured. The mishap aircraft (MA) was destroyed. The MP and the MA were assigned to the Air Force Flight Test Center, Edwards AFB, CA (Tab A-3).

## 2. ACCIDENT SUMMARY

The Beechcraft 1900C was flying a passenger transport mission and was on the second of three flight segments. The aircraft took off 0306L from home station transporting nineteen passengers to the first stopover point and made an uneventful landing at 0327L. After discharging all but four passengers, the mishap aircraft departed at 0343L and flew under visual flight rules (VFR) in visual meteorological conditions (VMC) through the Nevada Test and Training Range (NTTR) for Tonopah AF Auxiliary Airfield, NV.

At 0358L, six and a half miles from the airfield, the MP reported the runway lights in sight, configured the aircraft and then initiated a visual circling maneuver to the right for a VFR straight-in approach to runway (RWY) 32. He was 1000 ft above ILS glideslope at that distance from the runway. Approximately half way through the turn, the MA began a gradual descent to approximately 2100 feet per minute (fpm), still in the circling turn toward final approach. At 0401:50L, three-fourths through the turn and approximately seven miles southeast of the airfield, the MA impacted the ground.

The MA was totally destroyed, with the loss valued at $2,000,000.00. The pilot, a government civilian, and all four passengers (government contractor employees) were fatally injured. The Beechcraft 1900C was a twin-engine small transport aircraft and had no ejection seats. The crash site was on a remote area of the NTTR and there was no civilian property damage. Tonopah AF Aux Airfield Fire Department and local medical and security personnel conducted the crash response.

Nellis AFB Public Affairs handled media inquiries and coordinated with HQ AFMC Public Affairs. Local media interest was moderate and national interest was low.

## 3. BACKGROUND

The Air Force Flight Test Center (AFFTC), a component of Air Force Materiel Command (AFMC), conducts and supports research, development, test and evaluation of both manned and unmanned aerospace systems. As a component of AFFTC, the mission of the Beechcraft 1900C included the movement of personnel and equipment between test sites and test ranges, emergency medical evacuation, and aerial observation flights.

The MP was the director of transportation and a highly experienced pilot. The transportation directorate operated under established local flying procedures and operated like a small commuter airline. The Beechcraft 1900C was certified for single-pilot operation.

AFFTC conducted test operations in coordination with Air Combat Command (ACC) within the NTTR. The NTTR was a multi-use open-air test and training range used by multiple Departments of the Federal government. The NTTR was a federal facility operated by the 98$^{th}$ Range Wing. Tonopah AF Aux Airfield was located on NTTR and served as a logistics and personnel staging area for test and training events. This airfield was administered by the 99$^{th}$ ABW, and operated by the 98$^{th}$ Range Wing, components of ACC. A dedicated range control

element provided support functions for test, mission, and mission support aircraft operating on the range.

## 4. SEQUENCE OF EVENTS

### a. Mission

The sortie consisted of one Beechcraft 1900C aircraft, UB37, N27RA, transporting four contractor personnel to Tonopah AF Aux Airfield in support of range support requirements. This was the second of three flight segments. The sortie was flown night-VFR through the NTTR. The sortie was a passenger transport flight authorized under the authority of the Air Force Flight Test Center, Edwards AFB CA

### b. Planning

The printed schedule specified one sortie and 19 passengers. The second and third flight segments were not included on the printed schedule issued the day prior (Tab K-3, 4). Due to range support requirements, these flight segments were added to transport four contractor employees to Tonopah AF Aux Airfield and return (Tab DD-7, K-4). The MP was unaware of this change until he arrived at the terminal, approximately 30 minutes prior to the first scheduled takeoff (Tab V-24). The MP updated the manifest to reflect these changes (Tab K-4). Base Operations logged this change in the Air Traffic Log (Tab K-5).

Mission planning was adequate. The MP checked local weather prior to takeoff; it was unknown if NOTAMS were checked. NOTAMS for Tonopah AF Aux Airfield were in effect stating a 2000' displaced threshold on RWY 32 with PAPI lights out of service and ILS glideslope not aligned with the displaced touchdown zone (Tab K-14). The MP did not check NOTAMS at the first stopover point (Tab V-20).

### c. Preflight

Preflight activities were performed by the MP in approximately 30 minutes. The actual takeoff time was 36 minutes after the MP arrived at the terminal (Tab V-24). During this time, the MP amended the manifest, called the Weather Office, performed exterior and interior pre-flight checks, loaded passengers, started engines and taxied (Tab W-3). Of note, the Emergency Locator Transmitter (ELT), a pre-flight item, was found in the off position (Tab J-48).

### d. Flight

The MA (call sign N27RA) departed 0306L and landed at the first stop over-point without incident at 0327L. After offloading fifteen of the nineteen passengers, the MA received clearance from local air traffic control, took off again at 0343L and flew through the NTTR to Tonopah AF Aux Airfield in night VMC (Tab N-4, K-5). The MP contacted local air traffic control for flight following and leveled off at 12,500 ft MSL. The controller handled no other aircraft while the MA was enroute to Tonopah AF Aux Airfield (Tab V-18). There were no

other missions scheduled for the range airspace surrounding Tonopah AF Aux Airfield at the time of the mishap (Tab DD-11-12).

At 0352L, the MP reported his position 24 miles to the southeast on Tonopah tower frequency and started a descent to 8500 ft MSL (Tonopah AF Aux Airfield elevation was 5547 ft MSL) (Tab N-4, R-65). Tonopah tower and base operations were unmanned (Tab DD-3, 14). The MP tried several times to activate the Pilot Controlled Lighting (PCL), but was unsuccessful (Tab N-5). The MP then requested air traffic control to call the Fire Department at Tonopah via landline to activate runway lighting, which they did (Tab N-5). At 0358L, the MP radioed he had the runway lights in sight and announced his intention to circle to the right (southeast of the airfield) for a straight-in approach. This was the last radio communication from the MP (Tab N-5). The MA position at that time was 6.5 miles from the approach end of runway (RWY) 32, heading 311 degrees, approximately 9 degrees right of centerline, and 3,000 ft AGL (Tab II-4). Although flying under VFR, the MA was still 1000 ft above the ILS glideslope at this range. The MP initiated the visual circling maneuver 4 miles from the end of the runway, and flew it with approximately 12 degrees of right bank (Tab II-4).

The MA descended to the ILS glideslope intercept altitude, 7500 ft MSL. At 0359:30L, one-fourth through the visual circling maneuver, the seat belt light warning chimed, indicating a positive switch actuation by the MP as part of the Before Landing checklist (Pilot's Operating Handbook). This was the last positive action by the MP recorded on the Cockpit Voice Recorder (CVR). After this period, although still operable, the CVR recorded no further cockpit noises (Tab N-12). The aircraft accelerated its descent slowly to about 2100 ft per minute (Tab R-65).

**e. Impact**

The MA impacted the ground 0401:50L (1201:50Z) on 16 March 2004, North 37 degrees, 42 minutes, 19.701 seconds latitude; West 116 degrees, 40 minutes, 59.43 seconds longitude. The MA was three-fourths through the visual circling maneuver and approximately 7 miles southeast of the airfield (Tab II-4).

The MA contacted a flat dry lakebed with the right wingtip and right main landing gear, followed by the nose landing gear and the left main landing gear. All three landing gear separated from the MA upon impact with the ground. The MA contacted the ground in a 16-degree right bank in excess of 165 knots, with a descent rate of about 2,100 fpm. The wreckage path extended on a heading of approximately 240 degrees magnetic, for a distance of 1,855 ft. The MA came to rest on a magnetic heading of approximately 310 degrees and 963 ft from the initial impact point. A post-impact fire ensued immediately, and the MA was destroyed. A majority of the fuselage was consumed in the fire (Tab J-42). During the impact sequence, the fuselage broke into four main pieces: the cockpit section, the main cabin, the cargo door area, and the tail. The tail section was completely separated, and the other three sections were partially attached to each other. Also during the impact sequence, the right wing separated from the fuselage. This tore open the right side of the fuselage leaving the cabin exposed. Fuel from the damaged right wing fed a pool fire near this opening. Fuel from the left wing drained out over time, continuing to feed the fire in the center of the fuselage (Tab J-97).

**f. Life Support Equipment, Egress and Survival**

The Beechcraft 1900C has no ejection seats. There was one forward main cabin entry door, one aft cargo door, and three emergency exit doors, two located on the right side and one located on the left side of the fuselage (Tab J-71-72). The post-impact fire consumed a majority of the main cabin entry door. However, the exterior handle was found in the closed position. No remains of the three emergency exit doors were located (Tab J-47).

The MA was equipped with two portable fire extinguishers. One was installed on the main cabin entry door, and another beneath the copilot's seat. Both fire extinguishers were extensively charred (Tab J-79). The MA was equipped with one first aid kit, stowed in the forward closet behind the copilot's seat. It was recovered in the wreckage and was extensively burned and charred (Tab J-79). The Emergency Locator Transmitter (ELT) was located in the aft fuselage and was undamaged the ELT switch was found in the OFF position (Tab J-48).

The FAA crash survivability report described the sequence of events at impact: the right wing separated from the fuselage, it tore open the right side of the fuselage leaving the cabin exposed. Fuel from the damaged right wing fed a pool of fire near this opening. The fire could very easily enter the fuselage through the opening, with hot gases traveling through the fuselage and out the openings at the ends. The cabin was filled with smoke very quickly, estimated at less than a minute. Fuel from the left wing drained out slowly, and continued to feed the fire in the center of the fuselage. The temperatures exceeded 1100 degrees F nearly everywhere in the cabin and in some areas may have reached 2000 degrees F (Tab J-97). The MA was totally destroyed, with the loss valued at $2,000,000.00 (Tab M-3). Findings from the passenger's autopsies were consistent with an extremely brief survival period after the impact. There was no evidence to suggest anyone reached an exit or attempted to open an exit (Tab J-97).

**g. Search and Rescue**

Range controllers believed that the MA had landed safely at Tonopah AF Aux Field (Tab V-18). Later, multiple inquiries were made by Base Operations as to the whereabouts of the MA (Tab DD-7). Search and rescue operations were initiated on 16 March 2004 at 0616L (Tab GG-4). First on scene were two patrols of the contract security detachment. The two patrolmen immediately initiated a search for survivors with negative results (Tab V-25, 26). Initially, a Department Of Energy fire unit (one firefighter and a brush fire pump truck) responded with five contract security officers. The incident commander, assigned to Tonopah AF Aux Airfield Fire Department, and full crash response were dispatched at 0616L (Tab N-6) and arrived at the mishap location at 0626L (Tab GG-6). The Air Force diverted an alert aircraft (an F-16, with a photographer in the rear seat) into the area for air support (Tab DD-8). Once personnel were on-scene, the fires were effectively extinguished. Since the wreckage burned for nearly two hours before response crews arrived, search and rescue operations were rapidly converted to search and recovery operations.

### h. Recovery of Remains

Recovery of remains began on 16 March 2004 at approximately 0626L and continued through 0853L (Tab GG-6). At approximately 0626L, the remains of MP were found, and at approximately 0713L, the remains of the four passengers were found (Tab GG-10). The remains of the MP were found in the cockpit area of the MA. The remains of the four passengers were found in the aft cabin of the MA (Tab V-14).

Remains of the MP and the four passengers were removed from the MA by Tonopah AF Aux Airfield Fire Department and turned over to the local medical technicians present at the scene of the mishap. The remains went to the Wahsoe County Coroner/Medical Examiner. The Armed Forces Institute of Pathology (AFIP)/Medical Examiner Office, Walter Reed Medical Center, Washington, DC, performed the autopsies on the remains of the five fatalities at Nellis AFB on 18 and 19 March 2004. The remains were released to the next of kin through Palm Eastern Mortuary. The mortuary affairs were managed by Kenyon International Disaster Management. The AFIP positively identified the remains of the MP by antemortem and postmortem dental records and DNA comparison, the remains of two passengers by antemortem and postmortem dental records comparison, and the remains of the other two passengers by antemortem and postmortem DNA comparison.

## 5. MAINTENANCE

### a. Forms Documentation

All existing Air Force Technical Order (AFTO) form 781 series aircraft maintenance forms, contractor logbooks and pertinent Raytheon documentation for the MA were thoroughly reviewed for accuracy and completeness. The most recent aircraft documentation was lost in the post impact fire. Records indicated that the aircraft had flown a total of 60 sorties and 38.8 hours from 16 Feb to 16 Mar 04. The most recent 50-hour routine inspection completed on 9 Mar 04 was documented on the inspection worksheet (Tab U-4), but had not been updated in the aircraft logbook. This was not a contributor to the mishap.

### b. Inspections

The MA was on a continuous inspection cycle IAW the Raytheon Beech 1900/1900C Maintenance Manual. This cycle provides a means of inspecting the aircraft on a 50- and 200-hour basis. Routine inspections and servicing are conducted every 50 hours of operation, and more detailed inspections are conducted every 200 hours. After 6 of the 200- hour inspections, a complete inspection would have been performed on the aircraft. The last 50-hour routine inspection had been completed on 9 Mar 04 (Tab U-6, 8). At the time of the mishap, all required inspections had been completed, and the pertinent inspection worksheets were annotated and initialed by a qualified aircraft mechanic. The aircraft was 41 hours away from the next 50- hour routine maintenance inspection.

**c. Maintenance Procedures**

There were no abnormal or extraordinary procedures followed prior to the mishap. Maintenance conducted a thru-flight inspection on the MA at the first stopover point during a similar mission the day prior and a routine air conditioning line was replaced. It flew later that day to another location without incident. It was common local practice for the pilot to do a preflight or thru-flight inspection when the aircraft was launched from or landed at a location other than the maintenance operating location. The MP performed the pre-flight the morning before the mishap, which was normal procedure for this unit (Tab V-3).

**d. Maintenance Personnel and Supervision**

A commercial contractor, in operation since the Air Force accepted the aircraft in 1988, performed the maintenance on the MA. The MP supervised this contract in his role as the director of transportation. Personnel working for this contractor are all Airframe and Powerplant certified mechanics with significant years of experience. The aircraft forms for that day were consumed in the post impact fire, but recreated based on interviews and other documentation. These records showed the MP performed the pre-flight on the day of the mishap (Tab V-3).

**e. Fuel, Hydraulic and Oil Inspection Analysis**

Fuel samples from the refueling truck and the fuel storage tanks at the departure site showed no abnormalities. A fuel sample from the wing of the aircraft from post impact was sent to the Aerospace Fuels Laboratory at Wright-Patterson AFB for analysis and came back nominal (Tab J-101-105). An oil sample was taken from the left engine after the mishap and it was normal. Due to a massive post impact fire, no oil was recovered from the right engine.

**f. Unscheduled Maintenance**

The last major scheduled inspection performed on the MA was the #5 detailed 200 hour inspection, completed on 26 Nov 03 (Tab U-6). A review of the historical AFTO forms 781A from that date to 16 Mar 04 revealed a total of 20 unscheduled maintenance events. All of these events were resolved appropriately. The only unscheduled maintenance for March was an attitude gyro, copilot's brakes and air-conditioning line that were all replaced. A summary of all maintenance events for 30 days prior to the mishap recreated from interviews and other documentation is included at Tab (U-3). A sticking altimeter had been replaced on 26 Feb 04. Interviews with maintainers and aircrew (Tab V-3, 4, 7, 12) indicated that there were no further discrepancies with this item. A complete review of the maintenance records for the fleet revealed no adverse maintenance trends contributed to this mishap.

# 6. AIRCRAFT AND AIRFRAME SYSTEMS

## a. Condition of Systems

The MA had a total of 14,209.5 flight hours on the airframe. The aircraft had been stripped and painted in July of 2000. An interior reconditioning had been accomplished on 7 Nov 2003, including new carpet, new seat covers and recovered walls and bulkheads (Tab U-4-5). A thorough review of the MA wreckage (Tab J), contractor analysis (Tab J) and maintenance documentation (Tab U-3) indicated no pre-impact material failure.

## b. Testing

Numerous components recovered from the MA were tested on site or were sent off to a contractor or depot facility for analysis.

1) Airframe

A representative of the aircraft manufacturer conducted analysis of the MA wreckage on site. Data indicated the impact and the post- impact fire caused all of the damage to the airframe. The airframe had no structural failures that contributed to this mishap (Tab J-37-63).

2) Engines

A representative from the engine manufacturer analyzed the wreckage of the engines from the MA on site. The left engine had 12,725.5 total operating hours and was installed on 19 Feb 1999. Its last hot section inspection was completed in June 02. The right engine had 12,962.5 total operating hours and was installed on 20 May 03. Both engines were operating properly at the time of the mishap (Tab J-3-36).

3) Instrumentation

The aircraft had an avionics upgrade on 16 October 2003 that included an upgraded Global Positioning System (GPS), an upgraded Traffic Alert and Collision Avoidance System (TCAS) that included an Enhanced Ground Proximity Warning System (EGPWS). In addition, an FZ-200 Flight Control Computer (FCC) had been swapped out on 30 October 2003 (Tab U-4-5). These actions were completed by Banyan Air Service, Ft Lauderdale FL. A representative from OC-ALC inspected the instruments on site; all were too severely damaged by the impact and the post impact fire to provide any useful information (Tab J-67-68).

4) Survivability systems

A survival factors specialist from the National Transportation Safety Board did an analysis of the seats and doors on site. Results indicated that the damage to the seats was caused by the impact and the post-impact fire. There was no evidence that there was any attempt by the passengers or the MP to open the emergency exit doors or the crew or cabin entry doors (Tab J-69-100).

5) Landing Gear

A structural materials analysis was completed by the Materials Integrity Branch of the Air Force Research Laboratory, Wright Patterson AFB. Analysis of the gear revealed a significant structural overload and subsequent ductile failure. No metal anomalies were noted that indicated material failure. Impact marks in the ground corroborate that the gear was down when the mishap occurred (Tab J-106-132).

## 7. WEATHER

### a. Forecast Weather

Forecast weather conditions for Tonopah AF Aux Airfield, early morning of 16 Mar 04 were: sky - few clouds at 25,000 ft and no ceiling, visibility unrestricted, winds 300° at 8 knots, with wind direction variable from 270° to 040°, temperature 2° Celsius (C) or 35° Fahrenheit (F) at 0700L, warming to 20C/67F at 1400L. A high-pressure ridge was moving in from the northwest, with no precipitation, icing, or fog predicted (Tab K-6-13).

### b. Observed Weather

Observed weather at Tonopah AF Aux Airfield was recorded remotely via Automated Weather Observation Service (AWOS) at 0355L. Conditions were: winds 310° at 5 knots, 10 miles visibility (unrestricted), few clouds at 25,000 ft, temperature 3C/37F, altimeter 30.30 inches (Tab K-13). Sunrise was 0556L. Moonrise was 0350L, eleven minutes prior to the mishap. Moon illumination was approximately 20-24% (low) (Tab W-4). The maximum wind recorded at Tonopah AF Aux Airfield within one hour of the mishap was 8 knots, recorded 0322L (Tab W-5).

### c. Conclusions

The mishap flight occurred during night hours under visual meteorological conditions with low moon illumination. Weather conditions were good and the mission was performed within prescribed operational weather limitations. The actual weather had no adverse effect on the execution of the mission.

## 8. CREW QUALIFICATIONS

The MP was current and qualified for this mission (Tab G). The MP had a career total of 11,336.3 hours, with 3881.6 hours in the Beechcraft 1900C, of which 1007 hours were at night. He was also qualified in the Beechcraft 200C, a similar aircraft, with an additional 1995.5 hours, of which 350.2 were at night (Tab G-3).

The MP was hired into this unit in 1987 (Tab V-22). He qualified in the Beechcraft 1900C in February 1988, upgraded to instructor pilot in March 1992, and upgraded to flight examiner in April 1994. During those 16 years of continuous service he received 28 flight evaluations, all without a single discrepancy (Tab T-3). The MP was considered highly experienced and

knowledgeable, and his spotless record supported this conclusion (Tab V-22). He was considered an Air Force subject matter expert in regard to the Beechcraft transport aircraft (Tab V-28).

In the 90 days prior to the mishap, the MP logged time in the Beechcraft 1900C, the Beechcraft 200C, and the C-12F. His recent flight time in all three aircraft is shown in the table below (Tab G-4):

| Beechcraft 1900C / Beechcraft 200C / C-12F | | |
|---|---|---|
| RECENT HISTORY | HOURS | SORTIES |
| Last 30 days | 5.1 | 8 |
| Last 60 days | 11.3 | 17 |
| Last 90 days | 25.2 | 29 |

The MP's recent flight time in the Beechcraft 1900C only is shown in the table below (Tab G-4):

| Beechcraft 1900C | | |
|---|---|---|
| RECENT HISTORY | HOURS | SORTIES |
| Last 30 days | 2.1 | 4 |
| Last 60 days | 2.6 | 5 |
| Last 90 days | 8.1 | 11 |

## 9. MEDICAL

### a. Qualifications

The 57-year-old MP had a current FAA second-class medical certificate (#FF-2487009, dated 13 November 2003) with one restriction: must wear corrective lenses.

During his last 5 annual FAA medical exams he explicitly denied using inappropriate medication, visiting a health professional within the last 3 years, any cardiac and vascular disease, or any other medical problems. He consistently answered "NO" on the following questions: "Do you currently use any medications, prescription or non-prescription", "Have you

ever in your life been diagnosed with high or low blood pressure", "Have you used illegal substance in the past two years". He also denied any visit to a health professional in the last three years. (FAA Form 8500-8).

USAF medical records provided incomplete information from 1988 to the time of mishap, and there was no valid, current AF Form 1042 in his records (Tab CC-3). In his medical records, there were only one incoming-clearance AF Form 1042 in 1988, one return-to-flying-duty-recommendation AF Form 1042 in 1995, and one AF Form 1042 following periodic examination dated 1995. The first of these AF Forms 1042 reflected completion of the MP's Civil Service certificate of medical examination (SF 78), which was accomplished by a civilian physician assistant and a civilian physician in 1987 and then filed in his AF medical records.

There were copies of FAA second-class medical certificates from 1988 through 1995 and 1999 in his AF medical records. Four of these were signed by USAF Flight Surgeons. However, no AF flying class II physicals were documented in parallel for these four examinations. The MP's current position description required only that he maintain a "class 2 FAA medical certificate." There was no evidence that the MP ever received an AF periodic class II flying physical IAW AFI 48-123 and AFI 11-401.

The 24/72-hr history indicated that the MP suffered from high blood pressure and that he was taking blood pressure medication. However, this information was never documented in his AF medical records.

The MP's physiological training was current and valid until 30 Nov 2004 (Tab T-4). MP accomplished "Trainer, Attack, Reconnaissance, Fighter" Physiological Refresher on 16 Nov 99.

**b. Health**

Based solely on the information provided in the 24/72-hr history the MP was taking nadolol and guanfacine for high blood pressure on a regular basis. In addition, the MP was self-medicating with Benadryl® every night as a sleep aid, with over-the-counter medications for sinus and seasonal allergy problems, and with herbal supplements.

The family physician of the MP, who was not the MP's FAA medical examiner, provided the following information: he first saw the MP as a patient in 1988 and continued to provide him medical care until Nov 03 when MP was last seen in his office. Between 1988 and 2003, the MP was seen 44 times in his office, and all but nine of these visits were for hypertension, which was treated with medications (nadolol and guanfacine). The family physician specifically stated that he had not at any time prescribed to the MP any medications that could result in a positive methamphetamine or amphetamine toxicology result. He volunteered that the MP refused recommended laboratory work and any additional medical testing. He stated that there had been no recent changes in the MP's overall health status. He was not aware that MP was seeing or consulting any other physician or health care provider (Tab CC-4).

The review of all documentation available in the MP's AF medical records showed no documentation of any significant medical problem. Although reportable to flight medical

examiners none of the above medications or medical problems were documented in the MP's medical records. The MP's dental records were not available for review. Interviews with the MP's coworkers and family did not indicate or suggest any health problem, except for an infrequent discussion of high blood pressure (Tab V-22).

**c. Pathology**

The autopsy performed on the MP showed severe coronary artery disease, with 3-vessel disease, 90-95% pinpoint narrowing of the coronary arteries, and marked fibrosis of the myocardium. No soot was found in the airways. The blood toxicology was positive for acetaminophen (such as Tylenol®, Anacin®), diphenhydramine (like Benadryl®, Sleep-Eze®), and pseudoephedrine (Sudafed®, Sine-Aid®). The carboxyhemoglobin saturation of the blood was 1% (normal) and the cyanide concentration was 0.62 mg/L (not sufficient to cause death). The toxicology report (AFIP # 04-1332) showed the presence in the urine of pseudoephedrine, phenylpropanolamine, d-amphetamine, and d-methamphetamine. No evidence of traumatic injury sufficient to cause death was demonstrated during the autopsy. The AFIP stated the cause of death as "arteriosclerotic cardiovascular disease" and the manner of death as "natural."

**d. Lifestyle**

According to the 24/72-hr history, the MP did not indulge in alcoholic beverages, was on no special diet, observed rather regular sleep/wake habits consistent with his usual early work schedule (0500L –1400L), indulged in little fitness activity, and had no unusual or hazardous hobbies. The MP self medicated by ingesting a variety of drugs/medications as noted above (Tox report 04-1332). The MP quit smoking cigarettes a few years ago, perhaps as long as 6 years ago (Tab V-19) but continued to use nicotine replacement (Tab V-6). Within the 6 months prior to the mishap, the MP's wife was diagnosed with a worsening medical condition. The MP was planning to retire within the next few years (Tab V-6).

**e. Crew Rest and Crew Duty Time**

Unless waived IAW local regulation, crew rest was mandated at a minimum of 12 hours between stepping off the plane and the next show time; no waiver was required. By all reports, crew rest was meticulously observed. The MP departed work at 0930L on the day prior to the mishap (Tab V-13). In addition, the MP's usual work schedule was early during the day, approximately 0530L-1430L. However, he often flew the 0300L sorties. The day of the mishap was the second morning in a row that he had flown the 0300L sortie (Tab V-6).

**f. Passengers**

There was no evidence that any passenger's medical problem contributed to the mishap. An autopsy was performed on each passenger. The remains of the passengers were positively identified by the AFIP comparison of antemortem and postmortem dental records or DNA records. All four passengers died as a result of the impact and conflagration, sustaining traumatic and thermal injuries (Tab X-4, 5, 6, 7).

# 10. OPERATIONS AND SUPERVISION

### a. Operations

The unit's operations tempo (workload) was considered normal during the time of the incident. The MP was on a regular cycle for early morning flights and had flown this particular profile innumerable times over the past 16 years. The workload was considered average (Tab V-22).

Tonopah AF Aux Airfield was not manned for unscheduled operations outside normal duty hours. The Beechcraft fleet was often used to transport personnel who opened and operated this facility, including tower and Base Operations personnel. Local flying instructions established procedures for autonomous operations. These procedures allowed the MP to fly into Tonopah AF Aux Airfield under VFR rules with the tower and Base Operations unmanned.

### b. Supervision

This passenger transport flight was flown under the supervision of AFFTC, Edwards AFB CA. The MP was the director of transportation and the authorizing official for the Form 83, Flight Authorization (Tab K-3). The MP verbally authorized the added flight segments approximately 30 minutes prior to takeoff. Because the flight was not on the previous day's schedule and flown outside of normal duty hours, Base Operations and the tower at Tonopah AF Aux Airfield were unmanned and did not provide the usual flight following services.

The current operations protocol was modeled after FAA procedures (14 CFR 91) for the Beechcraft fleet. (Tab V-28). Often the Beechcraft fleet was allowed autonomous operation, and therefore, the SOF was not on duty at the time of the mishap.

The MP was asked to conform to FAA medical requirements (14 CFR 67). The MP had a second class medical certificate on file with the FAA during his period of employment.

The transportation directorate operated under established local flying procedures and operated like a small commuter airline under 14 CFR 91 (FAA General Operating and Flight Rules (Tab V-28). The Beechcraft 1900C was certified for single-pilot operation (POH).

# 11. HUMAN FACTORS

The MP was a highly experienced pilot who was intimately familiar with the Tonopah AF Aux Airfield area (Tab V-22). He was faced with the rare situation of non-standard runway lighting (Tab V-22). The MP had to become involved during the approach in the process of turning on the runway lights (Tab N-5).

A sound picked up by the CVR at 0352:14L was probably the EGPWS sounding a warning during the early part of the descent toward the airfield. Another sound picked up by the CVR at 0357:01L was probably the autopilot disconnect warning. It occurred during the latter part of the descent to 8500 ft MSL. The tower tape and CVR at 0357:55L recorded the MP stating that "...we're circling right for a straight in approach to runway 32" (Tab N-12).

There was evidence on the CVR at 0359:30L that step 3 of the Before Landing checklist was accomplished by the MP early in the circling descent (POH). The MA landing gear had been extended before impact (Tab J-60), indicating that the Before Landing checklist had been accomplished at least through step 7 by impact.

Turn-radius calculations indicated that the MP used a 12-degree bank angle for the visual circling maneuver descent (Tab II-4). The MP's colleague reported that they often set the radar altimeter to zero to avoid the visual distraction of its flashing warning light at inappropriate times during some approaches on the NTTR and that they often turned off the EGPWS to avoid the auditory distraction of its warnings at inappropriate times during some approaches on the NTTR (Tab V-22).

Visual illusions and operational distractions were minimal. The RWY 32 threshold was displaced, associated alterations of runway lighting had been made and the visual glideslope indicators were off (Tab K-14). There was an unlit landing strip in the vicinity of the Tonopah AF Auxiliary Airfield (Tab V-22). There were no other missions scheduled for the range airspace at Tonopah AF Aux Airfield during the time of the mishap (Tab DD-12). The MP was dealing openly and positively with the personal issues he faced. The unit used frequent inter-pilot discussions to prevent complacency (Tab V-22, 28).

The AFIP toxicology report revealed the presence of d-methamphetamine and diphenhydramine in the MP's system. However, the security personnel, who spoke to the MP immediately before the two mission segments and who had worked with the MP for approximately 20 and 15 years, respectively, testified that the MP displayed no obvious, overt behaviors, such as sedation or unusual agitation, consistent with the use of these substances (Tabs V-23, 24). The MP also drank coffee habitually (Tab V-19, 22). The MP drank coffee before the first flight segment (Tab V-24, 32).

A history provided typical sleeping patterns for work nights and for weekend nights, and provided a detailed sleep history for the 72-hour period preceding the mishap. The MP was a sophisticated user of computers and the Internet (Tabs V-22, 28). The MP, a well-liked and respected supervisor and aviator, faced several major personal issues at the time of the mishap, including planning for retirement in the next couple of years; caring for his spouse, who had a chronic illness; and the imminence of paying off his mortgage, perhaps even on the day of the mishap sortie (Tabs V-22, 28).

## 12. GOVERNING DIRECTIVES AND PUBLICATIONS

### a. Primary Operations Directives and Publications

- OI 11-202, *Aircrew Operations,* 1 Nov 03.
- AFI 11-401, *Aviation Management,* 12 Jun 03.
- AFI 48-123, *Medical Examination and Standards,* 22 May 01.

- Raytheon Aircraft Company. *Pilot's Operating Handbook and FAA Approved Airplane Flight Manual, Beech 1900/1900C Airliner (UA-1 and after, UB-1 and after)*, Reissued March 1994, Revised November 2001.
- Federal Aviation Regulations, 14 CFR 67, *Medical Standards and Certification,* 1 Jan 02.
- Federal Aviation Regulations, 14 CFR 91, *General Operating and Flight Rules,* 1 Jan 01.

**b. Maintenance Directives and Publications**

- Raytheon Aircraft Company. *Beechcraft 1900/1900C Airliner Maintenance Manual,* 2 Nov 01.

**c. Known or Suspected Deviations from Directives or Publications**

**(1) Mishap Pilot**

The MP suppressed his medical history and did not disclose the use of prescribed medications. This deviates from FAA form 8500-8 instructions and AFI 48-123, Attachment 7, para A7.32.

The CFRs (14 CFR 91.17) prohibit pilots from performing crewmember duties while using any medication that affects their faculties in any way contrary to safety. Similar prohibition was found in other FAA guidance (FAA Publication AM-4000-92/1; FAA Form 8500-8, Application for Airman Medical Certificate).

(2) **Operations and Medical Supervision**

The current position description for the MP, dated 1999 and reviewed annually through 2003, required only an FAA 2nd Class physical. This deviates from AFI 48-123, Para.1.1. and AFI 11-401, AFMC Supp 1, para 1.10.1.5.1.

## 13. NEWS MEDIA INVOLVEMENT

An official statement concerning this incident was released on 16 Mar 04 by Nellis AFB Public Affairs and coordinated with HQ AFMC Public Affairs (Tab HH-3). Reports appeared in the "Las Vegas Sun", 17 Mar 2004; "Air Force News Today," 17 Mar 2004; and "Newsday.com" on 16 Mar 04. Public interest was low.

## 14. ADDITIONAL AREAS OF CONCERN

The MP, a civil servant, was not directed toward the same system of medical scrutiny as his military counterparts.

There was local confusion concerning the applicability of USAF or FAA operating and medical regulations and instructions to Government civilian pilots operating USAF aircraft.

The MP's opportunity to operate autonomously and the two-hour mishap response delay raised concerns about a positive command and control structure.

The MP's use of d-methamphetamine or of a substance that metabolizes into d-methamphetamine and d-amphetamine such as benzphetamine (for example Didrex®).

30 April 04

CHRIS T. ANZALONE
Brigadier General, USAF
President, Accident Investigation Board

# STATEMENT OF OPINION
# AIRCRAFT ACCIDENT INVESTIGATION
# Beechcraft King Air 1900C, UB37, N27RA
# Tonopah Air Force Auxiliary Field, Nevada
# 16 March 2004

*Under 10 U.S.C. 2254(d) any opinion of the accident investigators as to the cause of, or the factors contributing to, the accident set forth in the accident investigation report may not be considered as evidence in any civil or criminal proceeding arising from an aircraft accident, nor may such information be considered an admission of liability of the United States or by any person referred to in those conclusions or statements.*

## SUMMARY

The mishap aircraft (MA), a Beechcraft 1900C support aircraft tail # N27RA, assigned to the Air Force Flight Test Center impacted the ground during a routine passenger transport mission on 16 March 2004. The mishap pilot (MP), Mr. David Palay, and four passengers were fatally injured (Tab A-3). The aircraft valued at $2 million (Tab M-3) was destroyed. There was clear and convincing evidence that the MP suffered incapacitation due to sudden cardiac death during the approach to land that resulted in the mishap aircraft impacting the ground. A substantially contributing factor was that the MP, in violation of federal policy and directives, willfully ingested inappropriate medications, suppressed significant medical information and deceived flight medical examiners in the presence of a deteriorating and dangerous health condition.

## DISCUSSION OF OPINION

1. The mission was a support mission to transport personnel in support of the daily operations schedule. The first sortie of the mission was scheduled and the second and third sorties of the mission, to Tonopah AF Aux Airfield and back, were added prior to the first takeoff. The flight authorization was amended by the MP to support the day's events. NOTAMS for Tonopah AF Aux Airfield were in effect stating a 2000 ft displaced threshold on RWY 32 with PAPI lights out of service and ILS glideslope not aligned with the displaced touchdown zone.

2. The MP was the director of transportation and a highly experienced pilot. The MP's usual work schedule was early during the day, approximately 0530-1430L. However, he often flew 0300L sorties. The day of the mishap was the second morning in a row that he had flown the 0300L sortie (Tab V-6). The transportation directorate operated under established local flying procedures and operated like a small commuter airline under 14 CFR 91 (FAA General Operating and Flight Rules). The Beechcraft 1900C was certified for single-pilot operation (POH).

3. The MA took off at 0306L transporting nineteen passengers through the Nevada Test and Training Range to the first stopover and made an uneventful landing at 0327L. After discharging all but four passengers, the MP received clearance to Tonopah AF Aux Airfield through local air traffic control.

4. The MA took off night-VFR at 0343L for Tonopah AF Aux Airfield. The takeoff and enroute segments of the sortie were uneventful. The weather was clear with unlimited visibility, and moon illumination was low. A local controller performed flight following through the range complex, and there was no other range traffic.

5. At 24 miles from Tonopah AF Aux Airfield, the MP reported the field in sight. Because the segment was unscheduled and outside normal duty hours, the tower was unmanned and the runway lighting was off. This runway was equipped with a pilot controlled lighting (PCL) system activated through multiple "clicks" on the UHF radio. After several attempts, the MP was unable to activate the lights. He requested support from local range control. The controller made contact with the Tonopah AF Aux Airfield Fire Department via telephone; they were able to activate the runway lighting. The MP acknowledged seeing the lights and decided to execute a right visual circling maneuver to descend and realign to the runway 32 centerline.

6. In the visual circling maneuver, the MA descended to the ILS glideslope intercept altitude, 7500 ft MSL. At 0359:30L, one-fourth through the visual circling maneuver, the seat belt light warning chimed, indicating a positive switch actuation by the MP as part of the Before Landing checklist (POH). This was the last positive action by the MP recorded on the Cockpit Voice Recorder (CVR). After this period, although operable, the CVR recorded no further cockpit noises (Tab N-12). Approximately halfway through the maneuver, the well-trimmed aircraft accelerated its descent slowly to stabilize at about 2100 ft per minute, rolled off to the right and impacted the ground.

7. At 0401:50L, during the approach phase of the flight, the mishap aircraft impacted the ground. The mishap aircraft broke apart while skidding, spilled fuel, and within seconds, was consumed in flames. The four passengers were fatally injured. Egress was not possible. The MA was destroyed.

8. The AFIP autopsy findings of the MP indicated cardiac death at some point prior to impact. Of note was the severe, 3-vessel coronary artery disease with several areas of 90-95% obstruction, and marked fibrosis of the myocardium, as well as the absence of traumatic injury to the body caused by the impact. Moreover, unlike the passengers, the absence of soot in the airway/respiratory tract of the MP indicated that he did not inhale any smoke generated from the fuel fire started at impact. In addition, the carbon monoxide blood saturation of the MP and the blood cyanide concentration were well below the lethal levels.

9. The toxicology report indicated the MP self-medicated. Specifically, acetaminophen, diphenhydramine, and pseudoephedrine were found in the blood, and d-methamphetamine, d-amphetamine, pseudoephedrine, and phenylpropanolamine were found in the urine.

10. FAA second-class medical examinations were performed to standard since 1988. On the most recent FAA medical exam, the individual denied using any medications or illicit substances, or visiting a health professional within the last 3 years (FAA form 8500-8).

11. The MP was a highly experienced pilot, intimately familiar with the Tonopah AF Aux Airfield approach, including unscheduled night operations (Tab V-22). Information from the CVR and the fact that the gear had been extended indicated that the Before Landing checklist (POH) had been accomplished. The MP used a 12-degree bank angle for the visual circling maneuver (Tab II-4).

12. Security personnel who spoke to the MP immediately before the two mission segments and who had worked with the MP for approximately 20 and 15 years, respectively, testified that the MP displayed no obvious, overt behaviors such as sedation or unusual agitation on the day of the mishap (Tabs V-23, 24). The MP drank coffee before the first flight segment.

13. The 24/72-hr history provided typical sleeping patterns for work nights and for weekend nights, and provided a detailed sleep history for the 72-hour period preceding the mishap. The MP was known to be a reformed habitual smoker who had been using a nicotine supplement for a number of years and was a habitual coffee drinker (Tab V-19, 22). The MP was a sophisticated user of computers and the Internet (Tabs V-22, 28). The MP faced several major personal issues at the time of the mishap, including planning for retirement in the next couple of years; caring for his spouse, who had a chronic illness; and the imminence of paying off his mortgage, perhaps even on the day of the mishap sortie (Tabs V-22, 28).

## ANALYSIS

The investigation strategy was a thorough and regimented process of elimination to discover clear and convincing evidence of cause. Specifically, the evidence suggested that the MP's qualification, the MA maintenance history, the MA's system operation, the airfield condition, the operational procedures, and human factors were not causal. The MP's health profile and willingness to suppress significant medical information became central to our analysis.

The MP was a 57-year-old highly experienced aircraft commander, instructor and evaluator pilot in the Beechcraft 1900C with over 11,366 hours accumulated over sixteen years. As the director of transportation, equivalent to a squadron commander, he was a well-liked and respected supervisor and aviator. He was considered an Air Force subject matter expert in regard to the Beechcraft transport aircraft.

The four deceased passengers were government contractor personnel who worked on the NTTR. Testimony and search and recovery results indicated that they remained situated in the aircraft cabin (one forward and three far aft) throughout both flight segments. They likely slept and were neither a distraction nor an aid to the MP.

The mishap aircraft was sound. Based on interviews, parts packing lists, and inspection worksheets, the MA's maintenance records that burned in the post impact fire were recreated. Analysis of the MA's engines, airframe, and subsystems revealed that the aircraft was operating normally until impact. There were no indications of pre-impact material failure (Tab J). Testimony from other pilots in the unit indicated no latent malfunctions. Aircraft maintenance and systems operations were not factors in the mishap.

Flight operating procedures and associated risk mitigation were adequate given the local concept of operations. Tonopah AF Aux Airfield was not manned for unscheduled operation outside normal duty hours. The Beechcraft fleet was often used to transport personnel who opened and operated this facility, including tower and Base Operations personnel. This concept of operations allowed the Beechcraft fleet to operate autonomously outside normal duty hours with minimally manned support structures. Local flying instructions established conservative procedures to mitigate the risks involved with autonomous operations. These procedures allowed the MP to fly into Tonopah AF Aux Airfield under VFR with the tower and Base Operations unmanned. It was considered a common practice. The high level of experience of the Beechcraft pilots also helped mitigate the risk. The MP followed established local procedures. Flight operations were not a factor in the mishap.

Preflight was accomplished in minimum time and the MP, who was the first-line authority for approving flight changes, handled the change personally. The mishap flight occurred during night hours under visual meteorological conditions with low moon illumination. Weather conditions were good and the mission was performed within prescribed operational weather limitations. The actual weather had no adverse effect on the execution of the mission.

Conservative in nature, the right-hand visual circling maneuver to the approach end of RWY 32 was flown with approximately 12 degrees of right bank. Circling was not authorized to the west due to high terrain. As the MP started the visual circling maneuver, he descended to ILS glideslope intercept altitude. At 0359:30L, one-fourth through the circle, the seat belt warning chimed, indicating a positive switch actuation by the MP as part of the Before Landing checklist. This was the last positive action by the MP recorded on the Cockpit Voice Recorder. The landing gear and flaps were probably lowered before this, as was the usual practice of the pilots interviewed. Approximately halfway through the maneuver, the MA slowly accelerated its descent. Considering the MP's extensive experience, under normal circumstances he would have been able to easily execute this visual circling maneuver. Evidence suggested that the pilot was not in control when the aircraft impacted the ground.

It appeared that the MP continued his visual circling maneuver for 180 degrees of turn and had the runway lights in sight at 7500 ft MSL. At this point his altitude and airspeed control terminated because the MP suffered a sudden-onset medical crisis that prevented him from controlling the MA. There was no sound of MP distress recorded on the CVR. This lack of sound was consistent with a silent, sudden incapacitation that did not alert the passengers. The MP probably released his grip on the yoke. The well-trimmed aircraft accelerated its descent slowly to stabilize at about 2100 ft per minute, rolled off to the right and impacted the ground.

The crash site, although seven miles from the field, was not detected for approximately two hours. Range controllers had assumed the MA had landed, and local operations personnel were not yet on duty. We investigated whether this delay might have reduced the likelihood of a successful personnel rescue. It was likely that the cabin was filled with smoke and flames in less than a minute. The temperatures exceeded 1100 degrees F nearly everywhere in the cabin and in some areas may have reached 2000 degrees F. Temperatures at or above this level would have caused severe, acute injury of the respiratory tract and airways, resulting in rapid death as air movement became impossible. Findings from the passenger's autopsies were consistent with an extremely brief survival period after the impact. There was no evidence to suggest anyone reached an exit or attempted to open an exit; they were probably unconscious at the time. Due to the immediate and extreme fire after impact, any rescue attempt would not have been successful.

A thorough examination of possible external distractions to the MP during the critical approach phase of flight was conducted. Although the RWY 32 threshold was displaced, associated alterations of runway lighting had been made and the visual glideslope indicators were off, it was unlikely these lighting deficiencies served to distract such an experienced pilot. There was an unlit landing strip in the vicinity of the Tonopah AF Auxiliary Airfield that was not visible to the MP during the visual circling maneuver. There were no other missions scheduled for the range airspace at Tonopah AF Aux Airfield during the time of the mishap. Thus, external distracters were not a factor in this mishap.

We examined the MP's lifestyle and job-oriented pressures. Interviews with the MP's peers and immediate supervisor suggested that the MP was dealing openly and positively with the personal issues he faced. We found no evidence that these personal issues were a factor in the mishap. The unit was quite competent at using frequent inter-pilot discussions to prevent complacency. We found no evidence that complacency was a factor in the mishap.

Crew rest was not a factor. Except for the fact that the scheduled time of the mishap flight was two hours prior to the usual first scheduled flight, no significant impingement on crew rest time could be demonstrated. This earlier flight resulted in a two-hour earlier report to work, which did not appear to be significant for the MP's performance.

A sleep and fatigue analysis was conducted using the DoD's Sleep, Activity, Fatigue and Task Effectiveness model. Generally, the MP's sleeping habits provided him with greater than 90% cognitive effectiveness during at least the first half of each work day, the period in which he usually flew his missions. This generalization did not hold for the back-to-back 0300L missions he flew on the night before and the night of the mishap. On these nights the MP's estimated cognitive effectiveness during his duty day fell slightly below the desired level of 90%. While not desirable, the decrement was not severe enough to be a likely contributor to this mishap.

We used an error-chain model to guide our Human Factors analysis, theorizing that the mishap may have resulted from a linked chain of minor errors. The list of situations revealed by our investigation that might have enhanced the likelihood of pilot errors included life style and stress; complacency; the relatively recent ingestion of d-methamphetamine and diphenhydramine; the time of night and sleep history; and pilot workload and practices, the relative absence of visual cues, the initial lack of runway lighting, and perceptual set. Because of

the MP's high level of experience, the relative simplicity of the airfield approach and the absence of evidence that complacency was an issue for this unit and this pilot, the error-chain explanation was a far less likely explanation for the mishap than the sudden-onset medical crisis.

The positive toxicology report was of concern because of potential effects on pilot performance. Despite the inappropriate medications ingested, the testimony of witnesses indicated that the MP was not experiencing untoward, overt behavioral effects on the day of the mishap. It was possible that he was experiencing alerting effects and that he used d-methamphetamine or a substance that metabolizes into d-methamphetamine, occasionally with that specific goal in mind. It was equally likely that he also used coffee for this purpose. Because d-methamphetamine was present in the urine and not the blood, it was inconclusive whether it had any effect on pilot performance. Because diphenhydramine was present in the blood, it was possible that he had experienced some positive effects on sleep quantity and/or quality and no or minimal effects on cognitive performance. There were no facts that revealed the MP's motivation for this substance abuse.

The mishap pilot's medical profile was investigated carefully. Although obligated to disclose significant medical information, such as high blood pressure, in all available FAA medical examinations the MP consistently stated: "no significant medical history." Interviews with the MP's coworkers did not indicate or suggest any health problem. There was nothing to suggest that the MP was in any need of using medications (phenylpropanolamine and/or d-methamphetamine and/or d-amphetamine) to control his weight or appetite, or any other medical problem. The MP was possibly unaware of his coronary condition. Had the MP complied with the requirement to undergo a periodic flying physical examination, and had he candidly shared his medical history with the examining USAF flight surgeon/physician, the probability of detecting severe CAD still would have been low without follow up medical testing.

Conversly, the MP was aware of his high blood pressure, took the prescribed medications, and suppressed the information. Discussion with the MP's family physician and review of the MP's civilian medical records revealed 44 visits between 1988 and 2003, all but nine of them for treatment and management of high blood pressure (hypertension) for which the MP received medications since 1990. This investigation raised doubt about whether the MP was medically qualified to fly. Given full disclosure of his medical history to his aviation medical examiner, further evaluation of his hypertension would have been required prior to medically qualifying the MP for flying duties. It was likely that his right to fly would have been revoked either permanently or until the MP received a waiver by medical authority

Based upon the autopsy findings, the MP's cause of death was sudden cardiac death "due to arteriosclerotic cardiovascular disease, with evidence of severe coronary artery disease." Additionally, the autopsy revealed ingestion of d-methamphetamine or of a substance that metabolizes into d-methamphetamine and d-amphetamine, such as benzphetamine (for example Didrex®), pseudoephedrine (commonly found in Sudafed®, Afrin®, and over-the-counter cold remedies), phenylpropanolamine (often found in over-the-counter diet pills such as Dexatrim®), and diphenhydramine (for example, Benadryl® used as a sleep aid). Although demonstrating severe thermal/fire injuries, the remains of the MP allowed adequate examination of all vital

organs. No evidence of traumatic injury sufficient to cause death was demonstrated during the autopsy. The manner of death was natural and not a result of the impact or fire.

Coronary Artery Disease (CAD) of such a degree predisposed the MP to sudden cardiac death (SCD). SCD is an unexpected death due to cardiac causes occurring in a short period in a person with known or unknown cardiac disease in whom no previously diagnosed fatal condition has been apparent. Most cases of SCD are related to cardiac arrhythmias. Approximately 1/2 of all cardiac deaths can be classified as SCD. More than 80% of SCD events occur in individuals with CAD. There generally are no warning signs that can warn either the patient or their doctors that sudden death is approaching. SCD is often caused by irregular beating of the heart (arrhythmia), most commonly ventricular fibrillation (VF). The person having VF suddenly collapses or falls unconscious because the brain and muscles have stopped receiving blood from the heart. Unless VF is treated immediately, death will ensue. VF is responsible for 75-85% of sudden cardiac deaths. Also, studies showed that many more cardiac deaths occur in the pre-dawn hours than during the remainder of the day and night (Tab FF-13).

Inappropriate self-medication by the MP was apparent. The toxicology reported revealed that the MP had willfully ingested a variety of medications/drugs, including pseudoephedrine, phenylpropanolamine, diphenhydramine, acetaminophen, and d-methamphetamine, or a substance that metabolizes into d-methamphetamine and d-amphetamine, such as benzphetamine (for example Didrex®). There was diphenhydramine in the blood. Due to poor sample quality caused by thermal effects, an accurate interpretation of the results and the effects of the medications on the MP were not possible. Toxic symptoms of diphenhydramine can include coma, seizures, heart arrhythmias, and cardiac arrest. The positive toxicology of the urine specimen allowed us only to conclude that these substances were used prior to death. This finding did not allow us to comment about possible effects at the time immediately prior to death. Although the individual was described by his co-workers as "thorough" and "very safety conscious," his self-medication suggested an individual who ingested inappropriate medications/drugs, concealed this information and accepted unnecessary risk.

It was inconclusive if any substance identified by the toxicology examination might have solely triggered an adverse cardiac event responsible for the MP's SCD. The toxicology exam revealed d-methamphetamine and d-amphetamine in the urine specimen only, not in the blood specimen in any measurable level, indicating that d-methamphetamine, or substance responsible for the presence of d-methamphetamine and d-amphetamine in the urine, was not ingested immediately prior to this mishap flight in any significant quantity. The facts are, any of the substances found in the MP's toxicology specimens could have been responsible for causing adverse cardiac effects. Although a major concern, it was not possible to focus solely on the potential adverse effects of d-methamphetamine and d-amphetamine on the MP's heart. Thus, d-methamphetamine and d-amphetamine, or substance responsible for their presence in the urine, were not a sole contributing factor. More likely was the MP's combined pattern of inappropriate self-medication and willful suppression of this significant medical information to flight medical examiners. As a consequence, the MP denied himself access to the medical care that could have detected his deteriorating medical condition.

**CONCLUSION**

I conclude there was clear and convincing evidence that the MP suffered incapacitation due to sudden cardiac death during the approach to land that resulted in the mishap aircraft impacting the ground. A substantially contributing factor was that the MP, in violation of federal policy and directives, willfully ingested inappropriate medications, suppressed significant medical information and deceived flight medical examiners in the presence of a deteriorating and dangerous health condition.

30 April 04

CHRIS T. ANZALONE
Brigadier General, USAF
President, Accident Investigation Board