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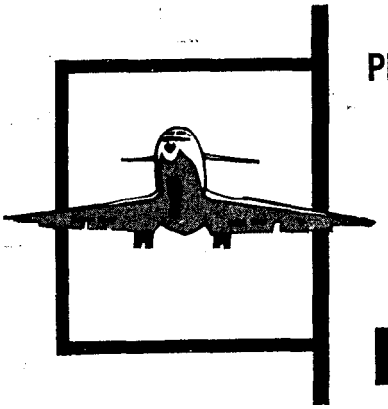

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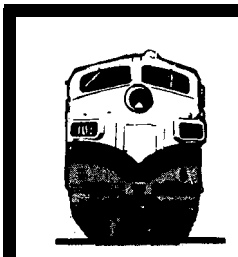

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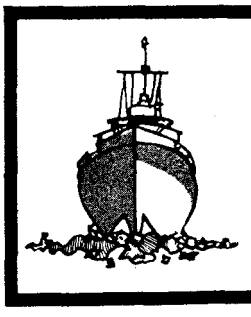
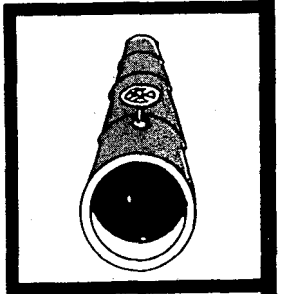


AIRCRAFT ACCIDENT REPORT

TRANS-COLORADO AIRLINES, INC., FLIGHT 2286
FAIRCHILD METRO III, SA227 AC, N68TC
BAYFIELD, COLORADO
JANUARY 19, 1988



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15. Supplementary Notes

16. Abstract: About 1920 mountain standard time on January 19, 1988, N68TC, a Trans-Colorado' Airlines Inc., Fairchild Metro III, operating as Continental Express flight 2286 from Stapleton International Airport Denver, Colorado, with 2 flightcrew members and 15 passengers on board, crashed on approach to Durango, Colorado. The two flightcrew members and seven passengers were killed as a result of the accident.

The National Transportation Safety Board determines that the probable cause of this accident was the first officer's flying and the captain's ineffective monitoring of an unstabilized approach which resulted in a descent below the published descent profile. Contributing to the accident was the degradation of the captain's performance resulting from his use of cocaine before the accident.

The safety issues examined in this investigation include the execution of a special approach by flightcrews and the effects of cocaine on human performance.

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APPENDIXES

EXECUTIVE SUMMARY

About 1920 mountain standard time on January. 19, 1988, N68TC, a Trans-Colorado Airlines Inc., Fairchild Metro III, operating as Continental Express flight 2286, on a flight from Stapleton International Airport, Denver, Colorado, with 2 flightcrew members and 15 passengers on board, crashed on approach to Durango, Colorado. The two flightcrew members and seven passengers were killed as a result of the accident.

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The safety issues examined in this investigation include the execution of a special approach by flightcrews and the effects of cocaine on human performance.

As a result of its investigation, the Safety Board issued three recommendations to the Federal Aviation Administration urging it to inform principal operations inspectors of the United States Standard for Terminal Instrument Procedures (TERPs criteria) and require them to personally observe an operator's conduct of a special instrument approach, to provide guidance to operators on conducting pre-employment verification of pilots' backgrounds, and to provide information on drug use and detection to aviation medical examiners.

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C. 20594

AIRCRAFT ACCIDENT REPORT

TRANS-COLORADO AIRLINES, INC., FLIGHT 2286
FAIRCHILD METRO III, SA227 AC, N68TC
BAYFIELD, COLORADO
JANUARY 19, 1988

1. FACTUAL INFORMATION

1.1 History of the Flight

At 1820 mountain standard time, on January 19, 1988, N68TC, a Trans-Colorado Airlines, Inc., 19-passenger Fairchild Metro III, operating as Continental Express flight 2286, departed Stapleton International Airport Denver, Colorado (DEN), with 2 flightcrew members and 15 passengers on board. Trans-Colorado 2286, en route from DEN to Cortez, Colorado, with a stop in Durango, Colorado (DRO), was a regularly scheduled flight conducted under 14 Code of Federal Regulations (CFR) Part 135. Trans-Colorado Airlines was providing Rocky Mountain Airways, a wholly owned subsidiary of Continental Airlines, with aircraft and flightcrews to operate scheduled passenger flights on routes flown by Rocky Mountain Airways.

The captain and first officer had reported for duty at 1230 to the DEN operations facility of Rocky Mountain Airways. The crew was scheduled to fly N68TC on a flight from DEN to Rivet-ton, Wyoming, then to Casper, Wyoming, before returning to DEN. That flight, scheduled to depart DEN at 1315, did not depart until 1425 due to weather delays at DEN and the late arrival of the airplane there. It returned to DEN at 1757, 42 minutes behind the scheduled arrival time.

Trans-Colorado 2286 was scheduled to depart DEN at 1740 for the 72-minute flight to DRO. The planned route of the flight was from DEN to the SO-nautical mile distance measuring equipment (DME) fix of its 185" radial, direct to the Blue Mesa VORTAC (very high frequency omni-directional range with TACAN navaid capabilities for DME use) direct to DRO. The planned cruising altitude was to be 22,000 feet mean sea level (msl). The landing alternate was Cortez.

Trans-Colorado 2286 departed DEN around 1820 and climbed to its assigned cruise altitude, 23,000 feet, without incident. At 1853:09, the captain, who was performing all communications with air traffic control, reported that "Trans-Colorado 2286 [is] level at [flight level] 230" or 23,000 feet pressure altitude: (See appendix B.) The Federal Aviation Administration's (FAA) DEN Air Route Traffic Control Center (ARTCC) acknowledged and informed the flight that "Durango zero one zero three [1803 local] observation: indefinite ceiling eight hundred sky obscured visibility one mile light snow and fog temperature two five dew point two five altimeter er correction wind is calm." The captain acknowledged.

At 1900:40 DEN ARTCC asked Trans-Colorado if they would "rather shoot the ILS [instrument landing system] or ah will the ah [VOR] DME approach to runway two zero be ah sufficient?" The captain responded that they would plan on the DME approach. DEN ARTCC then told the

flight, ". . .if you want to proceed direct to the [DRO] zero two three radial eleven mile fix that's approved." The captain acknowledged. (See figure 1.)

The Rocky Mountain Airways station agent at DRO stated that about 1905 the captain of Trans-Colorado 2286 told her on the company radio frequency that the flight was 25 minutes out, was full on water (i.e., engine water injection fluid used for increased engine power on takeoff), would be landing with 1,400 pounds of fuel, and would not be needing more fuel. She gave the flightcrew the current DRO weather.

At 1903: 11, DEN ARTCC cleared the flight to descend at pilot's discretion to 16,000 feet msl, and the captain acknowledged that they would be leaving flight level 230 to descend to 16,000 feet msl. At 1910: 19, DEN ARTCC cleared Trans-Colorado to descend to 15,000 feet and the captain acknowledged the clearance. Three minutes 28 seconds later, the DEN ARTCC told the flight to cross the DRO 023" radial 1 l-mile fix, at or above 14,000 feet, and cleared it for the VOR DME runway 20 approach to DRO. The captain did not respond immediately and the clearance was repeated at 1914:28. The captain responded that they were "down to 14 (i.e., 14,000 feet msl) and we're cleared for the approach." At 1916: 15, DEN ARTCC informed the flight that radar coverage was terminated. Six seconds later, the captain responded, "Twenty two eighty six Wilco." This was the last transmission from the flight.

Passengers on the flight remembered a crewmember announcing that they were 65 miles from Durango and they would be landing in about 20 minutes. Later, the crewmember announced that they were beginning their initial descent into DRO and requested that passengers fasten their seatbelts. One passenger observed flap extension; recognized Pagosa Springs and Bayfield, Colorado; and saw houses and lights on the ground. Passengers consistently characterized the flight as uneventful until the final moments. They said that the airplane leveled off briefly, then hit hard, followed by an abrupt pitch up and an increase in engine power. They reported that the airplane rolled several times laterally before it hit the ground and slid to a stop about 5 miles from the airport.

The accident occurred during the hours of darkness at 37°13' N longitude and 107°41' W latitude.

1.2 Injuries to Persons

Iniuries	Crew	Passenaers	Total
Fatal	2	7	9
Serious	0	1	1
Minor	0	6	6
None	0	1	1
Total	2	15	17

1.3 Damage to Aircraft

The airplane was destroyed in the accident. Its value was estimated at $3 million.

1.4 Other Damage

Several trees were damaged and several others were destroyed in the accident.

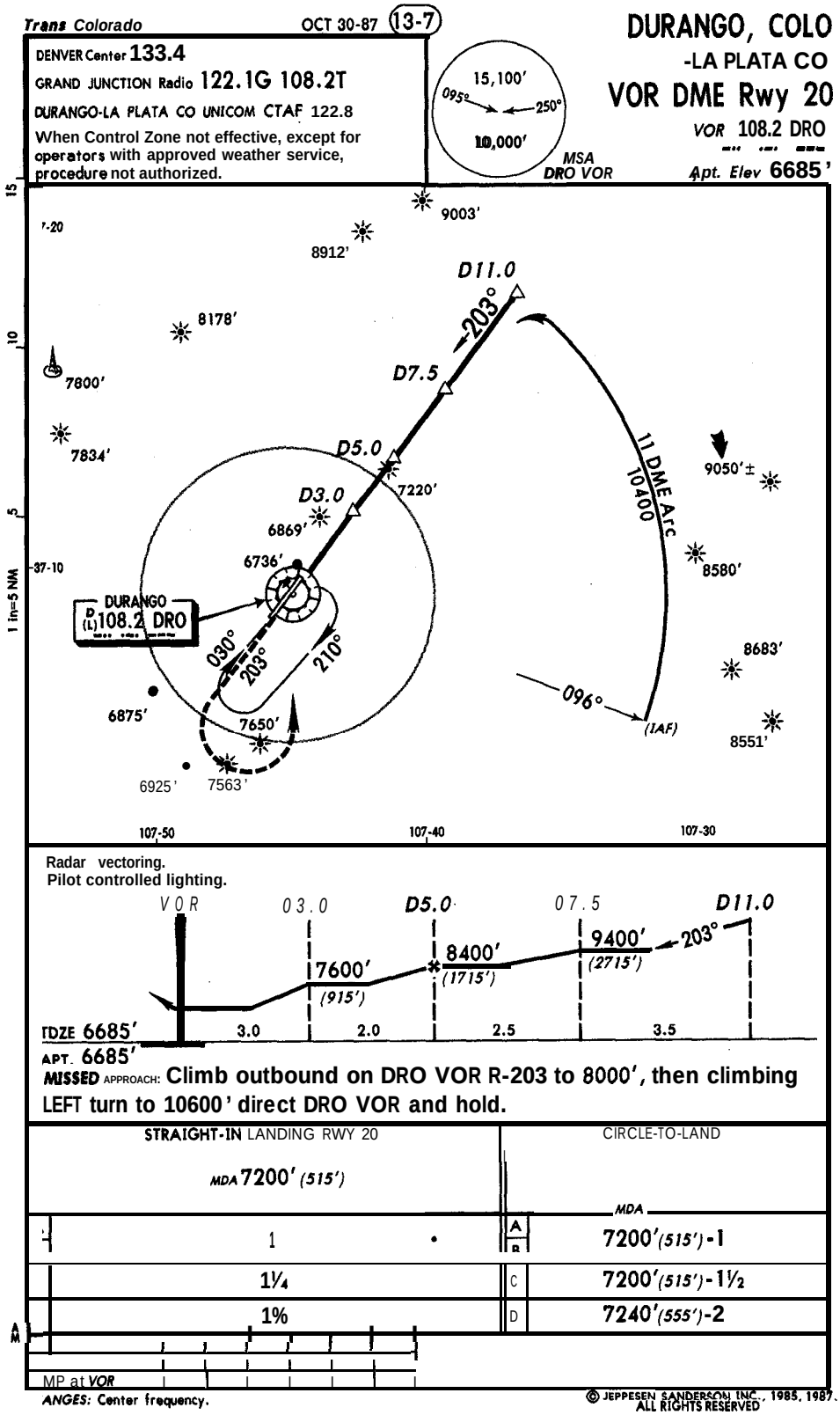

Figure 1.--VOR DME approach to runway 20 of DRO.
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1.5 Personnel Information

The captain and first officer had, in accordance with the policy of Trans-Colorado Airlines, been flying together for the l-month period beginning December 12, 1987. In this period, the first officer also had flown with other captains on January 11, 1988, and on January 13, 1988, when he was on reserve status. (See appendix C.)

1.5.1 The Captain

The captain had been employed as a captain on the Metro III by Pioneer Airways, which ceased operations on May 14, 1986. Pioneer had conducted scheduled revenue passenger service in Colorado under 14 CFR Part 135. The captain was then hired by Trans-Colorado Airlines on May 27, 1986, and was assigned to the position of first officer on the Fairchild Metro III. Due to his previous experience as a captain on a Metro III with Pioneer, he upgraded to the position of captain on that airplane a month later. As part of his training at Pioneer Airways, the captain completed 2 hours of recurrent training in a Phase I, Metro III simulator, administered by a company check airman.

At the time of the accident, the captain had accrued about 4,184 hours of flight time, of which 3,028 hours were in the Metro III. He served as pilot-in-command for 1,707 of those hours.

Personnel at Trans-Colorado described the captain as a highly skilled pilot. A first officer indicated that he enjoyed flying with the captain and had jokingly offered to switch assignments with the first officer on January 19. Other pilots commented favorably on the captain's skill as a pilot but criticized his tendency to rush. Two first officers commented on the captain's taxiing at high speeds. The chief pilot at Trans-Colorado characterized the captain as a good pilot, very intelligent, self confident, and with a casual style; however, he suggested that the captain liked to stay on schedule and at times operated a little too quickly. Other pilots who had flown with the captain described him as a better than average captain but one who had a reputation for being in a hurry and taxiing quickly. A dispatcher stated that the captain had a reputation for taking an airplane that was behind schedule and getting it back on schedule by the end of the day. A note to that effect was found in Trans-Colorado's personnel file on the captain. It stated, "My compliments to the crew of 842/43 . . . Silver/Rhoades . . . off DEN at 1056 into GUC 1132 and out at 1139.. . Gotta like it. . . SMJ." The Safety Board was unable to acquire additional information about the events surrounding this note.

Trans-Colorado records contained three items that contained critical or negative comments on the captain. In September 1987, the captain complained to a Continental Airlines customer service agent that he and his companion's baggage had been lost while the two were traveling on a Continental flight from Houston to DEN. The agent noted that the captain was "angry" and "carried on" while "his wife was interrupting another agent. . ." The captain did not identify himself to the agent as a nonrevenue passenger nor did he state that he was not married and as a result, his traveling companion was not his wife. This violated company and industry rules prohibiting nonrevenue travel by a someone not in the immediate family of a company employee. Trans-Colorado's Pilot Policy Manual, in effect at the time, stated that:

> All TCA [Trans-Colorado Airlines] Company personnel, while traveling on either TCA aircraft or another domestic carrier, are representing Trans-Colorado Airlines. Employees and family members are required to conduct themselves in a professional and courteous manner. Any abuse whatsoever of any travel benefit . . . will result in suspension of all benefits for at least six (6) months. Repeated abuses are grounds for dismissal!

In November 1987, in violation of a contract agreement with the fueling company, the captain personally refueled an airplane in Houston that was behind schedule because he believed that there were no fuelers available. One day later, the captain boarded a late passenger with one of the airplane's engines operating, in violation of company procedure.

Safety Board records indicate that, on February 11, 1983, the captain was involved in an airplane accident near Burlington, Colorado. The airplane, a Cessna 182, was destroyed and one passenger received minor injuries. The Safety Board determined that the factors involved in the probable cause of the accident were the pilot-in-command's selection of the wrong runway, improper compensation for wind conditions, misjudging distance, and delaying a go-around. The FAA required the captain to be reexamined by an FAA inspector. The captain completed the reexamination satisfactorily on March 2, 1983.

The captain's first-class medical certificate was issued on November 13, 1987. It contained a limitation requiring the captain to wear corrective lenses while performing his airman duties. The captain answered "no" to all medical history questions (contained within question 21) on the application for an FAA airman medical certificate. Question 21n asked the applicant whether he or she " . . . ever had or have . . . any drug or narcotic habit," and question 21v asked for "record of traffic convictions."

According to records of the Florida Department of Highway Safety and Motor Vehicles, the captain's drivers license had been suspended on November 1, 1980. Because the State did not maintain records beyond a certain number of years, the Safety Board could not determine the reason for the suspension. The captain later moved to Colorado and, after his Florida license had been suspended, obtained a Colorado drivers license. Records of the Colorado Motor Vehicles Division indicate that the captain did not inform Colorado, as required, that his previous driver's license had been suspended. From March 1983 through January 1986 the captain received five convictions for moving violations: one for speeding, two for improper yielding of the right of way, and two for disobeying a traffic signal or sign. Two violations involved traffic accidents. Trans-Colorado's vice-president of operations told Safety Board investigators that the company was unaware of any previous aviation accidents or driving convictions of either the captain or the first officer.

1.5.2 The First Officer

The first officer had been hired by Trans-Colorado on June 23, 1987 and assigned to the position of first officer on the Metro III. At that time, he had accrued about 8,500 total hours of flight time, of which about 3,300 hours were in multiengine airplanes, with about 1,500 of those hours in turbine equipment. At the time of the accident, he had accrued about 305 hours in the Fairchild Metro.

The first officer began his professional aviation activities in 1974 as a flight instructor in Colorado. He held the position until 1980 when he became a fir&officer with a commuter airline in Colorado believed to be Pioneer Airways; the airline terminated the first officer about a year later. The FAA's principal operations inspector (POI) of the airline stated that the first officer was terminated because he demonstrated a lack of proficiency in his attempt to upgrade to captain. A flight instructor of that airline said that the first officer "demonstrated period[s] of inaction as the flight regime required change[s in] the aircraft's configuration or attitude or a change of phase of flight."

Trans-Colorado requested and was given information by the first officer regarding his employment for the 5 years before he submitted his application for employment with Trans-Colorado. However, the first officer did not list his 1980-81 employer, nor was he required to list that information, on the S-year employment verification form that was part of his application for employment. The Safety Board was unable to determine the extent to which Trans-Colorado

obtained information about the first officer's background. Company personnel informed the Safety Board that they were unaware of deficiencies in the first officer's performance before he joined Trans-Colorado.

The first officer then flew for 5 years as an instructor pilot at a fixed base operator in Colorado. In 1985 he moved to Anchorage, Alaska, where he was employed as a charter pilot and flight instructor at a fixed-base operator. On February 12, 1986, while employed at the Alaska facility, the first officer failed to perform satisfactorily on a 14 CFR Part 135 proficiency check. The areas of difficulty involved ILS and nondirectional beacon (NDB) approaches. The first officer satisfactorily completed the proficiency check on March 18, 1986; however, because instrument approaches were not reviewed the first officer was limited to visual flight rules (VFR) flight operations. In September 1986, he returned to Colorado. According to friends, he moved because of the depressed state of the local economy and his desire to be near his family. After working for 9 months at several odd jobs, including some piloting jobs, he joined Trans-Colorado. His ground school training was without incident. The following comments were included in the record of his simulator training, "Average performance--A little more time spent on cockpit procedures would be benificial (sic)--Had no problems flying the sim." In his record of flight training of July 14, 1987, the instructor wrote: "Okay/weak." On July 15, the instructor wrote, "weak but improving." On July 17, a different instructor recommended the first officer for a checkride and added the following comments, "Overcorrecting and chasing needles during ILS." On July 17, 1987, the first officer satisfactorily completed a 14 CFR Part 135 proficiency check with Trans-Colorado. No difficulties were noted in his performance in the proficiency check, which included demonstration of ILS and VOR approaches.

The first officer was issued a first-class medical certificate on June 15, 1987. It contained no limitations but it did contain Statement of Demonstrated Ability (waiver) No. 40ID8515 for defective hearing in his left ear. On the application for the FAA medical certificate he responded "yes" to question 21v, Record of Traffic Convictions. On his September 18, 1985, application for an FAA medical certificate, the first officer responded "yes" to question 21v as well as to question 21w, Record of Other Convictions. On an application for an FAA medical certificate dated January 13, 1984, in addition to responding "yes" to questions 21v and 21w, he noted, in the "Remarks" section of question 21, "Feb 1982 DWI (driving while intoxicated) received; never lost license." The airman medical examiner (AME) noted, on question 61 of the application of January 1984, Report of Medical Examination--Comments on History and Findings; Recommendations: "Discussed DWI; He is a convert Now. "

Colorado records indicate that the first officer was convicted twice, in 1976 and 1983, of alcohol-related driving offenses, and in 1972, of one nondriving, alcohol-related offense. All records pertaining to the first officer indicate that he experienced no further alcohol-related difficulties after 1983.

The first officer's most recent physical examination was completed the day before the accident in preparation for a pre-employment examination by Rocky Mountain Airways. The examination, which included toxicological analyses, indicated that he was in good physical condition, and free of alcohol and licit or illicit drugs. (See section 1.17.4, Human Performance Information, for more information.)

1.6 Aircraft Information

The airplane, serial No. AC 457, United States Registry N68TC, was manufactured by the Fairchild Aircraft Corporation in 1981. It initially entered service on October 1, 1981. Trans-Colorado obtained the airplane from Fairchild and entered it into service in June 1986. (See appendix D.)

The takeoff weight of Trans-Colorado 2286 was 13,227 pounds and its center of gravity (CC) was 269 inches. The maximum landing weight for the airplane was 14,000 pounds, and the CC range

at 13,227 pounds was from 262.1 to 274.7 inches. As a result, both the weight and CG were within acceptable limits throughout the flight.

The airplane was equipped with two altimeters: one digital type and one three-pointer type. The digital altimeter, which was used by the captain, showed the altitude in IO-foot increments, as well as the approximate closest 100-foot reading with a pointer. The three-pointer altimeter was used by the first officer. The airplane was equipped with an altitude alerting device located in the center of the glareshield, which illuminated when the airplane approached within 100 feet of the altitude selected. The airplane had area navigation (RNAV) capabilities. A light emitting diode (LED) DME display, which showed either distance remaining, ground speed, or time to station, was located just under the captain's vertical speed indicator. The airplane was not equipped, nor was it required to be equipped, with a ground proximity warning system (GPWS).

The Metro III, SA227, is derived from the Metro and Metro II airplanes. The earlier Metro and Metro II airplanes are basically identical, except for some minor differences in appearance, such as window shape. The Metro III and Metro II share an approximate 57-foot fuselage, but the Metro III has an approximately lo-foot longer wingspan than its predecessor and is equipped with higher rated Garrett engines and four-bladed propellers compared to three-bladed propellers of the earlier Metro airplanes. As of July 1988, 15 Metros, 156 Metro II, 10 Metro IIA, and 205 Metro III airplanes were in service worldwide.

1.7 Meteorological Information

The 1700 surface weather map, prepared by the National Weather Service (NWS), showed a large, low-pressure area centered over Missouri. The low-pressure area influenced virtually all of the weather of the continental United States east of the Rocky Mountains. Colorado, east of the escarpment, was under the influence of the northerly flow west of the low-pressure area. A trough extended south through Colorado, approximately along the escarpment. The winds in this area were light to moderate and variable in direction, primarily due to the influence of the mountains. Conditions in the Four Corners area were characterized by broken to overcast skies with snow showers.

The 1700, 700 millibar map, approximately 10,000 feet msl, showed a deep low over southwestern Iowa with a trough extending southwest through the Texas Panhandle into southeastern New Mexico. The atmosphere at this level, over southwestern Colorado, the Four Corners area, and northeastern Texas was moist with a temperature/dew point spread of less than 4° C.

Weather observations at Durango-La Plata County Airport were taken by Rocky Mountain Airways personnel under a cooperative agreement between the airline and the NWS. The following surface observations were taken at the airport on the night of the accident:

> 1803--Surface Aviation: Ceiling--indefinite 800 feet obscured; visibility--l mile; weather--light snow and fog; temperature--24“ F; dew point--missing; wind--calm; altimeter--29.80 inches.
>
> 1905--Surface Aviation: Ceiling--partial obscuration estimated 800 feet overcast; visibility--S miles; weather--light snow; temperature--24” F; dew point--missing; wind--calm; altimeter--29.80 inches; remarks--snow showers intensity unknown all quadrants.

1950--Surface Aviation: Ceiling--partial obscuration estimated 600 feet overcast; visibility--S miles; weather--light snow; temperature--22" F; dew point--missing; wind--130" at 3 knots; altimeter--29.89 inches; remarks--snow showers intensity unknown all quadrants.

The 1905 observation was not available on the NWS network and was apparently not transmitted. It was later learned that this observation was not passed on to the NWS office in Grand Junction, Colorado, for transmission. Nevertheless, it was transmitted to the flight.

The following winds aloft were measured in the 1700 sounding taken at Grand Junction, located about 125 nautical miles (nm) northwest of DRO:

Altitude feet msl		Direction (degrees true)	Speed (knots)
4,829	(surface)	010	14
5,615		017	15
7,132		031	18
8,015		051	15
9,094		058	12
10,193		050	9
11,314		044	8
12,226		052	13
13,127		OS6	19
13,926		051	22
14,747		044	23
15,556		047	20
16,385		045	17
17,204		033	18
18,024		035	20
18,852		031	21
19,676		018	19
20,535		359	15

The 1700 sounding also showed a shallow surface inversion with a mixed layer to an inversion between the approximate altitudes of 13,800 and 14,600 feet msl. The atmosphere was moist between the approximate altitudes of 11,200 and 13,000 feet msl. The freezing level was at the surface.

1.8 Aids to Navigation

At the time of the accident, a notice to airmen (NOTAM) was issued for the glideslope to the ILS of runway 2 which indicated that it was out of service. This was due to an excessive amount of snow forward of the antenna which caused spurious glideslope signals. After the accident, the DEN ARTCC, Durango sector controller who on was duty at the time of Trans-Colorado 2286's approach, told the Safety Board that, although he did not so inform the flight, he was aware of the NOTAM, what it referred to and would have so informed the flight, as required, had the crew decided to execute what would have been a localizer approach to runway 2. Three hours after the accident, FAA personnel performed a ground check of the ILS and found no out-of-tolerance parameters.

Three days after the accident, a flight inspection was performed of the navigation aids associated with the instrument approaches to DRO. The navigational aids included those used by Trans-Colorado 2286, along the same routes and at the same altitudes of the flight. The Safety Board found that all navigational aids were operating within acceptable parameters.

1.9 Communications

There were no known communications difficulties at the time of the accident.

1.10 Aerodrome Information

Durango-La Plata County Airport, elevation 6,685 feet msl, has one hard surfaced runway, 2/20, 9,200 feet by 150 feet. The runway has high intensity runway edge lights and a visual approach slope indicator (VASI) at either end. Runway 20 also has runway end identifier lights (REIL) while runway 2 has a medium intensity approach light system with runway alignment indicator lights (MALSR). Witnesses reported seeing the REIL operating about the time of the accident. There is no control tower on the field; pilots can control the runway lighting on frequency 122.8 MHz.

There are three public use instrument approaches to the airport: VOR-DME runway 2, VOR-A, and an ILS-DME to runway 2. The VOR-DME runway 20 approach was a private use approach, considered a "special approach." (See section 1.17.2, Trans-Colorado Training and Procedures, for more information.)

1.11 Flight Recorders

The airplane was not equipped, nor was it required to be equipped, with either a cockpit voice recorder (CVR) or a flight data recorder (FDR).

1.12 Wreckage and Impact Information

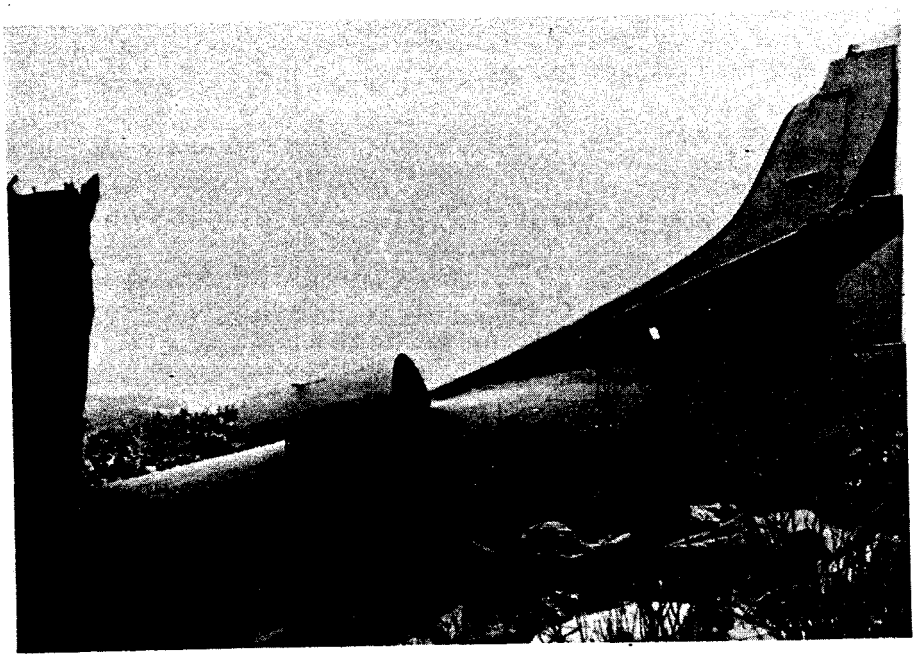
The wreckage path extended about 1,000 feet, on an approximate heading of 198". (See figure 2.) The airplane initially contacted several trees about 6 to 8 feet below the top of a hill, flew over the top of the hill, and impacted the ground near the bottom of the opposite side of the hill. The elevations at the location of initial impact and the final resting point were 7,180 and 7,100 feet msl, respectfully. The airplane slid about 300 feet along snow-covered terrain after it struck the ground on the second impact.

The main wreckage was found on a heading of 104". The fuselage was essentially upright, although lying nose down on a hill. (See figure 3.) The wing had separated from the fuselage at the attachment fittings and was lying inverted above the fuselage. (The Metro III is constructed of a single wing that is mated to the fuselage.) The right engine and its nacelle were hanging nose down from the wing, restrained primarily by control cables, tubing, and torn sheet metal. The left engine had been torn from its mounting and was found buried in the snow, adjacent to the right forward fuselage.

The fuselage was crushed and fragmented from the radome to the first cabin window, with additional crushing to just aft of the trailing edge of the wing. The aft 1/3 of the ventral fin was bent to the left. The upper 2 1/2 feet of the vertical stabilizer and the upper end of the rudder were bent to the right.

About 2/3 of the left part of the wing was fragmented from the tip inward. The left wing tip was found away from the main wreckage near the site of the initial impact with the trees. About 1/4 of the right part of the wing from the tip inward had separated from the remainder of the wing and came to rest about 250 feet from the fuselage within the wreckage path. The left flap actuator was found extended 5 inches, corresponding to a fully extended position.

The left aileron and trim tab were destroyed. The right aileron and trim tab were deflected fully downward and compressed forward. The horizontal stabilizer trim actuator had come apart in the accident and the drive gears were visible. The horizontal stabilizer trim position was about



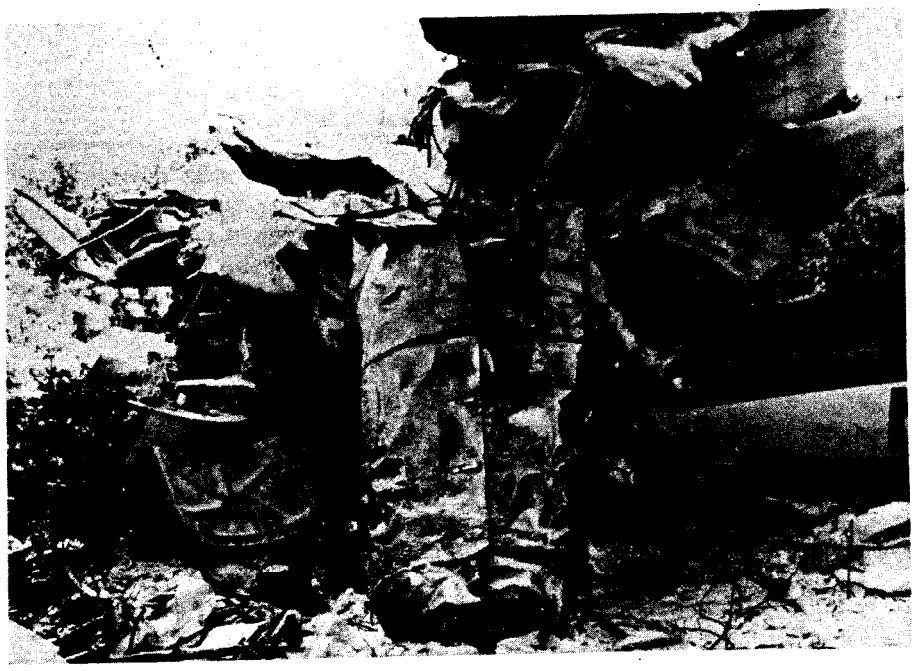


Figure 3.--Wreckage of Tram-Colorado 2286

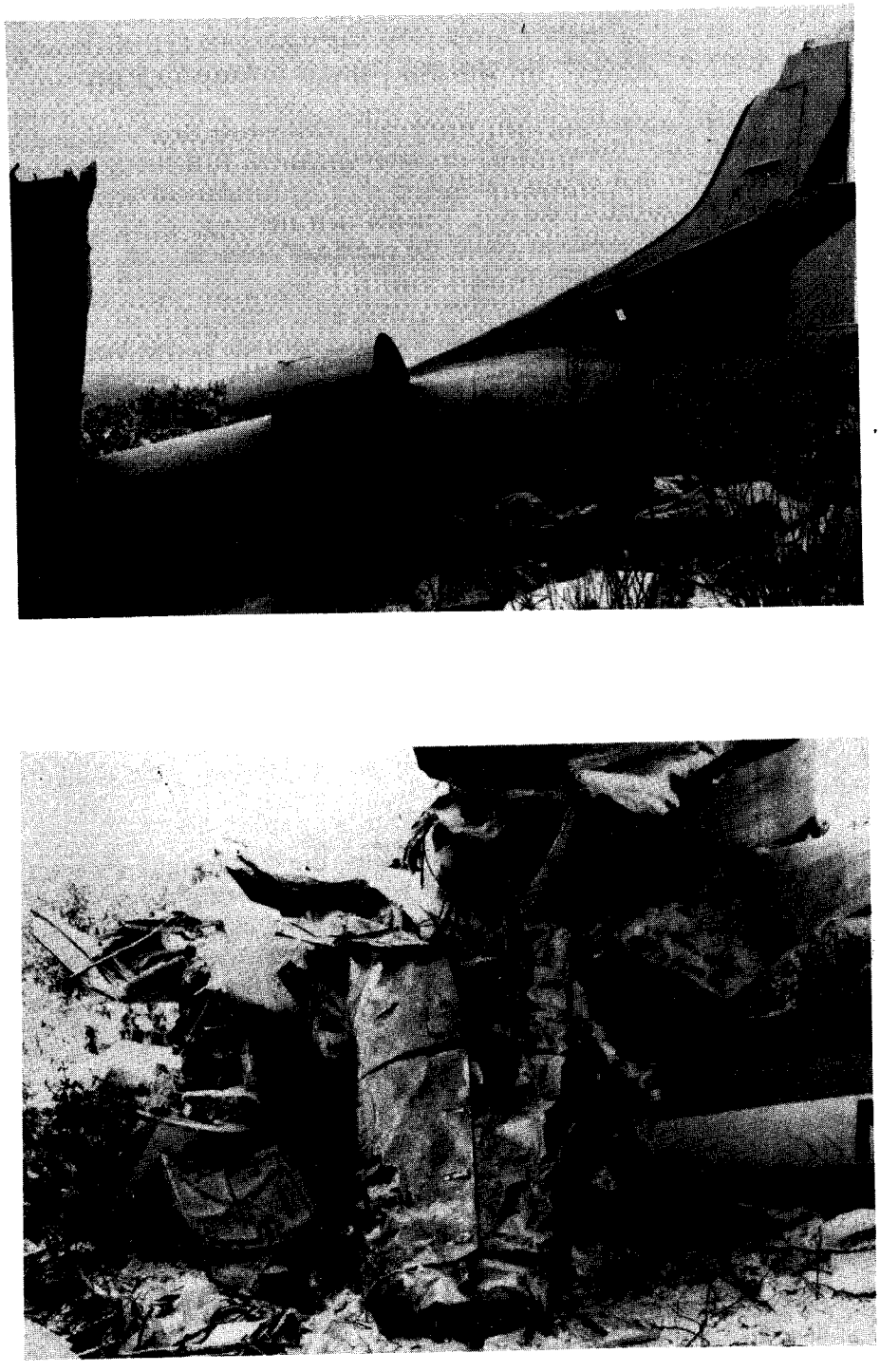


Figure 3.--Wreckage of Tram-Colorado 2286

1 inch above the green takeoff arc. The trim actuating arms were extended to different lengths, with the right arm about 1 inch further extended than the left.

Both main landing gear strut castings failed. The four main gear and one nose gear actuators were found, all in the extended position. The gear was found in the wreckage path.

The instrument panel was substantially damaged. The first officer's altimeter was set to 29.88 inHg. and read 16,290 feet. The captain's altimeter was set to 29.82 inHg. and read 7,100 feet. Both were disassembled. The first officer's altimeter showed substantial impact-related damage which affected its setting, the captain's did not. The altitude alert was set to 7,500 feet. The DME was destroyed and no useful information could be obtained from it. All communication and navigation radios were set to appropriate frequencies.

The speed levers were found in the full forward setting with the power levers at flight idle.

The left propeller was found about 200 feet east of the airplane wreckage south of the wreckage path. Three blades of the left propeller were bent toward the thrust face in angles ranging from almost no bend to 45"; one blade was bent toward the camber face at an approximate 45° angle. The right propeller was found about 35 feet south of the left propeller. The right propeller blades exhibited bending toward the thrust face. The blade bending angles ranged from 15" to 60°.

The engines were disassembled after the accident. Both engines showed evidence of ingestion of wood and other debris. All internal damage in both engines was consistent with post-impact type damage.

'9.13 Medical and Pathological Information

Autopsies indicated that both crewmembers of Trans-Colorado 2286 died from multiple impact trauma consistent with an airplane accident.

Blood, urine, vitreous, and bile samples from each of the crewmembers were submitted for toxicological examination to the Center for Human Toxicology of the University of Utah. The samples from the body of the first officer were negative for alcohol and all drugs. The blood sample from the captain showed 22 nanograms (ng)/milliliter (ml) of benzoylecgonine; the urine sample showed 22 ng/ml of cocaine and 1,800 ng/ml of benzoylecgonine. Benzoylecgonine is the principle metabolite of cocaine. (See section 1.17.5.) Additional samples from the body of the captain were then submitted to a private laboratory in Sacramento, California, for a second toxicological analysis which was performed over a month later. The results showed the presence of 26 ng/ml of benzoylecgonine in the blood and 11 ng/ml of cocaine and 1,596 ng/ml of benzoylecgonine in the urine. The analyses were able to detect amounts of cocaine in the blood as low as 10 ng/ml. The difference in the blood measurements between the two samples was attributed to measurement variation. The difference in the amounts of cocaine and benzoylecgonine in the urine of the two samples was attributed to measurement variation and/or the continued breakdown in the urine of the two substances.

The autopsy of the first officer's body included an examination of the liver. It showed no tissue pathology characteristic of alcohol abuse.

1.14 Fire

There was no evidence of preimpact or postimpact fire.

1.15 Survival Aspects

The airplane was crushed from the nose to the first row of passenger seats. Survivors' injuries ranged in severity from a fractured vertebrae to muscle strains. One survivor also sustained first degree frostbite of both feet.

The Durango-La Plata County Airport contacted the Durango Central Dispatch at 2002 and reported that the flight was overdue. At 2004, the airport called again and reported that the flight was 25 minutes overdue. The Civil Air Patrol was notified but, because the airplane's location was not known, a search was not initiated. At 2032, a Civil Air Patrol official from Denver informed Central Dispatch that the last DEN ARTCC radar contact with the flight showed Trans-Colorado 2286 at a point 6 miles east of DRO. At 2034, a local resident contacted Central Dispatch and informed it that a man had just reported surviving a plane crash. Central Dispatch sent a rescue vehicle to the survivor and it'arrived at 2045. The survivor had walked until he arrived at the residence. Five other passengers, including a 23-month-old who was carried by another survivor, walked together about 1 1/2 miles over 1 1/2 hours to a highway. They then met a motorist who transported them about a mile until he met a responding rescue vehicle. The group of survivors was transported to a local hospital.

About 2226 the crash site was located. Rescue units from various local agencies, using snowmobiles, ambulances, ski patrol sleds, and a bulldozer arrived at the site 48 minutes later. Ten passengers and crew were at the site. The crewmembers and 4 passengers had been killed. Rescue of the survivors was hampered by the *snow,* darkness, extreme cold and the remote location of the site. Two additional passengers died during extrication and one died a day later. Rescue efforts continued for over 1 hour after the first rescue personnel arrived at the site. The last survivor was transported from the scene at 0030.

1.16 Tests and Research

Not applicable.

1.17 Additional Information

1.17.1 Trans-Colorado Airlines

Trans-Colorado Airlines was incorporated on August 25, 1980, as Commuter Airlines of Colorado, Inc., and began operations on December 23, 1980, with one Metro II. It served and was based in Gunnison, Colorado, with scheduled flights to and from Denver. The company inaugurated service to Montrose, Colorado, in May 1981 and acquired a second airplane, a Metro III, in November 1981. On February 1, 1982, it acquired its second Metro III and, 1 month later, inaugurated service to Cortez, Colorado. On May 11, 1982, the company changed its name to Trans-Colorado Airlines, Inc. In 1983, the company began service to Durango and to Albuquerque, New Mexico, on June 15 and December 16, respectively. It also acquired its third Metro III on May 2. In 1984, Trans-Colorado began service to Colorado Springs, where it eventually moved its corporate headquarters and performed all maintenance activities. At the end of 1984, the company operated one Metro II and four Metro III airplanes. One year later, the company operated one Metro II and five Metro III airplanes.

On July 15, 1986, Trans-Colorado became a Continental Express carrier, serving Continental Airlines flights at Denver. Under the terms of the agreement between Trans-Colorado and Continental, Trans-Colorado flights were listed under the CO designation of Continental in airlines' computer reservations systems. In addition, Continental provided Trans-Colorado with ticketing, baggage handling, and passenger boarding at Denver and Colorado Springs and with passenger reservations through its own reservations system. Trans-Colorado was responsible for all aspects of

the operations and all maintenance on the airplanes. Trans-Colorado revised its schedule to provide feed to Continental at DEN, Colorado Springs, and, as planned, eventually at Albuquerque. Trans-Colorado records indicate that its load factor (percentage of available seats filled by revenue passengers) increased, as a result of this arrangement, from 36.6 percent during the first 6 months of 1986, to 55.6 percent in August of that year.

Continental Airlines later purchased Rocky Mountain Airlines, a regional operator considerably larger than Trans-Colorado and, as Trans-Colorado, was also based at DEN. On May 13, 1987, Trans-Colorado entered into an agreement with Rocky Mountain Airways to provide it with flights under the Continental Express designation. Under the terms of the contract, which was in effect through February 28, 1988, Trans-Colorado provided Rocky Mountain with airplanes and crews for $400 per block hour for flights operated from May 15, 1987, through December 31, 1987, and $357 per block hour for flights operated from December 31 through February 28, 1988, with a minimum of 245 block hours per aircraft per month guaranteed, averaged over the period of the contract. In addition, Rocky Mountain paid Trans-Colorado a fee for its aircraft that were not leased and for aircraft that were not flown due to weather, air traffic control, and related factors. Rocky Mountain provided the flight schedules and ground handling and support services for the flights. Flights were to be operated in accordance with Trans-Colorado policies and procedures. The contract specified that Trans-Colorado could not be sold or control of the voting stock transferred without the approval of Rocky Mountain. However, the contract stated that, "Continental's witholding of consent will not be unreasonable. . ."

In the early summer of 1987 Trans-Colorado began to experience serious financial difficulties. In a September 30 letter to a financial organization, a company official stated that, ". . . the only cash that is paid out will be only that which is essential to fulfilling the requirements of the Continental contracts.': On December 3, Trans-Colorado's chief executive wrote employees that:

> We have begun working on our long term restructure plan, which deals with both creditors and revenue sources. Please hang in with us, as great strides have been taken the last few weeks to stabilize the Company, but we still have a lot of work to do.

After the contract with Rocky Mountain Airways expired, Trans-Colorado then moved its operations and maintenance facilities to Houston, Texas, in anticipation of a contract to operate as a feeder to Continental Airlines through another wholly owned Continental subsidiary, Britt Airways. For several months, Trans-Colorado operated flights for Britt; however, no long-term contract materialized. In April 1988, the company filed Chapter 11 bankruptcy protection from its creditors. In July 1988, it ceased operations and voluntarily surrendered its operating certificate to the FAA, according to Trans-Colorado, "as a direct result of the economic hardship imposed by Continental Airlines (Britt Airways, Continental Express) when they prematurely terminated our contract with them."

1.17.2 Trans-Colorado Training and Procedures

Trans-Colorado conducted about 64 hours of ground school instruction for newly hired flightcrew members. The company performed flight training in an FAA-approved, Phase I, Metro III simulator. All initial simulator training was conducted until proficiency was achieved. First officers received annual recurrent training, and captains received semi-annual training, all in the simulator, for a minimum of 2 hours. Because of limitations in the Phase I simulator, certain flight check and flight training proficiency maneuvers were performed in the airplane, including: circle-to-land approaches, takeoffs, landings, and single engine ILS approaches. Vision restricting devices were used for training conducted in the airplane.

Trans-Colorado's FAA-accepted flight operations manual required the flying pilot, as an item in the descent checklist, to complete an approach briefing. (See appendix F.) The briefing was to include the following: approach chart date, approach to be used, approach frequency, procedure turn heading and altitude, final approach course, decision height or minimum descent altitude, and the missed approach procedure.

Company procedures required the flying pilot, when on vectors to intercept the final approach course of a nonprecision approach, to set engine rpm at 100 percent, extend the flaps 1/4, and maintain an airspeed of 160 knots which was to be reduced to about 135 knots to cross the final approach fix. At the final approach fix, the flying pilot was to extend the flaps to 1/2, lower the landing gear, and maintain a 135-knot airspeed while descending to the minimum descent altitude (MDA). When the runway was in sight and landing ensured, the flaps were to be fully extended and an airspeed of Vref plus 10 knots maintained.

The nonflying pilot was to perform all radio communications and make certain callouts to the flying pilot. These callouts included deviations of 5 knots or more from the desired airspeed, leaving 10,000 feet msl and 1,000 feet to go to the desired altitude.

Trans-Colorado supplied each of its pilots with sets of approach charts. In addition, pilots used noise attenuating headsets with intra-cockpit communications capabilities to facilitate communication between crewmembers.

1.17.3 DRO VOWDME 20 Approach

The VOWDME approach to runway 20 at DRO had been developed by Frontier Airlines for its exclusive use in accordance with applicable provisions of the United States Standard for Terminal Instrument Procedures (FAA TERPS) and submitted to the FAA for its acceptance. It passed a commissioning flight inspection on October 28, 1977, and was approved for use by Frontier on November 17. In 1985, Frontier Airlines, which had been purchased by People Express Airlines, was acquired with People Express by Continental Airlines and subsequently ceased operations. The FAA then authorized Trans-Colorado Airlines to fly the approach, considered a "special approach," on October 3, 1986. (See appendix E.) (FAA records indicate that, as of late 1988, there was a total of 332 special approaches to 172 different locations, independent of the Reno, Nevada, airport which had over 40 special approaches, many of which are similar approaches used by different operators.)

The intermediate approach fix of the procedure was the 11 DME fix of the DRO 096" radial. The minimum sector altitude for aircraft located generally south of this fix was 15,100 feet msl and for those located generally north, 10,000 feet msl. The minimum altitude for the 11 DME arc was 10,400 feet. Aircraft were to be established at or above that altitude by the time they reached the 023" radial, 11 DME of DRO. The final approach fix was the 5 DME of the 023" radial; the minimum altitude at that point was 8,400 feet msl. The MDA for a straight in landing on the approach was 7,200 feet msl. TERPS criteria establish an optimum descent gradiant of 250 feet/nm and a maximum gradient of 500 feet/nm. At 135 knots, those gradients result in descent rates of 562. feet per minute (fpm) and 1,125 fpm, respectively. Pilots are required to remain at or above all altitudes specified throughout the approach profile, the approach path, and sectors leading to the approach path.

Federal aviation regulations direct pilots to fly an approach as published according to a standard instrument approach procedure for that airport, However, if ATC provides the pilot with radar vectors, then, according to 14 CFR 91.119(i), "Radar vectors may be authorized to provide course guidance through the segments of an approach procedure to the final approach course or fix." In addition, according to paragraph 365(c) of the January 1988 edition of the Airman's Information Manual:

> If a route of flight directly to the initial approach fix is desired, it should be so stated by the controller with phraseology to include the words "direct . . .," "proceed direct" or a similar phrase which the pilot can interpret without question. If the pilot is uncertain of his clearance, he should immediately query ATC as to what route of flight is desired.

After the accident, the Safety Board asked Trans-Colorado, pilots about the approach and the techniques they employed in flying it. Eleven pilots responded. All but one had flown the approach at least once; one pilot had flown it approximately 30 times with most of the respondents flying it about 7 times. The pilots did not characterize the prevailing weather conditions at the times that they had flown the approach nor did they describe their positions in the cockpit, although two were first officers and three were captains.

The pilots used different techniques for flying the DRO VOR DME approach as well as which pilot, the captain or the first officer, actually flew it. One captain said that in instrument meteorological conditions (IMC) he would fly it. Another captain said that he would let the first officer fly it if it was his leg and "talk him through it." Two pilots said that the determination of which pilot flew the approach was made according to whose turn it was, that is, they employed normal captain-first officer flying of alternate flight legs and did not modify that system for this approach.

One pilot said that by ZEANS intersection, 15 miles from DRO, flaps are set to 1/2, with the gear down so that "you don't have to play catch up" when cleared for the approach. Another pilot said that when cleared for the approach, generally when at 14,000 or 16,000 feet msl, he reduces power to 10 to 20 percent, extends flaps to 1/2, lowers the gear, and establishes a 140-knot airspeed with a 2,000 to 3,000 fpm descent rate. A pilot said that when established on the radial, about 20 DME, and cleared for the approach, he reduces power sufficiently to slow the airplane, extends flaps to the full setting, lowers the gear, and establishes an airspeed of 160 to 180 knots with a 3,500 fpm descent rate. Another pilot said that he extends the flaps to 1/4 when reaching about the 17 DME fix and established on the final approach course. He extends the flaps to 1/2 and lowers the gear when descending to 14,000. When leaving 11 DME, he extends flaps to the full position and maintains a 140-knot airspeed. Another pilot said that he begins the descent about 40 miles out, maintains high propeller rpm, and extends flaps 1/4, as required, to reach the assigned altitude at a sufficiently slow airspeed. At 11 DME, flaps are extended to 1/2 and the gear-is lowered. When the runway is in sight, the flaps are fully extended.

Pilots also expressed different opinions about the DRO VOR DME approach. One pilot, who had seen the approach demonstrated but had not actually flown it, said that because of the high descent rate required in the approach he would fly the ILS approach to runway 2 if IMC prevailed. Another pilot, who had flown the approach between 10 and 20 times, said that because flying the DME arc is too time consuming he flies the approach straight in. However, because of the high descent rate required, a pilot must plan for the approach "way ahead." Another pilot, who had flown the approach about 30 times, said that the biggest difficulty in flying the approach is getting the airplane slowed up and properly configured by the 11 DME fix. Another pilot, who had flown the approach 2 or 3 times in "pretty good weather" said that he usually was too high when he reached the runway and had to circle to land. A first officer, who had flown the approach 5 to 7 times, said that the approach saved 10 minutes of flying time when arriving from the north. He believed that pilots fly the approach to stay on schedule since only 70 minutes was allotted for the flight from DEN to DRO. A captain, who had flown the approach "numerous times," said the approach was "safe, as long as you're set up in advance and there's a minimal tail wind component."

1.17.4 FAA Oversight

FAA Flight Standards District Office (FSDO) No. 60, located in Aurora, Colorado, had the primary responsibility for oversight of Trans-Colorado. FAA records indicate that its inspectors performed 323 surveillance activities of the airline between September 1987 and January 22, 1988. No major items of significance were found.

The FAA's principal operations inspector (POI) of Trans-Colorado had served in that capacity since 1981. He was type-rated in the Metro III and, at the time of the accident, was current in the airplane. During August 1987, the POI observed and monitored the airline's ground instruction and initial flight training.

The POI had neither flown nor observed the DRO VOWDME runway 20 approach, nor was he required to fly or observe the flying of the approach. He said that he reviewed the airline's request to fly the approach and approved the request because it appeared to be similar to other VOWDME approaches that the airline was using. He assumed that Trans-Colorado pilots were flying the approach as portrayed in the instrument approach procedures, i.e., direct to the DRO VOR, then proceeding outbound on the 096' radial to intercept the 11 DME arc. The POI was not aware of the waiver which allowed a descent rate of 400 feet/nautical mile (nm) rather than 300 feet/nm between the 7.5 DME fix and the 5 DME fix, that had been part of the original request for the approach by Frontier Airlines. The POI told Safety Board investigators that, had he been aware of the waiver, he would have examined the approach more closely. POIs are not required to be aware of FAA TERPS criteria and the POI of Trans-Colorado was not aware of those criteria.

There was no FAA policy guiding POI action on an operator's request for a special instrument approach procedures or on the transferring of special approaches from one carrier to another. After the accident, the POI stated that he would no longer approve a special instrument approach procedure without first flying it himself and describing to the operator how he expected the approach to be flown.

The manager of FSDO 60 stated that FAA personnel found the airline to be stable and well run through about 1986. Thereafter, the airline began to manifest financial difficulties, primarily in maintenance-related areas such as spare parts inventories. According to the FAA manager, Trans-Colorado's situation had deteriorated to the point that the FSDO decided, before the accident, to perform a special inspection of the airline. The inspection, which included a financial audit, was performed in February 1988.

The results of the inspection were discussed with Trans-Colorado personnel after it was completed. These included the determination that the airline was in very poor financial condition and the finding of 21 instances of alleged violations of maintenance-related procedures. In a March 11, 1988, letter to the FSDO manager, the president of Trans-Colorado stated that he agreed with the results, which, as he understood them, found the airline's " . . . procedures are acceptable. Our implementation is unacceptable. Our management appears to be adequate in the operations phase of our business, and inadequate in the maintenance phase, particularly in Houston." He then described the steps taken to respond to the FAA requests. Subsequently, FSDO 60 directed inspectors to oversee all Trans-Colorado maintenance, which by then was being performed in Houston. In addition, in April the FSDO began enforcement proceedings against the airline for the violations cited. FAA personnel estimated that the full value of the violations as initially cited amounted to several hundred thousand dollars. However, before the enforcement actions could be finalized, the company declared bankruptcy and voluntarily surrendered its certificate.

1.17.5 Human Performance

The Captain.--The captain had dinner with his parents in the Denver area the night before the accident. They stated that the conversation was normal and that he intended to go to bed early that night in anticipation of the next day's flying activities. He then left his parent's residence for his own residence, also in the Denver area. Trans-Colorado employees who saw the captain before the flight stated that he was friendly and in good spirits, characteristics of his typical behavior.

After the accident, a corporate pilot contacted the Safety Board. He said that on February 24, while staying at a hotel in the Phoenix, Arizona area, he met a woman who said that she had been the fiance of the captain of the Trans-Colorado airplane involved in the accident near Durango. The woman had the same name as that of the woman who had accompanied the captain, as his wife, on the trip to DEN in which the captain's bags were lost. The corporate pilot stated that the woman told him that she and the captain had been living together and that he had flown for a commuter airline based in DEN. Further, he stated that she said "I'm sure glad that we were able to bury him right after the accident, because the night before we had done a bag of cocaine . . . and I was worried that the autopsy would say there were traces of this in his system before he died." She admitted to him that she and the captain had used cocaine periodically. The corporate pilot added that he did not consider the woman to have been incoherent or inebriated. However, the corporate pilot, who had been a former drug counselor in the military, characterized her appearance as indicative of a "burn[ed] out look," typical of someone with a drug problem. The woman gave the corporate pilot her address and phone number.

The Safety Board attempted to contact the woman at the address that she had given to the corporate pilot. However, an attorney representing her informed the Safety Board that the woman had no information that could help the investigation, that she had not been with the captain during the 24-hour period before the accident, and that, in the woman's opinion, the captain was ". . . not an habitual user of cocaine, alcohol or other similar drugs."

The captain's parents told Safety Board investigators that they were unaware that their son had ever used cocaine. A close acquaintance of the captain, who had seen him almost daily from early 1984 through mid-1986, saw him again in the summer of 1987. In the interim between 1986 and 1987, she talked to him over the telephone but did not see him. She described him in the 1984 through 1986 period as "a very stable person . . . a nice guy . . . fun to be with." She described his demeanor, over a year later, as quite different than what it had been earlier:

> He wasn't himself any more. I knew right off that there was some kind of drug problem. He acted, oh very nervous like he was scared of something. He'd look over his shoulder a lot as if there was someone behind him when there wasn't. When I was over at his house, every time a car came through he'd jump up and look out that window. I thought he gained more weight than I had ever seen him gain before. And he was just real jittery.

In the course of their conversation, the close acquaintance reminded him that he had changed his phone number three times. The acquaintance said that when she told the captain that he must be consuming "a lot" of drugs, he responded, "She's like a sickness, it's all a disease and there is no cure." The acquaintance believed that the captain's girlfriend and the use of cocaine were "combined together." The acquaintance added that her perception of the captain's behavior had been influenced by the close relationship that she had established with him. Because he was a private person, the acquaintance believed that others, such as those who had worked with him, would probably have been unable to detect changes in his behavior resulting from his use of cocaine.

Trans-Colorado personnel who supervised the captain and those who worked with him were unaware of the captain's use of cocaine. None reported observing behavior that could be considered unusual or indicative of drug use.

The AME who had performed the captain's recent FAA medical examinations told Safety Board investigators that he had been surprised to learn of the results of the toxicological analyses. He described himself as unaware of the captain's drug use. He said that the captain's speech was coherent and that his behavior was unremarkable during the examinations.

The First Officer.--Friends and acquaintances described the first officer as being in good spirits before the accident. He had successfully completed a pre-employment physical examination the day before the accident and was looking forward to employment with Rocky Mountain Airlines.

The first officer was reported to have regularly attended Alcoholics Anonymous meetings. In the late 1970s, the FAA received several anonymous reports that the first officer had violated the prohibition against consuming alcohol at least 8 hours before operating an aircraft. FAA inspectors investigated the reports but could not obtain evidence to support the allegations.

1 .17.6 Cocaine and its Behavioral Pharmacology

Cocaine is a concentrate derived from leaves of the coca plant, which is grown primarily in the Andean regions of South America.1 It was introduced to Europe as early as the 16th century. In the late 19th century and early 20th century, cocaine was widely available in the United States in tonics and in soft drinks. It then became a controlled substance, was prohibited for nonmedical use, and experienced a decline in general, nonmedical use.

In the early 1970s, cocaine consumption underwent a resurgence in nonmedical use. Since then, cocaine consumption has changed in the number of the people consuming it, the nature of that consumption, and the potency of the dose being ingested. These reflect the evolution in its use from the "social-recreational user" in the early to late 1970s, to the often compulsive and addictive use of more pure (and therefore more potent) concentrations of the drug in the late 1980s.2

Cocaine has been found, in a variety of research settings, to be a potent reinforcer, i.e., a consequence of a behavior which increases the likelihood of its reoccurrence, for all animals, regardless of species.3 In fact, if forced to choose between cocaine and food, higher primates will consistently select cocaine, to the point where physical impairment will occur. Animals given unlimited access to the drug will self-administer it in erratic bursts, characterized as similar to cocaine binging seen in humans.

Humans can administer cocaine through any of several routes. The contemporary method of choice appears to be intranasally, that is, "snorted" through the nasal passages. The drug can also be injected subcutaneously, intramuscularly, or intravenously, and it can be smoked, either in a pure form (free-base) or as a coca paste where the leaves are mixed with tobacco or marijuana. The method of administration affects the levels of the drug in the bloodstream and the rate at which those levels are achieved. It has been suggested4 that the popularity of intranasal administration may be due not only to the relatively high percentage of the cocaine that reaches the bloodstream, (comparable to that of oral ingestion but below that of intravenous injection) but perhaps more

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'Siegel. R.K., "New Patterns of Cocaine Use: Changing Doses and Routes" In N.J. Kozel & E. H. Adams (Eds.) Cocaine Use in America: Eoidemiolooic and Clinical Perspectives. National Institute on Drug Abuse Monograph 61, Washington, DC, Government Printing Office, 1985.204 -222.

[2]Siegel, 'New Patterns of Cocaine Use."

[3]Fishman, M. W., Behavioral Pharmacology of Cocaine. Journal of Clinical Psychiatry, 1988, 49, 7- 10.

important, to the rapidity with which subjective and physiological effects are felt. These occur within 1 minute of its administration.

The effects of the drug on the central nervous system are complex and not fully understood. Current research suggests that it alters the metabolism of the neurochemical processes that form the basis for the functioning of the nervous system. In addition, some researchers have proposed the existence of a cocaine receptor within the brain. In this way, cocaine is positively reinforcing as are other activities, such as eating, which are necessary for survival, but, it provides no tangible benefits to the body. Perhaps as a result, heavy users of cocaine have been known to forgo food, sex, and other pleasurable activities to acquire the drug, and "... will relegate all other drives and pleasures to a minor role in their lives."[5]

While there is no evidence that cocaine can produce physiological addiction, there is considerable evidence that, even in relatively small. doses, it can produce a dependence as strong as that produced by physiologically addicting drugs.[6] The demonstrated general physiological effects that follow cocaine ingestion include increased heart rate, blood pressure, and altered brain waves. The subjective effects of the drug are analogous to those of other stimulants, e.g., amphetamine. Cocaine, as amphetamine, is a psychomotor stimulant that can produce feelings of alertness and a sense of enhanced performance, particularly if the user is fatigued. Moreover, cocaine is a euphoriant, a substance than can enhance the mood of the user and produce feelings of friendliness, vigor, and elation.[7]

Although cocaine has been reported by users to enhance both physical and cognitive performance, there is no empirical evidence to support this, with one notable exception. Cocaine will enhance the performance of fatigued subjects being "... generally successful in returning to its pre-deprivation level performance which has deteriorated due to fatigue."[8]

Regardless, these effects are rather short lived, lasting only minutes, a function of the dose and method of administration. If the user was fatigued before ingesting the drug, that fatigue will return after the effects have worn off. Moreover, the user's mood will return, at best, to pre-use levels. This phenomenon, which has been referred to by users as a "cocaine crash," often leads to additional cocaine administration.

As with any drug, tolerance to cocaine will develop after sustained administration. This will have a profound effect on the reinforcing properties of the drug to the habitual user. That person may then administer cocaine to avoid the crash. This will produce "a stimulant withdrawal syndrome ... the major manifestation of which is a marked psychological depression. The depression demands more cocaine for symptomatic relief, despite the transient nature of the mood elevation"[9] In addition, suspiciousness and paranoia have been found to follow cocaine ingestion in direct relation to the amount ingested.[10] In terms of behavioral theory, the drug will cease being positively

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[4]Jones, R.T., "The Pharmacology of Cocaine," in J. Grabowski (Ed.) Cocaine: Pharmacology, Effects, and Treatment of Abuse. National Institute on Drug Abuse Monograph 50, Washington, DC, Government Printing Office, 1984, 34-53.

[5]Cohen, S., "Reinforcement and Rapid Delivery Systems: Understanding Adverse Consequences of Cocaine. In N.J. Kozel & E. H. Adams (Eds.) Cocaine Use in America: Epidemiologic and Clinical Perspectives. National Institute on Drug Abuse Monograph 61, Washington, DC, Government Printing Office, 1985.151-157.

[6]Wise, R.A., "Neural Mechanisms of the Reinforcing Action of Cocaine,". in J. Grabowski (Ed.) Cocaine: Pharmacology, Effects, and Treatment of Abuse. National Institute on Drug Abuse Monograph 50, Washington, DC, Government Printing Office, 1984, 1s-33.

[7]Fishman, M.W. The Behavioral Pharmacology of Cocaine in Humans. in J. Grabowski (Ed.) Cocaine: Pharmacology, Effects, and Treatment of Abuse. National Institute on Drug Abuse Monograph 50, Washington, DC, Government Printing Office, 1984, 72-91.

[8]Fishman, "The Behavioral Pharmacology of Cocaine in Humans."

reinforcing, i.e., the user ingests cocaine to gain the consequences of use, and will become negatively reinforcing, i.e., the user ingests cocaine to avoid the consequences of non-use.

The negative reinforcing qualities of cocaine have been well documented in the clinical literature. For example:

> Finally . . . [after repeated administration] cocaine can no longer evoke the hoped-for euphoria. Instead, dysphoria dominates. The same inability to achieve feelings of pleasure in response to ordinarily rewarding events extends into the post-cocaine period. Anhedonia, the inability to enjoy, can persist for weeks. The prognosis for successful treatment is obviously diminished when every aspect of the conditioning process serves to intensify a return to cocaine-using behavior: the desire for euphoria, the effort to avoid dysphoria, the self-treatment of depression and the painful anhedonic period. If we were to design deliberately a chemical that would lock people into perpetual usage, it would probably resemble the neurophysiological properties of cocaine.11

1.17.7 Aircraft Performance

The Safety Board examined data on the flight of Trans-Colorado 2286 that had been collected by the DEN ARTCC. (See figures 4 and 5.) The data indicate that at 1910:30 the airplane was at an approximate altitude of 16,500 feet msl. It began to descend at an approximate rate of 1,000 fpm, which it maintained until 1911:40, when it leveled off at 15,000 feet msl. Trans-Colorado 2286 maintained this altitude until shortly before 1914:00 when it began a descent at an approximate 1,000 fpm rate, until approximately 1915:10 when it reached 14,000 feet msl. Its ground speed during this period was about 240 knots; its indicated airspeed in knots (KIAS) was about 184 knots.

About 1915:50, Trans-Colorado 2286 began the approach to DRO from an altitude of 14,000wfeet msl. At that time, the airplane began a descent at a rate which increased to over 3,000 fpm, which it maintained until 1917:30. The data from the last valid radar return, at 1917:24, shows the airplane at 9,000 feet msl. Analysis of the radar data indicates that, in the last seconds of flight, the ground speed of Trans-Colorado 2286 increased from 175 to over 190 knots or 137 to 183 KIAS.

Representatives of the airplane manufacturer indicated that the airplane, fully configured for landing with flaps fully extended and the gear lowered, will descend at an approximate rate of 1,700 to 1,850 fpm at an approximate 115-knot airspeed. The airplane's maximum safe descent rate, reached during an emergency descent, can reach 4,000 fpm with flaps extended 1/2, and gear lowered, at KIAS of about 173. Airspeed limitations were due to the maximum gear extended speed of 173 KIAS. Maximum flap extension speeds were 179 and 159KIAS for flaps 1/2 and fully extended, respectively.

9Cohen, "Reinforcement and Rapid Delivery Systems: Understanding Adverse Consequences of Cocaine."

10Sherer, M.A., Kumor, K.K., Cone, E.J., & Jaffe, J.J. Suspiciousness induced by four-hour intravenous infusions of cocaine. Archives of General Psychiatry, 1988, 45, 673-677.

11 'Cohen, "Reinforcement and Rapid Delivery Systems: Understanding Adverse Consequences of Cocaine., p.153"

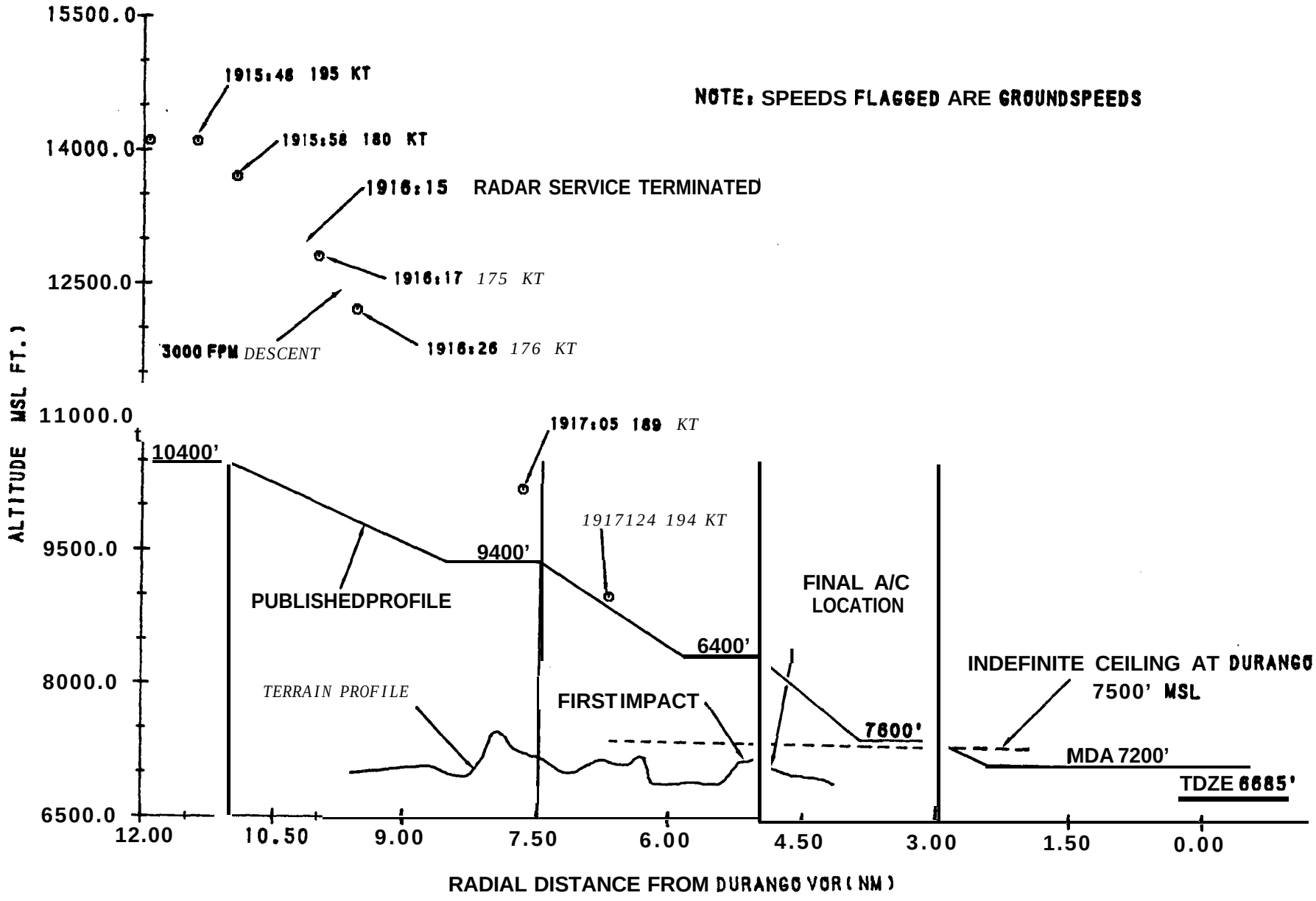

Figure k--Profile of the approach of Trans-Colorado 2286 with ground speeds, altitudes, and local times.

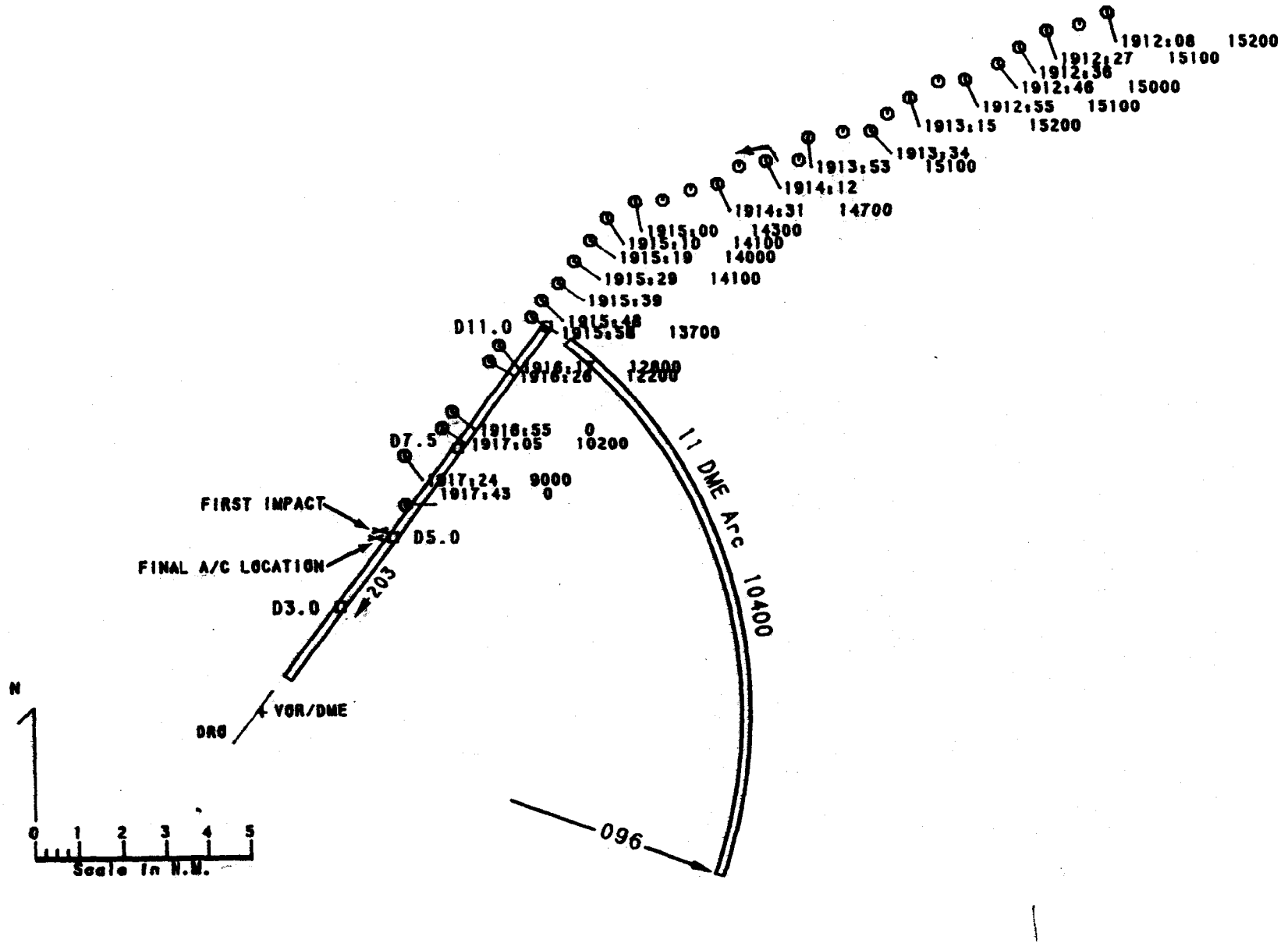

Figure S.-Overhead view of approach of Trans-Colorado 2286
with local times and altitudes using unprocessed, secondary radar returns

2. ANALYSIS

2.1 General

The airplane was maintained in accordance with Federal aviation regulations. There was no indication of preexisting defects in the airplane systems, powerplants, or airframe. The evidence indicates that because the captain of Trans-Colorado 2286 had been performing all communications with air traffic control, in keeping with Trans-Colorado procedures, he was the pilot not flying the airplane while the first officer was the pilot flying.

The first officer was properly certificated and qualified for the flight. Due to the captain's use of cocaine before the flight, he was not medically qualified to act a a flight crewmember.

The evidence indicates that the flightcrew of Trans-Colorado 2286 had descended below MDA without ensuring ground clearance in flying the VOR DME approach to runway 20 of DRO. The investigation examined the approach itself and the crew conduct of that approach to determine why the airplane descended below the published descent profile. In addition, the investigation focused on FAA surveillance of Trans-Colorado's use of the VOR DME approach to DRO and on the air traffic control handling of the flight to determine if either was improper or contributed to the accident.

The investigation was limited in its ability to learn precisely what communications had taken place between the captain and the first officer due to the absence of both a CVR and an FDR on Trans-Colorado 2286. However, since the accident, the FAA has mandated the installation of flight recorders in aircraft operating scheduled flights under 14 CFR Part 135. The Safety Board is pleased with the actions of the FAA and hopes that all regional carriers comply quickly with the new requirements.

2.2 VOR DME Runway 20 Approach

At 1915:48, when Trans-Colorado 2286 was at the 11 DME fix on the 023" radial of the VOR DME approach to DRO, the flight was at an approximate altitude of 14,000 feet with a ground speed of 195 knots, or 143 KIAS. In fact, at that location, the airplane should have been at 10,400 feet msl. Had Trans-Colorado 2286 been at 10,400 feet, the crew would have had to descend 3,715 feet to arrive at the airport elevation, or 3,200 feet to the MDA. The approach profile required a minimum altitude of 7,600 feet when crossing the 3 DME fix, after which a descent to 7,200 feet, the MDA, was permissible. Had the crew flown the final approach course at the speed appropriate for that segment of flight, about 135 KIAS, the resultant descent rate would have been 900 fpm without considering wind velocity or direction. By contrast, when Trans-Colorado 2286 began the approach from 14,000 feet msl, its ground speed ranged from 240 to 175 knots (180 to 142 KIAS) while descending through 12,000 feet msl to over 190 knots (165 KIAS) almost to impact. Moreover, its descent rate, which it maintained almost throughout the approach, was approximately 3,000 fpm. The airplane would have been required to descend at a rate over 1,910 fpm to reach the MDA at the 3 DME fix from an altitude of 14,000 feet msl, at the 11 DME fix, with a ground speed of 135 knots. The descent rate increases over the same distance to 2,125 and 2,550 fpm at ground speeds of 150 and 180 knots, respectively.

The evidence indicates that from the outset the flightcrew of Trans-Colorado 2286 flew the approach at an altitude that was too high to fly it safely within the parameters established for the approach. Moreover, the difficulties in flying the approach that the crew created for themselves by the excessive altitude from which they began the approach were exacerbated by the tailwind which they were likely encountering. The evidence indicates that, at the altitude from which the approach was begun, almost to the point of impact, the velocity of the tailwind was at least 10 to 15 knots.

The initial approach fix for the approach was on the 096" radial at 11 DME from the DRO VOR. Had the flightcrew flown the approach as published, they would have flown the 11 DME arc for a distance which would have enabled them to descend without difficulty from their altitude of 14,000feet and reach 10,400 feet on the 203' heading. Because they did not, they flew straight in and descended at a rate more than three times the rate intended for the approach.

Trans-Colorado pilots who described their procedures for flying the approach differed in the manner in which they flew it. One said that he used descent rates and airspeeds similar to those flown by Trans-Colorado 2286. Moreover, there was no consistency among the answers the pilots gave as to which pilot, captain or first officer, flew this approach, and under what weather conditions the particular pilot flew it. The variability in techniques and procedures reflects the lack of company procedures for flying this approach.

However, respondents were consistent in some answers. They had to be prepared in advance for flying the approach, and they flew it straight in when arriving from DEN because flying the 1 l-mile DME arc was considered to be too time consuming. Since Trans-Colorado 2286 was arriving from DEN, located northeast of DRO, flying the arc would have required backtracking with its attendant increase in flying time. Had the flight been arriving from a point southwest of DRO, as may have been true for the routes flown by Frontier Airlines when it designed the approach, perhaps the crew would have flown the procedure as published. The evidence indicates that beginning the approach from the northeast and flying it as published would have added perhaps as much as 10 minutes to the flight. Since the flight was only scheduled for 70 minutes, the Trans-Colorado schedule for the flight, as published, would have discouraged pilots from flying the full approach when conditions warranted. The Safety Board believes that such scheduling works against prudent decisionmaking by flightcrews.

Since the captain of Trans-Colorado 2286 had a reputation both as a highly skilled pilot and as one who could make up for lost time and attempt to arrive *on* schedule, the Safety Board concludes that the captain chose the VOR DME and not the ILS approach because it saved time. Moreover, as other company pilots had done, he allowed the first officer to fly the approach into the restricted visual conditions around DRO. Since the crew was given full weather information, they should have known that they would encounter a tailwind on the approach. The Safety Board believes that, while the approach was challenging, the combination of a low ceiling, tailwinds, and the high altitude from which the approach was initiated, required particular crew coordination and attention to execute it properly. Given these conditions, the flightcrew would have had to configure the airplane for an extraordinarily high descent rate, which would have reached over 2,550 fpm at 150 KIAS, twice the optimum descent rate specified for the approach, but still within the airplane capabilities. As a result, they should have been reluctant to execute the approach as flown. Irrespective of company scheduling policy, the flightcrew was still required to act in the best interests of flight safety. Therefore, the Safety Board believes that they should have either flown the full approach as published or informed DEN ARTCC that they could not fly the approach straight in and requested or suggested alternatives. However, having made the decision to allow the first officer to fly the approach from 14,000 feet msl, with the prevailing winds, the captain should have recognized the compelling need to monitor closely the first officer's conduct of the approach to ensure that he was maintaining altitude and situational awareness and not prematurely descending below the published descent profile.

The evidence indicates that the first officer, perhaps recognizing the potential influence of the tailwinds and the high altitude, allowed the airplane to reach an over 3,000-fpm descent and an indicated airspeed over 165 knots. Given the documented, repeated instances of deficiencies in his instrument flying abilities, the evidence suggests that he maintained a poor instrument scan and diverted his attention from his altimeter, his DME, or both and allowed the airplane to descend prematurely below the published descent profile.

Given the 800-foot overcast ceiling at the time and an altitude 515 feet above the airport, either flightcrew member could have seen the airport once the flight had reached MDA and, due to the apparently rushed nature of the approach, proceeded toward it without assurance of proper ground clearance between their location and the airport. Given the nature of the overcast in the DRO area, which would have created a particularly dark night and prevented the moonlight from showing the ridge that the airplane struck and the scarcity of ground lights, the crew may have been led to believe that a direct descent to the runway would have been safe. Had they been looking out the windscreen instead of monitoring their instruments, their ability to determine their proximity to terrain could have been compromised. Despite the fact that DRO was equipped with a VASI, which would have provided external visual vertical guidance to a crew, the ridge that the airplane struck may have obscured the VASI from the crew, or the crew may not have had sufficient time to perceive the VASI among the airport lights. As a result, the crew could have lost their awareness of their proximity to the ground during a very rapid descent. The Safety Board believes that because the crew flew the approach straight in with a tail wind, they flew the approach at a high descent rate at an excessive groundspeed. Further, because they failed to adequately monitor their instruments, they allowed the airplane to descend below the permissible altitude and strike the ground which caused the accident.

2.3 Crew Performance

Given the challenging nature of the approach on the night of the accident due to the prevailing conditions and the requirement for extreme vigilance and intense concentration on flight parameters, the Safety Board examined the factors that could have compromised the flightcrew's ability to effectively fly the approach. The evidence indicates a record of deficiencies in the first officer's piloting abilities, particularly in instrument flight skills. Although he had considerable piloting experience, several years before the accident he had failed to upgrade to captain due to his poor performance in instrument approaches on a flight check. Less than 1 year before the accident, the first officer failed a 14CFR Part 135 proficiency check, also due to his poor performance on instrument approaches. During his training at Trans-Colorado, the first officer continued to demonstrate deficiencies in instrument skills.

The Safety Board believes that flying the VOR DME approach to runway 20 at DRO straight in from 14,000 feet at the 11 DME fix in IMC required a high level of skills and abilities. The evidence of his past performance and descriptions of his flying abilities by those who had worked with him indicates that the first officer did not possess these abilities.

The Safety Board could find no evidence that Trans-Colorado had conducted a thorough preemployment verification of the first officer's employment. While the company may have been aware of his prior piloting activities, it apparently was unaware of his previous deficiencies in piloting, which may have been due to weaknesses in the method in which the preemployment verification was carried out. The Safety Board believes that the FAA should provide guidance to operators of scheduled revenue passenger service to assist them in obtaining relevant information from previous employers about the piloting skills and abilities of prospective pilots.

With the first officer flying the airplane, the captain was responsible for monitoring the flight parameters and ensuring that the approach was flown in a stabilized manner. The evidence indicates that the captain had used cocaine before the accident, most likely the night before. The Safety Board believes that, based on the reports about his use of the drug, the captain was not a novice cocaine user.

The amount of cocaine and its metabolite in his system indicates that the captain had ingested the drug before the accident. The evidence from literature on the rate of cocaine metabolism suggests that he had consumed the drug at least 10 hours before the accident, most likely in the

period 12 to 18 hours before. As a result, his piloting skills were likely degraded from his use of the drug before the accident.

The Safety Board believes that the research into the effects of cocaine use on performance suggest possible avenues of cocaine-related impairment of the captain's perceptual skills and abilities at the time of the accident. These include withdrawal effects, such as significant mood alteration and degradation, craving for the drug, and post-cocaine induced fatigue. Each of these effects, either alone or in combination, could have degraded the captain's abilities to fly as well as monitor the first officer's flying of Trans-Colorado 2286.

However, the research into the behavioral effects of cocaine use, while extensive, is relatively recent as compared with research into the effects of the use of other drugs. Moreover, generalizations into the behavioral effects of cocaine use, as with most drugs, are made difficult due to a variety of factors, including the difficulty in understanding the manner in which it effects the neural system, the variability in cocaine metabolism among users, as well as the variability in effects resulting from ingestion methods. Without information about the amount of cocaine the captain ingested, when he ingested it, and his recent and long term history of cocaine use, the Safety Board is unable to conclude the extent of the cocaine-related impairment of his piloting and perceptual abilities.

Nevertheless, the evident suggests that he had used the drug the night before the accident. If, as the corporate pilot related to the Safety Board, the captain and his friend had done a "bag" of cocaine the night before the accident, then according to a representative of the Drug Enforcement Administration, the couple had sufficient cocaine to stay up a good part of the night ingesting the drug. Given the known stimulant effects of the drug, the fact that he was not at rest while using the drug, and the likelihood of insomnia following cocaine use, with the fatiguing effects of flying for several hours before the accident, the Safety Board believes that the captain's use of cocaine the night before the accident impaired his abilities to both fly and monitor the first officer's flying of the Trans-Colorado 2286, most likely due to fatigue. Therefore, the Safety Board concludes that the captain contributed to the accident by his use of cocaine.

Despite the inability to conclude the precise effects of the captain's cocaine use on his abilities at the time of the accident and despite the difficulty in making such conclusions following evidence of cocaine use, the Safety Board strongly condemns the use of cocaine by an airman or by any individual involved in public transportation. The use of any illicit drug has no place in the transportation system.

Moreover, the captain's record also demonstrates other repeated instances of violations of rules and procedures, exemplifying what the Safety Board believes was a cavalier attitude to the need for rigorous adherence to rules and procedures. His relatively large number of traffic convictions, and his falsification of both a State driver's license application and an FAA airman medical certificate application support this. Such an attitude appears to have applied also to his violating relatively routine company procedures. For example, the captain created an incident as a nonrevenue passenger when his baggage did not arrive at the airport in an instance in which he had claimed that his companion on the flight was his wife when she was not. He twice violated company operating procedures by fueling an airplane himself and loading a passenger with an engine operating; both instances also supporting his reputation as a pilot who liked to hurry.

2.4 Cocaine

The literature on cocaine indicates that its use is still evolving in this country, both in the type of use, habitual vs. occasional, as well as the quality or purity of the drug. Certainly, public perception of the use of the drug has changed over the last few years with the cocaine-related

deaths and injuries of public figures. However, as this accident demonstrates, its use by pilots poses a threat to the safety of the flying public.

To exacerbate the problem, cocaine use is difficult to detect, even by individuals who interact daily with an abuser. Moreover, the behavioral manifestations of cocaine use, which are often quite subtle, are affected by several factors in addition to dosage. These include the method of ingestion, tolerance to the drug, and other factors which interact to create the variability in behavioral and physiological effects following both cocaine use and withdrawal from its use. Further, the complexity of the effects of cocaine ingestion and subsequent performance impairment extend to a host of licit and illicit drugs. As a result, this accident demonstrates both the danger of cocaine use in aviation and the difficulty faced by the aviation community in attempting to control that use.

The Safety Board previously examined the use of illicit drugs in its investigation of an airplane accident at Newark, New Jersey on March 30, 1984.12 As a result of that accident, the Safety Board recommended that the FAA:

> A-84-95
>
> In coordination with the Office of the Secretary, U.S. Department of Transportation, institute appropriate research to further the understanding of potential effects on pilot performance of both licit and illicit drugs, in both therapeutic and abnormal levels, and actively disseminate those findings.

The FAA responded that a working group with the Department of Transportation (DOT) was created and a literature search was funded and began. On December 29, 1988, the FAA informed the Safety Board that the literature search had been completed and that distribution of the report, Data Available on the *Impact of* Drug Use on Transportation *Safety,* would be accomplished through the regional flight surgeons. As a result, the Safety Board is changing the status of the recommendation to "Closed--Acceptable Action" with publication of this accident report and the issuance of a safety recommendation included in this report. The new safety recommendation is directed at dissemination of the report specifically to the AMEs. However, the Safety Board believes that research must be carried out to determine the effects of different blood levels of a variety of drugs, including therapeutic drugs, on human performance in transportation modes. This responsibility is more appropriately done within the confines of the Secretary of Transportation.

The Safety Board also issued a companion recommendation (A-84-96) to the Office of the Secretary, DOT to:

> A-84-96
>
> Review the existing research and literature in this area and institute research to: (1) determine the potential effects of both licit and illicit drugs, especially marijuana, in both therapeutic and abnormal levels, on human performance; (2) obtain correlations between toxicological findings of drug levels in blood, urine, and other specimens and various behavioral measurements; and (3) assess the effects of various drugs on the specific tasks performed by the operator in all transportation modes.

On August 8, 1988, the Office of the Secretary, DOT, responded to Safety Recommendation A-84-96, by transmitting a copy of a May *1988* DOT report, *Data Available on the Impact of Drug Use*

[12] Aircraft Accident Report-Central Airlines *Flight* 27, Hughes *Charter Air, Gates Learjet Model 25 (N51CA) Newark International Airport, Newark, New Jersey, March 30, 1984* (NTSB/AAR-84/11).

on Transportation Safety. The report contains considerable information that the Safety Board believes would be valuable to all segments of the aviation industry, particularly AMEs. However, the Safety Board's review of the DOT study resulted in the following evaluation which was sent to the Secretary of the DOT on September 29,' 1988:

> While the Safety Board appreciates the effort that went into producing the May 1988 final report, 'Data Available on the Impact of Drug Use on Transportation Safety," we believe it represents only a first step in doing what we asked for in Safety Recommendation A-84-96. Our review of the Department of Transportation (DOT) study shows it as a full review of existing literature and research related to alcohol use, measurement, and effect; but there is nothing in the report that suggests future research into a correlation of toxicological findings of a drug levels in blood, urine, other specimens, and various behavioral measurements. There is nothing in the DOT study assessing the effects of drugs on specific tasks performed by operators in various modes of transportation.
>
> We were disappointed to see that the conclusions and recommendations in the study were all directed at the level of drug use in the transportation industry and at obtaining a "drug-free transportation system" and not at furthering the understanding of the effects of drug use on an individual and how to measure it accurately in the aftermath of an accident.
>
> We had hoped that this study would launch further research in the areas we outline in the safety recommendation. The only possibility we see in this regard is in the seventh recommended action which proposes experimental drug studies under conditions that closely simulate the transportation jobs of interest, using subjects representative of the employee populations of interest. We encourage you to move ahead with such research and suggest again that the other areas of research listed in Safety Recommendation A-84-96 be advanced.

Safety Recommendation A-84-96 was placed in an "Open--Unacceptable Action" status, pending the Secretary's decision to initiate badly needed research into the aforementioned areas.

On January 17, 1989, the Assistant Secretary for Policy and International Affairs,DOT, responded to Safety Recommendation A-84-96 with a letter which contained information about various DOT programs on performance and drug use. One of the programs cited seeks to identify critical abilities that are necessary for safe vehicle operation. Based on this letter and subsequent conversations with DOT personnel, the Safety Board believes that programs are in progress which identify drugs in fatal vehicle accidents and which measure the effects of selected drugs on driving skills, skills which likely relate to piloting skills. These DOT programs are critical to understanding the effects of drugs on performance and appear to be responsive to the Safety Board's recommendations. Safety Recommendation A-84-96 will remain open pending a review of the results from these programs.

This accident also demonstrated the need for AMEs to more vigorously pursue the detection of drug use among applicants for medical certificates. Had this occurred, perhaps the captain's use of cocaine would have been detected by his AME and his application for a medical certificate disapproved. The Safety Board believes that, because of the valuable information contained within the DOT report, the report should be periodically updated as required and disseminated to all AMEs. In addition, information on the detection of drug use also should be disseminated to AMEs.

On November 21, 1988, the FAA published its final drug testing rule, "Anti-Drug Program for Personnel Engaged in Specified Aviation Activities" (Docket No. 25148, 53 FR 47024). This final rule sets forth regulations to require operators under 14 CFR Parts 121 and 135 to establish anti-drug programs for employees (including pilots) who perform safety-related functions. Testing under the rule will be conducted by an employer before employment, randomly following employment, after an accident, and based on reasonable cause. Employers also are required to provide employee assistance programs (EAP) education and training services to employees and supvervisors. The Safety Board supports the efforts of the FAA to eradicate drug use in aviation-related activities.

In its Notice of Proposed Rulemaking (NPRM), the FAA proposed requiring periodic testing to be conducted in conjunction with the medical examination required of airmen (53 FR 8368, 8386). However, in the final rule, the FAA significantly limited the requirement for periodic testing. A drug test is now required as part of the first medical evaluation of the employee during the first calendar year of implementation of the employer's anti-drug program. However, an employer may discontinue periodic testing of employees after that year if a random testing program has been implemented, Thereafter, random testing program will take the place of periodic testing in conjunction with medical exams.

In its June 14, 1988 comments on the NPRM, the Safety Board said:

> The NTSB believes that aggressive reasonable cause testing (triggered by any of a wide range of potentially safety-related errors), combined with effective management supervision of employees, post-accident/incident testing, pre-employment testing, periodic (medical) testing, and competent drug/alcohol education and treatment, are the essential components of an effective anti-drug/alcohol abuse program. The Board recommends that the FAA first require aviation employers to fully implement and utilize these critical program measures before embarking on more unproven, costly, and constitutionally uncertain measures such as random testing.

The Safety Board continues to believe, particularly in light of the findings of this investigation, that a program that incorporates both aggressive reasonable cause testing and effective management oversight of employees would be more effective in addressing the problem of drug use in aviation than what the FAA has proposed.

2.5 FAA Surveillance

The evidence indicates that the FAA pursued adequately its surveillance responsibility of Trans-Colorado. However, its POI did not, nor was he required to, personally observe how the company was flying its special VOR DME approach to runway 20 of DRO. He approved it since the approach, as portrayed, appeared similar to others flown by Trans-Colorado and because he was unaware of the TERPs criteria. However, he may have been unaware of how Trans-Colorado pilots were in fact flying the approach to DRO in IMC when arriving from DEN. The Safety Board believes that the FAA should inform POIs of TERPs criteria and require them to personally observe an operator's conduct of a special approach before it gives the carrier authorization to fly the approach.

2.6 ATC Procedures

After the crew had informed DEN ARTCC of their desire to fly the VOR DME approach, the ARTCC cleared the flight to proceed directly to the intermediate approach fix, the 1 l-mile DME point on the 023' radial of DRO. As a result, according to Federal aviation regulations, the crew did not have to fly the complete published approach. Consequently, it was the responsibility of the flightcrew and not ATC, according to Federal aviation regulations, to determine if they could safely

fly the approach from that point and from that altitude. Therefore, the Safety Board concludes that air traffic control actions did not contribute to the accident.

2.7 Ground Proximity Warning System

Since December 1, 1975, the FAA has required that large, turbine powered airplanes be equipped with ground proximity warning systems (GPWS) to alert pilots to the possibility of inadvertent impact with terrain. Since the requirement was established, ample evidence has been gathered to indicate that GPWS has fulfilled its intended function with regard to those airplanes. However, the FAA did not extend that requirement to smaller airplanes, such as those often operated in scheduled, passenger service under 14 CFR Part 135.

On October 9, 1986, following the investigation of of three approach phase accidents involving scheduled domestic passenger commuter flights operating under 14 CFR 135, which occurred in August 1985, September 1985, and March 1986, and in which 30 persons were fatally injured,[13] the Safety Board recommended that the FAA :

> A-86-109
>
> Amend 14 CFR 135.153 to require, after a specified date, the installation and use of ground proximity warning devices in all multiengine, turbine-powered, fixed-wing airplanes certificated to carry 10 or more passengers.

The FAA, since this recommendation was issued, has initiated a program to evaluate the potential availability of a GPWS device that would be practical and cost effective for installation and use on the category of airplanes carrying 10 to 30 passengers, such as the Fairchild Metro III. The Safety Board has learned that the initial stage of the program, to evaluate the practicality of such a system on this size airplane, has been completed. The FAA has initiated a rulemaking project which will result in requiring the installation of a ground proximity warning system in airplanes with 10 to 30 passenger seats that are operated under 14 CFR Part 135. As a result, the Safety Board classified the recommendation as "Open--Acceptable Action."

As an example of the terrain protection afforded by the GPWS, the Safety Board examined the alerting features of a GPWS product and applied the specifications to the flightpaths of the two airplanes involved in the Henson and Bar Harbor accidents. In the Henson accident, the GPWS would have alerted approximately 29 seconds, before impkt. The same GPWS would have alerted at least 10 seconds, and possibly as much as 17 seconds, before impact in the Bar Harbor accident. Analysis of the flight profile of Trans-Colorado 2286 indicates that had the airplane been equipped with a GPWS device, the excessive closure rate of the airplane with terrain would have triggered an alert over 23 seconds before impact.

The Safety Board believes that the millions of passengers who annually fly on aircraft similar to that operated as Trans-Colorado 2286, deserve the level of safety provided to passengers on larger, air carrier aircraft. Consequently, the Safety Board urges the FAA to expedite efforts to require the installation of GPWS devices on aircraft operating under 14 CFR Part 135.

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[13] Aircraft Accident Reports-Bar Harbor Airlines, *Beech* 899, *N300WP,* Auburn, Maine, *August 25, 1985* (NTSB/AAR-86/06); *Henson Airlines, Beech B99, Grottoes, Virginia, September* 23, 1985 (NTSB/AAR-86/07); and *Simmons* Airlines, Embraer *EMB-110P1,* near *Alpena,* Michigan, *March 13, 1986* (NTSB/AAR-87/02).

3. CONCLUSIONS

3.1 Findings

1. The airplane was properly maintained for the flight.

2. There was no evidence of preexisting damage to the airplane systems, structure, or powerplants that could have contributed to the accident. .

3. The captain was medically unqualified to serve as a crewmember on the flight due to his use of cocaine before the accident.

4. The captain falsified his application for an airman's medical certificate due to his failure to cite his previous traffic convictions.

5. The flight encountered a 10- to 15-knot tailwind while flying most of the VOR DME approach to runway 20 at DRO.

6. The flightcrew flew the VOR DME approach to runway 20 at Durango straight in from an altitude and a speed too high to achieve a stabilized approach.

7. The first officer was at the controls of Trans-Colorado 2286.

8. The first officer's record prior to his employment with Trans-Colorado and during his training with the company indicated deficiencies in performing instrument procedures.

9. The captain's performance was degraded due to the adverse effects of his use of cocaine before the accident.

10. Air traffic control did not contribute to the accident.

11. A ground proximity warning device probably would have alerted the crew to the airplane's increasing proximity to terrain and may have prevented the accident.

3.2 Probable Cause

The National Transportation Safety Board determines that the probable cause of this accident was the first officer's flying and the captain's ineffective monitoring of an unstabilized approach which resulted in a descent below the published descent profile. Contributing to the accident was the degradation of the captain's performance resulting from his use of cocaine before the accident.

4. RECOMMENDATIONS

As a result of its investigation, the Safety Board recommended that the Federal Aviation Administration:

> Inform principal operations inspectors of the United States Standard for Terminal Instrument Procedures (TERPs criteria), and require them to personally observe an operator's conduct of a special approach before they give the authorization to fly the approach. (Class II, Priority Action) (A-89-3)

Provide guidance to operators of scheduled revenue passenger service to assist them in obtaining relevant information from previous employers about the piloting skills and abilities of prospective pilots. (Class II, Priority Action) (A-89-4)

Distribute and periodically update, as needed, the Department of Transportation study, Data Available *on the Impact of Drug Use on Transportation Safety,* to all aviation medical examiners. In addition, information on the detection of drug use should be disseminated to aviation medical examiners. (Class II, Priority Action) (A-89-5)

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

/s/ James L. Kolstad
Acting Chairman

/s/ Jim Burnett
Member

/s/ John K. Lauber
Member

/s/ Joseph T. Nall
Member

/s/ Lemoine V. Dickinson, Jr.
Member

February 4, 1989

APPENDIXES

APPENDIX A

INVESTIGATION AND HEARING

1. Investigation

The National Transportation Safety Board's Denver field office was notified at 2045 mountain standard time on January 19, 1988, that Trans-Colorado 2286 was missing. An investigative team from its Washington, D.C., headquarters was dispatched to the site the following morning. investigative groups were established for operations, air traffic control, human performance, structures/systems, powerplants, survival factors, and weather. In addition, an aircraft performance specialist was assigned to the investigation.

Parties to the investigation were the Federal Aviation Administration; Trans-Colorado, Inc.; and the Fairchild Aircraft Corporation.

2. Public Hearing

The Safety Board did not hold a public hearing on this accident.

APPENDIX B

AIR TRAFFIC CONTROL TRANSCRIPT

M E M O R A N D U M
AUTOMATED FLIGHT
SERVICE STATION
7300 S. Peoria Street
Englewood, Co 80112

U.S. Department
of Transportation

Federal Aviation
Administration

Subject: INFORMATION: Transcription Concerning the Accident of TCE 2286 SW4 on January 20, 1988, at 0225 UTC

Date: February 8, 1988

From: Quality Assurance Specialist DEN AFSS

Reply to Attn. of: Giambrone (8020)

To:

This transcription covers the following time period from 0033:00 UTC, January 20, 1988, to 0022:10 UTC, January 20, 1988,

Agencies Making Transmissions	Abbreviations
Flight Watch, Denver AFSS	FW
Trans Colorado 2286	TCE2286

I HEREBY CERTIFY that the following is a true transcription of the recorded conversations pertaining to the subject accident.

Anthony Giambrone
Quality Assurance Specialist
Denver AFSS
Denver Automated Flight
Service Station

(0022)

(0023)

(0024)

(0025)

(0026)

(0027)

0027:10	TCE2286	Denver Flight Watch Trans Colorado twenty two eighty six over Denver
0027:22	FW	Braniff twenty two eighty six Denver flight watch go ahead
0027:25	TCE2286	I'd like the ah latest ah weather from Durango and Cortez please
0027:48	FW	Durango the latest we have is at twenty three fifty zulu indefinite ceiling one thousand two hundred sky obscured visibility two light snow fog
0028:00		temperature and dew point two five winds calm altimeter two niner seven six don't have any reports out of Cortez last three hours I have Farmington New Mexico will that help
0028:07	TCE2286	Ah no ah I think ah 1'11 wait til we get closer to Durango and company will give it to us thank you
0028:12	FW	You're welcome appreciate any pilot reports

0028:15	TCE2286	OK on ah climb out smooth it's ah that's about all I can tell you now
0028:23	FW	OK thanks alot if you have any of that icing they're still forecasting moderate icing below ah eighteen thousand appreciate a pilot report if you have any of that
0028:40	TCE2286	Alright will do

(0029)

(0030)

(0031)

(0032)

(0033)

END OF TRANSCRIPT

U.S. Department of Transportation
Federal Aviation Administration

Memorandum

DENVER AIR ROUTE TRAFFIC CONTROL CENTER
2211 - 17th Avenue
Longmont, Colorado 80501

Subject: INFORMATION: Transcription Concerning the Accident Involving TCE2286 Swearinger Metro IV, on February 20, 1988, at 9225 UTC

Date: March 11, 1988

From: Wayne A. Smith
Manager, Denver Center

Reply to Attn. of: DV-505:Bookout

To:

This transcription covers the time period from February 20, 1988, 0125 UTC to February 20, 1988, 0230 UTC.

Agencies Making Transmissions	Abbreviation
Continental Airlines Flight Eleven Forty Three	COA1143
Denver ARTCC Sector Twenty Seven Radar Controller Position	ZDV 27R
Continental Airlines Flight Five Twenty Five	COA525
Denver ARTCC Sector Twenty Eight	ZDV 28
Trans-World Airlines Flight Three Zero Two	TWA302
Continental Airlines Flight Five Sixty Seven	COA567
Denver Approach Control	D84
General Aviation Flight November Six Eight Eight One Lima	N6881L
Denver ARTCC Sector Forty One	ZDV 41
Denver ARTCC Sector Twenty Seven Sector Controller Position	ZDV 27S
Trans-Colorado Airlines Flight Twenty Two Eighty Six	TCE2286
America West Airlines Flight Thirty Four	CACTUS34

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Denver ARTCC Sector Twenty Nine	ZDV 29
Denver ARTCC Sector Twenty Five Radar/Sector Controller Position	ZDV **25R/S**
Continental Airlines Flight Sixteen Seventy Five	COA1675
Denver ARTCC Sector Twelve Radar/Sector Controller Position	ZDV **12R/S**
Flying Tiger Airlines Flight Two Seventy Six	**FTL276**
Unknown Agency	UNKN
Continental Airlines Flight Eight Seventy Sierra	**COA870S**
Northwest Airlines Flight Three Thirty Seven	NWA337
General Aviation Flight November Five Zero *Zero* Sierra Whiskey	**N500SW**
Rocky Mountain Airlines Flight Twenty One Thirty One	RMA2131
Denver ARTCC Sector Six	ZDV 6
Denver ARTCC Sector Unknown	ZDV/UNKN
General Aviation Flight November Eight *Zero* Whiskey Papa	**N80WP**
General Aviation Flight November Eight Echo Foxtrot	**N8EF**
Rocky Mountain Airlines Flight Twenty One Thirty Seven	**RMA2137**
Denver ARTCC Sector Thirty Eight Radar/Sector Controller Position	ZDV **38R/S**
General Aviation Flight November Four One Four Alfa Romeo	**N414AR**
Denver ARTCC Sector Fourteen	**ZDV** 14
Grand Junction Approach Control	GJT A/C

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Rocky Mountain Airlines Flight Twenty One Ninety Seven	RMA2197
Farmington, New Mexico, ATCT	FMN/TWR
Salt Lake ARTCC Sector Forty	ZLC 48
Mesa Aviation Services Flight Eighteen	MSE18
General Aviation Flight November One Two Zero Four November	N1204N
Mesa Aviation Services Flight Seven Twelve	MSE712
Albuquerque ARTCC Sector Sixteen	ZAB 16
Air Today Flight Eighty Six	TDY86
General Avaiation Flight November Three Niner Papa Whiskey	N39PW
General Aviation Flight November Four Two One Romeo Kilo	N421RK

I HEREBY CERTIFY that the following is a true transcription of the recorded conversation pertaining to the subject accident.

John B. Bookout

John B. Bookout

Air Traffic Assistant
Title

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(0125)

(0126)

0126:09	COA1143	Evening Denver Continental eleven forty three leveling two four oh
0126:12	ZDV 27R	Continental eleven forty three Denver, Center expect lower altitude in four minutes
0126:16	COA1143	Eleven forty three
0126:42	COA525	Good evening Denver Continental five twenty five is out of three one oh pilots discretion two four oh
0126:46	ZDV 27R	Continental five twenty five Denver Center cleared profile descent except to cross Kiowa at one seven thousand Denver altimeter is three zero zero eight
0126:54	COA525	Cleared for the profile except cross Kiowa at one seven thousand on three zero zero eight Continental five twenty five

(0127)

0127:26	ZDV 27R	Yep
0127:30	ZDV 28	Twenty eight
0127:31	ZDV 27R	This is ah (unintelligible) twenty seven TWA three oh two did not remove strips contact (unintelligible)

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0127:36	ZDV 28	(Unintelligible) I
0127:41	TWA302	TWA three oh two out of eleven for fourteen
0127:44	ZDV 27R	TWA three oh two Denver Center climb and maintain flight level one niner zero say your heading
0127:48	TWA302	One nine zero we're about ah (unintelligible) actually we're gain direct to Hugo we're on seventy right now
0127:54	ZDV 27R	Three zero two fly heading zero seven zero vector to Hill City rest of the route unchanged
0127:59	TWA302	Zero *seven* zero for Hill City TWA three oh two
(0128)		
0128:05	ZDV 27R	Continental five sixty seven contact Denver approach one two zero point eight
0128:09	COA567	Two zero point eight for Continental five sixty seven good night sir
0128:37	ZDV 27R	Continental eleven thir ah Continental eleven forty three is cleared for a profile descent except cross Kiowa at one seven thousand Denver altimeter three zero zero eight
0128:45	COA1143	Three zero zero eight cleared for profile descent except to cross at seventeen Continental eleven forty three

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(0129)

0129:01	ZDV **27R**	Kiowa twenty seven two line
0129:03	D84	Kiowa
0129:04	ZDV 27R	Continental five sixty seven was given the crossing restriction he did not say he couldn't make it
0129:07	D84	All right thanks
0129:08	ZDV 27R	Looks like **he's kinda** doggfn it there
0129:09	D84	Hope so
0129: 25	ZDV 27R	TWA three oh two climb and maintain flight level two one zero
0129:34	**COA1143**	Continental eleven forty three out of twenty four on profile
0129:37	ZDV **27R**	Continental eleven forty three thank you
0129:41	**ZDV** 27R	November eight one lima say heading direct to ah Garden City
0129:45	**N6881L**	(Unintelligible) eight one lima **I** show ah one oh eight
0129:50	ZDV 27R	Thank you
0129:54	ZDV 27R	TWA three oh two **I** can take you off course vector about thirty degrees right to **continue** climb or a higher altitude in ah four minutes your choice

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(0130)

0130:03	TWA302	Make turn and climb TWA three oh two
0130:05	ZDV 27R	TWA three oh two turn right heading one one zero vector for your climb maintain flight level two two zero
0130:11	TWA3 0 2	One one zero and on up to two two zero TWA three oh two
0130:16	ZDV 41	Forty one
0130:18	ZDV 27S	, Th this is sector twenty seven with a point out two zero east Colorado Springs TWA three oh two turnin right to a one eight zero heading vector for his climb
0130:29	ZDV 41	Point out approved TWA three oh two
0130:29	ZDV 28	(Unintelligible) sector twenty eight
0130:30	ZDV 27R	Sector twenty twenty nine forty twenty seven point out west of Hugo TWA three oh two ah point out released for higher and I I'd like higher to fit somebody here what can you approve climbin to
0130:31	ZDV 27R	X L
0130:38	ZDV 28	TWA three zero two point out approved GS wait a minute climb him to two niner zero
0130:45	ZDV 27R	Two niner zero heading one one zero now be direct Hill City when you get him

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0130:47	ZDV 28	All right
0130:47	TCE2286	Trans Colorado twenty two eighty six ah sixteen for twenty
0130: 52	ZDV 27R	Trans Colorado twenty two eighty six Denver Center climb and maintain flight level two two zero
0130:55	TCE2286	All right twenty two

(0131)

0131:00	ZDV 27R	TWA three oh two climb and maintain flight level two nfner zero
0131:02	TWA302	Two nine zero TWA three oh two
0131:26	ZDV 27R	November eight one lima if a fly a heading of one zero eight this will be a vector for traffic
0131:34	N6881L	Zero eight six eight eight one lima
0131:51	ZDV 27R	Continental eleven forty three contact Denver approach one two zero point eight we'll see ya
0131:55	COA1143	So long twenty point eight
0131:56	ZDV 27R	TWA three oh two upon leaving flight level two four zero fly heading zero seven zero direct Hill City when able

(0132)

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0132:02	TWA302	Out of two four go zero seven zero and Hill City when able *TWA* three oh two
0132:45	ZDV 27R	November six eight eight one lima resume your own navigation direct Garden City contact Denver Center one two six point six we'll see ya
0132:51	D84	South departure four line
0132:52	N6881L	Twenty six point six good day
0132:53	ZDV 27S	South departure
0132:54	D84	CACTUS thirty four is heading one ninety your control reference Trans Colorado
0132:57	ZDV 27S	x L
0132:58	D84	S E
(0133)		
0133:01	ZDV 27R	TWA three oh two contact Denver Center one two eight point seven we'll see ya
0133:09	ZDV 27R	TWA three oh two contact Denver Center one two eight point seven
(0134)		
0134:21	ZDV 27R	Continental five twenty five contact Denver approach one two zero point eight

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0134:25	COA525	Twenty point eight Continental five twenty five good night
0134:28	ZDV 27R	Good night
0134:42	ZDV 25R/S	Twenty five
0134:44	ZDV 25R/S	Yeah twenty six (unintelligible) Denver Center (unintelligible) seventy six heavy level three three zero zero (unintelligible) twenty one thirty one flight level one eight zero
0134:45	CACTUS34	Ah Denver CACTUS thirty four is with you climbin thru ah fourteen five for two zero zero
0134:50	ZDV 27R	CACTUS thirty four Denver Center climb and maintain flight level two three zero
0134:53	ZDV 25R/S	Approved RV
0134:54	ZDV 12R/S	R J
0134:54	CACTUS34	Up two three zero CACTUS thirty four

(0135)

0135:07	ZDV 25R/S	(Unintelligible) international two seventy six heavy Denver Center roger
0135:08	ZDV 29	Twenty nine
0135:09	ZDV 27S	Twenty seven CACTUS thirty four vector one niner zero when able direct Alamosa X L

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0135:13	ZDV 29	J B
0135:14	FTL276	And Denver Flying Tiger two seventy six heavy level three three zero
0135:19	ZDV 25R/S	Flying Tiger two seventy six heavy ah Denver Center roger sorry about that
0135:24	TCE2286	Trans Colorado twenty two thirty five request direct Durango at two three zero
0135:29	ZDV 27R	Trans Colorado twenty two eighty six stand by
0135:38	UNKN	(Unintelligible)
0135:40	ZDV 25R/S	Twenty five
0135:42	ZDV 27S	Sector twenty seven CACTUS ah correction Trans Colorado twenty two eighty six requesting flight level two three zero direct Durango he'll be your control
8135: 45	ZDV 27R	CACTUS thirty four fly heading one niner tero proceed direct Alamosa when able rest of the route unchanged
0135:50	CACTUS34	Okay one nine zero direct Alamosa when able CACTUS thirty four
0135:51	ZDV 25R/S	R V
8135: 52	ZDV 27S	X L

(0136)

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0136: 05	ZDV 27R	Trans Colorado twenty two eighty six contact Denver Center one two eight point two they have your request
0136:07	ZDV 25R/S	Continental eight seventy sierra descend and maintain flight level two four zero change to my frequency one two eight point two
0136:10	TCE2286	Thank you sir good night
0136:14	COA870S	Twenty eight two and down to two four zero do you need us down now
0136:18	ZDV 25R/S	Continental eighty seventy sierra affirmative start your descent now
0136:22	COA870S	Eight seven zero sierra is out of three seven oh for two four zero say the frequency again
0136:26	ZDV 25R/S	Change to my frequency one two eight point two
0136:29	COA870S	Twenty eight two okay we'll come up on that one
0136:32	ZDV 41	Sector forty one
0136: 34	ZDV 27S	Sector twenty seven point out one five miles northwest Colorado Springs VORTAC CACTUS thirty four climbin to flight level two three zero he's on a one nine zero vector when able direct Alamosa
0136:35	TCE2286	Trans Colorado twenty two eighty six twenty one five for two two zero

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0136:40	ZDV 25R/S	Trans Colorado twenty two eighty six Denver Center roger cleared direct ah stand by for direct Durango
0136:43	ZDV 41	Point out approved (unintelligible)
0136:45	ZDV 27S	X L
0136:51	COA870S	Right seven *zero* sierra is up on twenty eight two
0136:54	ZDV 25R/S	Continental eight seventy sierra Denver Center roger
(0137)		
0137:00	ZDV 27S	Twenty seven
0137:01	ZDV 27R	CACTUS thirty four contact Denver Center one three two point two two
0137:01	ZDV 28	Sector twenty eight two speeds
0137:01	NWA337	Denver Center Northwest three thirty seven three niner zero
0137:02	ZDV 27S	Go ahead
0137:03	ZDV 28	Continental sixteen seventy five two hundred eighty knots or greater
0137: 05	CACTUS34	One three two point two two CACTUS thirty four
0137:05	ZDV 25R/S	Northwest three thirty seven Denver Center roger

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0137:06	ZDV 27S	Go
0137:06	ZDV 28	Continental eight twenty three two hundred and eighty knots
0137:08	ZDV 27S	X L
0137:09	ZDV 28	(Unintelligible)
0137:18	ZDV 25R/S	Lear zero sierra whiskey descend and maintain flight level three niner zero
0137: 23	N500SW	Zero zero sierra whiskey down to three niner zero
8137: 29	ZDV 12R/S	Twelve Denver Center Rocky Mountain
0137:32	COA1675	Denver Center Continental sixteen thirty five with you we're level three one zero cleared P D down to two four zero
0137:33	ZDV 25R/S	This is twenty five and twenty six APREQ Trans Colorado twenty two eighty six direct Durango
0137:38	ZDV 12R/S	At twenty two
0137:39	ZDV 27R	Calling Denver say again
0137:40	ZDV 25R/S	Ah flight level two three zero if I could
0137:41	COA1675	Continental sixteen seventy five just checkin in with you we're level three one zero cleared P D down to two four zero

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0137:43	ZDV 12R/S	Approved
0137:43	ZDV 25R/S	R V
0137:44	ZDV 12R/S	R J
0137:47	ZDV 25R/S	Lear zero sierra whiskey say again
0137:47	ZDV 27R	Continental sixteen seventy five Denver Center cleared profile descent except cross Kiowa at one seven thousand Denver altimeter three zero zero eight
0137: 50	N500SW	Is that pilots discretion for three nine zero or do you need us down now
0137:53	ZDV 25R/S	Lear zero sierra whiskey start your descent now
0137: 54	COA1675	Zero zero eight cross Kiowa at one seven thousand Continental sixteen seventy five.
6137: 54	N500SW	Okay out of four five for three nine
(0138)		
0138:11	ZDV 25R/S	Trans Colorado twenty two eighty six climb and maintain flight level two three zero cleared direct Duranqo
0138:17	TCE2286	Two three zero and direct Duranqo twenty two eighty six thank you.
(0139)		

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0139:24	ZDV 25R/S	Tiger two seventy six heavy contact Denver Center one three two point two two
0139:29	FTL276	Okay three thirty twenty two for Tiger two seventy six heavy good day
0139:33	ZDV 25R/S	Good day
(0140)		
0140:14	ZDV 25R/S	Continental eight seventy sierra cross Byson at one seven thousand Denver altimeter three zero zero eight
0140:22	COA870S	Thirty oh eight Byson at one seven thousand for Continental eight seventy sierra
0140:34	ZDV 25R/S	Continental eight seventy sierra also at Byson maintain two five zero knots
0140:39	COA870S	Two fifty also at Byson I'll do that
(0141)		
0141:22	ZDV 25R/S	Lear zero sierra whiskey descend and maintain one seven thousand. Denver 'altimeter three zero zero eight
0141:32	N500SW	Seventeen thousand three zero zero eight
0141:35	RMA2131	Denver Center Rocky Mountain twenty one thirty one one eight zero

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0141:40	ZDV 25R/S	Rocky Mountain twenty one thirty one Denver Center roger
0141:44	ZDV 25R/S	Rocky Mountain twenty one thirty one say heading
0141:46	RMA2131	Twenty one thirty one is ehowin about zero seven zero
0141:52	ZDV 25R/S	Rocky Mountain twenty one thirty one toger
(0142)		
0142:27	ZDV 25R/S	Lear five zero zero sierra whiskey change to my frequency one two eight point two
0142:32	N500SW	Twenty eight two with you
0142:43	N500SW	Yeah five hundred sierra whiskey is with you ah one two eight point two
0142:51	ZDV 25R/S	Lear five zero zero sierra whiskey roger cross three six south of Denver at one five thousand
(0143)		
0143:00	N500SW	Three six miles south at one five thousand thanks very much
0143:10	N500SW	Ah Denver five zero zero ah sierra whiskey request
0143:16	ZDV 25R/S	Lear zero sierra whiskey go ahead

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0143:19	N500SW	Ah yes sir ah is there any chance you can get us into Stapleton ah there ah any positions open to get in there
0143:27	ZDV 25R/S	Lear zero sierra whiskey stand by
(0144)		
0144:03	ZDV 25R/S	Lear five zero zero sierra whiskey cleared to the Denver Stapleton Airport via present position direct Byson direct maintain flight level one niner zero
0144:13	N500SW	Okay its one niner zero direct Byson direct thank you
0144:48	ZDV 25R/S	Lear zero sierra whiskey cross Byson at flight level one niner zero and two five zero knots
0144:54	NSBBSW	One niner zero two five zero knots roger
(0145)		
0145:05	ZDV 12R/S	Rocky Mountain twenty one ninety seven Denver Center roger
0145:16	ZDV 6	Sector six'
0145:17	ZDV 25R/S	Twenty five request control for lower on Rocky Mountain twenty one thirty one
0145:20	ZDV 6	Released lower R Y
0145:21	ZDV 25R/S	R V

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0145: 26	N80WP	Hello Denver King Air eight zero whiskey papa is out of one nine oh for two three zero
0145:28	ZDV 25R/S	Rocky Mountain twenty one thirty one descend and maintain one seven thousand Denver altimeter three zero zero eight
0145:32	ZDV 12R/S	King Air eight zero whiskey papa Denver Center roger
0145:35	RMA2131	Twenty one thirty one down to one seven thousand zero zero eight
0145:37	ZDV 12R/S	Salt Lake thirty one Denver twelve low line
(0146)		
0146:21	ZDV 12R/S	Rocky Mountain twenty one thirty seven is radar contact ten miles northwest of the Aspen Airport show you leaving one four thousand four hundred
0146:30	RMA2137	I only show fourteen two Rocky Mountain twenty one thirty seven with two nine nine nine
0146:31	ZDV 25R/S	Lear eero sierra whiskey turn left heading three six zero intercept the Denver two one three radial inbound
0146:36	ZDV 12R/S	Okay thanks
0146:38	N500SW	Okay intercept the two one three (unintelligible) two one three Denver radial inbound and three sixty on the heading

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0146:45	ZDV 25R/S	Zero sierra whiskey what was your heading before
0146:49	N500SW	Zero two zero was our previous heading
0146:57	ZDV 25R/S	Lear tero sierra whiskey ah turn left heading three four zero intercept the Denver two one three radial inbound for spacing
0146:59	ZDV 12R/S	Salt Lake thirty one Denver twelve low line
(0147)		
0147:02	N500SW	Okay three four zero to intercept the two one three inbound
0147:06	ZDV 12R/S	Twelve
0147:07	ZDV/UNKN	You did terminate that Today sixty six didn't you
0147:07	ZDV 25R/S	Trans Colorado twenty two eighty six contact Denver Center one two seven point eight
0147:09	ZDV 12R/S	Yeah he's gonna I told him to call you (unintelligible)
0147:12	ZDV/UNKN	Yeah I been talkin to him but ah
0147:13	ZDV 12R/S	Okay
0147:14	ZDV/UNKN	He keeps givin me hints like I got him in radar ha ha ha ha

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0147:14	TCE2286	Twenty seven eight ah for twenty two eighty six goodnight
0147:16	ZDV 12R/S	Okay ha ha ha
0147:18	ZDV 25R/S	Northwest three thirty seven contact Denver Center one three five point four seven
0147:21	TCE2286	Trans Colorado twenty two eighty six two three zero
0147:23	NWA337	One thirty five four seven for Northwest three three seven good day
0147:25	ZDV 12R/S	Trans Colorado twenty two eighty six Denver Center roger
0147: 29	ZDV 25R/S	King Air eight echo foxtrot change to my frequency one two eight point two
0147:31	ZDV 38R/S	Thirty eight
0147:32	ZDV 12R/S	Twelve APREQ twenty Trans Colorado twenty two eighty six at two three zero
0147:36	ZDV 38R/S	Approved (unintelligible)
0147:36	N8EF	Ah roger eight echo fox is up one two eight point two
0147:37	ZDV 12R/S	R J
0147:40	ZDV 25R/S	King Air eight echo foxtrot roger

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0147:49	ZDV 12R/S	Salt Lake thirty one Denver twelve low line
0147:50	ZDV 25R/S	Continental eight seventy sierra cleared profile descent except cross Byson at one seven thousand
0147:57	COA870S	Byson one seven on the profile Continental eight seventy three eight seven sierra
(0148)		
0148:05	ZDV 12R/S	Yes sir whiskey papa expect higher in about two minutes
0148:09	N80WP	Okay thanks much
0148:13	ZDV 12R/S	Twin Cessna four one four alfa romeo contact Denver Center one two eight point two
0148:19	N414AR	One twenty eight point two roger so long
0148:21	ZDV 12R/S	See ya
0148:30	ZDV 25R/S	Rocky Mountain twenty one thirty one descend and maintain one five thousand
0148:35	RMA2131	Rocky Mountain twenty one thirty one down to one five thousand
0148:49	ZDV 14	Fourteen
0148:50	ZDV 12R/S	Is climbing to twenty seven okay (unintelligible)

23

0148:SB	RNA21 31	Center Rocky Mountain twenty one thirty five one verify one five thousand is the altitude
0148:53	ZDV 12R/S	Okay
0148:54	ZDV 12R/S	They shipped to me and they won't give me control for higher so I'll wait just a second here (unintelligible)
0148:55	ZDV 25R/S	Rocky Mountain twenty one thirty one ah maintain one six thousand
0148:58	zpv 14	Your control
(0149)		
0149:15	ZDV 12R/S	King Air eight zero whiskey papa climb and maintain flight level two seven *zero*
0149:18	N80WP	Up to two seven zero eight zero whiskey pop
0149:50	ZDV 25R/S	Twenty five
0149:51	ZDV 12R/S	Sector twelve
0149:53	N414AR	Denver Center November four one four alfa romeo would like to get back down to one seven thousand as soon as traffic permits ah the winds are better down there
(0150)		
0150:01	ZDV 25R/S	Twin Cessna four alfa romeo standby twenty five and twenty six

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0150:04	ZDV 12R/S	Point out Mooney two three one romeo papa direct Tinker
0150:08	ZDV 25R/S	Point out approved RV
0150:09	ZDV 12R/S	R J
0150:19	RMA2137	And ah Denver Center Rocky Mountain twenty one thirty seven
0150:25	ZDV 12R/S	Rocky Mountain twenty one thirty seven go ahead
0150:28	RMA2137	Ah yes with your approval we'd like to go direct Denver and with the beat of intentions to cancel forty west of Denver
0150:35	ZDV 12R/S	Rocky twenty one thirty seven stand by just a minute
0150:41	ZDV 6	Sector six
0150:42	ZDV 12R/S	Sector twelve at Red Table Rocky twenty one thirty seven wants to come direct Denver at Seventeen cancel forty west
0150:47	ZDV 6	That's approved (unintelligible)
0150:48	ZDV 12R/S	R J
0150:50	ZDV 12R/S	Rocky Mountain twenty one thirty seven is cleared direct Denver
0150:52	RMA2137	Direct Denver twenty one thirty seven

(0151)

25

0151:09	ZDV 12R/S	King Air eight zero whiskey papa stand by just a minute
0151:15	ZDV 14	Four teen
0151:17	ZDV 12R/S	(Unintelligible) want to talk to em
0151:18	ZDV 14	(Unintelligible)
0151:19	ZDV 12R/S	Okay
0151:23	ZDV 12R/S	I hate those guys twelve
0151:25	ZDV/UNKN	Is is he is is some kind a King Air over there
0151:27	ZDV 12R/S	*Yeah* what you want to do to him
0151:29	ZDV/UNKN	Just curious
0151:30	ZDV 12R/S	Okay
0151:32	ZDV 12R/S	Go ahead
0151:33	GJT A/C	Continental seventeen sixty six to Denver off' at five six
0151:36	ZDV 12R/S	Continental seventeen sixty six cleared to Denver as filed jay one thirty climb and maintain flight level two three zero squawk five five six seven
0151:42	GJT A/C	Thanks L N
0151:43	ZDV 12R/S	R J

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0151:55	ZDV 12R/S	King Air eight zero whiskey papa contact Salt Lake Center one one niner point two five
(0152)		
0152:01	N80WP	Nineteen twenty five eight zero whiskey papa good day sir
0152:04	ZDV 12R/S	Good day
0152:40	ZDV/UNKN	Thru seventeen
0152:41	ZDV 12R/S	Approved
0152:42	ZDV/UNKN	(Unintelligible)
0152:43	ZDV 12R/S	R J
0152:56	ZDV 12R/S	Trans Colorado twenty two eighty six contact Denver Center one three three point four
(0153)		
0153:01	TCE2286	Twenty two eight six switching good night sir
0153:03	ZDV 12R/S	Good night
0153:09	TCE2286	Trans Colorado twenty two eighty six level at two three zero

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0153:13	ZDV 38R/S	Trans Colorado twenty two eighty six Denver Center roger Durango zero one zero three observation indefinite ceiling eight hundred sky obscured visibility one mile light snow and fog temperature two five dew point two five altimeter er correction wind is calm
0153:29	TCE2286	Thank you
0153:31	RMA2197	Rocky Mountain twenty one ninety seven is ah (unintelligible) northeast of Blue Mesa
0153:46	ZDV 12R/S	Sierra Pacific twenty three fifty four Denver Center roger
0153:50	ZDV 12R/S	I missed the other call say it again
0153:52	RMA2197	Rocky Mountain twenty one ninety seven was lookin to see if I could turn about fifteen degrees right to intercept northeast of Blue Mesa
0153:59	ZDV 12R/S	Rocky twenty one ninety seven cleared as requested
(0154)		
0154:02	RMA2197	Twenty one ninety seven
(0155)		
(0156)		
0156:26	ZDV 38R/S	Denver Center

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0156:27	FMN/TWR	This is Farmington Tower request clearance Shuttle eighteen off runway two five to Gallup
0156:35	ZDV 38R/S	Shuttle eighteen cleared to the Gallup Airport via victor four twenty one climb and maintain one four thousand and you want to give me a time off here I'll give you a code on him
0156:46	FMN/TWR	On the hour
0156:47	ZDV 38R/S	Okay - - - - machines a little slow tonight here we go one four four one
(0157)		
0157:03	FMN/TWR	One four four one and ah fourteen thousand show well I've already told you twelve hundred C D
0157:07	ZDV 38R/S	Okay
(0158)		
(0159)		
(0200)		
0200:18	ZLC 40	Denver twenty two Salt Lake forty on the low
0200:31	MSE18	(Unintelligible) hundred for one four thousand off Farmington
0200:34	ZDV 38R/S	Shuttle eighteen Denver Center roger

29

0200:40	ZDV 38R/S	Trans Colorado twenty two eighty six ah for your approach into Durango would you rather shoot the I L S or ah will the ah DME approach to runway two zero be ah sufficient
0200:55	TCE2286	And ah Center twenty two eighty six we'll plan on a DME to two zero
(0201)		
0201:00	ZDV 38R/S	Trans Colorado twenty two eighty six I show you slant romeo if you want to proceed direct to the zero two three radial eleven mile fix that's approved
0201:07	TCE2286	Twenty two eighty six thank you
0201:17	ZDV 38R/S	Golden Eagle one two zero four november contact Albuquerque Center one two eight point four five
0201:22	N1204N	Zero four November good night
0201:24	ZDV 38R/S	Good night sir
0201:45	ZDV 38R/S	Denver Center
0201:47	FMN/TWR	Center Farmington Tower request clearance Shuttle seven twelve off runway two five to Albuquerque
0201:53	ZDV 38R/S	Okay let me get call you back here in a minute Shuttle has talked to me but I haven't seen him yet I'll have to qive you a call in about a minute or so

30

0201:59	FMN/TWR	Okay K Z
(0202)		
0202:02	ZDV 38R/S	Shuttle eighteen not receiving your transponder yet verify squawking one four four one normal say altitude leaving
0202:10	ZDV 38R/S	Shuttle eighteen not receiving transponder yet verify squawking one four four one normal say altitude leaving
0202:16	MSE18	One four four one out of ah one two thousand two hundred
0202:20	ZDV 38R/S	Thank you very much
0202: 31	FMN/TWR	Go ahead Shuttle seven twelve
0202:33	ZDV 38R/S	Seven twelve cleared to Albuquerque via victor one eighty seven climb and maintain one one thousand squawk two seven three four
0202:39	FMN/TWR	Two seven three four one one thousand show him off zero five K Z
0202:42	ZDV 38R/S	M G
0202: 53	ZDV 38R/S	Air Shuttle eighteen radar contact one two miles southwest Farmington VOR show leaving one two thousand seven hundred for one four thousand
(0203)		
0203:03	MSE18	Shuttle eighteen

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0283 : 11	ZDV 38R/S	Trans Colorado twenty two eighty six descend at pilots discretion maintain one six thousand Durango altimeter two niner eight zero
0203:19	TCE2286	All right we're leaving two three zero for one six thousand two niner eight zero twenty two eighty six
(0204)		
0204:37	ZDV 38R/S	Call thirty eight
(0205)		
0205:18	MSE712	And Denver Cen ah this is Shuttle seven twelve we are off Farmington ah seven point two for one one thousand
0205: 24	ZDV 38R/S	Shuttle seven twelve Denver Center roger radar contact one zero miles southwest of the Farmington VOR altitude checks climb and maintain one seven thousand
0205:34	MSE712	And Shuttle seven twelve is up to one seven thousand
(0206)		
0206:11	ZLC 40	Denver twenty two Salt Lake forty on the low
0206:20	ZLC 40	Denver twenty two Salt Lake forty low line
0206:42	ZLC 40	Denver twenty two Salt Lake forty on the low

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(0207)

0207: 23	ZDV 38R/S	Albuquerque sixteen thirty eight on the low line
0207:28	ZAB 16	Sixteen
0207: 38	ZDV 38R/S	I just want to verify that AGONE five five is descending into I R one ten
0207:34	ZAB 16	Yes
0207:35	ZDV 38R/S	Okay
0207:35	ZAB 16	Yes he's a should be entering in the next within a minute
0207:38	ZDV 38R/S	Okay
0207:39	ZAB 16	(Unintelligible)
0207:40	EDV 38R/S	(Unintelligible)

(0208)

(0209)

0209:53	MSE712	And ah Denver Center this is Shuttle seven twelve
0209:57	ZDV 38R/S	Shuttle seven twelve go ahead
0209: 59	MSE712	Ah seven twelve would like to request ah one nine zero

33

(0210)

0210:03	ZDV 38R/S	Air Shuttle seven twelve climb and maintain flight level one niner zero
0210:06	MS&312	And one nine zero thank you
0210:19	EDV 38R/S	Trans Colorado twenty two eighty six descend and maintain one five thousand
0210:24	TCE2286	One five thousand twenty two eighty six

(0211)

0211:07	LDV 38R/S	Shuttle eighteen contact Albuquerque Center one two five point twq
0211:11	MSE18	Twenty five two Shuttle eighteen
0211:38	TDY 86	Denver Center Air Today eighty six is checkin in at one nine zero
0211:42	ZDV 38R/S	Air Today eighty six roger
0211:48	ZDV 38R/S	Air Today eighty six cleared to the Centennial Airport from over Alamora via the Alamora three four one radial jay ten Denver direct Centennial

(0212)

0212:04	ZDV 38R/S	Air Today eighty six Denver did you copy

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0212:07	TDY86	Stand by please
0212:08	ZDV 38R/S	Roger
0212:18	TDY86	I copied ah (unintelligible) cleared the eighty six out the three forty one off Alamosa to intercept ah jay ten ah and what was after that
0212:25	ZDV 38R/S	Okay after J ten J ten to Denver direct Centennial and just verify that's the three four one out of Alamosa for jay ten
0212:33	TDY86	Okay jay ten on the three forty one degree radial for Air Today eighty six over to Centennial
0212:41	ZDV 38R/S	Roger
(0213)		
0213:47	ZDV 38R/S	Trans Colorado twenty two eighty six cross the Durango zero two three zero one one mile fix at or above one four thousand cleared VOR DME runway two zero approach to the Durango Airport
(0214)		
0214:08	ZDV 38R/S	Thirty eight
0214:10	ZAB 16	AGONE five six entering I R one ten one seven thousand and below
0214:14	ZDV 38R/S	M G
0214:15	ZAB 16	E Y

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0214:19	ZDV 38R/S	Trans Colorado twenty two eighty six Denver
0214:27	TCE2286	Two eighty six go ahead
0214:28	ZDV 38R/S	Okay Trans Colorado twenty two eighty six cross the Durango zero two three zero one one mile fix at or above one four thousand cleared VOR DME runway two *zero* approach to the Durango Airport
0214:41	TCE2286	Okay we're down to one four and we're cleared for the approach
0214:46	TCE2286	Twenty two eighty six how do you hear this transmitter
0214:48	ZDV 38R/S	Yeah I have you loud and clear I think my other transmitter is ah starting to fail me now would you give me a short count please
0214:55	TCE2286	Five four three (unintelligible) four five
0214:59	ZDV 38R/S	Okay thank you sir
(0215)		
0215:07	ZDV 38R/S	Trans Colorado twenty two eighty six how do you hear this transmitter
0215:11	TCE2286	Thats five by five
0215:12	ZDV 38R/S	Thank you

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0215:19	ZDV 38R/S	Air Shuttle. seven ah twelve Denver would you give me a short count please
0215:23	MSE712	Ah one two three four fi five four three two one
0215:29	ZDV 38R/S	Shuttle seven twelve thanks for your help Albuquerque now on one two five point two
0215:33	MSE712	Twenty five two we'll see you
(0216)		
0216:15	ZDV 38R/S	Trans Colorado twenty two eighty six radar service terminated cleared from Center frequency report downtime or cancellation with (unintelligible) or through radio
0216:21	TCE2286	Twenty two eighty six wilco
(0217)		
0217:14	ZDV 38R/S	Golden Eagle three niner papa whiskey Alamosa altimeter two niner niner two
0217:18	N39PW	Nine niner two
(0218)		
(0219)		
(0220)		
(0221)		

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0221:11	ZDV 38R/S	Golden Eagle three niner papa whiskey contact Denver Center one two six point six
0221:15	N39PW	Two six point six thank you good day
(0222)		
0222:02	N421RK	Denver Center ah Twin Cessna November four twenty one romeo kilo with you at two zero zero
0222:08	ZDV 38R/S	Golden Eagle four twenty one romeo kilo Denver Center roger
(0223)		
(0224)		
(0225)		
(0226)		
(0227)		
(0228)		
(0229)		
(0230)		

END OF TRANSCRIPT

APPENDIX C

PERSONNEL INFORMATION

Stephen S. Silver, Captain

Captain Stephen S. Silver, 36, was employed by Trans-Colorado on May 27, 1986. He held airline transport certificate No. 523667862 with SA227 and airplane multiengine land type ratings. His first-class medical certificate, dated November 13, 1987 contained the limitation, "Holder shall wear correcting lenses while exercising the privileges of his airman certificate."

At the time of the accident, the captain had accrued approximately 4,184 flight hours, of which about 3,028 were in the Fairchild Metro, with about 1,707 of these as pilot-in-command. In the previous 90 days, 30 days, and 24 hours, the captain had flown 165.1, 49.3, and 3.8 hours, respectively.

Ralph D. Harvey,First Officer

First Officer Ralph D. Harvey, 42, was employed by Trans-Colorado on June 23, 1987. He held airline transport pilot certificate No. 523585484 with an airplane multiengine land rating. His first-class medical certificate, dated June 15, 1987, contained a statement of demonstrated ability, with a waiver for defective hearing in his left ear.

At the time of the accident, the first officer had accrued about 8,500 total flight hours, of which about 305 were in the Fairchild Metro, all as second-in-command. In the previous 90 days, 30 days, and 24 hours, the first officer had flown 170.2, 58.2 and 1.5 hours, respectively.

APPENDIX D

AIRCRAFT INFORMATION

The airplane, a Fairchild SA227 AC, Metro III, United States Registry N68TC, entered service on October 1, 1981. At the time of the accident, it was owned by Metro Credit Corporation of Chantilly, Virginia, and leased to Trans-Colorado. The airframe had accumulated about 11,895.5 flight hours at that time.

The airplane was powered by two Garrett TPE 331-11U-611G engines, each with a Dowty-Rotol R321/4-82-F/8 four-bladed propeller. The engines were rated at 1,100 equivalent shaft horsepower, at sea level, given standard atmospheric conditions.

Enaines	No. 1	No. 2
Serial No.	P-44066	P-440 15
Total Time	14,276.6	10,428.7
Time Since Overhaul	8318.9	4410.7
Total Cycles	18,866	13,178
Cycles Since Overhaul	10,525	5,168

Propellers	No. 1	No. 2
Serial No.	1338181	2306/81
Total Time	NA	12,479.6
Time Since Overhaul	3,327.2	1,448.6

APPENDIX E

FAA AUTHORIZATION FOR VOR DME APPROACH TO DRO

M E M O R A N D U M

U.S. Department
of Transportation

Federal Aviation
Administration

Northwest Mountain Region
17900 Pacific Highway South
C-66966
Seattle, Washington 98168

INFORMATION: Response to NTSB Request for Information.

Date: March 17, 1988

Reply to
Attn. of: Chapman
FTS 446-2213

Manager, Flight Procedures Branch, ANM-220

Manager, Accident Investigation Division, ASF-100
ATTN. Mr. David Brown

The attached answers are in response to your memorandum dated February 23, 1988 concerning a TransColorado Airlines accident at Durango, Colorado.

Preston C. Gardner, Jr.

FILE: ANM-220/8260:DRO-1 (80226-01,JC)

Answers to questions concerning the TransColorado accident at Durnango, Colorado.

1. Our records do not contain a copy of the original request far the VOR/DME Rwy 20; however, other correspondence, the original instrument approach procedure and the original waiver are all for Frontier Airlines.

2. According to our records the VOR/DME Runway 20, Origins: instrument approach procedure was developed in accordance with the applicable paragraphs in chapters 2, 3 and 5 of 8260.3 "TERPS" with one waiver for descent gradient. The instrument approach procedure passed the commissioningflight inspection in accordance with the applicable paragraphs of sections 104 and 214 of the Flight Inspection Manual 8200.1 on 10/28/77.

   The instrument approach procedure was approved for Frontier Airlines use on 11/17/77 with an effective date of11/18/77 and submitted to the POI.

   The instrument approach procedure was approved for TransColorado Airiines use on 10/3/85.

   The procedure was amended on 9/4/86 resulting in the VOR/DME Rwy 20, AMDT 1 being approved for Frontier Airlines and TransColorado Airlines on 9/30/86.

3. One waiver for descent gradient in the intermediate segment (TERPS paragraph 242d) was approved in accordance with chapter 2. section 10 of 8260.19.

4. Our records do not indicate that this procedures would be limited to any certain type(s) of aircraft.

5. The Flight Procedures Branch reviewed an3 distributed the VOR/DME Rwy 20 special instrument approach procedure to TransColorado in accordance with 8260.19 paragraph 820. The original waiver was not modified and no additional waivers were required.

6. NON RADAR - The instrument approach procedure would be flown as published with the procedure commencing at (DR0) R-098.11 DME (the IAF) at or above the V-211 minimum enroute altitude (MEA) of 11000 west bound or 13000 east bound.

   Distance IAF to IF = 14nm (2x3.14x11nm)/360x(73=96-23)
   Required altitude loss on 11 DME arc = 2600 (13000-10400)
   Descent gradient between IAF and IF = 186'/NM (2600/14)

   RADAR - Air Traffic advised me that procedures are flown in the same manner with or without radar.

7. TERPS 8260.3 para 232c Obstacle Clearance 1000
   para 231 established in 100 ft increments
   not lower than intermediate or final
   para 232d DESCENT GRADIENT - Optimum 250ft nm.
   Maximum 500 ft /nm

8 . The FAA might have approved this procedure with a minimum altitude of 14000 vice 1.0400 on the 11 DME arc under certain conditions: need, aircraft capabilities, aircrew qualifications, aircrew initial and recurrent training such other requirements as deemed necessary.

9. All Flight Inspection is conduct in accordance with the United States Standard Flight Inspection Manual 8200.1 Sections 104 and 214. Non public use or "Special" instrument approach procedures are flight inspected in tho same manner as public use or "Standard" instrument approach procedures as follows:

(1) 8200.1 para 104.3 COMMISSIONING - Prior to publishing the original Instrument Approach Procedure.

(2) 8200.1 para 104.4 PERIODIC - Annually on a VOR procedure. (Final approach only)

(3) 8200.1 para 104.5 SPECIAL - Conducted on an as needed bases by special request for a variety of ie: after accident, facility modification or restoration, prior to publishing an amendment to an existing instrument approach procedure.

(4) 8200.1 para 104.51 AFTER ACCIDENT - Verify that the facility performance is satisfactory that it supports the instrument approach procedure.

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION - FLIGHT STANDARDS SERVICE

VOR SPECIAL INSTRUMENT APPROACH PROCEDURE

Bearings, headings, courses and radials are magnetic. Elevations and altitudes are in feet, MSL, except HAT, HAA, RA. Altitudes are minimum altitudes unless otherwise indicated. Ceilings are in feet above airport elevation. Distances are in nautical miles unless otherwise indicated, except visibilities which are in statute miles or in feet RVR.

If an instrument approach procedure of the above type is conducted at the below named airport, it shall be conducted in accordance with a charted instrument approach procedure predicated on the specifications contained herein, unless an approach is conducted in accordance with a different procedure for such airport authorized by the Administrator. Minimum altitudes shall correspond with those established for en route operation in the particular area or as set forth below.

TERMINAL ROUTES

FROM	TO	COURSE AND DISTANCE	ALT
R-096 DRO VOR (CCW) (IAF)	R-023 DRO VOR	11 DME ARC	0,400

MISSED APPROACH

MAP: DRO VOR

Climb on R-203 to 8000, thee climbing left turn to 10,600 direct DRO VOR and hold.

ADDITIONAL FLIGHT DATA

Hold SW, R turn, 030 inbound.

1. PT N/A SIDE OF CRS ____ ; OUTBND ____ FT WITHIN ____ MI. OF ____ (IAF)
2. Approach course (profile) starts at DRO R-023/11 DME Fix
3. FAC 203 FAF DRO R-023/5 DME DIST FAF TO MAP ____ THLD ____
4. MIN ALT R-023/7.5 DME, 9400; 5 DME, 8400; 3 DME, 7600.
5. DIST TO THLD FROM: OM ____ MM ____ IM ____ 150 HAT ____ 100 HAT ____ GS ANT ____
6. MIN GS INTCP ____ GS ALT AT: ____ OM ____ MM ____ IM ____
7. GS ANGLE ____ TCH ____
8. MSA FROM DRO VOR, 275-070, 15,100; 070-250, 10,000

FAS Obstacle:
1. Terrain 371306/1074108 7220
2. Terrain 371123/1074356 6869

FAC intercepts a point offset 500' SE of RWY C/L 3000' from threshold
Chart VASI Rwy-20

VAR ~~14~~3 VR 75

MINIMUMS

TAKEOFF [ ] STD [x] SEE FAA FORM 8260-15 FOR THIS AIRPORT

ALTERNATE: [ ] NA STANDARD @

CAT.	A			B			C			D			E		
	OH/MDA	VIS	HAT/HAA	OH/MDA	VIS	HAT/HAA	OH/MDA	VIS	HAT/HAA	OH/MDA	VIS	HAT/HAA	OH/MDA	VIS	HAT/HAA
RS-20	7200	1	516	7200	1	516	7200	1½	516	7200	1 3/4	516			
*Circling	7200	1	516	7200	1	516	7200	1½	516	7240	2	556			

NOTES

RADAR VECTORING

* When control zone not in effect, the following applies. 1. USC Farmington, New Mexico altimeter setting 2. @ Alternate minimums not authorized. 3. Increase all MDAs 140 feet. Activate REIL Rwy 20-122.8

CITY AND STATE	ELEVATION AIRPORT / TDZE	FACILITY IDENT.	PROC. NO.-AMDT. NO.-EFFECTIVE DATE	SUP. / AMDT. / DATED
Dutango, CO	6685 / 6685	DRO	November 18, 1977 VOR/DME Rwy 20 Original	

FAA 8260-7 (3-76) SUPERSEDES PREVIOUS EDITION

GPO 878-043

NOTES CONTINUED

D4

AIR CARRIER NOTES

TransColorado Airlines Use Only

The procedure on the other side and the foregoing data are hereby:

FLIGHT CHECKED BY

NAME: S. Dougherty — OKC FIPO — DATE: 10-28-77

DEVELOPED BY

SIGNATURE: H. FERER — DATE: 7-27-77 — LAX FIPO

APPROVED BY

SIGNATURE: [signature] — DATE: 10/31/85

NW Mountain REGION — FLIGHT STANDARDS DIVISION

OPERATIONS SPECIFICATIONS • AIRPORT

_____ holding Air Carrier Operating Certificate No. _____

ereby acknowledges receipt of Operations Specifications to operate into and out of the airport named on the other side as a ☐ Regular, ☐ Refueling, ☐ Alternate, ☐ Provisional for _____ airport with the follow-ng type aircraft:

Inless otherwise authorized in the Operations Specifications-Airport, an instrument approach of this type shall be conducted in accordance with he procedure specified on the other side and the air carrier minimums specified above with the following exceptions:

ATE 10/11/85 — RECEIVED FOR THE AIR CARRIER BY [signature] (Signature)

MENDMENT NO. _____ — Senior VP & Chief Operating Officer (Title)

pproved and made a part of the Operations Specifications of the above-named carrier. The amendment supersedes any previous Operations pecifications-Airport of this type and procedure number approved for this Airport.

BY DIRECTION OF THE ADMINISTRATOR — A. C. McDonald (Signature)

FFECTIVE DATE 10-11-85 — Pcl (Title)

GPO 888-042

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION - FLIGHT STANDARDS SERVICE

VOR SPECIAL INSTRUMENT APPROACH PROCEDURC

Bearings, headings, courses and radials are magnetic. Elevations and altitudes are in feet, MSL, except HAT, HAA, RA. Altitudes are minimum altitudes unless otherwise indicated. Ceilings are in feet above airport elevation. Distances are in nautical miles unless otherwise indicated, except visibilities which are in statute miles or in feet RVR.

If an instrument approach procedure of the above type is conducted at the below named airport, it shall be conducted in accordance with a charted instrument approach procedure predicated on the specifications contained herein, unless an approach is conducted in accordance with a different procedure for such airport authorized by the Administrator. Minimum altitudes shall correspond with those established for en route operation in the particular area or as set forth below.

TERMINAL ROUTES				MISSED APPROACH
FROM	to	COURSE AND DISTANCE	ALT	MAP: DRO VOR
R-096 DRO *VOR* CCW (IAF)	R-023 DRO *VOR*	11 DME ARC	10400	*Climb on R-203 to 8000, then climbing left turn to 10,600 direct* DRO *VOR and hold.*

ADDITIONAL FLIGHT DATA

Hold SW, RT, *030 inbound.*

1. PT NA SIDE OF CRS OUTBND ____ FT WITHIN ____ MI. OF ____ (IAF) *I FAS Obot: 2220 Terrain*
2. Profile starts at DRO R-023/11 DME fix. 371306/1074108
3. FAC 203 FAF DRO R-023/5 DME DIST FAF TO: MAP ____ THLD ____ *6869 Terrain*
4. MIN ALT R-023/7.5 DME 9400, 5 DME 8400, 3 DME 7600. 371123/1074356
5. DIST TO THLD FROM: OM ____ MM ____ IM ____ 150 HAT ____ 100 HAT ____ GS ANT ____
6. MIN GS INTCP ____ GS ALT AT: ____ OM ____ MM ____ IM ____ *FAC intercepts a point offset 500' SE of* RWY *C/L* 3000' *from* THLD.
7. GS ANGLE ____ TCH ____
8. MSA FROM DRO VOR 275-070 15100, 070-250 10000 VAR 14E YR 75

MINIMUMS

TAKEOFF: [ ] STD [X] SEE FAA FORM 8260-15 FOR THIS AIRPORT ALTERNATE: [ ] NA STANDARD @

CAT.	A			B			C			D			E		
	DH/MDA	VIS	HAT/HAA	DH/MDA	VIS	HAT/HAA	DH/MDA	VIS	HAT/HAA	DH/MDA	VIS	HAT/HAA	DH/MDA	VIS	HAT/HA
S-20	7200	1	516	7200	1	516	7200	1 1/4	516	7200	1 3/4	516			
Circling	7200	1	516	7200	1	516	7200	1 1/2	516	7240	2	556			

NOTES Radar Vectoring.
Activate MALSR, REIL, VASI *RWY 2,* VASI *RWY 20 and* Hir. RWY *2-20 - CTAF.*
When *control zone not in effect, except for operators with approved weather reporting service, procedure* NA.

@When CTLZ *not in effect, except for operators with approved weather reporting, alternate minimums* NA.

CITY AND STATE	AIRPORT	ELEVATION / TDZE	FACILITY IDENT.	PROC. NO.-AMDT. NO.-EFFECTIVE DATE	SUP. / AMDT. / DATED
Durango, CO	*Ourango-La Plata County*	6685 / 6685	DRO	9-30-86 VOR/DME *RWY 20, Amdt. 1*	Original 19 NOV 77

FAA Form 8260-7 (3-76) SUPERSEDES PREVIOUS EDITION

GPO 808-043

APPENDIX F

TRANS-COLORADO DESCENTCHECKLIST

5-1-86

CRUISE - S

1. POWER..... SET
2. PRESSURIZATION ..... SET
3. BOOST PUMPS ..... AS REQUIRED
4. LIGHTS ..... AS REQUIRED
5. PASSENGER BRIEFING ..... COMPLETE

DESCENT - C/R (leaving FL 180)

1. ALTIMETERS ..... SET
2. PRESSURIZATION ..... SET
3. NOSE WHEEL STEERING ..... ON
4. LANDING LIGHTS ..... AS REQUIRED
5. CURTAIN ..... CLOSED
6. CABIN SIGN ..... AS REQUIRED
7. PASSENGER BRIEFING ..... COMPLETE
8. APPROACH BRIEFING ..... COMPLETE

BEFORE LANDING - C/R

1. BRAKES ..... CHECKED
2. LIGHTS ..... AS REQUIRED
3. YAW DAMPER ..... OFF
4. PROP SYNC & SPEED LEVERS ..... OFF & HIGH
5. GEAR ..... DOWN 3 GREEN
6. FLAPS ..... SET

AFTER LANDING - S

1. FLAPS ..... UP
2. SPEED LEVERS ..... LOW
3. TRANSPONDER AND RADAR ..... STANDBY
4. SAS CLUTCH ..... OFF
5. BOOST PUMPS ..... OFF
6. TRIMS ..... 3 RESET
7. CABIN DUMP ..... DUMP

C/R 8. WINDSHIELD HEAT ..... OFF
C/R 9. ANTI-ICE ..... OFF
C/R 10. LANDING LIGHTS ..... AS REQUIRED
11. PASSENGER BRIEFING ..... COMPLETE
12. FLIGHT PLAN ..... CLOSED

SHUT DOWN - S

1. ALL SWITCHES (EXCEPT BATTERIES)..... OFF
2. ENGINES ..... STOP
3. BATTERIES ..... OFF
4. GUST LOCKS & CHOCKS ..... SET

WEIGHT*	V1	V2	Vxse**	Vyse**	Vref=1.3 Vso*** FLAPS UP	FLAPS ½	FLAPS DOWN
14,500	107	117	121	130	126	120	115
14,000	106	115	119	129	124	118	113
13,500	104	113	117	128	122	116	112
13,000	102	111	115	127	120	114	109
12,500	101	109	113	126	118	112	107
12,000	99	107	112	125	116	110	105
11,500	98	105	110	124	114	108	103
11,000	96	103	109	123	112	106	101
10,500	95	101	108	122	110	104	99
10,000	98	99	106	121	108	102	97

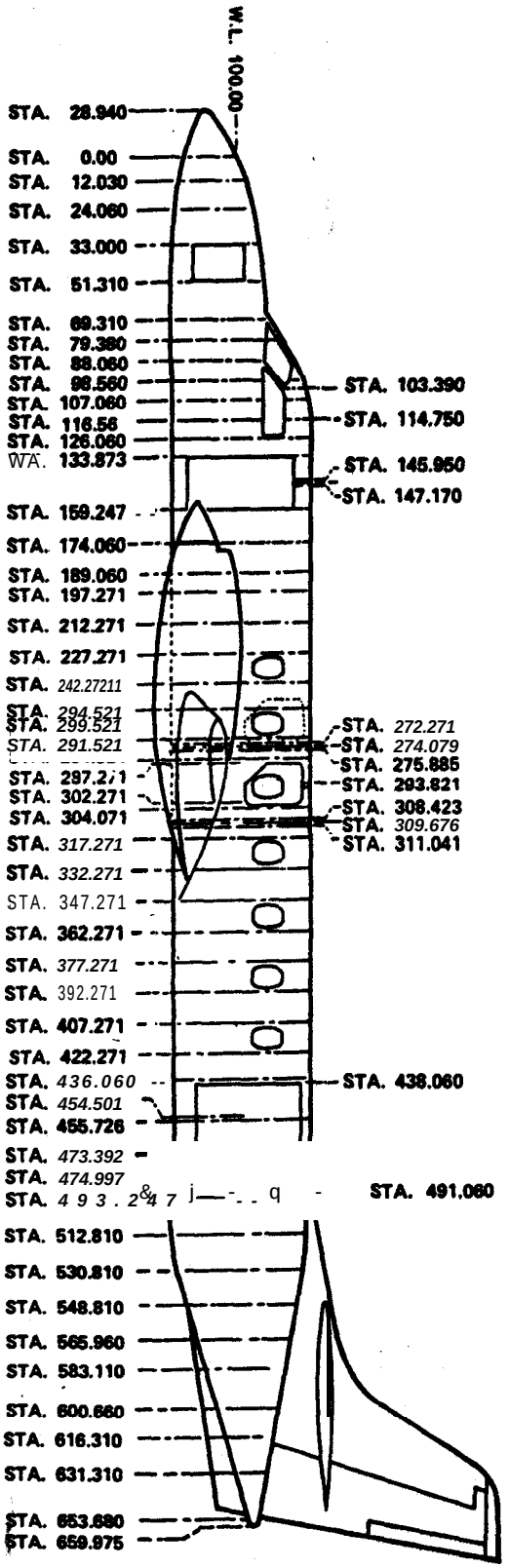
● OBSERVE YOUR MAX TAKEOFF AND LANDING WEIGHTS

**5000' ISA -20 to +20 BLEEDS ON

***FLIGHT INTO ICING ADD 19 KNOTS TO Vref AND 5 KNOTS TO Vmc

APPENDIX G

SIDE VIEW OF FAIRCHILD METRO III



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