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NATIONAL TRANSPORTATION SAFETY BOARD

WASHINGTON, D.C. 20594

AIRCRAFT ACCIDENT REPORT

AIR CALIFORNIA FLIGHT 336
BOEING 737-293, N468AC
JOHN WAYNE ORANGE COUNTY AIRPORT
SANTA ANA, CALIFORNIA
FEBRUARY 17, 1981

NTSB-AAR-81-12

UNITED STATES GOVERNMENT

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16. Abstract

At 1644 P.s.t., Air California Flight 336, a scheduled passenger service flight from San Jose to Santa Ana departed San Jose, California, with 105 passengers and 5 crewmembers on board. The en route portion of the flight was normal. About 1732 P.s.t., the aircraft was handed off to the John Wayne Orange County Airport control tower for a visual approach to runway 19R. The flight was initially sequenced for landing behind a Beech Bonanza and a Boeing 737, Western Flight 383. The Bonanza was turned out of traffic and subsequently sequenced to land behind Air California 336.

Western 383 landed and Air California Flight 931, Santa Ana to San Jose, was clea onto the runway and then cleared for takeoff. Recognizing that the separation criteria between Air California 336 and Air California 931 had been jeopardized, the air traffic controller instructed Air California 336 to go-around and Air California 931 to abort the takeoff. Air California 931 aborted and Air California 336 subsequently touched down on the runway and came to rest about 2,070 feet down the runway, with the landing gear retracted.

Four passengers sustained serious injuries and 29 incurred minor injuries. The aircraft was destroyed by impact and postimpact fire.

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Abstract Continued

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AVIATION ACCIDENT REPORT

Adopted: August 19, 1981

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BOEING 737-293, N468AC
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FEBRUARY 17, 1981

SYNOPSIS

At 1644 P.s.t., Air California Flight 336, a scheduled passenger service flight from San Jose to Santa Ana departed San Jose, California, with 105 passengers and 5 crewmembers on board. The en route portion of the flight was normal. About 1732 P.s.t., the aircraft was handed off to the John Wayne Orange County Airport control tower for a visual approach to runway 19R. The flight was initially sequenced for landing behind a Beech Bonanza and a Boeing 737, Western Flight 383. The Bonanza was turned out of traffic and subsequently sequenced to land behind Air California 336.

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The National Transportation Safety Board determines that the probable cause of the accident was the captain's failure to immediately initiate a go-around when instructed to do so by the tower's air traffic controller and his subsequent failure to correctly execute the specified go-around procedure which resulted in the retraction of the landing gear after the aircraft touched down on the runway.

1. FACTUAL INFORMATION

1.1 History of Flight

At 1644 P.s.t. 1/ on February 17, 1981, a Boeing 737-293, N468AC, operating as Air California Flight 336 (ACL336)--a scheduled passenger flight from San Jose, California, to Santa Ana, California--departed San Jose with 105 passengers and 5 crewmembers on board.

1/ All times herein are Pacific Standard times based on the 24-hour clock unless otherwise noted.

The departure and en route portions of the flight were normal. After the descent checklist was performed at 6,000 feet, 2/ ACL336 was cleared for a visual approach 3/ to runway 19R at the John Wayne Orange County Airport, at 17:30:30. About 1732, ACL336 contacted and advised the Orange County tower that the flight had been cleared for a visual approach. The tower controller advised ACL336 "keep it nice and square sir, you're following traffic between you and that Boeing on final." ACL336 was initially sequenced behind a Western Airline's Boeing 737, Flight 383 (WA383), and a Beech Bonanza, N12S.

About 17:32:11, the controller instructed Bonanza N12S to "make a left 360 and report again on downwind;" N12S acknowledged the instructions. ACL336 then advised the tower that they did not have the secondary traffic in sight. The tower replied "he's probably going to end up behind you, I've got him on a 360 on the downwind, see how that works out."

The local controller intended to sequence the Bonanza N12S between WA383 and ACL336 and, for that reason, gave the Bonanza a 360° turn to the left to keep him "close to the airport." He then asked ACL336 to make a square turn to assure spacing but noted that N12S had made a wide 360° turn and would not fit in the gap behind WA383. He, therefore, cleared ACL336 to follow WA383. At 1732:35, ACL336 asked if the flight could turn in. The controller cleared ACL336 to turn onto final but reemphasized "keep it nice and square to the final." WA383 was cleared to land at 1733:03 and ACL336 was cleared to land at 1733:11. At 1733:33 after WA383 had landed, Air California 931 (ACL931) was cleared onto the runway.

When ACL336 was 3 miles from the end of runway 19R, the controller instructed the pilot of ACL931 to taxi into position and advised him to be ready. He heard ACL931 acknowledge and saw the aircraft start to move into position. As WA383 initiated its turnoff, the controller noted that ACL931 was almost on the runway. Before ACL931 completed the turn onto the runway, the controller cleared ACL931 for takeoff at 1733:52 to keep traffic moving and cautioned "traffic Boeing 737 on a mile and a half final." He stated that he observed ACL336 just past the 2-mile mark on radar at this time. ACL931 then replied, "in sight we're rolling."

The tower controller saw ACL931 turn onto the runway, but at this point his attention was diverted to the northwest because another aircraft, N888AA, which had been instructed to report on downwind, reported on a wide base leg instead. He instructed N888AA to make a 360° turn and report again on base.

When the controller looked back at ACL931, the aircraft did not appear to be moving and ACL336 was on final approach. Because ACL336 was "about 3/4 mile from the end of the runway," the controller believed that the separation criteria between ACL931 and ACL336 would be jeopardized. Therefore, at 1734:13 he issued the following instructions: "OK Air California 336 go-around, 336 go-around." Five seconds later, the tower controller made the following transmission as taken from the tower tape; "and Air California 931 you can just go ahead and hold, got traffic on the go-around behind you, Air California 931 just abort, Air California 336 please go-around sir, traffic is going to abort on the departure." He started to tell ACL931 to hold its position on the runway but saw that the aircraft was already moving so he told ACL931 to abort. At this

2/ All altitudes herein are mean sea level unless otherwise indicated.
3/ Visual Approach - An approach wherein an aircraft on an IFR flight plan, operating in VFR conditions under the control of an air traffic control facility and having an air traffic control authorization may proceed to the airport of destination in VFR conditions.

point, he observed that ACL336 appeared to have a high pitch attitude, was still in a descent, and was inside the freeway just approaching the end of runway 19R. (See figure 1.) The controller noted that ACL336 touched down on the right side of the runway, close to the approach end with gear down. As ACL336 touched down, the controller noted that ACL931 had aborted the takeoff and was almost abeam taxiway Bravo, taxiing slowly. He observed the right main gear of ACL336 go off the pavement, the right wing drop, and the aircraft slide and then pivot to the right. He stated that he saw a flash of fire under the left wing, which lasted for about 15 seconds and then "died down." The fire department arrived in less than a minute. He stated that all of the visible aircraft exits were opened 5 to 10 seconds after the aircraft stopped and that the passengers departed soon thereafter.

The aircraft impacted the airport runway at approximately 1734:36 during daylight hours at coordinates 33°40'N latitude and 119°50'W longitude. It was destroyed by impact and postimpact fire.

1.1.1 Air Traffic Control

The local controller was controlling five other aircraft, in addition to ACL336, in the following sequence:

1. N8PB	Beech Baron	Landing
2. Western 383	B737	Landing
3. N12S	Bonanza	Landing */
4. ACL336	B737	Landing
5. N94M	Cessna	Takeoff Rwy 19L
6. ACL931	B737	Takeoff Rwy 19R

*/ Subsequently instructed to make a 360° for spacing and scheduled to land behind ACL336.

The controller stated that he considered the traffic to be light to moderate for the Orange County Airport and that this time period is locally referred to as the "jet rush." He also stated that he does not require a readback if he observes compliance with a clearance. In addition, if two-way communication has been established, the controller stated that he assumes his instructions have been heard, especially if the instruction has been repeated. He had previously given four air carrier go-arounds at Orange County and stated that all aircraft had responded immediately.

The controller stated that based on his experience more than adequate separation exists between an aircraft on a 1 1/2-mile final and a departing aircraft on the runway. When he instructed ACL931 to taxi onto the runway and then cleared the aircraft for takeoff, he expected that there would be no delay and that separation with ACL336 would be adequate.

1.1.2 Crew and Passenger Testimony

The captain and first officer of ACL336 were interviewed concerning the approach and landing. The captain stated that the aircraft was on a normal visual approach for runway 19R and that when they contacted the Orange County Airport tower the crew was advised that they were sequenced for landing behind the WA383 and the Bonanza N12S. The captain stated that they advised the tower that they did not have the Bonanza N12S in sight and that the controller informed them that he had instructed the

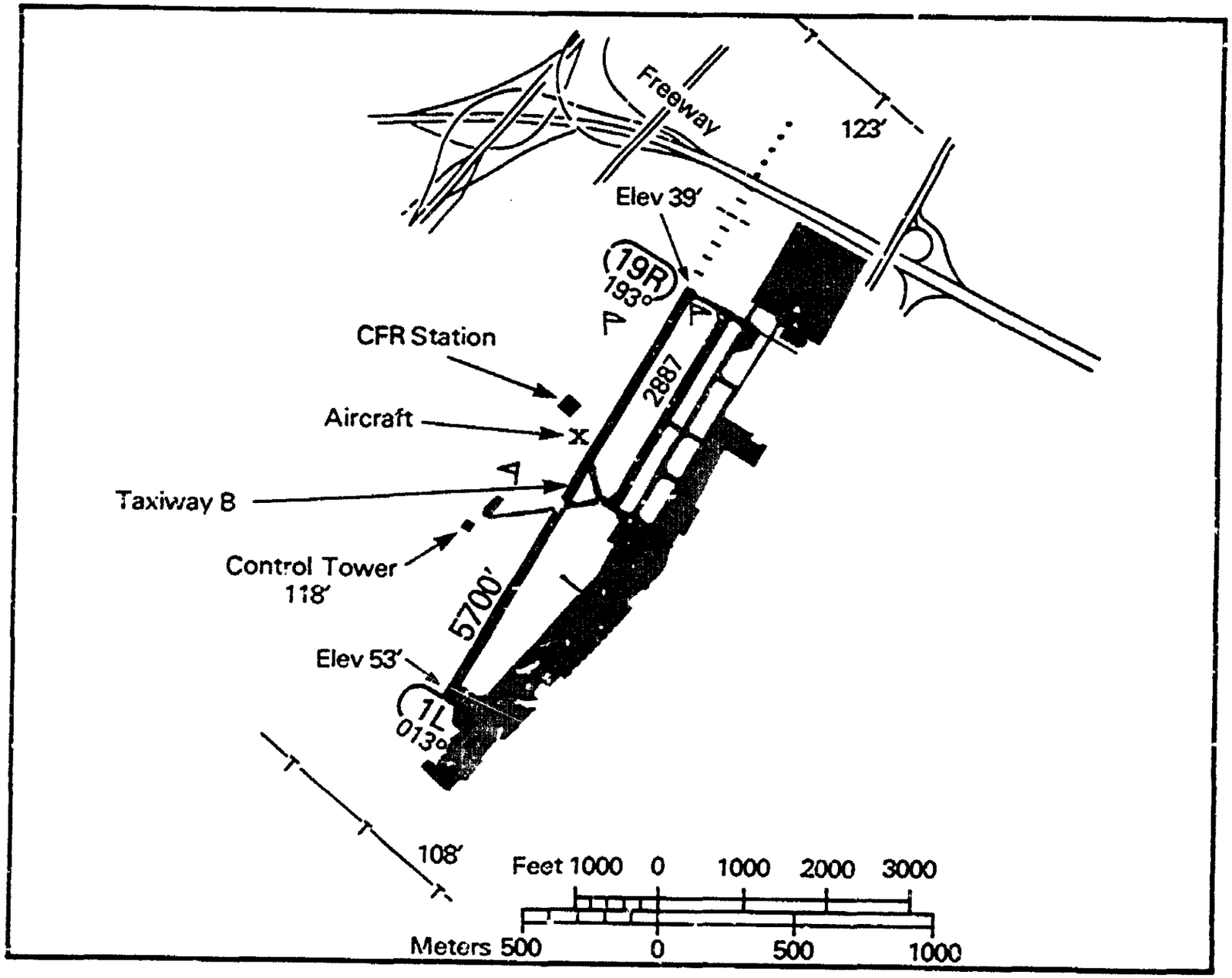


Figure 1.—Diagram of the John Wayne Orange County Airport at Santa Ana, California.

Bonanza N12S to make a left 360° turn and report on downwind. The captain stated that they were then cleared to land behind WA383. ACL931 was cleared onto the runway when ACL336 was on final approach. The captain of ACL336 at this point reduced power to flight idle and lowered the flaps to 40 degrees to slow the aircraft and provide adequate separation between the two aircrafts.

The captain stated that when he was on short final the controller instructed him to go-around and that he began advancing the power toward takeoff thrust. He stated that he then heard another go-around instruction and motioned for the first officer to raise the flaps to 15 degrees and to raise the landing gear. The captain stated that he felt that there was no place to land and that he wanted to reduce drag as much as possible.

The captain said that he had the power lever full forward but that the engines were not coming up. He believed that they were going to have to land, so he reached over and put the gear handle down. He said that the No. 1 engine accelerated and that he started a slight right turn in order to miss ACL931 on the runway. He said that the engines did not develop enough power to execute a go-around and that the aircraft touched down. He stated that he reduced the power and that the gear collapsed. As he left the cockpit, the captain said he saw the landing gear handle in the up position.

The first officer (FO) stated that the aircraft was flown by the captain and that the flight was routine until the final approach. He stated that ACL336 was cleared to follow WA383 and after turning final, was cleared to land by the Orange County tower. He also stated that V_{REF} was 119 knots and that the gross weight was about 84,000 pounds.

The FO heard the controller instruct ACL336 to go-around and then heard the controller repeat the instructions. The FO stated that he raised the flaps to 15 degrees and that the captain advanced the throttles and raised the nose. The captain called for gear up, and after checking for a positive rate of climb, the FO said that he thought he raised the landing gear.

At this point, the FO stated that he thought the aircraft encountered turbulence and began to settle, striking the right edge of the runway in a nose-up attitude. He said that the captain retarded the throttles to idle and the aircraft skidded to a stop. The captain pulled the handles for both engine fire bottles and executed the ground evacuation checklist. The FO stated that he and the captain went into the cabin to assure that no one was left on board and then they exited via the forward entrance door.

All three flight attendants were interviewed individually on February 19, 1981 The flight attendants recalled getting a before-landing signal from the cockpit approximately a minute before touchdown. All flight attendants agreed that the aircraft touched down, bounced up, and touched down "harder". They then felt "a forward thrust, as if on a go-around but not enough power." The senior flight attendant stated that the aircraft "wavered after the last bounce, as if on one wheel." The flight attendant seated in front next to the senior flight attendant felt the aircraft dip to the left. When the aircraft stopped, the flight attendants stated that they prepared for the evacuation.

Thirty-one passengers were interviewed either in person or by telephone by the investigative team. All passengers agreed that the flight from San Jose was uneventful until the aircraft touched down at the John Wayne Orange County Airport. Most passengers felt the aircraft touch down, and then lift off the runway and touch down

again hard. At this point, most passengers recalled hearing "a mechanical moving noise," such as that of the flaps or gear. A few passengers recalled the aircraft sinking. Six passengers seated in the rear of the aircraft heard the engines "get louder" following the second hard touchdown. According to most passengers, the next sensation was the aircraft "sliding hard." All passengers recalled being thrown hard to the left and some stated that they were temporarily detained in the cabin because of passenger seat failures. After the aircraft stopped, passengers in the rear end in the front stated that they heard the flight attendant instructing them respectively to move to the rear or to the front to exit the aircraft.

1.3 Injuries to Persons

Injuries	Crew	Passengers	Other	Total
Fatal	0	0	0	0
Serious	0	4	0	4
Minor/None	5	101	3	106

1.3 Damage to Aircraft

The aircraft was destroyed by impact forces and postcrash fire.

1.4 Other Damage

There was ground scarring parallel to runway 19R and a fuel spill in the field adjacent to the runway where the aircraft stopped.

1.5 Personnel Information

The flightcrew was properly certified and qualified for the flight. (See appendix B.) The captain had been on duty for 7.25 hours and had flown 5.0 hours at the time of the accident. The first officer had been on duty for 7.25 hours and had flown 5.0 hours at the time of the accident. Three qualified flight attendants were on board the aircraft. The air traffic controller working the local control position was a full performance level (FPL) controller. He had been on duty about 45 minutes at the time of the accident.

1.6 Aircraft Information

The aircraft, a Boeing 737-293, N468AC, was certificated, equipped and maintained in accordance with Federal Aviation Administration (FAA) requirements. The aircraft was equipped with two Pratt and Whitney Aircraft (P.W.A.) JT8D-7A turbo fan engines which developed 14,000 pounds of static thrust each.

The gross weight of the aircraft was about 91,800 pounds at takeoff and between 83,500 and 84,000 pounds for the landing. Maximum gross weight allowable for takeoff was 100,000 pounds. Since the aircraft cannot be out of balance if loaded normally below maximum gross takeoff weight, no center of gravity (c.g.) or percent of mean aerodynamic chord (M.A.C.) was computed for this flight. The aircraft had about 13,000 pounds of Jet A fuel on board at takeoff and about 6,500 pounds of fuel at landing.

1.7 Meteorological Information

The surface weather observation for John Wayne Orange County Airport at 1645, February 17, 1981, was: clear, visibility--10 miles; temperature--68° F; dewpoint--63° F; wind--calm; altimeter setting--29.93 inHg.

An observation taken after the accident at 1750 was: clear, visibility--10 miles; temperature--67° F; dewpoint--missing; wind--130° at 4 kn; altimeter setting--29.95 inHg.

1.8 Aids to Navigation

Not applicable.

1.9 Communications

There were no reported communications difficulties.

1.10 Aerodrome Information

The John Wayne Orange County Airport is located 5 miles south of Santa Ana. The airport has two asphalt runways and is surrounded by level terrain. Land use in the surrounding area is a mixture of commercial and residential.

Runway 19R/1L is 5,700 feet long and 150 feet wide. Runway 19L/1R is 2,887 feet long and 75 feet wide. The thresholds of 19L and 19R are adjacent. Runway 19R has high intensity runway lighting, medium intensity approach lighting with runway alignment lights, and visual approach slope indicators (VASI) on the left side of the runway. Elevation of the threshold of runway 19R is 39 feet. Airport elevation is 54 feet. Taxiway Bravo is approximately at the midpoint of runway 19R/1L.

The John Wayne Orange County air traffic control tower is a level 3 VFR tower, with a BRITE radar, and no alphanumerics. In fiscal year 1980, total operations for the facility were 569,779, making it the fourth busiest airport in the U.S. The airport is unique in that simultaneous operations are limited by the closeness of the parallel runways. The control tower is located about 750 feet west of runway 19R/1L, 3,000 feet from the threshold of runway 19R.

1.11 Flight Recorders

The aircraft was equipped with a Fairchild A-100 cockpit voice recorder (CVR), serial No. 2577. The recorder was removed from the wreckage, undamaged, on February 18, 1981, and brought to the Safety Board's Audio Laboratory. The audio quality of the recorder tape was excellent and the timing of the tape was accurate to within 1 percent. A transcription was made of voice communications and related cockpit sounds from 1731:49 until 1734:40, the end of the recording. (See appendix D.)

The aircraft was also equipped with a Sundstrand FA-542 flight data recorder (FDR), Serial No. 1343. The flight recorder was removed from the wreckage, undamaged, on February 18, 1981, and brought to the Safety Board's Flight Recorder Laboratory. The foil recording medium had all parameter and binary traces with no evidence of recorder malfunction or recording abnormalities. A barometric pressure of 29.95 inHg was used to

convert pressure altitude to mean sea level altitude. The readout covered about 6 minutes of recorded traces, starting 5:45 minutes before landing to the end of the recording. The indicated airspeed trace decreased from 124 knots to 106 knots in the last 10 seconds before touchdown. (See appendix G.)

An additional readout was made on the foil medium from the Sundstrand FA-542 FDR, Serial No. 3808, removed from the Boeing 737, N467GB, which was operating as Air California Flight 931. The readout covered a period of 10 minutes and contained airspeed, magnetic heading, and aircrew transmission indication parameters. (See appendix H.)

1.12 Wreckage and Impact Information

The aircraft wreckage distribution pattern was confined to the right side and the area adjacent to the right side of runway 19R. (See appendix E.)

The Boeing 737 maintenance manual states that the main gear tread width is 206 inches and that the main gear tires are numbered from left to right, Nos. 1 through 4. Tire marks on the runway indicated that at least three main gear tires contacted the runway (tires Nos. 1 and 2 and No. 3 or 4) about 620 to 624 feet from the threshold with about a normal tread width. Intermittent tire mark patterns on the runway continued for about 800 feet, trending toward the right side of the runway with the distance between the sets of marks decreasing. No nose gear tire marks were found on the runway. A deep scrape mark, 30 inches long by 20 inches wide, 1,330 feet from the runway threshold and 1 foot from the edge of the runway, was imbedded with metal particles. The No. 6 leading edge slat from the right wing was located in a 90-foot-long ground scar, which was about 1,350 feet from the runway threshold and about 28 feet outside of and parallel to the runway.

The right engine (No. 2), with nose cowl and thrust reverser attached, was found 1,550 feet from the runway threshold, 65 feet to the right of the runway edge. The left engine was found near the right wing tip of the aircraft and was located 2,000 feet from the threshold and 65 feet to the right of the runway edge. Engine components, lower fuselage panels, and flap fairing sections were scattered along the wreckage distribution pattern from about 1,550 feet from the threshold to the aircraft wreckage.

The aircraft came to rest about 2,070 feet from the runway threshold with the tail about 40 feet from the runway edge. The aircraft's centerline was oriented on a magnetic heading of 305°. The aircraft was intact, except for the loss of both engines and those lower body parts noted in the wreckage distribution pattern. Both wings were attached to the fuselage, although both had sustained substantial damage during the accident sequence. The fuselage was intact, except for a fracture at the top and side aft of the wings. There was fire damage and sooting of the left side of the fuselage in the area where the wing joins the fuselage and of the left wing from the engine pylon to the wing root. The empennage and aft fuselage received minor damage. The horizontal stabilizer was at 11 degrees nose up according to the stabilizer markings on the aft fuselage. At idle thrust, stabilizer trim should be between 6 and 14 degrees nose up. Neither the rudder nor the auxiliary power unit was damaged.

The nose landing gear and the right main landing gear were up and locked, with gear doors closed; however, the right nose gear door was broken off. The left main landing gear was driven up past the uplocks and both tires were deflated. Those trailing edge flaps still attached were found in a position corresponding to 15° flap position.

No evidence was found of separation of components buckling/bending of the flight control surfaces, or flight control malfunction before impact. All fractures observed were typical of those caused by overloads.

1.12.1 Cabin/Cockpit Damage Information

The cockpit was configured in the standard Captain and First Officer seating arrangement, with a folding jumpseat centered behind the Captain's and First Officer's seats.

The cabin contained 126 passenger seats in a single class configuration; 21 rows of triple seat assemblies down the right side of the aircraft and 20 rows of triple seat assemblies down the left side of the aircraft. An aft-facing double flight attendant jumpseat was located on the left forward cabin bulkhead, just inboard of the front entry door. A forward-facing double flight attendant jumpseat was fastened to the aft cabin wall on the left side just inboard of the left entry door. Both jumpseats were fitted with metal to metal seatbelts, but no shoulder harnesses were installed.

When the aircraft came to rest in a level attitude, a fuselage vertical separation occurred at fuselage station 727, or seat row 14, aft of the overwing exit. Due to a secondary explosion of the center fuel tank 3 hours after the accident, the interior of the fuselage forward of the vertical separation, which included rows 6 through 11, was in disarray. All emergency exits were operational except for the right forward emergency overwing exit which was jammed due to fuselage deformation. All seatbelts were intact and operable.

The legs of the passenger seats in rows 17, 18, and 19 right, had failed due to local column buckling, were separated from the seat track, and were blocking the aisle. A Civil Aeromedical Institute (CAMI) representative stated that the failures were caused by the combination of horizontal and vertical loads on the seats' legs. Other debris, including dislodged ceiling panels from row 13, was scattered in the cabin of the aircraft. The main floor beam was buckled at the vertical fuselage separation, at rows 14, 15, and 16. The inboard cantilever seat of row 20 right had a permanent deformation (downward) in the rear horizontal seat member. The inboard front leg of row 20 left had a local column buckling failure.

Documentation of the cockpit revealed the following information:

Captain's airspeed indicator - Bug at 120 knots
Flap indicators - 16° down
Gear selector handle - Up
Copilot's airspeed indicator - Bug at 119 to 120 knots
No. 1 engine throttle - Full forward
No. 2 engine throttle - 90 percent forward
No. 1 fuel lever - Idle, out of detent
No. 2 fuel lever - Cutoff, in detent
Flap selector handle - 15°

All other cockpit selections and instrument readings were normal.

1.13 Medical and Pathological Information

Four passenger injuries were classified as serious and three of these passengers were hospitalized for over 24 hours. One of these three passengers, an elderly man, remained in the coronary care unit for observation for 3 days and then released. Another male passenger in his early 30's complained of severe internal pain; he was kept in observation for 4 days and released. The third male passenger, age 31, sustained a fractured clavicle; he was kept in the hospital for 24 hours and released. A fourth male passenger had a chip fracture of the knee. The 29 passengers who suffered minor sprains, contusions, and abrasions were treated and released from 4 local hospitals on the evening of the accident.

1.14 Fire

The aircraft came to rest about 600 feet from one of the airport's Crash/Fire/Rescue (CFR) stations. Four on-duty CFR crewmen were in the station observation tower at the time of the accident and witnessed the entire accident sequence. They responded immediately and were at the scene in seconds with three CFR vehicles.

There were two fires in the wreckage. The left engine and other debris that had separated from the aircraft caught fire and fire also started in the left wing root area. CFR vehicle Crash-2 attacked the debris fire which could have threatened the disembarking passengers. Crash-3, spotted to the left front of the aircraft, controlled the fire in the left side wing root. Crash-2 extinguished the peripheral fires and then moved to the right front of the aircraft. At this time, a rescue party entered the aircraft to search for and assist those still remaining inside. Two handline operators controlled the remaining fires under the wing roots. During this period, the fire chief verified that the passengers were proceeding to an area of safety. He then contacted CFR dispatch and notified them of the incident and requested a second alarm assignment, two medical units and two ambulances.

About 3 hours after the accident, CFR personnel were cutting an access hole in the lower right center fuselage when an explosion occurred in the cargo compartment near the center fuselage fuel tank. The cabin caught fire and the cabin floor in the area of rows 6 through 11 left was disrupted. The fire was extinguished when the cabin was filled with foam by the CFR standby unit.

1.15 Survival Aspects

The accident was survivable since the decelerative forces during the accident were low and the cabin area remained mostly intact.

The passenger cabin had four doors and two overwing exits that could be used to evacuate the aircraft. In the forward and aft sections of the cabin, respectively, there was a left entry door and a right service door. All of the doors were equipped with automatically deployed, manually inflatable evacuation slides. There was one overwing exit on each side of the cabin adjacent to the seats in row 9. The forward left entry door was opened, the slide was deployed and manually inflated. The forward right service door was opened but was not used in the evacuation. Since the flight attendant seated in the rear saw smoke outside on the right side of the aircraft, she only opened the left aft door and extended the air stair. The left overwing emergency exit was also opened. Although two of the passengers exited through the left overwing exit, most of the passengers exited from the front and rear left exits. Because the passengers, after exiting the aircraft,

headed in all directions, a crewmember stopped Crash-1 at the edge of the CFR ramp and used its PA system to advise all passengers to head toward the fire station. The evacuation was completed in less than 90 seconds. The immediate response of the CFR and their subsequent control of the fire in the left side wing root enabled the crew and passengers to evacuate the aircraft without serious injury.

1.16 Tests and Research

1.16.1 Powerplants

Both engines separated from the aircraft during the accident sequence. The No. 1 engine was substantially damaged when the aircraft slid over it. The inlet section, cowls, tailpipe, and thrust reverser separated from the engine. The thrust reverser blocker doors were in the forward thrust position. All of the first stage fan blades were bent, in a semi-uniform arc, in the direction opposite to compressor rotation. The degree of bending ranged from about 5 to 25 degrees. The turbine blades were also slightly bent in the direction opposite to turbine rotation and there was no evidence of overtemperature in the turbine section. There was fuel in the engine and the filters were not contaminated.

The No. 2 engine sustained minor damage when it separated from the aircraft. The inlet section, most cowls, tailpipe, and thrust reverser where attached to the engine. The thrust reverser blocker doors were in the forward thrust position. The first stage fan blades were lightly damaged. One fan blade was bent in the direction opposite rotation. There was fuel in the fuel pump and the fuel control unit. Fuel control and fuel pump filters were not contaminated.

The No. 2 engine with its accessories and the No. 1 engine fuel control/fuel pump and constant speed drives were shipped to the Engine Division of Cooper Airmotive, Dallas, Texas, for disassembly, inspection, and testing. Disassembly revealed that the rotating and stationary components of the engine were normal and there was evidence of engine rotation at impact. There was no evidence of preaccident damage to or malfunction of any engine accessory.

The CVR tape was analyzed spectrally to determine if engine acceleration sounds could be detected. The spectrograph showed a slight increase in engine noise 9 seconds before the sounds of impact were recorded on the CVR. Seven seconds before impact, the engine noises increased steadily to stabilized levels at 3 seconds and 1.5 seconds before impact.

The engine manufacturer was asked about the effect of hot engine exhaust from another aircraft upon engine performance. They replied that experience indicates that engine response would not be significantly affected by hot gas ingestion unless acceleration stalls were evident. Neither pilot stated, nor did the CVR tape reveal, any indication of acceleration stalls.

1.17 Additional Information

1.17.1 Performance

The aircraft landing weight of 84,000 pounds, and the V_{REF} speed of 119 knots, 4/ computed by the crew, was verified by the investigation team.

4/ VREF--a speed approximately 30 knots above stall speed at which stabilized approaches should be flown.

The Operations Group computed the go-around performance data for ACL336 and determined that the aircraft was capable of executing a go-around in any configuration except with gear down, flaps 40°, and one failed engine.

1.17.2 Go-Around Procedures

The go-around procedures as outlined in the Boeing 737 Flight Manual are as follows:

1. Apply go-around thrust (maximum in-flight).
2. Simultaneously rotate smoothly to go-around attitude, approximately 12 to 15 degrees.
3. Retract flaps to 15 (if flaps at 15-maintain flaps 15).
4. If flaps at 15 and airspeed at 150 knots, maintain 150 knots.
5. Retract landing gear after attaining a positive rate of climb.
6. Crosscheck airspeed indicator for correct attitude and airspeed control.
7. Climb at bug + 15 knots or 150 knots as applicable.

A note to this procedure states:

> The normal approach requires that enough thrust be maintained to the go-around point so that an immediate thrust response will be available. If the thrust has been reduced to idle, the initial engine acceleration may be slow.
>
> With go-around flap, limit bank angle to 15 degrees until reaching bug + 15 knots. Adjust pitch attitude to maintain desired airspeed. Minimum airspeed for flap retraction from flap position 15 is bug + 15 knots.

1.17.3 Air Traffic Control Requirements

Federal Aviation Administration Manual 7110.65B is the Air Traffic Control Manual used by controllers to direct and control air traffic. Chapter 5 of the manual deals with Air Traffic Control Towers and states in part:

SECTION 10. SPACING AND SEQUENCING

1100. Sequence/Spacing Application

Establish the sequence of arriving and departing aircraft by requiring them to adjust flight or ground operation as necessary to achieve proper spacing.

SECTION 11. DEPARTURE SEPARATION

1110. Same Runway Separation

Separate a departing aircraft from a preceding departing or arriving aircraft using the same runway by ensuring that it does not begin takeoff roll until:

b. A preceding landing aircraft has taxied off the runway.

SECTION 12 ARRIVAL SEPARATION

1120. Same Runway Separation

Separate an arriving aircraft from another aircraft using the same runway by ensuring that the arriving aircraft does not cross the landing threshold until one of the following conditions exists or unless authorized in 1102:

b. The other aircraft has departed and crossed the runway end. If you can determine distances by reference to suitable landmarks and the other aircraft is airborne, it need not have crossed the runway end if the following minimum distance from the landing threshold exists:

(1) Category I aircraft landing behind Category I or II--3,000 feet.
(2) Category II aircraft landing behind Category I or II--4,500 feet.
(3) When either is a category III aircraft--6,000 feet.

Note: ACL336, ACL931, and WA 383 are category III aircraft.

1122. Anticipating Separation

Landing clearance to a succeeding aircraft in a landing sequence need not be withheld if you observe the positions of the aircraft and determine that prescribed runway separation will exist when the aircraft crosses the landing threshold. Issue traffic information to the succeeding aircraft . . . .

14 Code of Federal Regulations (CFR) 91 deals with general operating and flight rules and states in part:

91.75 Compliance with ATC clearances and instructions.

(b) Except in an emergency, no person may, in an area in which air traffic control is exercised, operate an aircraft contrary to an ATC instruction.

(c) When ATC clearance has been obtained, no pilot in command may deviate from that clearance, except in an emergency, unless he obtains an amended clearance. . . .

2. ANALYSIS

The aircraft was properly certificated and had been maintained in accordance with approved procedures. There was no evidence of preimpact failure of the aircraft systems, flight controls, or structure. The flightcrew was properly certificated and qualified for this scheduled domestic passenger flight. They held current medical certificates, and there was no evidence of any preexisting adverse medical or physiological factors which could have affected their ability to conduct a safe flight. The captain was flying the aircraft at the time of the accident. Weather was not a factor in this accident.

2.1 Engine Performance

The No. 1 engine had extensive rotational-type damage. The engine's fan blades were bent in the direction opposite to compressor rotation and the engine's front compressor stators and exit guide vanes were displaced from their installed positions. All of the engine's outer ducts were torn and/or torsionally twisted. The degree of physical and rotational-type damage sustained by the engine's inlet and fan section was typical of sudden stoppage from a relatively high engine thrust output level.

The No. 2 engine had minimal physical and rotational-type damage. Only one fan blade of the engine had a blade tip end that was slightly rolled over in the direction opposite to compressor rotation. The minimal degree of physical and rotational-type damage that occurred to the engine indicated that the engine had not been subjected to sudden stoppage. The absence of sudden stoppage-type damage precluded a determination as to the degree of thrust output that was being developed by the engine at impact. Engine damage was minimal since the engine departed the aircraft cleanly, landed in the dirt, and was not struck by any other portion of the aircraft. The engine's accessories, whose failure or malfunction could be associated with engine acceleration response delay, were capable of normal operation until impact. There was no mechanical or physical reason found that would have precluded the engine from accelerating normally.

Audio spectral analysis of the CVR tape indicated that engine power was at a comparatively low RPM during the final portion of the descent. About 9 seconds before impact, the power increased slightly, and 7 seconds before impact the engines accelerated continuously and steadily until comparatively high power settings were established 3 seconds before impact on one engine and 1.5 seconds before impact on the other engine.

Based on postaccident inspection of engine components, which revealed no evidence of preaccident damage or malfunction, and on passenger and witness statements that the engines accelerated before the accident and that there were no engine compressor stalls, the Safety Board concludes that the engines were operating satisfactorily before impact and that the engines accelerated from near idle to high power in 6 to 7.5 seconds which is normal for the JT8D engine.

2.2 Air Traffic Control

According to the air traffic control (ATC) transcript, the local controller who handled ACL336 was handling five other aircraft at the same time in the traffic pattern at Orange County Airport. Traffic was a mix of general aviation and air carrier jet aircraft. While this was not an unusual controller traffic load, sequencing was most important since a mix of both high-performance jet aircraft and low-speed general aviation aircraft were arriving and departing, saturating the traffic pattern.

The controller complied with the procedure in the Air Traffic Control Handbook 7110.65B Section 11, which deals with departure separation. Section 11 as applied to this accident states that the controller should separate a departing aircraft (ACL931) from a preceding departing or arriving aircraft (WA383) using the same runway by ensuring that the departing aircraft (ACL931) does not begin takeoff roll until the preceding aircraft (WA383) has taxied off of the runway.

Section 12 of the handbook as applied to this accident states that the controller should separate an arriving aircraft (ACL336) from another aircraft (ACL931) by ensuring that the arriving aircraft does not cross the landing threshold until the other aircraft (ACL931) has departed and crossed the runway end. If distances can be

determined by reference to landmarks, the departing aircraft need not have crossed the runway end if it is airborne and has 6,000-foot horizontal separation between the two aircraft. However, section 12 also states that landing separation may be anticipated.

ACL336 was 1.75 miles from the end of the runway when ACL931 was cleared for takeoff. The local controller stated that "an air carrier on a 1 1/2-mile final with a departing aircraft on the runway should result in more than adequate separation." This was based on the anticipation that the takeoff aircraft would expedite the takeoff and that the landing aircraft would fly a stabilized approach.

ACL931 Takeoff

At 1733:33, the local controller said "okay Air Cal nine thirty one let's do it taxi into position and hold, be ready." (See appendix F.) ACL931 replied immediately at 1733:37, "nine thirty one's ready." Eight seconds later ACL931 began a 15° turn to the right, then turned 105° back to the left and completed its turn to the runway heading in about 25 seconds at which time the airspeed showed an increase indicating the start of the takeoff roll at about 1734:10, 37 seconds after being cleared on the runway. ACL 931's delay in takeoff aggravated the situation and in combination with ACL 336's approach reduced separation between the aircraft.

ACL336 Approach

The air traffic controller's management of the traffic pattern was in accordance with current directives. However, the traffic pattern was congested with very little margin for error.

The captain of ACL336 did not fly a stabilized approach as he should have, nor did he "keep it nice and square" as requested by the controller. The captain flew the majority of the final approach at an airspeed of between 140-160 KIAS, rather than bug speed, 119 knots, and made a wide sweeping turn to final which, in conjunction with the high airspeed, decreased the separation between ACL336 and ACL931 to the point that the necessity for a go-around by ACL336 was inevitable. To further compound the situation, when the captain of ACL336 recognized the diminishing separation, he reduced the power to flight idle on both engines to slow the aircraft rather than maintain enough thrust to the go-around point so that immediate thrust responses would be available. This was in direct conflict with company procedures, which call for stabilized approaches for all landings.

After ACL931 was cleared for takeoff, the local controller directed his attention to another aircraft that called in at an unexpected position in the pattern. After giving the new aircraft air traffic instructions, the controller looked back to make the final check on ACL931 and ACL336 and noted that ACL931 was near the end of the runway and did not appear to be moving. The controller recognized that if the situation were to continue he would not have the required separation when ACL336 would have arrived over the threshold. Consequently, he instructed ACL336 to go around. When he noted that ACL931 was in fact moving, he again instructed ACL336 to go around and ACL931 to abort.

ACL336 Go-Around

The CVR showed that the captain did not respond when ACL336 was initially told to go around at an altitude of 250 feet, approximately three-fourths of a mile from the end of the runway. Even if the throttles had been immediately advanced, it would have taken about 6 to 8 seconds for the engines to spool up and develop power to

go-around since the captain had reduced the throttles to flight idle. In the meantime, the aircraft descended at a rate of approximately 1,000 feet per minute or approximately 17 feet per second, and would have descended at least another 102 to 136 feet during the power acceleration. However, a go-around from that point should have been routine and successful if it had been properly executed.

However, the captain did not execute a go-around when first instructed to do so at 1734:13 by the controller since at the request of the captain the first officer queried the tower at 1734:21, "can we land tower?" some 8 seconds after the instruction. The Safety Board believes that the captain was still committed to land at this time and did not add power for the go-around until about 1734:25 when ACL931 was told to abort and ACL336 was told to go around the second time. After the decision to go around was made, the captain advanced the power and called for landing gear up. The first officer responded "flaps 15," since the proper procedure called for flaps to 15° and a positive rate of climb prior to raising the gear. The first officer placed the flap handle from 40° to 15° which could have caused a loss of lift if not properly compensated for by an increase in pitch attitude and angle of attack. This apparently was not accomplished since the aircraft continued to descend. The CVR tape indicates that the captain called for the gear up again and the first officer responded "flaps" followed by the sound of a click. The landing gear handle was probably raised at about 1534:31 as noted by the click on the CVR tape.

Rubber tire marks positively indicated that the main landing gear were extended when the aircraft initially touched down. However, the distance between the runway tire marks decreased as they progressed down the runway, indicating that the landing gear were retracting during the accident sequence. The landing gear were found retracted when the aircraft came to rest. Based on this evidence and the remarks and events on the CVR, the Safety Board concludes that the captain probably raised the landing gear during the go-around attempt. Further, the premature retraction of the landing gear was not only contrary to procedures since a positive rate of climb had not been established, but it also made the accident inevitable because it placed the aircraft in a condition from which the go-around could not have been completed.

In summary, the Safety Board believes that flightcrew performance in the minimum separation environment of the traffic pattern was the deciding factor in this accident. The first indication to the controller of deterioration of the pattern was when he returned his attention to ACL336 and ACL931 after directing other traffic and realized that separation may have been jeopardized. The control tower is located about 1 mile from the approach end of runway 19R and the initial movement of aircraft on the runway is difficult to detect by the controllers because the aircraft are moving almost directly toward the tower. However, at 1543:13 the controller correctly instructed ACL336 to go around; the captain of ACL336 did not comply but instead at 1534:21 requested clearance to continue the approach. ACL336 continued on final and the controller, noting that ACL931 was moving, then ordered an abort and at 1534:25 again instructed ACL336 to go around. The captain added power and called for the gear up at 1534:27. The Safety Board concludes that the captain's delay in initiating the go-around was the primary cause of the accident.

Air traffic control in a congested traffic environment cannot be predicated on pilots operating contrary to ATC instructions. It is mandatory that instructions be followed. 14 CFR 91.75 states that except in an emergency, no person may, in an area in which air traffic control is exercised, operate an aircraft contrary to an ATC instruction. The Safety Board concludes that the flightcrew of ACL336 did not fly a stabilized approach, did not fly a square pattern as directed, delayed complying with go-around instructions, and did not follow the correct go-around procedures.

3. CONCLUSIONS

3.1 Findings

1. The aircraft was properly certificated and had been maintained in accordance with approved procedures.

2. The flightcrew was properly certificated and medically qualified for the flight.

3. There was no evidence of preaccident failure or malfunction of the aircraft systems, flight controls, or structures.

4. Weather was not a factor in this accident.

5. The air traffic controller complied with the Air Traffic Control Handbook procedures for separation of arriving and departing aircraft.

6. The captain of ACL336 did not fly a square pattern that was intended to preserve aircraft spacing, nor did he fly a stabilized approach as directed by the Flight Manual.

7. The captain of ACL336 reduced power on both engines to flight idle thus increasing time for engine response.

8. The powerplants of ACL336 were operating satisfactorily and accelerated from near flight idle to high power in 6 to 7.5 seconds.

9. The air traffic controller correctly instructed ACL336 to go around when he realized separation criteria had been jeopardized.

10. The captain of ACL336 did not comply with ATC instructions in that he delayed for about 12 seconds initiation of the go-around.

11. The flightcrew did not follow the proper procedures for the go-around.

12. The captain of ACL336 raised the landing gear handle before a positive rate of climb was established and as a result the landing gear retracted during the accident sequence.

3.2 Probable Cause

The National Transportation Safety Board determines that the probable cause of the accident was the captain's failure to immediately initiate a go-around when instructed to do so by the tower's air traffic controller and his subsequent failure to correctly execute the specified go-around procedure which resulted in the retraction of the landing gear after the aircraft touched down on the runway.

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

/s/ ELWOOD T. DRIVER
Vice Chairman

/s/ PATRICIA A. GOLDMAN
Member

/s/ G. H. PATRICK BURSLEY
Member

FRANCIS H. McADAMS, Member, filed the following concurring and dissenting statement:

I do not agree with the conclusion of the Board that air traffic control's management of the traffic pattern was in accordance with current directives.

The air traffic controller's manual states that an arriving aircraft shall not cross the landing threshold until the departing aircraft has crossed the runway end or the two aircraft are separated by 6,000 feet. In this case, the controller should have anticipated that the separation between the two aircraft would be substantially less than 6,000 feet when Air California Flight 336 reached the threshold of the runway and the departing aircraft would not have crossed the end of the runway.

The initial error in judgment was the controller's action in clearing Air California Flight 931 into position at 1733:33 and subsequently clearing Flight 931 for takeoff at 1733:52. The second error in judgment was delaying the go-around directive to Flight 336 until 1734:13, since at that time the aircraft were separated by only about 3,600 feet, or 2,400 feet less than the required distance.

At the time Flight 931 was cleared for takeoff at 1733:52, the two aircraft were separated by approximately 7,900 feet. The readout of the flight data recorder indicates that Flight 336 flew the majority of the final approach at an airspeed of between 140-160 knots. Even if the controller assumed that Flight 336 was maintaining an airspeed V_{ref} (120 knots or 2.3 miles per minute), he should have known that it would be over the threshold of the runway in approximately 38 seconds, or at 1734:30. Since Flight 931 began its takeoff roll at 1734:02, it would have been still on the runway or just starting to rotate at 1734:30 at a point approximately 3,200 feet from the threshold. Therefore, when Flight 336 was over the threshold, the two aircraft would have been separated by about 3,200 feet, and the controller should have anticipated that the separation would be substantially less than the distance required. However, in fact, Flight 931 aborted at 1734:27, or 25 seconds after starting its takeoff roll, and 1,774 feet down the runway. Therefore, when Flight 336 would have crossed the threshold, the two aircraft would have been separated by only 2,395 feet, and Flight 931 would still be on the runway.

The separation between the two aircraft becomes substantially less if we use a speed of 150 knots, the average of the FDR readout approach speed of 140-160 knots. At 150 knots, the aircraft would have had an airspeed of 2.9 miles per minute (176 miles per hour or 253 feet per second), and the separation between the two aircraft at 1734:13 at the time of the go-around directive would have been only 2,587 feet. At the time Flight

336 would have been over the threshold at 1734:23, Flight 931 was still on the runway and 4 seconds from abort, and the separation between the two aircraft would have been only 1,470 feet.

According to the majority, Flight 931 did not start its takeoff roll until 1734:10. This time is based upon the data from the flight data recorder and is not accurate since the FDR does not show an increase in airspeed until there is sufficient ram air to activate it, and this would take 6 to 8 seconds from the start of the takeoff roll. The far more accurate time of the start of the takeoff roll is the captain's transmission to the tower at 1733:57, "We're rolling." At this time, 931 was not lined up with the runway but was starting a rolling takeoff. Allowing 5 seconds to assume runway heading, the start of the takeoff roll would have been 1734:02. Therefore, Flight 931 began its takeoff roll about 10 seconds following the takeoff clearance given by the tower, which is not an unreasonable length of time, particularly when the tower issued takeoff clearance while the flight was 90 degrees to the runway heading. The controller should have realized that it was not possible for 931 to immediately start its takeoff roll.

It is stated by the majority that Flight 931 aggravated the situation by delaying its takeoff by 37 seconds. I do not agree. The delay was about 30 seconds, which I do not believe is unreasonable. Significantly, the Board's record of this investigation does not contain the written statements of the crew of Flight 931, so it is not possible to determine their version of the timing and sequence of the events. However, more important is that when the controller cleared 931 into position he did not tell him to expedite. He merely stated, "Taxi into position and hold." (Emphasis added.) "Be ready." Nor did the controller, when 931 was cleared for takeoff while still 90 degrees from runway heading, tell him to expedite takeoff. Once 931 was cleared onto the runway heading he had every reason to expect that he would be protected from arriving aircraft until completing the takeoff, which was not the case. Furthermore, the controller did not advise Flight 336 after it had turned to final at any time to reduce speed if possible, which was certainly an option in this situation.

I realize much of the above is based upon computations that are only estimates, and further that controllers do not control aircraft with a slide rule. However, the controller, based upon training and experience, should have realized at some point prior to 1734:13 that the situation would develop to a point where the two aircraft would be separated by substantially less than the required and safe distance. Therefore, in my opinion, the controller should have given Flight 336 a go-around directive much earlier than 1734:13 or he should not have cleared Flight 931 into position or for takeoff. If Flight 931 had been held in position while Flight 336 landed, there would have been very little loss of traffic expedition -- only about 30 to 40 seconds.

Although I agree that the crew of Flight 336 delayed its initiation of the go-around directive, I firmly believe the controller waited too long to advise the flight not to land because of the lack of the required separation. Aborting a landing under 250 feet can be accomplished safely, but it is always a hazardous procedure this close to the ground since the aircraft will descend approximately 130 feet even if the go-around is executed perfectly. Additionally, it would appear obvious that Flight 931 should not have been cleared into position for takeoff, nor should it have been given takeoff clearance, because the controller should have anticipated that the separation between the two aircraft would erode to an unsafe distance.

JAMES B. KING, Chairman, did not participate.

August 19, 1981

5. APPENDIXES

APPENDIX A

INVESTIGATION AND HEARING

1. Investigation

The Safety Board was notified of the accident about 1745 on February 17, 1981. Two investigators were dispatched to the scene immediately from the Board's Los Angeles Field Office. A full team was dispatched from the Washington, D.C., headquarters and arrived at Santa Ana about 1200, February 18, 1981. Working groups were established for operations, air traffic control, structures, systems, human factors, powerplants, cockpit voice recorder, flight data recorders, and performance.

Parties to the investigation were the Federal Aviation Administration, Air California, Boeing Aircraft Company, Pratt and Whitney Aircraft Company, Professional Air Traffic Controller's Organization, Teamsters Union, and Transport Workers Union.

2. Public Hearing

A public hearing was not held. Depositions were not taken.

APPENDIX B

PERSONNEL INFORMATION

Captain

Captain Don E. Clark, age 53, was employed by Air California on October 25, 1968. He held Airline Transport Pilot Certificate (ATP) No. 1237664 originally issued December 14, 1968. He held ratings in airplane Multiengine Land, Lockheed L188, and Boeing 737. He also held commercial privileges for airplane single engine land, rotorcraft and helicopters. Captain Clark had accumulated approximately 22,000 flying hours, of which about 11,000 hours were in the Boeing 737. His last first-class FAA medical examination was dated January 19, 1981, with the restriction that the holder shall possess correcting lenses while exercising the privileges of his airman certificate. He was wearing his glasses at the time of the accident.

First Officer

First Officer (FO) Noel N. Pederson, age 43, was employed by Air California in January 1981. He held Airline Transport Pilot Certificate (ATP) No. 145961 with type ratings in the DC-9 and DC-10 aircraft. He also held commercial privileges for airplane single engine land and the Convair 240, 340, and 440 aircraft. His ATP was originally issued on March 22, 1979. His flight instructor's certificate for airplane single engine and instrument was issued March 17, 1976. FO Pederson had about 10,000 total flying hours and 28 hours in the Boeing 737.

He held an FAA first-class medical certificate issued on December 30, 1980, valid for 6 months because he suffered from a duodenal ulcer, controlled by the medication tagament. According to a letter from his physician to the Federal Aviation Administration, Mr. Pederson had been asymptomatic for the past several months preceding the accident. He stated that he did not have any symptoms before the accident.

Air Traffic Controller

Jonathan Slipp, age 31, was working the local control #1 position in the control tower. He reached full performance level (FPL) November 1979, at Orange County. He held a commercial pilot's license with single, multiengine land, and instrument ratings. He held instructor ratings, CFI and CFII, and also held Advanced Ground Instructor and Instrument Ground Instructor ratings. He has 2,300 hours total flight time. Flight time was accumulated between 1971 and 1981.

APPENDIX C

AIRCRAFT INFORMATION

Boeing 737-293, N468AC, Serial No. 20334 was manufactured in 1970. The aircraft was equipped and maintained in accordance with applicable FAA regulations, Airframe total flying hours were 27,566 hours. The date of the last major base maintenance was December 11, 1980.

Data	Engines	
	No. 1	No. 2
Serial No.	P656101B	P655937B
Total Time	21461.7	25881.8
Total Cycles	36430	41174
Time Since Last Hot Section Overhaul */	4734.1	4002.4
Cycles Since Last Hot Section Overhaul	5833	4913
Date of Last Hot Section Overhaul	March 1979	September 1979
Date of Last Engine Repair	March 1979	September 1979
Date of Installation	January 20, 1980	November 8, 1979

*/ The Pratt & Whitney JT8D engine utilizes an inspection which is described as a "hot" section inspection. The frequency of this inspection is determined either by an accumulated hours of operation basis or by observation of engine performance degredation. Access to the engine's combustion or "hot section" is obtained by removal of the outer combustion chamber fan ducts, the combustion chamber outer case, and the combustion chamber liners. The inspection consists of a detailed examination of all of the engine's combustion and stationary components that are subject to the flame path of the engine's combustion gases.

APPENDIX D

TRANSCRIPT OF A FAIRCHILD A-100 COCKPIT VOICE RECORDER S/N 2577 REMOVED FROM THE AIR CALIFORNIA B-737 WHICH WAS INVOLVED IN AN ACCIDENT AT JOHN WAYNE AIRPORT, SANTA ANA, CALIFORNIA ON FEBRUARY 17, 1981

LEGEND

CAM	Cockpit area microphone voice or sound source
RDO	Radio transmission from accident aircraft
-1	Voice identified as Captain
-2	Voice identified as First Officer
-?	Voice unidentified
TWR	Tower Control
APP	Approach Control
*	Unintelligible word
#	Nonpertinent word
%	Break in continuity
( )	Questionable text
(( ))	Editorial insertion
Note:	Radio communications are heard by other aircraft throughout the transcript and are identified by their call numbers.

All times are expressed in Greenwich Mean Time.

APPENDIX D

INTRA-COCKPIT		AIR-GROUND COMMUNICATIONS	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
	((Descent checklist performed at six thousand))		
	((Given visual approach at four thousand by Approach Control))		
		0131:49 APP	Air Cal three thirty six, contact Orange County one two six point eight
		0131:52 RDO-2	One two six eight good day
		0131:54 APP	((Sound of mike keyed))
		0131:59 RDO-2	Orange County, Air Cal three thirty six is, ah, visual approach
		0132:02 TWR	Air Cal three thirty six, keep it nice and square sir, you are following traffic between you and that Boeing on final
		0132:08 RDO-2	Roger
0132:09 CAM-1	(Oh)		
		0132:11 TWR	Bananza one two sierra make one left three sixty, report again on the down-wind

APPENDIX D

INTRA-COCKPIT

TIME & SOURCE	CONTENT
0132:19 CAM-2	I don't see the other one
0132:21 CAM-1	I don't either --- you might ask them where it is

AIR-GROUND COMMUNICATIONS

TIME & SOURCE	CONTENT
0132:15 12S	One two sierra
0132:17 TWR	Eight papa bravo good job sir, left at the end without delay, ground one two zero point eight, good day sir Western three eighty three clear to land
0132:27 RDO-2	And Orange County this is three thirty six, we don't have our secondary traffic could you tell us where that is?
0132:31 TWR	He's probably going to end up behind you, I've got him on a three sixty on the downwind (we'll) see how it works out
0132:35 RDO-2	Okay, we cleared to turn in now
0132:38 TWR	Yeah, you can turn inbound, just keep it nice and square to the final
0132:40 RDO-2	Okay

APPENDIX D

INTRA-COCKPIT

TIME & SOURCE	CONTENT
0132:54 CAM-1	Gear down landing checklist
CAM	((Sound of click and sound of chime))
0133:00 CAM-2	Recall
0133:01 CAM-1	Check
0133:03 CAM-2	Speed brakes
CAM-1	Armed and a green light
0133:07 CAM-2	Landing gear
0133:08 CAM-1	Down and three green
0133:09 CAM-2	Flaps

AIR-GROUND COMMUNICATIONS

TIME & SOURCE	CONTENT
0132:47 888	Orange County tower twin Cessna tripple eight alpha alpha inbound for landing with the numbers
0132:52 TWR	Twin Cessna (tripple) eight alpha alpha right traffic one niner right, report downwind, wind is one five zero at (four) altimeter two niner niner five squawk one two zero zero
0132:59 888	One two zero zero
0133:01 W383	Three eighty three cleared to land?
0133:03 TWR	Western three eighty three affirmative cleared to land
TWR	West, correction

INTRA-COCKPIT		AIR-GROUND COMMUNICATIONS	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
0133:10 CAM-1	Fifteen		
		0133:11 TWR	Air California three thirty six, you're cleared to land
		0133:12 TWR	Bonanza one two sierra change in sequence you get to follow the Boeing just turning final three miles
0133:16 CAM-2	Flaps fifteen and a green light, and ah flight attendant calling two times		
		0133:18 TWR	That's correct sir
0133:20 CAM-1	I banged 'em		
0133:21 CAM-2	Okay	0133:21 94M	Orange County tower twin Cessna nine four mike short of the left for takeoff
0133:22 CAM-1	Flaps twenty five		
		0133:25 TWR	You take the left for departure today?
0133:26 CAM-?	Flaps two five and we're cleared land	0133:26 94M	Yes sir
		0133:30 TWR	Twin Cessna nine four mike, no delay you're clear for takeoff

APPENDIX D

INTRA-COCKPIT

TIME & SOURCE	CONTENT
0133:47 CAM-1	Flaps thirty and forty
0133:51 CAM-1	He'll never make (the turn)

AIR-GROUND COMMUNICATIONS

TIME & SOURCE	CONTENT
0133:32 94M	Four mike
0133:33 TWR	Air California nine thirty one let's do it taxi into position and hold, be ready
0133:37 931	Nine thirty one's ready
0133:38 TWR	Western three eighty three ground at the end, one two zero point eight, good day sir no delay at the turn traffic depart
0133:43 383	Three eighty three
0133:45 TWR	Ninety four mike caution, wake turbulence from the Boeing about to depart the right runway
0133:47 94M	Got 'em
0133:52 TWR	Air Cal nine thirty one traffic clearing at the end, clear for takeoff sir, Boeing seven thirty seven a mile and a half final

INTRA-COCKPIT		AIR-GROUND COMMUNICATIONS	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
		0133:57 931	In sight we're rolling
		0133:59 RDO-1	Go
0134:00 CAM-2	((Sound of laughter))		
0134:02 CAM-1	Flaps forty		
		888AA	Twin Cessna tripple eight alpha alpha is making a wide right base
		0134:04 TWR	Eight alpha alpha I want you on the down wind sir, okay I see you way out there, why don't you make a three sixty report again on the base you get to follow additional traffic Air Cal
0134:07 CAM-2	Come on		
0134:09 CAM-1	Ah #		
0134:11 CAM-2	They shouldn't have cleared him out there		
		0134:12 8AA	Three sixty left roger
		0134:13 TWR	Okay Air Cal three thirty six, go around three thirty six, go around
CAM	((Sound of trim))		

APPENDIX D

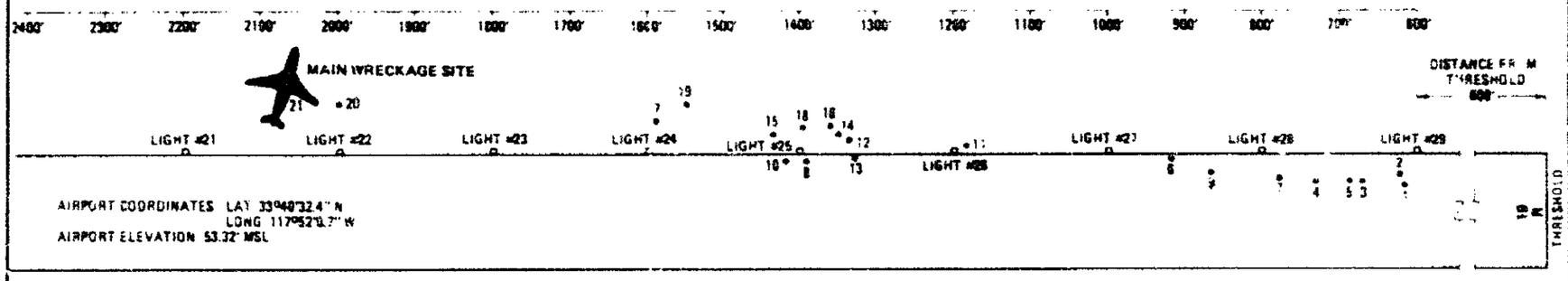
INTRA-COCKPIT		AIR-GROUND COMMUNICATIONS	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
0134:16 CAM-1	Can we hold, ask him if we can --- hold		
		0134:18 TWR	Air Cal nine thirty one if yew can just go ahead and hold ---
CAM	((Sound of trim))		
		0134:21 RDO-2	Can we land tower
		0134:22 TWR	Behind you Air Cal nine thirty one just abort
		0134:25 TWR	Air Cal three thirty six, please go around sir traffic is going to abort on the departure
0134:27 CAM-1	Gear up		
0134:28 CAM	((Sound of engine spool up begins))		
0134:29 CAM-2	Flaps fifteen		
0134:29.5 CAM-1	Gear up		
0134:30 CAM-2	Flaps *		
0134:31 CAM	((Sound of click))		

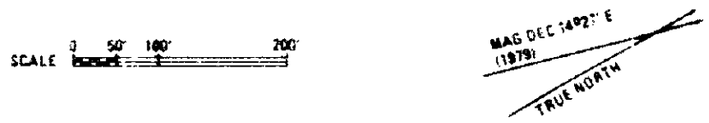
INTRA-COCKPIT		AIR-GROUND COMMUNICATIONS	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
0134:31 CAM	((Sound of gear horn))		
0134:32 CAM	((Sound of gear horn ceases))		
0134:33 CAM	((Sound of gear horn))	0134:33 746	Air Cal seven forty six turning base
0134:36 CAM	((Sound of impact))		
0134:40 CAM	((End of recording))		

APPENDIX B

LEGEND:

1. No. 1 tire mark, 38' from edge of runway
2. No. 3 or 4 tire mark, 24' from edge of runway
3. No. 2 tire mark starts
4. No. 1 tire mark ends
5. No. 2 tire mark stops
6. No. 3 or 4 tire mark stops 3' from edge of runway
7. No. 1 tire mark sta ts 159' from point 1
8. No. 1 tire mark stops 19' from edge of runway
9. No. 2 tire mark starts 175' from point 5
10. No. 2 tire mark ends 562' from point 9, 8' from edge of runway
11. Aerated ground cover starts 14' from runway, 19' back of light #1 28
12. Aerated ground condition ends, 18' from edge of runway
13. Scrape marks, 20" wide x 30' long, start one foot from edge of runway. Marks show metal particles, first solid ground impact
14. Ground scar starts 28' from edge of runway
15. Ground scar ends 28' from edge of runway
16. Ground scar starts, 37' from edge of runway
17. Ground scar ends from point 16
18. Portion of [illegible] nose slat
19. No. 2 ENGINE (S/N 866837) 65' from runway
20. No. 1 ENGINE (S/N 866101) 65' from runway
21. No. 1 ENGINE NOSE COWL AND THRUST REVERSER ASSEMBLY





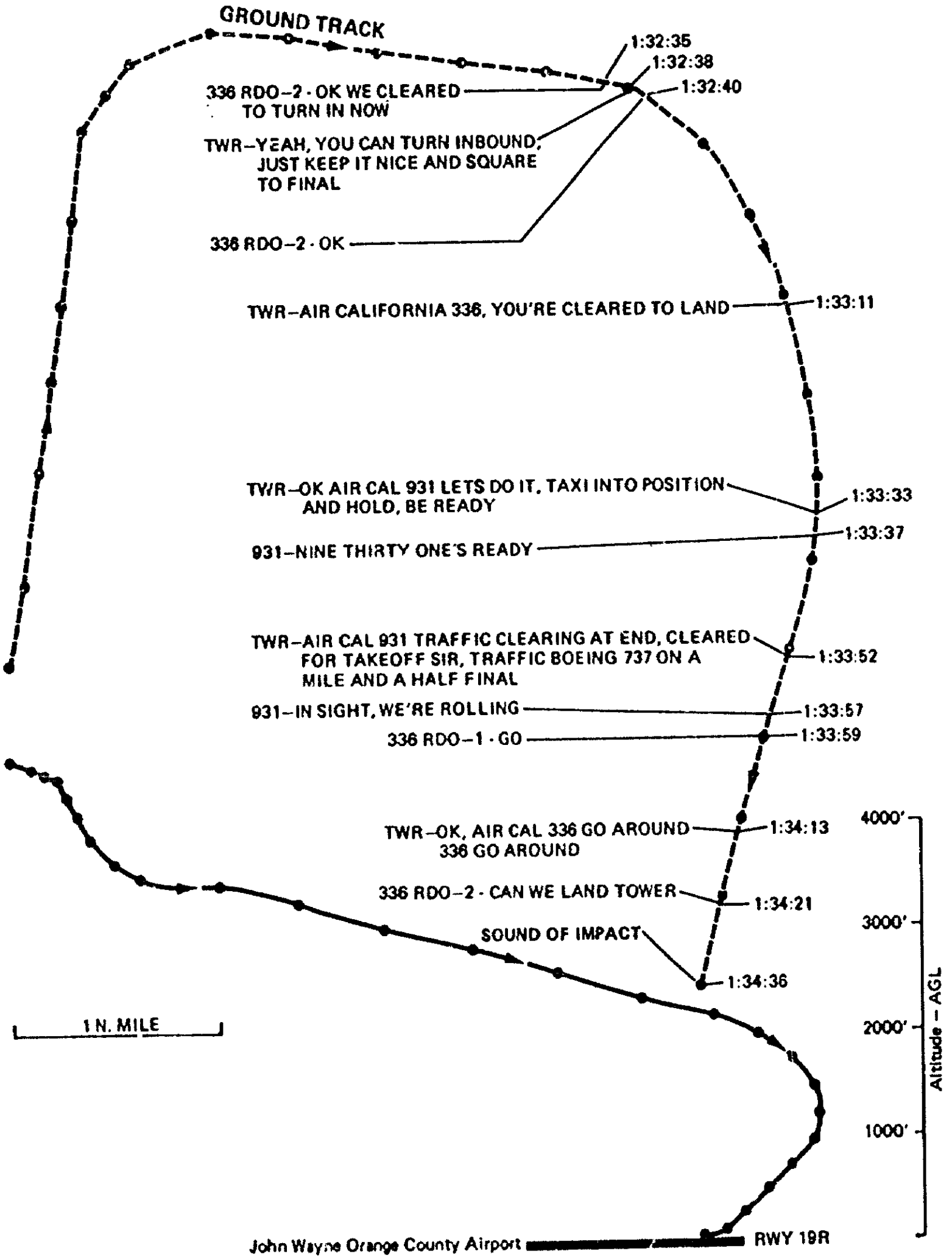
REMARKS

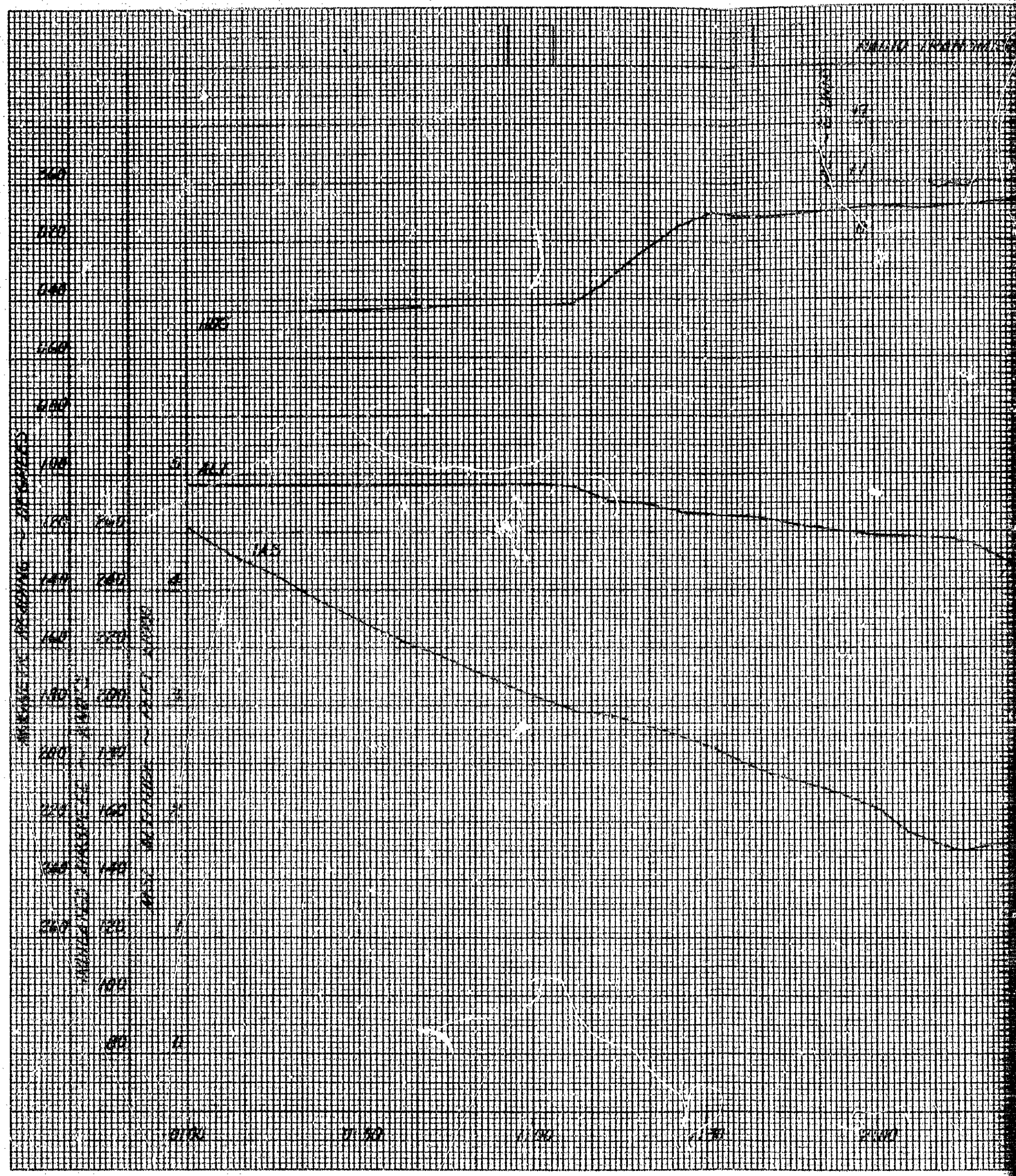
1. SKID MARK FROM POINT 9 FOR 361 FT., THEN TIRE MARK FOR 131 FT
2. GREEN PAINT ON SIDE OF GROUND SCAR BETWEEN 14 AND 15
3. 5' TO 35' WIDE SCUFFED DIRT BETWEEN POINTS 15 AND 20.
4. LIGHTS # 24 AND 25 WERE BROKEN
5. ENGINE COMPONENTS, LOWER FUSELAGE PANEL SECTIONS, AND FEW FLAP FAIRING SECTIONS WERE SLATTERED BETWEEN POINTS 17 AND 20.

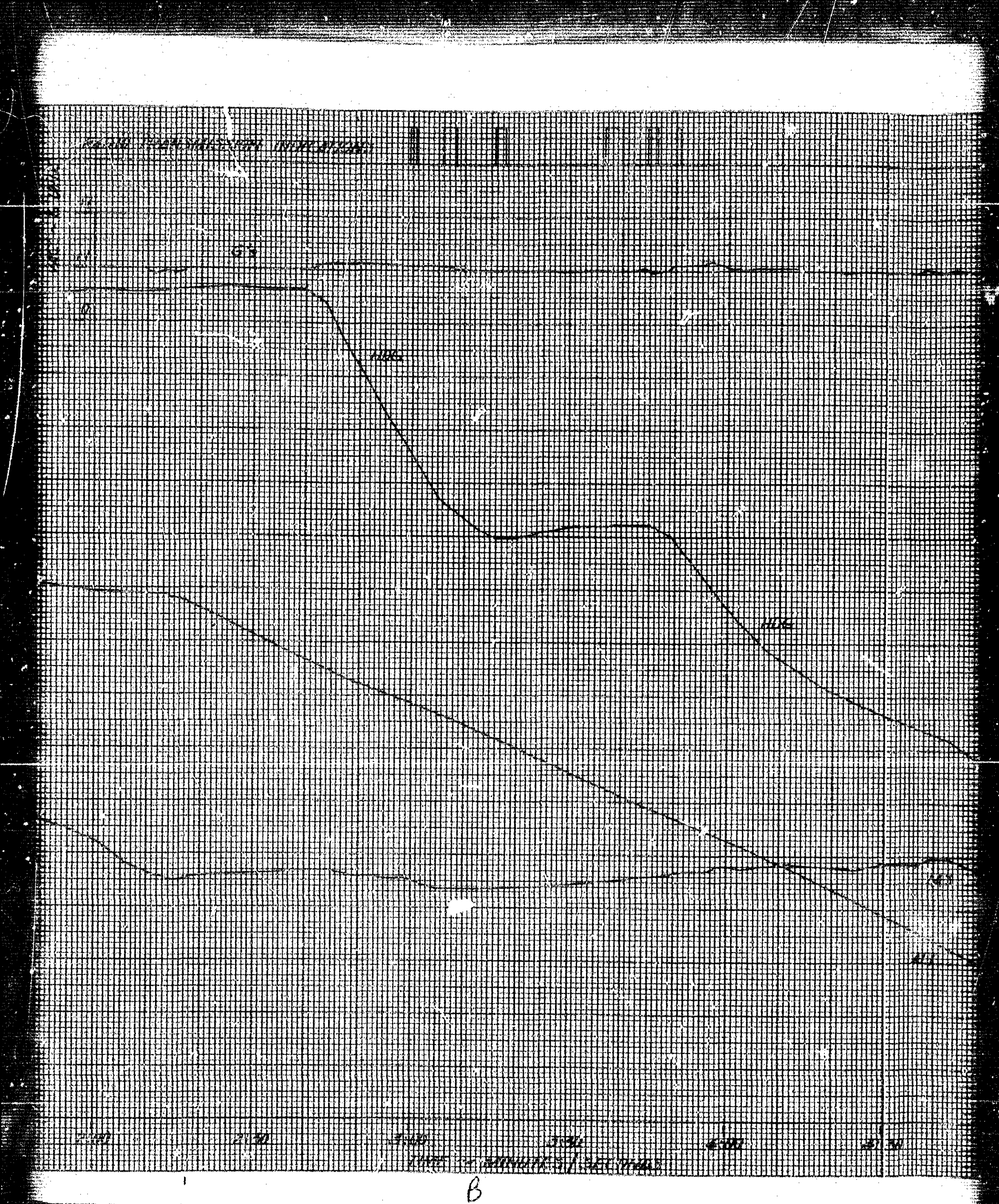
WRECKAGE DISTRIBUTION PATTERN OF AIR CALIFORNIA 336

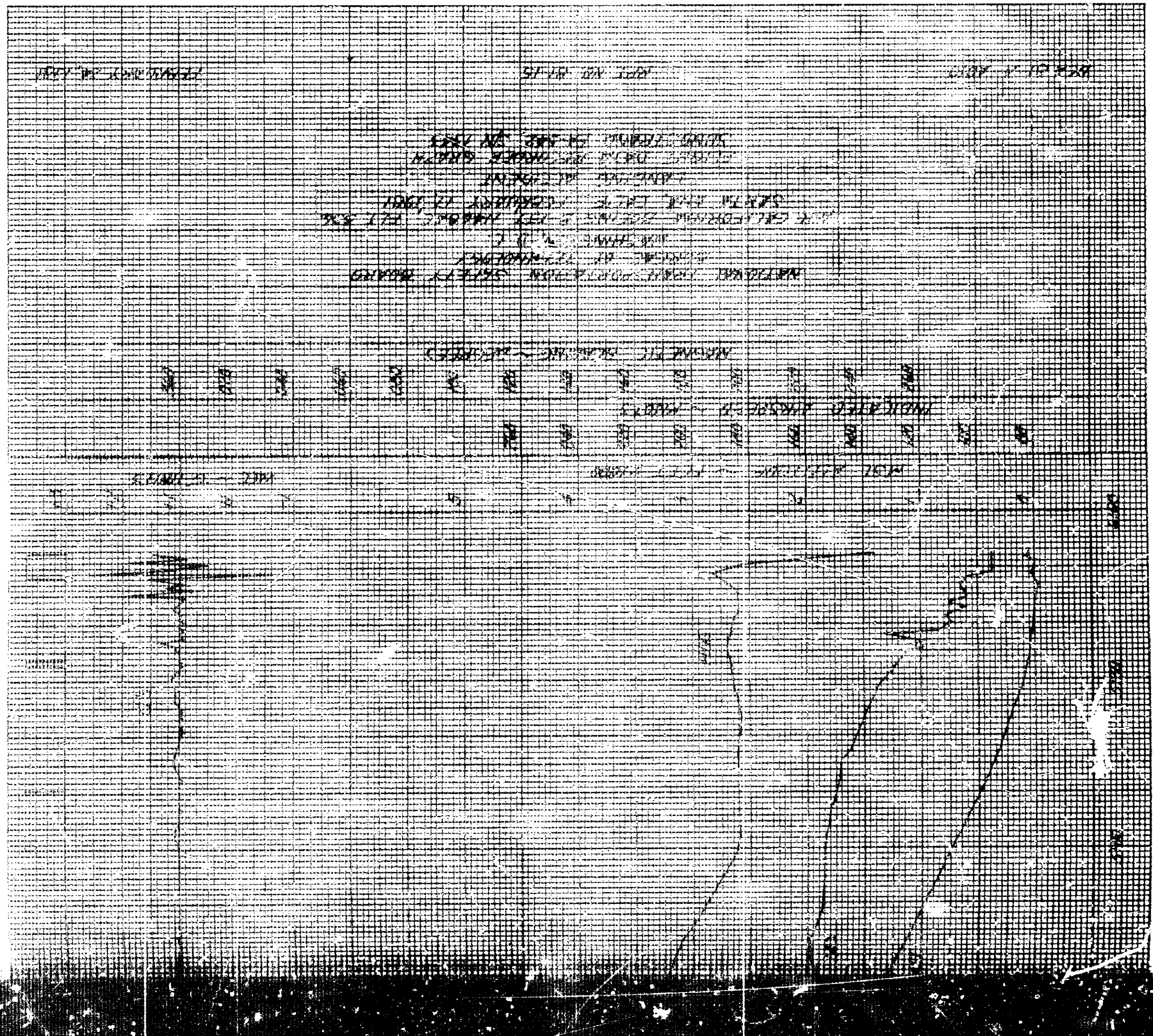
APPENDIX F

ALTITUDE VS. GROUND TRACK

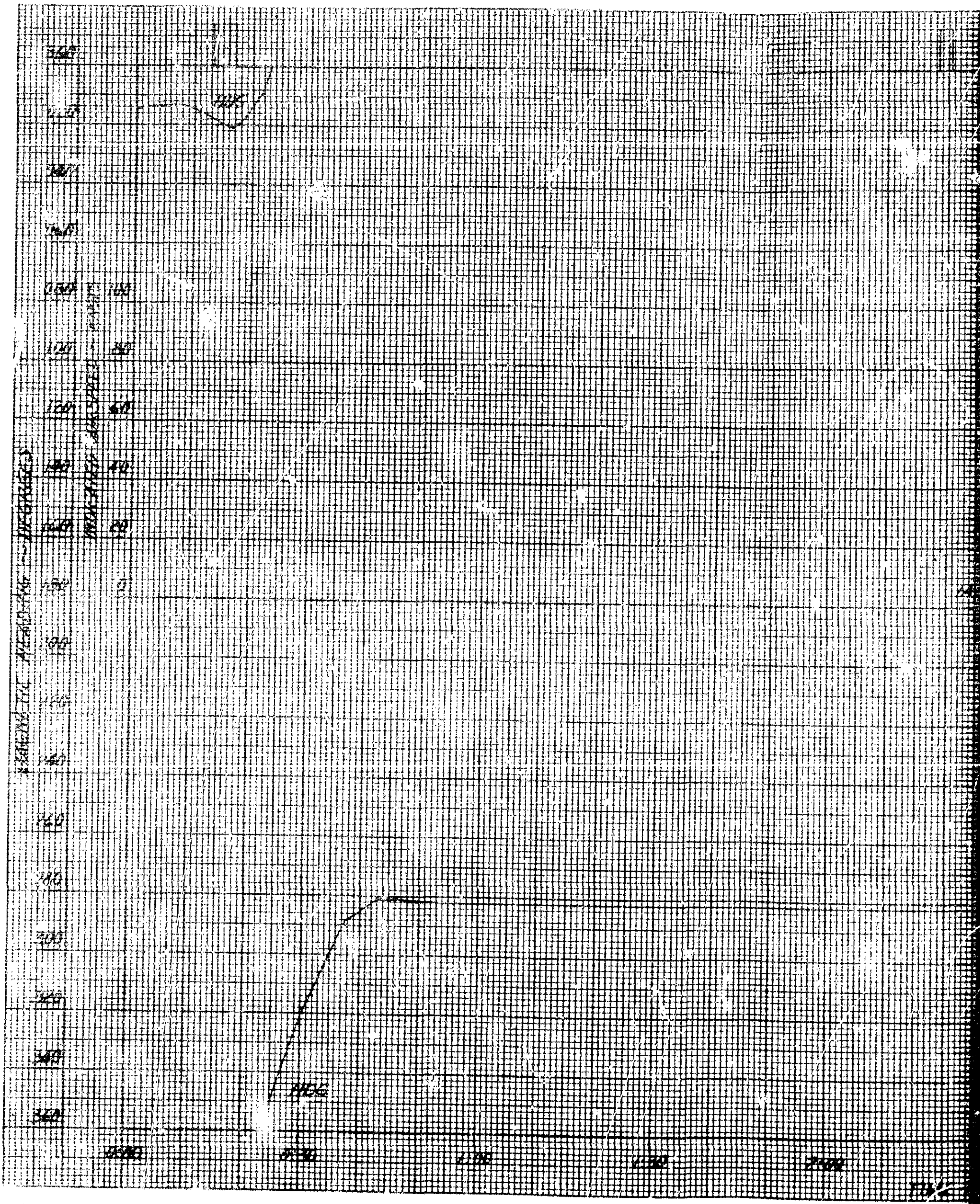




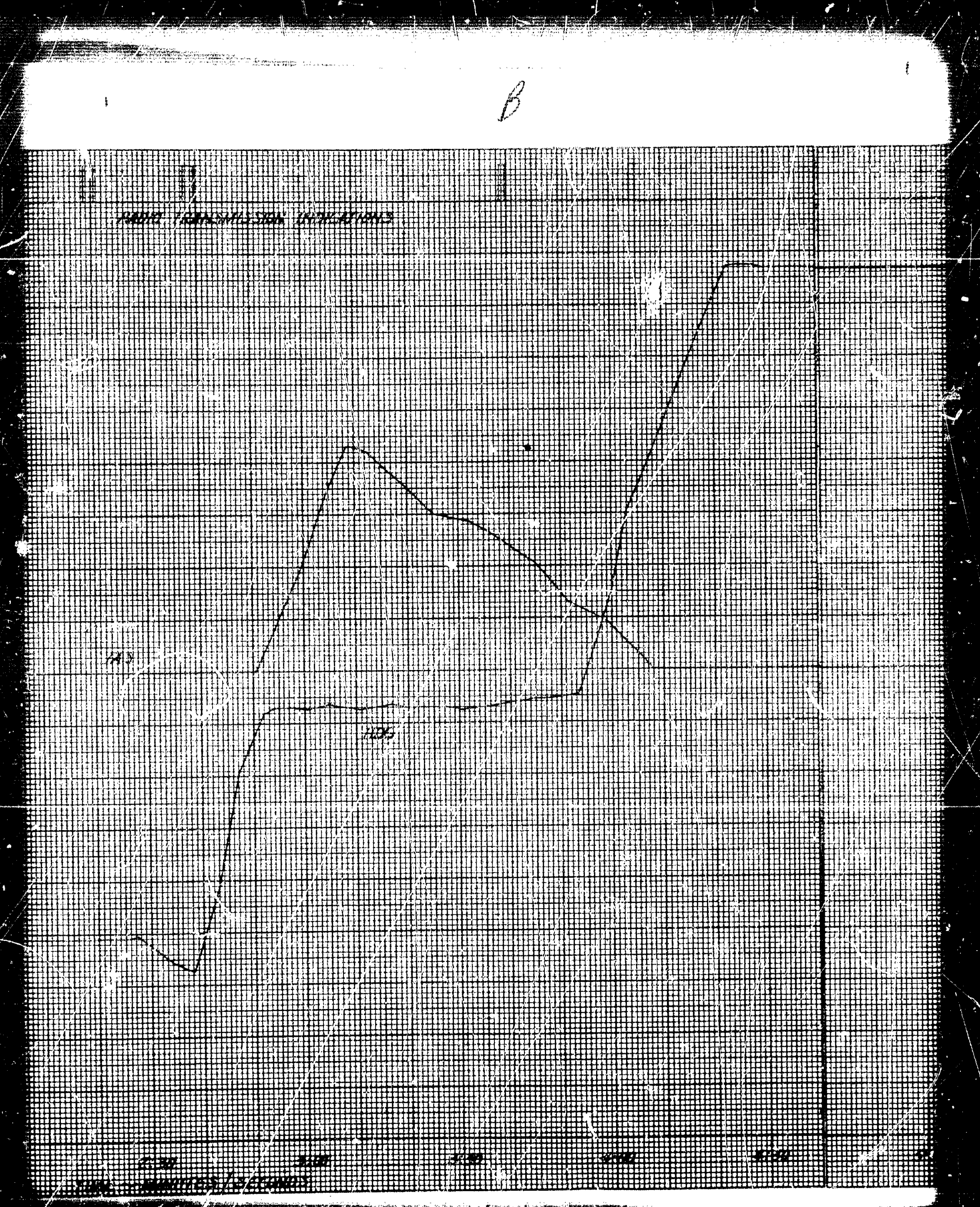




A



B



C

P

APPENDIX H