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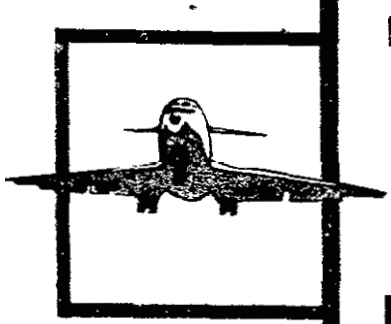

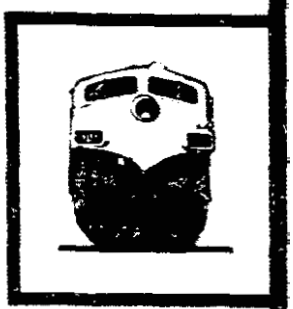

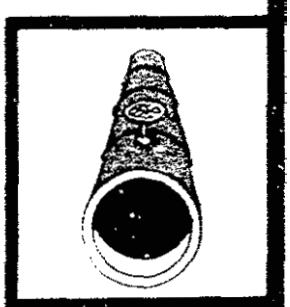

NATIONAL TRANSPORTATION SAFETY BOARD

WASHINGTON, D.C. 20594

AIRCRAFT ACCIDENT REPORT

RONSON AVIATION
BELL 206B, N27670 AND
SEMINOLE AIR CHARTER
PIPER PA-34-200T, N8110R
MIDAIR COLLISION
EAST RUTHERFORD, NEW JERSEY
SEPTEMBER 23, 1981

NTSB-AAR-82-6

UNITED STATES GOVERNMENT

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16. Abstract

About 0847 e.d.t. on September 23, 1981, a Ronson Aviation Bell 2068 helicopter and a Seminole Air Charier Piper PA-34 airplane collided in flight over the Meadowlands Sports Complex in East Rutherford, New Jersey, about 2 nautical miles south of the Teterboro, Sew Jersey, Airport. The airplane had departed Syracuse on an instrument flight rules flight plan to Teterboro and was on a left base leg to runway 1 following an instrument'landing system approach to runway 6. The helicopter was operating under visual flight rules inbound to Teterboro from Woodbridge, New Jersey, for a landing on the ramp area adjacent to the south end of runway 1. The two aircraft collided at about 650 feet. The helicopter fell into the Meadowlands Sports Complex parking lot, and both persons aboard were killed. The airplane, with about 8 feet of its left wing and its right engine missing, made a gear-up landing in a marsh about seven-tenths of a mile eas: of the collision point. The pilot was seriously injured, and the passenger received minor injuries. There were scattered clouds at about 6,000 feet and the visibility was 30 miles at the time.

The National Transportation Safety Board determines that the probable cause of this accident was the failure of each flightcrew to see and avoid the other aircraft and the failure of the local controller to perceive the traffic conflict due to the controller's preoccupation with a nonessential administrative telephone call. Contributing to the accident was a delayed position report from the airplane pilot due to his failure to activate his marker beacon receiver and to controller-induced congestion on the radio frequency and an inaccurate position reprrt from the helicopter pilot. The failure of the Federal Aviation Administration to train and qualify tower personnel in the use of tho BRITE radar display was also a factor.

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CONTENTS

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C. 20594

AIRCRAFT ACCIDENT REPORT

Adopted: May 18,1982

RONSON AVIATION BELL 206B, N27670, AND SEMINOLE AIR CHARTER PIPER PA-34-200T, N8110R, MIDAIR COLLISION EAST RUTHERFORD, NEW JERSEY SEPTEMBER 23, 1981

SYNOPSIS

About 0847 e.d.t. on September 23, 1981, a Ronson Aviation Bel! 206B helicopter and *a* Seminole Air Charter Piper PA-34 airplane collided in flight over the Meadowlands Sports Complex in Fast Rutherford, New Jersey, about 2 nautical miles south of the Teterhoro, **Sew** Jersey, Airport. The airplane had departed Syracuse on an instrument flight rules flight plan to Teterboro and was on a left base leg to runway 1 following an instrument landing system epproach to runway 6. The helicopter **was** operating under visual flight rules inbound to Teterhoro from Woodbridge. New Jersey, for a landing on the ramp area adjacent to the south end of runway 1. The two aircraft collided at about 650 feet. The helicopter fell into the Meadowlands Sports Complex parking lot. and both persons ahoard were kilied. The eirplane, with about 8 feet of its left wing and its right engine missing. made a gear-up landing in a marsh about seven-tenths of a mile east of *the* collision point. The pilot was seriously injured, and the passenger received minor injuries. There were scattered clouds at about 6,000 feet and the visibility was 30 miles at the time.

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1. FACTUAL INFORMATION

1.1 History of the Flight

Piper PA-34, N8110R.--On September 23, 1981, a Piper PA-34-200T Seneca II, N8110R, departed Rochester. New York, about 0720 eastern daylight time (e.d.t.) 1/ on an instrument flight rules (IFR) flight plan for Teterboro Airport. Teterboro, New Jersey. The airplane carried one pilot and one passenger.

1/ All times herein arc eastern daylight time baser: on the 24-hour clock.

The initial clearance to the flight was: "cleared *to* the Teterboro Airport via V-34 Hancock, V-273 Sparta. V-36 maintain 5,000, 2/ departure control frequency will be 119.95 MIIZ squawk 7460." This clearance was read back correctly by N8110R, end at 0719:41 the flight was cleared for takeoff end departed immediately. At 0725:51 the flight's clearance was amended by the Cleveland Air Route Traffic Control Center (ARTCC) requesting that the flight maintain 7,000 feet. *The* en route portion of the flight was without incident. At 0830:26, the flight receive6 an amendment to *its* clearance which stated: "10R proceed via V-34 'til intercepting V249, MOBBS direct Teterboro." This clearance was also acknowledged by N8110R.

Beginning at 0821:41, N8110R began receiving radar vectors and descent instructions from surcessive air traffic control (ATC) facilities along the route. At 0843:09, the flight was cleared to turn left to a heading of 0900 to intercept the runway 6 localizer, and at 0843:35, N8110R was cleared by Newark Approach Control for an instrument landing system (ILS) approach to runway 6 from a position 3 miles from the DANDY Intersection. At 0845:04, the following instructions were issued to N8110R: "8110R you're at DANDY, radar service terminated, call Teterboro tower nineteen five, good day." This transmission was acknowledged by N8110R. DANDY intersection is the final approach fix for the ILS approach to runway 6 and is 2.2 nautical miles outside ?he outer marker for this approach.

At 0845:22, N8110R called the Teterboro Airport tower. This transmission was acknowledged by the tower ai 0845:56 with a request that the flight report over the outer marker for a left base leg for runway 1. The next transmission to the tower was at 0847:08, when the pilot reported, "inside the marker, left base for 01." The tower replied, "in sight, continue, traffic departing." The pilot of N8110R stated that he did no: report over the outer marker earlier because of congestion on the radio frequency. (See appendix C.) According to the passenper, the pilot did no; have the marker beacon receiver turned on until the controller requested *that* he "report *the* outer marker."

The piiot and passenger said they were scanning the area forward end to the right of their flight path for inbound traffic. The passenger, a private piiot who had received training toward an instrument rating. stated that he was leaning forward in his seat, looking for traffic ahead and to the right, particularly looking for aircraft inbound from the southeast.

Bell 206B, N27670.--On September 23, 1981, a Rei! 206B, N27670, departed Linden, New Jersey, about 0826 carrying two crewmembers. The flight stopped at Woodbridge, New Jersey, and refueled with 3C gallons of Jet A fuel, bringing the total amount of fuel on board to approximately *53* gallons. No passengers were boarder; at Woodbridge.

The flight departed Woodbridge about 0829 on a course of approximately 040°, a direct course to the Teterboro Airport. At 0830:12, the flight was told by the Newark, New Jersey. tower controller to maintain 1,300 feet while crossing the Newark Terminal Control Area (TCA), and at 0837:38, N27670 was clewed to descend to 900 feet as it was leaving the TCA. Radar contact was maintained until it reached an altitude of about 700 feet, still on a course of 040". At 0844:57, the helicopter contacted the Teterboro tower and was told to "stand by." The next contact was at 0846:27 when N27670 reporter! "coming up on the sports complex . . . ." The tower controller answered this with a request for a report ". . . about a mile south. I don't he ve vou in sight." *(See* appendix C.) The controller stated that he considers the phrase "coming up on" to mean about 1/4 mile from a point when used by helicopter pilot.;.

2/ All altitudes herein ere mean sea level (msl) unless otherwise indicated.

At 0847:34, N8110R and N27670 collided over the Meadowlands Sports Complex st an altitude of about 650 feet. The helicopter and parts of the airplane fell in a paved parking lot of the sports complex. The airplane landed in a flat marsh about 4,220 feet on a 090" bearing from the helicopter wreckage, and subsequently was destroyed by fire. The two persons in the helicopter were killed, and the two persons in the eirplane were injured.

Witnesses said that the two aircraft converged at an angle of nearly 90°, with the helicopter approaching from the right of the airplane. Several witnesses said that the helicopter appeared to bank to the right immediately before the collision. Both persons in the airplane said that they neve? saw the helicopter before the collision.

1.2 Injuries to Persons

Injuries	Crew	Passengers	Others	Total
Fatal	2	0	0	2
Serious	1	0	0	1
Minor/none	0	1	0	1
Total	3	1	0	4

1.3 Damage to Aircraft

Both aircraft were destroyed.

1.4 Other Damage

Pavement and decorative landscaping in the Meadowlands Sports Complex parking lot was damaged.

15 Personnel Information

The flightcrew of both aircraft and the air traffic controller were certificated and qualified. (See appendix B.)

16 Aircraft Information

The Piper PA-34-200T Seneca II, N8110R, was owned by Air Charter Associates and leased to and operated by Seminole Air Charter; both firms were headquartered in Pittsford, New York. The airplane was within prescribed weight and balance limitations for the flight. There were 122 gallons of 100LL aviation gasoline on board at takeoff from Rochester.

The Bell 206B, N27670, was owned and operated by Ronson Aviation, Inc., of Trenton. New Jersey. The aircraft was within prescribed weight and balance limitations for the flight. On takeoff from Woodbridge, there were about 53 gallons of Jet A fuel on board.

1.7 Meteorological Information

At the time of the collision, the weather was generally clear. The reported weather at the Teterboro Airport at 0800 was: 7,000 feet scattered clouds, visibility 25 miles, temperature 53° F, wind 320° at 9 knots, altimeter 29.95 inches." At 0856, the reported weather was: "6,000 feet scattered clouds, visibility 30 miles, temperature 55° F, dew point 45° F, wind 320° at 18 knots, altimeter 29.95 inches."

1.8 Aids to Navigation

Not spplicable.

1.9 Communications

There were no known communications malfunctions.

1.10 Aerodrome Information

Teterboro Airport is located in Teterboro, New Jersey, 8 miles west of New York City. The field elevation is 9 feet. It has two runways: 1-19 is 7,000 feet long and 150 feet wide, and 6-24 is 6,015 feet long and 150 feet wide. It is served by a full-time control tower, and radar service is provided by the New York Terminal Radar Approach Control facility (TRACON). The airport does not have a designated Terminal Radar Service Area (TRSA). It underlies but is not included in ?he New York TCA. The floor of the TCA above Teterboro is 1,800 feet.

There are several published instrument approaches for the airport, including an ILS approach to runway 6. When visibility permits and the wind favors use of runway 1, aircraft making an ILS approach to runway 6 may be directed to turn right from the ILS course onto a left base leg for landing on runway 1.

The Teterboro ATC tower is a visual flight rules (VFR) tower with a RRITE radar connected to the Newark approach control radar. Although the BRITE radar had been installed in the tower for 1 1/2 years, no effort had been made to certify the controllers at Teterboro to use the BRITE radar as an aid in controlling traffic and it was not being used. However, on the day of the accident it was available and was turned on. The controller stated that he was not using it. Subsequent to this accident, the Federal Aviation Administration (FAA) instituted a program to begin certifying the controllers at Teterboro to use the BRITE radar.

1.11 Flight Recorder

Neither the airplane nor the helicopter was quipped with flight data or cocpkit voice recorders and none was required.

1.12 *Wreckage* and Impact Information

1.12.1 General Description

The helicopter's main wreckage was consumed by ground fire. (See appendix D.) The fuselage wreckage was oriented on a 120° heading. The outboard portion of the airplane's left wing was located 825 feet on a 180° bearing from the helicopter's main wreckage. Turbocharger parts and associated clamps and hoses from the airplane's right engine were found about 15 feet east of the airplane3 separated left wing section. The airplane's right engine, accessories. engine mount sections. and miscellaneous engine cowling were located 975 feet on a bearing of 148° from the helicopter's main wreckage. The airplane's right propeller assembly was found 900 feet on a 154° bearing from the helicopter's main wreckage. These airplane components showed *no* fire damage.

The following helicopter components were located as indicated relative to the main wreckage of the helicopter: brth landing gear skids (float panels and crosstubes), 60 feet on a 260° bearing; tail boom. 270 feet on a 220° bearing; main rotor blade

(red), 3/ main rotor hub assembly, and attached inboard section of the main rotor blade (white), 480 feet on a 200° bearing; midsection of main rotor blade (white), 550 feet on a 212° bearing; and tip section of main rotor blade (white), 1,012 feet on a 174° bearing. None of these helicopter components showed fire damage. Scrapes and impact scars were noted on the paved surface of the parking lot where the components were found.

The airplane's main wreckage was oriented on a 010' heading. The initial ground impact scar of the main wreckage was oriented on an 080' heading. The initial ground scar, made by the left main landing gear, was 85 feet from the main wreckage. Thirteen feet from the initial mark was a ground scar made by the left wing stub, and 12 feet farther was the impact mark made by the nose gear. Eight feet closer to the main wreckage was another ground scar of unknown origin.

1.12.2 Description of Collision Damage

Piper PA-34.--The right engine of the airplane was separated from the wing with a portion of the engine mount remaining attached to the engine. The mount structure was separated at about a 47° angle from forward inboard to aft outboard. The engine oil cooler was separated from the engine and had a large compressed area at about a 48° angle oriented parallel to the mount separation. The lower engine cowling was separated from the nacelle and had been separated into two pieces. The separation was at a diagonal cut with inwardly rolled edges and extended from the forward inboard side to the aft outboard side. Several right engine pieces and accessories were found in the parking lot.

The left wing was severed 111 inches from the wing fuselage attach point, measured at the chord centerline. The winp stub, outboard of the nacelle, was displaced upward and the main spar cap and web were broken. The section aft of the main spar was partially separated at the screw line. This same section displayed evidence of a flash fire and ground impact damage. The severed edges of the top wing skin were rolled upward and slightly to the rear. The bottom edges were rolled inward and rearward. The leading edge was rolled inward end rearward.

The separated outboard wing panel was found in the scatter pattern. A cut made by the helicopter main rotor blade started at the leading edge 76 inches inboard from the closure rib and traversed rearward through the main and rear spa?, exiting 91 inches inboard from the closure rib. The angle of the severed edge was 42° at the leading edge and 46° at the trailing edge using the chord of the wing for a reference line. The top wing skin edge was bent inward and rearward. Feathering on the edges was from forward to aft. The bottom skin edges were rolled downwerd and aft. Black deposits 4/were noted in the vicinity of the rolled edges and on the front of the rear spar web and upper main spar cap. The spar fractures are consistent with the damage noted on the skin edges. The leading edge cut was rolled inward. downward, and sit.

Bell 206B.--The red blade of the helicopter was attached to the main rotor and was intact. The blade was bowed upward from the root to the tip. It was bent upward from blade station (B.S.) 86 to the tip area, at about a 45° angle. with the leading edge bent up 25 inches from the horizontal plane; the trailing edge was bent up 21 inches from the horizontal plane and slightly aft. The top side of the red blade showed a 38" diagonal,

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3/ Helicopter main rotor blades are designated by color as an arbitrary means of identification for maintenance purposes. On two-blade rotors, the blades are designated red and white.

4/ The upper surface of the helicopter main rotor blades was gray and the bottom surface was black.

deep scratch starting 24 1/2 inches inboard from the blade tip on the leading edge and ending 33 1/2 inches from the blade tip on the trailing edge. Two identical scratches matching this scratch were found 4 1/8 inches and 4 3/4 inches apart. The bottom side of the red blade showed 32° diagonal, deep scratches starting 6 3/4 inches inboard from the blade tip that continued inboard far 34 inches on the leading edge. The first of the 38° diagonal scratches started on the trailing edge, 13 inches inboard from the tip. and continued inboard for 40 inches. A diagonal cut on the red blade went from 38° on the top side to 32° on the bottom side in this area. At R.S. 46, skin and honeycomb were cracked and debonded through B.S. 102, and debonded at the rear of the "D" 5/ spar from B.S. 60 through B.S. 102. The debonding in this area continued inboard to the radius of the lower blade doubler. The leading edge was scratched and gouged, with black and white marks starting at B.S. 159 and progressing through B.S. 193. The top skin had a rotational gouge starting at the leading edge at R.S. 175 extending through the trailing edge at R.S. 170 at a 58° angle. Minor dents and scratches were noted on the bottom and top skin at the same angle from R.S. 159 through B.S. 193. Minor impact scrapes, at 40° to the previously described damage. were consistent with ground impact demage.

The white blade was separated into two sections. All the leading edge was accounted for and the remaining section was still attached to the main rotor hub. One separation occurred at B.S. 60. The "D" spar was fractured upward and aft; the honeycomb panel was torn away in an inboard and rearward direction The "D" spar from B.S. 60 through B.S. 144 was bent upward in a manner similar to the red blade. From B.S. 144 through B.S. 177 the blade was bent downward and was oil soaked. The outboard separated blade section at R.S. 177 was heavily gouged in the leading edge "D" spar area. The "D" spar and tip weight were bent downward and slightly aft. No honeycomb panels were attached.

The main rotor hub was intact and part of the main rotor mast was attached but separated in shear 1 1/2 inches below the flap stops. The white main rotor grip was cracked from impact damage and rotated 90° down from its normal operating position. Its dynamic stop arm was broken. The red main rotor grip was rotated 90° up from its normal operating position with minor impact damage noted. Both main rotor pitch horn bearings were broken.

1.13 Medical and Pathological Information

The two pilots of the helicopter sustained multiple trhumatic injuries. Postmortem examinations disclosed no evidence of preexisting incapacitation or physiological problems which could have affected their performance. Toxicological tests were performed only on ?he pilot and were negative.

The pilot of the airplane sustained a concussion and two fractured vertabrse during the landing in the marsh. The passenger suffered oniy bruises.

The local controller was taking 2 mg of a prescribed antihypertensive medication twice a day. His most recent medical certification was a Class II Certificate issued in December 1979. The issuing examiner was aware of his use of the presrribed medication. On the day following the accident, he underwent a physical examination and was issued a new Class II medical certificate. Title 14 CFR 65.31 states: "No person may act as an air traffic control tower operator at an air traffic control tower in connection with civil aircraft unless he . . . (c) Except for a person employed by the FAA, holds et least a second-class medical certificate. . . ."

5/ The main structural member of the rotor blade made from an aluminum ext-usion whose cross section resembles the fetter D.

1.14 Fire

The main fuselage of the helicopter, except for the tail boom and main rotor, was destroyed by ground fire.

The pilot of the airplane stated that following the collision and loss of the outer portion of the left wing, he observed fire at the outer end of the remains of the left wing. The airplane was destroyed by ground fire following the landing in the marsh and after the occupants escaped.

1.15 Survival Aspects

The accident was not survivable for the occupants of the helicopter. It was survivable for the occupants of the airplane because the pilot was able to maintain sufficient control to make a successful emergency landing in the marsh.

1.16 Tests and Research

1.16.1 Reconstructed Ground Racks

The probable ground tracks of the helicopter and the airplane were reconstructed using the radar data from the New York TRACON and ATC communications transcripts. (See appendix H.)

The radar data provided by the Sew York TRACON was from an ARTS III system and contained beacon code radar returns in range and azimuth with Mode C altitudes for all 1200 and 7460 coded targets. The data covered a time period of 15 minutes from 08:35:00 to 08:50:00 e.d.t. The origin of the range and azimuth values is the antenna site located at Newark international Airport. The geographical area covered by the data was from 350° to 70° (magnetic) in azimuth and from 2 to 15 nautical miles in range. Radar returns a? this facility are recorded approximately every 4.7 seconds.

The ground tracks showed that after crossing over Newark airport and leaving the control zone at an altitude of 1,300 feet, the helicopter maintained an essentially constant northerly heading toward Teterboro Airport and descended gradually to about 650 feet. The airplane tracked inbound on the Teterboro runway 6 ILS, just slightly left of centerline, for about 2 1/2 minutes, descending from 1,900 feet to 1,000 feet. At 0846:36, the airplane turned right to an easterly heading and continued to descend. This heading was maintained until the collision. At the time of collision, the transponder returns from both aircraft indicated about 650 feet.

1.16.2 Cockpit Visibility Study

The cockpit visibility study was based on a series of photographs taken with a binocular camera mounted in the pilot's seat of a Piper PA-34-200T Seneca II. Similar photographs were made from the pilot's seat of a Bell 206B helicopter.

The airplane binocuiar photographs were taken with the camera placed in the left seat of the Piper PA-34-200T, at the design eye reference position as specified by CAM-4b. 6/ The view from the right seat was created by reversing the photographed image taken from the left scat. Two photographs were made with the camera in this position; one with the visor stowed and the other with it deployed. Only

6/ "Design Eye Reference Position" is defined by FAA policies contained in Civil Aeronautics Manual (CAM) 4b.351-3(a).

the photograph with the visor deployed, which represents the worst case, was used, because it could not be determined if the visor was deployed or stowed on the accident aircraft.

The asymmetry of the Bell **206B** cockpit seating required repositioning the camera to create the pilot and copilot views. In helicopters, conventional crew positions place the pilot on the right side and the copilot on the left. The camera was placed in the right seat of the Bell **206B** for both views, but positioned to reflect the location end dimensions of each crewmember in his respective seat. The copilot's view was then created by reversing the negative **of** the appropriate photograph.

The viewing angles and separation distances of each aircraft relative to the other were calculated by a computer program using the same radar data used for the flight track reconstruction, as well as performance end aerodynamic data for both aircraft, taking into account heading, pitch angle, and bank angle for both aircraft. The azimuth and elevation angles *so* derived were plotted on the binocular photographs to simulate the relative position and motion of the target aircraft as seen from the viewing aircraft. (See appendix E.)

A plot of the helicopter viewing angles on the binocular photograph from the pilot's position shows the airplane **just** slightly above the zero elevation position of the copilot's windshield moving alternately from left *to* right, but always in view. the only potential obstruction to the pilot's view of the airplane are the left and center windshield posts. A plo? of the viewing angles as viewed from the copilot's seat placed the airplane in the left side window slightly above the zero elevation line until approximately **1** minute **38** seconds before the collision when the left windshield post would have blocked it from view. The airpiane remained partially obscured by the windshield post for the next **03** seconds, until it entered the copilot's upper left windshield ***for*** the remainder of the angles plotted.

The airplane viewing angles when plotted on the binocular photographs from the pilot's position placed the helicopter in the right front cabin window for the first **122** seconds starting **182** seconds before the collision. During **this** period the helicopter would have been obscured about 50 percent of the time by the wing, nacelle, or windshield side post. The turn to base caused the heiicopter to move up and into the cabin overhead for about 15 seconds. When the wings were again leveled during the base leg, the helicopter moved down to just above the zero elevation line in the copilot's windshield just above the right engine for the 30 seconds of plotted data. The finai point plotted occurred approximately 9 seconds before collision.

The view from the right seat of the airplane would have placed the helicopter **nearly** in the center of the right front cabin window forward of the wing and above the nacelle for nearly two thirds of ?he 122-second time period prior to turning base. During the turn to Sese, **the** helicopter would have moved up and forward for *30* seconds and then down **as** the wings were rolled level. The helicopter continued *to* move forward during the remaining points staying within the right-side window.

1.17 Additional Information

1.17.1 Air Traffic Control Procedures

Procedures for the control of air traffic are contained in the **FAA Air Traffic** Control Handbook **7110.65B. All** handbook paragraphs cited herein were in effect at the time of the accident. Paragraph **22** of the handbook defines the duty priority for controllers. It states:

22. DUTY PRIORITY

Give first priority to separating aircraft **and** issuing safety advisories as required in this handbcok. Good judgment shall be used in prioritizing ali other provisions of this handbook based on the requirements of the situation at hand.

22. Note.-Recause there are many variables involved, it is virtually impossible to develop a standard list of duty priorities that would apply uniformly to every conceivable situation. Each set of circumstances must be evaluated on its own merit and when more than one action is required, the controller shall exercise his best Judgment based on the facts and circumstances known *to* him. That action whirh is most critical from a safety standpoint is performed first.

Paragraph **33** of the handbook specifies action to be taken if the controller becomes aware of a possible conflict between aircraft. It states:

33. SAFETY ADVISORY

Issue a safety advisory to an ai-craft if you are aware the aircraft is at an altitude which. in your judgment. places it in unsafe proximity to terrain. obstruction, or other aircraft. Once the pilor informs you acticn is heinp taken to resolve the situation. vou may discontintie the issuance of further advisories. Do not assume that because someone else has responsibility *for* the aircraft that the unsafe situation has been observed and the safety advisory issued: inform the appropriate controller.

33. Note 1.-The issuance of a safety advisory is a first priority (see para–reph 22) once the controller observes and recognizes a situation of unsafe aircraft proximity to terrain, obstacles. or uncsntrolled aircraft. Conditicns such as workload, traffic volume, ?he quality/limitations of the radar system. and the available lead time to react are factors in determining whether **it** is reasonable for the controller to observe and recognize such situations. While a controller cannot see immediately the development of every situation where a safety advisory must be issued, the controller must remain constantly alert for such situations and issue a safety advisory when the situation is recognized.

Paragraph 900 of the handbook specifies airport traffic control service as follows:

900. PROVIDE SERVICE

Provide airport traffic control service based onlv upon observed or known traffic and airport condition.

900. Note.-When operating in accordance with the FARs, it is the responsibility of the pilot to avoid collision with other aircraft. However, due to the limiter! space around terminal locations. traffic information can aid pilots in avoiding collision between aircraft operating within control zones, airport traffic areas, terminal radar service areas. terminal control areas, and transiting aircraft operating in proximity to terminal locations.

901. TRAFFIC INFORMATION

a. Describe vehicles, equipment, or personnel on or near the movement area in a manner which will assist pilots in recognizing them.

901.a. Examples.—

"Mower to left of Runway Two Seven."
"Trucks crossing approach end of Runway Two Five."
"Workman on Taxiway Bravo."
"Aircraft to left of Runway One Eight."

b. Describe the relative position of traffic in an easy to understand manner, such as "to your right," or "ahead of you."

901.5. Examples.—

"Traffic, Eastern DC-9 on downwind leg to your left."
"Twin Sonan–a inbound from outer marker on straight–in approach to Runway One Seven."

1.17.2 Pilot Responsibilities

The pilot's responsibilities for conducting either IFR or VFR flight are contained in 14 CFR 91. Title 14 CFR 91.67(a) states that when weather conditions permit, regardless of whether an operatic1 is conducted IFR or VFR, vigilance shall be maintained by each person operating an aircraft so as to see and avoid other aircraft in compliance with this section. This concept is also presented in the Airman's Information Manual in Section 9, "Pilot/Controller Roles end Responsibilities." Paragraph 407, "See and Avoid" defines pilot responsibilities:

> Pilot--When meteorological conditions permit, regardless of type of flight pian, whether or not under control of a radar facility, the pilot is responsible to see and avoid other traffic, terrain or obstacles.

Section 3 "Airport Operations," paragraph 221, "Tower Controlled Airports" provides guidance for helicopter pilots. It states, "pilots approaching to land in a helicopter must avoid the flox of fixed–wing traffic."

1.17.3 Teterboro Tower Letter to Airmen

In 1977, four helicopter arrival and departure routes were established to reduce noise complaints around the Teterboro Airport. They were developed jointly by the Teterboro tower staff, the airport manager. end several helicopter operators who were regular users of the airport. These routes were defined initially in a Teterboro Tower Letter *to* Airmen 77-1 issued in 1977. A new Letter to Airmen 81-2, redefining these routes, was issued April 1, 1981, and became effective April 15, 1981. (See appendix F.) Titis letter was distributed to all helicopter operators based at Teterboro Airport and to several others known to operate helicopters regularly into the airport. Ronson Aviation had received the Letter to Airmen 81-2, had it on file, and had brought it to the attention of its pilots. Letters to Airmen are advisory only, not mandatory. This letter stated thet helicopter operators were expected to identify the route they were following and maintain any safe altitude 1,000 feet msl or below.

1.17.4 Teterboro Tower Staffing

The staffing level of the Teterboro tower following the strike on August 3, 1981, by the Professional Air Traffic Controllers Organization (PATCO) was I chief; 3 team supervisors: and 11 controllers — 5 civilian 13 fully qualified) and 6 military. The authorized manning is 1 chief. 3 team supervisors, and 17 controllers. Prior to the PATCO strike. the actual manning was 1 chief, 3 team supervisors, and 12 controllers, all of whom were fully qualified.

Because of understaffing before the strike. the tower chief had regularly worked a few hours each week at each controller position in the tower. In the first few weeks after the strike. he worked 10 hours per day, 6 days per week. The week before the strike he worked 51 hours. with the overtime spent on administrative duties. In the 2 days before the accident. he worked 8 hours each day in control positions.

On the day of the accident there were five persons in the tower cab. The tower chief was working the local control position, one controller was working the flight date position. one controller was working the ground control position, and a trainee and instructor were working the clearance delivery position.

1.17.5 Teterboro Tower Operations

The tcwer chief. working in the local control position, had been on duty about 1 hour 45 minutes before ?he accident. He termed the volume of traffic as "moderate" that morning. The times and positions of the two accident aircraft during their arrivals in the Teterboro area were derived from a comparison of recorded ATC communications, recorder! radar data. and statements from the controller and the passenger in the airplane.

Between about 0829 and 0837. the helicopter, which had departed Woodbridge, was passing through the Newark TCA at 1,300 fee; in communication with the Newark tower. During that same time. the airplane was being vectored by Newark Approach Control southwest of the Teterboro Airport. Ai about 0837:38, the helicopter departed the Newark TCA and was told to descend to 900 feet and contact the Teterboro tower. At that time the helicopter was about 7 nautical miles southwest of Teterboro.

At about 0843:30, the airpiane intercepted the Teterboro runway 6 localizer and was cleared by Newark Approach Control for the ILS approach to runway 6. Approach control advised that the airplane was then 3 miles from DANDY Intersection, which is the final approach fix 6 miles southwest of the threshold of runway 5. About 1 1/2 minutes later at 0845:04. the controller advised the airplane pilot that ne was at DANDY Intersection. told him to contact Teterboro tower. and also told him that radar service was terminated.

The communication transcripts show that at 0843:45, the Teterboro local controller received a telephone call. concerning an administrative problem, which fasted until 0845:44. During those 2 minutes there were eight separate transmissions by five different aircraft. among them the initial contacts by both N27670 and N8110R, the sccident aircraft. Five were not acknowledged by the controller, including that from N8110R. Neither of the two accident aircraft stated their position in the initial contact. The controller acknowledged the call of N27670 by saying "helicopter stand by" at 0845:01. He responded to only two other transmissions during the telephone conversation. N8110R's initial cali which was not acknowledged was at 0845:22. After the controller terminated the telephone conversation at 0845144, the frequency became congested for about 90 seconds with transmissions and acknowledgments that were missed during the telephone conversation. At 0845:56 the controller acknowledged N8110R, requested the

piiot report at the outer marker, and advised that the approach would be a left base leg to land *on* runwav 1. The radar **data** plot showed that at that time N8110R was at the outer marker.

The passenger in N8110R, a private plot, stated that after the controller requested the report at the marker, the pilot turned on the marker beacon receiver and the audio and visual signals were received *"in* a few seconds." The passenger stated that the pilot did *not* report over the marker because of other transmissions on the radio frequency. According to the transcripts. one of these transmissions was from the helicopter, which reported "coming **up** on the sports complex" at 0846:27. The controller answered with a request *to* "report about *a* mile south. I don't have you in sight". The radar plot showed that at this time the helicopter was 1.6 miles south of the stadium and the airplane was 1.3 miles inside the outer marker 2nd starting to turn onto the base leg. At 0847:08, the airplane reported on a left base for runway 1 and the controller replied that he had the airplane in sight. The helicopter et this time was one-half mile south of the stadium, and about 1 mile east of the airplane. **The** collision occurred about 26 seconds later. No safety advisories were issued by the controller to either aircraft. The controller stated that he never had the helicopter *in* sight *tie* said that he never considered that the aircraft were in conflict.

2. ANALYSIS

2.1 Flightcrews

The flightcrews *of* both aircraft were properly certificated and qualified in accordance with existing regulations. There was *no* evidence that medica! or physiological problems affected their performance.

22 Weather

Weather was not a factor in this accident.

23 The Aircraft

Both aircraft were properly equipped for the operations and maintained in accordance with the applicable regulations. There was no evidence of prior existing discrepancies which would have been a factor in this accident.

2.4 Controller

The controller heir' a valid air traffic controller certificate and was properly qualified and current for the local control position. Although his Class II medical certificate had Seen issued more than 1 year before the date *of* the accident ar : was therefore valid only as a Class III certificate, he was not required to hold a Class II medical certificate according to 14 CFR 65.31. On the day following the accident. he underwent 2 physical examination and was issued 2 Class II medica! certificate **with** the restriction "must Rave glasses in possession *fo-* near vision." There was no evidence the: medical or physiological problems affected his performance at the time of the accident.

2.5 Collision Angle

Several witnesses stated that the two aircraft converged at an angle *of* nearly 90°. with the helicopter approaching from the right oi the airplane. Some of these witnesses described a sudden bank to the right **by** the helicopter immediately before the collision. The angles and directions of separation of the airplane's right engine and left wing, taken together with the damage and marks on the helicopter main rotor blades,

confirm that the helicopter was slightly below the airplane as they convergea. When the collision occurred, the helicopter rotor disk was banked at an angle of about 45° to the airplane's right wing with the rotor hub below and forward of the right wing leading edge. (See appendix G.)

2.6 Visibility Factors

2.6.1 Binocular Photographs

The binocular photographs used in the analysis of this collision were produced using a fixed eye reference point and aircraft flight paths reconstructed using radar data and calculated aircraft attitudes. They do not take into account seat adjustment, normal head movement, and pilot posture. Therefore, the binocular photographs are a?? approximation of the field of view available to the crewmembers. Nevertheless, the Safety Board believes that they provide a valid basis from which a rational analysis of visibility factors can be developed.

Analysis of the radar date plots shows that while the airplane was on the ILS course, the average closure rate between the aircraft was about 71 feet per second and after the right turn onto the base leg the closure rate averaged about 152 feet per second. When the airplane was at the outer marker, the separation between the two aircraft was about 2.2 nautical miles and the airplane's altitude was about 700 feet above that of the helicopter. After the airplane completed the right turn onto the base leg, the separation was about 13 miles and the altitude difference was about 200 feet.

Bell 206B.--Examination of the photographs taken from the pilot's Seat eye reference point of the helicopter indicate that for most of the time that both aircraft were approaching the airport, the airplane target would have been within the binocular vision envelope of the copilot's windshield, until about 15 seconds before the collision when it would have moved into the monocular area of the windshield post and then behind the post immediately before the collision. However, the apparent size of the target at that time should have been large enough that it would not have been completely obscured by the centerpost.

From the copilot's seat eye reference position the airplane target would have been in the upper forward ccrner of the left side window and for most of tne time would have been in the monocular vision envelope or completely obscured by the left windshield post. After the airplane turned to the base leg, it would have become visible in the left monocular area of the copilot's windshield ahead of the windshield post.

From the foregoing it is apparent that the airplane would have been more easily seen by the pilot in the right seat than by the copilot in the left. However, he would have had to have been looking nearly 90° to his left and scanning in that area to observe the airplane. It probsbly would not have Seen large enough or have had sufficient relative motion to be apparent in his peripheral vision until just before the collision. It is likely that if he were flying the helicopter his attention would have been directed toward that task and his scan would have Seen minimal. It is also possible that his scan for traffic was limited to the front and right of his flight path, and that he relied on the copilot to clear the flight path to the left.

If the copilots eyes were at the eye reference point, his view of the target would have been impeded unless he moved his eye position. It is unlikely that his eye position did not move during the flight from the Newark TCA toward Teterboro. However, for the 2 minutes before the airplane's right turn away from the ILS, it was between 70° and 80° to the left of the helicopter flight path and more than 1.5 miles

away. I? is unlikely that the scan of either pilot in the helicopter included that area, or if they did include it, that they gave it as much emphasis as the areas more directly in their flight path.

If they were monitoring the communications of other traffic with the Teterboro local controller, it is possible they could have been misled into believing the airplane was farther away from the airport. and this would not represent a conflict. When the airplane was advised to report the outer marker and to plan a left base leg to land on runway 1, the helicopter crew. who were familiar with the eirport. should have been aware that their inbound flight path would cross the base leg for runway 1. Yet, when 40 seconds later they reported "coming up on the sports complex:' and had not heard a report at the marker, the; may have assumed that the airplane was still outside the marker and that ?hey would cross the base leg before the other aircraft departed the ILS course. They also may have expected an advisory from the controller if the airplane was in potential conflict. In the absence of an advisory, it is not likely that they would have concentrated their scans to the !eft of their flight path. When the airplane reported being on the left base and inside the marker. this should have aierted the helicopter crew to at least scan :he area of the base leg to their left, even though they may have been convinced that they were well ahead of the other aircraft. At that time. the separation was about eight-tenths of a mile and the altitude difference about 100 feet. in order to have seen the airplane a? that point, the helicopter pilot would have had to turn his head to the left. The copilot would have had to look left and move his eyes forward of the eye reference point to view ?he target in the binocular vision area.

PA-34-200T.--The binocular photographs of ?he airplane indicate that from the pilot's eye reference point a large portion of the binocular vision area of the right cabin window is obstructed by the right wing and nacelle. For much of the time that the airplane was inbound on the ILS. the helicopter was hidden behind the right-front windshield post or the nacelle arid wing. During the time when the target was in the unobstructed vision area. it was in the upper-front corner of the window and at ranges of between 2 and 3 miles. The relative motion of the target with respect to the plotted track of the airplane indicates that the eirplane was maneuvering in roll and heading. which would be expected as the pilot intercepted and tracked the ILS localizer course. When cleared for an ILS approach, the pilot probably would have devoted rnos? of his attention inside the cockpit to the task of intercepting and tracking the localizer and glideslope. If so, then his scan outside the airplane probably would have been limited. With the small area of unobstructed vision through the right window. a relatively lengthy and concentrated scan would have been necessary to observe a target in that area, especially at a range of 2 miles or more.

When the right turn onto the base leg was initiated, the helicopter would have been hidden from the airplane pilot's view by the right wing. During the turn, it would have appeared briefly in the upper area of the right forward cabin window and then moved forward out of sight behind the right windshield post. As the airplane progressed on the base leg, the helicopter target would have moved right to left and downward across the right side of the windshield in the binocular vision area and also would have increased in relative size.

From the right-seat eye reference position, about half the binocular vision area of the right window is obstructed by the right wing and nacelle. The helicopter target was positioned generallv just ahead of the right wing leading edge and wing tip until shortly before the airplane's right turn to the base leg, when it moved out of sight behind the right wing. When the turn was started, it would have moved upward in the binocular vision area from behind the wing, and during the turn would have moved forward across the erea.

When the airplane was established on the base leg, the target, relative to the right-seat eye reference point. would have continued to move forward and downward into the monocular vision area of the right windshield post and continued to increase in apparent size. It would have Seen in the binocular area for about 40 seconds and in the monocular area about the last 15 seconds before the collision. Both the pilot and passenger of the airplane stated that they were scanning the area forward and to the right of their flight path for inbound traffic. The passenger stated that he was leaning forward in his seat. looking for traffic ahead and to the right, particularly looking for aircraft inbound from the southeast. At the time the airplane was just west of the collision point, the helicopter would have been to the south of the airplane. If the right-seat occupant were leaning forward scanning to the southeast, his emphasis would have been directed away from the helicopter's actual position. In addition, if the passenger's eyes were positioned forward of the eye reference point, the target most likely would have been hidden by the windshield post.

2.7 Air Traffic Control

The handling of the helicopter by the Newark tower and the airplane by Newark approach control was normal and without incident. During an interview with the local controller the day following the accident, he stated that he did have the airplane in sight, he never had the helicopter in sight, and he never considered that they represented a conflict.

The local controller in the Teterboro tower, who was *the* tower chief, characterized the traffic volume just before the accident as "moderate." The transcripts show that shortly before both the helicopter and the airplane made their initial calls to the Teterboro tower. the controller answered a telephone call and became engaged in a conversation concerning an administrative matter that he would have to deal with as a supervisor. The tape recording and the transcript (see appendix C) clearly show that his attention was diverted from the current traffic situation. During the conversation, both the helicopter and the airplane made their initial calls, neither of which included their position. it is apparent that the controller was distracted, by the way in which he responded to the helicopter to "stand by." Further evidence that he was distracted is the fact that he cleared an aircraft into takeoff position on the runway and then went back to the conversation for another minute. He issued the takeoff clearance for that aircraft only after terminating the telephone conversation. In addition, he did not respond to three other transmissions received while he *was* on the telephone.

The controller acknowledged the airplane's initial call after the telephone call was terminated. about 30 seconds after the transmission. It is probable that, because he would have received a flight data strip on the airplane, he remembered the initial contact and acknowledged. It also seems likely that he forgot the helicopter's initial contact because it occurred when his attention was diverted. This is indicated by his failure after the telephone call to acknowledge that initial contact. He did not speak to the helicopter until it again made an initial call nearly 45 seconds after the end of the telephone conversation. Also, during the telephone conversation. he received an initial call from Lance N1919H, including a position, which he failed to acknowledge until it was repeated 25 seconds efter the end of the telephone conversation.

When the controller acknowledged the accident airplane's initial contact, he requested a report when the airplane was at the outer marker. The correlation of transcript and radar piot show that at that time the airplane was within one-half mile of the marker beacon and should have been receiving the marker beacon signal. However, based on the passenger's statement. the pilot did not have the marker beacon receiver turned on until the controller made the request, which is contrary to normal practice. By

the time the pilot turned it on and was receiving the signal, other transmissions on the radio frequency prevented hirn from reporting a position until he was already on the base leg. Some of these transmissions were from the helicopter and Lance N1919H, which the controller had ignored earlier during his telephone conversation. Thus, it appears that after terminating his telephone conversation, the controller was catching up with the traffic situation which had gotten ahead of hirn. If the airplane pilot had turned on the marker beacon receiver when he began the ILS approach, which is normal procedure, he could have reported his position at the marker when the controller made the request. Further, if the controller had not had to catch up with the missed transmissions, the frequency would not have been so congested and the airplane pilot could have made a more timely report. In any case, in the absence of a report at or near the outer marker, the controller no doubt believed that the airplane was farther out on the ILS than was actually the case. Thus, when the helicopter reported "coming up on the sports complex," which is about 3 miles south of the tower and 2 miles south of the runway 1 threshold, the controller believed that the helicopter was nearer the airport than the airplane and would cross the base leg for runway 1 well ahead of the airplane. When the pilot of the Lance N1919H reported his position as "8 miles out" southwest of the airport. the controller advised that he remain "well clear" of the ILS course because of traffic inbound on the ILS. Although at that time N8110R had already passed the outer marker, the fact that he issued this advisory showed that the controller believed N8110R had not yet reached the marker.

When the helicopter reported "coming up on the sports complex," it was about 1.6 miles south of the stadium, or about 3.6 miles south of thr approach end of runway 1 and nearly 5 miles from the control tower at an altitude of about 700 feet. Considering the relatively small profile presented by the helicopter viewed head-on at 5 miles, and the alternating light and shaded areas due to the scattered clouds despite the reported 25 to 30 miles visibility, it is probable that the controller would not have made visual contact at that distance even with a concentrated visual search. Further, the phrase "coming up on" is sufficiently vague that it can he interpreted lo mean anything from li4 mile to 3 miles. and while it meant one thing to the helicopter pilc', it meant something much different to the controller. He considers "coming up on" to mean about 1/4 mile away from a point when used by helicopter pilots. The Safety Board believes that when reports of this nature are received. it is incumbent on controllers to request a more specific position. The Safety Board also believes that the FAA should emphasize to all pilots the importance and necessity of accurate position reporting. Because of the controiier's interpretation of "coming up on," it is likely that he perceived the helicopter to be nearly a mile nearer the airport than was sctually the case. Although the controller never observed the helicopter. and so advised its crew, he believed the airplane was still outside the outer marker, and he interpreted the helicopter's reported position to *be* nearly over the stadium. He then concluded that there was no conflict and no need to issue a traffic advisory to either aircraft. Therefore, because of a relatively vague position report from the helicopter, the absence of a timely position report from the airplane, and the earlier distraction of the controller by an administrative chore, the Safety Board conciudes that the controller had an erroneous perception of the relative positions of the two aircraft and therefore did not consider them to be in potential conflirt.

Although the helicopter was no? precisely following the inbound route "Whiskey" from the southwest as defined by Letter to Airmen 81-?. it was less than 1/2 mile east of the track. The Safety Board does not consider this to be a factor in the accident since even if the helicopter had Seen on the track. ?here would have existed a potential conflict between the two aircraf:. The route for helicopters inbound from the south and southeast, designated "Sierra," completely avoids the traffic flow for runway 1.

The Safety Board believes that if this route had Seen emphasized in the Letter to Airmen as the route for all helicopters inbound from the southwest thro gh southeast, the potential for conflicts such as occurred in this accident would have bee minimized.

The investigation revealed that although the RRITE radar display had been in the Teterboro tower over 1 1/2 years, no personnel were certified in its use, but it was referred *to* occasionally. Although it was available and turned *on* at the time of the accident. it was not being used by the controller. The Safety Board concludes that if **the** controller had been certified to use the BRITE display and had used it to rapidly update himself on the traffic situation followinp the distraction of the telephone call, he might have perceived the developing conflict and issued an appropriate advisory.

Because the Teterhoro tower had been understaffed even before the controller's strike. the tower chief had regularly worked in the different control positions on a regular basis and was therefore qualified and current as a controller. However, the need to perform administrative functions in his role as facility chief without bsckup supervisory capability in this instance led to his distraction from the control of traffic. The Safety Board concludes that the controller did not assign proper priorities to the requirements of his position as defined by paragraph 22 of the Air Traffic Control Handbook. The subject of the telephone call was not urgent and should have beer, put off until a time when traffic was light or until the controller could have been relieved at the position by other qualified personnel.

3. CONCLUSIONS

3.1 Findings

1. The crewmembers of each aircraft were properly certificated and qualified for the flight.

2. The aircraft were certificated and maintained in accordance with **FAA** requirements.

3. There were no atmospheric restrictions which would have prevented the occupants of each aircraft *from* seeing the other.

4. Each pilot had the responsibility to see and avoid the other.

5. The pilot and passenger of the airplane concentrated their traffic search in en arc.? ahead and to the right of the flight path.

6. The helicopter could have been hidden temporarily from the airplane pilot's view by the riph! windshield post.

7. Each aircraft would have been visible to the crew of the other and could have been seen in time to avoid the collision.

8. Both air—eft were operating in the control zone in accordance with established ATC procedures. except the airplane pilot initially did not have the marker beacon receiver on for the ILS approach.

9. Th FAA did not provide training *in* the use of BRITE radar; therefore, the controller was neither trained nor qualified in its use and he did not use the BRITE radar as an aid.

10. The eontroller did not issue a safety advisory to either aircraft with respect *to* the other.

11. Both aircraft were in radio contact with the local controller.

12. The local controller was distracted from the traffic situation for over 2 minutes by a telephone call concerning administrative matters.

13. The controller initially disregarded several radio communications which led to **a** busy radio frequency and further delayed **a** position report from the airplane.

14. The absence of a procedure to provide qualified personnel for assistance when supervisory duties interfere with control of traffic allowed the telephone call ***to*** be a distraction.

15. The angle of collision was about 45°, with the helicopter in a 45° right bank and the airplane descending in straight flight.

16. The center of rotation of the helicopter main rotor disk was about 10 feet below the airplane's fuselage.

Probable *Cause*

The National Transportation Safety Roard determines that the probable cause of this accident was the failure of each flightcrew to see and avoid the other aircraft and the failure of the local controller *to* perceive the traffic conflict **due** to the controller's preoccupation with a nonessential administrative telephone call. Contributing to the accident was ***a*** delayed position report from the airplane pilot due to his failure to activate his marker beacon receiver and to controller-induced congestion on the radio frequencv and an inaccurate position report from the helicopter pilot. The failure of the Federal Aviation Administration to train and qualify tower personnel in the use of the **BRITE** radar display was also a factor.

4. RECOMMENDATIONS

As a result of this accident the National Transportation Safety Roard made the following recommendations:

--to the Federal Aviation Administration:

Through pilot training and examination programs, emphasize to pilots the importance of accurate position reporting in communications with air traffic control facilities. (Class II, Priority Action) (A-82-58)

Revise the helicopter routes contained in the Teterboro Letter to Airmen **81-2** to provide improved separation and thereby minimize the potential for conflicts between helicopters and fiued-wing aircraft traffic. (Class II, Priority Action) **(A-82-59)**

Provide **all** pertinent personnel working traffic at BRITE-equipped, nonradar control towers with the proper training and certification regarding the use of that equipment. (Class II, Priority Action) **(A-82-50)**

--to the Aircraft Owners and Pilots Association, the Naticnal Association of Flight Instructors, the Commuter Airline Association of America, the Helicopter Association International, and the National Business Aircraft Association, inc.:

> Through appropriate educational programs and communications, emphasize to pilots the importance of accurate position reporting in communications with air traffic control facilities. (Class II, Priority Action) (A-82-61)

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

/s/ JIM BURNETT
Chairman

/s/ PATRICIA A. GOLDMAN
Vice Chairman

/s/ FRANCIS H. McADAMS
Members

/s/ G. H. PATRICK BURSLEY
Member

May 18, 1982

5. APPENDIXES

APPENDIX A

INVESTIGATION

1. Investigation

The Safety Board was notified of the accident about **0930** on September **23,** 1981, by the FAA's Washington Command Center. An investigator was dispatched immediately to the accident site from the Board's New **York** Field Office. An investigation team was dispatched from the Board's Washington headquarters with operations, air traffic control, and structures groups.

Parties to the investigation included the Federal Aviation Administration, Seminole Air Charter, and Ronson Aviation.

2. Public hearing

There was no public hearing.

APPENDIX B

PERSONNEL INFORMATION

N27670

Captsin John D. Flewitt, 38, held Commercial Pilot Certificate 'io. 2044183 issued on November 13, 1971. He also held ASEL, AMEL, instrument rotorcraft/helicopter, and instructor rotorcraft/helicopter privileges. His First Class Medical Certificate with no restrictions was issued on January 29, 1981. He had accumulated about 6,700 flving hours, 6,200 of which were in helicopters. He had accrued about 1,200 flying hours in the Bell 206B as of January 1977. He was administered and passed a proficiency check in the Bell 206B on July 28, 1981.

First Officer Mark J. Reynolds. 24. held Commercial Pilot Certificate No. 119.509261 issued on August 23, 1979. He also held privileges for ASEL, rotorcraft helicopter, and instrument helicopter. He was restricted from carrying passengers, in airplanes for hire. at night on cross-country flights of more than 50 nautical miles. His Second Class Medical Certificate with no restrictions was issued on July 7. 1981. He had accumulated about 1,602 hours of flying time. 1,532 of which were in helicopters. His total time in the Bell 206B was 302 flying hours. His last proficiency check in the Bell 206B was administered on March 19, 1981.

N8110R

Captain Donald A. Kirby. 43, held Airline Transport Pilot Certificate No. 1351210 issued on December 22. 1977. He held an AMEL rating with commercial privileges ASEL. He had accumulated about 3,100 hours of flying time. 50 hours of which were in the PA-34. He was administered a proficiency check in the PA-34 on July 7. 1981.

His First Class Medical Certificate was issued on January 13, 1981, with the restriction that "the holder shall wear corrective lens while exercising the privileges of his airman's certificate." He was qualified to use an autopiot in lieu of a second pilot as authorized in FAR 135.105 and 135.297(g). The aircraft was equipped with an operating King KFC 200 Autopilot System.

Tower

Richard F. Kellenberger was the chief of the air traffic control facility et the Teterhoro Airport tower and also the local controller. He began his career as a controller on February 14, 1955. at New York Center, after serving as a rontroller for 3 1/2 years in the Air Force. In November 1966, he went to the Newark, New Jersey, tower. In April 1970, he went to the Westchester, New York, tower as assistant chief. In January 1977, he became chief of Caldwell tower, and in January 1980 became chief of Tcterboro tower. He had no pilot certificates or ratings.

At the time of the accident, the most recent medical certificate held by the tower chief was issued in December 1979. The dav after the accident, a new Second Class Medical Certificate was issued with the notation, "Must have glasses in possession for close vision." He stated that, at the time of the accident he had his glasses in his shirt pocket.

APPENDIX C

TOWER COMMUNICATIONS TRANSCRIPT

Sources of Transmissions	Abbreviations
Teterboro Tower on telephone	TEBT
Teterboro Tower	TER
Piper Seneca N8110R	N8110R
Bell Jet Ranger N27670	N670
Airways Facility on telephone	AFT
N62BW (type unknown)	N62BW
N76F (type unknown)	N76F
N35805 (type unknown)	N35805
Lear Jet N294NW	N294NW
Piper Lance N1919H	N1919H
Helicopter N9YC	N9YC
Beeehcraft Sundowner N6718T	NE718T
N3410A (type unknown)	N3410A
Port Authority One (helicopter)	PA-1
Helicopter N710	N710
N10AP (type unknown)	N10AP
Beechcraft KingAir N1VP	N1VP
N1212H (type unknown)	N1212H

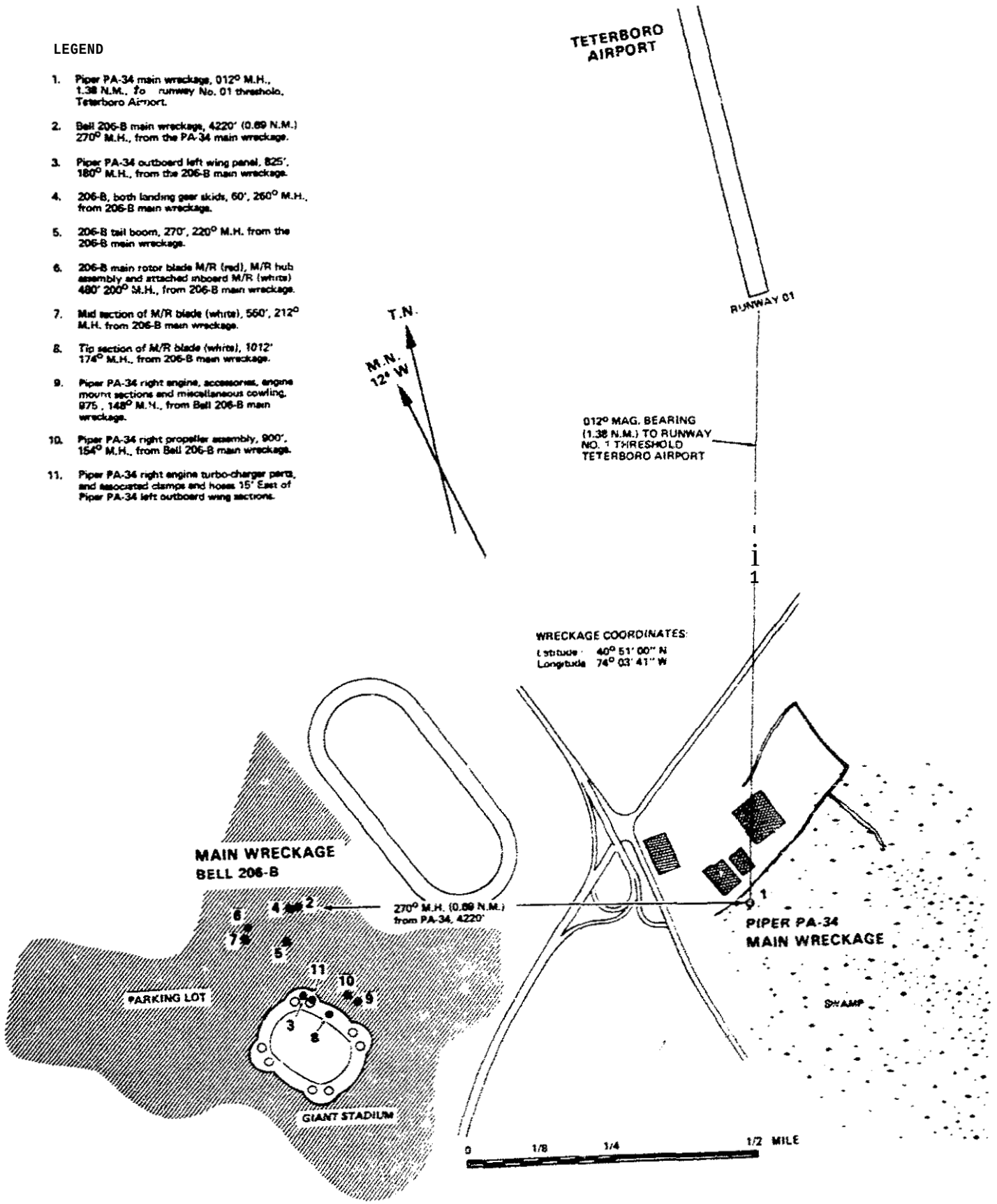
0844:42	TEBT	I don't know it was about, ah, saying back in June sometime now he did this.
0844:48	N35805	Tower eight oh five is going to cancel and go VFR.
0844:50	TEB	Eight oh five Roger taxi in position and hold.
0844:52	N35805	Position and hold eight oh five.
0844:55	TEBT	an he filed a claim the exact dates I don't know.
0844:57	N670	Teterboro helicopter six seventy.
0845:00	AFT	Yeah okay, couple of months ago.
0845:01	TEB	ah and ah helicopter stand by.
0845:05	TERT	and he a couple of months ago no it wasn't a couple of months ago it was less than a month ago.
0845:10	AFT	oh.
0845:11	N35805	Eight oh five be using full length.
0845:11	TEBT	ah forty five fifty davs sixty days after the alleged accident.
0845:15	AFT	oh.

0845:16	TEBT	No report the alleged accident was made to anybody.
0845:18	AFT	oh ump.
0845:22	TEBT	and ah hell I don't know what days even I have the dates downstairs.
0845:22	N8110R	ah Teterboro Tower Seneca eight one one zero Romeo with you.
0845:25	AFT	oh okay.
0845:27	AFT	You know more about it than I do I know nothing.
0845:29	TEBT	That's about all I know.
0845:30	AFT	Yeah.
0845:30	TEBT	I put it that no report of the accident was made to me at anytime until this date.
0845:35	AFT	oh okay.
0845:35	N1919H	Teterboro Tower Lance one niner one niner Hotel ah ten out on your two five zero radial two five five radial landing with Bravo.
0845:37	TEBT	Or injuries I have it downstairs if you need the data sometimes.
0845:40	AFT	He wants to call me and ask me for a statement I don't know what the hell he's talking about.
0845:41	TEBT	Okay, I've got, I'm getting busy.
0845:42	AFT	I know I know.
0845:43	TEBT	Okay goodbye.
0845:44	AFT	Right.
0845:48	TEB	ah okay eight oh five cleared for takeoff.
0845:51	N35805	Eight oh five is cleared for takeoff.
0845:56	TEB	Eight one one zero Romeo report the outer marker it will be a left base for runway one.
0846:01	N8110R	Roger.
0846:03	N1919H	Tower Lance one niner one niner Hotel.
0846:07	TEE	Over the meadow land say again.

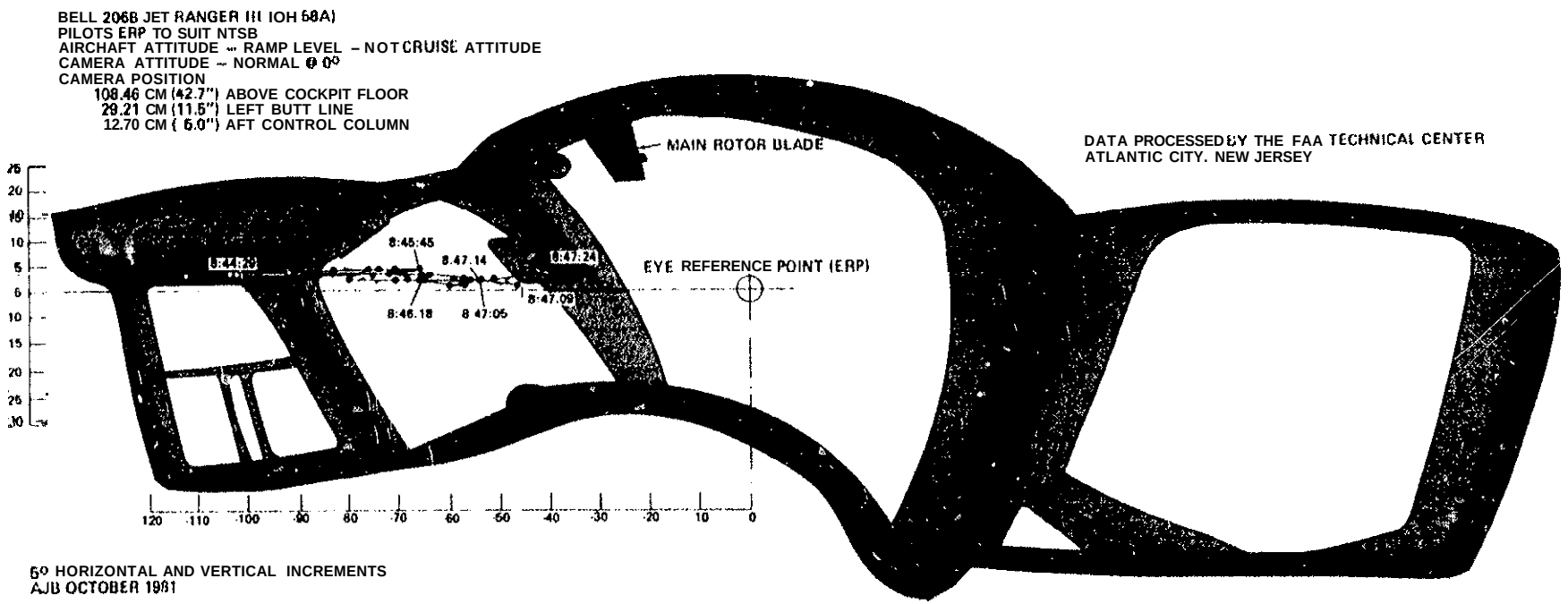
0846:09	N1919H	ah Lance one niner one niner Hotel is eight out on your two five five radial landing with Bravo.
0846:15	TEB	Lance one niner Hotel Teterboro Tower remain well clear, well west of the ILS course we have traffic inbound on the ILS proceed over the airport for right traffic report over the field.
0846:25	N1919H	One niner Hotel.
0846:27	N670	Teterboro helicopter six seventy.
0846:29	TEB	Helicopter six seventy Teterboro.
0846:31	N670	Coming up on the sports complex for **Aero** Services.
0846:34	TEB	Six seventy ah okay report about a mile south I don't have you in sight.
0846:40	N670	Six seventy.
0846:40	N9YC	Teterboro copter nine Yankee Charlie.
0846:42	TEB	Yankee Charlie go ahead.
0846:43	N9YC	tunnel inbound sir for heliflight.
0846:47	TEB	Nine Yankee Charlie roger ah report George's for the south complex wind *ah* ail aircraft wind three four zero at two zero altimeter two nine nine five.
0846:57	N6718T	Teterboro Tower Sundowner six seven one eight Tango ready for takeoff.
0847:02	TEB	One eight Tango Teterboro Tower cleared for takeoff.
0847:06	N6718T	One eight Tango.
0847:08	N8110R	ah one zero Romero inside the marker ah left base for one.
0847:12	TEB	One zero Tango in sight continue traffic departing.
0847:16	N8110R	a one zero Romeo.
0847:31	N3410A	Three four one zero Aipha we're holding short.
0847:34		(unintelligible)
0847:37		(unintelligible)

APPENDIX D

WRECKAGE DISTRIBUTION CHART

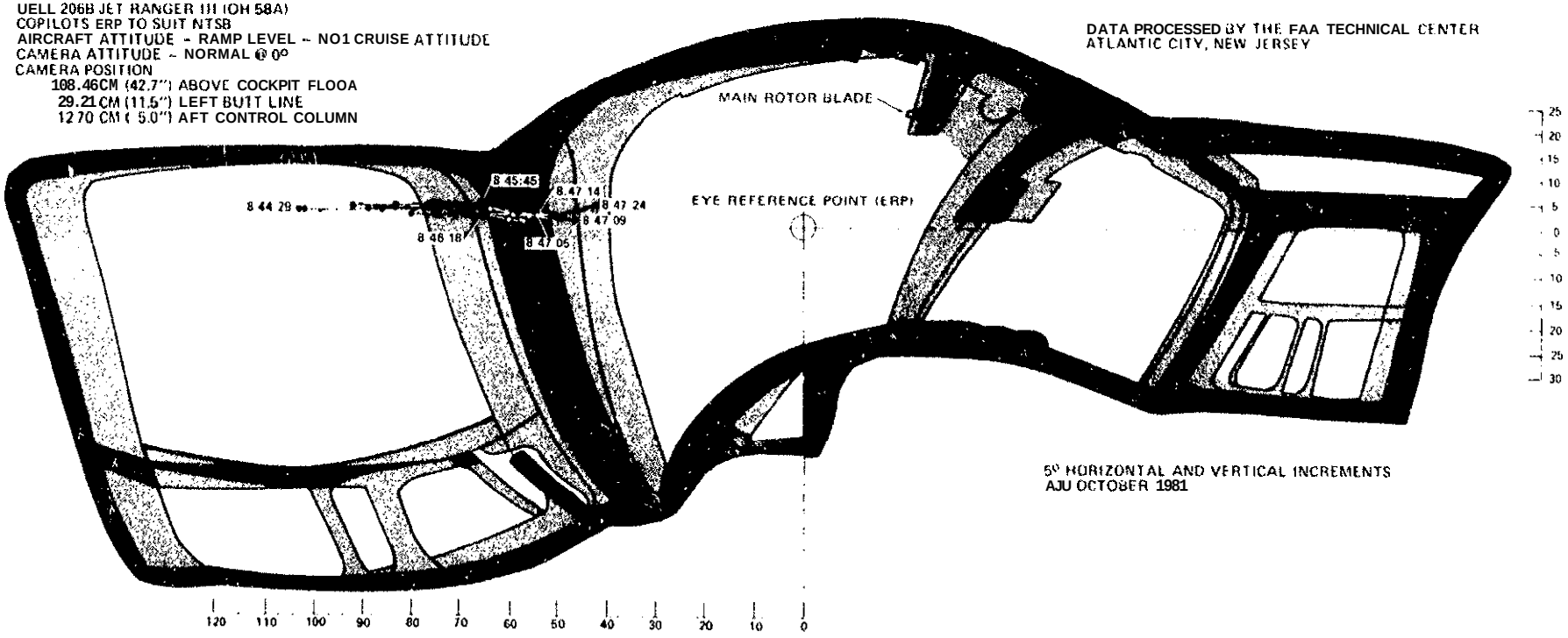


BINOCULAR PHOTOGRAPHS



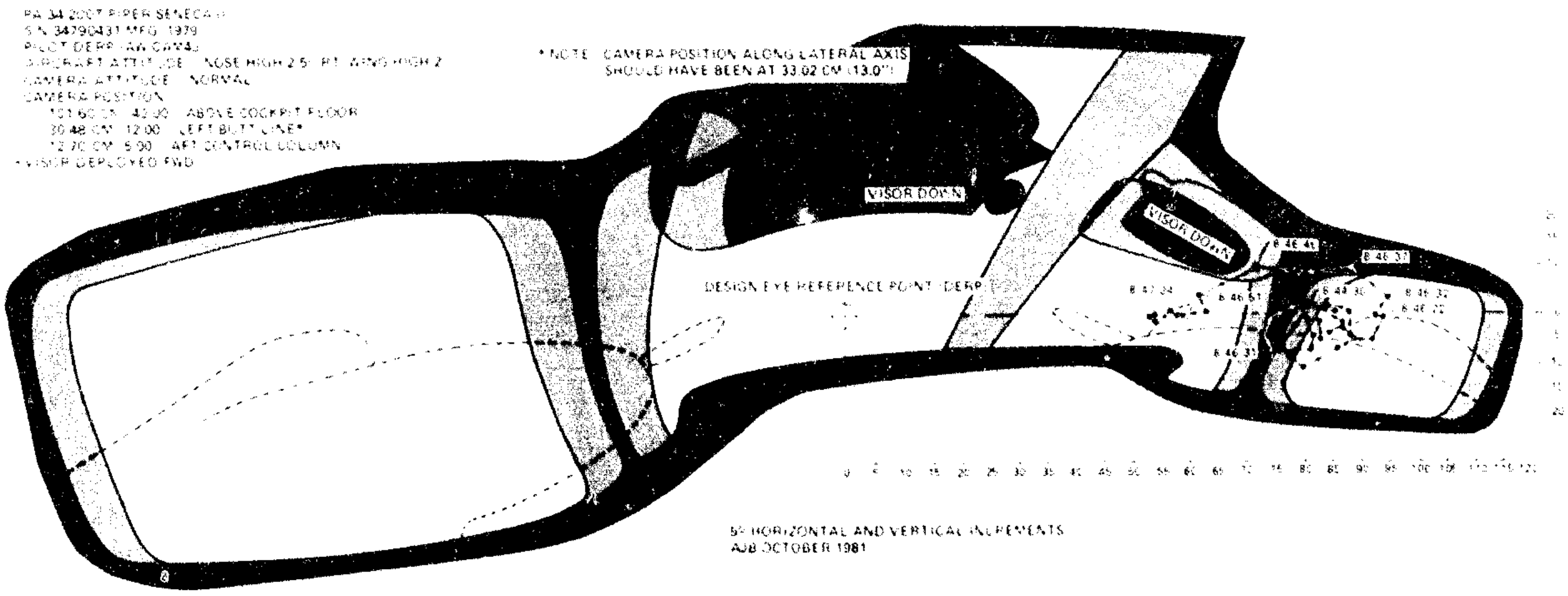
APPENDIX E

BINOCULAR PHOTOGRAPHS



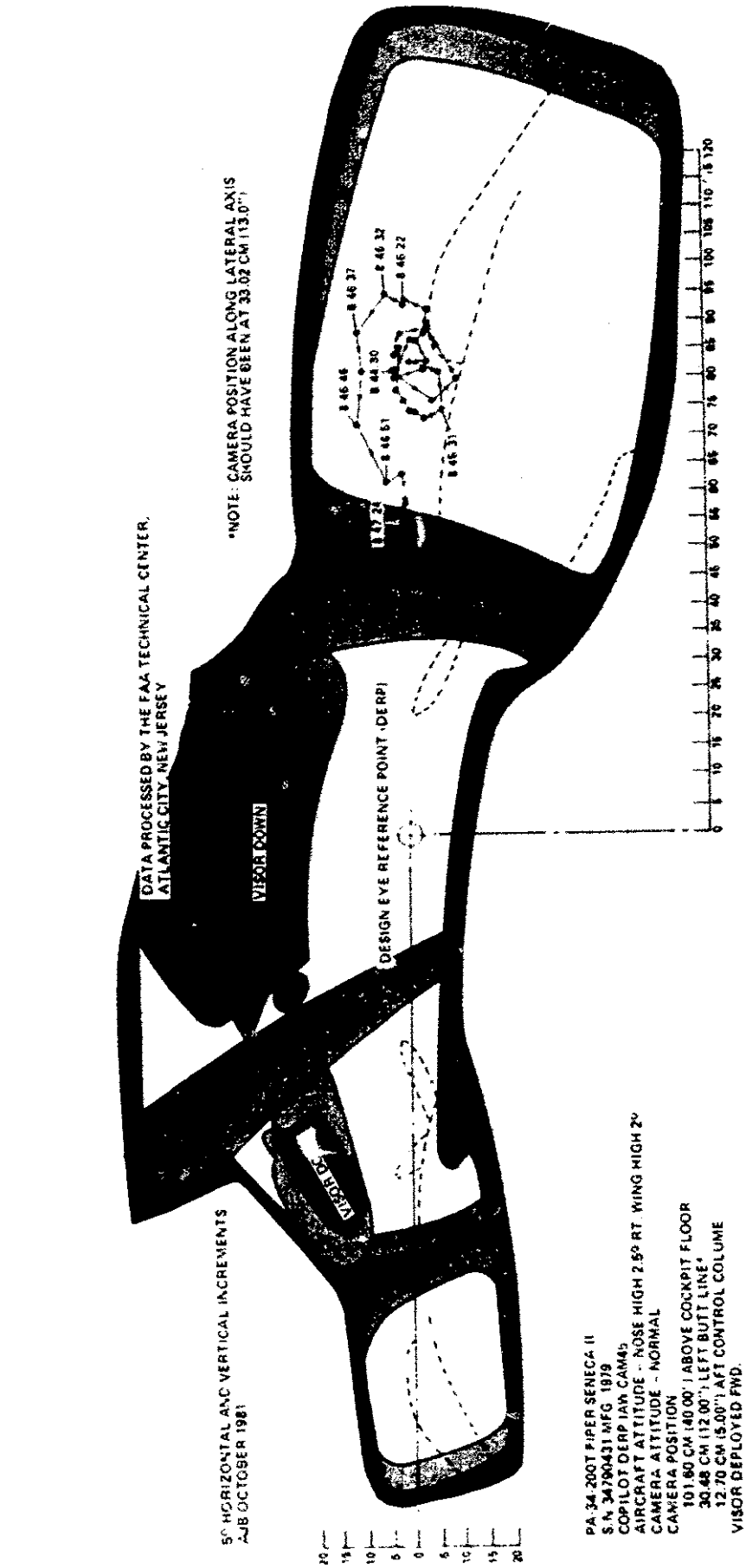
APPENDIX E

BINOCULAR PHOTOGRAPHS



APPENDIX E

BINOCULAR PHOTOGRAPHS



APPENDIX F

TETERBORO TOWER
LETTER TO AIRMEN 81-2

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

AIRPORT TRAFFIC CONTROL TOWER
TETERBORO AIRPORT
TETERBORO, NJ 07608

ISSUED: APRIL 1, 1981 EFFECTIVE: APRIL 15, 1981

TETERBORO TOWER LETTER TO AIRMEN 81-2

SUBJECT: HELICOPTER PROCEDURES

CANCELLATION DATE: APRIL 14, 1983

This letter cancels Teterboro Tower Letter to Airmen 77-1.

The purpose of this letter is to re-define the helicopter routes for traffic operating to and from Teterboro Airport. These routes have helped to reduce the noise complaints associated with helicopter operations and have assisted the tower in providing more efficient service. All helicopters are to observe and avoid fixed-wing traffic either airborne or taxiing. Helicopter operators are expected to identify the route by the associated phonetic letter. i.e. November, Echo, Sierra or Whiskey, and maintain any safe altitude of 1000 feet MSL or below along the route.

ROUTES

NOVEMBER (Northwest thru North)

Arrival: Via Alexanders/Garden State Plaza south along Route 17 to Interstate 80, east along Route 80 until between the extended centerlines of runways 19 & 24, then south to the airport.

DEPARTURE: Outbound between the extended centeriincs of runways 19 & 24 to Interstate 80, west along Route 80 to Route 17, north alono Route 17 to Garden State Plaza/Alexanders, then on course.

EAST (Northeast thru East)

Arrivai: Via George Washington Bridge to Interstate 80; south and west along Route 80 until between the centerlines of wunways 19 & 24, then south to the airport.

Departure: Outbound between the extended centerlines of runway 19 & 24, to Interstate 80, east and north along Route 80 to the Georne Washington Bridge, then on course. '(Contact LaGuardia Tower on 126.05 mHz or 263.G mHz prior to proceedins east of the Hudson River within 6 nautical miles *of* Latuardia Airport).

SIERRA [Southeast thru South)

Arrival: Via intersection Route 3/ NJ Turnpike East, north along NJ Turnpike to the twin white tanks, direct Georoe's Restuarant direct the airport.

Departure: Outbound direct teorqe's Restuarant, direct the twin white tanks, south alonc NJ Turnpike East to the intersection of Route 3, then on course.

WHISKEY (Southwest thru West)

Arrival: Via intersection of Route 3/Garden State Parkway, east alonq Route 3 to Berry's Creel, Bridqe, then direct the airport between the extended centerlines of runways 1 & 6.

Departure: Outbound between the extended centerlines of runways 1 & 6 to Route 3, west alonq Route 3 to the intersection of the Ga-der, State Parkway, then on course.

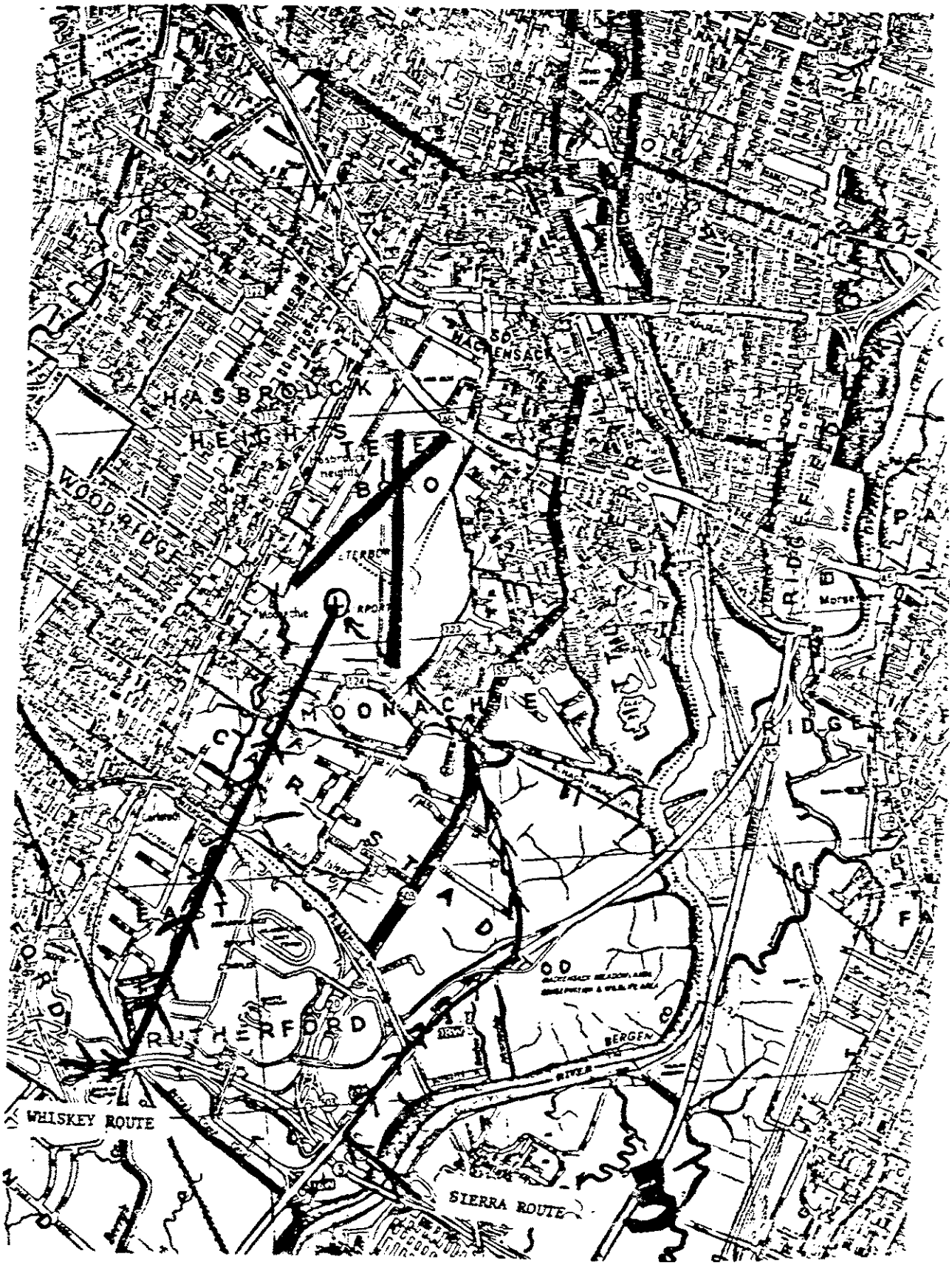
Pilots are requested to avoid flying over Giant Stadium and the Meadowlands R Racetrack when they are in use.

Deviation from the established routes is authorized at an altitude of 1000 feet MSL or higher. Deviation from established routes durinq IFR conditions shall be obtained from the tower.

Your cooperation in using the routes described herein will enable us to continue to be a "aood neighbor" to the surrounding communities, as well as provide you with efficient service.

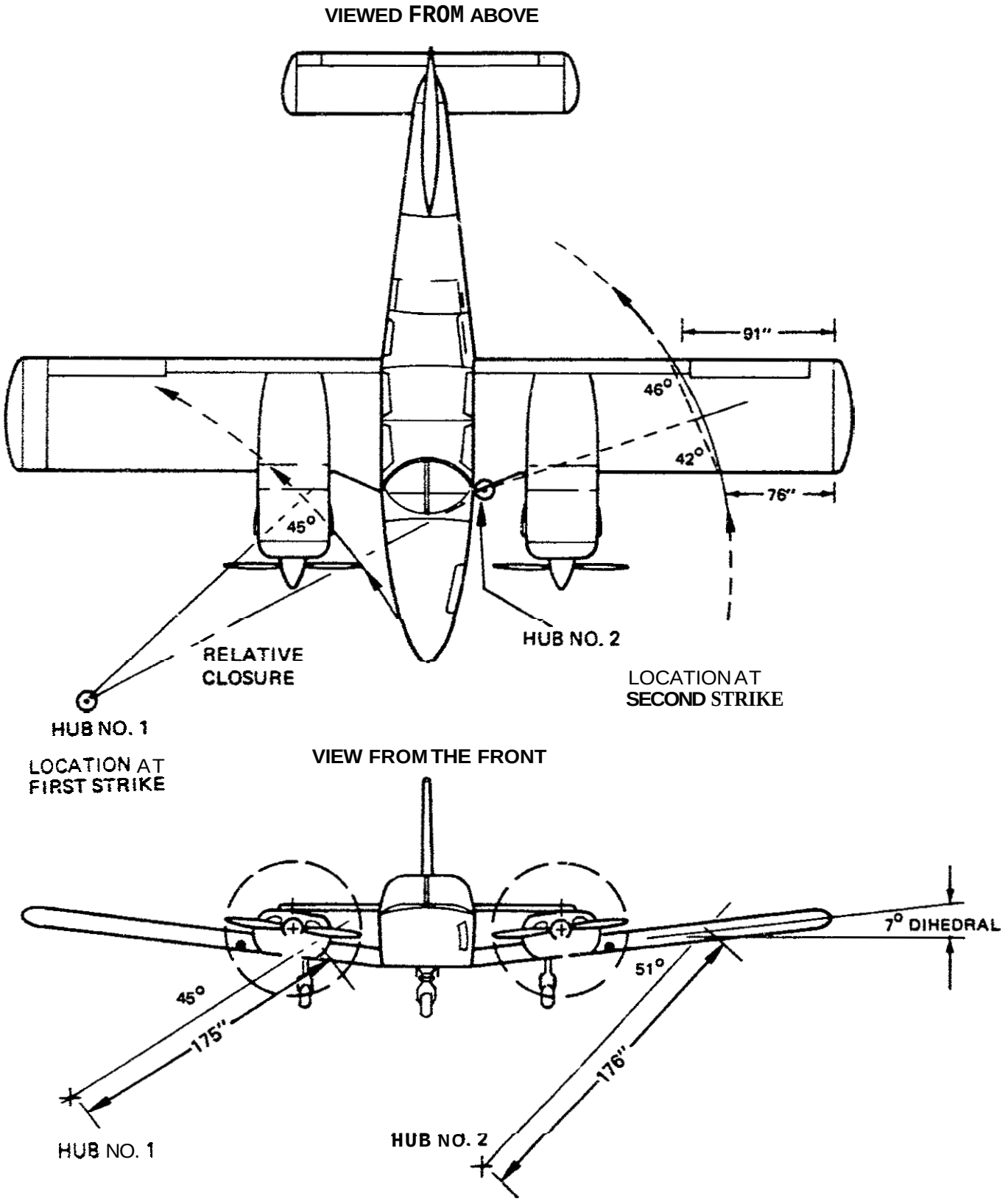
Richard Kelzenberger
Chief, Teterboro Tower

APPENDIX F


HASBROUCK HEIGHTS
WOOD RIDGE
MOONACHIE
CARLSTADT
RUTHERFORD
WHISKEY ROUTE
SIERRA ROUTE

APPENDIX G

COLLISION DIAGRAM



* U S GOVERNMENT PRINTING OFFICE 1982 361-828/322

LEGEND:

1. Piper PA-34 main wreckage, 012° M.H., 1.38 N.M;, from runway No. 01 threshold, Teterboro Airport.
2. Bell 206-B main wreckage, 4220' (0.69 N.M.) 270° M.H., from the PA-34 main wreckage.
3. Piper PA-34 outboard left wing panel, 825', 180° M.H., from the 206-B main wreckage.
4. 206-B, both landing gear skids, 60', 206° M.H. from 206-B main wreckage.
5. 206-B tail boom, 270', M.H. from the 206-B Main Wreckage.
6. 206-B main rotor blade M/R (red, M/R hub assembly and attached inboard M/R (white) 480', 200° M.H. from 206-B main wreckage.
7. Mid section of M/R blade (white), 550', 212° M.H. from 206-B main wreckage.
8. Tip section of M/R blade (white), 1012', 174°, M.H., from 206-B main wreckage.
9. Piper PA-34 right engine, accessories, engine mount sections and miscellaneous cowling, 975', 148° M.H. from Bell 206-B main wreckage.
10. Piper PA-34 right propeller assembly, 900', 154° M.H., from Bell 206-B main wreckage.
11. Piper PA-34 right engine turbo-charge parts, and associated clamps and hoses 15' east of Piper PA-34 left outboard wing sections.
12. Piper PA-34 right engine ground impact point.

▲ Bell 206 (radar position data)

● PA-34 (radar position data)

■ PA-34 Projected position data derived from radar return recorded at 12:47:18 and 12 47 24.

Collision area

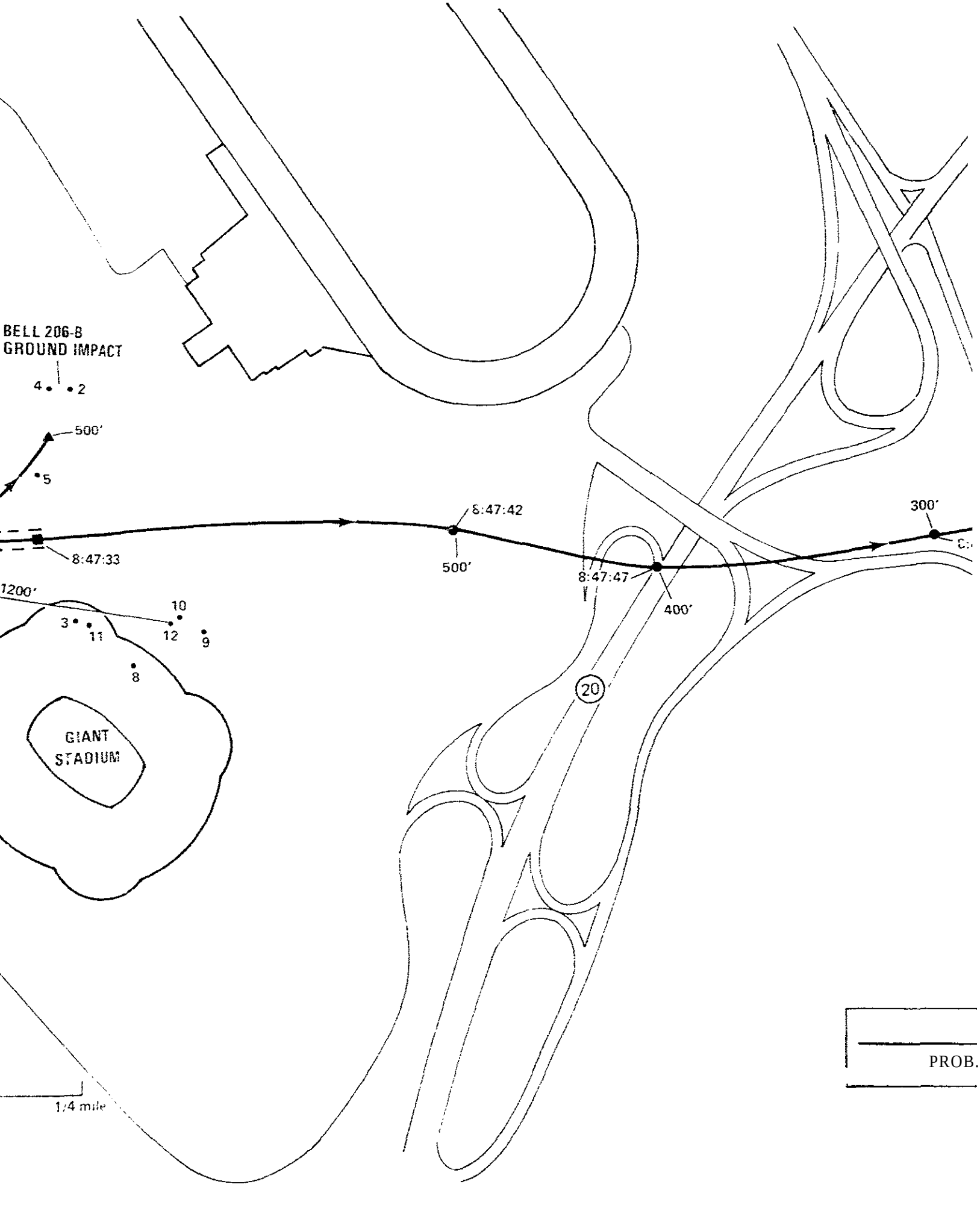
BELL 206-B GROUND IMPACT

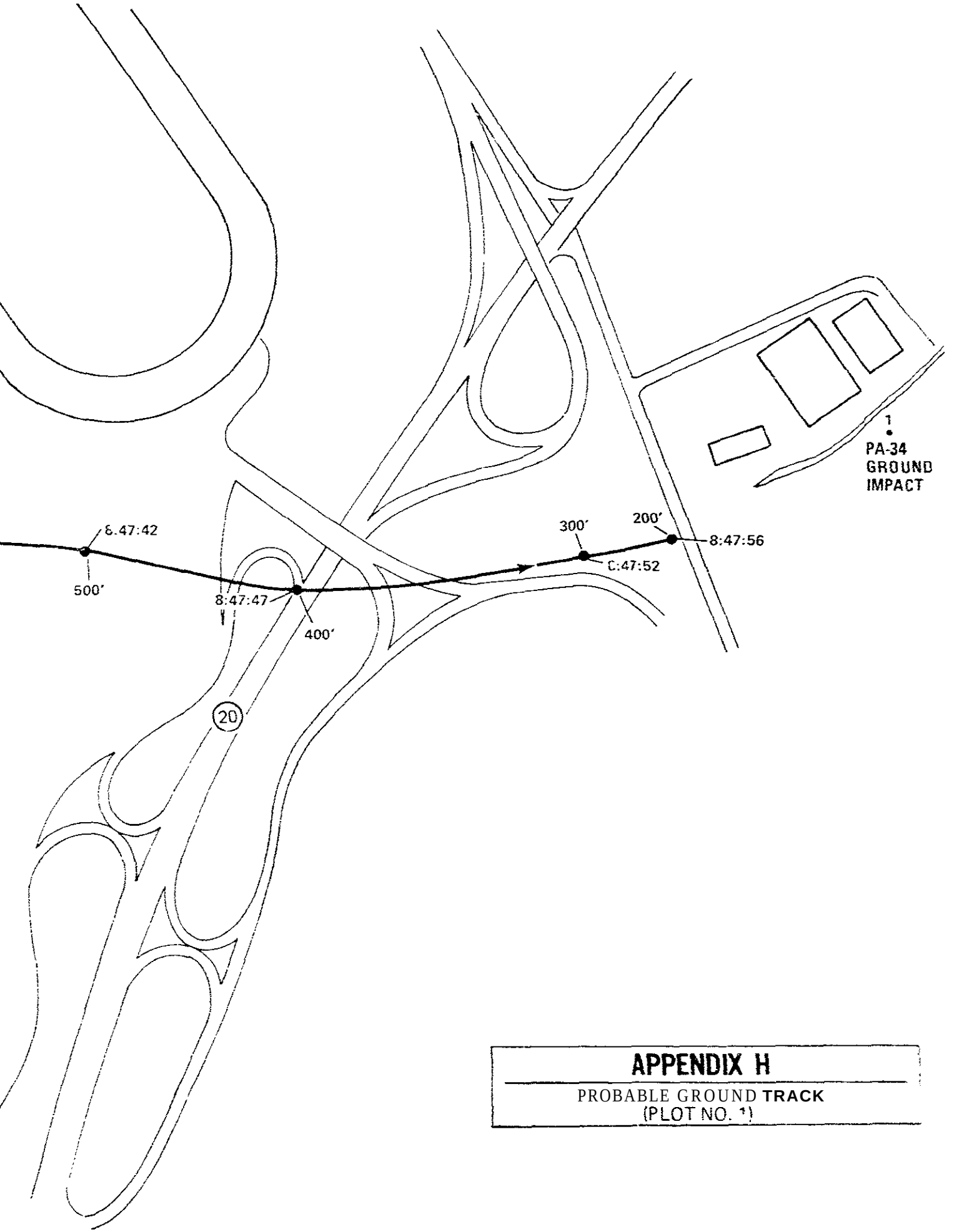
800'
8:47:18
700'
8:47:24
PA-34
8:47:28
8:47:28
8:47:29.6
800'
500'
8:47:33
8:47:28
1200'
BELL 206-B
8:47:24
600'
8:47:18
700'

Note. All times are derived from radar data.

GIANT STADIUM

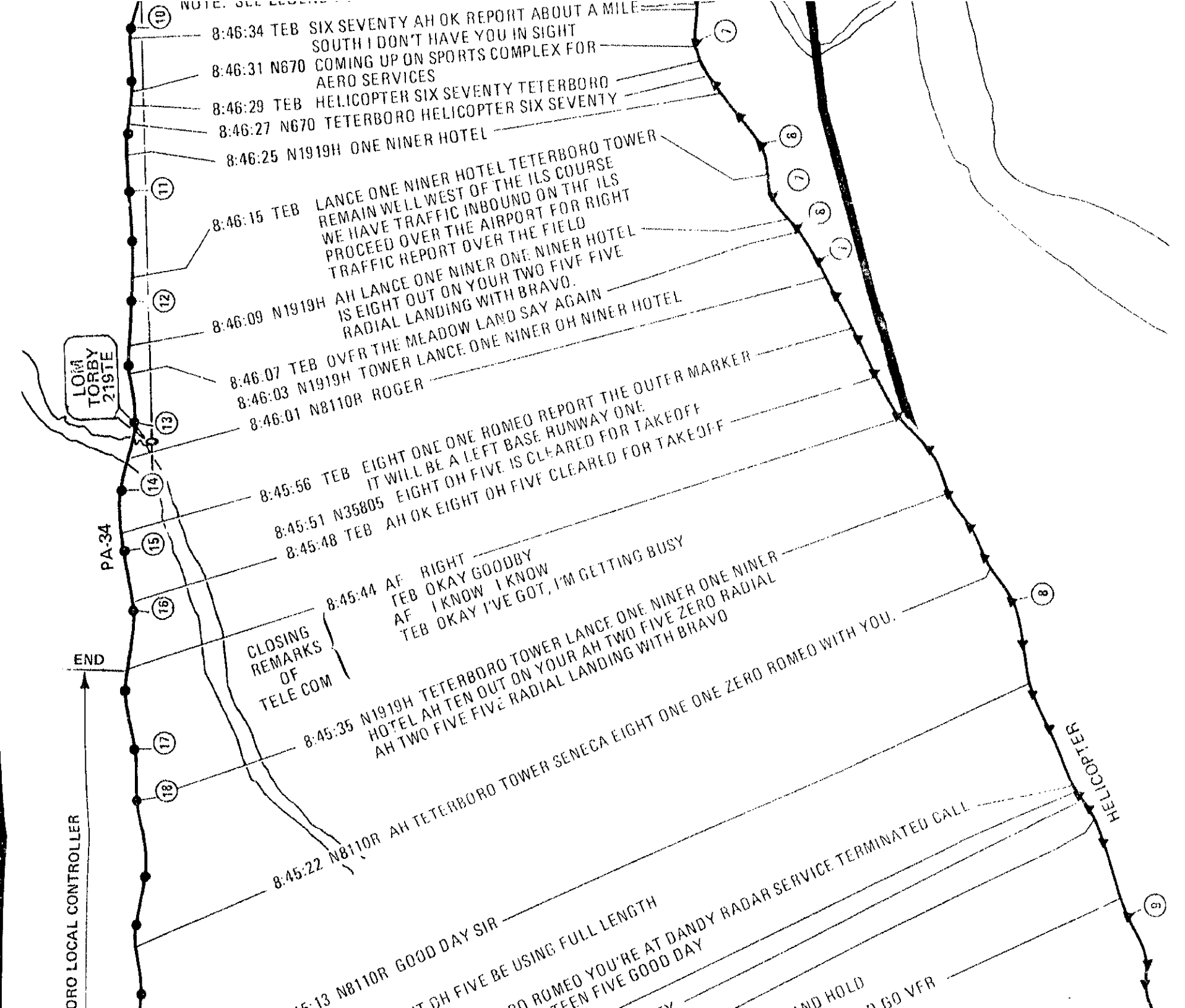
SCALE
0 1/8 1/4 mile

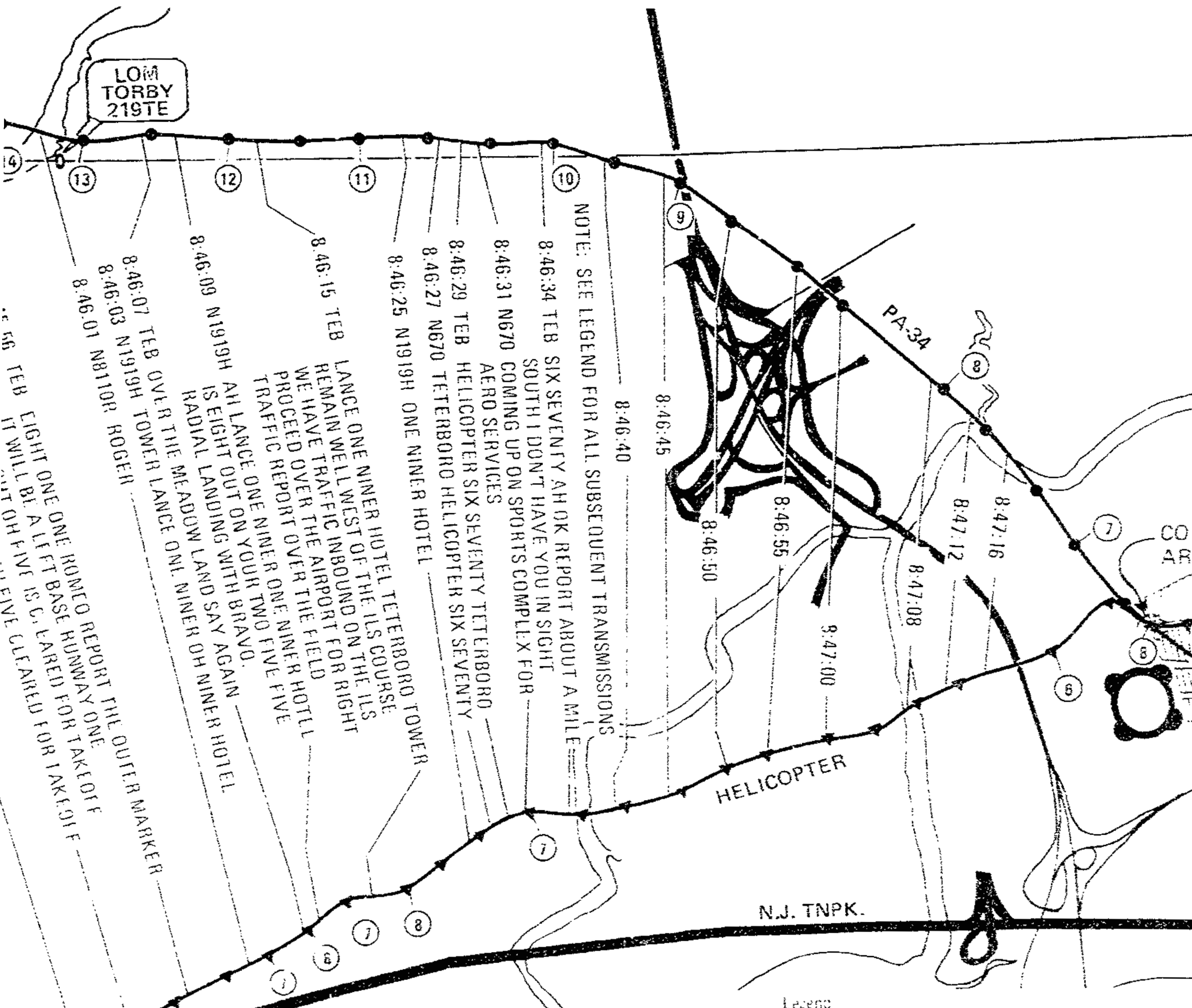

BELL 206-B
GROUND IMPACT
4
2
500'
5
8:47:33
8:47:42
500'
8:47:47
400'
300'
1200'
10
3
11
12
9
8
GIANT
STADIUM
20
1/4 mile
PROB.



APPENDIX H

PROBABLE GROUND **TRACK**
(PLOT NO. 1)


8:46:34 TEB SIX SEVENTY AH OK REPORT ABOUT A MILE SOUTH I DON'T HAVE YOU IN SIGHT
8:46:31 N670 COMING UP ON SPORTS COMPLEX FOR AERO SERVICES
8:46:29 TEB HELICOPTER SIX SEVENTY TETERBORO
8:46:27 N670 TETERBORO HELICOPTER SIX SEVENTY
8:46:25 N1919H ONE NINER HOTEL
8:46:15 TEB LANCE ONE NINER HOTEL TETERBORO TOWER REMAIN WELL WEST OF THE ILS COURSE WE HAVE TRAFFIC INBOUND ON THE ILS PROCEED OVER THE AIRPORT FOR RIGHT TRAFFIC REPORT OVER THE FIELD
8:46:09 N1919H AH LANCE ONE NINER ONE NINER HOTEL IS EIGHT OUT ON YOUR TWO FIVE FIVE RADIAL LANDING WITH BRAVO.
8:46:07 TEB OVER THE MEADOW LAND SAY AGAIN
8:46:03 N1919H TOWER LANCE ONE NINER OH NINER HOTEL
8:46:01 N8110R ROGER
LOM TORBY 219TE
8:45:56 TEB EIGHT ONE ONE ROMEO REPORT THE OUTER MARKER
8:45:51 N35805 IT WILL BE A LEFT BASE RUNWAY ONE EIGHT OH FIVE IS CLEARED FOR TAKEOFF
8:45:48 TEB AH OK EIGHT OH FIVE CLEARED FOR TAKEOFF
PA-34
8:45:44 AF RIGHT
TEB OKAY GOODBY
AF I KNOW I KNOW
TEB OKAY I'VE GOT, I'M GETTING BUSY
CLOSING REMARKS OF TELE COM
END
8:45:35 N1919H TETERBORO TOWER LANCE ONE NINER ONE NINER HOTEL AH TEN OUT ON YOUR AH TWO FIVE ZERO RADIAL AH TWO FIVE FIVE RADIAL LANDING WITH BRAVO
8:45:22 N8110R AH TETERBORO TOWER SENECA EIGHT ONE ONE ZERO ROMEO WITH YOU.
HELICOPTER
ORO LOCAL CONTROLLER
:13 N8110R GOOD DAY SIR
CH FIVE BE USING FULL LENGTH
O ROMEO YOU'RE AT DANDY RADAR SERVICE TERMINATED CALL
EN FIVE GOOD DAY
AND HOLD
GO VFR



Legend

AF - AIRWAY FACILITY

TEB - TETERBORO TOWER

SNAPY O R - NEWARK SNAPY RADAR ARRIVAL (INTERPHONE)

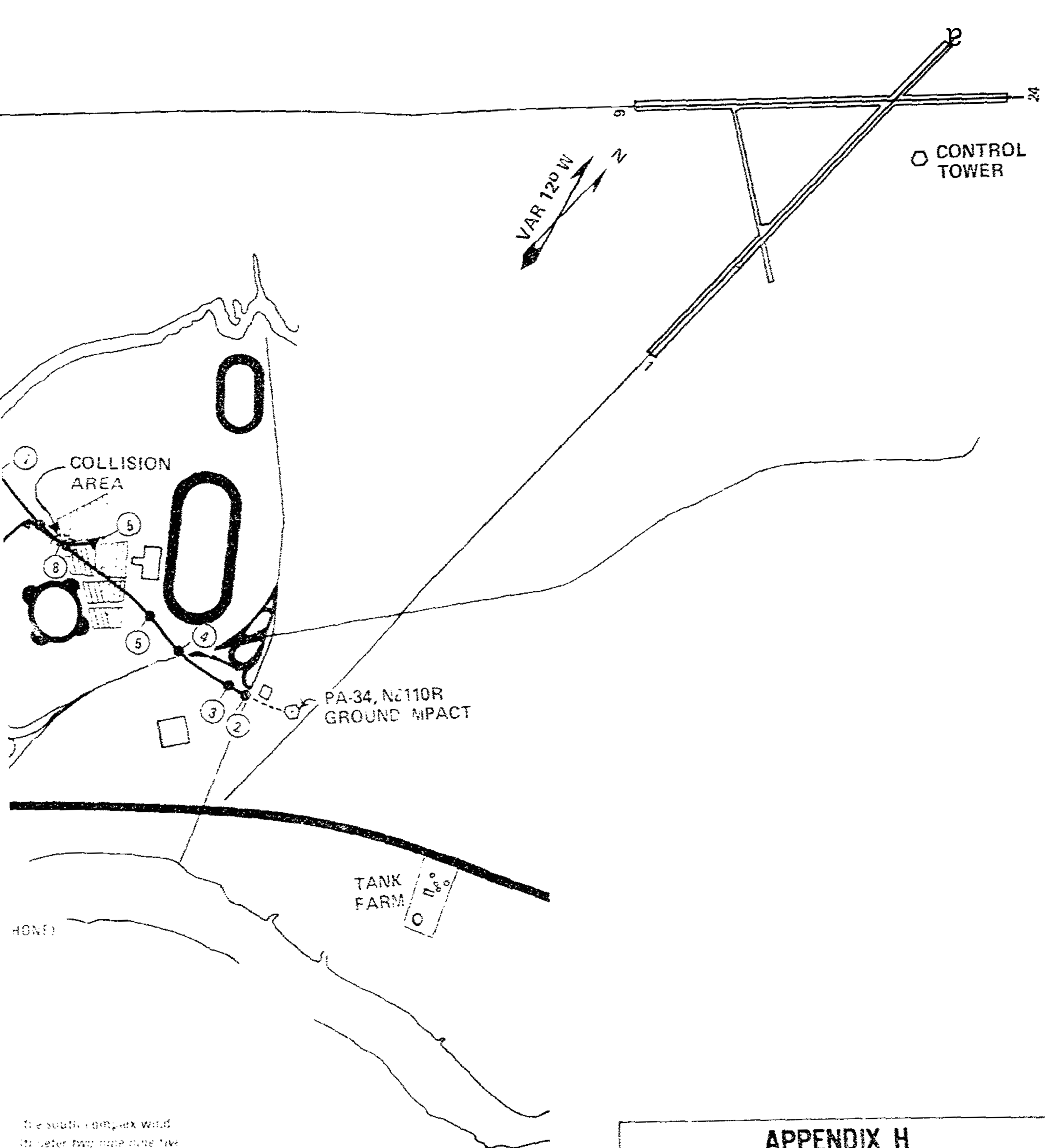
▲ - HELICOPTER, N670

● - PA-34, N8110R

○ - ALTITUDE IN HUNDREDS OF FEET

ATC TRANSCRIPT 8 46 40 TO 8 47 37.

8 46 40	N670	Six seventy
8 46 40	N9YC	Teterboro copter nine yankee charlie
8 46 42	TEB	Yankee charlie go ahead
8 46 43	N9YC	Tunnel inbound [illegible]
8 46 47	TEB	Nine yankee charlie roger [illegible] report George's [illegible] the south [illegible] an all aircraft wind three four zero at two zero [illegible] altimeter two [illegible]
8 46 57	N6718T	Teterboro Tower Sundowner six seven one eight Tango [illegible]
8 47 02	TEB	One eight Tango Teterboro Tower cleared for takeoff
8 47 06	N6718T	One eight Tango
8 47 08	N8110R	Ah one zero Romeo inside the marker a left base [illegible]
8 47 12	TEB	One zero Tango [illegible] sight [illegible] traffic departing
8 47 16	N8110R	A one zero Romeo
8 47 31	N3410A	Three four one zero [illegible]
8 47 34	(Unintelligible)	
8 47 37	(Unintelligible)	



APPENDIX H

PROBABLE GROUND TRACK
(PLOT NO. 2)