1957 SEPT. 19-20 KANS.-TEXAS

CHASE CASE

The other case that emerged from these meetings was one of the most amazing ever to confront the Project. Having taken place in connection with an Air Force training flight on September 19–20, 1957, it first came to our attention from the pilot of the mission, who happened to be attending these meetings. The final leg of this particular composite training mission had been planned to give the ECM (Electronic Counter Measure) crew some practice in locating ground radar sites. In flight, when the ECM crew turned on their equipment, they were startled to find it was being jammed, first on one frequency and then on another. Just after this, a glowing white UFO was sighted from the cockpit, and it proceeded to play tag with the B-25 for several hundred miles. As the flight progressed, the UFO and the B-25 were seen separately and distinctly by radar after radar on the ground, and all their observed maneuvers were visually confirmed by the pilot and copilot in the air as well as by the B-25's own radar. The pilot-witness, Colonel Chase, concluded his account to us by remarking that whatever it was that flew around with them that night, it had a power output equal to an electric generating station.

Upon landing, the entire crew was questioned by Air Defense Command intelligence personnel and asked to fill out bulky reports. All the ECM equipment and in-flight wire recordings were turned over to the intelligence people. Our first check was at Blue Book, Norm Levine personally verified that the case was not in their files. Our next checks were with the copilot and the radar operator; they told Roy Craig essentially the same story we had had from the Colonel. Once again, it seems impossible to doubt that there was a UFO there, and once again hard to believe that the evidence is still not somewhere.

June 20, 1967, one week after the UFO officers' meeting, was the 20th anniversary of Kenneth Arnold's famous sighting from which "flying saucers" got their name. The occasion provided a natural excuse for the "Congress of Scientific Ufologists" to hold a three-day convention, which they did, in the East Ballroom of the Commodore Hotel in New York City. More than 2,000 people attended. Under the chairmanship of James Mosely, editor of the contactee-oriented *Flying Saucer News*, the program was scheduled to include talks by biologist Ivan Sanderson, radio commentator "Long John" Nebel, author John Keel, and Roy Thinnes, star of ABC's flying-saucer-oriented TV series, "The Invaders."

Difficult as it was even to keep Condon awake for discussions of such cases as Richmond, Indiana, Great Falls, Montana, or the Chase Case just described, it was nevertheless impossible to keep him away from the convention of the "Congress of Scientific Ufologists." It was not that he didn't have every right to attend. But knowing the record and knowing Condon, everyone on the staff was on pins and needles that entire weekend, hoping for no adverse publicity. Everyone, that is, except perhaps Bob Low.

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THE RB-47 UFO CASE -- A NEW EXPLANATION

By Philip J. Klass

This is an analysis of one of the most curious UFO cases on record. It illustrates that a UFO report which may at first seem to be explainable only in terms of an extra-terrestrial spaceship can, when investigated in depth, yield a more plausible, if less exotic, explanation.

The case involves an Air Force RB-47 on a flight over four southern states (Mississippi, Louisiana, Texas and Oklahoma) during the pre-dawn hours of July 17, 1957. An account of the incident was published in the July, 1971, issue of the AIAA magazine Astronautics & Aeronautics (p. 66). It was written by the late Dr. James E. McDonald, an outspoken proponent of the hypothesis that the Earth is being visited by spaceships from other worlds.

McDonald's investigation convinced him that an "unusual craft," which had the ability to fly at supersonic speed and to hover, had "played tag" with the RB-47 for approximately two hours. The presence of the "unusual craft," McDonald believed, was confirmed by three independent means: visual sightings by the RB-47 pilot and co-pilot; by electronic intelligence (Elint) equipment aboard the RB-47; and by an Air Defense Command ground radar located at Duncanville, Texas, near Dallas.

In another published paper on the RB-47 incident, McDonald called it "a case in which the reported phenomena appear to defy explanation in terms of either natural or technological phenomena." (UFO symposium sponsored by the American Association for the Advancement of Science in Boston, Dec. 27, 1969.)

My own investigation prompts quite a different conclusion, after a careful study of the same source material used by McDonald, followed by an analysis of the electronics equipment that figured so prominently in this UFO case.

An inherent difficulty in investigating any old UFO case, such as this one which occurred more than 14 years ago, is that the principals have difficulty in accurately recalling some details. A more serious problem is possible embellishment, due to the passage of time and repeated re-telling of the story. Embellishment need not be the result of a conscious effort to alter the facts. A principal may unconsciously report how he thinks he should have behaved at the time of surprise or stress, rather than how he actually did behave.

When an investigator must choose between conflicting accounts given by the same individual, where one account was made shortly after the incident and the other was given a decade or more later, generally the earlier version should be accepted -- unless there is physical evidence to support the later. (In the A/A article, the early account is referred to as the "contemporary" version.)

However, there may be an obvious error in the contemporary report. For instance, the Airborne Observer's Report prepared by RB-47 commander/pilot Lewis D. Chase with the aid of the navigator's log, diagrams the airplane's flight path and the time of major events. This report shows the RB-47 to be at two widely separated locations at the same time -- 10:30Z. From the airplane's reported airspeed, it seems certain that the second notation should be 10:30Z.

Where there is a discrepancy between early accounts of two crew members, the report by the individual most directly involved in the duty seems most likely to be correct. For example, in Chase's original report, the pilot said that the UFO did not show up on

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* *AUTHOR OF: "UFOs--Identified" (Random House, 1968)*
"Secret Sentries in Space" (Random House, 1971)

[OVER]

the RB-47's navigation radar (AN/APS-23). This was confirmed by the navigator himself, McDonald reported. However, ECM (Elint) Monitor #2, Frank B. McClure, told me that he was sure that the UFO had produced an echo on the RB-47 navigation radar, based on his recollection of interphone conversations between the pilot and navigator which he overheard. In this case, it seems appropriate to accept the recollection of the pilot and navigator, especially since the pilot noted in his original Airborne Observer's Report that the UFO was not detected on the RB-47 navigation radar.

Another example: McClure is positive that the mission on July 17, 1957, was intended to check out the RB-47 equipment prior to the airplane's being sent overseas and that it was not a regular training mission. RB-47 pilot Chase disagrees. In this instance there is circumstantial evidence to support McClure's recollection. During a normal training mission, the ECM Monitors make a very detailed log of each measurement and the time it was taken. If such a log were available, it would have been turned over to the Wing Intelligence Officer when he interviewed the crew about the UFO incident following their return to home base. Yet the Wing Intelligence Officer's report to Strategic Air Command Headquarters contains only spotty data. Further, McClure says that if the flight had been a regular training mission, the ECM equipment cameras would have been loaded with film to photograph the equipment displays and such film would have been turned over to the Wing Intelligence Officer. Yet there is no reference to such film in any of the contemporary reports.

None of the discrepancies between the crew members' original and recent accounts, or between different members, are thought by this investigator to be the result of an intentional effort to alter the facts. Rather, they are believed to be the result of the "ravages of time."

Were it not for the initiative of Dr. James E. McDonald in locating the original reports in the UFO archives at Maxwell AF Base, Ala., this case almost certainly would remain inexplicable because of the discrepancies that have crept into the recent recollections of the crew and the extreme difficulty of trying to reconstruct the details of what actually happened. The original (contemporary) reports include the following:

1. Report by Wing Intelligence Officer Elwin T. Piwetz, based on interview with the crew shortly after they returned to home base. The date when Piwetz actually wrote his report and transmitted it to SAC Hdqtrs. is not known. A "Received" stamp on the last page is illegible except for the date "Oct. 11, 1957." This is believed to be the date that the report was received by UFO Project Blue Book in Dayton, Ohio. Unfortunately, Piwetz did not show his report to the RB-47 crew members to check its accuracy--so far as is known--before filing it with SAC Hdqtrs.

2. Airborne Observer's Report, prepared by RB-47 pilot (then Major) Lewis D. Chase. The report is dated Sept. 10, 1957, nearly two months after the incident.

3. Teletype message from the Commander of the Duncanville radar station (Code name: "Utah") to Air Defense Command Headquarters. The message was dispatched at 14:45Z, or approximately four hours after the UFO incident involving the Utah radar.

So far as is known, there are no other contemporary reports of this UFO incident that were prepared by the RB-47 crew members or by others with their assistance.

The RB-47 had departed from its home base at Forbes AFB, Topeka, Kan., and headed south to the Gulf of Mexico. Turning to the east, the tail turret was tested over a gunnery range set aside for this purpose in the Gulf. This was followed by a celestial navigation test/mission. Then the RB-47 turned north toward Meridian. Its flight plan called for the airplane to turn west at Meridian and fly to Waco, Tex. During this

west-bound leg, the three Elint (ECM) operators would check their equipment against the numerous ground radars and military communications facilities in that region.

THE FIRST INCIDENT:

This event involved ONLY some unusual behavior of the AN/ALA-6 Elint equipment operated by ECM Monitor #2, Frank B. McClure. There are no reports of any visual UFO sightings.

McClure's current recollection is that the incident occurred as the RB-47 was approaching the coast, near Biloxi, Miss. The contemporary account by Piwetz disagrees, saying that it occurred "approximately at Meridian." Because McClure did not notify any other crew members of the anomalous behavior of his equipment at the time, it is not possible to check other crew members for their recollections. However, for reasons to be discussed shortly, it is believed that McClure's recollection is correct and that the incident occurred near Biloxi.

As the RB-47 neared the coast, McClure decided to check the operation of his ALA-6 equipment, knowing that the aircraft was approaching air defense ground radars against which it could be operated. The system involved included the ALA-6 direction-finder, an associated AN/APR-9 Elint receiver and an AN/ALA-5 pulse analyzer.

This Elint system is designed to locate the position of ground radar and to measure its signal characteristics. By taking several bearings to the source of a radar signal at different, known locations along the airplane's flight path, the position of the radar can be determined by triangulation. The ALA-6 bearings are displayed relative to the airplane's fore-aft axis.

The ALA-6 can be fitted with several different types of antennas, depending on the frequency of the ground radars involved. (See: ALA-6 Handbook of Operating Instructions, T.O. 12P3-2ALA6, dated 1 May 1954.) During this mission, the RB-47 was using a Type AS-656 antenna system that covered the frequency range of 1,000 mc. (L-band) to 5,000 mc. (C-band). It consists of TWO nearly identical parabolic antenna dishes which are mounted back-to-back. The antenna assembly rotates at 150 rpm or 300 rpm, selectable by the operator.

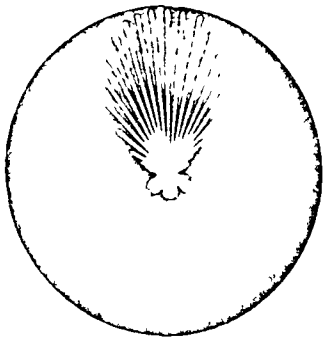
To illustrate how the ALA-6 functions to measure bearing to a ground radar, which is important to understanding this UFO case, only ONE of the two back-back antennas will be considered for the moment. When the Elint aircraft is within receiving range of a ground radar, and when the radar antenna is illuminating the airplane, the ALA-6 antenna will receive the radar signal. (Because of the comparatively high scan rate of the ALA-6 antenna relative to the ground radar, the ALA-6 is assured of receiving ground radar pulses whenever the airplane is illuminated by the radar.)

The signals received are fed to the APR-9 Elint receiver for detection/amplification for subsequent display on a small cathode-ray-tube (CRT) for the Elint operator. To display the bearing of the source of the received signal relative to the airplane's fore-aft axis, the antenna assembly contains a synchro-resolver whose rotor is geared to the antenna drive mechanism. The rotor winding of this synchro-resolver is excited from the output of the APR-9 receiver. And its sine/cosine output windings are connected to the deflection amplifiers and then to the vertical/horizontal deflection plates of the ALA-6 CRT display. (See Fig. 3.)

At such times as the airplane is illuminated by a radar, the ALA-6 will display the situation somewhat as shown in Fig. 1. (See next page.) The photo shown is an idealized version copied from the ALA-6 operator's manual.

[OVER]

FIG.1



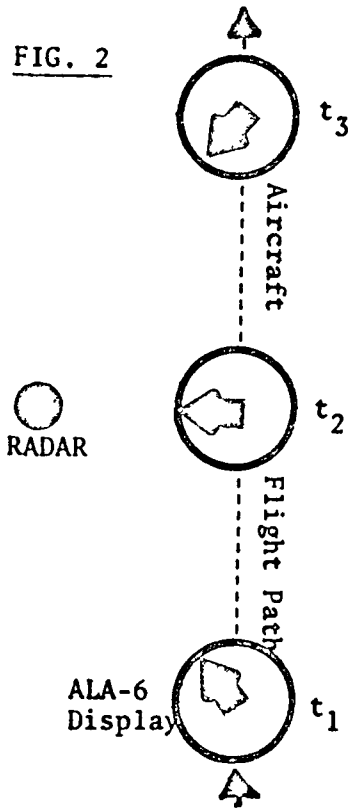
NORMAL OPERATION of AN/ALA-6 Elint Direction-Finder

Because the top of the ALA-6 display corresponds to a bearing of 0°, the radar shown in Fig. 1 is dead-ahead of the airplane. If the center of the displayed pattern were at the 3 o'clock position, then the radar would be abeam of the airplane, on its right-hand side.

As the aircraft flies along, unless the radar is dead-ahead or astern, the displayed bearing to the signal source will move DOWN-SCOPE, providing the aircraft is in straight/level flight. If the airplane is turning toward the radar, then the bearing displayed will move UP-SCOPE. (See Fig. 2.)

As the RB-47 approached the coast in the pre-dawn hours of July 17, ECM Monitor #2 (McClure) decided to check out his equipment. Beginning at the high end of the APR-9 frequency range (5,000 mc.), McClure worked down until he found an S-band signal. The signal had all the characteristics of a CPS-6B air defense radar, one of several models then in use. (A slightly later version of the CPS-6B, known as the AN/FPS-10, had identical signal characteristics.)

FIG. 2



It is important to note that McClure did not write down the specific frequency or other signal characteristics at this time, so we are not certain of the precise frequency of the S-band signal involved in this first incident.

The S-band signal even showed that the source was a scanning one, typical of radar. This is manifested by the brief appearance, then disappearance, of the signal bearing display on the ALA-6. As a ground radar antenna begins to illuminate the Elint airplane, the signal is briefly displayed. Then, as the radar antenna rotates to where it no longer illuminates the airplane, the signal displayed slowly disappears as the CRT phosphor decays.

McClure was not surprised to see a signal with the characteristics of a CPS-6B, as he explained to me, for he knew that such a radar was installed near Biloxi, near the RB-47 position. This radar was used in conjunction with an Air Force training school for ECM operators.

The signal was "mighty strong," according to McClure, as would be expected if it came from the CPS-6B radar at Biloxi. However, the bearing to the signal displayed on the ALA-6 showed the radar to be on the RIGHT-HAND SIDE of the RB-47, at roughly the 5 o'clock position. The Biloxi radar would be on the LEFT-HAND SIDE of the aircraft. The bearing displayed on the ALA-6 would place the unknown radar in the Gulf, and McClure knew there were no such shipboard radars.

As the RB-47 proceeded toward Meridian, McClure noted another anomalous characteristic. Instead of the displayed bearing moving down-scope, it moved up-scope. McClure, knowing that such behavior could occur if the airplane were in a turn, says he called the pilot on the intercom to ask if he was maneuvering. The pilot replied that he was not. (This would confirm the fact that the incident happened near the coast rather than at Meridian, as Piwetz reports, because the airplane did turn west at Meridian.)

McClure decided that there must be a malfunction in his ALA-6, but he did not report it to the aircraft commander at the time. (It was not until later, following the visual sighting of a luminous object by the pilot/co-pilot that McClure realized that the unusual up-scope movement could result from an airborne signal source passing the RB-47 at greater than the RB-47's 500 mph speed.)

Analysis of the circuit diagram from the ALA-6 instruction books suggests several possible malfunctions that could cause an anomalous up-scope movement, one of which will be considered here. As previously noted, the AS-656 antenna assembly installed on the RB-47 employs TWO back-back dishes. One of these is selected when the ground radar signal is horizontally polarized, while the other is used when the signal is vertically polarized. Only one antenna dish is used at any instant.

The ALA-6 operator selects the proper antenna dish by means of a toggle switch on the front of the ALA-6 control panel. If the operator lacks apriori knowledge of the radar signal polarization, he toggles back/forth and selects the dish which gives the optimum signal.

When the switch is thrown to the "Vertical" position [See Fig. 3 below], it applies + 28 volts to relay K-701, which then connects the vertically polarized dish to the APR-9 Elint receiver. When the toggle switch is thrown to the "Horizontal" position, it removes the +28 volts from relay K-701 and the spring-loaded relay then connects the horizontally polarized dish to the APR-9 receiver.

When selecting the appropriate antenna dish, it is also necessary that the correct polarity of APR-9 signal be applied as excitation to the synchro-resolver rotor

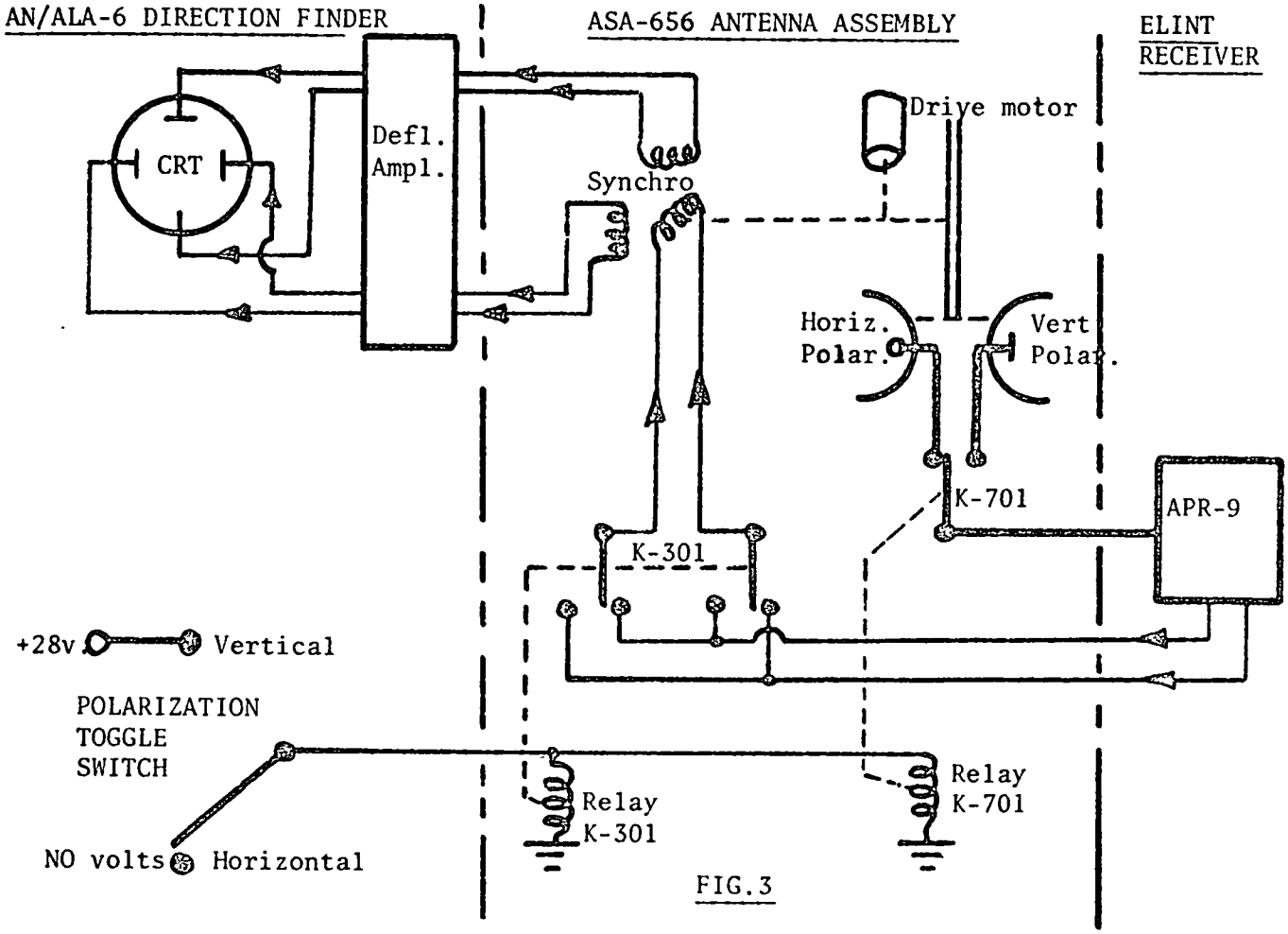


FIG. 3

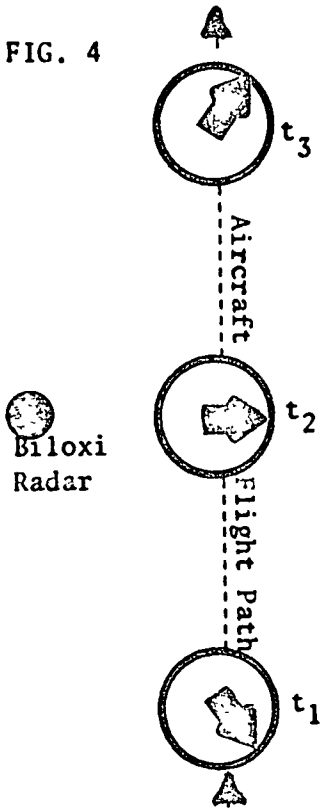
[OVER]

so that the bearing displayed on the ALA-6 will correspond to the antenna dish in use.

The same toggle switch that applies, or removes, the +28 volts from relay K-701 also does the same for relay K-301, whose function is to apply the correct polarity excitation to the synchro-resolver rotor. IF RELAY K-301 SHOULD FAIL TO ACTUATE WHEN THE TOGGLE SWITCH IS THROWN TO THE "VERTICAL" POSITION, THEN THE BEARING-TO-THE-RADAR DISPLAYED BY THE ALA-6 WILL BE 180° IN ERROR. AS THE AIRCRAFT FLIES PAST THE RADAR, THE INDICATED BEARING THEN WILL MOVE UP-SCOPE INSTEAD OF DOWN-SCOPE.

Thus, if K-301 failed to actuate when McClure positioned the toggle switch to the "Vertical" position (to coincide with the known vertical polarization of the CPS-6B radar at Biloxi), the bearing displayed on the ALA-6 not only would be 180° in error (pointing out toward the Gulf, as reported), but the bearing would move up-scope as the RB-47 proceeded toward Meridian, also as reported. [This is shown in Fig. 4 in a not-to-scale representation.]

FIG. 4



ANOMALOUS BEARING Caused by malfunction of K-301 or K-701.

According to McClure's recent recollection, the displayed bearing moved from approximately 5 o'clock to roughly 1 o'clock during the approximately 5 minutes which he "worked" the signal. This would be the angular movement expected if the RB-47 was within approximately 20 miles of the Biloxi radar.

In the mid-1950s, at the time the ALA-6 was built, the two principal sources of equipment malfunctions were vacuum tubes and relays. Analysis of subsequent events in the RB-47 mission, to be discussed shortly, suggests that the malfunction of K-301 was an intermittent or temporary one and that it later resumed normal operation.

This could have resulted from an imperfect, cold-soldered, connection to relay K-301 terminals, or within its solenoid coil . Another possibility is that moisture accumulated in the relay during a humid July day may have frozen as the RB-47 climbed to altitude, preventing the K-301 armature from operating when McClure first applied power to the ALA-6 as he neared Biloxi. However, after a few minutes of operation, the heat from the relay solenoid and other electrical devices on the antenna could have melted the ice, allowing the relay armature to operate normally, thereby curing the 180° ambiguity.

The same sort of 180° ambiguity could also result if relay K-301 functioned properly but antenna-dish switching relay K-701 failed to actuate. Under this condition, the ALA-6 would be operating from an antenna dish of the opposite polarity to that selected by the operator. Normally this improper polarization discrepancy should be readily apparent to the ALA-6 operator as his flipped his toggle switch seeking the optimum signal. However, because the RB-47 was so close to the powerful CPS-6B at Biloxi, the difference in signal strength might not be detectable.

Beyond the possibility of an 180° ambiguity caused by a malfunction of relay K-301 or K-701, there are other sources, such as an intermittent malfunction in the deflection amplifiers or in the synchro-resolver.

McClure says that he abandoned the anomalous S-band signal after about 5 minutes, without notifying the aircraft commander or the other two Elint (ECM) operators. Some

time later, McClure recalls that he decided to check the ALA-6 against other air defense radars in the region. These operate at a lower frequency in L-band (1,000 mc.) McClure recalls that the ALA-6 seemed to give the correct bearing for the known location of these L-band radars. (This detail is not included in the original Piwetz report.) Unfortunately, McClure did not think to tune back to S-band to check the ALA-6 performance against the original signal. If McClure's recent recollection of having checked the ALA-6 against L-band radars is correct, it would seem that the transient malfunction had by this time cleared.

THE SECOND INCIDENT:

The RB-47 turned west near Meridian and took up a true heading of 265° on a path toward Waco, during which time the three Elint operators were to check out their equipments against radars and communications stations in the region. At 10:10Z, while the RB-47 was in the vicinity of Winnsboro, La., the pilot observed "a very intense white light with light blue tint" coming toward the aircraft from the 11 o'clock position. As the pilot and co-pilot watched, the luminous object cut in front of the RB-47, at a distance later estimated to be roughly two miles, and zoomed off to the right of the airplane, disappearing at roughly a 2:30 o'clock position.

The encounter would have been an unnerving one for the flight crew because the luminous object seemed to at first threaten a head-on collision. So far as the record shows, the RB-47 had not received any warning from the Civil Aeronautics Administration (Now the Federal Aviation Administration) traffic controllers or from any of the several nearby air defense radar stations that there was any other traffic near their altitude/position.

Large meteors, or "fireballs," on a near-horizontal trajectory often produce UFO reports, even from experienced pilots. For example, on Dec. 9, 1965, a former Royal Canadian Air Force pilot (Mr. A.G.M. of Toronto) wrote a letter to the USAF's Project Blue Book office describing a UFO he had seen while flying near Pittsburgh, Pa., at 4:45 p.m. (daylight) on Air Canada Flight #781.

Quoting from his letter: "We were at 18,000 ft., I was looking out the window toward the east when I saw 'it.' A sort of pencil shaped object flying horizontal for a split second, then going into a 70° dive with an orange flame then appearing behind it. In a matter of just 3 or 4 seconds it was gone. Just like a rocket taking off...Am a former Royal Canadian Air Force pilot from the last war. I had never seen anything like it before, especially the rapid changes in direction and terrific speed." [Emphasis supplied.]

If this incident had occurred very late at night and/or over a thinly populated area, this particular UFO report might still be unexplained. However, because the same object reported by this RCAF pilot was also seen and reported by hundreds of observers on the ground, this UFO is known to have been a bright meteor. It left a characteristic meteor trail which persisted for 20 minutes and which was photographed by a man in Michigan who obtained four good pictures.

The RB-47 incident occurred at 5:10 a.m. Central Daylight Savings time, when there would be few ground observers if any. In the summer of 1957, it was not surprising that the RB-47 flight crew began to consider the possibility that the luminous object they had seen might be a UFO, for the U.S. was in the midst of a major "UFO Flap" that summer. Since the "discovery" of UFOs in 1947, there would be more UFO reports filed with the USAF in 1957 than in any previous year except 1952!

[OVER]

In the RB-47, the pilot and co-pilot sit in tandem in a bubble canopy so their conversations must necessarily be conducted via the airplane's interphone system. As Chase and co-pilot James H. McCoid began to speculate on what they had seen and the possibility that it might be a UFO, their conversation was heard by the Elint operators sitting within the RB-47 fuselage who had not been able to see the luminous object.

THE THIRD INCIDENT:

When McClure noticed ECM Monitor #3, Walter A. Tuchscherer, laughing and asked the reason, Tuchscherer (who had been listening on the RB-47 intercom) replied: "They're chasing flying saucers up-front," according to McClure's recent recollection. This prompted McClure to think about the anomalous S-band signal he had earlier worked near Biloxi.

During the intervening time, McClure had re-tuned to work L-band radars in Louisiana and Arkansas. Now he decided to tune his APR-9 and ALA-6 back to S-band to see if he could find the earlier S-band signal. But it was not until 10:30Z, or 20 minutes after the visual sighting, that McClure detected an S-band signal, according to the Piwetz account. (This time figure and subsequent ones were hastily jotted down by McClure on scraps of paper, he recently told me.) It was only after this second encounter with an S-band signal, after 10:30Z, that McClure jotted down the characteristics of the signal:

Frequency: 2,995-3,000 mc.; Pulse repetition frequency (PRF): 600 per second; Pulse Length: 2 microseconds; Scan rate: 4 rpm.

The CPS-6B radar, an early post-war design, radiates six separate beams from three different antenna dishes. Each beam operates in a different part of S-band. The frequency and other signal characteristics noted by McClure are identical to those for the VERTICAL-CENTER BEAM -- except for the pulse duration/length at a PRF of 600/sec. According to the Handbook of Operating Instructions for the CPS-6B [T.O. 31PG-2CPS6-11, revised 15 Jan. 1957], when the radar is operating at a PRF of 600/sec., the pulse length is 1 microsec., not the 2 microsec. noted by McClure. But an Elint specialist who is familiar with the APR-9 Elint receiver says that smearing of the received pulse due to ground reflection could easily cause an operator to err by this small increment.

The newly acquired S-band signal, at 10:30Z, showed a bearing of roughly 70°. This was roughly the same relative bearing at which the bright luminous object had zoomed out of sight some 20 minutes earlier as it headed north. IF this S-band signal came from the UFO, then the UFO must suddenly have changed course and was now flying abeam of the RB-47, somewhere out there in the darkness. However, the flight crew did NOT see any visual target at 10:30Z -- at a 70° bearing or elsewhere.

One of the curious aspects of this incident is why the S-band signal did not show up on the ALA-6 until 20 minutes after the initial visual sighting. McClure assures me that it would not take more than 10-15 seconds for him to re-tune from L-band to S-band.

This delay is readily explained IF the signal detected by McClure at 10:30Z came from an FPS-10 radar (with signal identical to a CPS-6B) situated at Duncanville, just southwest of Dallas. Analysis of the RB-47's flight path and the coverage of the Duncanville radar's Vertical-Center beam at the RB-47's 34,500 ft. altitude shows that this beam's lower sidelobe would first begin to illuminate the aircraft at approximately 10:30Z. (See Fig. 6; also Appendix.)

However, if the signal was coming from the Duncanville radar the displayed bearing should have been approximately 35°, whereas the bearing reported by McClure and listed in the Piwetz account is 70°. But as earlier noted, all bearings are measured relative to the airplane fore-aft axis so that if the RB-47 were maneuvering at the time this would introduce a discrepancy. Since there is no way to know for certain whether the aircraft was in level or maneuvering flight at that moment, it will be useful to examine subsequent ALA-6 bearing measurements and compare them with the expected values to determine if the S-band signal was coming from the Duncanville radar.

Figure 6 (p. 11) is a careful plot of the calculated RB-47 flight path, developed with the assistance of aircraft commander Chase, showing all reported bearings of the unknown S-band signal, so the reader can compare them with the actual bearing to the Duncanville radar. All times/events are based on the Piwetz report, unless otherwise noted.

At 10:35Z, McClure reported the S-band signal to be at a relative bearing of 68°. From my calculated RB-47 flight path, assuming the airplane in level flight, the bearing to Duncanville would be roughly 40°

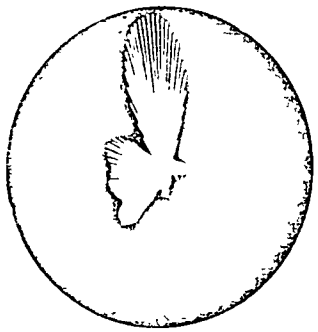
At 10:38Z, the S-band signal bearing was approximately 40°. The bearing to the Duncanville radar would be roughly 45°.

At 10:39Z, the aircraft commander "sighted a huge light which he estimated to be 5,000 feet below aircraft at about 2 o'clock. [Piwetz account.] Aircraft altitude was 34,500 feet, weather perfectly clear. Although aircraft commander could not determine shape or size of object, he had a definite impression light emanated from top of object." [NOTE: This was the first visual sighting since 10:10Z, and did not occur until nine minutes after McClure acquired S-band signal.]

At 10:40Z, McClure "reported he then had two signals at relative bearings of 40° and 70°." Based on calculated RB-47 position, the bearing to the Duncanville radar would have been roughly 50°. Piwetz account states: "aircraft commander and co-pilot saw these two objects at the same time with same red-color." However, Chase recently told me that he does not recall ever seeing two visual objects.

If the S-band signal was coming from a UFO, then the craft apparently had divided into two widely separated objects! A more plausible explanation is suggested by the ALA-6 Handbook of Operating Instructions IF the signal was coming from the Duncanville radar. The handbook says that the ALA-6 may at times display what appears to be TWO SIGNALS AT TWO DIFFERENT BEARING ANGLES (from a single radar) "due to a reflection from some nearby object to the left of the true signal reflection." This condition is illustrated in Fig. 5, using a photograph from the ALA-6 handbook.

FIG. 5



Shortly after 10:40Z, the RB-47 commander obtained permission from the Civil Aeronautics Administration to deviate from the original flight plan to pursue the UFO. The RB-47 then turned right, to a heading of 320°, putting it on a path that would take it toward Dallas-Ft. Worth. [See Fig. 6, p. 11.] The RB-47 contacted the Duncanville radar station (Code Name: "Utah") and "requested all assistance possible," in its UFO chase, according to the Piwetz account.

At 10:42Z, only a single S-band signal was noted by McClure, having a bearing of 20°. From the RB-47 calculated flight path, the bearing to the Duncanville radar also

[OVER]

would be approximately 20°. Chase accelerated the RB-47 as the "object pulled ahead" [Piwetz account] in an effort to close on it. [Chase's original Airborne Observer's Report says the RB-47 accelerated to Mach 0.83, but his more recent recollection is that he was near maximum speed, or at roughly Mach 0.87.]

At 10:42.5Z, the ALA-6 once again showed TWO S-band signals, with bearings of 40° and 70°. If the RB-47 had by this time completed its turn onto the new 320° heading, the bearing to Duncanville would have been roughly 15°, but the bearing would be larger if the turn was still in process. So far as the Piwetz report shows, and Chase's current recollection, there was only a single visual target.

At 10:44Z, the ALA-6 once again showed only a single S-band signal, with a bearing of 50°. The estimated bearing to Duncanville, assuming the aircraft was not maneuvering, should have been roughly 10°.

At 10:48Z, the Duncanville station asked the RB-47 to turn on its radar transponder to Mode III "for positive identification, then requested (crew to advise) position of object." [This seems curious because the air defense radar personnel should have been able to identify the RB-47 some minutes earlier when assistance was first requested, considering the typically light traffic in the pre-dawn hours. The radar had height-finder beams so it should have been quite easy for experienced operators to identify the RB-47 from the pilot's estimated position and reported altitude.]

When the RB-47 crew "reported position of object as 10 nautical miles northwest of Ft. Worth, Texas" [Piwetz account.], the radar station "immediately confirmed presence of object on their scopes." [Again, it seems curious that an air defense radar station had overlooked an unidentified craft until the RB-47 called attention to it. This almost suggests an inexperienced or inattentive radar station crew.]

At "approximately 10:50Z object appeared (to flight crew) to stop and aircraft overshot. Utah (radar) reported they lost object from scopes at this time, and ECM #2 (McClure) also lost signal." If the ALA-6 signal was coming from the Duncanville radar, it would logically disappear from McClure's scope at about this time because the RB-47 was now so close that it no longer would be illuminated by the Vertical-Center beam to which the ALA-6 and APR-9 were tuned (2,995-3,000 mc.) A possible explanation for why the Duncanville radar lost its unidentified target and the RB-47 crew lost its visual target will be discussed shortly.

The RB-47 commander, thinking he had overshot the UFO, began a turn to the left shortly after passing between Dallas and Ft. Worth. At roughly the same time (which I estimate to be 10:51Z), "ECM #2 picked up signal at 160° relative bearing." Reference to Fig. 6 shows that by this time the RB-47 would now be far enough away from the Duncanville radar so that it would again be illuminated by the Vertical-Center beam. And the bearing to the radar would be roughly 160°, as McClure observed. [For coverage of Vertical-Center beam at RB-47 flight altitude, see Appendix B.]

At the same time, "Utah (radar) regained scope contact and aircraft commander regained visual contact." This is believed to be an error in the Piwetz account, according to extended correspondence with pilot Chase, who is certain that the new visual contact did not occur until several minutes later. IF there was visual contact at this time, the "object" could NOT POSSIBLY BE THE ONE GENERATING THE S-BAND SIGNAL ASTERN OF THE RB-47 (160°) BECAUSE THE FLIGHT CREW COULD NOT LOOK IN THIS DIRECTION AT AN OBJECT BELOW RB-47 FLIGHT ALTITUDE. IF the Utah radar operators advised of the position of their new unidentified radar target, this is not indicated in the Piwetz account.

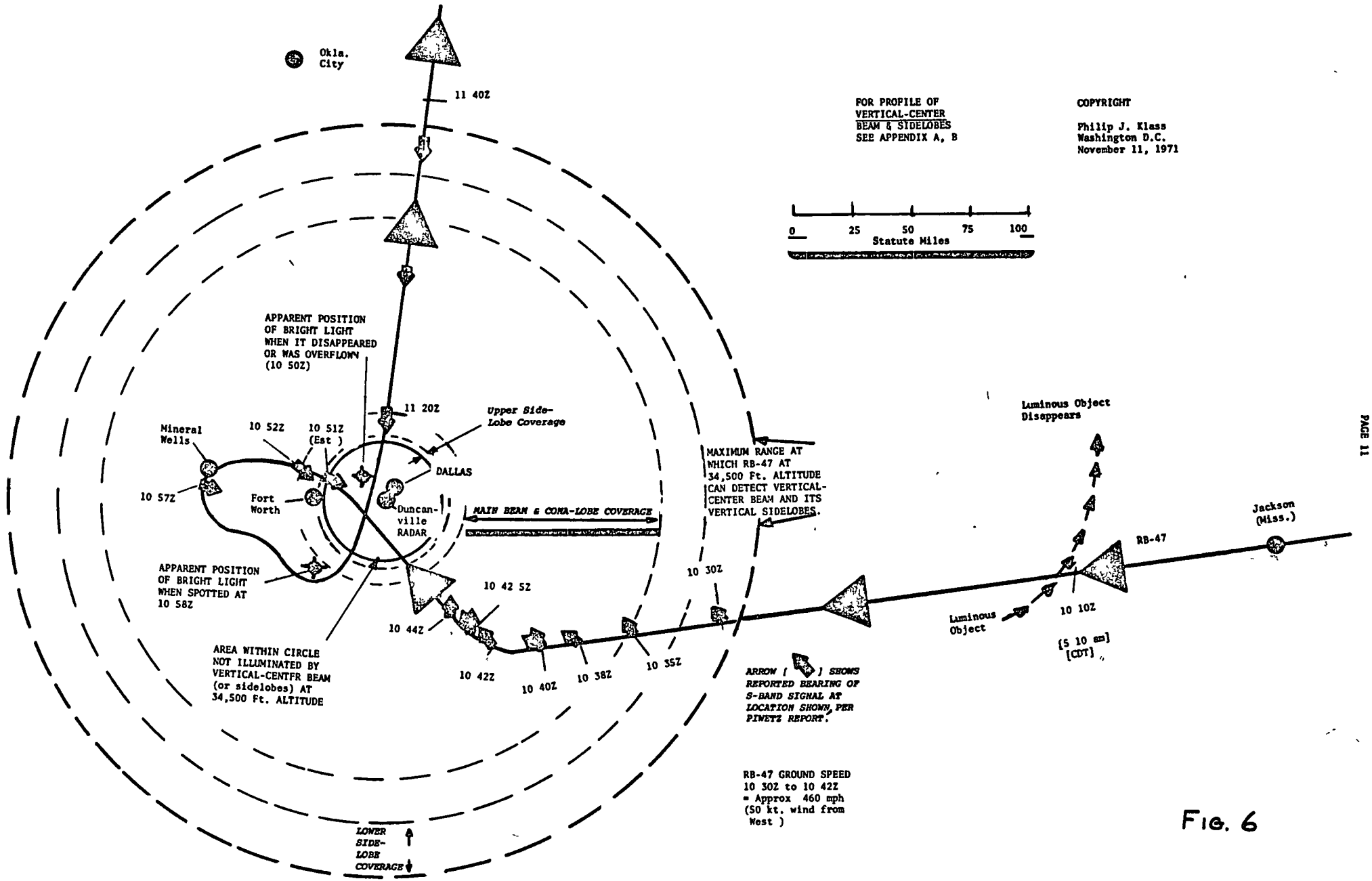

Okla. City
11 40Z
FOR PROFILE OF VERTICAL-CENTER BEAM & SIDELOBES SEE APPENDIX A, B
COPYRIGHT
Philip J. Klass
Washington D.C.
November 11, 1971
0
25
50
75
100
Statute Miles
APPARENT POSITION OF BRIGHT LIGHT WHEN IT DISAPPEARED OR WAS OVERFLOWN (10 50Z)
11 20Z
Upper Side-Lobe Coverage
Mineral Wells
10 52Z
10 51Z (Est)
DALLAS
10 57Z
Fort Worth
Duncan-ville RADAR
MAIN BEAM & CONA-LOBE COVERAGE
MAXIMUM RANGE AT WHICH RB-47 AT 34,500 Ft. ALTITUDE CAN DETECT VERTICAL-CENTER BEAM AND ITS VERTICAL SIDELOBES.
Luminous Object Disappears
Jackson (Miss.)
RB-47
APPARENT POSITION OF BRIGHT LIGHT WHEN SPOTTED AT 10 58Z
10 42 5Z
10 30Z
10 44Z
Luminous Object
10 10Z
[5 10 am] [CDT]
AREA WITHIN CIRCLE NOT ILLUMINATED BY VERTICAL-CENTFR BEAM (or sidelobes) AT 34,500 Ft. ALTITUDE
10 42Z
10 40Z
10 38Z
10 35Z
ARROW [ ] SHOWS REPORTED BEARING OF S-BAND SIGNAL AT LOCATION SHOWN, PER PINETZ REPORT.
RB-47 GROUND SPEED 10 30Z to 10 42Z = Approx 460 mph (50 kt. wind from West)
LOWER SIDE-LOBE COVERAGE

FIG. 6

At 10:52Z, McClure "had signal at 200° relative bearing, moving up his D/F (direction finder) scope," according to the Piwetz account. For the calculated RB-47 position at that time, the bearing to Duncanville would have been 200°, as McClure observed. And because the RB-47 was then making a left turn toward the direction of the ground radar, the bearing indication should have been moving up-scope, exactly as reported, if the S-band signal was coming from the Duncanville radar.

At 10:55Z, the Piwetz account says that the RB-47 crew notified Duncanville that the aircraft was running low on fuel and would soon have to head back to its Topeka base. [Chase now believes that this was done several minutes later than 10:55Z, but the discrepancy is not of consequence.]

At 10:57Z, the ALA-6 showed a signal with a bearing of 300°. Based on the RB-47 position, the bearing to the Duncanville radar is estimated to be approximately 270°. However, the airplane would have been turning at the time which would make it difficult for McClure to obtain a very accurate measurement.

Also at 10:57Z, the Piwetz account says that the Duncanville radar "had no scope contact" with the unidentified target. There is no further mention of ground radar contact after 10:57Z, yet the RB-47 continued to obtain its S-band signal, off-and-on, for another 40-odd minutes! THUS THE DUNCANVILLE RADAR HAD CONTACT WITH AN "UNIDENTIFIED TARGET" FOR NO MORE THAN SEVEN MINUTES -- between 10:48Z and 10:50Z, and again between 10:51Z and 10:56Z.

At 10:58Z, according to the Piwetz account, the aircraft commander "regained visual contact of object approximately 20 naut. miles northwest of Ft. Worth, estimated altitude 20,000 ft., at 2 o'clock from aircraft." [Chase has clarified the ambiguous language, explaining that it was the RB-47 that was northwest of Ft. Worth which would place the visual object south of Ft. Worth, as shown on Chase's original Airborne Observer's Report. My calculation of RB-47 position at this time, made with Chase's assistance, actually places the RB-47 west of Ft. Worth, not northwest.]

The Piwetz account contains almost no details of what happened during the next few minutes. RB-47 pilot Chase recalls that he obtained permission to dive toward the visual object (a light) and that the airplane went down to roughly 20,000 ft. Because the aircraft was maneuvering almost continuously during the next few minutes, McClure would have difficulty taking signal bearing measurements. This probably explains why there are no further S-band bearing measurements given by Piwetz until some minutes later when the aircraft gave up its chase and headed north toward Topeka.

By 10:58Z, darkness would be fast receding in the Dallas/Ft. Worth area. According to the World Almanac, official sunrise at Dallas on July 17, 1957, was 11:31Z (5:31 CST, or 6:31 CDT). The sky would be moderately light at least 30 minutes before official sunrise. The fact that the RB-47 crew abandoned their chase suggests that they did not find any unusual craft or object when they reached the area where the visual light seemed to be situated. Otherwise, we can assume they would have lingered longer and reported their sighting to Duncanville inasmuch as the RB-47 could have arranged an emergency landing for re-fueling at a nearby Air Force base.

According to the Piwetz account, the RB-47 finally took up a heading for home at 11:02Z, and by 11:40Z, the aircraft was roughly abeam of Oklahoma City. The 11:02Z time is believed to be a typographical (transposition) error, intended to be 11:20Z. This would be much more consistent with the 11:40Z time abeam of Oklahoma City and the aircraft's position at 10:50Z when it is known to have been near Dallas/Ft. Worth.

From 11:20Z (or 11:02Z) until 11:40Z, the ALA-6 was again showing an S-band signal with a measured bearing of "between 180° and 190°." The signal "faded rather abruptly" as the RB-47 neared Oklahoma City, according to the Piwetz account.

This is precisely what would be expected if the S-band signal were coming from the Vertical-Center beam of the Duncanville radar, which would be at a bearing of roughly 180° as the RB-47 headed north. (See Fig. 6.) Furthermore, the signal should disappear as the RB-47 neared Oklahoma City, for this would be the outer limit of coverage of the beam at the airplane's flight altitude.

On Sept. 5, 1971, I first wrote to ALA-6 operator McClure, seeking clarification of some aspects of this case. In his reply, dated Sept. 10, McClure volunteered the following view:

> *"I personally think that there was no airborne signal of this nature, so I can only say that it [i.e. the anomalous signal near Biloxi] must have been caused by some other reason, unknown to us. I also think later we became mixed up with signals from Houston, Dallas or Oklahoma City, all of which had operational CPS-6B radars." [Actually, these were FPS-10 radars with signal characteristics identical to the CPS-6B.]*

In a subsequent telephone conversation and later correspondence, McClure re-stated his opinion even more emphatically.

If the CPS-6B type signal had indeed come from an airborne vehicle, the signal would have been within receiving range of the air defense radars at Houston, Dallas and Oklahoma City at various times between 10:40Z and 11:40Z. Such a signal could be expected to cause severe interference with one or more of these ground radars, if it came from an airborne source within receiving range. YET THERE WAS NO REPORT OF ANY SUCH INTERFERENCE FROM ANY OF THESE RADARS, SO FAR AS IS KNOWN.

Furthermore, if there had been an unknown craft flying in the vicinity of the RB-47 from the time it neared the coast until roughly two hours later when it neared Oklahoma City, it is strange that the unknown craft was not spotted by any of the many air defense radar stations in Mississippi, Arkansas, Louisiana, Texas or Oklahoma, except for the brief, sporadic report from the Duncanville station.

Curiously, the formal teletype report filed by the Duncanville radar station commander to Air Defense Command Headquarters within four hours of the incident (14:45Z, July 17, 1957) denies that the UFO appeared on the station's scope! The report says: "UTAH (Duncanville radar) HAD NEGATIVE CONTACT WITH OBJECT."

This seems to contradict statements by the RB-47 crew members, yet there is no reason to question the veracity of the latter. The most logical explanation for this apparent discrepancy is that between the time of the incident (roughly 10:50Z) and the time of the report (14:45Z) the unknown target on the Duncanville radar scopes had been identified as an ordinary airplane!

If this were the case, the Duncanville station commander might well have been too embarassed to admit the temporary "goof" of possibly inexperienced operators and would logically try to minimize the whole incident with the cryptic report: "NEGATIVE CONTACT WITH OBJECT." By the time the unknown was identified, the RB-47 could have been well beyond direct radio communications range of Duncanville.

[OVER]

There is reason to believe that the "unidentified" target that appeared on the scopes of the Duncanville radar sporadically between 10:48Z and 10:56Z may have been American Airlines Flt. #966. This flight from Los Angeles, via El Paso, was scheduled to arrive at the Dallas Airport (Love Field) at 6 a.m. CDT, which would be 11:00Z. If the flight was on time on July 17, the aircraft would have been making its approach to Love Field at approximately the time that Duncanville reported its "unidentified" target. Since the weather conditions were good, and pre-dawn traffic is light, Flt. #966 should have been on schedule, but 14 years after the fact it is not possible to locate original records to confirm or deny this speculation.

Recall that the RB-47 flight crew reported that the visual object (light) was located northwest of Dallas/Ft. Worth, and Duncanville confirmed this approximate location for its unidentified radar target. Love Field is situated northwest of Dallas.

The original Airborne Observer's Report has a question which asks whether the flight crew saw any other air traffic. Chase reported that he saw no other traffic and he recently re-confirmed this in response to my query. Yet if Flt. #966 was approximately on schedule there would have been at least one other aircraft in the Dallas area at the time.

If the unidentified radar target noted by the Duncanville radar was indeed Flt. #966, the explanation for its brief disappearance from the scopes at 10:50Z and subsequent re-appearance is understandable by examination of the coverage patterns of the multiple beams of the radar. (See Appendix A) At such time as Flt. #966 came within roughly 5 miles of the radar, the airliner would no longer be illuminated by any of the beams. Depending on the airliner's approach path, it could have passed through this zone of no-illumination twice if it made an outbound/inbound approach and landing--finally disappearing for good as it descended for its landing.

If the landing lights of Flt. #966 were the "visible UFO" which the RB-47 flight crew saw northwest of Dallas, and which was over-flown at 10:50Z, it seems certain that this particular airliner could not have been the "visible UFO" seen by the RB-47 crew at 10:39Z which prompted them to change flight plan and head toward Dallas/Ft. Worth.

Any attempt to identify the source of this light 14 years after the incident is a hopeless task, especially for an investigator who is not familiar with possible ground-based light sources in that region, such as industrial facilities, oil refineries, etc.

IN SUMMARY:

The real crux of this UFO case is whether the source of the S-band signal, which had all of the characteristics of a CPS-6B/FPS-10 radar, did in fact come from such radars located near Biloxi and Duncanville, or whether the signal was being radiated by an airborne object/craft.

IF the signal was being radiated by an airborne craft, there are only three possibilities:

1. A U.S. aircraft: It makes no sense for the U.S. to go to the expense and trouble of building a CPS-6B like radar and mounting it on an aircraft. If the purpose were to mimic enemy jammers, to train our own air defense radar operators, there are far simpler and less expensive ECM equipments available for that purpose. The RB-47 UFO case file contains a letter dated Oct. 30, 1957, signed by Capt. Edwin H. Mammen of Air Intelligence, in reply to a query from Project Blue Book,

prompted by the RB-47 incident. The letter, originally classified, says: "This office knows of no S-band airborne equipment having the characteristics outlined."

I have personally questioned several long-time Elint specialists, including a former official in the USAF's airborne electronic warfare laboratory who would have been responsible for having developed the airborne CPS-6B radar-mimic. Today, nearly 20 years after such equipment--if it existed--had been developed, it would certainly be declassified. Yet none of the Elint specialists had ever heard of such equipment.

2. A foreign aircraft: Only two countries -- Britain and the USSR -- had jet aircraft large enough to carry a powerful CPS-6B type radar and fly at speeds comparable to that of an RB-47. If either country had built such equipment, it could test the equipment against U.S. air defense radars by flying over the international waters of the Gulf of Mexico, without risking a grave international incident by penetration of U.S. airspace.

   If either country had built the equipment for the purpose of spoofing, or "playing games" with U.S. Elint aircraft, this sort of experiment could have been conducted in West Europe or Asia where numerous RB-47 Elint aircraft were based.

3. An extra-terrestrial (E-T) spaceship: Inasmuch as the signal had all of the characteristics of a CPS-6B/FPS-10, it seems certain that the equipment was specifically designed either for use against American air defense radars or against U.S. Elint-type aircraft.

   If the intent was to interfere with (jam) CPS-6B/FPS-10 radars, then clearly the E-T mission of July 17, 1957, was a complete failure for there were no reports of such interference from the radars at Houston, Oklahoma City, Duncanville or at Biloxi. Having gone to so much trouble, it would seem logical for the E-Ts to subsequently modify their equipment and to return to Earth for another attempt--hopefully more successful. Yet this has never happened, so far as the record shows.

   If the E-T went to the trouble of building a CPS-6B type radar and transporting it all the way to Earth for the capricious mission of playing games with the crew of an Elint airplane, then clearly the mission was a success. But an important question is how the E-T spaceship was able to identify this particular aircraft--the RB-47--among all of those aloft around the Earth on July 17, 1957, as an Elint aircraft?

   Elint aircraft do not radiate any distinctive signal to identify their function. They do carry a number of appendages and antennas, but many other types of military aircraft carry a variety of appendages, such as mapping radar, doppler radar, fuel tanks, etc. In darkness and at high speed, it would be especially difficult even for a U.S. Elint specialist to identify an Elint aircraft.

   Another curious aspect is that having gone to all the trouble to build equipment to spoof an Elint aircraft, the E-Ts have never since attempted to play games with such an aircraft, so far as is known.

CONCLUSIONS:

This analyst believes that the S-band signal with all of the characteristics of a CPS-6B/FPS-10 radar actually came from radars of this type at Biloxi and Duncanville. The signal bearings reported by Piwetz, based on figures hurriedly jotted down by

[OVER]

McClure, when plotted against the RB-47 flight path, generally coincide with the direction to the Duncanville radar. The match is not perfect, but McClure never had the opportunity to check the accuracy of the figures contained in the Piwetz report and we are almost certain that there was at least one typographical error [11:02Z vs. 11:20Z.]

If the S-band signals displayed on the ALA-6 came from ground radars, and if the unidentified radar target briefly observed on the Duncanville scopes was later identifield as ordinary air traffic, then this case really boils down to the bright luminous object that flashed by the RB-47 at 10:10Z, which had all the earmarks of a bright meteor, and the various colored lights later observed in the general vicinity of Dallas/Ft. Worth. The latter could have a variety of explanations, including other air traffic.

IT IS NOT SURPRISING THAT THE SERIES OF UNUSUAL INCIDENTS PROMPTED THE RB-47 CREW TO BELIEVE THAT THEY HAD HAD AN ENCOUNTER WITH A UFO. In 1957, with UFO reports and interest at nearly an all-time high, it would have been surprising if the RB-47 crew had not reached such a conclusion.

CREW COMMENTS:

A draft of this analysis-report was submitted to the two principal RB-47 crew members involved in this incident for their reactions, which follow:

Lewis D. Chase, RB-47 aircraft commander/pilot:

> *"I think this study is an excellent work! I apologize for fearing you would not go in deep enough with your analysis. Congratulations, and my thanks, for giving me a plausible explanation for the events that happened to my crew that night in 1957."*

Frank B. McClure, ECM Monitor #2:

> *"I am certain that for some reason we had intercepted ground signal that moved up-scope. I know that once we were near Dallas and (flying) north toward Forbes (AF Base), the signals were undoubtedly CPS-6B/FPS-10 air defense radars. I do not believe any UFO was emitting these signals."*

IMPLICATIONS:

In presenting this case to AIAA members, the AIAA's UFO Subcommittee observed: "This sample case may serve to illuminate the difficulties in deciding whether or not the UFO problem presents a scientific problem." This case does indeed illuminate two central aspects of the entire UFO issue:

1. If it were not for the belated discovery of the original ("contemporary") records, meager as they are, this case would be unexplainable simply because of the discrepancies that have--understandably--crept into the current recollections by the principals of events that transpired 14 years ago. Because most of the old UFO cases lack such original documentation, they must remain unexplained. But this lack-of-explanation should not imply that they involve extraterrestrial spaceships or other exotic phenomena.

2. Even when original data are available, if an investigator approaches his task with a conscious, or unconscious, desire to find no conventional explanation so as to end up with extraterrestrial spaceships as the only possible alternative, then the investigator will find no plausible conventional explanation.

* * *

Philip J. Klass
December 30, 1971

RADIATED BEAMS OF CPS-6B and FPS-10 RADARS: (From T.O. No. 16-30CPS6-7)

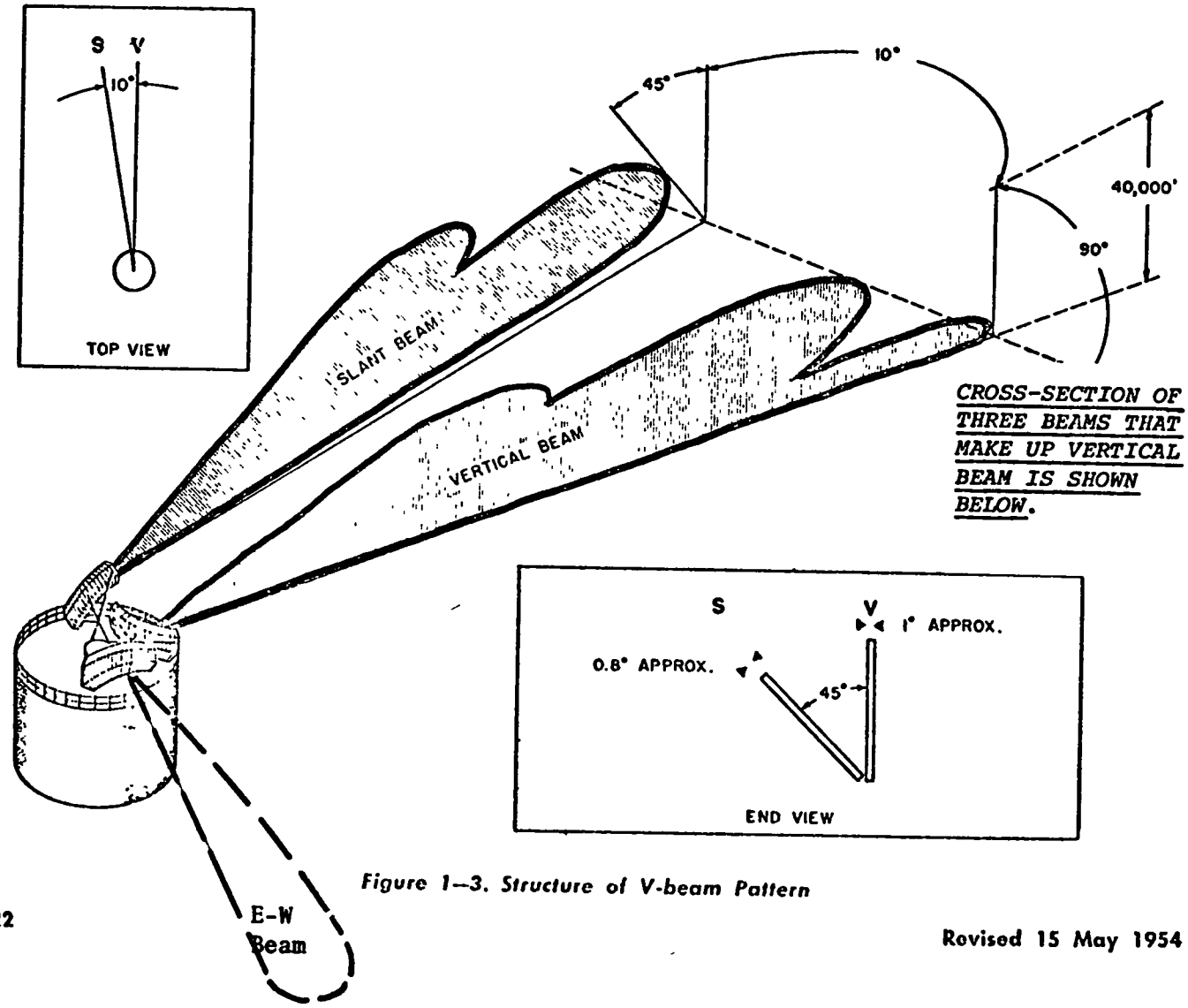


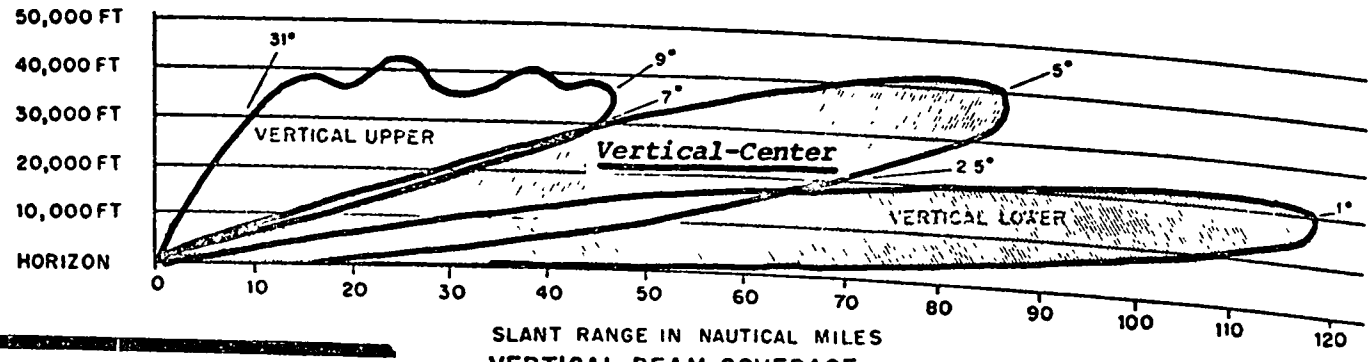
Figure 1—3. Structure of V-beam Pattern

22

Revised 15 May 1954

VERTICAL PROFILE OF VERTICAL-CENTER BEAM (2,992 - 3,019 mc.) WITHOUT SIDELOBES:

[Detection range shown for fighter aircraft (1 sq. meter target); detection range for bomber-type aircraft is approximately twice distance shown.]



VERTICAL BEAM COVERAGE
FOR 1.0 SQUARE METER EFFECTIVE TARGET AREA
(A)

NOTE: ANGULAR DIMENSIONS SHOWN FOR BEAMS ARE FOR 3 db.-down points and do not include sidelobes.

1957 SEPT. 19-20 TEXAS-LA.

CHASE PAGE CASE

Case 5
South Central
Fall 1957
Investigator: Craig

Abstract:

The crew of a B-47 aircraft described an encounter with a large ball of light which was also displayed for a sustained time for both airborne radar monitoring receivers and on ground radar units. The encounter had occurred ten years prior to this study. Project Blue Book had no record of it. Attempts to locate any records of the event, in an effort to learn the identity of the encountered phenomenon, failed to produce any information. The phenomenon remains unidentified.

Background:

At a project-sponsored conference for air base UFO officers, held in Boulder in June 1967, one of the officers revealed that he personally had experienced a puzzling UFO encounter some ten years previously. According to the officer, a Major at the time of the encounter, he was piloting a B-47 on a gunnery and electronic counter-measures training mission from an AFB. The mission had taken the crew over the gulf of Mexico, and back over South Central United States where they encountered a glowing source of both visual and 2,800 mHz. electromagnetic radiation of startling intensity, which, during part of the encounter, held a constant position relative to the B-47 for an extended period. Ground flight control radar also received a return from the "object," and reported its range to the B-47 crew, at a position in agreement with radar and visual observations from the aircraft.

According to the officer, upon return to the AFB, electronic counter-measures, graphic data, and radar scope pictures which had been taken during the flight were removed from the plane by Intelligence personnel. He recalled that an Intelligence questionnaire regarding the experience had later been completed by the B-47 crew; however, the "security lid"

shut off further information regarding the encounter. The crew learned nothing more regarding the incident, and the pilot occasionally had wondered about the identity of the phenomena encountered ever since his experience.

Investigation:

When no report of this incident was found in Blue Book or Air Defense Command records, this project undertook to obtain leads to the location of data recorded during the event through detailed interview of all available members of the B-47 crew. Of the six crew members, the three most closely involved in the encounter were the pilot, co-pilot, and the officer who had been in charge of the most involved radar-monitoring unit.

Details of the encounter, as best they could be recalled, were obtained by interview with the pilot and, later, with the two other officers at another air base. All remained deeply impressed by the experience, and were surprised that a report of it was not part of Blue Book files. Their descriptions of the experience were generally consistent, although the pilot did not mention that the navigator also had received a radar return from the object in question, as was recalled by the other officers. (The navigator, on duty in Vietnam, was not available for interview). The two other crew members, each of whom had operated a radar monitoring unit in the B-47 during the UFO event, were involved to a lesser extent in the incident, and were not located for interview.

The crew's description of the experience follows:

Time: Early morning, Fall 1957.

Place: Over South Central United States

Plane's altitude: About 30,000 ft. during the first part of the encounter.

Nature of Mission: (Pilot): Combined navigation, gunnery, and electronic countermeasure training mission.

(Other Crew): Check-out of plane and equipment, including electronic counter-measures equipment, prior to European assignment.

Weather: Witnesses recalled seeing, from 30,000 ft. altitude, lights of cities and burn-off flames at gas and oil refineries below. They have no recollection of other than clear weather.

Radar monitoring unit number two, in the back end of the B-47, picked up a strong signal, at a frequency of about 2,800 mHz., which moved up-scope while the plane was in straight flight. (A signal from a ground station necessarily moves down-scope under these conditions, because of forward motion of the airplane). This was noted, but not reported immediately to the rest of the crew. The officer operating this unit suspected equipment malfunction, and switched to a different monitoring frequency range. The pilot saw a white light ahead and warned the crew to be prepared for a sudden maneuver. Before any evasive action could be taken, the light crossed in front of the plane, moving to the right, at a velocity far higher than airplane speeds. The light was seen by pilot and co-pilot, and appeared to the pilot to be a glowing body as big as a barn. The light disappeared visually, but number two monitor was returned to the frequency at which the signal was noted a few monents earlier and again showed a target, now holding at the "two-o'clock" position. The pilot varied the plane's speed, but the radar source stayed at two o'clock. The pilot then requested and received permission to switch to ground interceptor control radar and check out the unidentified companion. Ground Control in the area informed the pilot that both his plane and the other target showed on their radar, the other target holding a range of ten miles from him.

After the UFO had held the two o'clock position and ten-mile range through various test changes in aircraft speed, the number two monitoring officer informed the pilot that the target was starting to move up-scope. It moved to a position dead ahead of the plane, holding a ten-mile range, and again became visible to the eye as a huge, steady, red glow. The pilot went to maximum speed. The target appeared to stop, and as the plane got close to it and flew over it, the target disappeared from visual observation, from monitor number two, and from ground radar. (The operator of monitor number two also recalled the B-47 navigator's having this target on his radar, and the target's disappearing from his radar scope at the same time). The pilot began to turn back. About half way around the turn, the target reappeared on both the monitor and ground radar scopes and visually at an estimated altitude of 15,000 ft. The pilot received permission from Ground Control to change altitude, and dove the plane at the target, which appeared stationary. As the plane approached to an estimated distance of five miles the target vanished again from both visual observation and radar. Limited fuel caused the pilot to abandon the chase at this point and head for his base. As the pilot leveled off at 20,000 ft. a target again appeared on number two monitor, this time behind the B-47. The officer operating the number two monitoring unit, however, believes that he may have been picking up the ground radar signal at this point. The signal faded out as the B-47 continued flight.

The co-pilot and number two monitoring officer were most impressed by the sudden disappearance of the target and its reappearance at a new location. As they recalled the event, the target could be tracked part of the time on the radar monitoring screen, as described above, but, at least once, disappeared from the right side of the plane, appeared on their left, then suddenly on their right again, with no "trail" on the radar scope to indicate movement of the target between successive positions.

The monitoring officer recalled that the navigator, who reported receiving his own transmitted radar signals reflected from the target, not only had a target on his screen, but reported target bearings which

coincided exactly with the bearings to the source on the monitoring scope. He also indicated that the officer operating the number one radar monitoring unit, which was of a different type, having a fixed APD-4 antenna instead of a spinning antenna as used with the number two unit, and covering all radar ranges, also observed the same display he observed on unit two. The sixth crew member, operating number three radar monitor, which covered a lower frequency range, was searching for something to tie in with the signals being observed on the other scopes, but found nothing.

The following questions are raised by this information:

1) Could the number two monitoring unit have received either direct or reflected fround radar signals which had no relation to the visual sighting?

The fact that the frequency received on number two, about 2,800 mHz., was one of the frequencies emitted from ground radar stations (CPS6B type antennas) at an airport and other airports near by, makes one suspect this possibility. The number two monitoring officer felt that after the B-47 arrived over South Central U. S., signals from GCA sets were received, and this confused the question of whether an unidentified source which emitted or reflected this wave length was present. On original approach to the area, however, a direct ground signal could not have moved up-scope. Up-scope movement could not have been due to broken rotor leads or other equipment malfunction, for all other ground signals observed that night moved down-scope. A reflected signal would require a moving reflector in the region serving as apparent source, the movement being coordinated with the motion of the aircraft, particularly during periods when the UFO held constant position relative to the moving aircraft. Since the monitor scans 360°, if a reflected beam were displayed on the scope, the direct radar beam also would be displayed, unless the transmitter were below the horizon. As the event was recalled by the witnesses, only one signal was present during initial observations. If the UFO actually reflected radar signals transmitted from the B-47, and appeared in the *same* position on the

navigator's scope as one, the number two monitoring scope, reflection of 2,800 mHz. ground signals from these same positions seems extremely unlikely.

2) Could the visual observations have been misinterpreted airplane lights, airplane afterburners, or meteors?

The persistence of the phenomenon rules out meteors. Observed speeds, plus instant re-position and hovering capabilities are not consistent with the aircraft hypothesis.

3) Were the visual observations necessarily of the same phenomenon as the radar observations?

Coincidence of disappearances, appearances, and indicated positions suggest a common cause.

4) If the reported observations are factual and accurate, waht capabilities and properties were possessed by the UFO?

a) Rapid motion, hovering, and instant relocation.

b) Emission of electromagnetic radiation in the visible region and possibly in the 2,800 mHz. region.

c) Reflection of radar waves of various frequencies. (From airborne radar units as well as 2,800 mHz. ground units). Failure to transmit at the frequency of the number three radar monitor.

d) Ability to hold a constant position relative to an aircraft.

5) Could the observed phenomenon be explained as a plasma?

Ten scientists who specialize in plasma research, at our October 1967 plasma conference regarded an explanation of this experience in terms of known properties of a plasma as not tenable.

Further investigation of this case centered around efforts to trace reports of this event submitted by the crew after the B-47 returned to the AFB. Recollections of the nature and manner of submission of such reports or records were in sharp divergence. As the

pilot recalled the incident, the landing plane was met by their Wing Intelligence personnel, who took all filmed and wire-recorded data from the "back-end" crew. The crew was never extensively questioned about the incident. Days or weeks later, however, the crew did receive from Air Defense Command, a lengthy questionnarie which they completed including sketches of what they had seen and narrative descriptions of the event. The questionnaire also had a section to be completed by the ground radar (GCI) personnel. The pilot could not recall where or exactly when the completed questionnaire had been sent.

In contrast with this recollection, the co-pilot and number two monitoring officer said that no data whatsoever had been recorded during the flight. The #1 monitoring unit was equipped for movie filming of its display, and #2 was equipped for wire recording of data. Since the flight had been merely for the purpose of checking equipment, however, neither film nor recording wire was taken aboard. Both these officers recalled intensive interrogation by their Intelligence personnel immediately after their return to the AFB. They did not recall writing anything about the event that day or later. According to their account, the B-47 crew left for England the following day, and heard nothing more of the incident.

Since it appeared that the filmed and recorded data we were seeking had never existed, we renewed the effort to locate any special intelligence reports of the incident that might have failed to reach Project Blue Book. A report form of the type described by the pilot could not be identified or located. The Public Information Officer at ADC Headquarters checked intelligence files and operations records, but found no record of this incident. The Deputy Commander for Operations of the particular SAC Air Wing in which the B-47 crew served in 1957 informed us that a thorough review of the Wing history failed to disclose any reference to an UFO incident in Fall 1957.

Conclusion:

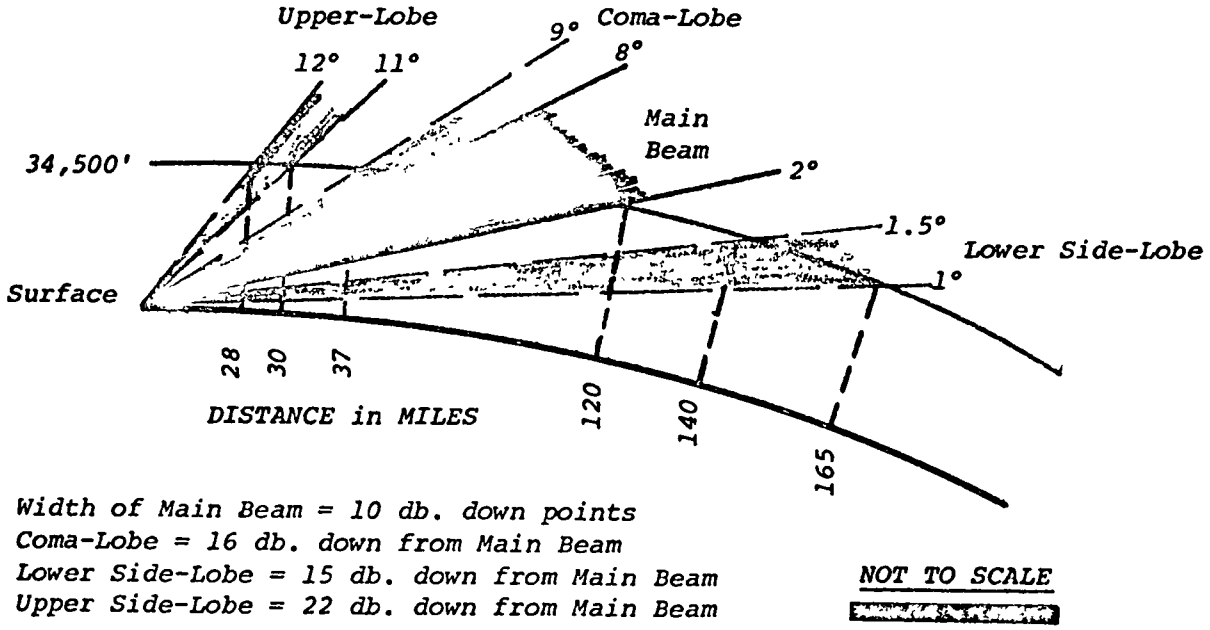
If a report of this incident, written either by the B-47 crew or by Wing Intelligence personnel, was submitted in 1957, it apparently is

no longer in existence. Moving pictures of radar scope displays and other data said to have been recorded during the incident apparently never existed. Evaluation of the experience must, therefore, rest entirely on the recollection of crew members ten years after the event. These descriptions are not adequate to allow identification of the phenomenon encountered (cf. Section III Chapters 2 & 6, and Appendix Q).

APPENDIX B

ESTIMATED RANGE AT WHICH ALA-6 COULD DETECT SIGNAL FROM CPS-6B/FPS-10 RADAR VERTICAL-CENTER BEAM AND ITS SIDELOBES AT RB-47 ALTITUDE OF 34,500 FEET.

(Distances shown are as measured along surface of the earth and are not slant ranges.)



Width of Main Beam = 10 db. down points
Coma-Lobe = 16 db. down from Main Beam
Lower Side-Lobe = 15 db. down from Main Beam
Upper Side-Lobe = 22 db. down from Main Beam

NOT TO SCALE

NOTE: Radar energy reflected off the ground may partially fill "gap" shown between lower sidelobe and main beam because of antenna's low elevation angle. The radar antenna is assumed to be aligned to horizontal although dish can be elevated slightly to clear local obstructions.

MY THANKS TO THE FOLLOWING PERSONS AND ORGANIZATIONS FOR THEIR VALUABLE ASSISTANCE

RB-47 crew members: Pilot Lewis D. Chase, ECM Monitor #2, Frank B. McClure, and ECM Monitor #1 John Provenzano.... Elint specialist Rod Simons of the AIL Div. of Cutler-Hammer, which developed the APR-9 Elint receiver.... George Rappaport, former technical director of USAF's electronic warfare laboratory at Wright-Patterson AFB, Ohio....Ken Klippel of Hoffman Electronics Corp., which produced the ALA-6.... Tom Paganelli, Paul J. Teich and C.I. Robbins, of General Electric's Heavy Military Electronic Systems Dept., which produced the CPS-6B and FPS-10 radars.... Dr. Maurer Maurer, chief of the Historical Research Div., Maxwell AFB, Ala., where the Project Blue Book UFO case files are archived.... The Air Defense Command, which dug into ancient records to obtain information on the deployment of CPS-6B and FPS-10 radars in July, 1957,....American Airlines for doing the same to provide the scheduled arrival times for its Flt. #966 and #655 on July 17, 1957.... Finally, the late Dr. James E. McDonald for his initiative in locating the original RB-47 case records in the Project Blue Book archives.

* * *

Philip J. Klass
Washington D.C.
December 30, 1971

1957 SEPT. 19-20 TEX-LA

CHASE

3. September 19-20, 1957, Texas-Louisiana area (Case 5, Bantam ... 57, 136-139, 26[illegible]-26[illegible], and 877-893)

This case has a very interesting history, since it was brought to the attention of the Project staff when one of the principal witnesses, an Air Force Lieutenant colonel, was at a Project briefing session for airbase UFO officers. As is elaborated in the Report, a determined search failed to turn up any official report on the incident in Bluebook files at Wright-Patterson AFB, so it was concluded that the Air Defense Command (ADC), which had direct surveillance of the incident, had not passed on a report to Bluebook. There is no reason to view this as evidence of super-secret handling; such instances come to one's attention in digging into the UFO problem. The system is big and just tends to work that way; all ... between commands are semi-autonomous; it's a bother to fill out detailed report forms, and, if it's known that higher echelons look on UFOs as some kind of a nonsense problem the subject of one's report, it may just not get filed.)

A B-47 out of Forbes AFB was conducting a composite mission on the night of September 19-20, 1957, had completed navigational exercises out over the Gulf and was ... coaching Gulfport, Miss. on a southbound heading, when the operator of #2 radar-monitor picked up unusual signals near a frequency of 2800 Mhz. The operator was alerted by the fact that, on his monitor display, the blip moved ... instead of down-scope, as it should have moved had it been ... ordinary ground-radar unit. (This was a B-47 equipped with ... electronic countermeasures equipment, and carried a crew of six, ... three of the ECM personnel. It was presumably an RB-47H. An ECM radar-monitor listens passively while frequency-scanning is performed until it detects impinging radar signals from hostile ground ... radars. Once so detected, frequency scanning ceases, and

...ming readings plus other required information are fed into the ...dar system to yield a scope-display on which the azimuth to the ... source is the principal output information. Various types of ... processing are possible, and, without precise information ... particular monitor used, the reader cannot reach clear-cut ... on some aspects of this sighting. The Condon Report ... some, but not enough, information on certain of these points.) Evidently, when this up-scope effect was first noted on crossing the Gulf coast near Gulfport, the #2 monitor operator in the aft section ... in as to whether these were ambiguously processed signals ... some ground radar, so he did not then report it to the cockpit ...

I had heard this case discussed with great interest by members of the Condon Project months ago (especially relative to hoped-for impact on Dr. Condon himself), and hence knew the name of the B-47 pilot in this incident. After studying the case-description in the Condon Report and noting that it gives the reader no indication that this aircraft-pacing case extended over a total distance of more than 400 miles, I located the officer and went over the incident with him in some detail. He pointed out that my earlier information was correct, in that the UFO was first picked up well east of the Ft. Worth area which most readers will think was the locale of this incident. He had sighted a bright white light closing on what seemed a collision course, from an 11 o'clock initial position, shortly after they had turned into a westbound heading over Jackson, Miss. (Since the incident terminated near Mineral Wells, Texas, the section of the flight in which the UFO was near the B-47 extends over about 450 miles. At B-47 cruising speeds in the 30-35,000-ft altitude range involved, that would represent a time of perhaps 40-45 minutes. I think many physicists and meteorologists who read the Condon Report's deliberations over mirage and anomalous propagation interpretations of this complex and protracted UFO incident will feel that they have been seriously misled by not being informed that the radar-visual observations involved in this case were occurring in generally consistent manner over so great a distance as 400+ miles. This was information well-known within the Project staff, since that is the way the incident was first related to me by staff members over six months ago. If this were the sole example of significant case details not fully and clearly spelled out in the Condon Report, it might not merit remark; but it is not an isolated example.

I tried to secure from the pilot his recollections of the angular diameter of the inbound bright light, but he recalled only that, for the first few moments, during which he alerted the rest of the crew to be ready for sudden evasive maneuvers, the light looked essentially like aircraft landing lights. After closing still further, until (Bantam 262) it "appeared to the pilot to be a glowing body as big as a barn", the light abruptly and with very high angular velocity shot across their flight path to their right and blinked out. That marks only the beginning of what the crew regarded as the unexplainable portions of the incident, and it was only the start of a 400-mile-long pacing-and-pursuit incident. As the Condon Report put it, "all remained deeply impressed by the experience."

The pilot told me that, after he and his copilot began joking about having perhaps seen a "flying saucer", the #2 monitor operator switched back to the 2800 Mhz frequency at which he had picked up unexplainable signals back near Gulfport, to see if anything showed up the 360-degree scan of his spinning antenna. He got 2800 Mhz return from some source out on their 2 o'clock relative azimuth. And it held there in a manner that would not have occurred had this been a fixed ground radar emitting 2800 Mhz signals. I queried the pilot as to whether the #2 monitor was getting signals of pulsed or continuous-wave character, but he said all he could reliably assert was that it was a strong signal because "the #2 monitor had no difficulty tracking him." As the Condon Report notes (Bantam 261), the 2800 Mhz source held a steady bearing as the plane kept moving ahead, and even speed-variations led to no apparent bearing-variations in the azimuth painted on the #2 monitor.

At some undetermined time after the foregoing developments, the pilot radioed the radar controller at the flight control center in the Dallas-Ft. Worth area, and was informed that ground radar was showing two echoes, at 10-mile separation, in his area. No visible object was present at this time, but #2 monitor had the 2800 Mhz signal coming in from the 2 o'clock position, and the relative positions on the ground radar were compatible with this.

Soon thereafter the #2 monitoring officer informed the pilot that the unknown was beginning to move up-scope (for the first time since its rapid maneuver into the 2 o'clock position). The pilot emphasized to me that this shift in position was also being followed by the ground controller, who informed him that it shifted to a 12 o'clock position at 10 miles range. The #2 monitor also showed it stopping at a new bearing dead ahead. As it reached that position, it "again became visible to the eye as a huge, steady red glow" (Bantam 262). The Condon Report continues: "The pilot went to maximum speed. The target appeared to stop, and as the plane got close to it and flew over it, the target disappeared from visual observation, from monitor number two, and from ground radar." I asked the pilot if he had any feeling for its apparent distance below him as he overflew it; he did not. He remarked that they went in over it "wide open" and that the apparent closure rate struck him as due solely to their own motion in the aircraft, in accord with ground radar's painting the return as stationary.

Putting the B-47 into a turn (which the pilot remarked to me requires about 20-30 miles at top speed), they started to head back to try to pick up the unknown again. "About halfway around the turn, the target reappeared on both the monitor and ground radar scopes and visually at an estimated altitude of 15,000 ft. The pilot received permission from Ground Control to change altitude and dove the plane at the target, which appeared stationary. As the plane approached to an estimated distance of five miles the target vanished again from both visual observation and radar" (Bantam 263). A final signal on the #2 monitor, as the B-47 levelled off near 20,000 to head north to its home base, originated from behind the aircraft; but whether it was from the unknown or from a ground radar unit is indicated as unsure. There were no further encounters with the unknown following that diving maneuver and disappearance in the vicinity of Mineral Wells, Texas.

The Condon Report gives much interview information bearing on the subsequent ADC intelligence interrogation of the crew, and on their several recollections of whether there was or was not a wire-recorder aboard and operative. As noted earlier here, a concerted search did not turn up any official records at Bluebook or ADC headquarters on this incident. The three crew members interviewed by investigators of the Project "were surprised that a report of it was not part of Bluebook files."

Although a few comments appear in the Condon Report that will be construed as indicating that mirage effects (Bantam 138) might explain the visual sightings and that an elevated radar duct present near 7000 feet altitude (Bantam 391) might have caused misinterpreted ground returns, both of those hypotheses fall far short of adequately explaining the phenomena. It is, therefore, only appropriate that the Condon Report further notes that, "There are many unexplained aspects to this sighting, however, and a solution such as given above, although possible, does not seem highly probable. One of the most disturbing features of the report is the radar operator's insistence, referring to ground and airborne radars, that '...this would all happen simultaneously. Whenever we'd lose it, we'd all lose it.' Another unexplained aspect is the large range of distances, bearing angles, and, to some extent, altitudes covered by the UFO." This case was outlined to a group of plasma specialists who rejected the hypothesis that such a report could be attributed to any known plasma effects.

So, in this 1957 B-47 case, I think we have one more example of an impressive Unexplained UFO within the body of the Condon Report, and one more reason for wondering how Condon could urge that "further intensive study of UFOs probably cannot be justified in the expectation that science will be advanced thereby." To me, the above UFO report is loaded with implications and questions of very substantial scientific interest. Why shrug off reports like that? Why advise the scientific community to ignore such matters? And, if there are cases like the above in the record (and I can assure you there are all too many equally baffling, equally intriguing in Air Force records alone), why should Condon even advise the Air Force to drop its already inadequate UFO project rather than to advise it to expand its efforts to unravel events like that which clearly impinge on matters of fairly direct military concern? Puzzling indeed, the Condon Report Conclusions and Recommendations and their seeming mismatch with the contents of the Report.

(Note: Foregoing notes, prepared for reference use of participants in Medical Students Colloquium, will be incorporated into a longer discussion of the Condon Report for presentation in the near future. Hence above is to be treated as a draft only.)

UFOs AND THE CONDON REPORT:
A DISSENTING VIEW

James E. McDonald
Institute of Atmospheric Physics
The University of Arizona

(Presented to the Pacific Missile Range Section, American Institute of Aeronautics and Astronautics, Pt. Mugu, Cal., Feb. 18, 1969)

* * *

"Further extensive study of UFOs probably cannot be justified in the expectation that science will be advanced." -- Dr. E. U. Condon, in *Scientific Study of Unidentified Flying Objects*, Bantam Books, 1969.

* * *

RÉSUMÉ

As a result of more than two years of rather intensive study of the UFO problem, interviewing about five hundred witnesses in selected cases here and abroad, talking to most of the persons who have been concerned with recent aspects of Air Force handling of the UFO problem, exchanges with many of the major independent UFO investigating groups, and repeated discussions of the UFO question with scientific colleagues, including members of the Condon Project, I might summarize my main findings and conclusions as follows:

1) The number of substantial reports of entirely unconventional, structured objects exhibiting performance characteristics far beyond the state of any known terrestrial technology seems too great by one or two orders of magnitude to justify further scientific neglect of this body of evidence.

2) All evidence points to the global scale of the phenomena; reports from essentially all parts of the world exhibit a sufficient degree of similarity to rule out hypotheses that these are secret test vehicles of any nation. Many other considerations support that conclusion so strongly that it may safely be rejected.

3) Despite many superficial efforts to explain away this body of reports on meteorological, astronomical, optical, or psychological grounds, and despite obvious operation of such factors in many reports of low evidential quality, these factors seem quite incapable of resolving the puzzling nature of hundreds to thousands of reports from reliable observers made during the 1947-69 period.

4) There is certainly no evidence that any nation has mounted any major scientific program to explore the UFO problem in depth. Nor is there evidence indicating clandestine investigations anywhere in the world.

5) With the exception of persons affiliated with the several independent UFO investigatory groups such as NICAP, APRO, etc., who have been checking UFO cases for years, most members of the public appear to have accepted the periodically reiterated claim that the best scientific talent available to the U. S. Air Force was being used to study UFO reports -- and that the findings indicated nothing unexplainable in terms of existing science and technology.

6) Although the UFO studies within Air Force Project Bluebook have repeatedly been officially described as scientific in nature, that is very far from the case. Superficial and often quite incompetent UFO evaluations have issued from Project Bluebook over the past 15 years. Major Air Force laboratories (*e.g.*, AFCRL) were never brought actively into an extended study of UFO phenomena, yet it is just such laboratories where the requisite Air Force talent lay.

7) When one examines the 20-year history of Air Force efforts to secure outside scientific advice on the UFO problem, one encounters repeated instances of negative advice, recommendations to downgrade or even to abandon the Air Force UFO studies. In my view, the scientific advice that the Air Force has received, over the years, from the scientific community has been exceedingly poor advice, in almost all instances, and is a major factor in its quite inadequate response to the UFO problem. I have come to regard this, and not some high-level coverup, as the reason USAF has repeatedly failed to react to striking UFO reports coming from their own flight personnel.

8) In the Condon Report, I believe the Air Force and the federal government have now received the largest single piece of bad scientific advice on UFOs that has ever come out of a segment of the scientific community. Despite a great deal of publicity to the contrary, I believe that this Report is not the definitive, exhaustive study it is being made out to be. Rather, I think it is a very weak study, as measured by usual standards of scientific investigation, and that it is characterized by numerous defects of serious nature.

9) The mischief has, in my opinion, been sorely compounded by a quick and almost certainly superficial assessment and strong endorsement of the Condon Report by an *ad hoc* review panel within the National Academy of Sciences. I believe that none of the 11 NAS panelists had any extensive prior investigatory experience in the UFO problem.

10) All of the above appears to indicate that no further significant scientific progress towards elucidation of the 20-year mystery of the UFOs, their nature and origin, will be possible until the serious inadequacies of the Condon Report are exposed to general discussion in scientific and technical channels.

11) The AIAA, through its UFO Subcommittee has (12/68 issue *Aero. & Astro.*) been urged to give serious scientific attention to the UFO problem. I wish to heartily second that excellent suggestion. The AIAA is perhaps the single most appropriate professional

1957 SEPT. 19 TEXAS

APPENDIX Q: WEATHER CONDITIONS IN THE AREA BETWEEN DALLAS AND MINERAL WELLS, TEXAS, 19 SEPTEMBER 1957

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June 10, 1968

The following is a summary of weather conditions to determine whether or not the atmosphere was favorable to producing optical mirages and anomalous radar propagation for an area from 50 miles east of Dallas to Mineral Wells, Texas, during the time period from 2:00 A.M. to 3:00 A.M., Central Standard Time, September 19, 1957, for an aircraft flying in that region at elevations between 10,000 to 30,000 feet.

SOURCES OF DATA

Radiosonde and wind data from -

Carswell AFB at Fort Worth

Surface weather observations surrounding the time of UFO sightings from -

Love Field - Dallas, Naval Air Station - Dallas, Carter Field - Fort Worth, Mineral Wells, Tyler, College Station, Perrin AFB, Connolly AFB, Gray AFB.

A special study -

"On the Effects of Atmospheric Refraction on Radar Ground Patterns" by the Department of Oceonography and Meteorology, Texas A & M University, 1963.

National Bureau of Standards Monograph 92 -

"Radio Meteorology", U.S. Department of Commerce, 1966.

GENERAL WEATHER SITUATION

The weather which prevailed in the entire northeast part of Texas during the early morning hours of September 19, 1957, consisted of a stable air mass with clear conditions. Air movement near the surface was from the

southeast at all stations. Table I on the following page presents the actual condition for ceiling, visibility, temperature, dew point, wind direction and velocity at the surface for several surrounding stations. Figure 1 presents the conditions at 2:00 A.M. for these same stations and is representative of conditions that continued beyond 3:00 A.M.

VERTICAL PROFILE OF TEMPERATURE, HUMIDITY AND WIND

The vertical soundings of the atmosphere made about three hours before the UFO sightings and an equal time following gives the vertical profile of atmospheric conditions in the immediate vicinity of the sightings. The radiosondes were released at 11:30 P.M. and 5:30 A.M. respectively from Carswell AFB which is near Fort Worth, Texas.

Probably the most significant portion of the profile is the very rapid decrease in moisture content at a level between 6000 feet and 7000 feet. Temperatures increased with height in this same layer. Beneath this inversion layer the wind direction changed from southerly in the lower part of the atmosphere to a westerly and northerly direction at approximately 6000 feet. Wind velocities increased during the night in the layer between 2000 feet and 5000 feet. Figure 2 presents this pattern for the two different soundings.

EFFECTS OF TEMPERATURE AND HUMIDITY ON REFRACTIVE INDEX

If a radio ray (including radar) is propagated in free space, where there is no atmosphere, the path followed by the ray is a straight line. However, a ray that is propagated through the earth's atmosphere encounters variations in the atmospheric refractive index along its trajectory that caused the ray path to become curved. The total angular refraction of the ray path between two points is commonly called the "bending" of the ray. This "bending" is strongly influenced by rapid changes in refractive index within the atmosphere and such rapid changing in refractive index is caused by rapid changes in the moisture in the air. The typical temperature inversion permits the temperature to increase over a fairly short increase in height, while at the same time the amount of moisture decreases rapidly. Experimental work has developed relationships between the moisture content and the refractive index so that data obtained in the vertical sounding of temperature and humidity from a radiosonde can be converted to corresponding values of refractive index. Figure 3 presents the profile of refractive index that directly corresponds with the vertical temperature and humidity profile in Figure 2.

In Figure 3 a critical gradient line is drawn for change in refractive index with height. Later discussion will indicate the importance of this critical gradient.

STANDARD ATMOSPHERE VERSUS ACTUAL ATMOSPHERE

When only a standard atmosphere is considered the change in temperature and humidity with height is quite gradual and there are no sharp changes due to rapid decreases in humidity. Figure 4 gives the typical profiles for a standard atmospheric profile in the top part of the figure. The

Table I. Hourly Weather Conditions Observed Early Morning Hours, September 19, 1957

2:00 A.M.

	Ceiling	Visibility	Temperature	Dew Point	Wind Direction & Velocity
Perrin AFB	clear	15 miles	72°F	66°F	SE 9
Mineral Wells	clear	25	72	66	SE 9
Ft. Worth	clear	15+	72	66	SE 10
Naval Air Station	clear	15	75	69	SE 16
Love Field-Dallas	clear	15	74	68	SE 10
Tyler	clear	12	70	67	SE 5
Connally AFB	clear	15	73	67	SSE 3
Gray AFB	clear	15	73	67	SE 4

3:00 A.M.

Perrin AFB	clear	15	71	66	SE 9
Mineral Wells	clear	25	71	66	SE 10
Ft. Worth	clear	15+	72	67	SE 9
Naval Air Station	clear	15	75	69	SE 14
Love Field-Dallas	clear	15	73	67	SE 10
Tyler	clear	12	70	66	SE 5
Connally AFB	clear	15	72	67	SSE 3
Gray AFB	clear	15	72	64	SSE 6

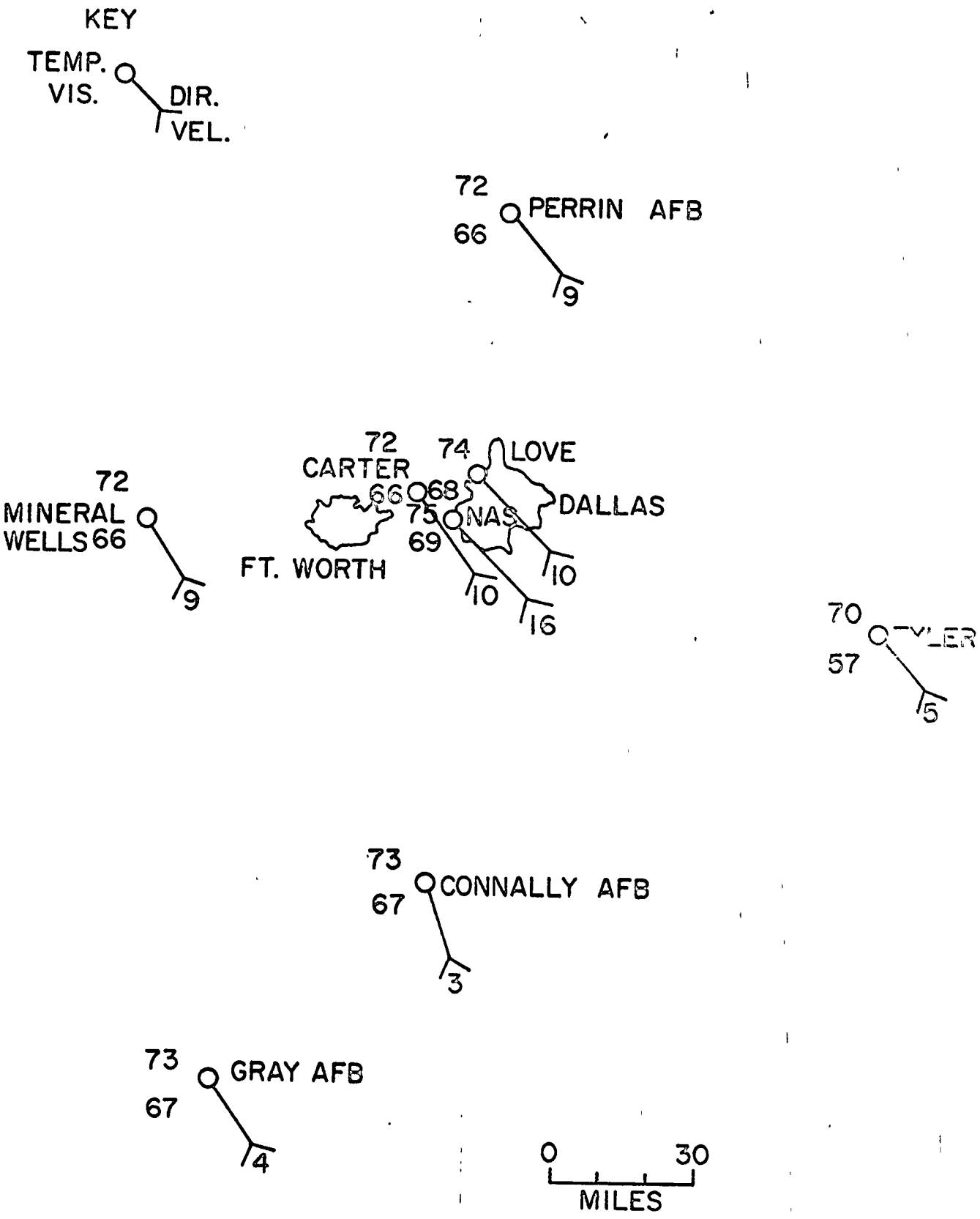


Fig. 1 Multiple Reports of Surface Wind, Temperature and Dew Point as Observed by Trained Weather Observers at 2:00 a.m., September 19, 1957.

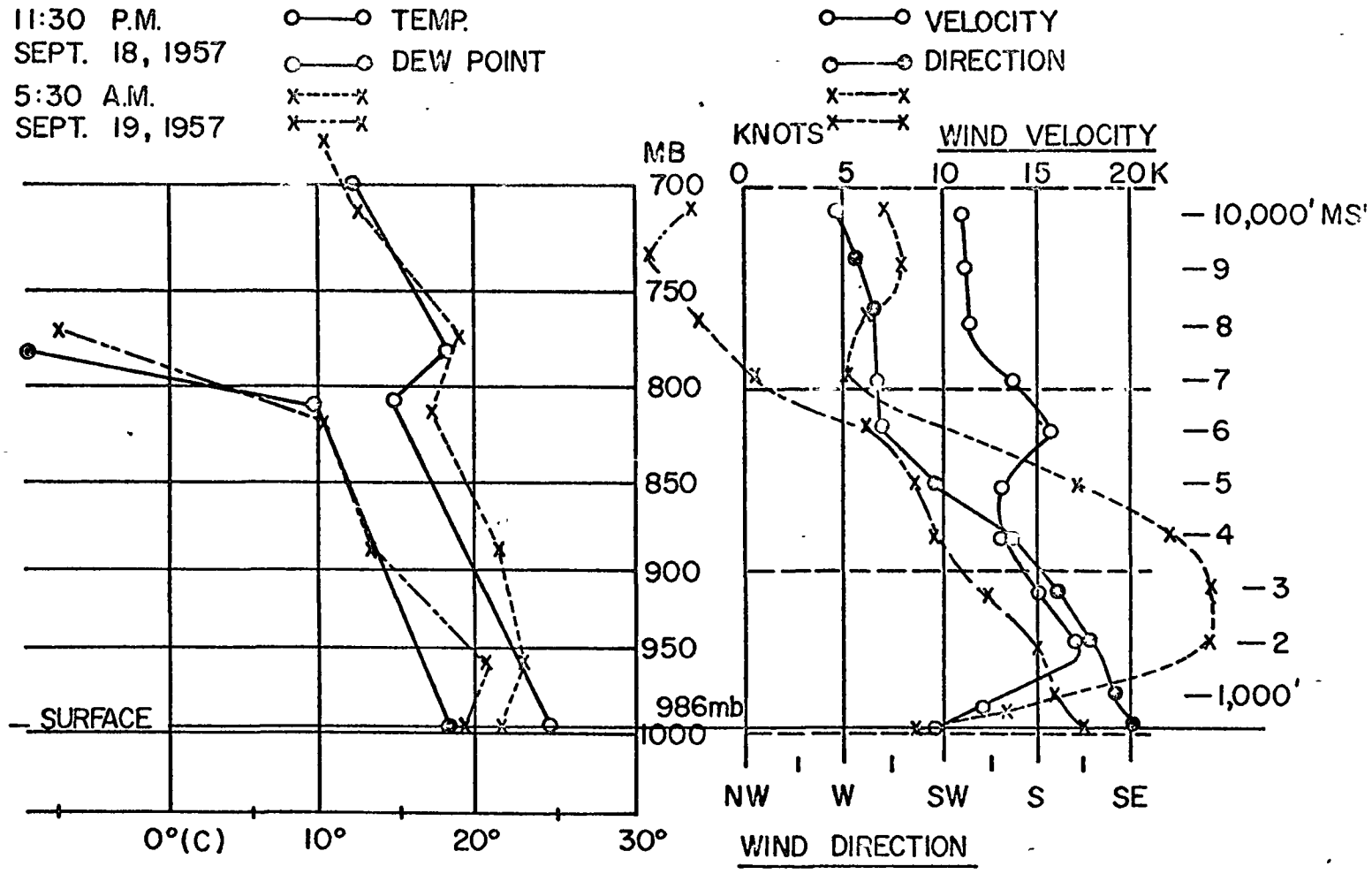


Fig. 2 Profiles of Temperature, Dew Point, Relative Humidity, Wind Direction and Velocity at Ft. Worth, Texas, during night and early morning hours, September 18-19, 1957.

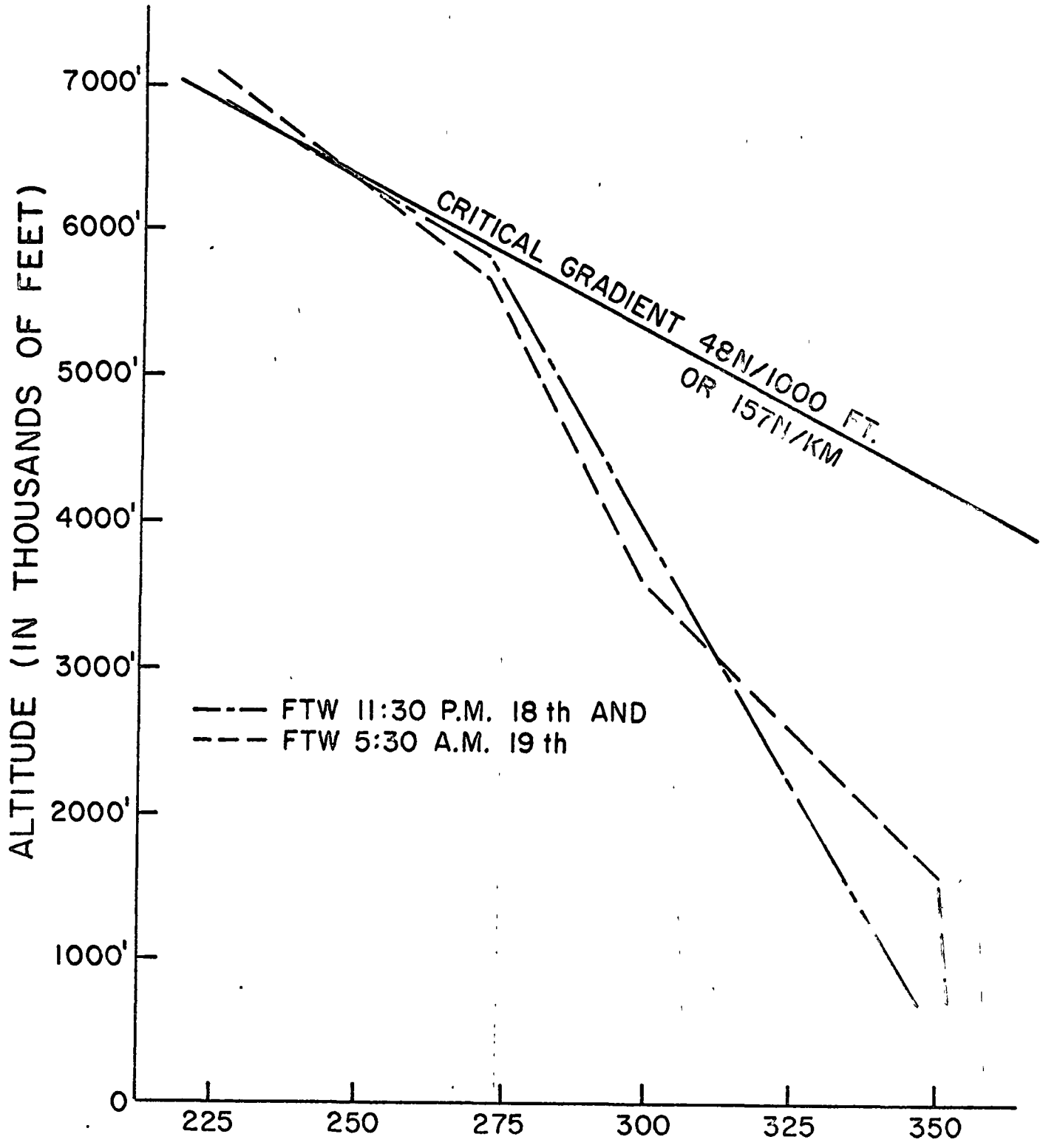


Fig. 3 Refractivity profiles at Ft. Worth, Texas, Carswell AFB, 11:30 p.m. September 18 and 5:30 a.m., September 19, 1957. Note critical gradient of N for microwave ducting in the vicinity of 6000 feet to 7000 feet altitude.

middle portion and the lower portion of Figure 4 indicate the corresponding effect on the change in refractive index with height as inversions are observed near the surface and at some elevated layer. In both of the non-standard patterns the gradient of N is somewhat greater than the critical value capable of producing ducting of microwave energy.

EXTRAORDINARY RADAR ECHOES

Of special importance in this investigation was some research work done at Texas A & M using their 3.2-Cm. AN/CPS-9 weather radar. The report, prepared by L. B. Cobb and V. E. Moyer, covers research carried out in 1962 and 1963, supported by National Science Foundation Grant NSF G-13834. This study was particularly interested in abnormal PPI presentations of radar echoes that occurred during clear weather.

The effect of atmospheric refraction on microwave propagation in the lower troposphere is a problem with which radio engineers and radio meteorologists have been vitally concerned since World War II. Prior to that time, the speed of propagation of electromagnetic energy had been considered to be a constant, that of the speed of light in a vacuum. As radar, missiles, and other radio-controlled equipment were developed and became more complex, evidence of small changes in the speed of propagation due to atmospheric conditions began to mount. These small changes in speed are very important as they cause refraction, or a change in the direction of propagation, of the electromagnetic energy. Radar trapping, errors in the positioning of targets, the radio hole, fading of radio signals, and "anomalous" echoes on weather radar scopes are some of the problems encountered. Any observer who makes critical deductions based on radar observations may be tricked into bad decidions unless he is familiar with the limitations of the equipment under nonstandard atmospheric conditions. Radar echoes of unknown origin near a vertical beam above the earth's surface are commonly called "angels". Unusual echoes from the surface are generally referred to as "anomalous propagation" or "AP". Both of these phenomena have been ascribed to abnormal refraction of the radio ray.

A study of abnormal radar echoes made at Texas A & M dealt primarily with anomalous propagation brought about by ducting or bending of radar beams due to inversions near the surface. They studied the expansion of ground clutter echoes due to increased gradient of refractive index near the surface. They examined large areas of anomalous echoes separated from the normal ground clutter pattern brought about by both strong surface inversions and strong upper level inversions.

The index of refraction, n, of electromagnetic energy in a non-dispersive medium such as the troposphere is defined as the ratio of the speed of propagation in a vacuum to the speed of propagation in the medium:

$$n = \frac{c_{vacuum}}{v_{air}} \qquad (1)$$

The speed of radar energy in the atmosphere is slightly less than the speed in a vacuum, so that the index of refraction always is very close to, but in excess of, unity. A typical example is 1.000287. For convience in handling, the index of refraction is converted to a

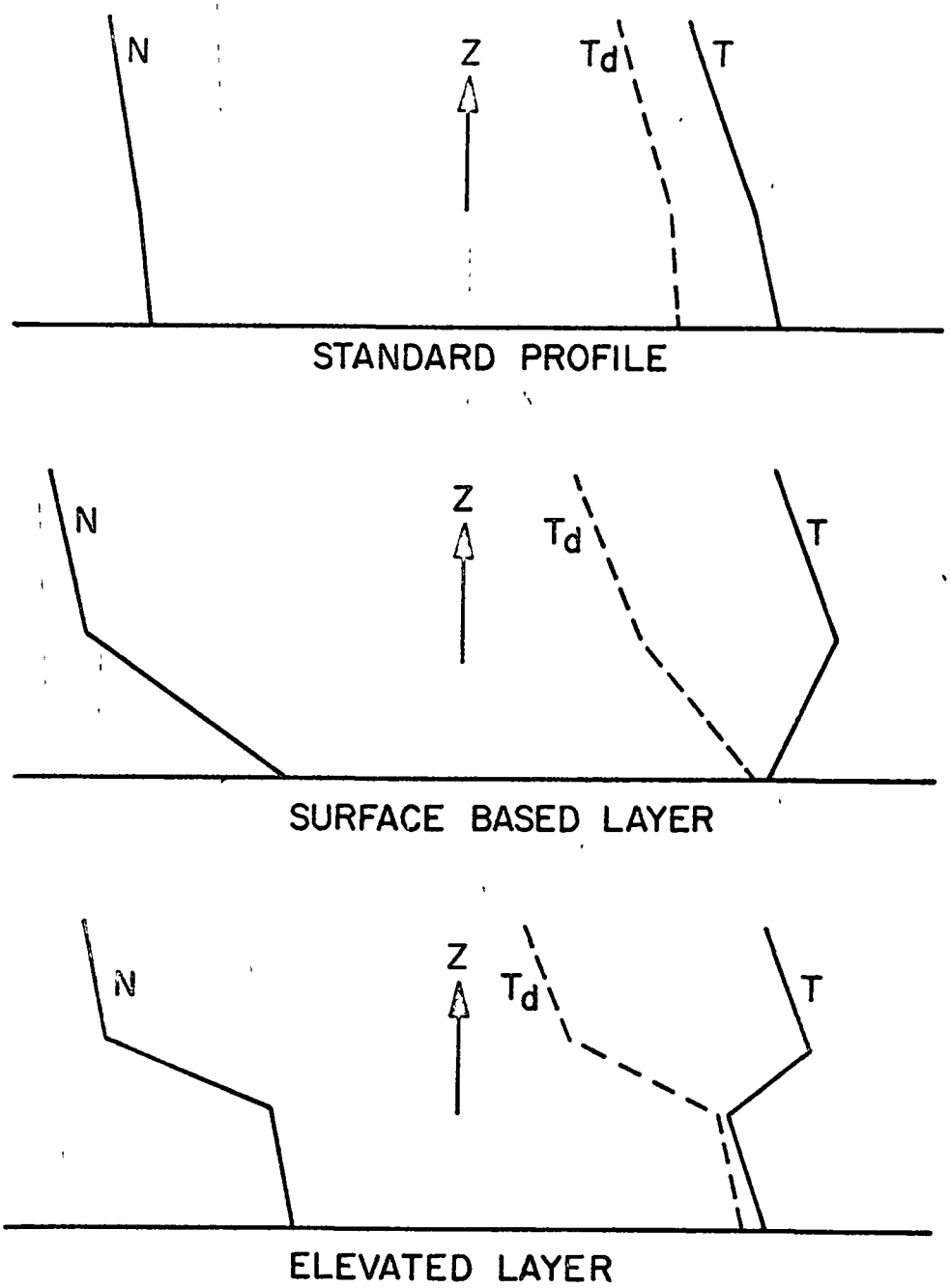


Fig. 4 Typical refractive index (N) profiles and sounding curves for three refractive index models. Solid curves on the right are for temperature--dashed curves for dew point temperature.

"refractive modulus," N, which is referred to most frequently as "refractivity":

$$N = (n - 1)10^6. \qquad (2)$$

The refractivity for the above example would be 287.

The index of refraction is a function of temperature, pressure, and humidity, their relationship being given by the equation

$$N = (n - 1)10^6 = \frac{Ap}{T} + \frac{ABe}{T^2} \qquad (3)$$

where p is the total atmospheric pressure in millibars, e is the partial pressure of atmospheric water vapor in millibars, T is the temperature in degrees Kelvin, and the constants A (= 76.6 deg/mb)* and B (= 4810 deg)* are average values recommended by Smith and Weintraub. A is the dielectric constant for dry air and B is the water vapor dipole moment. The formula is correct to within 0.5 per cent for the temperature range of -50C to 40C and the frequency range of 30 mc/sec to 30 kmc/sec. The actual amount of refraction is small, never exceeding a fraction of a degree; it is usually expressed in milliradians, or "mils." Therefore, radar operations will be influenced most when the angle between the refracting layer and the radar ray is very small.

Standard propagation occurs when the atmosphere is stratified vertically in such a way that a lapse of 12 N-units occurs in each 1000 ft. Under these conditions, a horizontal radar ray will be bent downward slightly due to increasing velocity aloft. This increase in velocity is very small; e.g., in the time it takes the horizontal ray to travel 1 mi at the surface, it will travel 1 mi. plus 3/4 in. at a height 1000 ft above the surface. This has the effect of extending the radar horizon about 15 per cent beyond the geometric horizon.

Nonstandard propagation will result when the temperature or water content of the atmosphere vary significantly from so-called "standard" values. Substandard refraction, i.e., less downward bending or possible actual upward bending of the radar ray, will occur if the refractivity is constant or increases with height. The propagation is superstandard if the refractivity decreases with height at a rate exceeding the standard rate. This causes an increased downward bending of the ray. If the velocity difference between the surface and 1000 ft achieves 3in./mi of horizontal travel, as occurs with a refractivity of -48N/1000 ft., a ray will have the same curvature as the earth with resultant greatly extended horizons, a condition referred to as "ducting."

Superrefraction normally results from a combination of increasing temperatures and decreasing humidities with height. Nocturnal radiational cooling at the surface and normal lack of nighttime convection will cause a temperature inversion, if other physical parameters are favorable. These

*slightly different than values presented by Bean and Dutton.

conditions are conducive to the formation of superrefractive strata in the lower troposphere. The formation of superrefractive strata is favored by clear skies and low wind speeds.

Elevated superrefractive layers also occur with temperature inversions or in stable layers in which there is a decrease in moisture with height. Subsidence inversions are the most common cause of this situation.

LOCAL TERRAIN SURROUNDING COLLEGE STATION, TEXAS

When the beam of a radar unit is used to cover a large horizontal area - from 200 to 300 miles - the elevation angle of the beam must be at or near zero. Near the radar site, even when the antenna is several feet above the ground, part of the energy is "echoed" back from nearby objects and/or the ground itself. As the energy goes farther and farther from the radar site the curvature of the earth permits the beam to extend into the air mass higher and higher above the earth's surface. The local terrain surrounding any particular radar location helps define the typical ground pattern. Figure 5 shows the topographic map of area within 150 miles of College Station, Texas.

NORMAL GROUND PATTERN

A standard pattern must be determined if one wishes to ascertain the degree of abnormality of nonstandard patterns. Figure 6 presents the PPI (Plan Position Indicator) pattern for College Station with the elevation angle set at 0^{o} and a full gain setting of the receiver. It is the ground return pattern associated with standard refraction in the atmosphere. The black circle shown in Figure 6 encloses an area inside 25 miles from the radar site at College Station (CCL). The terrain features in Figure 5 are reflected in this normal ground pattern. For example, the line of echoes oriented southwest - northeast (approximately 25 miles south of CLL) represents the ridge which rises south of Yegua Creek west of Navasota. The low ground along the three streams - Brazos River, Yegua Creek, Navasota River - is indicated by the converging blue lines which join to form the expanded Brazos River near Navasota before it heads southeastward to empty into the Gulf at Freeport.

Figure 6 can be reproduced with a 0^{o} beam angle and a near standard atmosphere day after day at College Station, Texas, and can be considered the normal ground pattern. A standard pattern must be determined if one wishes to ascertain the degree of abnormality of nonstandard patterns.

EXPANSION OF NORMAL GROUND PATTERN

Eleven cases were studied in which anomalous propagation caused an expansion of the normal ground pattern. The amount of additional echo observed varies from scattered, small additions to large areas of anomalous echoes which extend beyond the 50 mi range. The eleven cases were divided roughly according to whether they had small or large amounts of AP. Examples from each division are shown in Figures 7 and 8. The black circles enclose the same 25 mile radius area in these figures as in Figure 6.

The common feature of all cases was a surface refracting layer less than 2000 ft thick, overlain by air of standard or near-standard refraction. The difference in refractivity between the two divisions is reflected in the extent to which the ground pattern is expanded. The smaller expansions of AP echoes are associated with smaller refractivity values, and larger amounts with larger values. All cases with greater amounts of AP were from periods of higher temperatures than those with lesser amounts. Warmer air masses, with their larger values of temperature and humidity, have greater values of refractivity. However, the gradient of N, rather than the discrete values of N, is most important in determining the refracting properties of an air mass.

The difference in amount of anomalous echoes appear to depend upon the gradient and thickness of the surface refracting layer. All of the smaller amounts occurred with gradients between 18N/1000 ft and 30N/1000 ft; the larger amounts occurred with gradients between 26N/1000 ft and 40N/1000 ft. In general, the refracting layer was thicker when the larger amounts of anomalous echoes were observed. However, the thickness of the surface refracting layer was less than 1600 ft in all cases.

The anomalous echoes are related to the topographic features. Comparison of Figure 7 with a map of the terrain shows that the excess echoes (indicated by white arrows) are reflections from hills at those locations. These hills are not detected under standard refractive conditions, but are detected when the radar ray is bent one and one-half to two times the standard rate of bending. Greater bending of the ray will cause additional topographic features to be presented on the PPI (Figure 8).

LARGE AREAS OF ECHO SEPARATED FROM THE NORMAL GROUND PATTERN

The examples that are included in this group are those which have anomalous echoes at a considerable distance from the normal ground pattern. In some cases, these echoes encircle the local area; in others, they are confined to one or two quadrants. In most cases, they appear to be caused by an elevated ducting layer.

Two examples of anomalous echoes which encircle the local area are considered first. Figures 9 and 10 are examples of "radial patterns" which occurred on 7 May 1962 and 12 February 1962. The black circles again show an area of 25 miles radius nearest CLL. A polaroid photograph is presented for 7 May because the regular photographs were not useable. In the case of 12 February, there had been a complete ring of echoes earlier, but those in the eastern quadrants had begun to disappear by 0820CST, when the photograph was taken. The refractivity profiles for both dates were very similar.

A large anticyclone was located over the Gulf of Mexico at the surface, with a smaller high-pressure area aloft centered over Texas, on both 7 May 1962 and 12 February 1962. Thus, there was a layer of moist Gulf air near the surface, overlain by a very dry layer caused by subsidence. Nocturnal radiational cooling at the surface, together with the subsidence warming aloft, created a very sharp inversion. These are the ideal conditions for the formation of an elevated superrefractive layer, with

near-standard refractive conditions above and below the layer. The effect of the elevated layer on the radar ray is dependent on the location of the antenna relative to the layer, and on the antenna elevation angle. If the antenna is located well below the layer, total bending of the ray may be considerable at low elevation angles, but the ray will emerge on the top side of the layer. When the antenna is located just below the layer (within several thousand feet) and elevated less than 2 deg, the ray may be trapped or totally refracted.

There are several characteristics which distinguish these echoes from those discussed previously. First, a radial pattern is caused by total or near-total refraction from an elevated layer, so that its location is dependent on the vertical distance between the radar and the layer, as well as on the antenna elevation angle. Terrain features are of secondary importance in giving the pattern its shape and location. Second, these echoes usually persist longer because it takes much more convective mixing to destroy an elevated layer than is needed to destroy a layer next to the surface. Third, elements of a second ring of echoes are often observed; they probably result from a second "bounce" of the ray between the surface and the refracting layer.

A good example of anomalous echoes associated with the formation of an elevated refracting layer occurred during the night of 27 April 1962. An elongated low-pressure trough aloft, extending from Illinois to central Texas, triggered severe thunderstorms as it moved eastward during the day. Clearing occurred over the southern half of the state during the afternoon, but thunderstorms continued in the Dallas-Shreveport area. Moist Gulf air was flowing northward aloft, ahead of the trough, at the time of the 0000UT radiosonde soundings; it was replaced by very dry air from the west after passage of the trough. Figure 11 shows the refractivity profiles for San Antonio (SAT) and Lake Charles (LCH) at 0000 Universal Time (UT) and 1200UT, 28 April (1800CST, 27 April and 0600CST, 28 April); the profile for Ft. Worth (ACF) is not shown as it did not change appreciably from one sounding to the next. The formation of an elevated superrefractive layer is clearly indicated at both stations between the times of the two soundings. Figure 12 shows the AP echoes which had formed in the southern quadrants by 2250CST (skies were then clear); the echoes to the north were caused by thunderstorms.

The last example to be considered in this group occurred on 9 February 1962 (Figure 13a--e). Skies were generally clear over the state, except for some early morning fog along the coast and low stratus clouds which dissipated as the temperature increased. A large high-pressure area was situated over the southeastern United States, so that warm, moist air was flowing northward from the Gulf at the lower levels. Cold, dry air aloft had entered Texas from the northwest; the 1200UT refractivity profiles Figure 14) indicate that this air had not reached LCH. Very strong superrefractive layers existed at ACF and SAT; it appears to be a reasonable assumption that such a layer existed at CLL also, if one considers the amount of anomalous echoes that were occurring (Figure 13a---e). Both the profiles and the photographs demonstrate that the pattern was not a true radial pattern at 0850CST, although echoes occurred in all directions. During the next 15 min, heating and convective mixing began to destroy

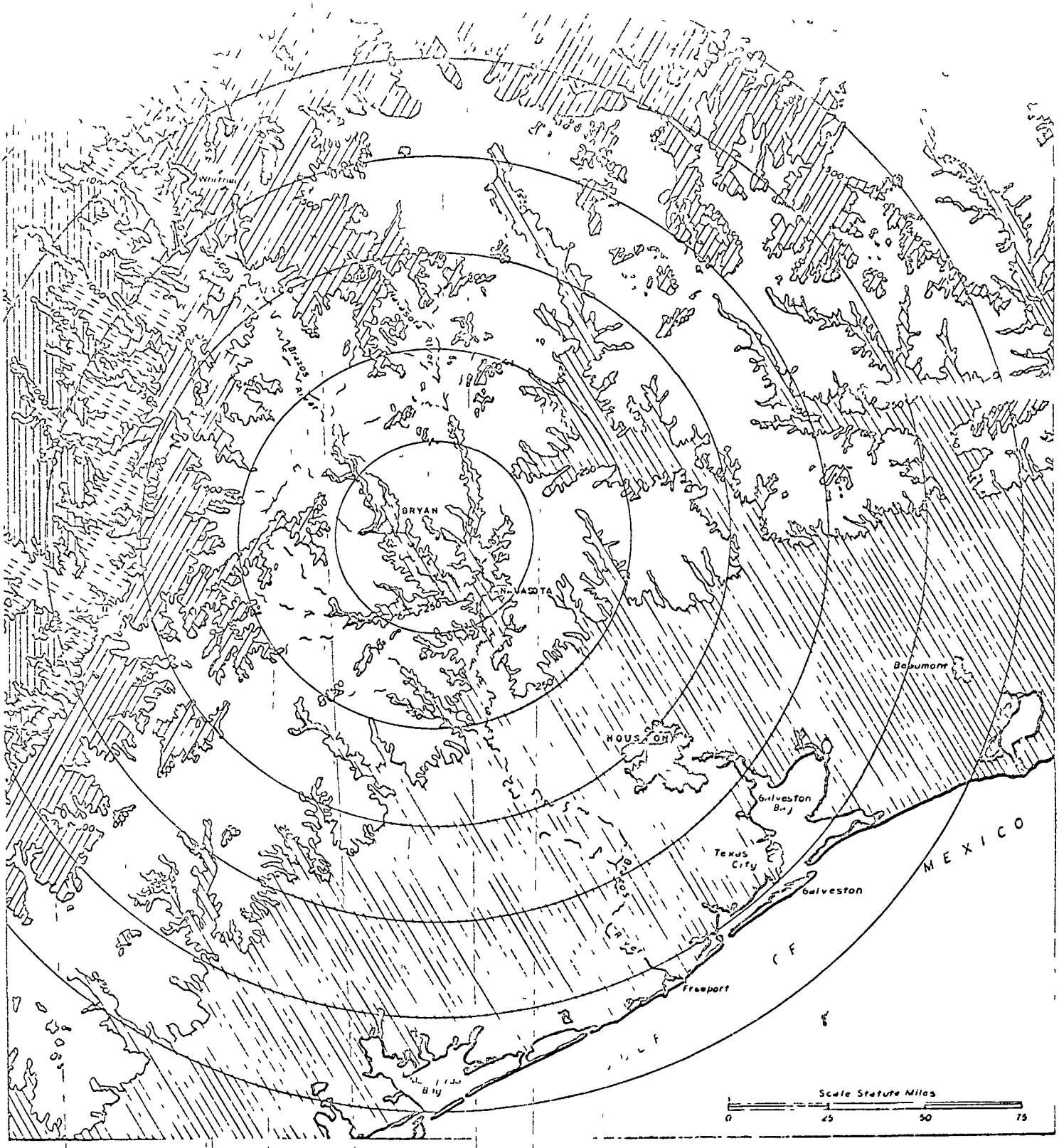


Fig. 5 Topographic Map of Area within 150-mi Radius of CLL.

...refractive layer reached the surface; an elevated layer was ... and the echoes moved outward from the center (Figure 13b). ...nued heating and convection during the next 26 min destroyed much ... the radial pattern (Figure 13c, 0931CST); in the following 13 min, all the echoes in the northwest quadrant disappeared and new echoes appeared in the southwest quadrant (Figure 13d, 0944CST). Nearly all the echoes had disappeared by 1021 CST, except several in the eastern quadrants beyond 100 mi, indicating that the low-level refracting layer was virtually destroyed. This example tends to confirm all previous conclusions concerning the relationship between anomalous echoes and the location and strength of superrefractive layers.

OPTICAL AND RADIO PROPAGATION

In Chapter 13 of the Handbook of Geophysics for Air Force Designers, published by the U. S. Air Force in 1957, various equations, tables, and nomograms are presented covering electromagnetic wave propagation in the lower atmosphere. Figures 15 and 16, as copied from that book, show how refractive modulus values vary with altitude for both optical and radio wavelengths. As shown in Figure 16 the two curves for optical and radio wavelengths converge at altitudes greater than 20,000 feet. This would indicate that any abnormal ducting of optical and/or radar type images might be similarly distorted to observers in aircraft flying above 20,000 feet when atmospheric abnormalities are uniquely favorable for anomalous propagation.

AIRCRAFT PENETRATION OF CLEAR AIR "ANGELS"

At the Ninth Weather Radar Conference in Kansas City in 1961, R. Q. Tillman, R. E. Ruskin, and M. N. Robinson of the U. S. Naval Research Laboratory, reported on the tracking of approximately 500 clear air "angel" echoes. Most of the "angels" plotted had radar cross sections between approximately 0.2 and 3 cm^2.

The maximum detectable range usually fell between 2,000 and 4,000 yards. On occasion, distinct angels with the appearance and characteristics of large airplanes or vessels were tracked, presenting targets roughly 100 times the minimum detectable target at that range. The physical extent of most of the angels, as deduced from manually varying the range setting across the target, was approximately 35 yards.

A series of attempts was made to vector an instrumented WV-2 Super-Constellation aircraft through the apparent location of the angel echoes. Of 28 attempts, 4 were successful. The plane was directed by radio by the radar operators, using the altitude and heading information from the plotting boards. On the four successful runs the plane passed directly through the telescope cross hairs, and its radar return was visible in the range notch of the A-scopes. In each case the radar shifted to this stronger target. However, in one run it was possible to unlock momentarily from the plane and to pick up the angel again. On another occasion, the angel echo disappeared when the aircraft passed through. The aircraft instrumentation included: a rapid-response refractometer, a vortex thermometer, electric field and conductivity instruments, and space charge detector. In none of the four instances was there any correlation between

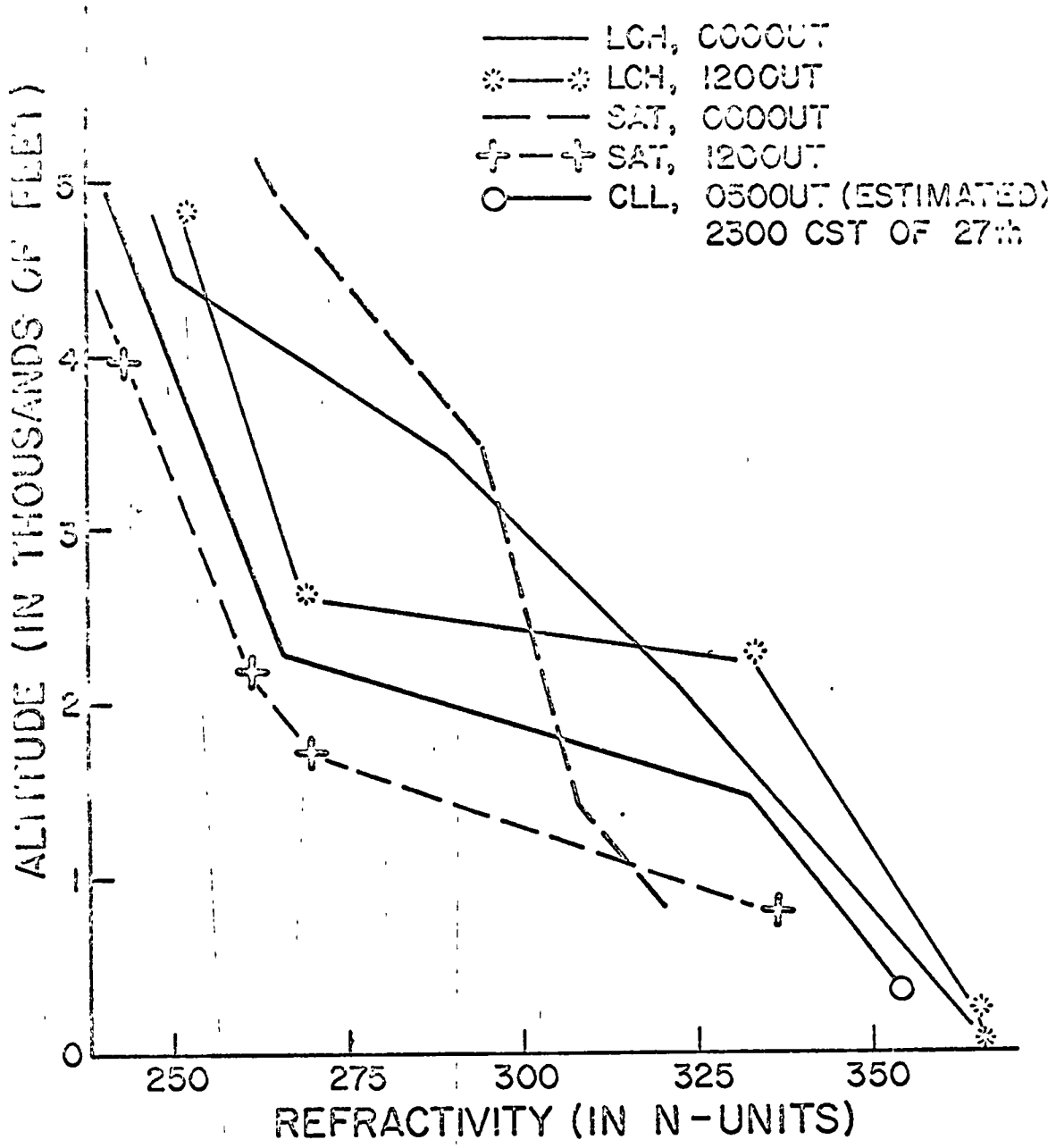


Fig. 11 Refractivity Profiles for 0000UT and 1200UT, 28 April 1962.

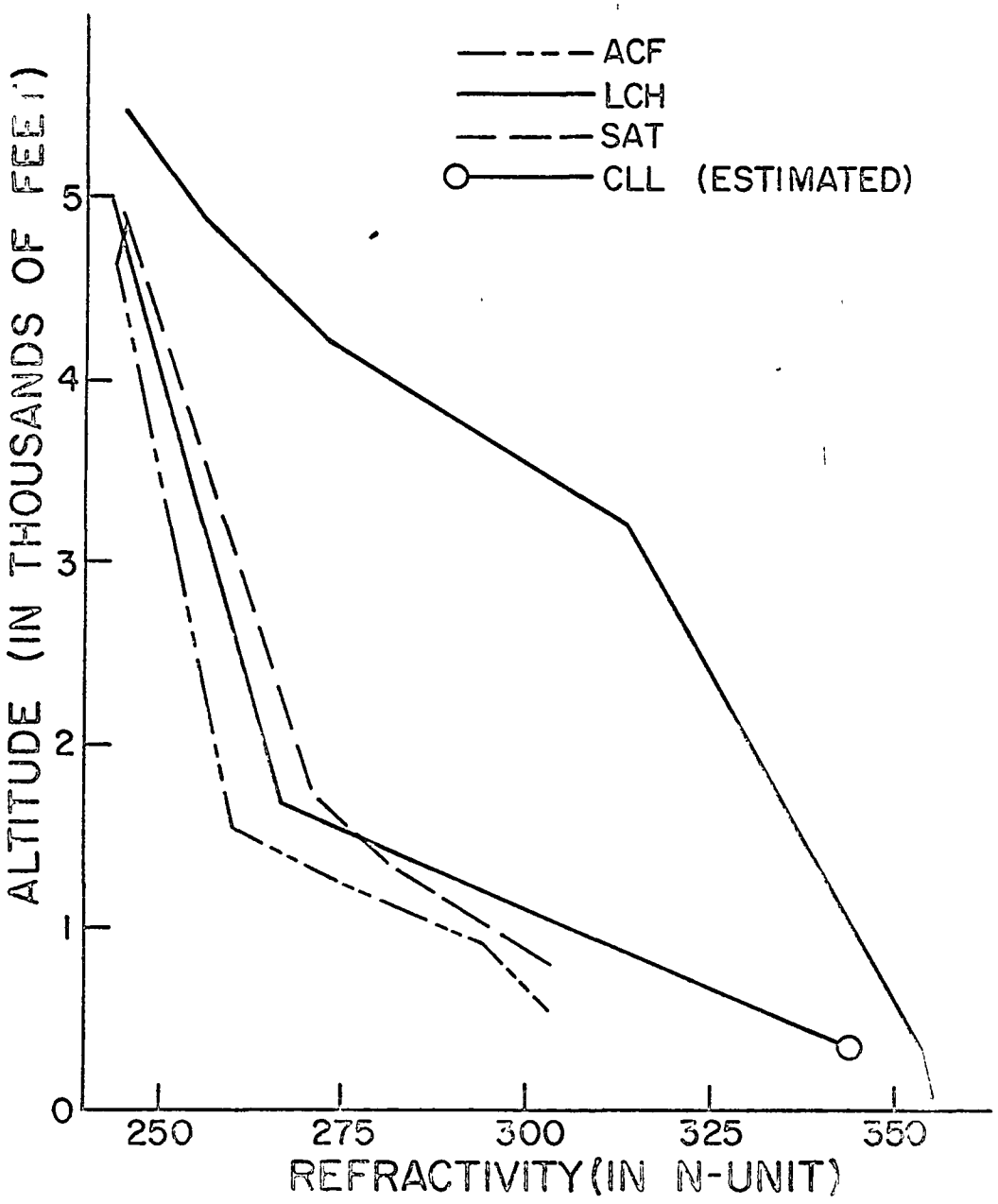


Fig. 14 Refractivity Profiles for 1200UT, 9 February 1962.

[illegible] these instruments [illegible] angel location. Slight [illegible] encountered in close proximity of several of the angels, but [illegible] correlation could be ascertained.

SUMMARY

Cloudless skies and good visibility prevailed at the time of the UFO sightings in an area from 50 miles east of Dallas to Mineral Wells, Texas in the early morning hours of September 19, 1957. Therefore, the UFO sightings were not related to cloudiness, lightning, or radar echoes from shower activity near the flight path.

The vertical profile of the atmosphere as measured at Ft. Worth did contain a sharp temperature inversion near the 6000 - 7000 foot level (Figure 2). The temperature increased and moisture content decreased rapidly with height in this layer. The change with height was great enough to permit a corresponding gradient of refractive index near the critical level which allows extensive anomalous propagation of either optical or radar energy (see Figures 3 and 16). The aircraft crew, although flying above the ducting layer, could have been receiving echoes and/or images of objects or lights many miles from the path of the aircraft. The ground operators of radar, located below the ducting layer, probably were observing echoes which were part of an anomalous propagation pattern transmitted to them due to the elevated refracting layer.

The air mass itself would have been changing slowly with respect to time during the night time hours. From a fixed position the ground radar operators would have been able to detect anomalous propagation near one particular position for fairly long periods. By contrast the airborne equipment would have been constantly changing its position relative to both the surrounding atmosphere and terrain. The probable ducting of images from considerable distances through the layered atmosphere would have tended to keep the images in the same general direction from the aircraft and at some distance away from the aircraft itself. This is in some ways similar to the observation of a rainbow from a moving automobile.

It is worthy to note that a large fraction of the reports on detailed research which have been used as references for the conclusions in this study have publication dates after September 1957. Even in 1968 it is not likely that the results of such research are common knowledge to a high fraction of aircraft crews who might on rare occasions fly near a "ducting layer" which is invisible in a cloudless atmosphere.

The detailed observations are being retained in my files. Should they be of further use to you please let me know.

LWC:dd

...863 and 1,037 ... ... of -297 km^{-1}; a ... elevated inversion is reported through this layer. A strong inversion layer evidently formed during the night and was "lifted" to the 853 m. level by solar heating after sunrise at about 0500 LST.

The Bismarck profile for 2100 LST 5 August (Fig. 4) shows a 1.2°C temperature inversion between the surface and the 109 m. level, the resulting layer forming a radio duct with a refractivity gradient of -182 km^{-1}. It is noteworthy that the Bismarck sightings show more evidence of optical inversion-layer effects than the Rapid City sightings.

In summary, the Rapid City-Bismarck sightings appear to have been caused by a combination of (1) stars seen through an inversion layer, (2) at least one meteor, (3) AP echoes on a GCI radar, and (4) possible ghost echoes on the GCI radar and malfunction of an airborne radar gunsight (although the commanding officer of the Rapid City detachment was later skeptical that there had in fact ever been even a ghost echo present on the GCI radar).

Case 5*. Louisiana-Texas (Ft. Worth) area, 19 September 1957, sometime between midnight and 0300 LST.

The weather was clear. The radio refractive index profiles for Ft. Worth, for 1730 and 0530 LST, 18-19 September 1957, are shown in Figs. 7 and 8. The aircraft was flying at an altitude between 30,000 and 35,000 ft. as recalled 10 years later by the witnesses involved. There was a slight temperature inversion at an altitude of 34,000 ft., which may have been associated with a jet stream to the north.

There is a possibility that a very thin, intense temperature inversion was present that night over certain localized areas at an altitude of about 34,000 ft., a layer capable of giving strong reflections at both radar and optical frequencies. There are many aspects of the visual appearance of the UFO that are strongly suggestive of optical phenomena: the bright, white light without apparent substance, the

*Cases referred to thusly are found in Section IV.

turning on and off "like throwing a switch," the amorphous red glow without "any shape or anything of this nature." The radio refractivity profile for the time of the sighting, with several strong super-refractive layers, is conducive to the formation of radar AP echoes. The description of the GCI radar targets is suggestive of AP phenomena:

> All of a sudden they would lose it, or something. They had it and then they didn't, they weren't sure. There was a lot of confusion involved in it. They'd give you these headings to fly. It would appear to just -- they had maybe a hovering -- capability and then it would just be in a different location in no time at all.

This type of behavior is typical of moving AP targets. The elevated duct shown on the Fort Worth profiles is very thick, and seems fully capable of causing these effects.

In summary, it is possible to account for the major details of the sighting through three hypotheses:

(1) The UFO at 30,000 to 35,000 ft. may have been a combined radio-optical mirage of another aircraft, at great distance, flying just below a thin inversion layer which was also just above the B-47's flight path. This aircraft would have had to have (a) displayed landing lights which were turned off (creating the first sighting), (b) been equipped with 2800 MHz radar, and (c) displayed a red running light (causing the red glow).

(2) The GCI UFOs were AP echoes.

(3) The last "red glow" at "15,000 feet" may have been a ground source, which became obscured or was turned off as the aircraft approached.

There are many unexplained aspects to this sighting, however, and a solution such as is given above, although possible, does not seem highly probable. One of the most disturbing features of the

report is the radar operator's insistence, referring to ground and airborne radars, that " . . . this would all happen simultaneously. Whenever we'd lose it, we'd all lose it. There were no "buts" about it, it went off." Another unexplained aspect is the large range of distances, bearing angles, and to some extent, altitudes covered by the UFO. The radar operator's comment that the return "had all the characteristics of -- a ground site -- CPS6B," indicates that an airborne radar source is unlikely due to the large power requirements. There remains the possibility that the "red glow" was the mirage of Oklahoma City which was in about the right direction for the original "red glow" and presumably had a CPS6B radar installation, but subsequent direction and location changes would seem to rule out this possibility and the grazing angle at the elevated inversion layer would be too large for a normal mirage to take place.

In view of these considerations, and the fact that additional information on this incident is not available, no tenable conclusion can be reached. From a propagation standpoint, this sighting must be tentatively classified as an unknown.

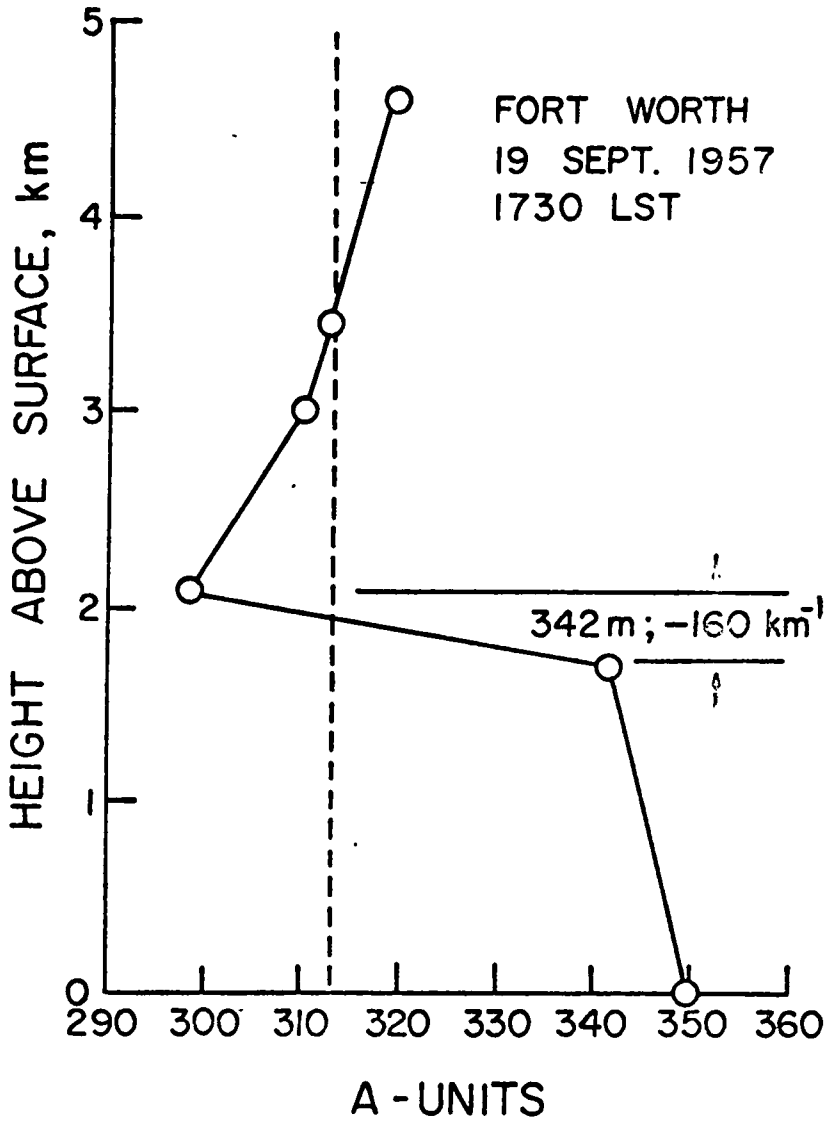
I-D: Primarily visual, miscellaneous appearance: balloon-like aircraft-like, etc.

Over Labrador, 30 June 1954, 2105-2127 LST. Weather: (at 19,000 ft.) clear, with a broken layer of stratocumulus clouds below, excellent visibility. No radar contact was made in this incident.

A summary of the pilot's first-hand account of his experience reads :

> I was in command of a BOAC Boeing Strato cruiser en route from New York to London via Goose Bay Labrador (refuelling stop). Soon after crossing overhead Seven Islands at 19,000 feet, True

Figure 7


FORT WORTH
19 SEPT. 1957
1730 LST
342 m; −160 km⁻¹
HEIGHT ABOVE SURFACE, km
0
1
2
3
4
5
290
300
310
320
330
340
350
360
A-UNITS