

ATTC NO. _____

AP NO. _____

REPORT NO. _____

DATE OF REPORT _____

TIME OF SIGHTING _____

SHAPE _____

SIZE _____

COURSE _____

NO. IN GROUP _____

MOULD _____

REF. NO. _____

SKETCHES _____

Temporary ATTC Form 329
(1 Jan 52)

✓ DATE OF _____

27-30 Nov 50

LOCATION _____

Knoxville, Tenn

COUSIN _____

Radar Operator

DATE IN TO ATTC _____

COLOR _____

SPEED _____

6 mph

ALTITUDE _____

2500'-3000'

LENGTH OF TIME OBSERVED _____

Lengthy

TYPE OF OBSERVATION _____

Radar

MANEUVERS _____

Gained altitude

Fighters dispatched to intercept objects
sighted nothing.

OTHER (FALSE REPORTS)


UNCLASSIFIED

AUTH: CO, AWC
BY: N.R. Rosengarten
Date: 11 Dec 50

is susceptible to having its radiated beam bent by "anomalous propagation" which effects the radar beam at angles which are nearly tangent to the "duct" layer.

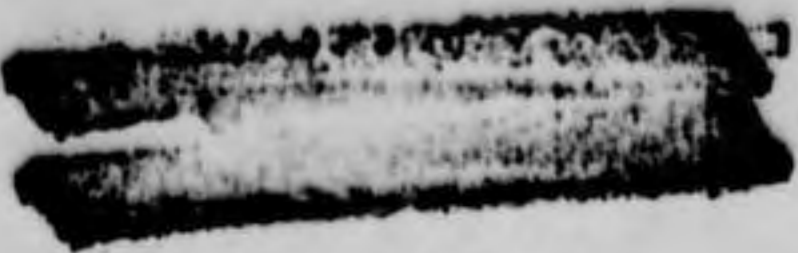
The effects reported by the radar station, 663rd Aircraft and Warning Squadron, located at the McChessee-Tyson Airfield, Knoxville, Tennessee on the nights of 29 and 30 Nov 1950, are considered to be due to a rather mild (compared to the same effects observed on this type equipment at other locations) "duct" effect.

Major Steel, AWC Procurement and Security officer on the NEPA project was advised to arrange with the weather station at Oak Ridge to have atmospheric soundings of temperature and humidity made during subsequent occurrences of the "duct" phenomenon. The Oak Ridge weather station has the necessary equipment, a captive balloon wire sonde, to make these soundings. Such soundings were not available for the period of detection of unknown radar targets. It was also recommended that equipment be requisitioned making radar scope photographs of subsequent occurrences of the detection of unknown targets, photos to be made at one-two minute intervals.

It is of interest to note that flights of ducks have been detected on the AN/CPS-1 radar set at this location and intercept aircraft have intercepted this type target. Ducks were detected at an altitude of 8000 feet.

It appears that several individuals at Oak Ridge were extremely concerned with the possible tie-in between earlier incidents especially one regarding a report received from a former Oak Ridge trooper to the effect that he had aided two men and a woman having

UNCLASSIFIED



UNCLASSIFIED


AUTH: CG, AWC
BY: W.R. Rosengarten
DATE: 11 Dec 50

difficulty with a truck in the mountains in the Oak Ridge area on 30 Mar 1950.

It was stated that this truck was on a seldom used road and was carrying a partially covered silver colored cylindrical object. The occupants reportedly spoke with a foreign accent. However, from the standpoint of technical intelligence, it appears that there is no relation between the two incidents. There are no electronic countermeasures known to this department that would cause such radar targets as those reported on 29 and 30 November 1950.

UNCLASSIFIED

Roy L. James
J.J. Rodgers

MCIAAXE
MCIAAXA-1a


CONFIDENTIAL

SUMMARY OF INFORMATION

DATE

1 December 1950

PREPARING OFFICE

CIC, FAO/s, P. O. Box 379, Knoxville, Tennessee

SUBJECT

UNIDENTIFIED OBJECTS ON RADAR SCOPES
AT McGHEE TYSON AIRPORT, KNOXVILLE,
TENNESSEE.

CODE FOR USE IN INDIVIDUAL PARAGRAPH EVALUATION

OF SOURCE:

COMPLETELY RELIABLE A
USUALLY RELIABLE B
FAIRLY RELIABLE C
NOT USUALLY RELIABLE D
UNRELIABLE E
RELIABILITY UNKNOWN F

OF INFORMATION:

CONFIRMED BY OTHER SOURCES . . . 1
PROBABLY TRUE 2
POSSIBLY TRUE 3
DOUBTFULLY TRUE 4
IMPROBABLE 5
TRUTH CANNOT BE JUDGED 6

SUMMARY OF INFORMATION

(In compliance with letter AJACI-360.33 General, dated 15 November 1950, Headquarters, Third Army, SUBJECT: Unconventional Aircraft, the following is submitted.)

A. Location and Time of Sightings:

1755 through 2400 hours on 29 November 1950; 0000 through 0500, 1351 through 1405, and 1630 hours through 2330, on 30 November 1950.

B. Weather at the Time:

Clear, temperature near freezing, and weather as described below.

C. Names, Occupations, and Addresses of Witnesses:

See "F" below.

D. Photographs of objects, if available:

No photographs available, however, the radar personnel attempted taking photographs of the radar scopes with a 35 millimeter personal camera. Apparently the exposure time was not correct because no image was found on the developed negative.

E. Object Sighted:

Unaccounted for, uncountable, unexplained, and unknown radar targets which varied in intensity from light to heavy aircraft, traveling between six (6) and sixty (60) miles per hour, heading Southwest at an altitude of 2500 to 3000 feet.

F. Any other pertinent information:

Other pertinent information is as follows:

DOWNGRADED AT 3 YEAR INTERVALS;
DECLASSIFIED AFTER 12 YEARS.
DOD DIR 5200.10

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WD -AGO FORM 568
1 JUN 47

U. S. GOVERNMENT PRINTING OFFICE: 1946-53306-1

SUMMARY OF INFORMATION

UNCLASSIFIED

DATE

1 December 1950

PREPARING OFFICE

CIC, FAO # 8, P. O. Box 379, Knoxville, Tennessee

SUBJECT

UNIDENTIFIED OBJECTS ON RADAR SCOPES
AT McGHEE TYSON AIRPORT, KNOXVILLE,
TENNESSEE.

CODE FOR USE IN INDIVIDUAL PARAGRAPH EVALUATION

OF SOURCE:

COMPLETELY RELIABLE A
USUALLY RELIABLE B
FAIRLY RELIABLE C
NOT USUALLY RELIABLE D
UNRELIABLE E
RELIABILITY UNKNOWN F

OF INFORMATION:

CONFIRMED BY OTHER SOURCES . . . 1
PROBABLY TRUE 2
POSSIBLY TRUE 3
DOUBTFULLY TRUE 4
IMPROBABLE 5
TRUTH CANNOT BE JUDGED 6

SUMMARY OF INFORMATION

At 1755 hours on 29 November 1950, numerous unidentified paints (objects) appeared on the radar scopes of the 662nd AW Radar Detachment, located at McGhee Tyson Airport, Knoxville, Tennessee. These paints, so numerous that they almost covered the "Restricted Area" at Oak Ridge, Tennessee, seemed to originate near the center of the "Restricted Area's" northwest boundary and travelled southeast at about six (6) miles per hour. As the paints crossed the "Restricted Area" (as indicated on the radar scope), some of them tended to change directions slightly so as to travel east-southeast. It appeared that these "paints" might be slightly affected by the wind which was from the southwest at six(6) miles per hour. These objects were estimated at 2500 - 3000 feet mean sea level, and they could not be sighted on the radar high scope until they were within ten (10) miles of the Radar Station. From the original source, the objects appeared to gain altitude as they proceeded across the "restricted area". The maintenance personnel checked the radar equipment in a fruitless attempt to find malfunctions, and the controller switched the radar set from "high to low beam" etc., doing everything he could to verify the readings, except to change the frequency of the radar equipment. The controller also called another radar expert to examine his findings and the above information was verified by this person. The controllers describe their observations of the radar scope as "strangely cluttered with paints" as though pellets from a shotgun shell were poured onto a table and allowed to go across it. (The table being the "Restricted Area".)

The paints varied from 290 degrees to 330 degrees at from ten (10) to twenty-six (26) miles distance from the Radar Station, and they would appear, disappear, paint bright and paint dim at various times.

A fighter aircraft was sent to intercept one or any of the targets and was vectored through, and around, specific targets and was vectored through, and around, an area in which many paints appeared, but no visual contact was reported by either the pilot or the observer. Installation of Geiger counting equipment into the fighter aircraft of the 5th AW Fighter Squadron was contemplated on 30 November 1950, at which time representatives from the NEPA Division, Oak Ridge, Tennessee, inspected the aircraft for the possibility of said installation. Most of the targets were visible on the radar scope for two or three hours, and a few could still be seen at 0500 on 30 November 1950.

The graph record of a background (Geiger) counter in the "Restricted Area" indicated a pronounced rise in Alpha particles at 1900 hours on 29 November 1950, and a slight rise in Gamma rays at the same time. These Alpha particles and Gamma ray readings are unaccounted for at the present time. Atomic Energy Commission officials advise that there were no known "Argon releases" (Argon

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508-134446

WD -AGO FORM 1 JUN 47 568

U. S. GOVERNMENT PRINTING OFFICE: 1946 O-3306

UNCLASSIFIED

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SUMMARY OF INFORMATION UNCLASSIFIED

DATE
1 December 1950

PREPARING OFFICE

CIC, FAO # 8, P. O. Box 379, Knoxville, Tennessee

SUBJECT

UNIDENTIFIED OBJECTS ON RADAR SCOPES
AT McGHEE TYSON AIRPORT, KNOXVILLE,
TENNESSEE.

CODE FOR USE IN INDIVIDUAL PARAGRAPH EVALUATION

OF SOURCE:

COMPLETELY RELIABLE A
USUALLY RELIABLE B
FAIRLY RELIABLE C
NOT USUALLY RELIABLE D
UNRELIABLE E
RELIABILITY UNKNOWN F

OF INFORMATION:

CONFIRMED BY OTHER SOURCES . . . 1
PROBABLY TRUE 2
POSSIBLY TRUE 3
DOUBTFULLY TRUE 4
IMPROBABLE 5
TRUTH CANNOT BE JUDGED 6

SUMMARY OF INFORMATION

charged with radioactive particles) during 29 and 30 November 1950.

On 30 November 1950, (during the presence of CIC and OSI representatives from 111th CIC Detachment and 8th OSI District) at 1351 hours, a single unidentified target appeared on the radar scopes. Following is the controllers notes of the objects progress.

Time (hours)	Range (miles)	Azimuth (degrees from Radar Station)
1351	21	317
1354	17	310
1400	15	300
1402	14	295
1403	13	290
1405	12	285

At this time the target disappeared from the scope.

At approximately 1630 hours, on 30 November 1950, unaccountable paints reappeared on the radar scopes and these generally followed a similar pattern, as described before. In addition to the regular radar crew, the following persons were present to witness these targets:

Lt. Col. [REDACTED], USAF, NEPA, [REDACTED] Oak Ridge, Tenn.
Major [REDACTED], USAF, NEPA, [REDACTED] Oak Ridge, Tenn.
Major [REDACTED], USAF, [REDACTED]
Captain [REDACTED], USAF, Radar Controller (off-duty)
Commander [REDACTED], USN, [REDACTED] Oak Ridge, Tennessee
Mr. [REDACTED], Oak Ridge National Laboratories, Oak Ridge, Tenn.
Mr. [REDACTED], Oak Ridge National Laboratories, Oak Ridge, Tenn.
Mr. [REDACTED], OSI, Knoxville, Tennessee
Mr. [REDACTED], CIC, Knoxville, Tennessee

These "paints" as before, were so numerous that they could neither be counted nor plotted and they remained visible on the radar screens until approximately 2330 or 2400 hours on 30 November 1950.

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1 cc OSI, Knoxville, Tenn.

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1 JUN 47

U. S. GOVERNMENT PRINTING OFFICE 16-53306-1

CONFIDENTIAL

SUMMARY OF INFORMATION UNCLASSIFIED

DATE

1 December 1950

PREPARING OFFICE

CIC, FAO # 8, P. O. Box 379, Knoxville, Tennessee

SUBJECT

UNIDENTIFIED OBJECTS ON RADAR SCOPES
AT McHER TYSON AIRPORT, KNOXVILLE,
TENNESSEE.

CODE FOR USE IN INDIVIDUAL PARAGRAPH EVALUATION

OF SOURCE:

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UNRELIABLE E
RELIABILITY UNKNOWN F

OF INFORMATION:

CONFIRMED BY OTHER SOURCES . . . 1
PROBABLY TRUE 2
POSSIBLY TRUE 3
DOUBTFULLY TRUE 4
IMPROBABLE 5
TRUTH CANNOT BE JUDGED 6

SUMMARY OF INFORMATION

The Weather Division at the Oak Ridge Atomic Energy Commission reports the following concerning the weather during the above period:

<u>Wind</u> (degrees)	<u>Speed</u> (miles per hour)	<u>Altitude</u>	<u>Mean Sea Level</u>
210	5	Surface	800 feet
230	12	1200 feet	2000 feet
240	14	2200 feet	3000 feet
260	23	3200 feet	4000 feet

The temperature at this time (1600 hours on 29 November 1950) was 32 degrees at the surface; 30 degrees at 500 feet (1300 feet mean sea level), and 27 degrees at 1000 feet (1800 feet mean sea level). There were no such observations taken on 30 November 1950 but the temperature was listed as 45 degrees at 1330 hours.

The possibility that the Geiger counters in the "restricted area" are receiving indications from the Oak Ridge National Laboratory plants is rejected because at 500 feet from the plants' "stack" there is only a 1/10th tolerance of radioactivity (tolerance is the amount of radioactivity that a human body can stand under continuous exposure for ones entire life, without affecting the persons health). Also rejected is the possibility that normal physiological radioactive masses, such as radon (natural radioactivity radiated through the ground from radium, etc., in the earth) could cause the Geiger counter readings found in the "restricted area", because said radon is a minute concentration generally measured at 1/1000th tolerance of that generated at 500 feet from the Atomic "stack".

Recent experiments designed to ascertain the effect of "Argon releases" on radar have shown that such releases cause no interference or any indication on the radar screens at the Knoxville Radar Station. Prearrangements between the Radar Station and the Weather Division at Atomic Energy Commission, for the release of Argon, were made and at the times of releases (one of which was a full power release) there were no radar indications. Therefore, a previous belief that such releases were being registered on the radar screens has been disproven.

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5 134446

WD - AGO FORM 568
1 JUN 47

U. S. GOVERNMENT PRINTING OFFICE 16-53308-1

UNCLASSIFIED
DEPARTMENT OF THE AIR FORCE
HEADQUARTERS UNITED STATES AIR FORCE
WASHINGTON

AF252

Am

THE INSPECTOR GENERAL USAF
8TH DISTRICT OFFICE OF SPECIAL INVESTIGATION
MAXWELL AIR FORCE BASE, ALABAMA

4 December 1950

24-109

SIXT INTELLIGENCE REPORT

SUBJECT: Unidentified Flying Objects

TO: Director of Special Investigations
Headquarters, U. S. Air Force
Washington 25, D. C.

1. **SYNOPSIS:** From 1715, 29 November until 2400 hours, 30 November 1950 unidentified objects appeared at various times on the scopes of the AF Radar Station, Knoxville, Tennessee over the Controlled Area of Oak Ridge, Tennessee.

2. **DETAILS:** At 1715 hours, 29 November 1950, three (3) unidentified points (objects) appeared on the radar scopes of the AF Radar Station, 66th AGW Squadron, Robbes-Tyson Airport, Knoxville, Tennessee. These points were over the Oak Ridge Controlled Area and they were not aircraft as they were moving at a speed of about six miles per hour. By 1755 the scopes "had become cluttered with points". These objects appeared to have originated near the ground at the center of the northwest boundary of the Controlled Area and were traveling and ascending at a slow rate of speed in a southeasterly direction over the Controlled Area. As the objects, now at an altitude of 2500 to 3000 feet, came over the center of the Controlled Area they spread or fanned out and some changed directions to East South East and to West South East. The points varied from 120 degrees to 320 degrees at from ten (10) to twenty six (26) miles from the Radar Station and they would appear, disappear, point bright and point dim at various times. An F-82 fighter attempted interception of specific targets but no visual or airborne radar contact was made. At 1930 the points began to diminish and after about two (2) hours had disappeared from the scopes.

The following wind conditions prevailed over Oak Ridge at 1600, 29 November 1950:

Surface	Wind 99	110 Deg.	8 mph
1200 ft.	"	220 Deg.	12 mph
2200 ft.	"	240 Deg.	14 mph
3200 ft.	"	250 Deg.	28 mph

(Oak Ridge is 800 ft. above sea level.)



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file w/ other material

Encl #1, 2

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The following temperatures were recorded at 1700 on 29

November 1950:

Surface	32 Deg.
500 ft.	30 Deg.
1000 ft.	27 Deg.

At 1900, 29 November 1950 a graph record of a background counter (Geiger counter used to determine radio activity) located in the Controlled Area indicated a pronounced rise in Alpha particles and a slight rise in Gamma rays at the same time. These readings are unaccounted for at the present time. Atomic Energy Commission officials state that no unusual release of radioactive particles was made from their installations on 29 or 30 November 1950.

On 30 November 1950, Mr. W. B. Gray, Special Agent, CIC, and Mr. William M. Price, Special Agent, OSI, were present at the AF Radar Station when a single, unidentified object appeared on the radar scopes. Following is the controller's notes of the object's progress:

<u>Time</u>	<u>Range (miles)</u>	<u>Azimuth</u>
1351	21	317 deg.
1354	17	310
1400	15	300
1402	14	295
1403	13	290
1405	12	285

(Object disappeared from the scope at 1405.)

At approximately 1630, 30 November 1950, paints, too numerous to count, reappeared on the radar scopes. These paints followed a pattern similar to those of the 29th. These objects remained visible on the radar scopes until 2330 or 2400, 30 November 1950. Present at these observations, in addition to the regular radar crew, were the following persons:

1. Col. [REDACTED] USAF, [REDACTED] Oak Ridge, Tenn.
Commander [REDACTED], Oak Ridge, Tenn.
Major [REDACTED], USAF, [REDACTED] Oak Ridge, Tenn.
Major [REDACTED], USAF, [REDACTED]
Mr. [REDACTED], Oak Ridge National Laboratories, Oak Ridge, Tenn.
Mr. [REDACTED], Oak Ridge National Laboratories, Oak Ridge, Tenn.
Mr. [REDACTED], S/A CIC, Knoxville, Tennessee
Mr. [REDACTED], S/A OSI, Knoxville, Tennessee

2. AC-119: A plan is being considered whereby background counters would be installed in the fighter aircraft in order to measure radio activity in the air during the time of radar sightings of unidentified flying objects over Oak Ridge.

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A plan has been arranged whereby the release of radio active particles from the installations at Oak Ridge will be checked for possible readings on the radar scopes.

cc: Hq. AEC
ATTN: MCIS

PATRICK W. HAYES
Lt. Colonel, USAF
District Commander

UNCLASSIFIED

For Col Willis
131-71095

HEADQUARTERS
AIR WEATHER SERVICE
WEATHER ANALYSIS DIVISION
ANDREWS AIR FORCE BASE
WASHINGTON 25, DC

4 December 1950

Weather Summary for Knoxville for the 28th, 29th, 30th November

28th

Mountains east of Knoxville obscured by low ceilings with snow and poor visibility. Clear west of Knoxville.

Knoxville Weather.....

2000 overcast lowering to 1000 feet in snow showers and occasionally continuous snow becoming broken at 4000 feet at 2030E. One isolated snow shower ceiling 3700 feet at 2330E but clearing again by 0030E, 29th.

29th

Front well east of Knoxville but still orographic clouds in mountains. Overcast 2000 to 3000 feet with snow over mountains, 3-4 miles visibilities in mountains.

Knoxville Weather.....

Scattered to broken 3000 feet, 5 miles in smoke becoming clear till 1230E becoming scattered 3000 till 1430E becoming scattered to broken at 25000 feet till 1630E becoming overcast to broken 25000 till 1930E becoming scattered to broken till midnight. Visibilities 7 miles in afternoon. Scattered to broken over ridges east, clear west of Knoxville latter half of day.

30th

Generally scattered to broken 10000 to 15000 becoming clear. Visibilities 10 miles.

WINDS ALOFT
28th

5000 350/20k

10000 350/20k

29th

5000 320/35k

10000 320/60-80k

30th

5000 270/20k

10000 300/55k

Weather for Knoxville for the hours of 2230E, 2330E on 12th, and for the hour of 0030E on the 13th Oct

122230E	Clear 15 mi	173/52/40SE3	004	Runwy lgts inopv	N S ILS inopv
122330E	Clear 15 mi	176/49/40SE2	004	Runwy lgts inopv	N S ILS inopv
130030E	Clear 12 mi	180/48/40C	005	Runwy lgts inopv	N S ILS inopv

ROUTING AND RECORD SHEET UNCLASSIFIED AIR MATERIEL COMMAND

Use this form for inter-office correspondence within headquarters.

Number all comments consecutively.

Use entire width of sheet, both sides.

Use authorized office symbols to designate addressee and addressee.

Note warning signal at lower left of form. Remaining space is sufficient only for proper spacing of typewritten signature.

Place initials of dictator and typist, telephone number and location to right of signature.

Separate comments by horizontal lines across page.

SUBJECT Investigation of Radar Returns in the Oak Ridge Area.

TO MCIA

FROM MCREEP-4

DATE 11 JAN 1951 COMMENT NO.

1

1. The attached report is submitted for inclusion with the trip report of Mr. ~~XXXXXXXXXX~~, Mr. ~~XXXXXXXXXX~~, and Capt. ~~XXXXXXXXXX~~, covering the trip to Oak Ridge for the purpose of investigating unidentified radar targets and flying objects.

2. The report is for your information and distribution as you may desire.

E. A. Kiessling

E. A. KIESSLING
Lt. Colonel, USAF
Acting Chief, Plans Office
Electronic Subdivision
Engineering Division

JCS/1a
3-9258
B 126
Rm 211

1 Incl
Report
(4 cys)

CONCURRENCE:

J. C. Sadler

11 JAN 11 11:14 PM
TSAGDS-NO.37

12 JAN 51 00:00

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Winds over Knoxville are not available. Following are winds aloft for Nashville for 12th and 13th Oct 1950:

1500Z 12 Oct	1500Z 13 Oct
2000 Ft 350/20	60/02
4000 350/33	350/09
6000 340/45	360/11
8000 340/48	360/11
10000 330/50	340/11

Attached are RAOBS for Nashville for 1500Z on 12th and 13th October 1950.

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UNUSUAL RADAR RETURNS IN THE OAK RIDGE AREA
UNCLASSIFIED

BACKGROUND

On the night of 29 and 30 November between the hours of 1700 and 2300 there were unusual returns or targets reported by the radar station at the McGee-Tyson Airport at Knoxville, Tennessee. This is the only radar station in the area and is charged with the coverage of the Oak Ridge Reservation. The only equipment operative on these nights was a CPS-1. These targets caused considerable alarm to the personnel charged with the security of the Oak Ridge plants and in particular to the personnel of the Air Force NEPA project. The weather on both nights was clear and cold with light surface winds. An interceptor aircraft was dispatched over the Oak Ridge Area but failed to intercept any targets. The aircraft radar picked up no targets. Alerted ground observers on the Oak Ridge Reservation neither sighted nor heard anything.

There were conflicting versions of the mysterious targets as observed on the radar scope. The two main versions were:

1. A few individual sharp targets appeared on the scope around sundown in the sector from 60° through north to approximately 250°. The targets in the northern sector increased in number and appeared to move south through a gap between two well defined permanent echoes (ridge peaks) located north and northwest of the Oak Ridge Reservation. As these targets moved south over the reservation they fanned out and increased in number until they completely blanked out or covered the scope over the Oak Ridge Reservation. The apparent target speed was 6 to 8 mph. The targets disappeared around 2300.
2. A very few widely scattered targets appeared around sundown in the north and west quadrants. A more noticeable one larger than the others appeared in the northwest corner of the Oak Ridge Reservation. Numerous targets appeared to "boil" out of this one and spread over the entire reservation completely saturating the scope in this area. This mass of targets spread slowly to the south and southwest and disappeared south of 260°. All targets disappeared around 2300.

DISCUSSION

Assuming no connections with previous reports of visual sightings, mysterious characters in the hills and radar returns which were proven to be flights of ducks, a solution is presented that the unusual radar returns of the nights of 29 and 30 November were due to beam "trapping" or "ducting" caused by the meteorological situation.

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Both nights were clear and cold with maximum ground cooling to be expected. The Weather Bureau Station at Oak Ridge has low level temperature records up to 1500 ft (Wiresonde) for a period of approximately one year. The records indicate that on similar nights the inversions start at the ground at sundown and reach a depth of 500-600 feet during the night. There are no records for the nights of 29 and 30 November. Such ground inversions are ideal for ducting which has the effect of increasing the number and intensity of permanent echoes and extending the ground clutter.

There are still the following questions to be answered in order to differentiate these unusual sightings from others at different radar locations on similar nights:

1. What are the "echoes" and why are they so sharp in outline?
2. Why do they appear at sundown and disappear around 2300 local time?
3. Why do they have a movement of 6 to 8 mph?
4. Why are they concentrated in the Oak Ridge sector of the scope and not in all sectors?

Suggested Answers:

1. The targets are thought to be high tension power lines, water towers, smoke stacks and similar objects which will give a sharp outline.
2. The radiative cooling starts at sundown and after a very shallow inversion is formed the beam is bent or refracted just enough to bring in the distant ground targets and as the inversion continues to increase in depth the beam is further bent so that the number of targets increase in a direction closer and closer to the station and at the optimum beam bending point the returns become so numerous that it appears as a complete blank of the scope and at this point we might say the ground clutter area has been extended due to the "ducting." After 2300 the inversion has become deep enough (400-500 ft) so that the bending of the beam will be such that it will again pick up only distant targets. If a close check is kept on the scope it is felt that the fade out of targets will be similar to the fade in except in the opposite sense, i.e., the ground clutter should break up into numerous individual targets and then the individual targets should disappear, a few at each antenna revolution.
3. It is proposed that the reported movement is only an apparent movement caused by different targets being picked up by successive, relatively slow, revolutions of the radar antenna. This would also explain the erratic directions and speed of movement of the targets.

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4. There are various versions of where the targets first appeared, their movement and area of disappearance. It is impossible to discount any of the versions as each version is from personnel who actually observed the scope. Only good scope photographs can give the true story.

A study of the general surrounding topographical features and the radar scope picture shows that the strong "permanent echoes" (mountain ranges) running in a continuous line from approximately 60° to 240° would prevent any ground targets being detected in the sector from 60° through south to 240° . Therefore, only ground targets in the sector from 60° through north to 240° could be expected to be picked up during these strong ground inversions or "ducting" conditions.

A more detailed study of the surrounding topographical features reveal the following:

- 1) The city of Knoxville is located in the sector of $0-30^{\circ}$ from the radar station. The heat from the city would tend to counteract the ground cooling and lessen the chances of ground "ducting" in this direction.
- 2) The region adjacent to the radar site in the sector $270-0$ (Oak Ridge Sector) contains the Fort Loudown Reservoir. This sector within a five-mile radius of the radar site is approximately 50% covered by the lake. An important parameter in the change of index of refraction curve with height and time is the change in moisture content. Considerable moisture is transported from the lake surface to the very low layers of the adjacent air during cold nights (steam fog conditions) and it is probable that this effect greatly modifies the low level radar transmission characteristics in this sector during clear, cold nights. Detailed atmospheric soundings adjacent to and over the lake would be required to determine the magnitude of this effect.

CONCLUSIONS:

1. The unusual radar returns in question are attributed to the atmospheric conditions prevailing at the time of observation.

RECOMMENDATION:

1. Continuous scope photographs should be taken during unusual radar return conditions.
2. Low level atmospheric soundings should be taken at 30 minute intervals by the Oak Ridge Weather Bureau Station during these unusual radar return conditions.

3 UNCLASSIFIED

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[REDACTED]
UNCLASSIFIED

3. Airborne sampling runs should be made adjacent to and through the top of the inversion layer (approximately 300 feet at 2300 local time).
4. An L-Band search radar (TPS-1) should be obtained and used in conjunction with the present S-Band set. Test runs have shown that there is very little correlation with time between targets picked up during ducting conditions on the two frequency bands. Therefore, a comparison of the returns from the two radars will give an indication of whether the targets are due to "ducting."
5. If possible, Mr. [REDACTED] and the Weather Bureau personnel at Oak Ridge should be brought to work on the problem on a cooperative basis.

James C Sadler
Capt USAF
MLRBP-4

UNCLASSIFIED

[REDACTED]

HEADQUARTERS THIRD ARMY
FORT MCPHERSON, GEORGIA
UNCLASSIFIED

13 DEC

AJACI-3 360.33

11 December 1950

SUBJECT: Unconventional Aircraft

TO: Commanding General
Hq 14th Air Force
Robins AFB, Macon, Georgia

ATTENTION: Director of Intelligence

Inclosed herewith is summary of information re unidentified objects on radar scopes at McGhee Tyson Airport, Knoxville, Tennessee, dated 1 December 1950.

FOR THE COMMANDING GENERAL:

[Signature]
JOHN MEADE
Colonel, GSC
AC of S, G-2

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As stated above

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DEC 15 1950

Hq Fourteenth Air Force, Robins Air Force Base, Georgia.

TO: Commanding General, Air Materiel Command, Wright-Patterson AFB,
Dayton, Ohio. ATTN: MGIS

Forwarded in accordance with letter, Headquarters USAF, dated 8 Sept 50, subject: "Reporting of Information on Unconventional Aircraft."

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A. R. BENDER
COL, USAF

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11 December 1950

AUTH: C, A C
BY: N.R. Rosengarten
Date: 11 Dec 50

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This information is forwarded in accordance with agreement made in telephone conversation between Col Indweiss and Col Dunn on 8 Dec 50.

Personnel representing AMC Intelligence Dept and Electronics Sub-Division visited Oak Ridge on 5 and 6 Dec. Matter was discussed with Major Steele, Major Carrs, and Mr. Kurts, NEPA project, together with representatives of OSI and CIC in that district. Matter was also discussed with Major Carr and Capt ~~Chandler~~ at Radar station, Knoxville, airport. The investigators concluded that the targets which reportedly "blacked-out" the North East sector of the radar scope" were caused by ground targets which became visible due to "anomalous propagation" or bending downward of the radar beams. Bending of radar beams is caused by non-uniformity of the atmosphere in either density or moisture content. This phenomenon is sometimes referred to as "temperature inversion" or "duct" effect. The theory of how this effect occurs is too lengthy for further discussion here.

Important characteristics of the reported radar targets, as stated by the radar operations officer, Capt ~~Chandler~~, are given below:

1. First target appeared in the northwest corner of the restricted area.
2. Additional targets appeared in the same general area and spread south and east.
3. All targets appeared in a sector between approximately 260 and 350 degrees and between the ranges of 12 and 25 miles.
4. Targets first appeared at about 1745 and were seen until 2330 on 29 Nov 50.

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AUTH: CG, AMC
BY: H.R. Rosengarten
DATE: 11 Dec 50

5. Targets of the same nature as those observed on the 29th appeared on the 30th of November 1950 between the hours of about 1630 - 2330.
6. Permanent echoes, said to be a railroad track, in the area of the unknown echoes were much more distinct during the period of observance of unknown targets.
7. Ground clutter extended on the radar scope out to about 12 miles in the direction of Oak Ridge, and high mountains, 3 to 4 miles outside of the restricted area to the northeast were visible on the radar screen.
8. Unknown targets first appeared on the lower radar beam and as they spread southward they were picked up by the upper beam.
9. Wind was from the southwest during the period of the observation of unknown targets.
10. Targets were reported to be moving at a rate of 6 to 8 miles per hour. (It is the investigators' belief that the targets were so numerous that actual movement of a specific echo would be very hard to ascertain. Movement could be mistaken by the appearance of new signal echoes as the affected area spread.)
11. Targets beyond the so-called "blacked-out area" were detected during the period of reception of unknown target echoes.
12. Intercept aircraft were unable to intercept any of the unknown targets, neither did any of these targets appear on the airborne radar set.

The ground radar set, an AN/CPS-1 early warning radar, operates at a frequency of about 3000 megacycles per second, and, like all microwave electronic equipment,

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