

**NEW ZEALAND DEFENCE FORCE**

**UNIDENTIFIED FLYING OBJECTS (UFO) FILES**

**COPIES FOR RELEASE TO THE PUBLIC**

**File Number: AIR 1080 / 6 / 897 Volume 1**

**File Title: Investigations of Unidentified & Radar Sightings  
East Coast South Island – December 1978**

**File Timespan: Opened: 1978 - Closed 1981**

**File Declassified: December 2010**

**Location of Original File: Held at Headquarters NZDF**

**Access to Original File: Restricted until 2051**

**File Contains: Interviews with people involved in the 1978 Kaikoura sightings conducted by the RNZAF preparatory to the preparation of a formal report into these sightings. File also contains technical reports from DSIR and other scientific experts and an independent report of the Kaikoura sightings by the NZ UFO Studies Centre.**

# NEW ZEALAND DEFENCE FORCE

## PUBLIC RELEASE OF UNIDENTIFIED FLYING OBJECTS (UFO) FILES

These copied and redacted files of correspondence on **Unidentified Flying Objects** dating from 1952 to 2009 have been Declassified and released to the public by the New Zealand Defence Force under the Official Information Act.

Access to the original files held by Archives New Zealand is restricted up until the year 2080 for Personal Privacy reasons. These copied files have had the personal details of members of the public making UFO reports removed to preserve their privacy. Personal details of service personnel and civilians employed by the New Zealand Defence Force and other Government Departments and Agencies have not been removed. No other information has been removed or omitted from these files.

### GENERAL DESCRIPTION OF FILES

Correspondence on Flying Saucers began in New Zealand Defence Force files in 1952 and continued under different names, Unidentified Flying Objects (UFO) and Unidentified Aerial Sightings (UAS) until the present. The files contain reports of sightings by private individuals and military personnel, investigations by Defence and other Government Departments and agencies into these reports, newspaper clippings on UFOs and letters from individuals who claim to be in touch with alien beings and craft.

While the files are in general date order from 1952 until the present some file periods overlap with one another and the documents within each file are not necessarily in strict date order. There can be duplicate documents within each file and copies of the same documents (particularly media releases and reports) can appear in different files.

### ACCESS TO UFO FILES

These redacted files are available in hard copy from the Defence Library c/o Headquarters New Zealand Defence Force Aitken St Wellington. They are not available in electronic format.



# STAFF IN CONFIDENCE

File No. AIR 17/4/897

Volume No. ONE

**SUBJECT (or NAME):** COURTS OF ENQUIRY : INVESTIGATION OF UNIDENTIFIED VISUAL AND RADAR SIGHTINGS EAST COAST SOUTH ISLAND DECEMBER 1978.

File Opened Dec 78

File Closed: JUL 81

Previous File: —

Subsequent File: —

## OTHER RELEVANT FILES

Subject:

REPORTS OF U.F.O's.

File No.

AIR 39/3/3

Copy of CADMOT tapes held in DOPS safe.

Folio	Referred to	Date	Cleared, Initials	Folio	Referred to	Date	Cleared, Initials
<u>Five</u>	<u>D OPS</u>	<u>9 JUL 81</u>	<u>[Signature]</u>				
	<u>PLANS 1</u>	<u>11 MAR 08</u>	<u>[Signature]</u>				
	<u>Sup Reg (F)</u>	<u>11/3/09</u>	<u>M.S. 25/8/09</u>				
	<u>Sub Reg A</u>	<u>25/8/09</u>	<u>[Signature] 25/8/09</u>				

# VETTING RECORD SHEET

PLEASE COMPLETE ONLY ONE PAGE PER RECORD

NZDF STORAGE NO 89354

\*~~HQ NZDF/ARMY/NAVY/AIR FORCE/ISO~~ FILE \*Delete as appropriate

FILE NO 1080/4/897

LOCATION  FRB

PART NO 1

TYPE  F  NFM

(File or Non File Material)

Series GENERAL ADMINISTRATION AND MANAGEMENT

Sub-Series BOARDS OF INQUIRY AND SUMMARY INVESTIGATIONS

Subject INVESTIGATIONS OF UNIDENTIFIED VISUAL AND RADAR SIGHTINGS EAST COAST SOUTH ISLAND - DECEMBER 1978

Date of first document 22/12/1978

Date of last document 2/7/1981

*Please Tick the Appropriate Boxes:*

<input type="checkbox"/> No NZ Documents on File <input type="checkbox"/> No Classified Documents on File <input checked="" type="checkbox"/> NZ Documents Cleared for Access <input checked="" type="checkbox"/> No Classified NZ Documents on File	<input checked="" type="checkbox"/> No Foreign Source Classified Documents on File <input type="checkbox"/> Some Foreign or Special-Source Documents placed on restricted Parallel File <input type="checkbox"/> Some NZ (Non-NZDF) Documents placed on Restricted Parallel File <input type="checkbox"/> Some <input type="checkbox"/> All Classified Foreign Source Documents Cleared for Access or <input type="checkbox"/>
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OR

<input checked="" type="checkbox"/> Release on 1 <u>JAN</u> in the Year <input type="checkbox"/> Review again before the Year	<table border="1" style="margin: auto;"> <tr><td style="padding: 2px;">20<u>51</u></td></tr> <tr><td style="padding: 2px;">20</td></tr> </table>	20 <u>51</u>	20
20 <u>51</u>			
20			

VETTING COMMENTS IF NECESSARY

File contains copy of the 'Trackers Sightings - Dec 78' Investigation and associated papers that correspond to related to other sightings  
File also contains radio reports by the Physical Engineering Laboratory (SER)

**PUBLIC ACCESS TO THIS FILE IS RESTRICTED UNTIL 2051 IN ACCORDANCE WITH THE PRIVACY PROVISIONS OF SECTION 9 OF THE OFFICIAL INFORMATION ACT 1982.**

Re-Vetting Commenced 2/12/10

Re-Vetting Completed 2/12/10

SIGNED [Signature]

DATED 2/12/10

STAMP (place relevant NZDF decision STAMP here, sign and date)

File Number 1080/6/897... Vol No. 1.....

## FILE RELEASE STATEMENT

### VETTING COMPLETED AND:

No classified documents on file.

NZDF documents have been declassified

~~Other NZ Govt Dept classified documents have been cleared for access~~

~~Foreign Source classified documents have been cleared for access~~

~~Some foreign or special source documents have been placed on a restricted parallel file (see separation sheets herewith recording transfer).~~

Other comments:

File contains copy of the 'Walkover Sightings - Dec 78' Investigation and associated papers, plus correspondence related to other sightings.

File also contains two reports by the Physics & Engineering Laboratory (SER).

Access to this file is restricted on Airway grounds until 2051

Signed..... D. McEneaney ..... Date..... 2/12/10 .....  
For Headquarters New Zealand Defence Force

**NB: Classified documents of other New Zealand Departments where there is some concern about declassifying them should be referred to the relevant department.**

# ACTION SHEET

## ON COMPLETE ON RECORDS BELOW THIS PAPER

Personnel other than Registry staff are

**NOT**

to place documents below this paper.

Documents may be placed above this paper for action/filing.  
Enclosure numbers are not to be issued.

### **NOTE:**

1. The position of this sheet in file **MUST NOT** be changed except by Registry staff.
  2. File maintenance remains a Registry responsibility and users are reminded that papers are to be filed/removed by Registry staff only.
- .....

17/4/897.

---

TO. FSIAC. W/O IC. 8.7.81. BY HITUP.

44/3/4

2 July 1971

Mr Quentin Fogarty  
11 Metung St  
Victoria 3103  
AUSTRALIA

Dear Quentin,

Thank you for your letter seeking a copy of the report of Captain Randle concerning the light sightings off the Kaikoura coast in 1973.

I have this day dispatched two copies of the report to Captain Randle, along with a copy of this letter. Presumably, as he has indicated his willingness to let you have a copy of his report, he will forward a copy to you in due course.

Kind regards,

Yours faithfully,

*(Signature)*  
(G. T. CLARKE)  
Wing Commander  
Director of Public Relations

*copy to Capt Randle  
with suggestion he may  
like to forward to Fogarty*

*3/7/81*

*G.T.C.*

*(Signature)*  
*Wing Staff*

*see your attention*

*(Signature)*

MINUTE SHEET

Department: .....

Subject:

File No. ....

KANCOORA UFO SIGHTINGS

Date: .....

To-

*[Handwritten signature]*

1. Herewith two copies of the notes prepared by Captain Randle for Wg Cdr Clement investigation. We should retain the original. Captain Randle should pass on to Quentin Fogarty whatever he wishes, but we should not deliver anything to Fogarty.
2. Please return copies of the Fogarty letter and your responses to him and Captain Randle for retention on the investigation file.

*[Handwritten signature]*

Wg Cdr

DSPT

18 Jun 81

MINUTE SHEET

Subject: STATEMENT : LIFO SIGHTING:

Department: DPR

File No. 44/3/4

Date: 5/6

To-

SASO Y

DDPS -

Do we have this report? If so we should return it to Randle along with this letter - Y.

1. Please see letter below regarding the statement given to the RNZIF by Capt John Randle during the compilation of the report by the other D ops.

2. If a copy of Capt Randle's statement is still held I will undertake to have it returned to him with a copy for Fogarty

Note by DDPS

We can return original and copy to

Randle. who can pass on to Fogarty

himself if he wishes

*[Signature]*

WY bh  
DPR

11 Metung St  
Balwyn  
Victoria 3103  
Australia  
June 10, 1981

Dear Geoff,

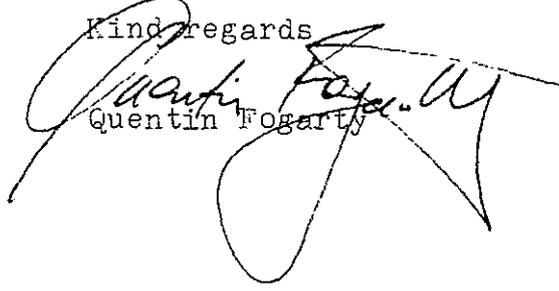
I hope this letter reaches you, as I have no way of knowing whether or not you are still with the Ministry of Defence. If you have moved on, and this letter is opened by someone in the public relations section, then I hope they can act on my request.

I have written a book on the UFO sightings off the Kaikoura Coast in December 1978 and it has been accepted for publication. My publisher is keen for me to expand the section dealing with the December 21 incidents and I have written to a number of the witnesses for additional information. One of those I contacted was Captain John Randle who told me he had no desire to go over the whole thing again, so much later. However, he did tell me that he supplied the RNZAF with a written summary of the incidents and he said that if I was able to obtain that summary, or a copy, then I could use the information.

He told me that the RNZAF had indicated they would return the summary, but apparently that has not been done. I would appreciate a copy of the summary, or the summary itself. If you would like to verify Capt. Randle's approval for me to use the summary, may I suggest you contact him at

I am working to a deadline and whatever your decision, I would appreciate being informed as soon as possible.

Kind regards

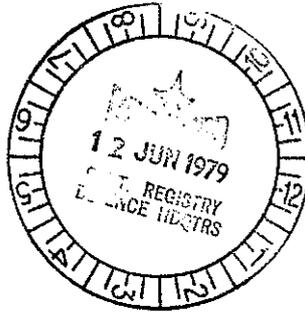
  
Quentin Fogarty

NEW ZEALAND UFO STUDIES CENTRE (NUSC)

Dr.J.F.deBock  
5 Ngahue Crescent,  
ELSDON.

5 June, 1979

Ministry of Defence,  
Private Bag,  
WELLINGTON.



39/3/3

REFERRED TO	
<del>DDE</del>	
<del>D 6/15</del>	

Dear Sir,

Please find enclosed a copy of the provisional report made by Dr.Bruce Maccabee on the Kaikoura UFO case. Through our contacts with CUFOS (Centre for UFO studies) and MUFON (Mutual UFO Network) in the USA, the report was forwarded to us. In a personal letter, Dr.Maccabee requested us to send copies to those who have been involved in the investigation. Copies are being sent to DSIR, Met.Office, Civil Aviation, Ministry of Defence, Carter Observatory and Wellington Air Traffic Control.

Although Dr.Maccabee has released the copyright for some parts of the report, we still have to emphasise its confidential character. MUFON will publish the complete report, while the magazine "Nature" will issue a more technical article on the New Zealand case.

I would like to take the opportunity to inform you of the frequent sightings reported to us. Most of which can easily be explained after an initial investigation with the limited aids in our hands. However, some sightings have to remain unexplained since we are unable to obtain sufficient background information from such institutions as yours. With this problem in view we would be very grateful if you could advise us in future on those limited unexplained cases. In several overseas countries this assistance has led to the setting up of an advisory committee, with specialists in various fields. The aim of the committee, which only meets when necessary (perhaps twice a year) is to come to a natural explanation of the more complicated sightings, to avoid the public phoning your institutions, and to reduce speculation that reported sightings are Flying Saucers, space-ships and other types of so called extraterrestrial manifestations.

We already have the promise of a representative from a few institutions, and we would be grateful if you could consider your participation as well in the advisory committee.

If you wish to have additional information on similar set ups in overseas countries, please do not hesitate to contact us.

I thank you in advance, and hope the report enclosed shows the serious approach into this field of unidentified aerial phenomena.

Yours sincerely,

A handwritten signature in black ink, appearing to read 'J.F. De Bock', with a long horizontal line extending to the right.

J.F. De Bock.

With the compliments of the  
New Zealand UFO Studies Centre (NUSC)

As of  
April 19  
27

subject to  
further revisions  
and additions

WHAT REALLY HAPPENED  
IN NEW ZEALAND

by

Dr. Bruce S. Maccabee

(Copyright, Bruce Maccabee, 1979)

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## Sources of Information

The primary sources of information are the memories of the eight witnesses who were involved. These memories contain a wealth of information which, nevertheless, is "soft information". However, this case is unique for the amount of hard information which was available after the events were over. The hard information includes a tape recording of the conversations between the Wellington ATC Center and the aircraft. This recording establishes an irrefutable time line for the events. Then there is the tape made on the aircraft by Quentin Fogarty (how many UFO sightings have information recorded in situ?). Although this tape cannot be exactly synchronized with the Wellington tape, the approximate times of Fogarty's statements can be determined from the content (he occasionally repeated what Wellington had told the plane). Then there are scribbled pencil notes by Dennis Grant, the Christchurch N.Z. reporter. (He took the place of the cameraman's wife, Ngaire Crockett, on the trip north.) He was apparently the only one who actually wrote anything down during the sightings. And finally, there is the film, which is a veritable tour de force of UFO images. The film contains pictures of airport lights (landings and takeoffs), pictures of the airplane cockpit, pictures of Quentin Fogarty at Christchurch Airport, and pictures of..... UFOs. The landing light sequences and the cockpit sequences serve to establish that the film was taken from inside the aircraft. A study of the edge numbers of the original film (edge numbers are put on by the manufacturer) shows that they are continuous, except for a change in film at Christchurch (they needed a new roll for the journey north). Thus the film is not a hoax. The landing light sequences provide color and brightness information which can be used to calibrate the film and the optical quality of the airplane window. All of this hard information (acoustic and optical) is supplemented by the memories of five witnesses on the aircraft at any time and one or two witnesses at the Wellington ATC (two witnesses for part of the trip south; one witness at all other times). As the interviews proceeded I found that the statements of the various witnesses tended to complement rather than contradict one another. There were some variations in descriptions of events, etc., as might be expected from different observers after a time lapse of over a month, but I found no outright contradictions. To my surprise (and delight) almost every new "bit" of information I learned supported rather than contradicted

the previous "bits". From this wealth of information I have abstracted a summary of the events which, when read in conjunction with the "Event Descriptions and Map Legend" will give the reader an overview of the N.Z. Radar-Visual UFO case. The associated maps, Figures 1 and 2, show the overall path of the aircraft as a dashed line. The T shaped symbols represent the aircraft at various points along the path and the numbers refer to events in the "Event" sheet. The events are primarily those associated with radar targets referred to by Wellington ATC. Specifically, the location of the airplane each time Wellington referred to a target (or targets) is shown on the map. The locations are believed to be accurate to within 1 or 2 miles. The specific radar target(s) associated with a specific position of the airplane is (are) connected to the airplane symbol by a line(s). The events that occurred as the plane flew away from Christchurch (#21-27) are reconstructed from the witness statements about what they saw and what the airplane radar screen showed. The path of the plane from Event # 25 to Event #27 is approximate and is subject to further revision. The path of the object was estimated from witness statements, airplane radar data, and from the image sizes on the film. The film image sizes (except when defocussed) are never larger than several milliradians in angular size. Assuming that the object was of a fixed size, this means that it never was closer than some minimum distance, probably about 10 miles, during the time it was being filmed. On the other hand Fogarty remembers looking almost straight down on the object out the right window (his last view of it), and the captain is quite certain that the plane passed over it. At these times the cameraman was not able to film it because it was moving rapidly with respect to the plane and because the film magazine and the overall size of his camera made it difficult to shoot at large downward angles (for example, the top of the film magazine could have bumped some of the overhead switches in the cockpit). The remainder of the airplane path (everything except 25-27) is reconstructed from the standard flight plans and from the memory of the Wellington Air Traffic Controller, Geoffrey Causer.

To obtain a good impression of the bewildering number of unusual occurrences during those early morning flights I suggest that the reader read the summary first and then read the "Event" sheet, paying rather careful attention to the details of the events.

**Summary of Events**

(NOTE: all miles are nautical and times are local D.S.T.)

**FLIGHT SOUTH**

At 11:46 pm on December 30, 1978, a four-engine turbo prop Argosy freighter left Wellington, N.Z., on a standard Saturday evening-Sunday morning newspaper delivery run, from Blenheim, N.Z., to Wellington to Christchurch, and then back to Blenheim. Aboard the aircraft were the pilot, Captain Bill Startup, the co-pilot, Robert Guard, the Australian news reporter, Quentin Fogarty, and a film crew which consisted of the cameraman, David Crockett, and his wife, Ngaire, who operated the tape recorder.

The reporter and film crew had been commissioned by a Melbourne TV station to fly to Christchurch to obtain film footage for use in a news story about a previous UFO sighting that had been made by pilots on a similar aircraft flight. During the flight south the pilot and co-pilot observed lights that were first seen in the direction of Kaikoura, from a point just southeast of Cape Campbell (see map <sup>and Event Sheet</sup>) Coincidentally, Wellington radar picked up and reported targets which were in the vicinity of the plane. It appears that at least two, and perhaps several, of these anomalous radar targets were observed by the passengers on the plane.

The cameraman obtained 16mm color film footage of the inside of the plane, the lights of Kaikoura, and of anomalous bright objects that were seen occasionally in the 12:00 to 3:00 (front to rightside) quadrant with respect to the direction of travel. The reporter recorded on-the-spot comments and descriptions and occasionally referred to statements made by Wellington **Air Traffic Control (ATC)**. The anomalous lights seen on the trip south were observed to be mainly in the direction of Kaikoura or ahead of the plane, except for one, which was seen off the right wing after the plane was south of Kaikoura.

Radar targets that were reported to the plane by the Wellington **ATC** within about 20 miles of the plane as it travelled from a point just south of Cape Campbell to a point about 57 miles northeast of Christchurch. The airplane radar was not used on the flight south.

**One particularly interesting sequence of events involving**

Wellington ATC occurred just after the plane had turned toward Christchurch at a non-geographic reporting point called "Kaikoura East" (see map). The plane had shifted to the Christchurch communication frequency when Wellington saw a target appear behind the plane about one or two miles (Event Sheet # 12 ) . Wellington told the Christchurch controller, who asked the plane to shift back to the Wellington frequency. Wellington then told the plane <sup>that</sup> the target was about four miles behind them. About half a minute later Wellington said there was a further target about four miles to the right of the plane. About 45 seconds after that Wellington told the plane that something was flying in formation with it. The plane and the unidentified target flew side by side for at least half a minute, after which the radar target reduced to that of the plane alone (Event Sheet #15 and 16). About a minute later the plane contacted Wellington and reported a "target", which was a flashing light, at the right of and falling behind the airplane. (Event Sheet # 17). Wellington agreed that there was a target at the right of the plane that was drifting behind as the plane moved forward.

The plane landed at Christchurch, N.Z., at 1:01 AM, December 31. While newspapers were being unloaded the crew discussed the sightings with the Christchurch radar operator, who described to the crew an anomalous target that was not particularly impressive to him. In order to obtain more film footage, **Crockett and Fogarty** decided to fly back to Blenheim. One of the passengers, the wife of the cameraman, decided not to make the return flight and her place was taken by a reporter from Christchurch, **Dennis Grant**, a personal friend of the Australian reporter (the only person involved that the Australian reporter had known before the flight).

#### FLIGHT NORTH

The plane left Christchurch on its flight north to Blenheim at 2:16 am. About 3 minutes later, as the plane climbed through a low cloud cover, the pilot, co-pilot, and cameraman, who were all in the cockpit at the time, observed a bright yellow/white/orange light apparently at about their level, which would appear and disappear through the tops of the clouds. It was between 10 and 30 degrees to the right of the aircraft, which was flying northeast. This light was pointed out to the two reporters who arrived in

the cockpit several minutes after the takeoff. The captain obtained a strong return from his radar which was operated in its "mapping mode." The size of the radar "blip" was estimated by the flight crew to have been 3 to 5 times larger than the blip from a large fishing boat. The flight crew and the Christchurch reporter, who had a good view of the radar display and of the object, repeatedly compared the direction of the bright light with that of the target as indicated by the azimuth markers on the radar screen. They assured themselves that the radar target and the bright light were in the same direction. The radar distance was initially 18-20 miles. As the plane proceeded along a straight northeasterly path and climbed to its cruising altitude, the distance to the bright light gradually decreased, as indicated by the radar, and the sighting line tended to move around to the right. By the time the plane was about 17 minutes (32 miles) out of Christchurch at <sup>an altitude</sup> of 11,500 ft the bright light was about 70 to 90 degrees to the right of the aircraft (southeast of the aircraft) and about 12 miles away and no longer on the plane radar. All observers agreed that the object appeared to be at a lower altitude than the aircraft, with depression angles below horizontal estimated to be between 5 degrees and 30 degrees. The radar in the map mode could only pick up targets with depression angles between about 3° and 15° below the centerline of the aircraft.

The cameraman obtained several minutes of film out the far right-hand cockpit window during this period. Images on the film range from yellowish white elliptical shapes with reddish fringes to overexposed, nearly triangular and circular shapes. Typical angular sizes were on the order of 1-2 milliradians\*. He also obtained several feet of film showing a cockpit meter just below the image of the bright light. At about 12-13 minutes (35-38 miles) out of Christchurch the plane reached 13 thousand feet and a speed of 215 knots. At this time the flight crew decided to turn to the right toward the bright light. As the plane turned, the sighting line to the object moved toward the front of the aircraft, but even after a turn of about 90 degrees, the object

\* Divide the distance to the object by 1000 and multiply by the number of milliradians to find the size. For example, an angular size of 1 milliradian corresponds to an object size of 1 foot at 1000 feet:  $(1000 \text{ feet}/1000) \times (1 \text{ millirad.}) = 1 \text{ ft.}$

was not directly ahead of the aircraft, as if the object had moved to the right. The captain proceeded in a straight line along a southeast heading and again the sighting line to the object moved from nearly directly ahead toward 90 degrees to the right as the plane flew. The depression angle below horizontal was apparently very noticable at this time. The object was not picked up on radar after the turn, even though the object was nearly ahead of the aircraft immediately after the turn, which suggests that the depression angle was greater than 15 degrees. After travelling on this new heading for 1 or 2 minutes, the captain began a turn to the left back toward his original flight path, at which time the light was observed to move quickly to the left-front and above the aircraft and then to the left and down and apparently below the aircraft. The object was not seen again after the plane completed its left turn.

During the time that this object was seen by the plane passengers, it was not seen on the Christchurch or Wellington radars. This may have been because it was too low to be picked up by either <sup>Radar</sup> and/or because it was a weak target for 50 cm radar.

After the aircraft gained its original course and approached a point south-east of Kaikoura, Wellington control tower again began to call the attention of the flight crew to anomalous targets which were within 20 miles of the plane as it travelled toward Cape Campbell. Occasionally, unusual bright lights were visible in the directions indicated by the Wellington control, and in <sup>at least</sup> one instance the plane radar picked up a target that appeared to the captain to be in the same position as that indicated by Wellington control. There were also apparently temporal coincidences between appearances and disappearances of visual and radar objects.

One particularly bright object that was seen as the plane approached Cape Campbell was photographed by the cameraman. The film shows a bright light which alternates in a regular, cyclic manner from bright white to dim red and orange. It apparently travelled in a series of loops, described as "rolling and tumbling" by the reporter ( see Event #33 ).

The plane landed at Blenheim airfield at about 3:10 A.M.

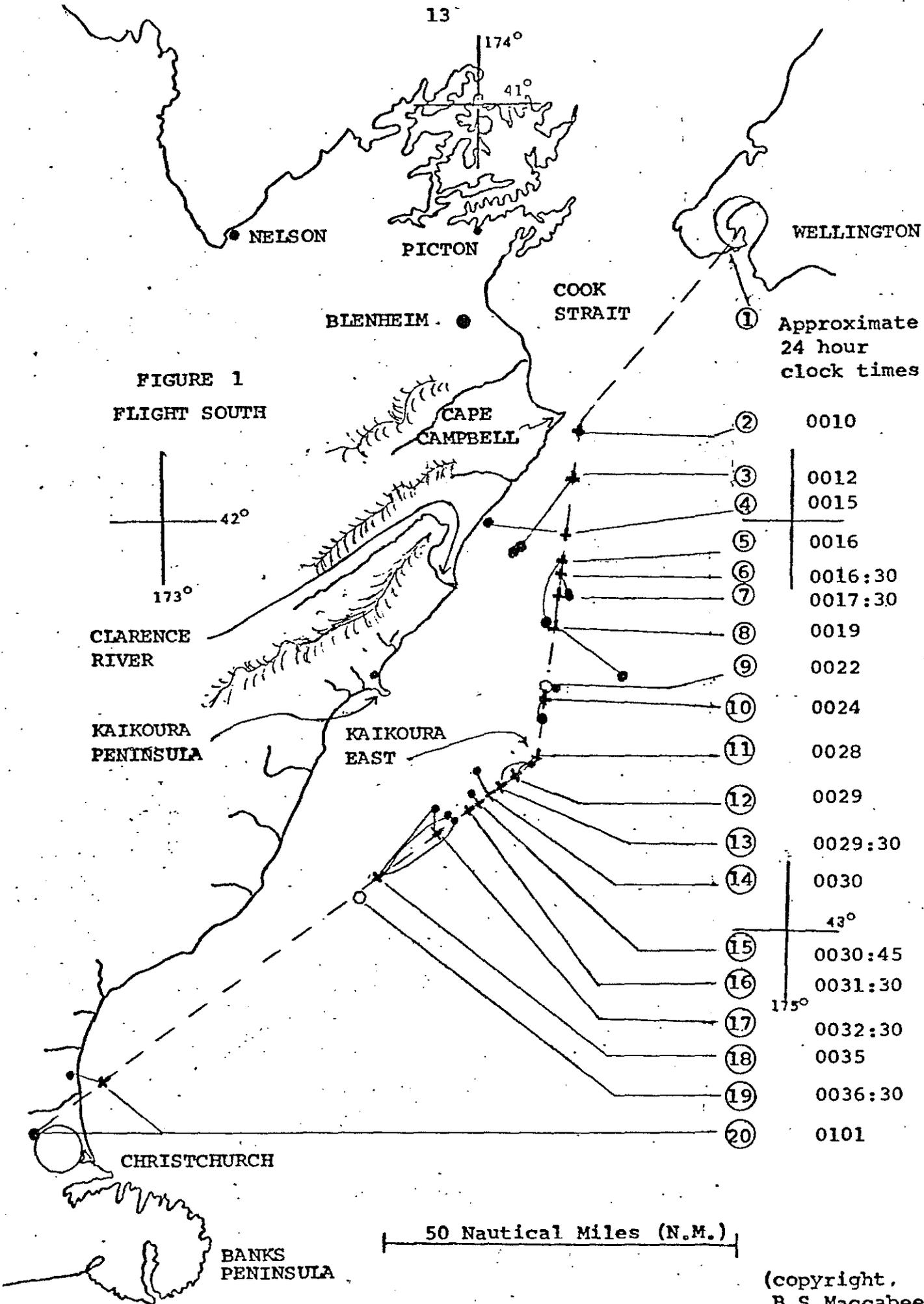


FIGURE 1  
FLIGHT SOUTH

① Approximate  
24 hour  
clock times

CLARENCE  
RIVER

KAIKOURA  
PENINSULA

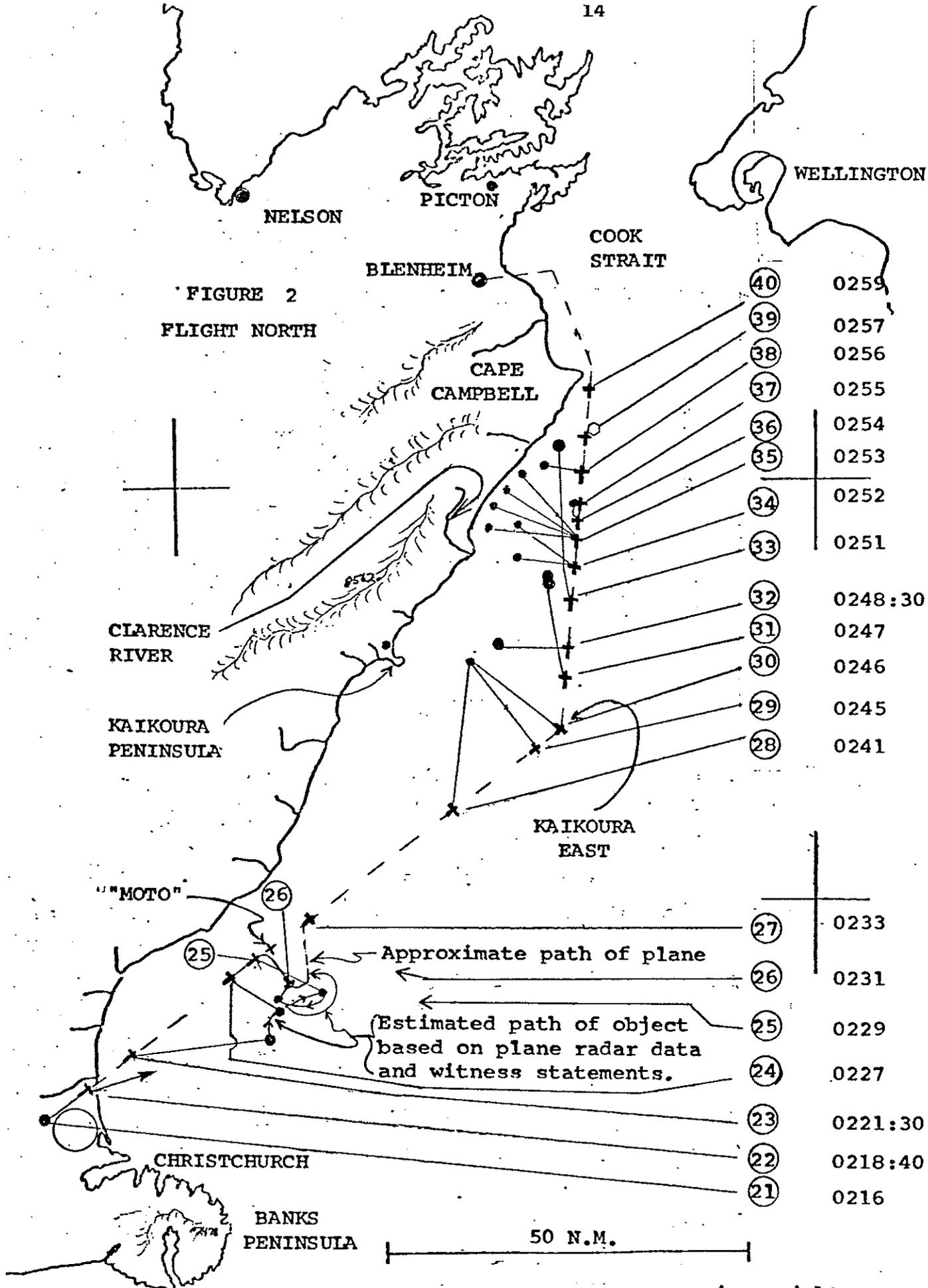
KAIKOURA  
EAST

CHRISTCHURCH

BANKS  
PENINSULA

50 Nautical Miles (N.M.)

FIGURE 2  
FLIGHT NORTH



- |      |         |
|------|---------|
| (40) | 0259    |
| (39) | 0257    |
| (38) | 0256    |
| (37) | 0255    |
| (36) | 0254    |
| (35) | 0253    |
| (34) | 0252    |
| (33) | 0251    |
| (32) | 0248:30 |
| (31) | 0247    |
| (30) | 0246    |
| (29) | 0245    |
| (28) | 0241    |
| (27) | 0233    |
| (26) | 0231    |
| (25) | 0229    |
| (24) | 0227    |
| (23) | 0221:30 |
| (22) | 0218:40 |
| (21) | 0216    |

(copyright,  
B.S.Maccabee, 1979)

## Event Descriptions and Map Legend

Times are in local Daylight Savings Time and are accurate to within one minute. Distances are in nautical miles (6076 ft or 1.852 km). At the cruising altitude the plane travelled at an air speed of about 3.6 miles/minute.

During the trip south the people aboard the plane were Captain William Startup (S), First Officer Robert Guard (G), cameraman David Crockett (DC), sound recordist Ngaire Crockett (NC) and reporter Quentin Fogarty (F). The Wellington Air Traffic Controller was Geoffrey Causer (GC). For part of the time the radar technician, Bryan Chalmers (BC) was also present. GC used a radar scope which presented an MTI (moving target indicator) processed radar picture; BC operated a non-MTI display for part of the time. The plane (P) is treated as an "entity" when communicating with Wellington radar (W). Christchurch is noted as CH. During the trip north NC was replaced by a Christchurch reporter, Dennis Grant (DG).

This event listing is to be used with the especially marked maps (Figures 3 and 4).

## TRIP SOUTH

EVENT NUMBER	DESCRIPTION
1	about 2354 (11:54 P.M.), Dec. 30, 1978 : the plane has taken off and circled to head south and was at this time passing over Wellington.
2	about 0010 ( 10 min. after midnight), Dec. 31, 1978 (all succeeding times are on this date) : the plane was passing or had passed Cape Campbell. F,DC, and NC were in the loading bay working on a "standup" for the news story on the previous UFO sightings when S and G first spotted lights in the direction of Kaikoura. The plane had passed 10,000 feet in altitude and was travelling at about 170 knots air speed (the ground speed might have been about 180 knots since there was a slight wind).
3	about 0012 : the plane (P) contacted Wellington(W) and asked "Do you have any targets in the direction of the Kaikoura peninsula on your radar at about that range?" (approximately

correct; the radio communications from the plane are difficult to understand). W replied " There are targets in your one o'clock (1:00) position (i.e., about 20-40° to the right of straight ahead) at, uh, 13 miles.....appearing and disappearing. ....At the present moment they're not showing.....but were showing about a minute ago." GC had been noticing "weird" targets east of the Clarence River area and the Kaikoura Coast for as long as half an hour before the plane reported anything. S and G reported seeing lights that would appear and then disappear in an apparently random manner, which is consistent with the appearance and disappearance of targets on the W radar. By this time the plane was at 14,000 ft. and travelling at 215 knots air speed (3.58 miles/min.)

- 4 about 0015 : W reported a target in the 3:00 position on the coastline. This may have been seen, but no mention of it was made on the W tape. By this time F, DC, and NC had joined S and G on the flight deck.
- 5 about 0016 : W reported a target at 12:00 at 10 miles which was probably only seen for one sweep of the scope (12 sec. per sweep). This may have been seen by the passengers since they reported seeing lights that occasionally appeared ahead of them.
- 6 about 0016:30: W reported a strong target at 11:00 at 3 miles from the plane which apparently appeared for one sweep. P responded with "no contact yet".
- 7 about 0017:30: W reported a target just left of 9:00 at 2 miles (the spacing between the edges of the radar blips; the actual spacing of target could have been more like 4 miles, assuming that they were at the same height; W had no way of knowing what heights the targets were at). There was no visual confirmation.
- 8 about 0019 : W reported a strong target at 10:00 at 12 miles. This may have been seen, but there is no specific confirmation.
- 9 about 0022 : W reported a target at the left of the plane at about 1 mile (between blip edges) which remained stationary while the plane did a left hand orbit to see if the passengers could see anything. About this time F, who had been watching the lights, recorded his first "on-the-spot" commentary: "It's kind of hard to describe my feelings right at the moment, but, uh, we've seen probably 6 or 7 or

even more bright lights over Kaikoura. A number of these have been picked up by Wellington radar." The plane did an orbit (hexagon on the map) which lasted about 2 minutes. Nothing to the left of the plane was seen. Before the orbit started there were lights (other than city lights) in the direction of Kaikoura.

- 10 about 0024 : just after the orbit was completed W reported a target at 12:00 at 3 miles. The plane responded "Thank you....we pick it up. It's got a flashing light." F recorded, as the plane came out of the orbit, "At the moment there is no activity. When we first made the run (i.e., started the orbit) the lights were so bright they appeared to be lighting up the sky of the town (Kaikoura).... . Now we have a couple right in front of us! Very, very bright." These lights flashed on and off. F recorded "We have a firm convert here at this moment." One of these lights may have been filmed. DC obtained about 12 seconds of footage showing sort of oval, blue-white images which were quite bright (considerable film exposure of stationary, focused images). DC also obtained about 5 seconds of film showing several lights at once in a horizontal row that randomly (?) flashed on and off. He also obtained film of the town of Kaikoura, but the town lights appear to have been much less intense .
- 11 about 0028 : P passed the "turning point" at Kaikoura East. W reported that the only targets were 12-15 miles behind them. At this point the plane switched to the Christchurch (CH) air traffic control on another radio frequency.
- 12 about 0029 : W called CH by telephone and said that there was a target about 1 mile (between blip edges; blips would have been about 1 mile "thick" in a radial direction out from Wellington at the distance of the plane) behind the plane. CH said it would inform the plane and have the plane switch back to the W frequency.
- 13 about 0029:30 : P contacted W and was told that the target was now at 6:00 at 4 miles. Apparently the target had remained stationary behind the plane for 6 or 7 sweeps of the radar (72-84 seconds). F recorded : "We've just heard from Wellington radar that we got an object about a mile behind us and it's following us". Actually W did not say the target was following the plane. 4.

- 14 about 0030 : W contacted P and said there was a "further" target at 3:00 at 4 miles. GC did not specify whether or not the previous target behind the plane was still there. This new target appeared for two or three sweeps. F recorded "There's a whole formation of unidentified flying objects behind us."
- 15 about 0030:45 : W contacted P and said "There's a strong target right in formation with you know....Could be left or right. Your target has doubled in size. " The previous target at 3:00 at 4 miles had disappeared, so this may have moved closer to the plane. The distance from W to the plane was now about 90 miles, so on the radar scope the airplane "blip" would have been a small arc about 3 miles "long" from left to right and about 1 mile "thick" from front to back (the blip size is always much larger than the target would be on the scale of the radar scope) because of the  $2.1^\circ$  azimuthal resolution (angular resolution in a horizontal plane) and the better than 1% radial resolution (accuracy of measuring distance from Wellington). Because of the blip size the unusual target could have been as much as 3 miles from the plane ( farther than 3 miles if it was not at the same altitude). BC was in the control room at this time and witnessed the unusually large blip on the scope.
- 16 about 0031:30 : W contacted the plane and stated that the target had "reduced to normal size". The plane blip had been unusually large for at least three sweeps (36 seconds) and perhaps for as long as 45 sec. or so. GC and BC agreed that the large blip was like two aircraft flying side-by-side at the same speed..... the whole arc shaped blip moved down the radar scope as a unit. There was no bending of the blip as might be expected if one portion (i.e., the unusual target) were stationary while the other portion (plane) moved by it. The plane would have moved about 2 miles during this time, a distance which would have exceeded the differential radial resolution of the scope ( i.e., exceeded the minimum difference in distance between two targets that could be measured on the scope). Shortly after this occurrence BC went to another radar scope and turned off the MTI processing. He then saw the normal amount of land and sea clutter within 20 to 30 miles from Wellington, but he saw no indications of anomalous propagation. Also, the "weird" targets which had appeared on the MTI display did not appear on the "uncancelled" display, suggesting that the anomalous targets were actually

weak reflectors of the 50 cm wavelength radar.

About this time the copilot spotted a flashing light that was apparently travelling along at the right of the aircraft. S turned off the wingtip running light (steady green) to make sure that there was no problem with unusual reflections.

- 17 about 0032:30 : P contacted W and stated: "Got a target at 3:00 just behind us." W responded: "Yes, and going around now at 4:00 at 4 miles." F recorded "I'm looking over towards the right of the aircraft and we have an object confirmed by Wellington radar. It's been following us for quite a while. It's about 4 miles away and it looks like a very faint star but then it emits a very bright white and green light." Unfortunately this object was too far to the right and behind the plane for the cameraman to be able to get a picture (he would have had to sit in the copilot's seat).

----- Shortly after this W contacted CH. CH had nothing on radar, but W referred to a target at 5:00 to the plane at 10 miles, which could have been the previous target if it had remained stationary as the plane moved along.

- 18 about 0035 : W contacted P and asked if they had seen the previous target at 4:00 at 4 miles. P responded "We think we saw that one. It came up at 4:00....around 4 miles away." (The distance estimate was based on what W radar had told the plane; the people on the plane had no way of measuring distances behind them.) W then continued "Roger. That target is still stationary. It's now 6:00 to you at about 15 miles and its been joined by two other targets." F referred to this as follows: ".....that other target that has been following us has now been joined by two others, so we now at this stage have three unidentified flying objects just off our right wing, and one of them has been following us now for probably about 10 minutes." Actually the time was more like 7 to 7 1/2 minutes and the targets were stationary behind the plane. F did not have airplane earphones on, so he couldn't hear the communications from the W or CH radar controllers. His information came from S,G, or DC, all of whom had on earphones and who yelled information to F over the noise of the airplane.

About this time F also reported the CH radar had picked up something "67 or 68 miles north of the city". That distance would have been about 6 or 7 miles behind the plane, no more than 7 miles from the location the W gave for the three unusual targets, assuming that CH really said "northeast of the city" and not due north of the city, as F recorded.

19 about 0036:30 : W contacted P and said that the three targets behind the plane had been replaced by a single one that produced a blip larger than the blip from the aircraft. At this point S decided to do another orbit to see what was behind him. F recorded "We've just heard from Wellington radar that there's a strong target straight behind us, so we're turning....". The plane was cleared by W for a left hand two minute orbit, but again nothing was seen.

20 about 0101 : the plane landed at CH . It was a "straight-in" landing since there was negligible wind. F recorded a statement that CH radar had said there were six UFOs headed for the aircraft just before it landed, but no one else remembers such a statement and no lights were seen heading for the aircraft. However, G and S do remember the CH controller referring to a target at the right of the aircraft that seemed to pace the aircraft in toward the landing. G looked out the right window and saw at a lower altitude a flashing light moving along. He at first attributed it to a car headlight that was passing behind trees along a road that ran along the shoreline. Then he realized that the flashing was too regular. He also observed that the light apparently crossed a river at the speed of the aircraft. However, he was too busy with his copilot duties during landing to watch the object closely. S remembers saying to the CH controller that perhaps the object was cleared to land in the grass at the side of the runway.

After the plane landed S and G talked to the Ch controller while the airplane was being unloaded. G remembers being told about a target which was at the right of the aircraft until just before landing , when it curved and travelled inland. He also remembers being told that someone at the control tower (close-in radar controller?) had looked out a window and seen a light heading inland at about the same time as when the plane landed. The CH controller attributed the anomalous target to a "side-lobe" problem, which might<sup>have</sup> been a satisfactory solution if the "side lobe"<sup>had</sup> disappeared at the same time that the plane landed, rather than travelling inland. In an interview about 6 weeks later the CH controller would neither confirm nor deny picking up a target, but whatever he might have seen was unimpressive to him. Unfortunately the CH control tower tape was erased and reused, according to a standard 30 day retention rule, before it was copied (in spite of

a specific request by S that the tape be retained until he could copy it) so any information that was recorded on the tape is no longer available.

#### TRIP NORTH

- 21 about 0216 : P took off from CH toward the northeast along the "MOTO" track toward Kaikoura East. The heading is 033 magnetic or 054° true (i.e., 54° clockwise from true north). DG had replaced NC. The climb rate was somewhat greater than 1000 ft/min, a number which decreased as the altitude increased, and the air speed was about 155 knots, a number which increased with altitude. There was a southwest wind of about 15 knots which added to the air speed of the aircraft.
- 22 about 0218:40 : the plane had travelled about 7 miles from CH and was not yet over the ocean. It was at an altitude of about 2800 ft, and was just breaking through a low cloud cover that was over the land. S, D, and DC, who were in the cockpit, observed a bright light through the cloud tops. The light was about 10-30° to the right of the airplane heading. The light was apparently about at the height of the plane. S's first impression was that he was looking at the full moon without seeing any features. (The moon had set in the west many hours before.) G described it as a "squashed orange". S turned on the airplane radar and placed it in the "mapping mode". About the time that the light was first seen DG and F, who had been sitting in seats in the loading bay during takeoff, arrived on the flight deck and G pointed out the light to them. This was at about 2:18 A.M. according to a note written down by DG. DG described the light (not necessarily his first impression) as looking like a ping-pong ball (white) that was in a dark room and illuminated by a spotlight. DG also recalled a light below the object which he attributed to a reflection on the ocean. (It might have been a reflection on clouds.) DC had filmed the takeoff from CH so he was ready to film and probably was filming at the time the F and DG arrived on the flight deck. F was now operating the recorder. H recorded: "We are now about 3 minutes out of Christchurch airport and on our starboard side we can see two very bright lights.....one much brighter than the other. The only way to describe it.....it's like a very very bright star

and just below it is another light not quite so bright."

23 about 0221:30 : the plane radar warmed up and S switched from the 50 to the 20 mile range. He picked up a target about 30° to the right of straight ahead just inside the 20 mile range ring. By this time DG had moved so that he was standing behind S on the left of the plane where he could see the radar scope. DG repeatedly compared the direction to the bright object with the azimuth (angular direction) of the target on the scope and assured himself that both directions were the same. S and G were also sure that the radar target was in the same direction as the visual target. S and G estimated that the size of the radar blip was 3 to 5 times that of a blip from a large fishing boat. The altitude of the plane at this time was about 6000 feet and it was about 15 miles out of CH. About this time F recorded "....those two lights appear to be travelling with us.....the brighter light is still up above the other and has moved a little further ahead.....now it's just dimmed! It's gone! ...Back again. It appears to be going behind a cloud. I can't quite make out whether in fact it is going behind a cloud or whether in fact the light is just dimming.....it's lighting up the clouds around it....." DC filmed a light which did fade in and out. DG described the object as if it were a light connected to a dimmer switch so the brightness could increase and decrease continuously rather than going off and on abruptly as when a light is switched off and on.

Since the target was about 18-20 miles away from the plane at about 30° to the right, and since the plane was about 15 miles from CH, the target was 32-35 miles from CH. Since the CH radar has a "cone of silence" that extends upward from ground level as the distance from the airfield increases at a rate of 100 feet/mile, an object below 3000 ft. at 30 miles would not (normally) be seen. A weak target for 50 cm radar might not be detected even at altitudes somewhat greater than 3000 ft. at 30 miles. Since the object was not detected by Ch radar it was probably at an altitude of around 3000 ft or lower. Since the airplane radar was operated in the mapping mode the 3 cm airplane radar beam could have picked up a target at a lower altitude.

Sometime during the time interval from 0222- 0225 DG scribbled a note " close as 10 miles; 170 knots; pace aircraft". At about 0225-0225:30 the target went off radar because the

azimuth angle to the target had increased from  $30^{\circ}$  to beyond about  $50^{\circ}$ , which was the maximum angle that the scope would display. Before it went off the scope it may have come as close as 8-10 miles, according to S, who had the best view of the scope. G remembers it being at least as close as 12 miles. F recorded "We must now be about 30 miles out of Christchurch and that bright light is still with us. According to Captain Bill Startup it came as close as 10 miles to us...."

- 24 about 0227 : P contacted W and said that the plane was 32 miles out of CH at an altitude of 11,500 feet and that there was a "great big target sitting at, uh, 3:00 to us..... at about 12 miles". P then asked W if W had anything on radar. However, W had not been expected to be called and was not looking at a range great enough to see the plane. W did say that there were many targets off Clarence and Kaikoura. The plane was climbing at a rate of about 800 ft/min at this time and travelling at about 200 knots ground speed.
- 25 about 0229 : the plane reached the cruising altitude of about 13,000 ft and an air speed of 215 knots. S and G decided to turn to the right toward the object to see what would happen. S made a turn that lasted about 45 seconds. He hadn't expected to have to turn very far, suggesting that the object was not directly to the right of the aircraft, but was still somewhat ahead. However, he found that he had to keep turning and he finally stopped when he had turned about  $90^{\circ}$  to the right. Before the turn started F recorded "The pilot has just told us he is going to actually level off.....and head toward the object to see what happens." During the turn F recorded the apparent motions of the object, not realizing that the turning of the plane made it look as if the object were moving up and then down and then to the front of the aircraft. After the turn was completed the sighting line to the object was ahead and downward. DG wrote a note " 2:30 A.M., directly ahead, no radar reading " The fact that it was not seen on the radar scope even though it was ahead of the airplane suggests that the sighting line to the object must have been considerably lower than  $15^{\circ}$  below horizontal, which is the nominal lower bound of the radar beam in the mapping mode. (The pilot did not try to increase the tilt of the radar beam.) If the sighting line had been at an angle of  $20^{\circ}$  below horizontal and the object had been at an altitude of 3000 ft. while the plane was at 13,000 ft. the distance to the object would have been about 5 miles. G had the impression that the plane had "overflown"

the object as far as the radar beam detection was concerned.

During the time that the plane was on its southeast course the sighting line to the object moved around to the right again. When the sighting line was so far downward and to the right that S couldn't see the object he decided to turn to the left to regain his original track. Before he turned he could see a glow in the right hand windows and the other passengers could see the object. S and G remember flying for "no more than" 4 - 5 minutes on the southeast heading before turning back. Actually they must have flown only about 1-1.5 minutes on that heading.

About the time of the turn to the right, DC stopped filming and went downstairs into the loading bay to get his bigger lens (he had been using the 100 mm. and now he got the 240 mm lens). It took several minutes for him to install the lens on the camera, but he was ready to film probably just before the plane turned to the left.

26 about 0231 : S could no longer see the object so he turned left onto a heading of 066 magnetic (087 true) for a short time and then he continued the left turn to head back to the "MOTO" track. F. apparently mentioned the start of the turn saying "It's now dropping away right below us...." (He was not aware that the captain had decided to turn. Since he was looking out the right window, when the plane banked to the left it would appear to him that the object dropped downward.) Fogarty continued "It appears, in fact, to be losing its speed...rising, coming back up towards us again..... It appears to be coming straight for us.... It's getting a little bit brighter." A few seconds later F said "It's now dropping right away behind us."

Probably during this turn DC obtained film footage with his 240 mm lens. This footage shows an image which starts off large, then shrinks to small bright images, and then grows large and dim. He described the large image to F : "It now appears to be an oval shaped object with rings of light going around." A previous description given by DC before the plane turned to the right was that it had a "brightly lit bottom and a sort of transparent top". The large image was apparently an out-of-focus version of the smaller image. During the time that the 240 mm lens was in focus DC did obtain

images that are consistent with his description of the object as seen earlier through the 100 mm. lens. These focused images are sort of bell shaped with bright bottoms and less bright tops. The angular sizes of the focused images obtained with the 240 mm lens are about the same as the sizes of the images obtained earlier with the 100 mm lens, suggesting that the object did not actually get closer to the plane at least during the time that DC was filming. However, it apparently did get quite close to the plane after DC filmed it. DC could not film when the sighting line was too far below horizontal because the top of the film magazine would have bumped overhead switches. Therefore he was not able to film it during the time that it apparently passed under the airplane.

During the left turn S was surprised to see the object, which had been on the right side of the aircraft, suddenly appear at the <sup>front</sup> left and apparently above the aircraft. (The appearance of being above may have been due to the tilt of the aircraft during the left turn.) The object then appeared to move downward and pass behind and beneath the aircraft. F last saw it out the far right window while looking almost straight down on it.

- 27 about 0233 : the plane regained the MOTO track at some point north of "MOTO", which is 40 miles out of CH. There is a "slight" time problem here in that the W and CH controllers were discussing the position of the plane at 0229:30-0230 and in their discussion they implied that the plane was already heading for or about to reach the MOTO track, perhaps close to the point MOTO. The estimate listed previously that the plane turned to the right at 0229 is based on the requirement that the plane reach its altitude of 13,000 ft. and upon the statement made by P to W at 0227 that the plane was at 11,500 ft. The estimate that the plane turned left at 0231 is based on the minimum length of time taken by F's recorded comments during and after the turn to the right. The estimate that the plane reached the MOTO track at 0233 is based on the travel time of the plane to go along a track as indicated on the map from #36 to #27. These times and the estimated path of the airplane, as well as the estimated path of the object, are all subject to revision. 4.
- 28 about 0241 : W reported to P that there was a target at 20 miles at 10:00, just off the coast 6 miles north of Kaikoura. The location of the object for #28 on the

map does not agree exactly with the location reported by W, but it is close. There was no <sup>visual</sup>sighting, but S may have seen it on the plane radar.

- 29 about 0245 : W told P that the same target was at 16 miles at about 9:30 to the plane. There was still no sighting.
- 30 about 0246 : the plane "turned the corner" at Kaikoura East and headed toward Cape Campbell, which they estimated they would reach at 0300. W read the Blenheim weather report. Then, at about 0246:30, W told the plane that the same target just north of Kaikoura was at 9:00. The plane did not indicate that the target was seen.
- 31 about 0247 : W reported two targets at 11:00 at 15 miles. P responded "We don't seem to be picking them up quite so easily on the leg (of the trip)."
- 32 about 0248:30 : W reported a target at 9:00 at 8 miles. P did not indicate that anything was seen.  
At about 0250 F recorded the following statement: "We've now just passed Kaikoura and, uh, there's been no further activity. There are pinpoints of light in the sky, but nothing's been confirmed on Wellington radar. I, for one, am hoping that, uh, we've seen enough, and, uh, the rest of our journey back to Blenheim will be uneventful. I've had quite enough of UFO's for one night." Apparently S had the same feeling. He said that he had detected objects on the airplane radar which appeared to him to be in the positions reported by W, but he didn't tell anyone and, in fact, paid very little attention to the radar screen throughout the rest of the trip. He did tell several people after the trip was over, however, that he had had targets on his radar.
- 33 about 0251 : P asked W if there was a target in the 12:00 position. W responded "... a strong target at 12:00 to you at 20 miles.....2 miles off the coast, 10 miles south of Cape Campbell." P responded "We have that one also (?) and quite a good visual display at the moment..... it looks like a collection of lights...." F recorded "About 30 seconds after that last statement we've got another one right in front of us.....very bright.....seems to be a long way away. Another one just to the left of it. That one flashed extremely brightly. They've both now faded..... The other one's flashing again. It's giving off an orange flashing light. It looks like an aircraft beacon." (Note: this comparison is intended to convey the visual impression of very brief and

bright flashes as opposed to "pulsations" in which the light grows and dims slowly enough so that the brightness change appears continuous rather than abrupt.) F continued "It's moving off. It's extremely bright. It fades..... and its dropped. It seems to have just dropped at an incredible speed and it seems to be rolling and turning....in fact,..one light has another beside it. " The "rolling and turning" was described by F as movement around a sort of elliptical path with the long axis of the ellipse in the vertical direction. The object travelled downward in the elliptical motion faster than it rose upwards, in the opinion of F. DC obtained about 7 feet of film that show a light source that changes in a regular cyclic manner from bright white to dim red and orange for about 32 cycles at a rate of 1.1 cycles/sec. The bright source also apparently moved up and down in a flattened elliptical path much higher than it was wide. This up and down motion was periodic, at least for the first portion of the film, at a rate of about 2.5 cycles/sec.

After describing the flashing light that dropped, rolled, and turned, F described a "whole cluster" of lights including one that "keeps flashing" and was part of a "distinctive" pattern of lights. This one may have been the Blenheim airfield beacon.

After describing the "collection of lights" to W, P asked W if the Blenheim beacon could be turned off so that the passengers on the plane could be sure that they weren't mistaking it for a ' flashing UFO'. The Blenheim beacon flashed red every 1.5 sec. or so. (Note : At this time the beacon would have been about 45 miles from the airplane and perhaps under the 1/8 cloud cover over Blenheim. The cloud cover was at 4000 ft.) The beacon was turned off and at about the same time the bright flashing light disappeared.

34 about 0252 : W called the plane to report "...two further targets, one at 9:00 at 8 miles and one at 10:00 at 10 miles." Within a few seconds W also reported " the one south of Cape Campbell has now gone off radar." The disappearance of the target from the radar scope was approximately (or exactly?) coincident with the visual disappearance and with the turning off of the Blenheim beacon. However, the radar would not have lost a target just because the Blenheim beacon was turned off.

Whether or not the Blenheim beacon was in fact seen was not established. Other bright lights did appear within seconds after the flashing one disappeared. However,

they may not have been to the left of the plane as were the W radar targets which "replaced" the "strong target" that had been south of Cape Campbell.

F recorded "Well, we can't be right all the time, but it in fact appears that the last flashing light we saw was in fact a beacon at Blenheim and the pilots asked for the beacon to be turned off. But at the same time that they turned the beacon off, Wellington radar told us that we had targets coming from the left of us. But as I speak now, we have another one, above Blenheim, and that's not a beacon because it's not in the same position as the lights were before, and these sightings at the moment are right in the position where Wellington radar said they should be!" Actually, W radar had referred to targets to the left of where the strong target had been, and F referred to a light that was to the right of and higher than the one that had disappeared. DG described these lights as "pulsing" on and off as if they were incandescent bulbs operated with dimmer switches so the the brightness could change continuously rather than abruptly.

- 35     about 0253         : W told P about 4 targets at 9:00, 9:30, 10:00 and 10:30, all about 1 mile off the coast. One or more of these may have been seen.
- 36     about 0254         : W told the plane about a target at 12:00 at 2 miles. P responded "No sighting of that one. "
- 37     about 0255         : W told the plane that it was about to merge with the target that had been just ahead. Since W did not have any measure of the heights of the radar targets W could not have told the plane whether it was above, below, or level with the anomalous target. The passengers were unaware of any target close enough to "merge" with. However, about 0255:30 the plane said to W: "We had a pretty bright light. We have it again now. It appears to be behind Woodbourne ( Blenheim Airfield) from where we are..... Do you have anything over there?" W responded "Nothing showing over there at all."
- 38     about 0256         : P asked W if there was anything in the 2:00-3:00 position with respect to the plane. W responded "Nothing showing up 2:00-3:00 to you. I have a target just off the coast at 9:30.... at 5 miles." The passengers may have seen targets at 9:30 . P then described lights that looked like fishing boat lights on the right side in the

Cook Strait. W then responded " I got just one paint now at 3:00 to you at 15 miles," and P said "Roger. Sounds like some of the lights we can see....scattered through the Strait."

39 about 0257 : the plane was too high in altitude to begin its descent into Blenheim, so it did a two minute right hand orbit to lose altitude. Just before the orbit the passengers had been watching a pair of bright lights at the left of the airplane and DC was about to film them. He didn't get a chance to film them, however, because the plane turned, and when the plane had completed its turn the lights were gone. W referred to targets at 12:00 at 2 miles before the turn and at 12:00 at 10 miles as the orbit began. The plane apparently attributed these to fishing boat lights on the surface . ( W radar could detect boats in the Cook Strait if they moved fast enough to exceed the minimum MTI speed.)

It was probably during or just after this orbit that G pointed out the planet Venus that was just rising and would have been visible at the altitude of the plane.

40 about 0259 : coming out of the orbit the plane asked if there was a target over Picton. W responded that there was no target over Picton. This was the last anomalous light seen during the flight. The plane landed at Picton at about 0310.

## TECHNICAL DETAILS FOR THE FLIGHT SOUTH

TIME: 11:46 pm, December 30, 1978, to 1:01 am December 31, 1978.

WEATHER: (as determined by the flight crew) excellent flying conditions with no noticeable departure from a standard temperature lapse rate from ground level to 14,000 feet; low clouds over Wellington; visibility about 60 km over the sea; wind speed at cruising altitude estimated to be no more than 10-15 knots from the west; atmospheric conditions sufficiently steady to allow operation with automatic pilot and automatic height control (as pressure sensitive device); no noticeable inversion effects on Wellington radar. The temperature and humidity variations with altitude are shown in Figure 3.

NUMBER OF WITNESSES ON PLANE: 5 (pilot, co-pilot, reporter, cameraman, sound recordist)

AIR SPEED OF AIRCRAFT WHEN CLIMBING: 155-180 knots.

CRUISING ALTITUDE: 14,000 ft.

AIR SPEED AT CRUISING ALTITUDE: 215 knots.

TYPE OF AIRCRAFT: 4-engine turbo prop freighter -- 2-man crew (Argosy, SAE)

CAMERA EQUIPMENT USED: Bolex H16, EBM electric, 16 mm. reflex movie camera operated at 24 frames/sec. and a Kern, vario-switer 16-100 mm zoom lens at f/1.9.

FILM: Fujicolor type 8425, 16 mm, ASA 400 color reversal film; standard developer

RADAR EQUIPMENT USED:

WELLINGTON TOWER RADAR: Marconi 264, 50 cm (587 MHz), 500 kilowatts, with some adaptations for use at Wellington.

MTI CAPABILITY: targets with radial velocities in excess of 15 knots are detected in the MTI mode with phase shift and digital scan summing electronics. Observations on known targets with and without the MTI processing indicate that the MTI processing improves the sensitivity of the radar. (Strong targets in the MTI mode may be weak or even non-existent in the non-MTI mode.)

PULSE REPETITION RATE: automatically varied between six frequencies averaging 500/sec.

PULSE DURATION: 2.7 microseconds

ROTATION RATE: 12 sec./revolution

AZIMUTHAL BEAMWIDTH:  $2.1^{\circ} \pm 0.2^{\circ}$

ANTENNA GAIN: 30 db over a dipole

POLARIZATION: horizontal

ABSOLUTE DISTANCE ACCURACY: 1% of full scale

RELATIVE DISTANCE ACCURACY: (set by blip size on the display): about 1 mile on the maximum range

MAXIMUM RANGE: 150 nautical miles at 10,000 ft.

ANTENNA HEIGHT: about 1,700 ft. above sea level

UPWARD TILT OF THE CENTER OF THE TRANSMITTED LOBE:  
about  $4^{\circ}$  (there is no height resolution for this radar; the radar detects surface targets for a distance of 30 to 50 miles under normal conditions)

DISPLAY: 12" diameter PPI with 10 miles range rings on the 150 mile range.

NUMBER OF WITNESSES: 2 (controller and technician)

CHRISTCHURCH TOWER RADAR: Marconi 264, 50 cm., 50 kw.

MTI CAPABILITY: not as sophisticated as Wellington, but similar

MAXIMUM RANGE: 100 nautical miles at 10,000 ft.

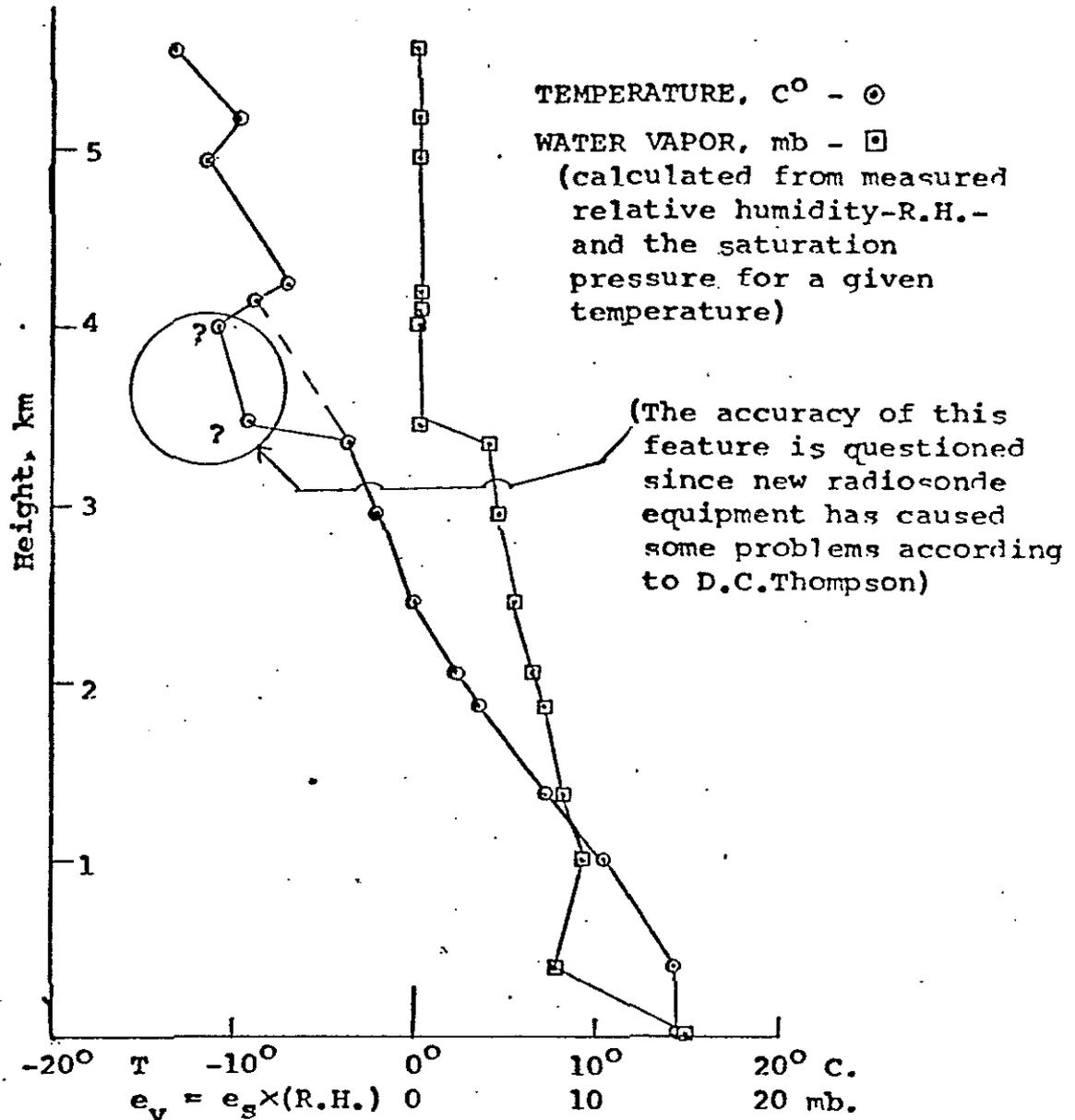
ANTENNA HEIGHT: about 120 ft. above sea level

UPWARD TILT OF THE TRANSMITTED LOBE: there is a cone of invisibility extending outward from the antenna which rises at a rate of 100 ft/mile, beneath which targets cannot be seen under ordinary atmospheric condition

NUMBER OF WITNESSES: 1

FIGURE 3

## TEMPERATURE AND HUMIDITY



VERTICAL STRUCTURE OF THE ATMOSPHERE FOR  
 CHRISTCHURCH, N.Z. from the 11:00 P.M.  
 balloon launching, Dec. 30, 1978. Data  
 supplied by J.T. Steiner, Ass't. Dir.  
 for Research and D.C. Thompson, Superintendent  
 Physical Meteorology ; N.Z. Meteorological  
 Service, Wellington, N.Z.

## TECHNICAL DETAILS FOR THE FLIGHT NORTH

TIME: 2:16 am to 3:15 am, December 31, 1978

WEATHER: (as determined by the flight crew): excellent flying conditions with no noticeable departure from standard lapse rate conditions; wind speed at cruising altitude estimated at 10-15 knots from the southwest; possibly a cloud bank more than 40 miles east of the South Island: low cloud cover 1200 to about 3000 ft. above Christchurch; scattered low cloud over ocean; CAVU conditions above clouds; for Blenheim at about 2:45 am the wind was out of the northwest at 10-15 knots, the visibility was 60 km, the cloud cover was 1/8 at 4,000 ft, and the temperature was 15°C; after achieving the cruising altitude the crew operated the plane on automatic height control. (See also Figure 3.)

NUMBER OF WITNESSES IN THE PLANE: 5 (pilot, co-pilot, cameraman, Australia reporter, Christchurch reporter)

CRUISING ALTITUDE: 13,000 ft.

(aircraft details are the same as for the flight south)

CAMERA EQUIPMENT USED: same, but now run at 10 frames/sec.; also used Sun Macro-Zoom, 80-240 mm lens used at f/4. (This lens was later found to be out of adjustment. At full zoom objects at "infinity" came into focus when the focus ring read 15 ft., and distant objects were out of focus when the ring read "infinity." This condition of the lens may explain the section of film footage which shows a large dim image which then contracts to a bright, much smaller image, and then expands again to a dim large image, accompanied by an apparent symmetry inversion → of the defocused image.)

FILM: same type as for the flight south.

RADAR EQUIPMENT USED:

WELLINGTON TOWER RADAR: same as for the trip south  
NUMBER OF OBSERVERS: 1

CHRISTCHURCH RADAR: same as for the trip south  
NUMBER OF OBSERVERS: 1

AIRPLANE WEATHER RADAR: M.E.L. Equipment Co. E190 Series, 3 cm (9375 MHz), 15 kw.

MIT Capability: none

Operating Mode: operated in the "map mode" which produces a fan-shaped beam extending from 3° to about 15° below the centerline of the aircraft

Azimuthal Sweep Range: ± about 50° from straight ahead

Sweep Rate: about 3 sec. per cycle

Pulse Repetition Rate: 400/sec.

Pulse Duration: 2.2 microseconds

Beamwidth: 3.5°

Range: 150, 50, 20 miles (used on 20 mile range)

Display: sector display with 5 miles range rings and 15° azimuth markings.

## NATURAL AND ARTIFICIAL SOURCES OF LIGHT

ASTRONOMICAL: Jupiter, visible in the northeast, magnitude about -2.0

Saturn, visible in the northeast, magnitude about 0.0

Venus, visible in the east after about 3 am at the altitude of the plane, magnitude about -4.3, except on the horizon where atmospheric extinction reduces its brightness by a factor of 100 or more.

Stars and other sources, visible in the clear sky, but all dimmer than Jupiter

No comets, meteors, or aurora were reported.

(NOTE: the co-pilot pointed out Venus to the plane passengers near the end of the flight north.)

ARTIFICIAL: City lights.

Flashing and steady coastal and airport beacons, with flashing or rotation periods ranging from about 1.5 sec (flashing only red) to 30 sec (flashing only white)

Japanese fishing fleet lights, used for squid fishing, were at distances estimated to be over 100 km east of the South Island and east to southeast of Christchurch. A large boat carrying 50, 4,000 watt bulbs, would put out between 4 and 5 million lumens, yielding a luminous intensity of 300,000 to 400,000 candlepower.

(NOTE: the pilot and co-pilot pointed out artificial sources including the squid fleet to the passengers.)

## Analysis of the Wellington Radar Sightings

Geoffrey Causer reported that the Wellington radar picked up anomalous targets more or less continually during the period that he was on duty from about 11:45 PM, Dec. 30, through about 4:00 AM, Dec. 31. The previous controller had also seen the targets and had pointed them out to GC. The targets were unusual because they did not generally leave trails on the radar scope, indicating to the controller that they were stationary. However, the MTI processing was supposed to reject stationary targets. Some targets would appear for only one sweep (in which case no motion could have been detected anyway; you need several sweeps for the motion of a target to leave a trail) and some targets would remain at fixed positions for many sweeps. One anomalous target <sup>at 0246</sup> apparently paced the aircraft during the flight south when the aircraft target "doubled in size". One other anomalous target did make a consistent trail. This target was observed to move continuously northward from a point south of Cape Campbell to a point several miles northeast of CC during the period 0226 to 0300, when it disappeared off the scope. GC first reported it to the plane at 0246 as follows: "The most consistent and interesting target I've been observing for the last 20 minutes, uh, is about 10 miles south of Kames and slowly moving north. It's moved about 10 miles in that time." (Kames is a non-geographic reporting point about 4 miles east of Cape Campbell.) The average velocity suggested by these statements is 30 knots. GC referred to this consistent target again at about 0256: "Target I mentioned before that was consistent and strong and moving north is now just past Kames and still heading slowly north." During the time period 0246-0256 this target had moved about 10 miles, suggesting a velocity of 60 knots. A few minutes later it disappeared off the radar scope. The speed seems somewhat excessive for a fishing boat.

(The characteristics of the radar targets picked up during the early morning of Dec. 31 were similar to those reported during the early morning of Dec. 21. Senior Controller John Cordy and controller Andy Herd reported targets which appeared and disappeared off the coast near the mouth of the Clarence River. They also reported a target which appeared at about 0300 at 160° azimuth and about 48 km (26 nautical miles) from Wellington. It remained at that location for a period of time and then moved, leaving a continuous track, to a point 80 km away from Wellington on the same heading, where it remained for "at least 30 minutes". The average speed of the target when it moved was about 120 knots. These radar sightings form part of the collection of radar-visual sightings of Dec. 21.)

Stationary targets can be presented on an MTI processed radar scope display providing that they can, in some way, change the phase of the returned signal or shift its frequency slightly. Such a phase shift could be provided by a vibration of the surface of an object, or by a back and forth motion of an object toward and away from the radar antenna. A plasma might also shift the phase of a portion of the reflected radar signal (this assumes the object is a plasma or is surrounded by a plasma).

The "blips" (bright arc-shaped spots) on the radar scope that were made by the unusual targets were comparable in size and intensity to the blips made by the airplane, according to GC and Bryan Chalmers. However, BC determined that when the MTI processing was removed the targets were not seen. (The non-MTI display showed the normal amount of nearby land and sea clutter and the plane.) Targets could appear on the MTI display and not on the non-MTI display if they were basically weak targets (i.e., not very reflective for the 50 cm radar). This is because the MTI processing makes the radar receiver more sensitive (by integrating over pulses and more effectively separating the signal from the background noise). Even normally strong targets, such as aircraft, can be weak reflectors if the targets are oriented in such a manner as to present small "cross-sections" for radar reflection. For example, a plane travelling directly toward or away from a radar antenna has a smaller cross-section for radar reflection than a similar plane travelling at an angle of  $90^\circ$  to the line-of-sight to the radar antenna (i.e., "broadside" to the radar antenna). Thus the orientation in space is a major factor in determining the cross-section. An object which appears as a strong target (relatively large cross-section) on one sweep of a radar scope might turn between sweeps and become a weak target (relatively small cross-section) by the time of the next sweep. If the cross-section were to become too small the target would "disappear", as far as the radar operator is concerned.

Blips are produced on the radar scope whenever the radar antenna picks up sufficient power at the correct frequency. Except in the cases when external sources of radar frequency power irradiate the antenna (jamming, interference with other radars), power is received at the antenna only when there is a (or more than one) reflective object within the irradiating field of the transmitter. In other words, when there are no reflections of the radar beam there are no targets on the scope.

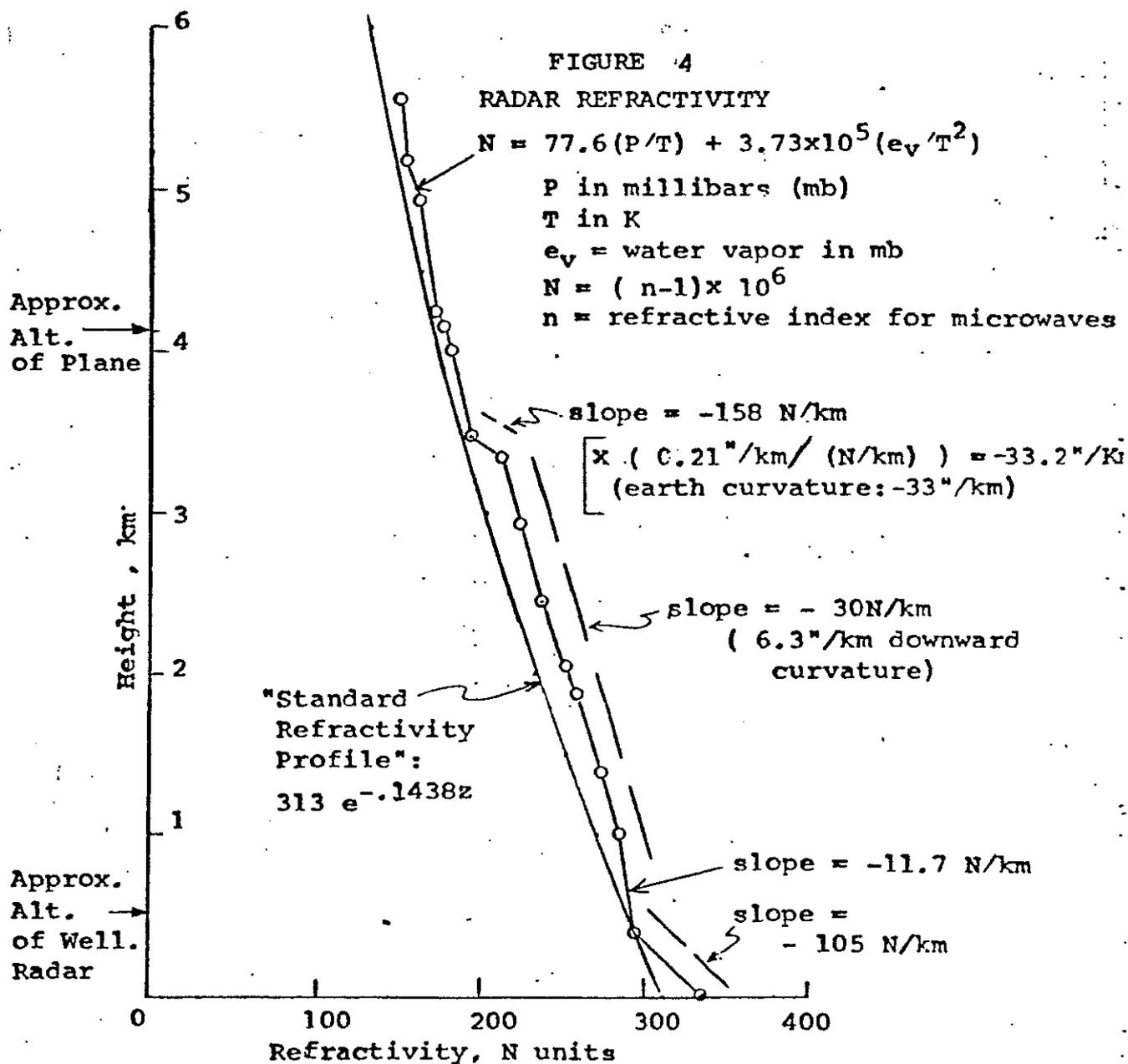
Reflections can be provided by metallic objects ( e.g., planes), conducting media ( e.g., ionized air or plasmas, such as are created by lightning and meteors) and by discontinuities or variations in the dielectric constants of the media through which the radar signal passes. In the case of the anomalous targets referred to here , one proposed explanation is that the radar was picking up reflections from "dielectric discontinuities or variations" caused by clear air turbulence. However, "clear air turbulence" requires that the air be turbulent. According to the flight crew the air was quite calm. The captain estimated that the wind velocity was about 10-15 knots from the northwest when they were near Wellington and from the southwest when they were near Christchurch. He was able to operate the plane on "automatic height control", a device which keeps the plane at a level corresponding to a particular air pressure. (Since air pressure decreases with increasing altitude, a particular pressure corresponds to a certain altitude, or range of altitudes. When the air is turbulent the pressure fluctuates considerably and the automatic height control will not operate.) Regions of clear air turbulence have very small cross-sections for radar reflection, especially at rather long radar wavelengths like 50 cm. ( clear air turbulence cross-sections may be one millionth of the cross-section of an Argosy aircraft, or even smaller).

An alternative to having the atmosphere itself reflect the radiation would be to assume that the atmosphere bends the radar beam so that it reflects off objects on the surface. Since the Wellington radar had no capability of determining the height of a target, the controller could not tell from the strength of the return whether he was looking at a boat , a wave, or an airplane. However, by comparing successive blips he could usually distinguish between slowly moving targets such as boats and waves and rapidly moving targets such as airplanes. ( A slowly moving airborne object such as a helicopter could produce a blip that would be comparable to that of a boat.) When the atmosphere is sufficiently refractive to bend the radar beam downwards , an unusual amount of land and sea clutter is visible on a non-MTI display. As already pointed out, BC made such a check and determined that there were no conditions indicative of "anomalous propagation" apparent on the non-MTI display. The lack of anomalous propagation effects on the scope is consistent with what would be expected from the temperature-humidity "structure of the atmosphere" as determined by data from a balloon launching earlier in the

evening (see Fig. 3). Refractive bending of the radar beam is caused by the variations in air pressure, temperature, and humidity with altitude. The amount of bending to be expected for a particular temperature-pressure-humidity "structure" of the atmosphere can be estimated by calculating the radar refractivity profile. Fig. 4 shows the profile calculated from data in Fig. 3. Radar ray curvatures in seconds or arc per kilometer are also illustrated in the figure. Only for a small height region around 3400 meters was the refractivity sufficient to make a ray follow the curvature of the earth. Nowhere was the refractivity great enough to bend a ray as much as a minute of arc per kilometer of distance travelled. A ray which travels 10 km through a medium that bends it downward from a starting angle of  $5^\circ$  upward would be only about 30 meters lower in altitude if the bending rate is 2 minutes per kilometer than it would be if the bending rate were 0.0 minutes per kilometer (no bending). Thus one can see that the effect of the curvature is small. The same ray would rise to a peak altitude of about 6.5 km after travelling about 150 km (assuming the refractivity gradient is constant up to that altitude) and then it would bend downward and intersect the earth at a point about 300 km from where it started at the earth's surface. A ray that started off at a steeper angle would go farther before reaching the earth's surface, and one that starts off at an angle of less than  $5^\circ$  would not go as far.

(For comparison, Fig. 5 shows the refractivity profile for the early morning of the 21<sup>st</sup> of Dec. Note that there is a sufficient refractivity gradient in the first kilometer to cause some trapping of radiation near the earth's surface. One might expect a non-MTI display to show ground and sea clutter at greater distances than would be normal.)

One particular incident involving the Wellington radar occurred when the plane was about 84 n.m. (155 km) from Wellington and flying south (see #12,13,14,15 in the event description listing). The radar picked up a target that was apparently stationary behind the plane for a over a minute. Then another (or the same?) target appeared at the right of the plane, and finally the return from the plane "doubled in size" suggesting that something was moving along with the plane. The two witnesses to the scope at this time described the motion of the large return blip along the scope as looking like two airplanes 4.



## REFRACTIVITY PROFILE FOR CHRISTCHURCH, N.Z.

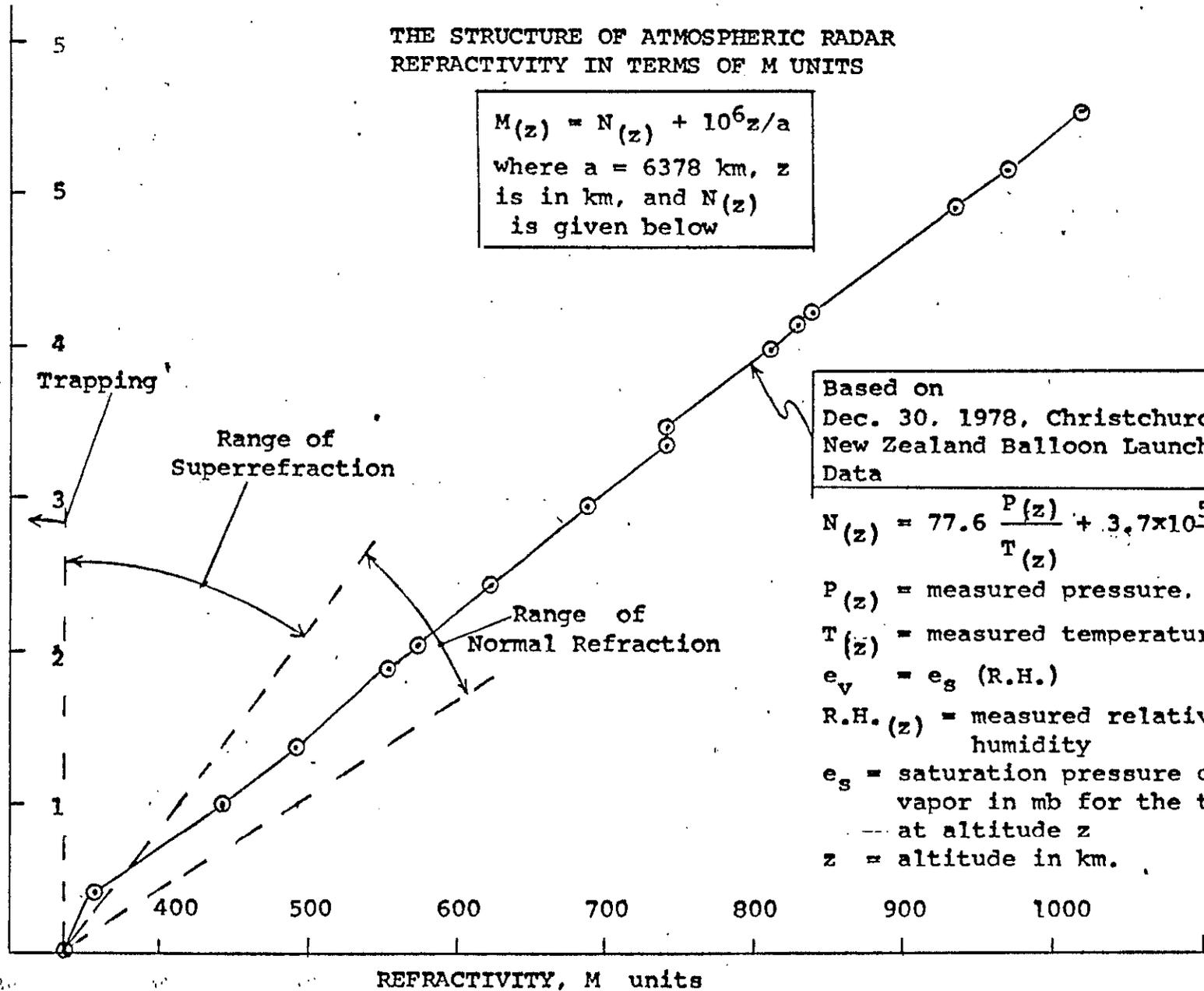
From the 11:00 P.M. balloon launching, Dec. 30, 1978.

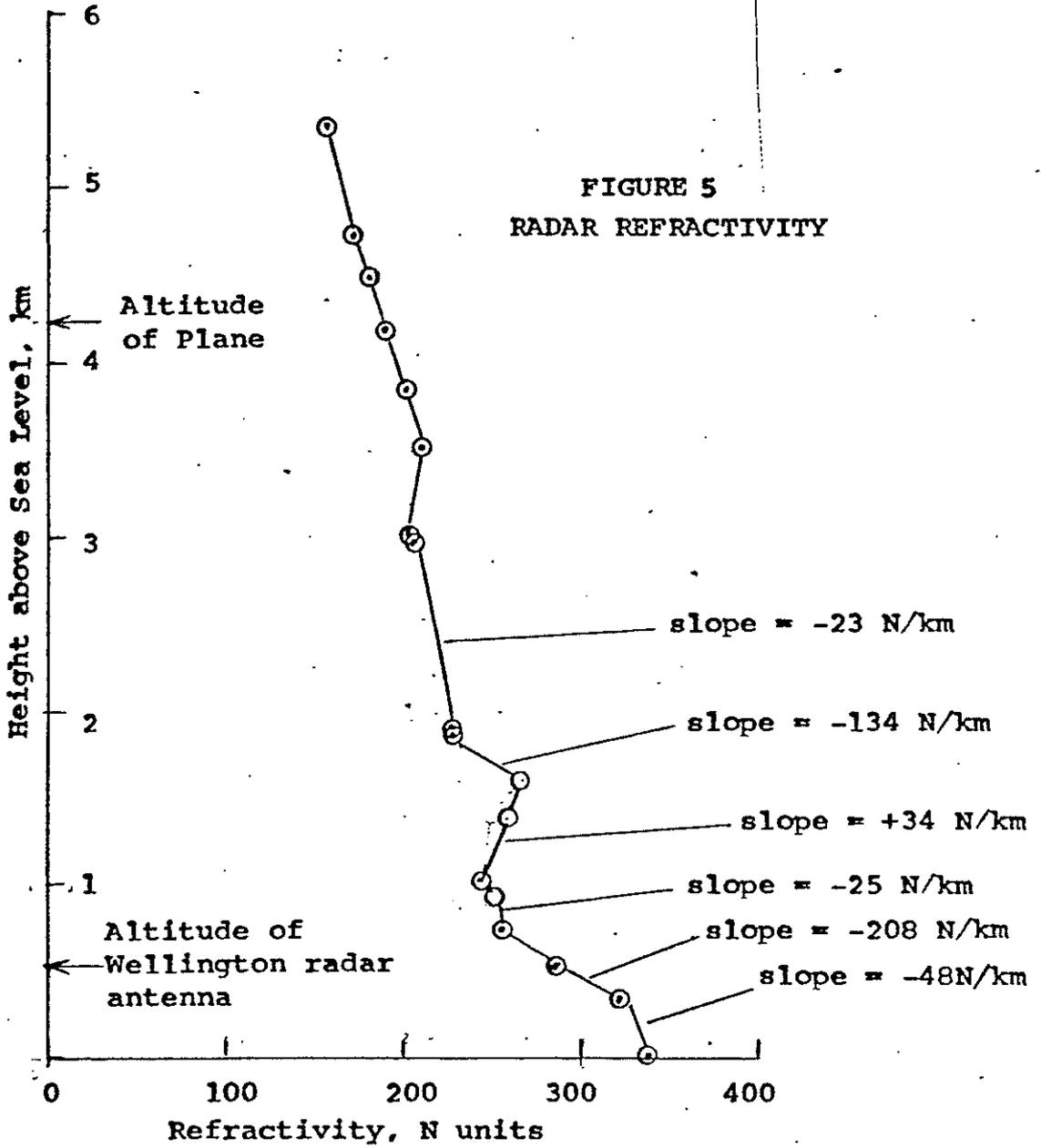
Multiply by  $0.21''/\text{km} / (\text{N}/\text{km})$  to get curvature in  $''/\text{km}$ . Curvature is downward if the sign is negative. The earth's curvature is  $-33''/\text{km}$ . Only at about 3400 m altitude was there a region with sufficient curvature to bend rays downward toward the earth at a bending rate equal to the earth's curvature.

THE STRUCTURE OF ATMOSPHERIC RADAR  
REFRACTIVITY IN TERMS OF M UNITS

$$M(z) = N(z) + 10^6 z/a$$

where  $a = 6378$  km,  $z$   
is in km, and  $N(z)$   
is given below

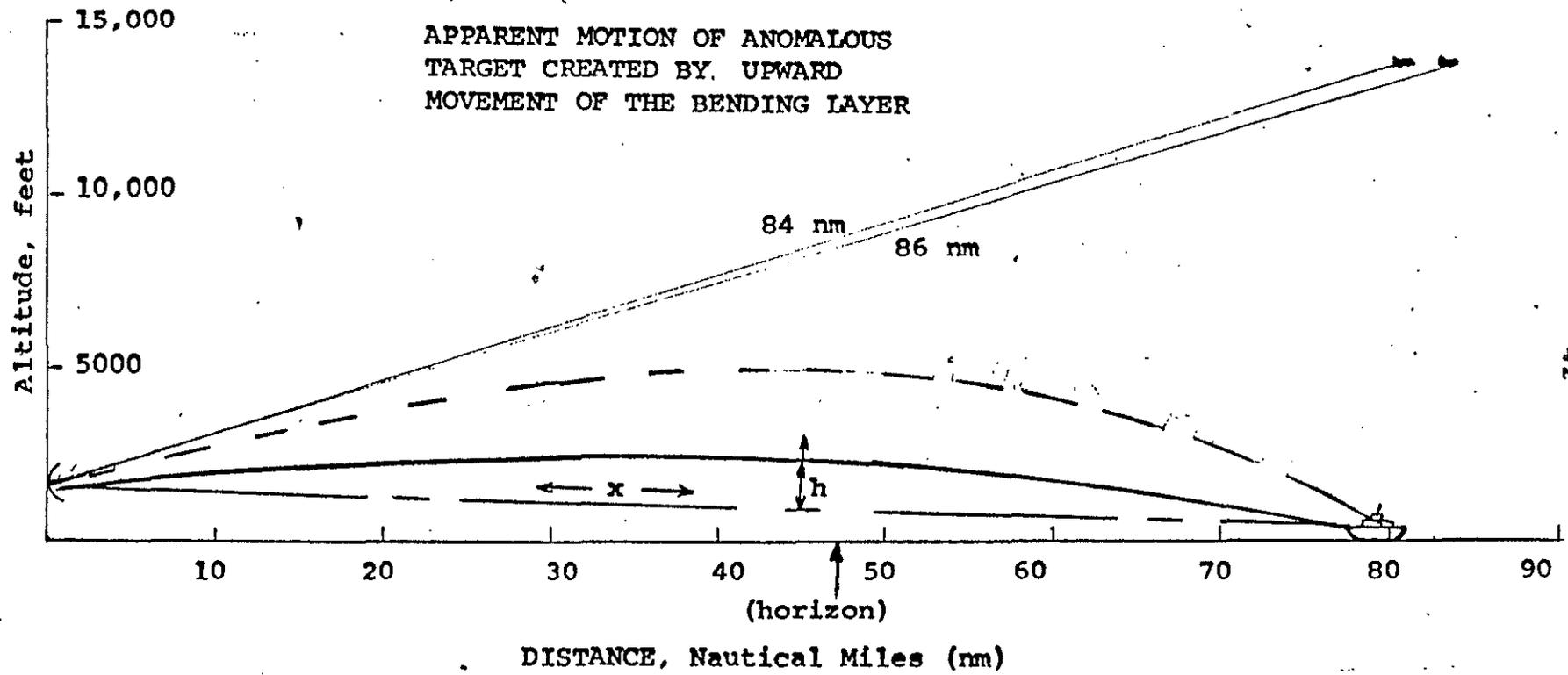




REFRACTIVITY PROFILE FOR CHRISTCHURCH, N.Z.  
From the 11:00 PM balloon launching, Dec. 20, 1978

flying side by side. The question now to be raised is, can this be explained by anomalous propagation effects or radar "angels"? To answer this question one must keep in mind that the existence of a radar return requires that there be something reflective, and that the "radar path length" from the radar antenna to the object be the value given on the radar screen. Since this value was apparently the same as the path distance to the airplane for a period of over 36 seconds, this requirement means that the radar path length to the anomalous target must have increased at the same rate as the path length to the aircraft. The simple way for this to happen is to have a "real" reflective object which is moving away from the radar antenna at the same speed as the aircraft. It also has to be at the same azimuth as the aircraft, although not necessarily at the same altitude. It should be obvious that no natural radar reflector could effectively pace the aircraft for such a long period. Another airplane could do it, but there were none. An alternative hypothesis is that the radar picked up a stationary target which was made to appear to move by effects of anomalous propagation. If the radar rays were bent down sufficiently so that they could pick up a boat or a wave on the surface, the assumed boat or wave could be at the distance of the aircraft, but clearly neither a wave nor a boat could move at the same speed as the aircraft. Thus a "direct" radar path from the antenna to a boat (or some relatively stationary target) will not work. But what if the rays from the antenna first travelled upward and then were reflected downward, as if by an atmospheric mirror, and then the reflector started to move upward! In this case the radar path length would increase as the reflector moved upward while the reflective target remained relatively stationary compared to the speed of the plane. Fig. 6 illustrates the geometry. Initially one might assume a curved radar path such as the dashed line. However, such a trajectory has a curvature of about 17 minutes/km, which would require a refractivity gradient of about 5000 N/km, which is way out of the range of values on Fig 4. The only possibility would be a very flat ray which has undergone little bending on its way to the hypothetical ship on the surface. (The curvature of the "flat" ray - solid line - has been exaggerated.) Assuming the reflecting or bending region moves upward, as indicated by the arrow, the path length from the antenna to the ship will increase at a rate approximately given by  $(8h/x)$ , where  $x$  is the straight line distance from the antenna to the ship and  $h$  is the maximum distance between the straight line and the curved path. Since  $x$  is large (84 n.m.) and  $h$  is small (initially zero), the path length increases very slowly as  $h$  increases. For example, let the straight line be 84 n.m. long, the approximate distance to the

FIGURE 6



plane when the blip first increased in size. The blip size remained large for at least 36 seconds, which means that the plane travelled at least 2 miles. Thus the radar path length to the anomalous target (ship) must also have increased by 2 miles during the same time period. That means the solid arc line on Fig. 6 is 86 miles long. Using trigonometry and calculus one can show that the arc length (segment of a circle) of 86 n.m. and the chord length (straight line) of 84 n.m. have a maximum spacing (h) of about 8 n.m. or 48608 feet, a distance which would not even appear on the figure if it were drawn to scale! (The plane is only 14,000 feet high.) The reflective or bending region of the atmosphere would have to move upward 8 n.m. in the same time that the plane moved only 2 miles, or at a speed four times faster than the plane. Needless to say, volumes of air (which do the bending) that are moving at  $4 \times 215$  knots would cause some turbulence since they would be moving faster than the speed of sound! One may conclude from this argument that motion of refracting layers cannot account for this incident.

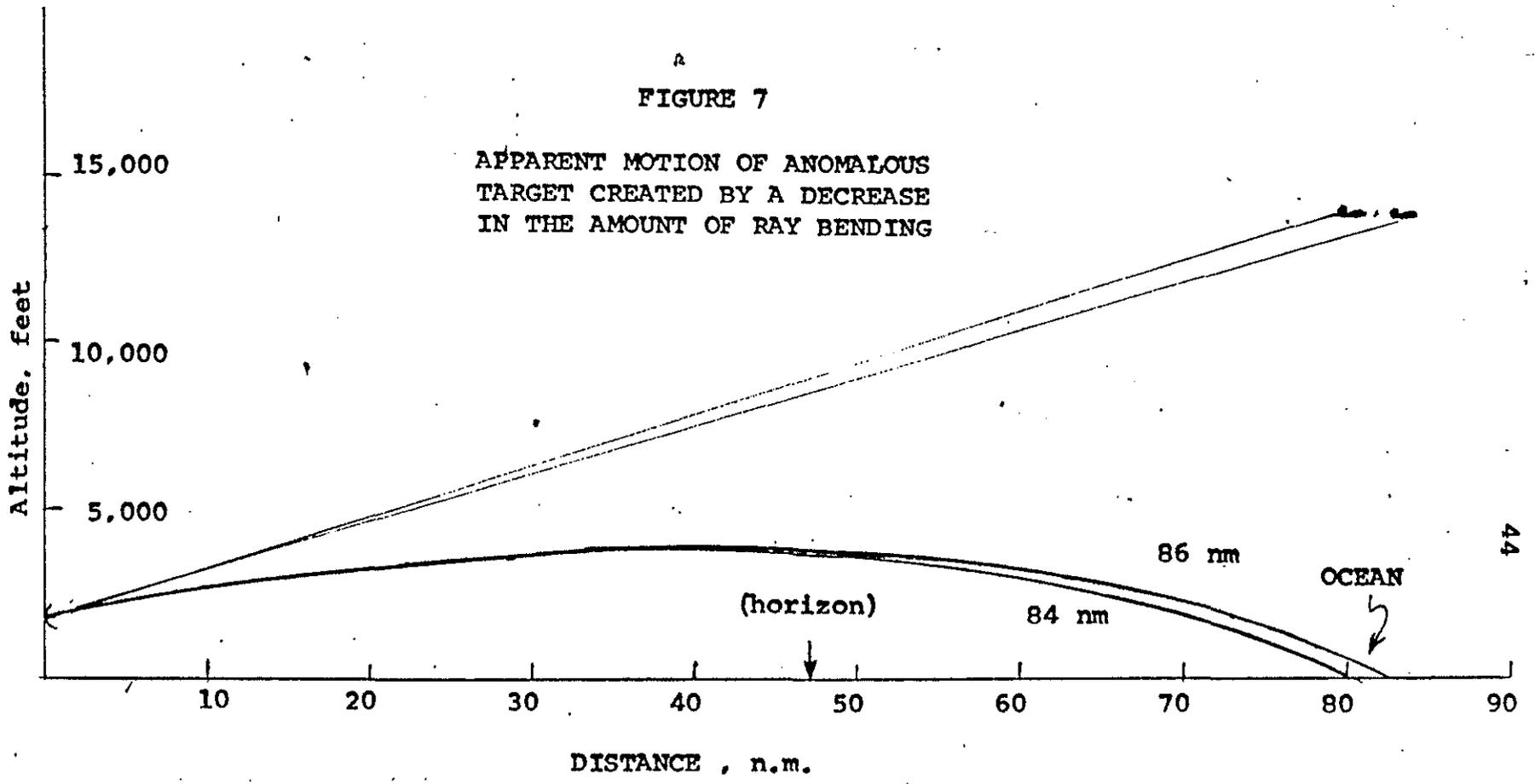
One could make another suggestion: namely that the radar beam bounced off the airplane and hit a stationary target and then was reflected back to the antenna. However, unless the stationary target were within 1 mile of the airplane during the whole period, the extra distance travelled would show up on the scope as a bend in the unusually long return blip. A boat on the surface, properly oriented, might provide a sufficient reflection ..... but the plane was flying at an altitude of over 2 n.m., so the extra distance travelled by the twice reflected ray (one by the airplane and once by the boat) would show up on the scope.

There is still another alternative, illustrated in Fig. 7. In this case we assume that a bending layer develops at just the right time and place so that a few rays hit the surface of the ocean at a path distance equal to 84 nm. Then we assume that the bending decreases slightly in time so that the rays hit the surface at a greater distance. The decrease in bending has to occur at exactly the correct rate to make the path length increase by 2 nm in 36 seconds. It would not require much of a change in the amount of bending to accomplish this, although the average amount of bending would have to exceed the curvature of the earth since the horizon, for an antenna at 1700 feet, is at 47 nm (no bending; straight line distance). 4.

The big problem with all of these explanations requiring ray bending is that, when conditions are correct to that "one" ray or "ray bundle" bends down and hits the ocean, or a ship on the ocean, many adjacent bundles also bend down. Thus one would

A  
FIGURE 7

APPARENT MOTION OF ANOMALOUS  
TARGET CREATED BY A DECREASE  
IN THE AMOUNT OF RAY BENDING



expect not one but many apparently real targets at various azimuths and distances all moving at various apparent velocities as the conditions of the atmosphere change. Moreover, when the conditions of the atmosphere are such that noticeable ray bending is taking place and producing sea clutter, the random targets appear on a non-MTI presentation as well as on the MTI presentation. Yet BC saw no evidence of anomalous propagation. Thus it appears to be difficult to ascribe this particular radar incident to anomalous propagation. It is also difficult to ascribe the other "class" of unusual radar targets, those that remained stationary for long periods of time (minutes) to anomalous propagation since stationary targets produced by ray bending are, nevertheless, stationary, and therefore should not be able to defeat the MTI processing.

## Analysis of Radar-Visual Sightings

A radar-visual sighting occurs when a visual target (object) is seen in the same direction as a radar target. Unfortunately the radar target may not be the same thing as the visual object since the radar operator has no way of estimating altitude (when using a long range search radar, as in this case), and the visual observer usually has no way of estimating distance. However, if the visual and radar targets are observed to change in some way (e.g. move, "appear", or "disappear") at the same time, it is reasonable to assume that they are the same object providing that the nature of the change is the same for both types of observation. In this case we have three classes of observations: those in which radar and visual targets in the same direction with respect to the plane changed simultaneously (apparent radar-visual : ARV); those in which radar and visual targets were changing in similar ways but for which the exact directions of the visual targets are not known ( maybe radar-visual:MRV); and those in which there appeared to be no synchronism between radar and visual targets (not radar-visual: NRV). Out of about 28 separable incidents involving the Wellington radar, 16 are NRV's, 8 are MRV's , and 4 are ARV's. The sighting as the plane left Christchurch which involved the airplane radar for about 4 minutes continuously belongs to the ARV class. In this last sighting the object was picked up on radar as soon as the radar was warmed up and the sighting line to the object was in the same direction as the radar azimuth until the object was so far to the right of the plane that it went off the radar scope. The object was not detected on radar when the plane turned toward it, but at that time the depression angle (angle below horizontal) was quite large, so the object may have been below the radar beam.

The Wellington radar ARV's are described in the event description listing under #3, #10, #17, and #33. The MRV's are described in events #4,5,8,16,20,34,35, and 38. Only the ARV's will be discussed in detail.

Event # 3 was the beginning of the whole series of occurrences. This is considered to be an ARV because the lights were seen in the same direction as the radar targets and because the "dynamic" characteristics of the lights matched those of the radar targets" namely, they would appear and disappear apparently at random. The visual estimate of distance ( over the town of Kaikoura) must be considered to be erroneous for this to be an ARV sighting.

Event # 10 is considered to be an ARV because of the apparently simultaneous appearance of a radar target and a light directly ahead of the plane. It is possible that the two targets that Fogarty referred to were sufficiently close together to look like a single target on the radar scope, or it may be that only one of them was sufficiently radar reflective to show up on the radar scope.

Event # 17 followed the period of time when the radar target at the location of the plane was twice its normal size. In this case the observers looked to the right of the plane where Wellington said there was a target. They saw a flashing light which the copilot eventually lost sight of as it drifted behind the plane. Wellington saw a target which apparently remained stationary at the right of the plane as the plane moved along.

Event # 33 was the beginning of the last series of sightings just before the plane landed. Both Wellington and the plane referred to the appearance of a target almost directly ahead of the plane. About a minute later this target disappeared both visually and on the radar scope. It is impossible to establish simultaneity of disappearance of the visual and radar targets at this late date, but the disappearances occurred within 5 or 10 seconds at least. The disappearance of the visual target may have been at the same time that the Blenheim beacon went off, but certainly the beacon was not the radar target. The object referred to here may have been one of the several targets picked up by the plane radar when it was heading toward Cape Campbell.

(PARTIAL ANALYSIS OF THE FILM  
OBTAINED FLYING SOUTH AND NORTH)

Projection Transmissometer Measurements  
on Magnified Images Using the Original  
Film

Magnification : 67

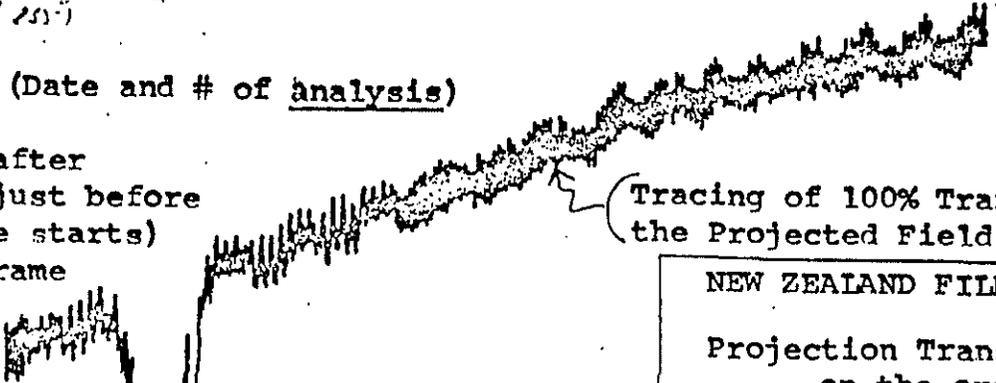
Each figure shows the date of the analysis  
(measurement) and the # in order of analysis.

The number of a frame obtained when the plane was  
flying south is obtained by counting from the  
"orange" frame (overexposed when camera stopped  
with shutter open) just before the first anomalous  
light images

The number of a frame obtained when the plane was  
flying north is obtained by counting from the  
first anomalous light image after the takeoff  
from Christchurch.

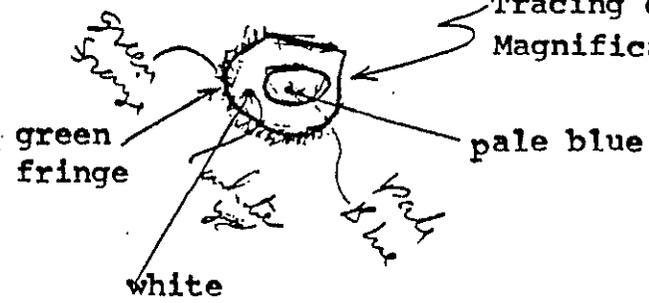
also plot frame at  
beginning of south sequence  
(2nd orange frame is at 255)

MARCH 26 # 3 (Date and # of analysis)  
FLYING SOUTH  
FRAME 330S (after  
orange frame just before  
South sequence starts)  
(2nd orange frame  
is at 255)



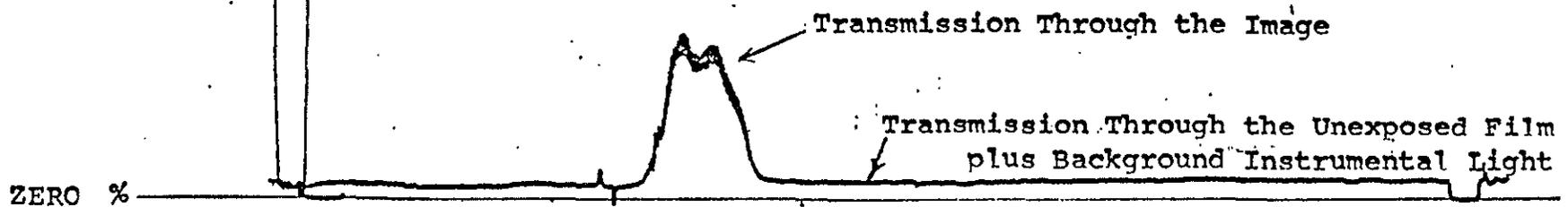
Tracing of 100% Transmission Level Across  
the Projected Field

NEW ZEALAND FILM OF DEC. 31, 1978  
Projection Transmissometer Measurements  
on the original film



Tracing of Image  
Magnification: ~67

(defocused slightly?  
on original film?)



*red pen start  
of sound*

100 % Transmission

MARCH 26 # 4 (Date and # of Analysis)  
 FLYING SOUTH  
 FRAME 855 (after orange  
 frame just before start  
 of south sequence)

NEW ZEALAND FILM OF DEC. 31. 1978  
 Projection Transmissometer Measurements  
 on the Original Film

white  
 (slight tinge  
 of blue)

*D = 0.25  
 D = 0.26*

9.7 cm

Tracing of Image  
 Magnification: 67

*Since  $D_{\text{book}} = 2.18$   
 Transmission should be  
 0.066  
 $18.1 \times 0.066 = 1.14$  cm  
 Excess light = 2.114  
 2.04 cm*

D = film neutral density  
 $= - \log_{10} (T_i / T_o)$

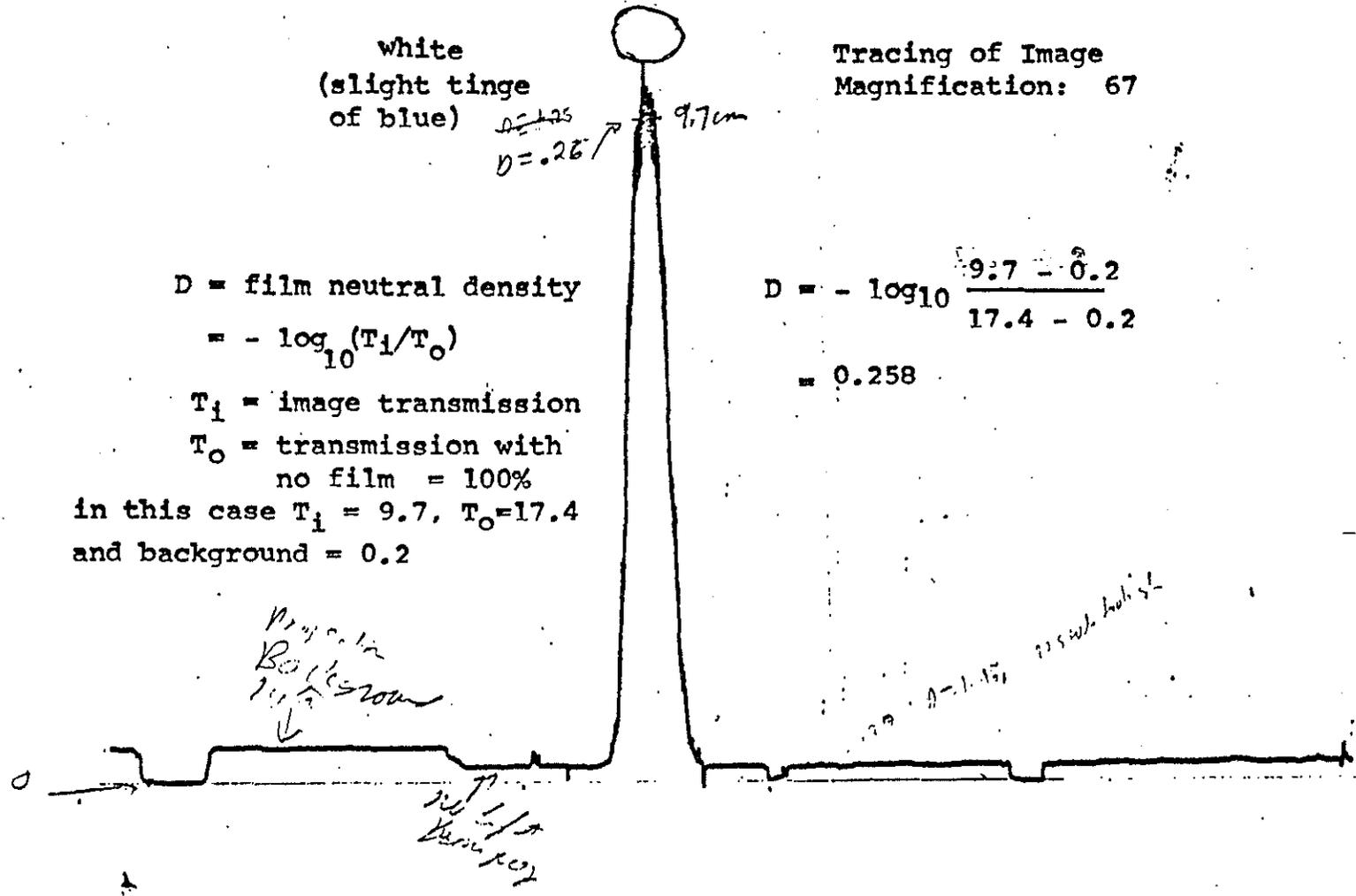
$T_i$  = image transmission

$T_o$  = transmission with  
 no film = 100%

in this case  $T_i = 9.7$ ,  $T_o = 17.4$   
 and background = 0.2

$$D = - \log_{10} \frac{9.7 - 0.2}{17.4 - 0.2}$$

$$= 0.258$$



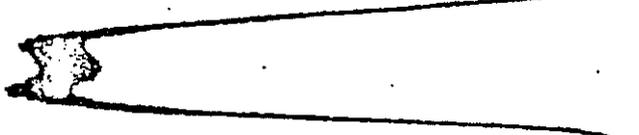
*Projection  
 Ballerrow  
 1/11/78*

*red pen  
 start of  
 sound*

*D = 0.258  
 18.1 cm*

4321

MARCH 26 #5.  
FRAME 432 N  
FLYING NORTHEAST  
("Squashed orange")



about 7/16N

1' 0" below  
at old

MARCH 26 # 6  
FRAME 746N  
FLYING NORTHEAST  
TRIANGULAR IMAGE



$D = .21$

Dark  
yellow  
white  
yellow

11/1 on way



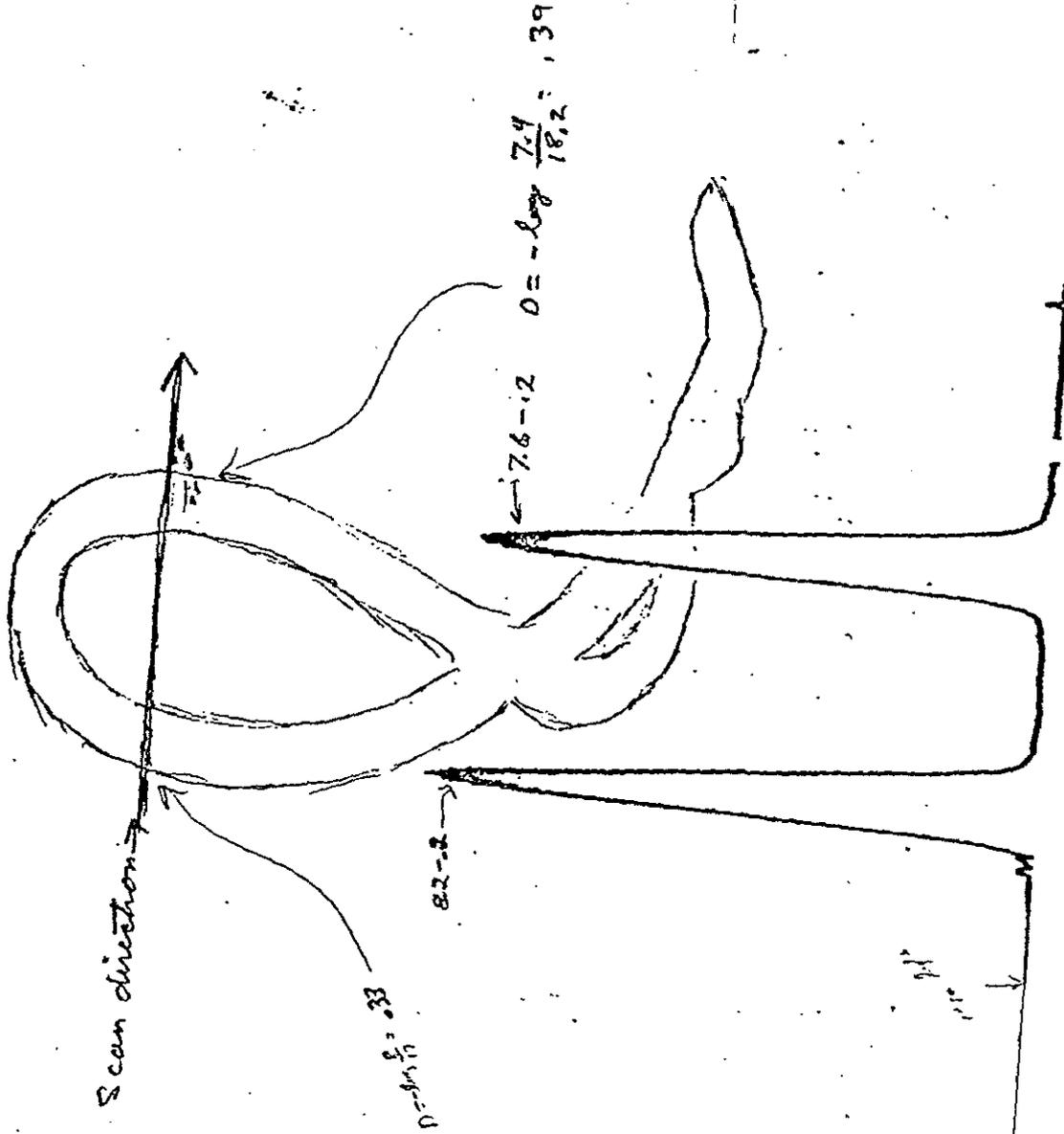
1766N

No film ad ad

MARCH 26 # 7

FRAME 1766N

6cm  
↓  
17.2cm  
102-2



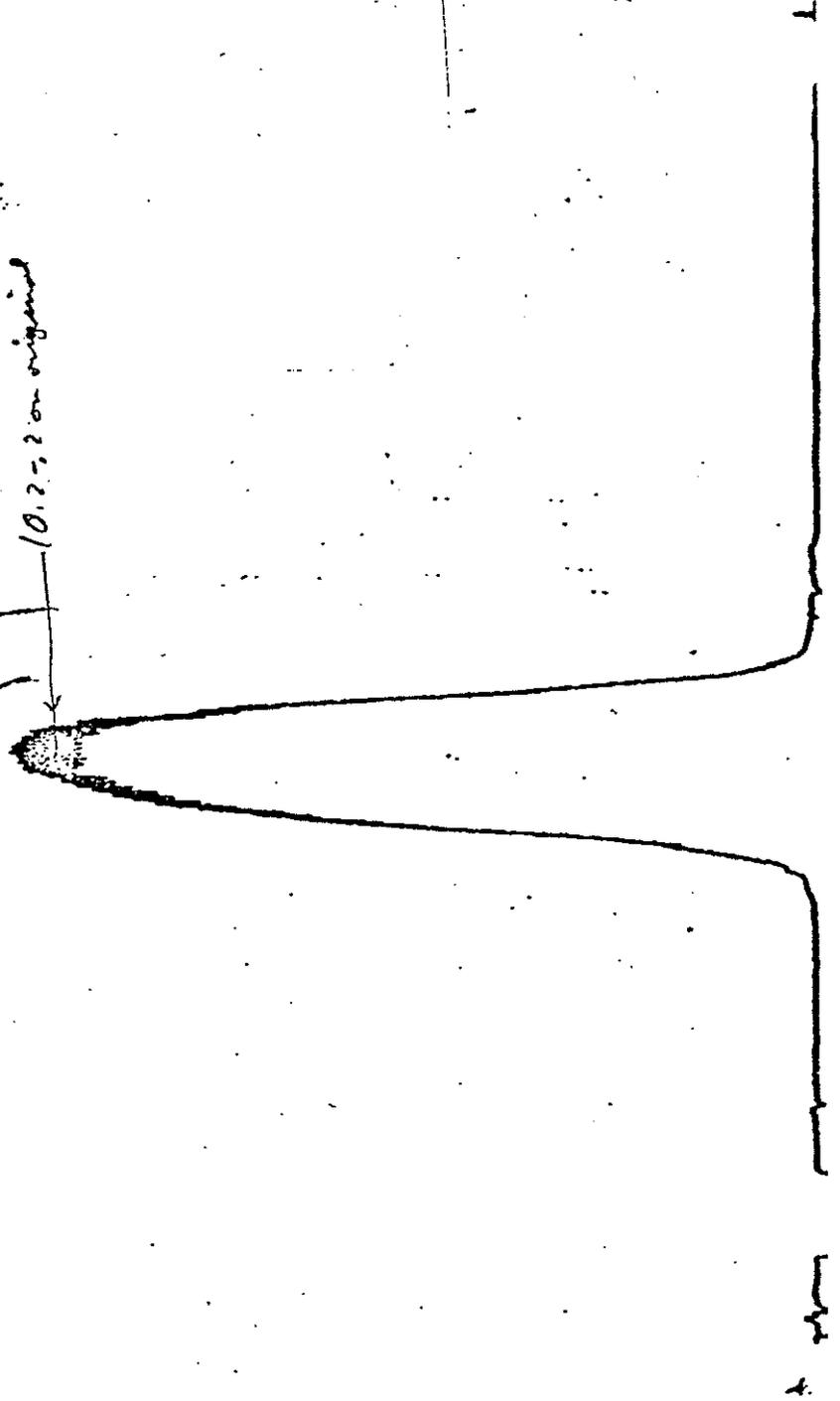
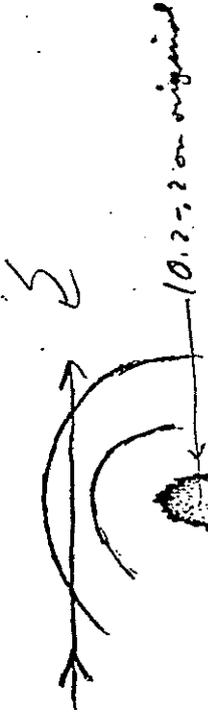
1766N

MARCH 26 #8

FRAME 1766N



$$0 = -\log \frac{10}{16.4} = +2.3$$



MARCH 26 #9

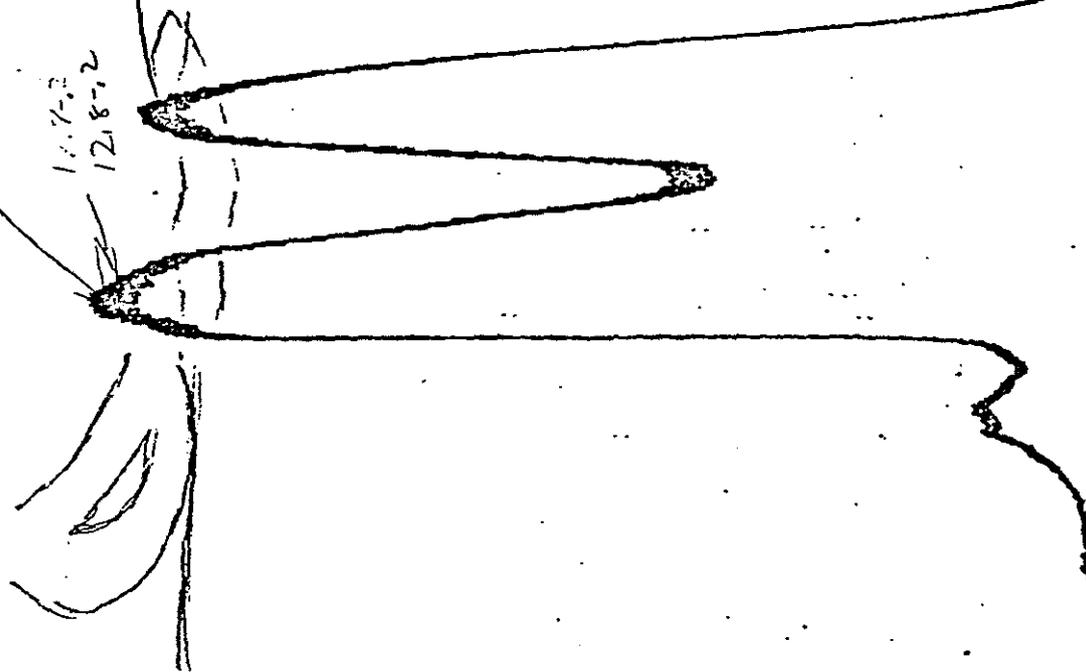
FRAME 1766N



$$D = -\log \frac{226}{167} = .176 \sim 0.18$$

12.8-2

$$D = -\log \frac{172-22}{21-2} = .24$$



1768N

MARCH 26 #10

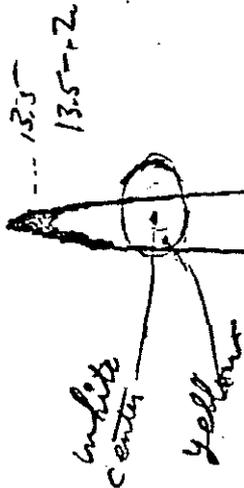
FRAME 1768N



19.7

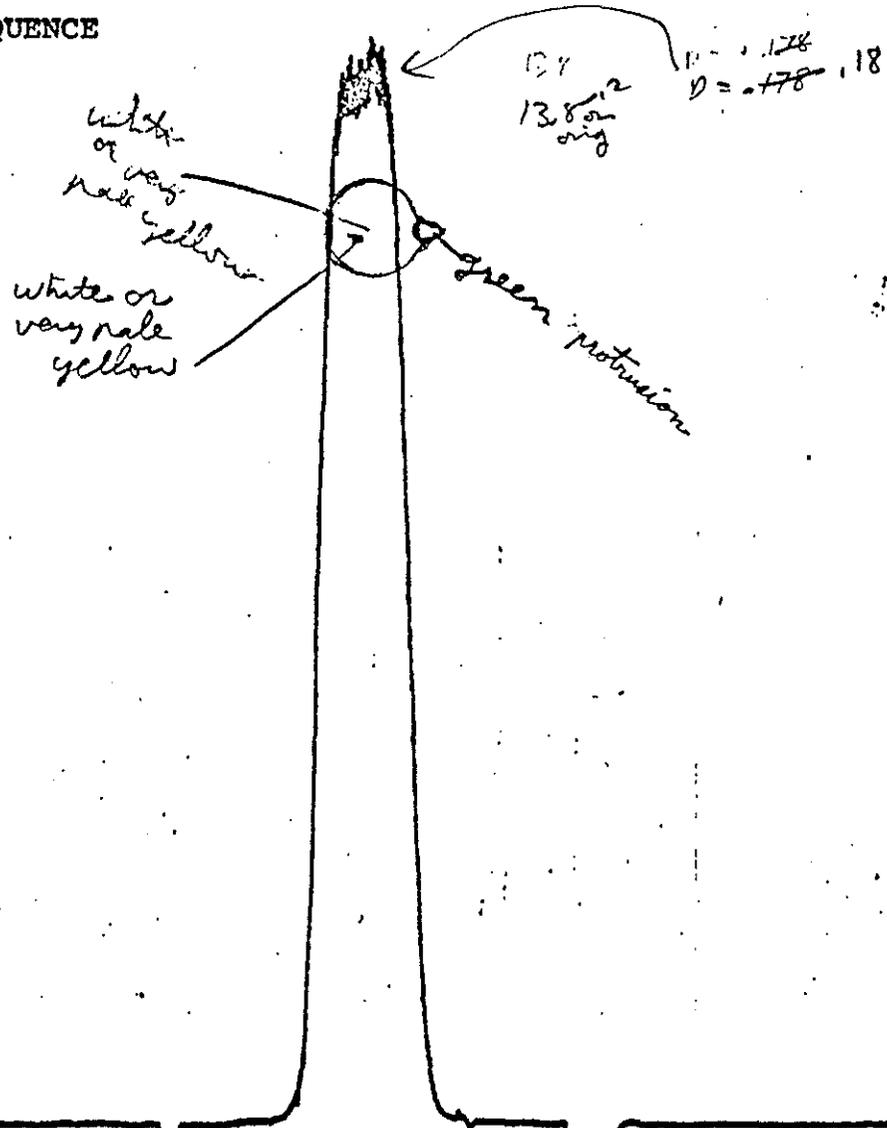
19.7-12

$$D = -\log \frac{13.5-2}{19.7-2} = .166 \approx 0.17$$



MARCH 26 # 11  
FRAME 3042 N  
FLYING NORTH

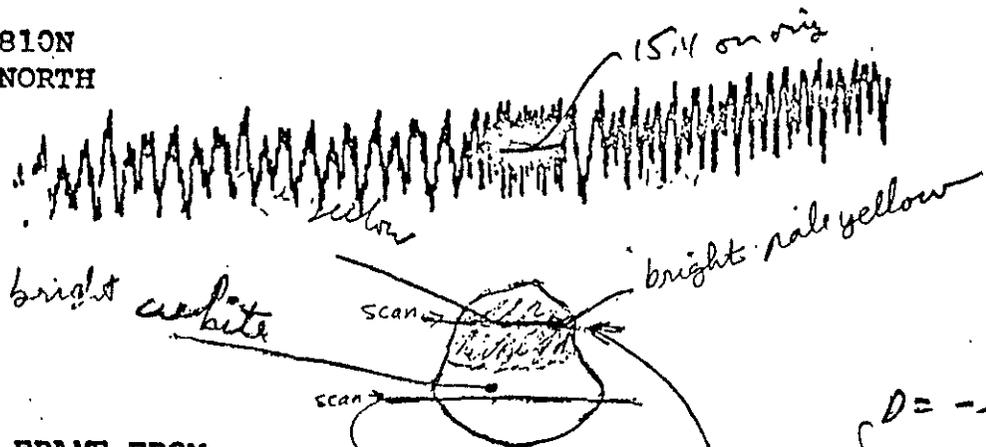
PART OF "STEADY" SEQUENCE



3810N

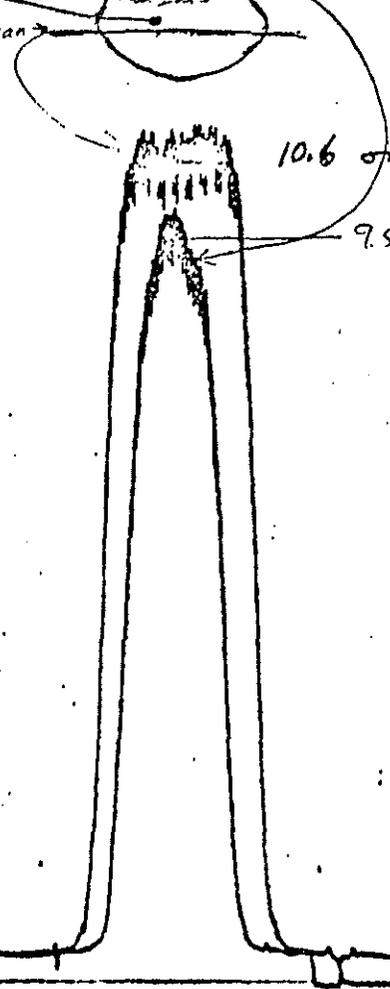
MARCH 26, #12

FRAME 3810N  
FLYING NORTH



FOCUSED FRAME FROM  
"DEFOCUS-FOCUS-DEFOCUS"  
SEQUENCE

(240 mm lens used  
at this point)



$$D = -\log \frac{10.6-2}{15.4-2} = .165$$

$$D = -\log \frac{9.5-2}{15.4-2} = .21$$

(Partial Analysis of the film  
obtained near Christchurch)

(abstracted from a paper  
submitted to Nature )

During the time that the object was detected on radar the plane was climbing on a  $54^\circ$  heading out of Christchurch, N.Z. and the ground speed increased from about 315 to about 370 km/hr. Estimated positions of the plane and the object are illustrated on Figure 1. The object was first detected on radar at point A on the figure, and it was continuously on radar until the azimuthal angle reached about  $50^\circ$ , the limit of the radar scan, at point B. During that time (about 4 minutes) the plane travelled about 23 km and the object apparently travelled about 5 km. The witnesses had the impression that the object was at least as high as the top of the scattered cloud layer (about 800 m) and that for a period of time it actually "paced" the aircraft. Since it was not detected by the Christchurch radar<sup>2</sup> it was either a weak reflector of 50 cm waves, or below about 1 km in altitude (or both).

The photographic equipment consisted of a Bolex EBM electric 16 mm movie camera with a 100 mm, f/1.9 zoom lens that was used at full aperture and full zoom (except for a short section of wide angle photography which shows a meter inside the airplane). The camera was operated at 10 frames/sec. Fujicolor type 8425 color reversal film with an ASA speed of 400 was used. The camera was hand held (a tripod was found inconvenient to use on the flight deck of the aircraft) and consequently most images are smeared. Microdensitometer scans have shown that the images which are small and not streaked are very often highly overexposed, with the film having a transmission that approaches the transmission of the clear film leader. For such highly overexposed images it is very difficult to estimate the illuminance on the film plane. On the other hand, smeared images are somewhat less overexposed and allow better estimates of the film plane illuminance. With less exposure it is possible to use the published characteristic curves (film density vs exposure) to estimate the luminous flux which reached the film plane during the frame time.

With an estimate of image illuminance, and a measurement of the image area, it is possible to estimate the flux (lumens) which reached the film and, with the following equation, to estimate the candlepower of the source:

$$I = \frac{E_i A_i R^2}{T A_L} e^{(3.9R/V)} \quad (1)$$

where I is in lumens/steradian (i.e., candelas, cd.),  $E_i$  is the film plane illuminance in  $\text{lm/m}^2$ ,  $A_i$  is the image area, R is the distance to the source, T is the lens transmission (assumed to be 80%), and  $A_L = \pi D^2/4$  is the area of the lens aperture. For f/1.9,  $D = 10 \text{ cm}/1.9 = 5.26 \text{ cm}$ . The visibility, V, estimated from ground level data, was about 70 km.

Of particular interest is a single frame image smear obtained when the radar range, R, was between 18 and 35 km. This image, illustrated in Figure 2, ranges in color from bright yellow in the "sides" of the loop to white-yellow at the top and bottom of the loop. Neutral densities (density =  $-\log_{10}$  of the film transmission) range from 0.4 down to 0.2, while that of the clear leader is about 0.12. The densities for the three colors (red, green, blue) in the portions of the film which have not been exposed (e.g. the black background) lie in the range 2.1 - 2.3. Published film characteristics<sup>3</sup> indicate that the normal density range is from about 0.10 to about 2.3 - 2.7 for the three colors, and that the "speed point density" for the film is about 0.90. Since the upper density range of the film under study here is somewhat below the normal density, the speed point may also be somewhat low. A conservative estimate is that the speed point density for this film might be as low as 0.80.

According to the ANSI standard, ASA 400 film reaches its speed point density 4 when exposed by a flux of about  $0.025 \text{ lm}\cdot\text{sec}/\text{m}^2$  ( $0.025\cdot\text{lux sec}$ ). For a 0.044 sec exposure this becomes  $0.56 \text{ lm}/\text{m}^2$ . The measured loop image densities

differ from the speed point density by 0.4 to 0.6 density units, indicating the image illuminance was  $10^{0.4} = 2.5$  to  $10^{0.6} = 4$  times the speed point illuminance. (Note: The relationship between density and exposure is somewhat less than linear to nearly linear in this region of the characteristic curves.) Accepting a conservative estimate of three times the speed point illuminance,  $E_i = 1.7 \text{ lm/m}^2$ . The total image area for which the density is 0.4 or less (exposure is three times the speed point value or greater) is about  $0.003 \text{ cm}^2$ . Assuming a radar range of only 18,000 m, equation (1) yields about 217,000 cd. For  $R = 35 \text{ km}$ , equation (1) yields about  $2.1 \times 10^6 \text{ cd}$ . For comparison, a relatively high efficiency 10,000 watt incandescent bulb radiates about 330,000 lumens into  $4\pi$  steradians, which corresponds to about 26,000 cd.<sup>4</sup>

A characteristic source size may be estimated from the lens focal length and the widths of the streaked image. The angular width of the narrow horizontal sections is about 0.00065 radians, and that of the wider vertical sections is about 0.001 radians. Assuming a stationary object (streak due only to camera motion) these angular sizes would be consistent with a non-circular source which, at 18 km, would be about 12 m high by about 18 meters wide. At 35 km the dimensions would be about twice those given.

It is not the intent of this paper to offer an explanation for the unusual bright source. However, one may note that the brightness (over 100,000 cd), the size (on the order of 20 m or more), and the duration (it was seen for over twelve minutes<sup>5</sup>) place rather severe requirements on a conventional phenomenon such as, for example, glowing plasma or "ball lightning."

## Bibliography and Notes

1. The object discussed here was one of several that were seen, filmed, and detected on radar during the flight of an Argosy air freighter that flew from Wellington to Christchurch and then to Blenheim, New Zealand, between 0010 and 0300 on December 31, 1978. An intensive non-government related investigation has ruled out conventional explanations, including Venus and other planets, stars, meteors, squid fishing boats, ground lights, atmospheric effects, military maneuvers, balloons, mating mutton birds, glowing bugs, and hoax.
2. The airplane has a 3 cm wavelength weather radar made by the M. E. L. Equipment Co. of Crawley, England. It was operated in the mapping mode with a radar lobe that is centered at an angle of about  $9^\circ$  below the centerline of the aircraft. In the vertical plane the half power points are about  $6^\circ$  above and below the center of the lobe. The azimuth of the radar target was the same as that of the sighting line to the bright object as nearly as the witnesses could determine. The radar target was unusually large, with an azimuthal width on the radar screen of about  $10^\circ$ , even though the rated azimuthal beamwidth is only about  $3.5^\circ$ . The object was not detected by the Christchurch 50 cm radar, which cannot detect objects below about 16 meters <sup>in altitude</sup> for every kilometer <sup>horizontally</sup> away from the antenna.
3. Photo-lab Index, Morgan and Morgan, Inc., Dobbs Ferry, N.Y. (1978)
4. Handbook of Optics, Driscoll, W. G., Editor, McGraw-Hill, N.Y. (1978)

5. The object was seen for about 3 minutes before the radar warmed up, and it was seen for about 6 minutes after it went off radar. The object was last seen apparently passing beneath and behind the aircraft as the aircraft turned to the left to regain its northeasterly heading after flying southeasterly toward the object for a minute or so.

## FIGURE CAPTIONS

Figure 1 Relative positions of the airplane and the bright object during the period of radar detection. The plane travelled along the path indicated by the dashed line. The altitude of the plane increased from about <sup>1800</sup>1500 m at point A to about <sup>2000</sup>2600 m at point B.

Figure 2 Tracing of the smeared image on a single frame from the New Zealand film of December 31, 1978. The background neutral density is about 2.18, as it is for preceding and succeeding frames. The time duration of the frame was about 0.044 sec. The bright yellow-white color is consistent with the witness descriptions.

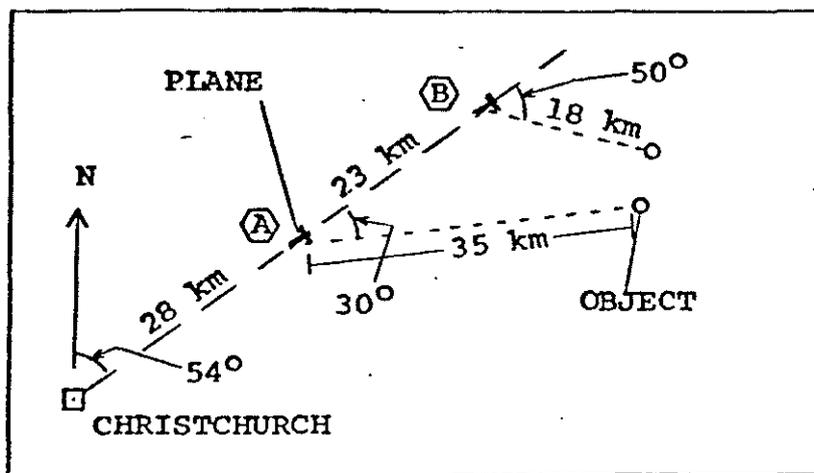


FIGURE 1

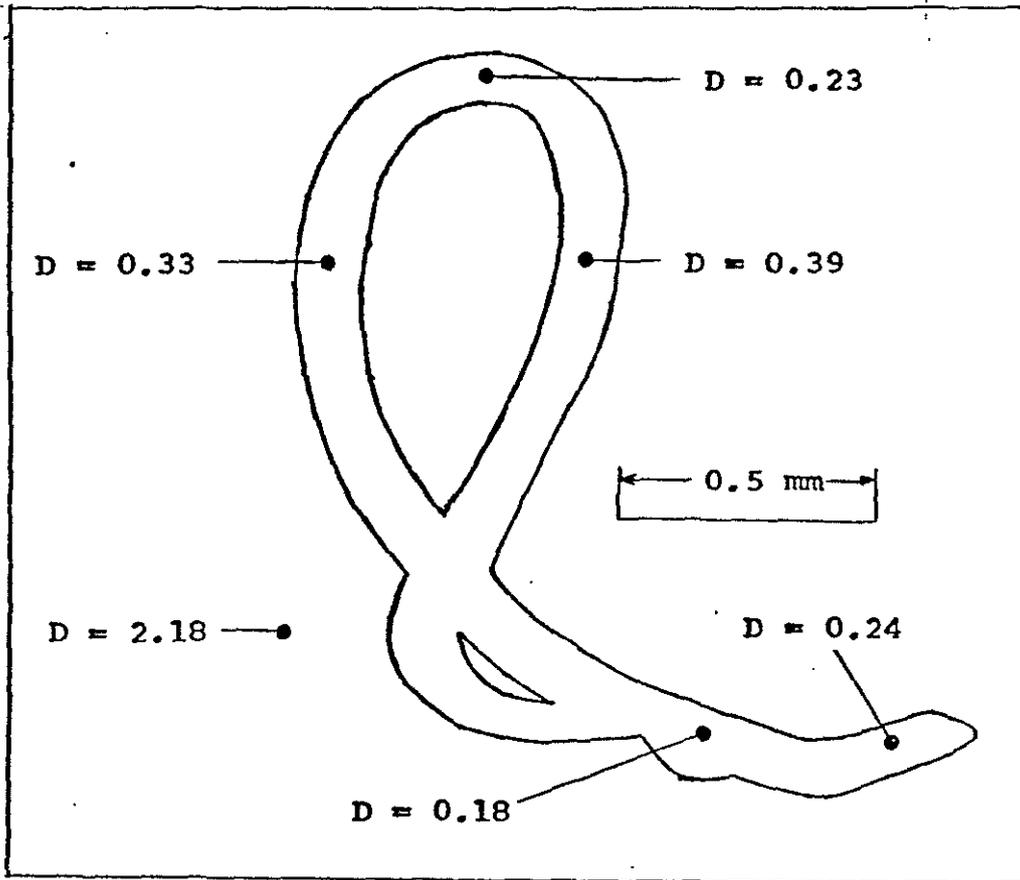


FIGURE 2

Subject:

UFO Report

Department: Air Staff

File No.: .....

Date: 11 July 75

0-

D/Ops

✓

11/7

Noted

1. NPA.

2. ? UKC

D SMR??

1 I received a telephone call from Mr Brian Meachen, Civil Aviation, at 2240 hours last night. He advised that both W/H and OH radars had been tracking an unidentified flying object (UFO) since approx 2140 hours. The UFO had crossed the coast near Waverley and was heading towards 3 vessels off the Wanganui coast. Civil Aviation had advised the Police in case it involved a Hele involved in a nefarious operation (perhaps drugs)

2 I called the Duty Supervisor, W/H Radar (Mr Keith Masbit) who advised ~~that~~ the following info:

- a. A Strikemaster had been homed to the radar target by OH Radar. The pilot could see the 3 vessels but observed no aircraft / UFO
- b. The target ~~had~~ passed the vessel on a direct track to the Brothers lighthouse
- c. The target appeared to be travelling at 60 <sup>KTS</sup> but occasionally this dropped to 30 - 45 <sup>KTS</sup>
- d. An Argoxy passed within  $\frac{1}{2}$  NM of the radar target without making any sighting

## MINUTE SHEET

Subject:

Department: .....

File No: .....

Date: .....

To -

e. The policeman at Waverley had not heard or sighted any aircraft at the time the target was plotted crossing Waverley.

f. The lighthouse keeper at The Rocks was asked to look out. He reports no visual sighting or ~~to~~ sound even though the target passed within 3 NM of the lighthouse.

3. At that stage I advised Mr Nashitt that there was nothing that the RNZAF could achieve by launching an Orion. I advised him that I would make a report to you.

James  
(P. J. GARRETT)  
Sqn Ldr  
DASO

MINUTE SHEET

Subject:

Department: .....

File No.: .....

Date: .....

To --

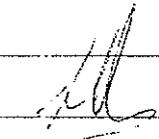
D ops.

REF : HELLO SIGHTING FROM POLISH VESSEL.

- MR COKEA RANG : MINISTRY OF TPT.

1. CAPTAIN OF POLISH VESSEL ADMIRANT THAT THE A/C SIGHTED WAS A HELLO.

2. ACCORDING TO MR COKEA THERE WAS A DEVON IN THE AREA AT 2000' F MIN TPT THINK THAT THE SIGHTING WAS THIS DEVON IN SPITE OF CAPTAIN'S ASSERTION. (DEVON WAS WITHDRAWN TO AVOID CLASH WITH HELLO)

  
TSAC 3.

MINUTE

Air Staff

DASA

UFO SIGHTING

DOPS

1. At 11:45 pm I received a telephone call from a  
Upper Hutt  
who reported seeing occultating lights in the sky
2. The lights, of which there were three, were in the  
direction of Porirua/Panmure to the right of and at a  
higher altitude than MK Kauran transmitter. The lights  
which remained stationary & were changing colour regularly,  
red, green, blue. Witness stated that he was alerted to  
the lights by his neighbour at approximately 11:15 pm  
and then they both observed them for the next half  
hour when he rang here. The lights were still visible at  
this time(?). Witness who appeared sober and calm stated  
that he had not seen the lights before and he was of  
nothing to explain their presence
3. After the telephone call, I checked the telephone  
directory but could find no entry under the name of  
at the stated phone number or address. Wellington  
ATC only movement at that time was a DSE Co Australia which  
landed at 11:47 pm.

Watson

(C J Watson)

Sqn Ldr

DBO

14 Apr 74

~~Date~~

2. Peng back at O&S am who confirmed that lights were still visible at midnight. He emphasized that they did not think them stars and elaborated that they appeared like large stars. There was one that was much brighter than the others and he was basically curious as to what they were.

UFO REPORT

by phone to 7015

1. - visible to own
2. Hi speed light over Johnsonville  
E to W about 1842 4 Apr 79.  
Took about 2 sec to cross  
about 15 nm. Above the mist  
or cloud. Stars were visible  
but it was 'a lot bigger'.
3. Adams

MINUTE SHEET

Subject: ' /

HFO INVESTIGATION  
JAN 79

Department: An Staff

File No.: Ln 39/3/3

Date: 5 JAN 79

9.

To -

JCAS

1. Reference ES.

2. I am rather surprised at the tone of W/O Hffindell's letter and equally surprised at the manner in which CO Woodbourne has chosen to handle the matter. Nevertheless, since the papers have wended their way through the command chain, and because my integrity is being questioned, I consider it appropriate that you decide whether An Staff wants to respond.

3. CO Woodbourne has seen a copy of my report since he wrote the covering letter to W/O Hffindell's submission, thus it might be appropriate to ask CO Woodbourne to debrief W/O Hffindell.

4. Request your advice please.

✓ SC SP  
(2754)

PERSONAL FOR OOPS (P)

PHYSICS AND ENGINEERING LABORATORY  
DSIR  
NEW ZEALAND

**Postal Address:**

**PHYSICS AND ENGINEERING LABORATORY, DSIR  
PRIVATE BAG  
LOWER HUTT  
NEW ZEALAND**

**Location:**

**PHYSICS AND ENGINEERING LABORATORY, DSIR  
GRACEFIELD ROAD  
LOWER HUTT  
Near WELLINGTON**

COMPUTER ANALYSIS OF SELECTED  
CLARENCE RIVER "UFO IMAGES" FILMED BY

TV1

M.J. McDonnell  
and  
A.D.W. Fowler

Physics and Engineering Laboratory  
Report No. 632                      February 1979

ABSTRACT

On 3 January 1979 some cine film of a suspected "UFO" was taken by a Television One camera crew in the Clarence River area. Computer image processing techniques were used to analyse some frames of this film. The results of this analysis are presented in this report.

## 1. INTRODUCTION

Early on the morning of 3 January 1979 some cine film of a bright light in the night sky was taken by a Television One (TV1) camera crew in the Clarence River area north of Kaikoura. This film was widely publicised as being of a suspected "unidentified flying object (UFO)". As this film appeared to be blurred it was considered worthwhile applying computer image processing techniques to some frames of the film, in order to assess whether the image was blurred, and if so in what way. If the image frames were blurred, it was hoped to be able to deblur them. This image processing system has been developed by the Remote Sensing Section of the Physics and Engineering Laboratory (PEL).

Two samples of the original film, each containing several frames, were kindly provided to PEL by TV1. The first sample was near the beginning of the original film sequence, and the second near the middle. Each sample was chosen to be at a time when the image was steady.

## 2. IMAGE DIGITISATION

Five sample frames (numbered A to E) of the 16 mm colour film provided (the first two being from the first piece of Fuji 8425 film) were enlarged by a factor of 7, and printed through a 92 Wratten red filter onto an Ilford Pan F black and white film.

Each black and white image was then digitised on the Remote Sensing Section's scanning microdensitometer to produce a 64 x 64 matrix of picture elements (pixels) which was stored on magnetic tape. For each pixel, the intensity of light transmitted through it was measured to an accuracy of 8 bits. The gamma for the Fuji film was calculated to be 1.8 and that for the Ilford film 0.6. Each sampled image was then corrected to have a resultant gamma of 1.0 and a constant was subtracted from each image to give a background level of 0. Each image then consisted of pixels ranging in intensity value from 0-90.

Each image was then smoothed according to the following algorithm which was applied first in the along scan line direction, and then in the cross scan line direction. If a pixel was greater than or less than both of its nearest neighbours it was replaced by the average of itself and its nearest neighbours. The purpose of this smoothing procedure was to reduce the effect of film grain noise in the original image frames. The result of applying this smoothing procedure in the along scan line direction only is shown in Figure 1. The images in Figures 1-12 were written out on the Remote Sensing Section's Optronics Colorwrite machine using the 100 micron spot size.

### 3. INTENSITY OF LIGHT SOURCE

The original 400 ASA film was taken with a 600 mm lens using an f/5.6 aperture setting and an exposure time of 1/50 sec. The image formed on each frame of the first film sample can be approximated by a uniformly bright circle of diameter 0.70 mm on a black background. The circle had an average density of approximately 0.62. Using this information and referring to Thomas (1973) page 815 it was calculated that the total luminant energy recorded on the film was  $1.5 \times 10^{-8}$  lumen seconds. It is estimated that this calculation could be in error by up to a factor of 2.

By comparison, on the morning the original film was taken, Venus had a stellar magnitude of -4.2. Assuming an elevation of angle of  $20^\circ$ , it was calculated that Venus would have caused a total luminant energy of  $1.9 \times 10^{-8}$  lumen seconds to be recorded on each film frame. This figure is estimated to be in error by up to a factor of 1.5. The brightness of the original film is therefore consistent with its having been an image of Venus.

### 4. IMAGE ANALYSIS AND RESTORATION

Each 64 x 64 pixel image was Fourier transformed on the Varian V76 computer at PEL to give a new 64 x 64 pixel image matrix. The complex part of the Fourier transform was set to zero. Any resulting real pixel value which was negative was set equal to +1. The logarithm of the resultant image matrix was then taken and the result scaled to range from 0 to 255. The result of applying this procedure to images A and B is shown in Figures 2 and 3 respectively. Each of these images includes a series of concentric rings around the central d.c. term. These rings are caused by phase reversals in the Fourier transform and are characteristic of out-of-focus blurring (McDonnell 1975). From the rings and their spacing it can be concluded that the original image is strongly out of focus.

A strongly out of focus image should be uniform in its centre. Each of the original images scanned had a noticeable darkening near the image centre which is very probably caused by spherical aberration in the imaging lens. It was decided to concentrate on image B as the darkening was least for this image and it had the clearest Fourier transform rings. The smoothness of the scanned image and the number of visible Fourier transform rings indicated that it would be worthwhile attempting to deblur the selected image frames.

The first step in the restoration procedure was to estimate the blurring point spread function (psf). For out of focus blurring the psf should be a disc. It was decided to complicate this model slightly to include the effect of spherical aberration. This was done by subtracting from the disc a cone with the diameter of the disc and zero at its edge. Initially the diameter of the disc was chosen to be 45 pixels and the height of the cone to be 10% of that of the disc.

The restoration of image B was then carried out using standard Wiener filtering techniques (McDonnell 1975). The restoration program accepted five input variables. These were the psf average diameter, its ellipticity, the cone height, the film gamma and a constant noise to signal ratio. The psf disc was allowed to be distorted into an ellipse as it was suspected from the shape of the blurred image that the true psf might be slightly elliptical. The film gamma was allowed to vary to compensate for errors in the original estimate.

The diameter of the model psf implies that the original image should have been a small bright object on a black background. Any errors in the above input parameters would cause noise or artefacts to be distributed throughout the restored image. The restoration procedure is based on the concept that the worse the estimate of the input parameters the more pronounced the artefacts.

Each parameter was varied in turn so as to reduce the intensity of the brightest artefact. This procedure was iteratively repeated until a stable result was obtained. The optimum restored image B was obtained using a circular psf of diameter 47.75 pixels, with cone height 10%, a film gamma correction of 1.05, and a noise to signal ratio of 0.004. The cone height, film gamma and noise to signal ratio were not critical. The critical parameters were the ellipticity and the psf diameter. The resulting restored image B is shown in Figure 5. The maximum artefact intensity is 10% of maximum image intensity.

The same restoration procedure (but using the optimum psf of image B) was then applied to images A, C, D and E. The results are shown in Figures 4, 6, 7 and 8 respectively. All five restored images have a similar size although they have no discernible shape. This shows that the restoration procedure is producing consistent results. Figure 5 is the most reliable image as the restoration procedure has been optimised for this image.

Figure 9 is the result of deblurring the above psf by itself with the same assumed noise to signal ratio. It shows that the restoration procedure is not noticeably contributing to the residual blurring present in the deblurred images. The aim of the above restoration procedure has been to produce the image that would have been obtained if the camera had been in focus. The residual blurring present in Figure 5 is partly caused by errors in estimating the psf but may also have been contributed to by atmospheric effects.

Figure 10 is the result of clipping the image in Figure 5 so as to cut out the lowest 20% of the intensity range. This eliminates the artefacts. The same clipping was used to produce Figures 11 and 12, which show the images in Figures 4 and 5 enlarged by a factor of 4. Figure 12 is the best restored image that was produced. The image in Figure 5 has a maximum half width of 7 pixels which corresponds to 35 seconds of arc. This is a reliable upper limit on the size of the original object. By comparison, when the original image was recorded, Venus subtended an angle of 28 seconds of arc. The size of the restored image is therefore consistent with its being an image of Venus.

On the night the original image was recorded, Venus had a broad crescent shape which would have been oriented along the diagonal from bottom left to top right in Figure 12. Such a crescent shape is not discernible in Figure 12. However, it is quite likely that such a small crescent shape would not have been observable even if the original image had been in focus.

## 5. CONCLUSIONS

The following conclusions may be drawn from the work reported here.

- (a) The brightness of each original TVI image frame is consistent with its having been an image of Venus.
- (b) The original image frames are severely out of focus.
- (c) Deblurring selected image frames produced images of a size consistent with what would have been expected of Venus.
- (d) The size of the original object is too small for detail on it to be resolved on the deblurred image.

## ACKNOWLEDGEMENTS

We are grateful to TVI for their co-operation, and to Mr N.J. Rumsey of PEL for a number of helpful discussions.

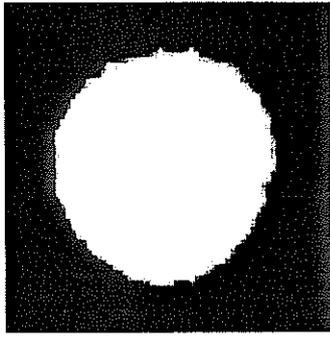
REFERENCES

THOMAS, W. Ed., "SPSE Handbook of Photographic Science and Engineering", 1973.

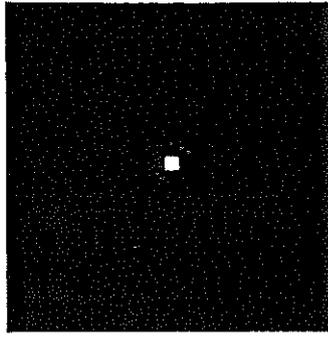
McDONNELL, M.J., "Nonrecursive Digital Image Restoration", Ph.D. dissertation, Department of Electrical Engineering, University of Canterbury, Christchurch, New Zealand, 1975.

FIGURE CAPTIONS

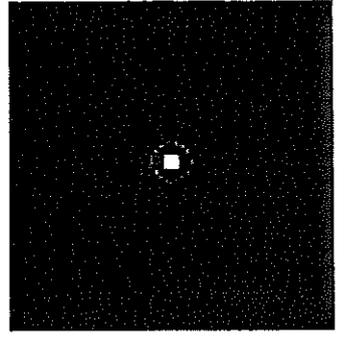
- Figure 1. Original image B after scanning and vertical smoothing.
- Figure 2. Logarithm of positive real Fourier transform of image A.
- Figure 3. Logarithm of positive real Fourier transform of image B.
- Figure 4. Image A deblurred using Image B psf.
- Figure 5. Image B deblurred using Image B psf.
- Figure 6. Image C deblurred using Image B psf.
- Figure 7. Image D deblurred using Image B psf.
- Figure 8. Image E deblurred using Image B psf.
- Figure 9. Image B psf deblurred by itself.
- Figure 10. Figure 5 with dark 20% clipped.
- Figure 11. Figure 4 clipped and enlarged by a factor of 4.
- Figure 12. Figure 10 enlarged by a factor of 4.



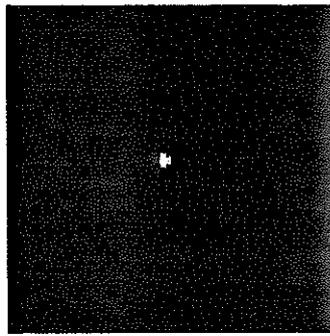
1



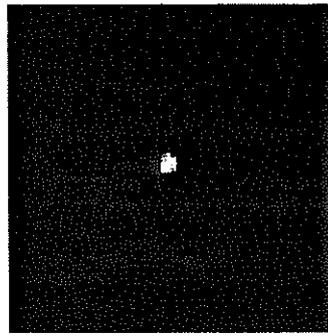
2



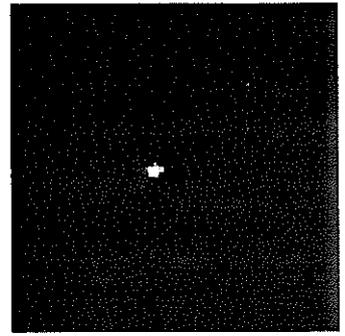
3



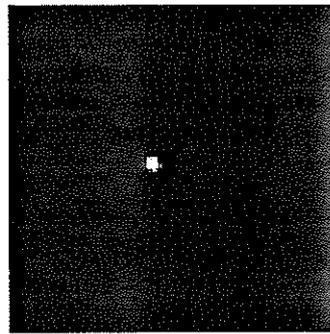
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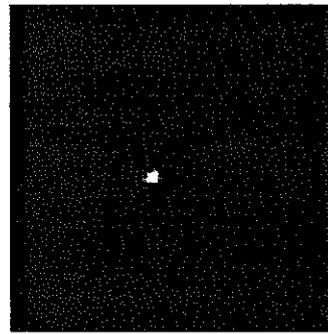
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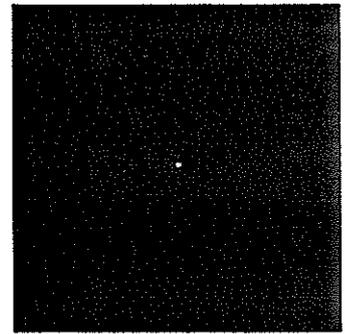
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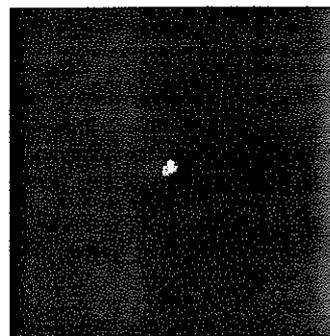
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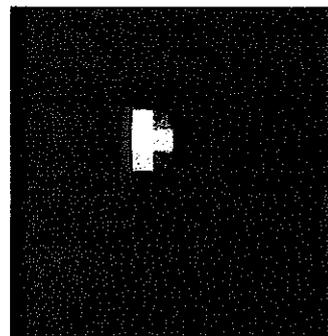
8



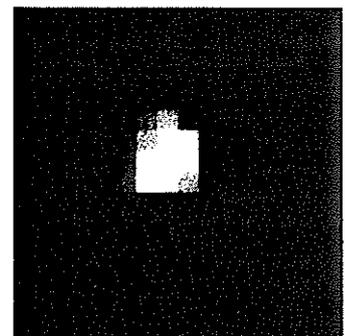
9



10



11



12



From: Group Captain I.V.Mackay, AFC.  
New Zealand High Commission

Reference DL 4/4/45

New Zealand Defence Liaison Staff  
New Zealand House  
Haymarket  
London SW1Y 4TQ  
Telephone: 01-930 8422 Telex: 24968

14 February 1979

Wing Commander J.B.Clements,  
Director of Operations,  
Defence Headquarters,  
Private Bag,  
WELLINGTON.

*Dear John,* UFO Witness Reports.

Some time before leaving on my recent visit to New Zealand, I agreed to speak to Mr. Andrew Andrea, 6A, Mornington Crescent, London N.W.1 7RH, about the UFO report questionnaire that he put together. I may have mentioned the impending interview with him, when we spoke on 29th January.

The UFO sightings in New Zealand in late December sparked off Mr. Andrea's interest, although it is clear that he has an abiding interest in such phenomena. I know only what I read in the papers, about the RNZAF (Clements) report, and I leave it to you to decide if possession of a stack of questionnaires of the sort Mr. Andrea has produced, would facilitate UFO reporting in future by individuals in New Zealand, and thereby aid the author of the official comment, in arriving at his conclusions.

*Yours sincerely,  
Ivan Mackay*

Encl: UFO Witness Report Sheet (2)

UNIDENTIFIED FLYING OBJECT WITNESS REPORT SHEET.

This questionnaire has been prepared in order to give the authorities as much information as possible on the Phenomenon that you witnessed. In order that a detailed investigation can be carried out in finding an explanation to your sighting, try to answer as many questions as possible. Any information that you give will be treated in the strictest confidence. If you have any additional information that you think may be helpful, including diagrams, use the reverse side of each questionnaire, or on a similar sized sheet of paper.

<p>1. When was the object seen?</p> <p>Day .....</p> <p>Month .....</p> <p>Year .....</p> <p>Time ..... am/pm. ....</p>	<p>6. Weather (underline any)</p> <p>DRY</p> <p>FOGGY</p> <p>MISTY</p> <p>LIGHT RAIN</p> <p>HEAVY RAIN</p> <p>SNOW</p> <p>HAIL STONES</p>										
<p>2. Approximate vicinity that you were in when sighted. (or nearest postal address)</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p>	<p>7. Wind (underline any)</p> <p>NO WIND</p> <p>SLIGHT BREEZE</p> <p>STRONG WIND</p> <p>COLD WIND</p> <p>WARM WIND</p>										
<p>3. How long did you observe the object?</p> <p>Hours .....</p> <p>Minutes .....</p> <p>Seconds .....</p>	<p>8. Temperature (underline any)</p> <p>COLD</p> <p>COOL</p> <p>WARM</p> <p>HUMID</p> <p>HOT</p>										
<p>4. Was the object brighter than the sky?</p> <p>YES.            NO.</p>	<p>9. If you saw the object at night, dawn or dusk did you notice the moon or any stars. (underline one or more)</p> <table border="0"> <tr> <td>STARS</td> <td>MOON</td> </tr> <tr> <td>None</td> <td>Bright</td> </tr> <tr> <td>Some</td> <td>Dull</td> </tr> <tr> <td>Many</td> <td>Hazy</td> </tr> <tr> <td>don't remember</td> <td>don't remember</td> </tr> </table>	STARS	MOON	None	Bright	Some	Dull	Many	Hazy	don't remember	don't remember
STARS	MOON										
None	Bright										
Some	Dull										
Many	Hazy										
don't remember	don't remember										
<p>5. What were the weather conditions at the time you saw the object? (underline any)</p> <p>CLOUDY</p> <p>CLEAR SKY</p> <p>HAZY</p> <p>SCATTERED CLOUDS</p> <p>THICK or HEAVY CLOUDS</p>											

Signed .....

Date .....

10. NO the object do any of the following?  
 (Underline one or more)

- a. Appear to stand still
- b. Suddenly accelerate
- c. Separate into different parts
- d. Give off smoke
- e. Get brighter or dimmer
- f. Change shape
- g. Throb or pulsate

Any additional remarks to be written on reverse side of this sheet.

15. Did you observe the object through any of the following?  
 (Underline one or more)

- a. Eyeglasses
- b. Sun glasses
- c. Car windows
- d. House windows
- e. Binoculars
- f. Telescope
- g. Camera lens
- h. Curtains
- i. Other .....

11. Did the object move behind or in front of any clouds or buildings?

- a. YES
- b. NO

If yes please state which

.....

.....

16. If you took a picture of the object please complete the following.

Movie camera .....  
 (make and model)

Still camera .....  
 (make and model)

What size film used .....

A.S.A. rating .....

Aperture setting <sup>f</sup>.....

Camera speed used .....

At what setting was lens focus ring .....

If movie camera was used, how many frames per second (F.P.S.) was camera set at .....

Does your camera have an automatic exposure meter?

- a. YES
- b. NO

12. Where was the sun located when you saw the object? (Underline one)

- a. Behind you
- b. To your left
- c. In front of you
- d. To your right
- e. Don't remember

13. When did you first report the sighting to an official?

day .....

month .....

year .....

14. Did the object appear to you (Underline one)

- a. Solid
- b. Transparent
- c. Don't know

17. Can you estimate the distance of the object from your position

- a. YES
- b. NO

If yes, please state estimation

miles .....

yards .....

feet .....

Signed .....

Date .....

18. How large did the object appear compared with any of the items listed below, held at arm's length? (Underline any)

- |                  |                  |                   |
|------------------|------------------|-------------------|
| a. Pin head      | f. 2 cent piece  | k. Ping pong ball |
| b. Nail head     | g. 5 cent piece  | l. Cricket ball   |
| c. Shirt button  | h. 10 cent piece | m. Grapefruit     |
| d. Jacket button | i. 20 cent piece | n. Football       |
| e. 1 cent piece  | j. 50 cent piece | p. Other .....    |

19. How certain are you of the above answers? (Underline any)

- |                         |              |
|-------------------------|--------------|
| a. 100 per cent certain | d. Uncertain |
| b. Fairly certain       | e. Guess     |
| c. Not very certain     |              |

20. Describe as best you can the following. (If none write NONE)

- a. Colour .....
- b. Sound .....
- c. Electrical malfunctions in your immediate area  
.....  
.....

21. How did the object disappear from your view? .....

.....  
.....

22. If you are familiar with angular direction answer the following.

- i. When you first saw the object.
  - a. from true North ..... Degrees
  - b. from horizon ..... Degrees
- ii. When you last saw object.
  - a. from true North ..... Degrees
  - b. from horizon ..... Degrees

23. If you suffered any injuries on the date mentioned in Question 1. specify below

.....  
.....

Signed .....

Date .....

24. What direction were you looking in when you first saw the object?  
(Underline any)

- a. North
- b. North East
- c. East
- d. South East
- e. South
- f. South West
- g. West
- h. North West
- i. Don't know

25. What direction were you looking in when you last saw the object?  
(Underline any)

- a. North
- b. North East
- c. East
- d. South East
- e. South
- f. South West
- g. West
- h. North West
- i. Don't know

26. Please state names and addresses of any other witnesses.

Name .....	Name .....
Address .....	Address .....
.....	.....
.....	.....
Telephone .....	Telephone .....

27. Were there any distinguishing marks on the object such as letters or unknown markings?

- a. YES
- b. NO

If yes, try to duplicate as best you can on reverse side of this sheet.

28. Did the object do any of the following? (Underline one or more)

- a. Stay motionless
- b. Move upwards
- c. Move to your left
- d. Move to your right
- e. Move downwards
- f. Move towards you
- g. Move away from you

Other comments .....

29. As best as you can remember which of the above movements occurred first, if any.

eg. a. first ..... a. .... d. ....  
b. second ..... b. .... e. ....  
c. .... f. ....  
g. ....

Other comments .....

Signed .....

Date .....

30. We   the edges of the object (Underline one or more)  
a. Fuzzy c. Don't remember  
b. Star like d. Other comments .....

31. How many objects did you see? .....

32. Please give the following details of yourself in order that you could be contacted should the necessity arise.

Name .....  
last name middle name first name

Full postal address .....  
.....  
.....  
.....

Telephone .....  
Country .....

33. If the above address is temporary give details of permanent address or an address through which you could be contacted.

Address .....  
.....  
.....

Telephone .....  
Country .....

34. Profession .....

Date of birth .....

Sex .....

Signed .....

date of completion .....

FOR OFFICIAL USE.

CODE NUMBER

UNIDENTIFIED FLYING OBJECT WITNESS REPORT SHEET.

This questionnaire has been prepared in order to give the authorities as much information as possible on the Phenomenon that you witnessed. In order that a detailed investigation can be carried out in finding an explanation to your sighting, try to answer as many questions as possible. Any information that you give will be treated in the strictest confidence. If you have any additional information that you think may be helpful, including diagrams, use the reverse side of each questionnaire, or on a similar sized sheet of paper.

<p>1. When was the object seen?</p> <p>Day .....</p> <p>Month .....</p> <p>Year .....</p> <p>Time ..... am/pm. ....</p>	<p>6. Weather (underline any)</p> <p>DRY</p> <p>FOGGY</p> <p>MISTY</p> <p>LIGHT RAIN</p> <p>HEAVY RAIN</p> <p>SNOW</p> <p>HAIL STONES</p>										
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Signed .....

Date .....

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- g. Camera lens
- h. Curtains.
- i. Other .....

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- a. YES
- b. NO

If yes please state which

.....

.....

16. If you took a picture of the object please complete the following.

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 (make and model)

Still camera .....  
 (make and model)

What size film used .....

A.S.A. rating .....

Aperture setting <sup>f</sup> .....

Camera speed used .....

At what setting was lens focus ring .....

If movie camera was used, how many frames per second (F.P.S.) was camera set at .....

Does your camera have an automatic exposure meter?

- a. YES
- b. NO

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- a. Behind you
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If yes, please state estimation

miles .....

yards .....

feet .....

13. When did you first report the sighting to an official?

day .....

month .....

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- c. Don't know

Signed .....

Date .....

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- |                  |                  |                   |
|------------------|------------------|-------------------|
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| c. Shirt button  | h. 10 cent piece | m. Grapefruit     |
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  - b. from horizon ..... Degrees
- ii. When you last saw object.
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  - b. from horizon ..... Degrees

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.....

.....

Signed .....

Date .....

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(Underline any)

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- b. North East
- c. East
- d. South East
- e. South
- f. South West
- g. West
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.....	.....
.....	.....
Telephone .....	Telephone .....

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- a. YES
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Other comments .....

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- eg. a. first .....
- a. ....
  - b. second .....
  - b. ....
  - c. ....
  - d. ....
  - e. ....
  - f. ....
  - g. ....

Other comments .....

Signed .....

Date .....

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a. Fuzzy

c. Don't remember

b. Star like

d. Other comments .....

.....

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Name .....  
last name middle name first name

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Telephone .....

Country .....

33. If the above address is temporary give details of permanent address or an address through which you could be contacted.

Address .....  
.....  
.....

Telephone .....

Country .....

34. Profession .....

Date of birth .....

Sex .....

Signed .....

date of completion .....

FOR OFFICIAL USE.

CODE NUMBER

Subject: UNIDENTIFIED RADAR CONTACTDepartment: DC-E

File No. ....

Date: 9 FEB 79

To-  
~~SASO~~  
~~KMU~~  
~~DOPS~~  
 ✓ JC  
 D/H

1. At 082105 NZDT Feb 79 I received a telephone call from MR REG PHILLIPS of Wellington ATC who informed me that he had been observing a solid radar contact off the Clarence River.

2. The contact was reported at 2040 NZDT and was still firmly held at 2125. Position was given as 167m/65 nms from the radar head and the operator reported the contact was maintaining a left hand triangular pattern at approximately 80 Kts. After 40 minutes of observation the operator calculated that the targets pattern was advancing on an MHA of 140m/10 Kts.

3. An ANZ B737 was directed through the area at FL260 as was a Cessna 402 who was in and out of stratus at 1500'. Neither aircraft saw anything.

4. Wigram had a Deson ready for a planned sortie to WN which I requested to have a look in the area. He saw only transluc.

5. The PRO (SAN LOR COLE) and OPS3 (SAN LOR COLLINS) were kept in the picture in case of a press leak.

6. I did not consider any further action

Subject: .....

File No. ....

-2-

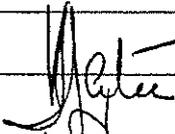
Date: .....

To-

by the RNZAF to be wanted.

7. The contact faded at 2135 NZDT.

8. No explanation for the contact can be given; one ATC operator considered the contact to look like a helicopter, another considered it to be an aeroplane. The stratus in the area was not showing on radar and it is unlikely that the trawlers would paint.

  
(H. J. LAWTON)

SRN LDR

DASO

X 838

MINUTE SHEET

Department: OPS 1

Subject: NIGHT HELICOPTER SIGHTING.

File No. ....

30 Jan 79.

Date: 2 FEB 79

To: ~~DOOS/~~  
sc  
sjt.

Russian  
Vessel  
Smolny.  
Posn  
4326 S  
73 20 E  
28 NM E  
of Waimak.

1. Re: night helicopter sighting off Waimak  
near ... rang with following info:

A. Crew reports (Capt and Officer of Watch) that  
helicopter was picked up on radar at 1 1/2 nm  
and was visually spotted on three other  
occasions.

B. Helicopter was seen at times to be  
almost hovering. It displayed a white light  
beneath (almost like search light) that did appear  
to have some small vertical movement.

C. Helicopter disappeared in north/north east  
direction.

D. As well as large vessel observed  
heading south in area a small (~~grey~~ <sup>grey</sup> ~~ship~~ <sup>boat</sup>)  
grey ship with no lights (or very poorly  
lit) was <sup>also</sup> observed in area. Crew could see  
it only by radar or by light of  
helicopter.

*John A. St*

021600 NZDT

**RECEIVED**

On 26/8/79

Reference 257

Appointment Kevin Smith

**RECEIVED**

020 11 5129

N141

UU LKA775160953 HH  
 RR RZYXCE  
 DE RZYXUU 5430 0202130  
 ZNY RRRRR  
 R 252330Z JAN 79  
 FM RNZAF WOODBOURNE  
 TO RZYYUT/SGHQ RNZAF  
 INFO RZYXCE/NZDEF AIR  
 BT

**RECEIVED**

R E S T R I C T E D  
 DTG KSY/KSZ

549 SUBJECT UNIDENTIFIED SIGHTING CLARENCE RIVER MOUTH AREA  
 REF YOUR KSY/KSZZ WOP DTG 171915Z JAN 79. NIL TO REPORT FROM THIS  
 BASE  
 BT

**RESTRICTED**

DISTRIBUTION		
DEF	AIR	36/3/3
ACTION: _____		
_____ D O P S _____		
_____ O P S 2 _____		

NNNN  
 KSY 0  
 ACTION OPS2 11  
 INFO

← **THIS**

KSZ 0  
 ACTION OPS2 11  
 INFO

LKA10218A963 UU  
NR RZYXCE  
DE RZYXUV 5107 0222140  
ZNR UUUUU  
R 220120Z JAN 79  
FM ANZAF WOODBOURNE  
TO NZDEF AIR  
BT

022 78 01 279

MARCO

UNCLAS  
DIG RTT/KSY/KSZ  
497 FOR DOPS FROM CO PD UNIDENTIFIED SIGHTINGS 20 DEC 78 PD  
FOLLOWING INFO PROVIDED BY FRAME/DFFINDELL CLN  
A. INITIAL (MIDNIGHT) SIGHTING BEARING 098M 4 PT 5 DEGREE  
ELEVATION  
B. SIGHTING AT 0335M WAS ON BEARING OF 070M ALSO AT 4 PT 5 DEGREE  
ELEVATION  
TWO. I COMMEND TO YOUR READING THE EDITORIAL ON PAGE TEN OF 6 JAN  
ISSUE OF THE ECONOMIST  
BT

NNNN

ACTION SUPERVISOR

KSY 0  
ACTION OPS2 11  
INFO



DISTRIBUTION		
<del>DEF</del>	AIR	36 / 8 / 3
ACTION: <u>D OPS</u>		

22/1

KSZ 0  
ACTION OPS3 11  
INFO



To—

we did consider the 'practical joke' aspect during our depend investigation of the December sightings. However, there was no proof that any persons had been sky larking. There is little more than one would expect — if they had:

✓ BC 3815  
(5754)

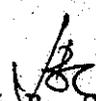
NOTICE

Defence Duty Officer

UFO SIGHTINGS

1. Any reports from Wellington Air Traffic Control Authorities of unidentified radar contacts are to be passed to the DASO as soon as possible. As much detail as possible should be obtained from ATC including any visual or radar contacts made by aircraft at or about the same time.
2. Any reports from civilians should be recorded with details of time, place, height, description etc and passed to the DASO during normal working hours.
3. Thank you.

14 Feb 79

  
(J.B. CLEMENTS)  
Wg Cdr  
D Ops

Ross, C

As discussed, herewith my 'report' plus the two bits from DSIR that were used as the basis for the DSIR report to the Minister.

I have since listened to the tapes (para 14) and was not overly excited. In my view they did not correlate any of the various sightings. There was however a fair bit of 'auto suggestion' between the controller, the aircraft crew, and Mr Frame!

The main conclusion I have drawn from my initial investigation and the various inputs since then is that there really was very little correlation between the many sightings.

In summary:

- a. the radar is OK for bearing but not for height - returns could be anywhere twist 0 and 50,000';
- b. aircraft radar - much the same except height band much narrower of course;
- c. Visual obs fair for bearing no value in terms of distance - lights could have been three feet or three light years away;
- d. when the crew were 'keyed' to look out on a 'bearing' from

Wn radar they saw the 'lights'.

Verne saw the light that seemed  
to 'track' them, which John saw  
"a planet" !!

d. Wn radar was very noisy in  
the 'spurious-return-mode' over the  
period — seems to have quietened  
down now:

The one thing that has arisen since the  
sightings is that it is possible that somebody  
is strapping around with a hero somewhere  
twixt Banks Peninsula — Rarokura.  
But it would not account for many  
(if any) of the STAFF sightings.

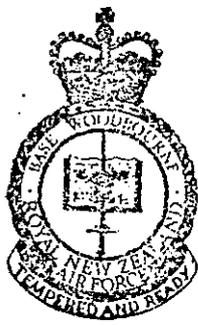
I hope this stuff is of some interest and,  
as I said to you earlier, I am only  
too happy to find a verbal de-brief to  
you chap when I am over there sometime.

Pse return the info when you can.

John.

23/2

PS. Note my report said I had  
interviewed most of witnesses. BCAS  
wrote the 'news release' !!



from:

Commanding Officer

R.N.Z.A.F. Base Woodbourne

John

Thanks very much.  
No further comment at this  
end, and I am not  
raising subject. Had it  
die a natural and  
unmourned death

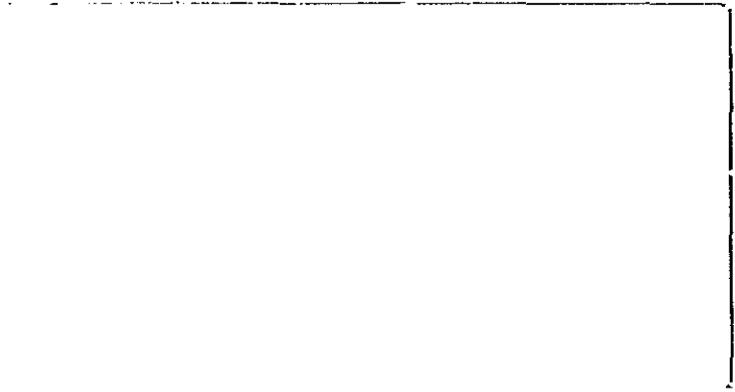
Kind regards

— Ross

PERSONAL FOR DEAS

(DEAS (F))

2



PHYSICS AND ENGINEERING LABORATORY  
DSIR  
NEW ZEALAND

**Postal Address:**

**PHYSICS AND ENGINEERING LABORATORY, DSIR  
PRIVATE BAG  
LOWER HUTT  
NEW ZEALAND**

**Location:**

**PHYSICS AND ENGINEERING LABORATORY, DSIR  
GRACEFIELD ROAD  
LOWER HUTT  
Near WELLINGTON**

OPTICAL QUALITY OF THE WINDOWS OF  
"ARGOSY" AIRCRAFT IN RELATION TO  
PHOTOGRAPHY WITH LENSES OF LARGE  
APERTURE.

by N.J. RUMSEY.

PEL REPORT NO. 625      JANUARY 1979

## Introduction

On the evening of Tuesday, 2 January 1979, TV1 showed a film taken by a Wellington photographer, Mr David Crockett, from a SAFE AIR Argosy aircraft on the night of 31 December 1978, for a Melbourne TV channel. Photographs of a bright object taken with a long-focus lens (250 mm focal length) show structure in the form of horizontal streaks. It seemed to me very probable that these streaks were an artifact produced by imperfections in the aircraft window. It also seemed to me possible that the image was somewhat defocussed. These points needed to be settled before there could be any possibility of placing a reliable interpretation on the image.

## Method of Investigation

A suitable test method had to be one that could be carried out relatively quickly and with no disturbance to the normal running of the aircraft. We put together a short telescope (for portability) of high magnification (for ease in detecting defects in the image). The objective was of 75 mm aperture and relative aperture f/5: one of three high quality collimator objectives recently made by Garry Nankivell of the PEL Optics Section. The eyepiece was an "orthoscopic" of 4 mm focal length intended for astronomical use. The magnification was thus  $75 \times 5/4 = 94 \times$  approximately. A small area light source consisted of an illuminated torch bulb placed sufficiently far away that any significant blurring of the image would destroy the ability to recognise the filament as such. In practice, when the crucial test of the window through which most of the photography had been done was carried out, the distance was probably about 40 metres. The test was qualitative rather than quantitative, or at best semiquantitative. When the light source was viewed directly, i.e. not through an aircraft window, the presence of some residual aberration in the optical system in the form of secondary spectrum (a lack of perfect coincidence of the foci in different colours) was easily detected; but the envelope of the torch bulb appeared well defined and the bright image of the filament nowhere obliterated the outline of the bulb.

## Observations

When the author arrived at Woodbourne the aircraft from which the photography had been done was not available, so three windows of another Argosy were tested. The first two windows caused the image of the light source to show considerable coma (a lop-sided flare), and the third caused astigmatism (which gives as the image of a point of light two lines at right-angles to each other and separated along the line of sight).

When the plane arrived from which the photography had been done, the crew pointed out the window through which most of the photographs had been taken. When this was tested through

an area near its bottom, the most compact image found by varying the focus setting had an outline shaped like an inverted pear and it was crossed by two bright streaks. When the telescope was moved, the appearance of the image changed rapidly; but horizontal streaks were generally present. This observation, taken in conjunction with the way in which the position of the streaks on the filmed image changed as the line of sight moved relative to the window, make it substantially certain that (as conjectured) the streaks across the filmed image are artifacts caused by the window and are not images of genuine detail in the object. On the other hand, it appears that we should absolve the photographer from illegitimate enlargement of the image, for the most compact images that could be obtained were generally less compact than I had expected.

### Conclusions

During the admittedly rather brief testing of four different windows in the Argosy aircraft, no part of any window was found that did not introduce serious aberrations into the images formed by an optical system of 75 mm aperture. Thus the windows are not suitable for photography with long focus lenses (which, for a given relative aperture, have of course an absolute aperture proportional to their focal length). Further, the particular window through which film was shot with a long focus lens was almost certainly responsible for the horizontal streaks that appear in the resulting images. Thus the only use to which these images can safely be put (apart from making money) appears to be to set an upper limit to the angular size of the object photographed. (It would be extremely difficult to establish how much smaller than this a sharply defined image would have been.)

### Acknowledgement

The author is particularly indebted to Mr J. Kundycki, Assistant General Manager of SAFE AIR LIMITED, who spared no effort to facilitate these investigations.

# UFOs no threat to US — now there's N Korea

UFOs were put in their place this morning — in exactly 14 seconds — by General James A Hill, the Vice-Chief of Staff of the United States Air Force

in Wellington for the annual airman-to-airman talks with his New Zealand counterparts. General Hill digressed from military discussions with the media to answer a question on UFOs.

Asked what the official United States Air Force view was on them, he treated the query as seriously as he had previous subjects. "We have investigated more than 12,000 sightings, but terminated any further investigations in 1969.

"And that was after 22 years of thorough research.

"Our findings were that nearly all of them were natural things, such as meteors, stars, and atmospheric phenomena.

"We drew the conclusion that they led to no threat to us or anyone else.

"At that stage, we terminated any further investigations. However, while UFOs are now casually dismissed, other threats are faced with a grim determination that puts a sharp edge to General Hill's normally quiet tone.

"The main threat to peace in the Pacific? North Korea," is the instant answer. North Korea is the one place where an armistice exists — there is no treaty there.

"However, we are hopeful that the new alliance between us and China may influence the situation there. And from there lead to an amicable solution.

Earlier, General Hill had some forthright comments to

make on Russia's military machine. "The Soviets and Vietnam have a pact — we have seen it."

"Compared with the recent events in Cambodia, we can hardly look on Russia favourably.

"They are manifesting a global presence — and it must be realised they have a quarter of their forces in the Far East region.

Here in New Zealand to "foster and promote our common goals within the Angus pact," General Hill said the United States aim was to ensure peace and stability in the Asian region — and indeed, in the world.

During discussions today with Air Marshal R B Bell, New Zealand's Chief of Defence Staff, and the Secretary of Defence, MA J R Robertson, he will cover a number of subjects. The main one being the United States "Pacific to the Pacific."

"Intelligence matters will also be discussed, as will mutual problems in training, technology, and the utilisation of women in the military service."

All members of the United States military are now volun-



General James A Hill

teers, and about 7 percent of them are women. "And with the decline in eligible males we expect to reach our goal of 18 percent (female) by 1984."

General Hill will also have talks with Air Vice-Marshal C L Slegert, the Chief of Air Staff RNZAF, and other senior RNZAF officers before flying out from Ohakea air base tomorrow.

MINUTE SHEET

Department: ASCP

Subject: UFO : RADAR SIGHTING

File No.                     

Date: 23 JAN 79

To—

*D. ABS.  
✓  
23/1*

1 AS DASC ON SUNDAY 21 JAN I RECEIVED  
 ADVICE OF THE FOLLOWING UFO SIGHTING BY WLN RADAR:

A FIRST SIGHTED 1208 H, 50 NM 150° MAG WLN  
 B TOTAL CONTACT 50-80 NM  
 C DIRECTION SE AT 2 NM/HOUR  
 D MET CONDITIONS N/A - RADAR SIGHTING ONLY  
 E FADED AT 80 NM  
 F TARGET APPROX SIZE OF MEDIUM SIZE A/C

2 THE REPORT WAS PASSED BY MR GALLEY, DUTY SUPERVISOR  
 WLN ALSO ADVISED THAT THERE WERE NO MET BALLOONS  
 IN AREA NOR ANY KNOWN AIRCRAFT.

*Francis J.C.  
 (P. J. GAGNER)*

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RZYXUV/RNZAF WOODBOURNE  
INFO RZYXCE/NZDEF AIR

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BT  
R E S T R I C T E D  
DIG KSY/KSZ

290 REF NZDEF AIR KSY/KSZ 849 160240Z JAN 79 AIR 36/3/3 NOTAL PD  
SUBJECT UNIDENTIFIED SIGHTING CLARENCE RIVER MOUTH AREA PD  
ONE PD HAVING CONDUCTED INQUIRY INTO RECENT QUOTE UNIDENTIFIED  
VISUAL AND RADAR SIGHTING UNQUOTE IN CLARENCE REGION THERE REMAINS  
SOME DOUBT ABOUT SOURCE OF THE LIGHTS THAT WERE OBSERVED BY THREE  
SAFE ARGOSY CREWS CMM AIRSTAFF HAVE NOW ASKED FOR ANY FEEDBACK FROM  
GROUPS ESPECIALLY OBSERVATIONS IN THE AREA AT NIGHT PD  
TWO PD BASES ARE TO INVITE REPORTS THROUGH DROS FROM SERVICEMEN OR  
DEPENDENTS WHO MAY HAVE OBSERVED THIS OCCURRENCE PD THESE REPORTS ARE  
TO BE FORWARDED EXPEDITIOUSLY TO THIS HQ  
BT

DISTRIBUTION		
<del>RAF</del>	AIR	36/3/3
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# DEFENCE

## NEWS RELEASE

Address all inquiries to:

Public Relations,  
Defence Headquarters,  
Wellington, N.Z.

Telephone: 49 800 Ext. 882 or 792.



### RNZAF UFO SIGHTING REPORT

The unidentified radar and visual sightings reported by aircraft and the Air Traffic Control radars off the north east coast of the South Island recently, are the result of natural but unusual atmospheric phenomena.

This is the conclusion arrived at in the Air Force's just completed investigation into the sightings.

Before arriving at his conclusions, the investigating officer interviewed all the principle witnesses involved in the sightings on the nights of 20 and 30 December. He also worked closely with the Department of Scientific and Industrial Research, the Civil Aviation Division of the Ministry of Transport, and the Meteorological Service.

His report reveals that during the months of December and early January, atmospheric conditions over New Zealand were conducive to freak effects on radar and light waves. Also, the planet Venus was rising in the eastern sky early in the morning, and at this time of the year is unusually bright in appearance.

It was also revealed that for some time the Wellington Air Traffic Control radar has been giving spurious returns off the east coast of the South Island.

Over the period more than 50 Japanese squid boats sailed from Wellington to a position 120 miles off Banks Peninsula.

Not only would the squid boats give a good source of radar return whilst in transit to the squid fishing grounds, but they generate a very large amount of light when fishing at night. Each boat generates about 200 kilowatts of light to attract squid to its lures, and this light source cannot be discounted as a cause of some of the visual sightings.

An investigating officer also speculates that lights seen in the Clarence River mouth could have come from trains or vehicles travelling along the coast, and affected by unusual atmospheric reflections and refractions.

There is no evidence to connect the many radar and visual sightings in the Clarence River and the larger lights seen to the east.

A Ministry of Defence spokesman said the Ministry was completely satisfied there were no unexplained physical objects in the skies at the time of the sightings.

The lights were almost certainly from surface or planetary sources affected by atmospheric reflection, refraction and distortion.

Radar sets are known to be subject to spurious returns, and it was significant that on the occasions the large light was being filmed by a television team on board the Argosy freighter, neither Christchurch or Wellington radars reported any related visual sightings on their screens.

The spokesman said that the Ministry of Defence was not specifically charged with formal responsibility for investigating so-called unidentified flying objects in peacetime. However, the Ministry does take an active interest in all such reports and within the limitations of its resources, conducts investigations as necessary.

Commenting on some media speculation that the country was defenceless against air attack, the spokesman said that New Zealand did not have a complex air defence system, comprising sophisticated radar equipment and a force of missiles and interceptor aircraft.

The recently announced Defence Review explains that over the next decade at least, a physical threat to New Zealand's security, by sea or from the air, is so remote that expenditure of funds on sophisticated air defence equipments could not be justified.

No costing of a comprehensive air defence system for New Zealand had been done, but the Defence spokesman said that the bill would be enormous and well beyond current resource levels.

The Defence spokesman concluded by saying that the Ministry totally discounts the possibility of visits to New Zealand, and particularly to the areas of the country where the recent reports have suggested, of alien aircraft or other flying machines. It also categorically discounts any suggestion that air activity of any kind has taken place which poses any threat to New Zealand's security. Defence does not share the view of those who believe we are visited from outer space, or covertly by the aircraft or machines of potentially unfriendly nations.

~~RESTRICTED~~



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REPLY OR REFERENCE

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**DECLASSIFIED**  
On 26/8/12  
Reference D. J. S. D.  
Appointment Kevin P. ...

~~RESTRICTED~~  
DIG KSY/KSZ

849 AIR 36/3/3 SUBJECT UNIDENTIFIED SIGHTINGS CLARENCE RIVER  
MOUTH AREA PD HAVING CONDUCTED INQUIRY INTO RECENT QUOTE UNIDENTIFIED  
VISUAL AND RADAR SIGHTINGS UNQUOTE IN CLARENCE REGION THERE REMAINS  
SOME DOUBT ABOUT THE SOURCE OF THE LIGHTS THAT WERE OBSERVED  
BY THREE SAFE ARCOSY CREWS PD REQUEST ANY FEEDBACK FROM GROUPS  
ESPECIALLY OBSERVATIONS IN THE AREA AT NIGHT PD SPECULATIVELY CMM  
IT IS POSSIBLE THAT LIGHTS ON COAST COULD BE FROM CARS AND TRAINS  
SINCE ALL HAD BEAM APPEARANCE PD UNLIKELY THAT THEY WERE LIGHTS  
FROM A SQUADRON OF HELICOPTERS AS NO REPORTS OF AERONAUTICAL  
ACTIVITY RECEIVED FROM LOCAL INHABITANTS PD FOR YOUR REPEAT YOUR  
INFO ONLY CMM MOST PROBABLE THAT RADAR RETURNS WERE SPURIOUS

BT  
~~C WA THEY WERE~~

~~RESTRICTED~~

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James C. Collins

P.E.L. 9/10/-

DETAILS OF RELATING TO SIGHTINGS OF OBJECTS OFF

P.E.L.

15 JAN 1979

RECEIVED

SOUTH ISLAND EAST COAST , MORNING OF December 31st 1978.

- 1) Quentin Fogarty, 32, a journalist from Melbourne Television ATV60 is an old friend. He his wife and two children planned to come to New Zealand for a holiday ..plans were made about the middle of 1978.
- 2) Fogarty, as part of his duties as a general reporter for Channel 0, covered a similar 'UFO' event in Bass Strait during 1978. A young Pilot named Valentich claimed he had been 'buzzed' by a 'UFO' in his last radio contact before he disappeared.
- 3) While Fogarty was on holiday at his wife's <sup>her</sup> parents farm in Martin borough he was asked by Channel 0 to prepare a report on a sighting by Safe Air Capt, Vern Powell on Dec. 21st. Fogarty filmed at Wellington Rader Centre and with the ministry of transport and made arrangement's to travel with the Safe Air Argosy delivering Sunday newspapers to the South Island on the night of Sat 30th/Sun 31st December.
- 4) He hired a 'stringer' or contracted film crew, David and Ngaire Crockett *of Wellington*
- 5) Fogarty, the Crocketts, Safe Air Pilot Bill Startup and First Officer Bob Guard flew to Christchurch and encountered objects on the trip South.

Copy for Mike Collins

REFERRED TO  
MAC

6) My first contact with Fogarty was when he called me from Christchurch Airport (approx 1am). He informed me of the contacts. I ~~drove to the airport with his wife.~~ <sup>drove to the airport with his</sup> wife.

7) When we arrived at the airport Fogarty and the Safe Air Crew were in the Christchurch Radar Centre ~~and~~ discussing what they had seen with Christchurch Operators.

8) Mrs Crockett, who was acting as sound recordist for her cameraman husband, informed her husband and Fogarty she was upset at what she had witnessed and would not make the return trip to Blenheim.

9) I asked Fogarty would he have any objections to my travelling to Blenheim on the Argosy. He did not, I asked Pilot Bill Startup if he had any objections and he said I was welcome to fly with them.

10) The Flight left Christchurch at 2.10am (Approx) Fogarty and I were seated at the rear of the air craft and remained there until the 'Fasten Seat Belt' light was extinguished and we made our way to the Flight Deck. (approx 2.18)

11) On the Flight Deck Capt Startup was seated on the left monitoring the planes radar. First Off. Guard was on the right in command of the Air craft which was in the 'Auto-pilot' mode. ~~The~~ Cameraman Crockett was in the third seat in the centre and behind the two front seats. Fogarty was to Crocketts right behind Guard....I was to his left, behind Capt. Startup. Crockett, Guard and Startup were <sup>had</sup> on headphones. ~~on~~

\*Summer Time 12) At 2.18\* by my watch the object was pointed out to me by First Officer Guard. It was to the right of the Argosy and below the craft...keeping pace with us.

13) I checked with Capt. ~~Startup~~ <sup>Startup</sup> our hieght..13-thousand feet and speed...approx ~~170~~ 170 mph. ~~cccccccccccccccc~~

14) The object appeared to be circular in shape...a whitish/yellowish light varying in intensity. At one point I saw a reflection from the object on the surface of the Ocean.\*\*

15) Capt ~~Star~~ Startup estimated the object came as close as 10 miles on his radar.

16) The object kept abreast and below us for approx 40 miles when First Officer Guard took the plane off Auto-pilot and headed directly towards the object. at a greater speed than us  
The Object moved to our right until it went out of our view and off the screen.

17) ~~The object was seen from the aircraft~~

\*Travelling NW approx. Object slightly left of dead ahead.

As we approached Blenheim\*I saw a smaller object over the town...after some four or five minutes it was joined at the same height by a similar object..as we turned the aircraft for landing, I lost sight of both of them.

18) We landed and I made arrangements to get a film crew to Blenheim where, later in the morning, I filmed a report of my experiences and interviewed Mes rs Startup and Guard.

\*\* Experiment with Dennis Grant at Clarence on night 5/6 January. Gary Lewis walked away with a torch to a distance where Grant estimated the size of the light to be approximately the same as the UFO. Distance was 30 paces ( $\approx$  yards) and torch face  $2\frac{1}{2}$  inches across. Hence size  $\sim 0.13^\circ = 8'$  of arc.

and  
19) I do not wear glasses, enjoy excellent health.  
~~SPECTACLES~~  
I had two glasses of white wine with my meal at approx  
7pm the previous evening. I do not smoke, except for  
the occasional cigar.

DC GRANT

Senior Journalist

Television One

10 Dg 2659 CNET

11 ~~ET~~ 60838

---

Res: 5 To Derby St

CA 91111

67124

**DECLASSIFIED**

On 26/8/12  
 Reference D-1 J  
 Appointment for contact  
 - sometimes

1. Introduction

Widely publicised sightings of unidentified flying objects - sometimes accompanied by reports of unidentified radar returns - were made on the nights of 20/21 December 1978, 30/31 December 1978, and the morning of 3 January 1979. In addition to visual reports, two film records of the sightings were obtained and unidentified returns were recorded by the Wellington Airport Traffic Control radar at Hawkins Hill. The Physics and Engineering Laboratory, DSIR, undertook some investigation of the reported sightings in support of the detailed investigation being conducted by the Ministry of Defence. This report is limited to comment on the physical conditions prevailing at the time of the sightings.

2. Sightings

The major reported sightings were made by responsible people with considerable experience, and who would not be easily misled by normal natural phenomena. These comprised the crews of two Safe Air Argosy transport aircraft - the first on the night of 20/21 December piloted by Captain Vern Powell, and the second on the night of 30/31 December piloted by Captain Bill Startup. An Australian TV report and NZ cameraman (Mr Quinten Foggarty and Mr David Crockett) were present on Captain Startup's flight. A TV1 camera crew made sightings from the Clarence River valley on the morning of 3 January 1979.

In addition, many reports from individuals have been received.

3. Physical Factors

Physical factors which need to be considered, and which prevailed over this period are as follows :

1. The atmosphere was very clear.
2. Venus which was rising at about 3.15 a.m. (NZ Daylight Saving Time), was at its brightest in late December (table 1). Venus was 12 times brighter than the brightest star (Sirius) over this period.
3. Jupiter, which was rising about 10 p.m. (NZ Daylight Saving Time), will be at its brightest in late January.
4. North westerly winds were producing inversion layers over the Canterbury coast.
5. The movement into the sea off the Canterbury coast of approximately 75 Japanese fishing boats.

4. DSIR Involvement

DSIR involvement was to provide technical support to the Defence investigation. This support was provided by physicists from the Physics and Engineering Laboratory (PEL). Investigations were as follows :

1. Examination of the films of the UFO's taken on 31 December from an Argosy, and 3 January from the Clarence River. In both films it was obvious that some distortions were present making identification of the object filmed difficult, if not impossible. Hence the laboratory endeavoured to obtain selected frames of these films to see if such distortion could be removed to enable a clearer picture.

Subsequent investigations of the conditions under which the films were produced indicate that there is little merit in proceeding with an analysis of the film taken by Mr Crockett on 31 December, since the image recorded is almost entirely due to imperfections of the window of the Argosy aircraft (Appendix 1).

Analysis of the film obtained by a TV1 camera crew under the direction of Terry Olson on 3 January from the Clarence River, will continue since the greatest distortion appears to have been produced by out of focus. Analysis will take approx. 2 months due, largely, to pressure of other work.

2. Obtaining further data. Unfortunately data relating to direction and height of observations was lacking from most early reports although reasonably accurate times were available. Date on these parameters was obtained by interview and field parties (Appendix 2).
3. Radar Signals. The Canterbury coast is well known for its anomalous radio wave propagation and PEL has studied this phenomenon for many years - the first occasion being in 1948. Officers of the laboratory spent the nights of 5/6 and 7/8 January observing the Wellington Airport Authority radar (Appendix 3).

#### 5. Findings

It is not possible to prove what other people have seen, but merely to predict probabilities. Careful examination of sightings and data obtained indicates that the majority of substantive sightings occurred from about 3 a.m. looking toward the east and low on the horizon. These observations are consistent with the UFO's being related to the rising of Venus, but are not consistent with the normal appearance of that planet.

It is known, moreover, that atmospheric temperature inversions produce considerable refraction of light (and radar waves) producing strange effects upon an image. Such effects are often referred to as mirages. It should be noted that on the night of each major sighting such atmospheric inversions were recorded. The most outstanding observation reported (that of the Argosy piloted by Captain Startup) sighted their UFO shortly after 0230 a.m. - some 10 minutes before Venus should rise at their altitude. The description of the object is classic for that of a planet substantially refracted by the atmosphere - as indeed it must be to appear 10 minutes early! Rapid, random motion (as observed) is also to be expected as the atmospheric conditions change.

It should be pointed out that Venus was at its most brilliant and the atmospheric disturbance would have made its identification difficult indeed; on one observation by PEL staff (Appendix 2)

a star was observed on the horizon directly above a fishing vessel. The heat produced by this vessel was sufficient to produce atmospheric disturbances which refracted the image considerably - the effect being similar to that described in the majority of sightings.

Estimates of distance from one fixed point are difficult. In each reported sighting distances were estimated as being "A few miles". However, rough estimates for distance are possible for the sightings of the 20/21 and 30/31 December. For the former, an aircraft sighting at 0335 a.m. and a sighting from Woodbourne airfield at 0335 a.m. could be correlated and indicate the object was at a very great distance - consistent with Venus. For the latter, observations of the reflection of the object in the sea indicate a very small angular difference - certainly less than  $5^{\circ}$ . Hence, even without atmospheric refraction the object could not have been closer than 100 km and was most likely at a much greater distance.

Unidentified radar reflections are quite common from the radar on Hawkins Hill, and may be produced by a variety of targets brought into the beam by super refraction (or ducting). Super refraction is one consequence of atmospheric temperature inversions. In no case brought to my attention was it shown that unidentified reflections were coincident with visual UFO sightings. Also, at least one reflection reported by Hawkins Hill and which should have been seen by Christchurch Airport radar, was not. Radar operators are very skilled at interpretation and in general recognise spurious signals - indeed most operators agree that most signals observed on the nights in question fit that category. However, two changes to the radar system have been made recently (a signal processor and tilting of the aerial) which will have produced effects not yet assimilated into the experience of the operator.

On the night of 7/8 January 1979, an officer of PEL (expert in radio wave propagation in this area) attended the Wellington Airport Control Centre and observed many unidentified radar returns; 3 ground parties on the Kaikoura coast were in radio contact with him but failed to make any visual contact to suggest these were other than known targets (e.g. ships) or spurious returns (appendices 2 and 3).

While the above relates to the majority of sightings, several others are not well enough defined to follow up. In addition, two pieces of data do not fit this pattern. Firstly, in the flight of 20/21 December (Captain Vern Powell) a pulsating light was observed moving toward the aircraft from Banks Peninsula which veered away to the left, and this was accompanied by an on-board radar return. The speed was estimated as being about 15,000 km per hour. The sighting as described was not confirmed by Wellington radar. No further data is available, hence one can only speculate on the cause, but meteorite showers have the appropriate characteristics. Secondly, on the flight of 30/31 December (Captain Bill Startup) the visual observation was accompanied by a large on-board radar signal in approximately the right bearing which indicated an object keeping station at about 16 km. This object was not seen by ground based radar but - had an object been there - it should have been. Distance estimates (above) suggest the visual sights were certainly not coincident. Hence, this unidentified return could be attributed to a mirror reflection from the atmosphere not observed by Wellington because of (1) the different look angle, and (2) the different radar wavelength.

CONCLUSION

○ This report does not attempt a detailed explanation of all reported UFO sightings in New Zealand over the December-January period. It does, however, deal with the physical conditions occurring and major sightings. In each case (with the exceptions noted above), it is our interim conclusion that the major sightings are consistent with observations of the planet Venus through a disturbed atmosphere.

(M.A. Collins)  
12 January 1979

TABLE 1

Data on Venus Rising.

Date	Rise time (sea level) NZ Daylight Saving Time	Bearing	Magnitude
21 Dec 1978	0331	8½° S of E	-4.3
31 Dec 1978	0316	9½° S of E	-4.3
3 Jan 1979	0313	10° S of E	-4.3

NOTE: Magnitue of brightest Star, Sirius, is -1.6

OPTICAL QUALITY OF THE WINDOWS OF  
"ARGOSY" AIRCRAFT IN RELATION TO  
PHOTOGRAPHY WITH LENSES OF LARGE  
APERTURE.

by N.J. RUMSEY.

PEL REPORT NO. 625      JANUARY 1979

## Introduction

On the evening of Tuesday, 2 January 1979, TV1 showed a film taken by a Wellington photographer, Mr David Crockett, from a SAFE AIR Argosy aircraft on the night of 31 December 1978, for a Melbourne TV channel. Photographs of a bright object taken with a long-focus lens (250 mm focal length) show structure in the form of horizontal streaks. It seemed to me very probable that these streaks were an artifact produced by imperfections in the aircraft window. It also seemed to me possible that the image was somewhat defocussed. These points needed to be settled before there could be any possibility of placing a reliable interpretation on the image.

## Method of Investigation

A suitable test method had to be one that could be carried out relatively quickly and with no disturbance to the normal running of the aircraft. We put together a short telescope (for portability) of high magnification (for ease in detecting defects in the image). The objective was of 75 mm aperture and relative aperture  $f/5$ : one of three high quality collimator objectives recently made by Garry Nankivell of the PEL Optics Section. The eyepiece was an "orthoscopic" of 4 mm focal length intended for astronomical use. The magnification was thus  $75 \times 5/4 = 94 \times$  approximately. A small area light source consisted of an illuminated torch bulb placed sufficiently far away that any significant blurring of the image would destroy the ability to recognise the filament as such. In practice, when the crucial test of the window through which most of the photography had been done was carried out, the distance was probably about 40 metres. The test was qualitative rather than quantitative, or at best semiquantitative. When the light source was viewed directly, i.e. not through an aircraft window, the presence of some residual aberration in the optical system in the form of secondary spectrum (a lack of perfect coincidence of the foci in different colours) was easily detected; but the envelope of the torch bulb appeared well defined and the bright image of the filament nowhere obliterated the outline of the bulb.

## Observations

When the author arrived at Woodbourne the aircraft from which the photography had been done was not available, so three windows of another Argosy were tested. The first two windows caused the image of the light source to show considerable coma (a lop-sided flare), and the third caused astigmatism (which gives as the image of a point of light two lines at right-angles to each other and separated along the line of sight).

When the plane arrived from which the photography had been done, the crew pointed out the window through which most of the photographs had been taken. When this was tested through

an area near its bottom, the most compact image found by varying the focus setting had an outline shaped like an inverted pear and it was crossed by two bright streaks. When the telescope was moved, the appearance of the image changed rapidly; but horizontal streaks were generally present. This observation, taken in conjunction with the way in which the position of the streaks on the filmed image changed as the line of sight moved relative to the window, make it substantially certain that (as conjectured) the streaks across the filmed image are artifacts caused by the window and are not images of genuine detail in the object. On the other hand, it appears that we should absolve the photographer from illegitimate enlargement of the image, for the most compact images that could be obtained were generally less compact than I had expected.

#### Conclusions

During the admittedly rather brief testing of four different windows in the Argosy aircraft, no part of any window was found that did not introduce serious aberrations into the images formed by an optical system of 75 mm aperture. Thus the windows are not suitable for photography with long focus lenses (which, for a given relative aperture, have of course an absolute aperture proportional to their focal length). Further, the particular window through which film was shot with a long focus lens was almost certainly responsible for the horizontal streaks that appear in the resulting images. Thus the only use to which these images can safely be put (apart from making money) appears to be to set an upper limit to the angular size of the object photographed. (It would be extremely difficult to establish how much smaller than this a sharply defined image would have been.)

#### Acknowledgement

The author is particularly indebted to Mr J. Kundycki, Assistant General Manager of SAFE AIR LIMITED, who spared no effort to facilitate these investigations.

APPENDIX 2  
VISUAL OBSERVATIONS FROM CANTERBURY COAST  
5/6 AND 7/8 JANUARY 1979.

Observations were made of the azimuth and elevation of objects that could be interpreted as UFO's on the nights of 5/6 and 7/8 January 1979. In order to determine their position in space these were made from three different points.

- 1) Trig Station near Met. Office Kaikoura, elevation 108 metres.
- 2) DSIR Magnetic Radio Station, Clarence River Mouth, about 20 miles north east of Kaikoura.
- 3) Coast at eastern end of Kaikoura Peninsula (5/6 January) and the Post Office radio relay station Waipapa point (elevation 360 metres) a few km south of Clarence River Mouth (7/8 Jan.).

Although not essential for determining position, the third station was included at a different level in case atmospheric refraction influence had significantly different effects at different heights.

NZ Army supplied two land rovers equipped with VHF and HF transceivers together with driver/radio operators and portable VHF transceivers. One station was to be in HF contact with the Surveillance Radar in Wellington where a scientist from PEL would be located. Communication was not established on the night of 5/6 January.

Azimuth and elevation were determined by theodolite, magnetic compass (azimuth) and inclinometer (elevation). The former was useful only on fixed or very slightly moving objects, the latter were necessary for something moving more rapidly. Instruments were cross-checked against each other using stars, observations being synchronised from the base station by VHF. After an observing routine had been established, checks on stars showed the scatter of the order of 1 deg. which was satisfactory.

5/6 January 1979

Light southerly mainly clear though with a little cloud low in the east. No temperature inversion predicted or observed from radiosonde from Christchurch.

Nothing unusual observed before 3.15 a.m. when a series of observations was made on Venus during the first half hour after it rose to check the effects of refraction. These have still to be reduced but Venus appeared to behave normally.

At 4 a.m., what afterwards turned out to be a star, rose slightly south down wind of a ship anchored a few miles offshore from Clarence River mouth. The heat given off by the ship produced "shimmering" effect on the star image which appeared as a random motion of about 5 minutes of arc for amplitude and several seconds in mean period. Other stars to the north and south showed no such effects. The random motion continued for several minutes until the star went behind a cloud. It reappeared later at higher elevation and the motion was less obvious; after 10 minutes it was no longer detectable, comparable motion was not seen from the Kaikoura station.

This was an excellent example of a phenomenon that could be interpreted as a UFO. The motion of the image produced by the localised heat source could be described as "hovering" and the "UFO would have approached" as the star slowly rose in the sky. It is important to realise that there would have been a small area a few km up the coast where the line of sight of Venus would have passed close to the ship, and anyone in that area would have observed a spectacular "UFO".

It was subsequently confirmed that no spurious echoes were detected by the Wellington radar on the night of 5/6 January.

7/8 January 1979

Light westerly conditions, mild to warm temperature inversion predicted to be at 300 metres elevation off shore. This prediction was consistent with conditions at the Waipapa Point site where it was generally mild, though sometimes relatively cool for short periods, suggesting the site was then temporarily below the inversion.

No unusual optical effects were observed, although due to cloud, Venus could not be seen until it was nearly a degree above the horizon, and it was intermittently obscured for 20 minutes. Observations made similar to those on the previous occasion are not yet reduced.

A large number of spurious echoes were observed on the Wellington radar by W. Ireland. The directions of some of these from the observing sites were passed by radio and observations then made by (theodolite) telescope, binoculars and visually from 0 to high elevations. Nothing was seen corresponding to 18 different radar echoes or groups of echoes. Some echoes were almost "overhead" of a site, one group was interpreted by the Wellington radar controller as a rain shower!

There was clearly very substantial ducting but it appears temperature (and humidity) gradients that produced spurious echoes were not appropriate to produce effects on stars or planets which might lead to their being interpreted as a UFO. This is not surprising, spurious echoes on the Wellington surveillance radar are quite common in summer when inversions are present, but optical effects leading to a "UFO sighting" relatively rare.

(R.S. Unwin)  
10 January 1979

OBSERVATIONS OF UNIDENTIFIED RADAR RETURNS  
ON 50 cm HAWKINS HILL RADAR, 8.1.79.

In the early morning of Monday 8.1.79, I kept watch with John Cordy at the Wellington Control Centre. The general consensus of others present before midnight was that there was an inversion - witness echoes from mountains such as Ruapehu to confirm this. In extreme inversions the coast near Wanganui is seen, but it was not seen on Monday morning.

Significant modifications to the radar have taken place since last summer. The effect on the display of anomalous echoes is probably significant, but I have not attempted to verify this assumption.

Anomalous returns which John Cordy could not identify were present all the time, especially between about 1 a.m. and 3 a.m., when there may have been a dozen present at a time. They all had the appearance of aircraft echoes when seen on the MTI (Moving target display). I think they were generally absent when viewing "raw video". I suspect that even the "raw video" was pre-processed somewhat.

Early in the morning we attached no significance to movement of the anomalous returns, but on reflection, I think they were moving quickly outwards, because the afterglow was often visible at shorter range. John had pointed this out at some stage.

Most of the anomalous returns were noticed in the area off the Kaikoura-Cape Campbell coast, but others occurred in Cook Strait and over Marlborough Province. They generally appeared suddenly and lasted for a short time, rarely for more than a few minutes.

A persistent group, seen I think only with raw video, occurred about 15 miles from Christchurch. They moved generally northwards over more than  $1\frac{1}{2}$  hours. (The radar is calibrated in nautical miles.)

Between 0450 and 0500 unusual "spotty" echoes covered the coastline at Kaikoura-Clarence R. John Cordy identified these as rain, but there was no rain there at that time.

On the MTI photo at 0219 an echo composed of three spots appears. This was different to all the others seen. It moved northwards and I would identify it as a ship seen on "raw video" photos later, moving at about 11 knots, passing Cape Campbell at about 0340. Another ship was tracked from Brothers westwards for an hour at about 17 knots - this was visible on MTI.

The most interesting example was seen to be moving radially outwards at  $172^{\circ}$  at an erratic 100-150 knots for 10-15 minutes. It was 50-60 N.MILES from Wellington. Although we did not notice when it first became visible, it disappeared quite quickly at about 0445.

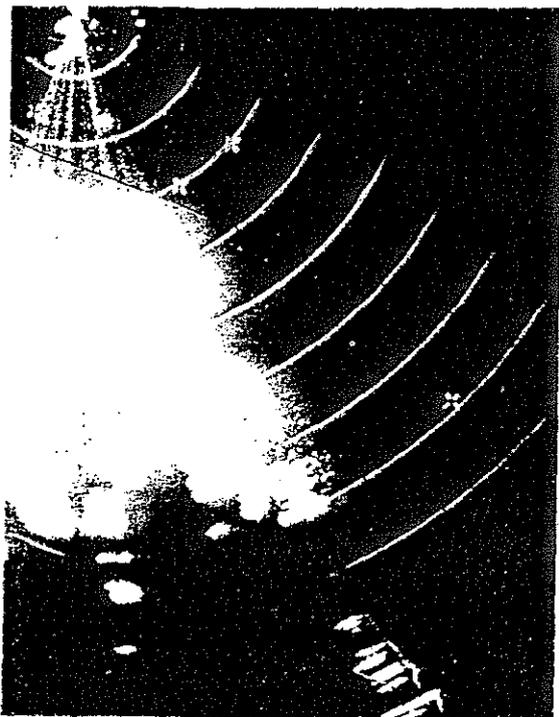
(W. Ireland)  
9 January 1979



0330. RAW VIDEO. 160 MI.

BANKS PENINSULA RETURN  
AT MAX<sup>m</sup> RANGE

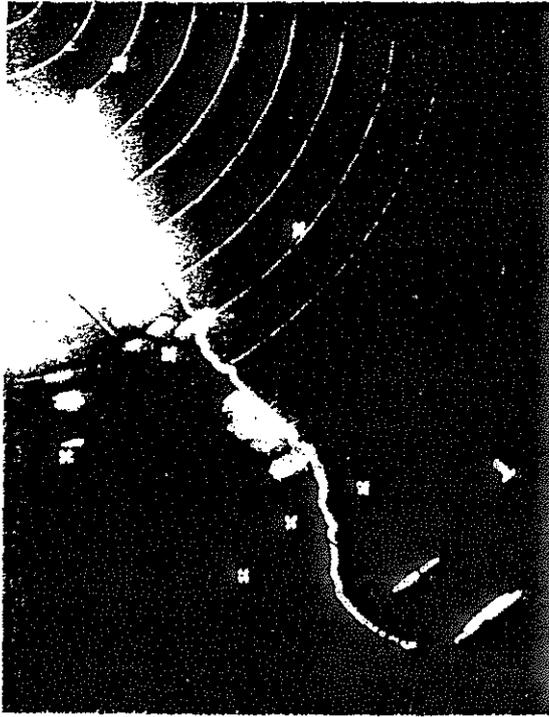
TWO ANOMALOUS ECHOES  
15 MI. NORTH OF BANKS P.



0450. RAW VIDEO 90 MI.

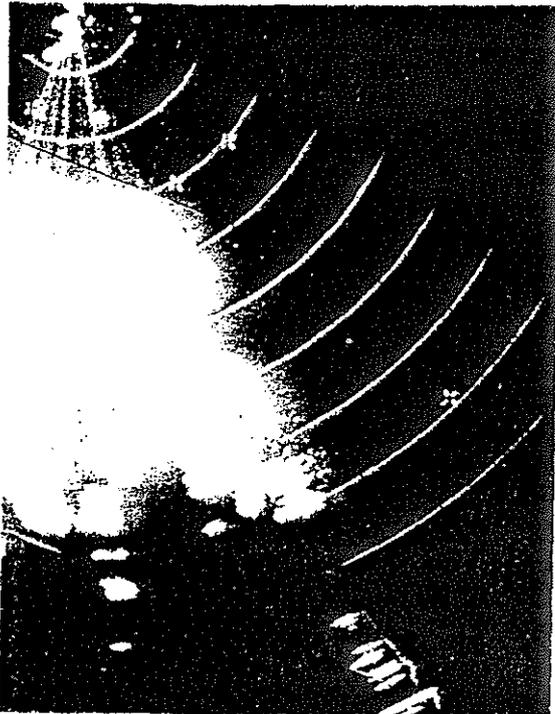
"RAIN" ECHOES OVER KAIKOURA

POSSIBLE SHIP AT 18 MI.



0333. RAW VIDEO. 160 MI.  
BANKS PENINSULA RETURN  
AT MAX<sup>m</sup> RANGE

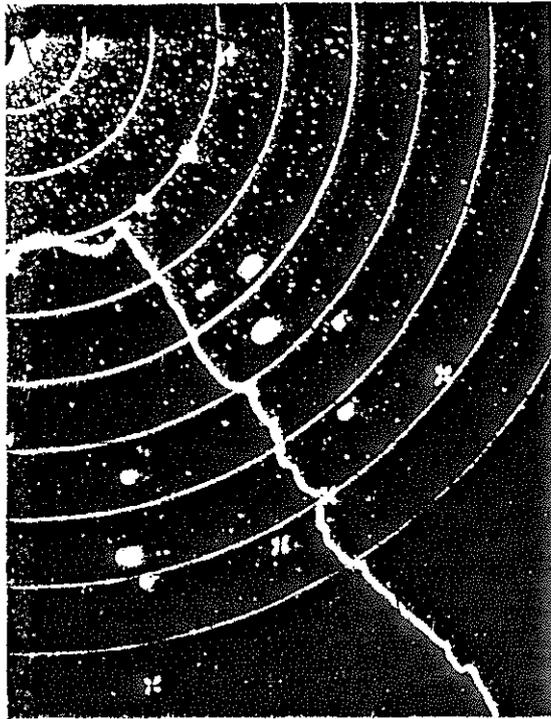
TWO ANOMALOUS ECHOES  
15 MI. NORTH OF BANKS P.



0450. RAW VIDEO 90 MI.

"RAIN" ECHOES OVER KAIKOURA

POSSIBLE SHIP AT 18 MI.

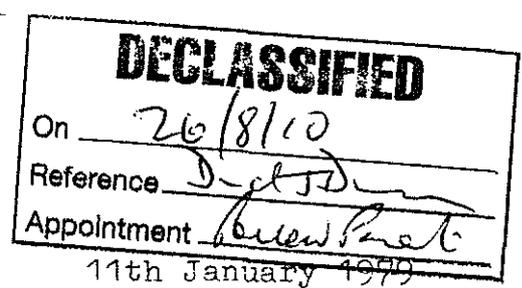


0219. M.T.I. 10 MI CIRCLES  
 TRIPLE ECHO POSSIBLY SHIP  
 AT 46 MI.  
 ALL OTHER ECHOES (8)  
 ANOMALOUS.



0436. M.T.I. 10 MI CIRCLES  
 SHIP OFF SOUNDS 36 MI.  
 ANOMALOUS ECHO AT 172°  
 50 MI, MOVING RADIALLY  
 OUTWARDS 100-150 KT.

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Air 39/3/3

REPORT ON UNIDENTIFIED VISUAL AND  
RADAR SIGHTINGS EAST COAST SOUTH ISLAND  
DECEMBER 1978

Introduction

1. On the nights of 20/21 December 78 and 30/31 December 78 Wellington ATC Radar, and the crews of SAFE Argosy aircraft (both visually and on radar) made many unidentified sightings off the east coast of the South Island. The first sightings gave rise to much publicity by the media and eventual involvement of the RNZAF when it was decided to conduct an Orion surveillance of the area on the night of 2/3 January 79. At that time it was decided to start a Defence investigation and this report is submitted in accordance with DCAS instructions to provide a report on the events surrounding the various sightings.
2. Air Staff was first advised by Civil Aviation Division of Ministry of Transport (CADMOT) of these events mid-morning 21 December 78. Historically, Defence has adopted a 'low profile' in connection with reports of unidentified sightings. Thus CADMOT has not normally reported unusual sightings to Defence. However, because of the number and nature of reports on the night 20/21 December 78 the Director of Civil Aviation specifically instructed his staff to advise Defence. On the basis of the information received Air Staff decided that should any further similar instances occur we would, if possible, carry out an investigation by the most appropriate aircraft available over the Christmas period. CADMOT were advised to contact the Defence Duty Officer in the event of any more sightings. As it transpired the memorandum from CADMOT Head Office to the ATC Centre was not delivered, thus the events of 30/31 December 78 were not reported to Air Staff until the next day.
3. Other Government agencies, notably DSIR and NZ Meteorological Services, are conducting their own investigations and have provided relevant input to this report. The report is confined to the events of 21 and 31 December 78. It does not take into account the film made by TV1 on 3 January 79 which is now being examined by DSIR and will most probably prove to be a film of Venus and Jupiter rising.
4. When interviewing witnesses it was pointed out to them that this was not a judicial enquiry. The credibility of witnesses' statements was taken at face value. However, witnesses were not necessarily interviewed separately because it was considered that, with a fairly emotive issue such as 'UFOs', corroboration was best achieved by interviewing observers of the same events together.

/Events 20/21 ...

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Events 20/21 December 78 (Refer Chart at Annex A)

5. On 20/21 December 78 there were two SAFE Argosy flights from Woodbourne to Christchurch one of which proceeded to Dunedin and terminated, and the other returned to Woodbourne. The first aircraft departed Woodbourne 210110 NZDT. At 0159 when south-bound to Christchurch the aircraft captain was asked by Wellington Radar to check the Clarence River area because Wellington ATC was receiving radar returns from there. The crew observed lights at low level that could possibly have been off the Clarence River mouth but when the aircraft was about 30 miles north the lights appeared to go out or disappear. During this period Christchurch was visible and the sky was clear. Later in the morning (0405) when the aircraft was northbound the crew was again requested to check the area because Wellington Radar was again picking up radar returns in that vicinity. The aircraft crew confirmed that lights were visible to seaward and the crew got the impression of the lights making rectangular patterns at irregular frequency. The lights had a beam appearance rather than a point source appearance and seemed to turn away rather than turn off. One light appeared to illuminate the surface of the water and the aircraft captain assesses that the source of the light could have been at about 1,000 feet. However, it is the reporting officer's opinion that from the aircraft's height (14,000 feet) it would not be possible to judge accurately the height of lights below the aircraft. One possibility is that the aircraft captain was observing lights from cars or trains because the main road and railway run parallel and very close to the coast for some miles in this area. However, the aircraft captain considers that the sightings could have been produced by four or five helicopters and the whole thing was 'quite undramatic'. The likelihood of such extensive aeronautical activity has not been confirmed by any reports received from the Police or local inhabitants. In fact, no reports have been received and the Police do not have any interest in the area.

6. The second aircraft, which departed Woodbourne at 0315, was also asked by Wellington Radar to look at the Clarence River mouth area because Wellington was picking up radar returns there. That aircraft crew did not observe anything in the region either visually or on radar.

7. Subsequent investigations and scientific observation carried out by DSIR proves conclusively (in the reporting officer's opinion) that Wellington SRE Radar does give anomalous radar returns off the east coast off the South Island. This was proved by DSIR observation of the Wellington radar 8/9 January 79 and taking a series of photographs of the radar presentation throughout the night. Concurrently three field parties were stationed at vantage points along the east coast with radio communications to the Radar Control Centre. On several occasions during the night when many large returns were painting on Wellington Radar the observers on the coast could see nothing either in the air or on the sea in the positions passed to them by the Radar Controller.

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Furthermore, from discussions with two or three controllers it is evident that the Wellington SRE has for several months been giving anomalous radar returns in the Clarence area and south of Wellington. It is possible that this could be caused by a modification that was recently made to the radar head at Wellington depressing it one degree. DSIR scientists are following up this possibility and their findings should be available in due course.

8. There is no evidence to suggest that there was any clandestine activity in the vicinity of the Clarence River mouth. It is possible however that surface vessels could have been in the area with or without navigation lights but it is doubtful that such vessels could have given rise to the visual observations made by the aircraft crew. The fact that Wellington Radar 'keyed' both aircraft captains to look for objects in the Clarence area might well have induced observations from the air which might or might not have been related to the Wellington Radar returns.

9. From information supplied by DSIR, the NZ Meteorological Services, and astronomers, it is evident that during this period, and indeed for the last month or so, atmospheric conditions have been conducive to freak propagation of radio and light waves. Thus it is possible that the lights observed by the aircraft captain could have been produced by ships' lights reflected or refracted from afar. Such anomalous propagation (ducting) could also give rise to spurious radar returns. Note: The reporting officer has just received (1155 NZDT) a report from Auckland that ATC has issued a NOTAM that Auckland Radar is giving spurious returns caused by atmospheric conditions.

10. During the period that the Wellington Radar Controller was in dialogue with the aircraft captains about radar returns in the Clarence area the radar was also tracking a steady return on a track of  $140^{\circ}$  (M) which started at Wellington, proceeded to 30 miles and then, with less consistent radar returns, tracked out to 60 miles where it became stationary for 35 minutes. It then roved west and appeared to 'track' the second southbound Arcozy at about 0328. The Wellington Radar Controller alerted the captain that there was a strong radar return about 25 miles to the port of the aircraft. The aircraft crew observed on that bearing a very bright light which they variously describe as a bright orb, pear shaped with a reddish tinge that then turned white. From the aircraft the object appeared to be stationary by visual observation but by the aircraft radar appeared to track the aircraft. The light appeared to be very close - less than ten miles. Although the aircraft radar return and the visual observation of the light were on more or less the same bearing the crew cannot confirm that the range was coincident. It is significant that within a few minutes of the crew's observation, Venus was rising on a bearing that coincided with their visual observation. DSIR optics, physics, and meteorological experts have confirmed that prevailing atmospheric conditions might well have produced most unusual but not unknown phenomena that could have made Venus appear large, bright and orange. There is a plethora of astronomical information that describes this phenomenon. Thus it is highly probable that the aircrew's observation was an unusual view of Venus.

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/11. The radar

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11. The radar returns observed on the aircraft radar might have been caused by a natural return by a ship or perhaps could have been anomalous returns caused by the prevailing atmospheric conditions. During the period 19 - 28 December 78 some 50 Japanese squid boats sailed from Wellington to the area of the Mernoo Bank (120 miles east of Banks Peninsula). These vessels departed Wellington in groups of about 10 and their track to their fishing grounds is almost identical to the radar track plotted by Wellington radar. While there is no conclusive proof that these vessels could have caused the fairly steady trace observed by Wellington it is a fact that during the period of all these observations there was no shortage of shipping in the area. Furthermore, once in position and fishing, the squid fleet would have produced an intense light source which coupled with prevailing meteorological conditions could have been responsible for many and varied reflected or refracted light images. (Each boat puts out about 200kw of light.)

12. A further observation (which has not been reported by the media) was made by the crew of this the same Argosy when the aircraft was some 50 miles north east of Christchurch. The captain observed five consecutive blips on the aircraft radar which over a period of five seconds traced a pattern towards the aircraft and then veered off very sharply to its port. Simultaneously the co-pilot observed a flashing white light (which looked like a strobe light) describing the same sort of path. For the brief period that the returns were received on radar the object must have been travelling at about 10,800mph! This sighting, above all others during the night, caused the crew considerable consternation! It is possible that such a phenomenon could be produced by a meteor which are not unknown at this time of the year. A further possible explanation could be that the effect was caused by a 'double bounce' radar contact produced by ducting. It is note-worthy that an RNZAF Orion crossing Cape Palliser on 9 January 78 at 1552 NZDT observed a radar contact at 15 miles moving fast towards the aircraft. There was no cloud and no surface contacts visible. The radar return crossed the aircraft's track one mile ahead, but there was no visual sighting. The closing speed was calculated at 1,000mph thus the object itself was travelling at some 630 mph. OPHQ staffs have considered the possibilities and assess that the radar return could have been of an object 200 miles north of NZ (perhaps cloud) with freak propagation giving rise to the radar observation made in the aircraft. But for knowing that a Defence enquiry was under way OPHQ would not normally have considered it necessary to pass on this information.

13. A further sighting on the 20/21 December 78 was made by the Orderly Officer and Duty Air Traffic Controller at RNZAF Base Woodbourne. At 2350 the Orderly Officer saw what he considered to be three lights of a Bristol Freighter three to four miles from Woodbourne. However, as no aircraft could be heard and the lights did not appear to get any closer he checked through binoculars and determined that the lights appeared to be going towards Wellington. Of the three lights the middle one appeared as a white beam pointing northward. The lights appeared to move upward

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and around in a rectangular pattern but at random speed. He observed the lights for about 50 minutes. The bearing from Woodbourne was about  $080^{\circ}$  (M), i.e., towards Cape Campbell. At one stage the lights appeared to 'rush forward' but generally over the period seemed to move northward and eventually fade. In comparative terms the observer considered that the lights' pattern looked like somebody 'spotlighting'. The Duty Air Traffic Controller observed the same lights from the control tower balcony. His impression was that the lights comprised one bright orange light and two less intense white lights. The large light appeared to remain stationary while the other two seemed to move north. A shaft of light periodically appeared to 'beam down' from the white lights at about  $40^{\circ}$  in a northerly direction. Using binoculars apparently had no enlarging effect on the lights! This could indicate that the lights were at a great distance from the observer and not in Cook Strait as he imagined. This thesis is supported by the fact that on checking with Wellington Radar the Woodbourne observer was advised that the radar was painting five targets in the Clarence area but no mention was made of any returns in Cook Strait. It is highly improbable that the radar returns and the visual observations were in any way connected.

14. The reporting officer awaits a copy of the taped conversation between the Wellington Radar Controller, the aircraft and the Woodbourne observer and in addition the Woodbourne observer is preparing a sketch map showing bearings, etc, in more detail. When these two pieces of evidence are available they may shed more light on the occurrence!

#### Summary

15. It is the reporting officer's opinion that almost all the sightings made 20/21 December 78 can be explained by natural but unusual phenomena. There were atmospheric conditions that could have produced unusual visual and radar returns. There is no doubt that Wellington SRE was (and still is) giving spurious radar returns in the area under surveillance. With some of the visual sightings of 'beams' of light it is only possible to speculate on possible causes. On-going investigation by DSIR scientists and the reporting officer may help to clarify this in due course. Perhaps the most difficult aspect to explain away is the apparent concern - even apprehension - of the aircrews involved in the sightings. At present they do not seem to be prepared to accept the fact that they might have observed Venus. Thankfully, however, neither do they believe that they saw a visitor from outer space! Perhaps, when more scientific evidence is gathered, their minds will be set at rest.

#### Events 30/31 December 78 (Refer Chart at Annex B)

16. On 30/31 December 78 an Argosy on a routine flight (but carrying the TV crew that made the film shown on Australian TV) departed Wellington at 2346 to proceed Christchurch and then

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return to Woodbourne.

17. At 0013 while climbing to 14,000 feet the aircraft crew observed four to five lights close to the surface near the coast of the Kaikoura Peninsula (possibly in the Clarence River area but the crew were not sure and did not confirm with their radar). On checking with Wellington ATC the crew were advised that Wellington Radar had contacts 13 miles ahead of the aircraft (these would have been off Clarence). The crew observed a pulsing type of white light that looked like a helicopter search light zooming on to the beach somewhere north of the Kaikoura Peninsula. Again, it is difficult to explain the lights, short of them being some anomalous type of reflection or refraction, cars, or trains. However it is most probable that the Wellington Radar returns were spurious.

18. At 0018 when the aircraft was about 10 miles north of the Clarence River Mouth, Wellington Radar advised the crew that there was a strong radar return behind them. They orbited and saw nothing. This was almost certainly a spurious radar return.

19. At 0042 when the aircraft was about 10 miles northeast of Motunau Island, Wellington Radar advised the crew that there was a large radar target behind the aircraft that appeared on the radar screen as a blip larger than the aircraft return and appeared to be tracking the Argosy. The aircraft captain carried out a left orbit but neither he nor the first officer saw anything. The crew did not refer to the aircraft radar and Christchurch radar was not operating for ATC purposes at the time.

20. Just before crossing the coast near Woodend the crew observed a white light on the starboard side of the aircraft and Christchurch Radar advised that there was a target at three-o'clock to the aircraft that 'moved off' when the aircraft was about 1.5 miles from touch down. No reports have been received from inhabitants of the area of any unusual lights or aeronautical activity. Thus, again, the natural explanation is that the light and radar return were spurious, possibly caused by some sort of anomalous propagation.

21. It is interesting to note that while taxiing to dispersal both the aircrew on the Argosy and the ATC officers in the control tower observed lights to the right of Sugar Leaf Hill which seemed to have the same pulsating characteristics as the lights observed earlier during the flight. The bearing of these lights would almost certainly coincide with the bearing of the squid fleet from Christchurch and if the lights could be proved to be refracted or reflected returns from the squid vessels much of the mystery would be solved!

22. At 0216 the aircraft departed Christchurch on the 033 radial. When overhead Woodend both crew members observed a large white light to the northeast. They also observed on the aircraft radar a very large target at 18 miles from the aircraft. The crew cannot be positive that the light and the radar return were coincident but that was the appearance that they gave. Slightly before these observations, the first officer had noticed through thin cloud a light which he describes as having the

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appearance of a squashed orange. Eventually this light became fully visible and measured against the thumb at arms length appeared to be about two inches long, that is, a very large source of light. The crew observed this light for some minutes while cruising at 13,000 feet. Between 35 and 40 miles from Christchurch the aircraft captain, of his own volition, turned towards the light. This necessitated a 90° turn onto a heading of about 125° at about 25° bank. The aircraft speed was 215 knots. The image on the aircraft radar moved to 10 miles from the aircraft but the crew cannot say whether this was due to their velocity or the movement of the radar return. The radar image then stayed in the same relative position to the aircraft for a few minutes (as if it were 'backing up' at the aircraft's speed). At this stage the large light appeared to go above, behind, and below the aircraft as the captain turned left to regain track and avoid further 'confrontation' with the object! This series of events occurred over a time frame of about 20 minutes. Throughout, Christchurch radar was working but reported nothing. Wellington Radar had been observing the aircraft during the period but did not report any unidentified radar contact in that area.

23. The visual observation made by the crew is consistent with an unusual view of Venus. The bearing of the observation coincides with the point at which Venus would have been visible. However, this observation was made at about 0225 and Venus did not rise until about 0328. Nevertheless, DSIR scientists have advised that with super refraction it would be possible to see the planet some time before it's actual rising and if it were seen it would have the appearance that the crew described. The last effect of the light passing above, below and behind the aircraft could be explained by an astronomical phenomenon known as the 'troublesome layer'. In the prevailing conditions with a marked inversion above about 10,000 feet, and fairly strong westerly winds with standing waves on the leeward side of the Alps the inversion layer can take on a marked wave form. Thus at the time that the light performed its convolutions around the aircraft it is possible that the aircraft was passing from one side of the inversion layer to the other. The fact that the light was no longer visible tends to support this thesis and it is most probable that the aircraft's radar return was spurious or of a ship, in view of the lack of confirmation of any other targets in the area by the Wellington Radar.

24. As the aircraft approached Kaikoura two or three radar contacts were noted on the aircraft radar at about ten o'clock position. These would be consistent with the radar returns Wellington had noted in the Clarence area for most of the night - and were almost certainly spurious.

25. Approaching Cape Campbell the aircraft captain observed what he thought was a fishing fleet off Cape Palliser. These might well have been part of the squid fleet enroute south.

26. As the aircraft turned towards Blenheim the first officer observed what appeared to be orange lights in the Nelson Bay area which appeared to move across the sounds towards Picton. No explanation can be offered for this observation but it has not

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been confirmed by any sightings made from the ground. The aircraft landed at Blenheim at 0315.

Conclusions

27. The foregoing report has been compiled after interviews with most of the principle witnesses involved with the sightings 20/21 and 30/31 December 1978. The SAFE pilots were most helpful to the reporting officer in the very frank manner in which they related their experiences and the time they spent in interview. It is considered that the reporting officer should, as soon as possible, informally debrief the SAFE aircrew involved on the general tenor of the findings to date.

28. It is evident that because of the interest over these sightings reports will continue to come in from various sources and on-going investigations by DSIR and meteorological officers will probably serve to correlate much of the information. Nevertheless, it is considered that Defence should issue a PR statement fairly soon in order to tone down much of the wild speculation that has existed over recent weeks.

29. In summary the reporting officer has made the following findings:

- a. During the period of the observations, and indeed now, atmospheric conditions over NZ are conducive to freak propagation of radio and light waves.
- b. Venus was rising in the eastern sky and at this time of the year is unusually bright in appearance.
- c. Wellington Radar has been giving spurious indications off the east coast of the South Island for some time but over recent weeks anomalous returns seem to have been more prevalent.
- d. During the period an unusually large number of vessels (the squid fleet) sailed from Wellington, often at night, to position off Banks Peninsula. Not only would these vessels provide a good source for radar returns but the lights that they use when fishing could explain some of the visual sightings of unusual lights.
- e. The reporting officer speculates that the observation of lights in the Clarence area might have been caused by trains or cars.
- f. The reporting officer is of the opinion that the large number of unusual occurrences on

/the nights

~~RESTRICTED~~

-9-

the nights in question made some aircrew and air traffic controllers particularly responsive to the various sightings.

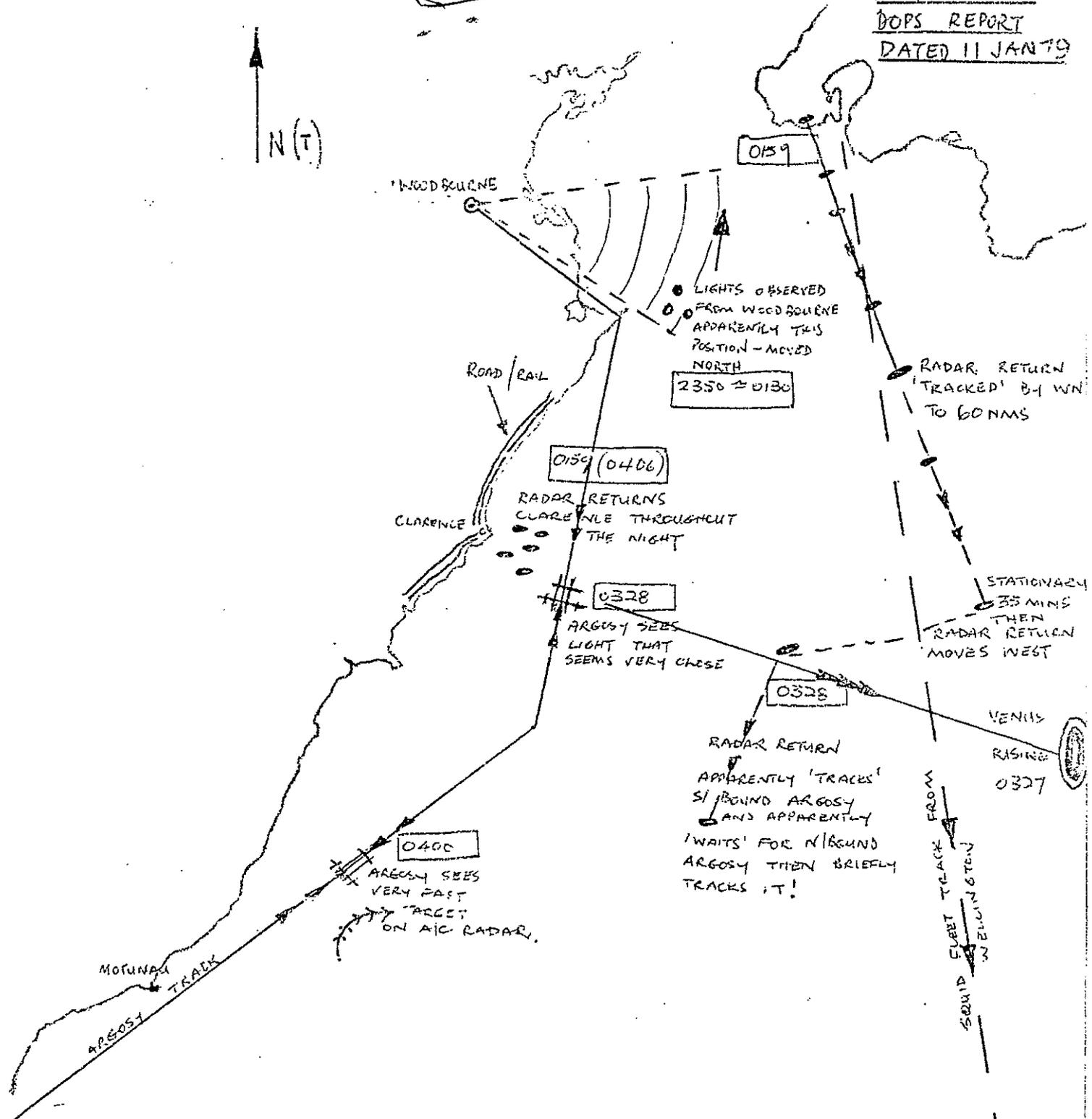
- g. There is no connection between the many sightings in the Clarence area and the larger lights seen to the east (and which were the subject of the much publicised TV films).
- h. Almost all the sightings can be explained by natural but unusual phenomena. The few for which the evidence to date is inconclusive may well be explained in due course when current investigations are completed.

  
(J.B. CLEMENTS)  
Wing Commander  
Director of Operations

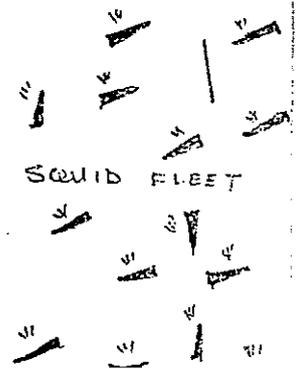
~~RESTRICTED~~

~~RESTRICTED~~

ANNEX A TO  
DOPS REPORT  
DATED 11 JAN 79



OBSERVATIONS  
20/21 DEC 78



~~RESTRICTED~~

~~RESTRICTED~~

ANNEX 5 TO  
DOPS REPORT  
DATED 11 JAN 79

LIGHTS  
OBSERVED  
NELSON BAY  
REGION



WOODBURN  
0315  
ARGOSY  
LANDS.

0346  
ARGOSY LEAVES  
WN

ROAD/RAIL

CLARENCE

0013-18

LIGHTS/RADAR  
RETURNS.  
A/C INVESTIGATES  
"ARGOSY" RADAR RETURN  
BEHIND THE A/C - SEES  
NOTHING

AGAIN, N/BOUND A/C INVESTIGATES  
RADAR CONTACTS AT 10 O'CLOCK.  
(CLARENCE AREA)

0042

A/C ADVISED BY WN RADAR  
TRACE TARGET BEHIND.  
A/C ORBITS - SEES NOTHING.

0035

A/C TURNS TOWARDS LIGHT AND  
RADAR RETURN. LIGHT EVENTUALLY  
Goes ABOVE, BELOW, BEHIND  
AND DISAPPEARS.

SOUTH BOUND  
A/C SEES LIGHT TO  
RIGHT. CH RADAR ADVISE  
A TARGET THAT POSITION

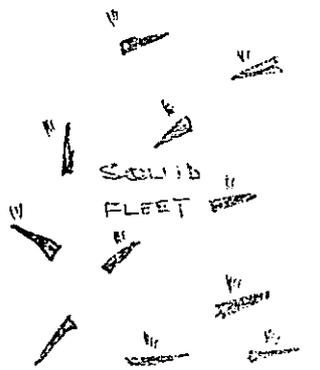
0025

WHEN N/BOUND  
A/C SEES ORANGE  
LIGHT AT 2-O'CLOCK  
POSITION.

BEARING ON WHICH VENUS  
WOULD RISE AT 0328

OBSERVATIONS  
30/31 DEC 78

LIGHTS VISIBLE FROM CH AIRPORT  
TO THE RIGHT OF SUSAN LOMA.  
(SQUID FLEET LIGHTS REFLECTED?)



~~RESTRICTED~~

SRE Wexford Road/Hawkins Hill Changes.

- ✓ SRE Notamed RNO 091309 PBF = 400 ± 14% 9% & 17%
- SA 120 New aerial reflector, slotted feed and 3/4" co-ax run from rotating joint. Re-conditioned pedestal and rotating joint - data gearbox - no change. Digital turning encoder fitted.
- Radar Rx. Two S2050 solid state receivers installed, old S8100 receivers still in position but switched off and by-passed - can be brought into service if required.
- Processors Two S7100 solid state, digital processors installed. Both SJ1000's removed from NH as well as associated delay cells.
- L/R SRE Max range = 160nm. Range 2/SD 1010 display T.B. amplifiers set to place 80nm range ring under the cursor knots.  
~~Video map - dots set at 15nm, 'T' marks at 145nm.  
Terrain Clearance map - not available - test slide fitted.~~
- Remote switching - No change except DSP S7100/1 and 2 replaces SJ 1000/1 and 2.
- Aerial To be run at half speed. Tilt = ~~14~~<sup>+4</sup> deg.
- MTI Cancelled radar clutter is excessive but levels will be adjusted over the next few weeks.
- Radar Uncancelled radar appears different to previous radar due to use of the S2050 radar receiver log/FLD (pulse length discriminator) video output at NH.
- Faults Until staff are more familiar with the new equipment Ways 2 will look after faults on the S2050 receivers and S7100 data processors - all other faults to be cleared as before the upgrading.

*[Handwritten signature]*

TTO SRE,  
Wellington Airport.

- ① PRF stagger - fixed sequence NOT random  
 $0 = 0 \text{ when } \rightarrow 2500 \text{ S.}$   
 $400 + 14 = C$   
 $9 = B$   
 $17 = A$ 
DC DB DA - then repeats.
- ② Clearance returns were probably coincident.
- ③ Enhanced video levels. All above noise appear as '1' level - same size

PERSONNEL INTERVIEWED

<u>Name</u>	<u>Designation</u>
Capt V. Powell	Captain SAFE Argosy 22 Dec 78 (second acft).
First Off I. Pirie	First Officer SAFE Argosy 21 Dec 78.
Capt J. Randle	Captain SAFE Argosy 22 Dec 78 (first aircraft).
W/O Uffindell	RNZAF Duty Officer Woodbourne 22 Dec 78.
Mr W. Frame	Flight Service Woodbourne 22 Dec 78.
Mr M. Collins	Director Physics Laboratory DSIR.
Mr N. Rumsey	Head of Optics Division DSIR.
Dr D. Phillips	NZ Meteorological Service.
Mr R. Davison	Superintending Engineer Radar CADMOT.
Mr J. Cordy	ATC Radar Controller 22 Dec 78.
Mr A. Herd	ATC Radar Controller 22 Dec 78.
Capt W. Startup	Captain SAFE Argosy 31 Dec 78.
First Off R. Guard	First Officer SAFE Argosy 31 Dec 78.
Mr G. Causer	ATC Radar Controller 31 Dec 78.
Sqn Ldr R. Carran	Orion Captain Jan 79. Fisheries Control Centre, MAF.
Dr Cherry	Lincoln College (Propagation Exp)
Dr Wall	Positron " " (1948)

AIDE MEMOIRE

Possibilities:

Ducting  
Hotspots  
Venus  
Jupiter  
Stars  
Planets  
Clandestine Operations  
Hoax  
'Real UFO'  
Ships  
Birds  
Wave Cap Radar Returns  
Cyclical Patterns?  
Light Waves  
Radio Waves  
Squid Fleet Movement over period?  
Dr Wall Porirua - freak propagation experiment Canterbury 1948.  
Dr Neil Cherry Lincoln College - current study Canterbury NW conditions.  
Clarence TV film - possible planet or star rising?  
DSIR Clarence/Kaikoura theodolite observation star rising. Apparent movement caused by heat from Japanese vessel on horizon in line of sight.  
Coincidence of observations only by SAFE Argosy crews?  
Freak return generated by aircraft itself (mirror, mirage, radar return etc)?  
Squid fleet position 21 Dec 78 onwards.  
Squid fleet lights turn off time.  
Meteorite, asteroid shoals - refer astronomy info.  
Jupiter/Venus rising/setting times.  
ANZ timetables (strobe lights).  
Observations all over water, distances vague except for radar plots.  
Radar plots possibly not coincident with visual sightings.  
Lighthouses, aerodrome, navigation etc beacons.  
Last month extreme clarity of atmosphere.  
Inversion layer (refer T<sub>g</sub> gram).  
Examine films (Sqn Ldr Clarke to arrange).  
DDI interest?  
Customs interest?  
Police interest?  
Fisheries interest?

## SURVEILLANCE RADAR EQUIPMENT

## 1. MARCONI RADAR TYPES S264 AND S264A

## TECHNICAL DATA

Wave Length	50 cms.
Frequency	585 - 610 mc/s
Peak Power Output	<del>S264:</del> 50-60KW S264A: 500KW (nominal) ✓
Beam width	2½°
Pulse Length	2 or 4 <u>microsecs</u> ✓
Pulse Recurrence Frequency	S264: 525 - 775 p.p.s. S264A: 500 - 800 pps (2ms pulse) 260 - 385 pps (4ms pulse)
Rate of Scan	5 or 10 r.p.m.
Range Selection	In ratio of 1 : 2 : 3 : 4 according to range available
Antenna System	Parabolic reflector with offset linear wave guide feed.
Wind Limitations	Up to 60 knots at 10 r.p.m. Up to 90 knots at 5 r.p.m.
Presentation	S264: Moving coil 12 in. PPI S264A: Fixed coil 12 in. PPI
Special Facilities	MTI, STC, Swept Gain, Video Mapping, Off centering.

## 2. GENERAL

2.1 The main features of the S264 are its almost complete freedom from weather clutter, the stable and efficient MTI system and the high overall radar performance obtained with comparatively low power. The S264 can be converted to S264A equipment at any time.

2.2 The S264A possesses all the main advantages of the S264 plus the exceptional range and altitude cover. These features make this equipment most suitable for its dual role as both area and approach S.R.E.

## 3. SPECIAL FACILITIES

3.1 MTI

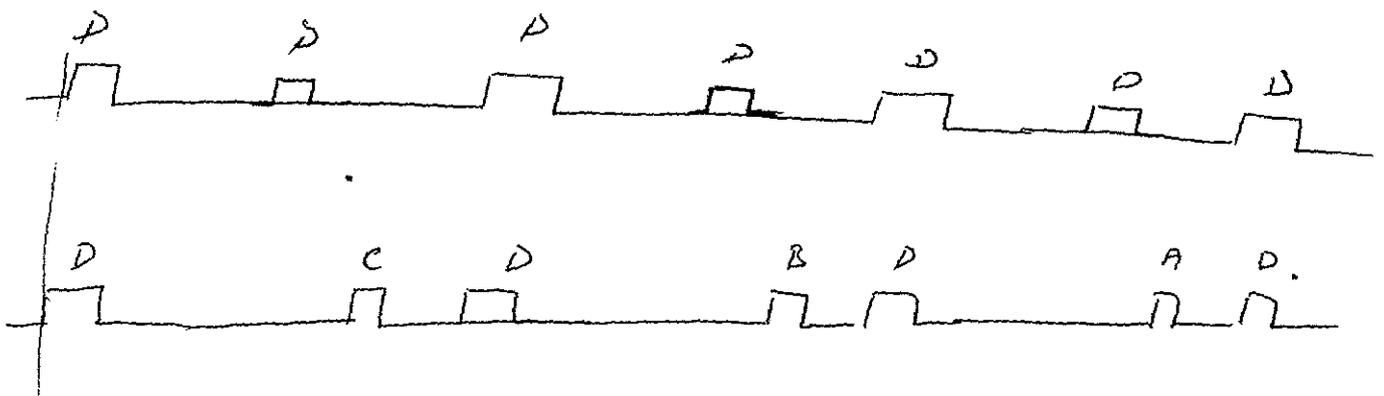
3.1.1 This is a fully coherent system with the transmitter, reference oscillator and trigger pulse generator all crystal controlled. No automatic frequency control is required as the receiver is locked to

$$D = 2500 \mu s.$$

$$A = 17\% \quad (423.5 \mu s)$$

$$B = 9\% \quad (224.84 \mu s)$$

$$C = 14\% \quad (349.58 \mu s)$$



20/21 Dec 78 SIGHTINGS

WE	WHO	WHAT
2- 1325	W/O HFRANDEN WOOD BOWANE	Three lights C Campbell / White Bluffs big from WB. Move NE over period
	MR FRAME ATC W/BOUENE	Same as w/o u. Three lights. One bright / orange stationary. Two small white moving N.
19 106.	CAPT RANDE SAFE #1 ATC	lights in Clarence River area - reported by WN SRE as radar returns.

## Paper Structure

1. Background  
OCAS instructions
2. Aim
3. Veracity of statements / credibility of witnesses
4. Two SAP flights 21 Dec  
0110 - NB - CH - AK - WB (Capt Rowles)  
0310 AK - WB - CH - JM (Capt Powell)
6. Squid Fleet sailed WN.  
19, 21, 26, 28 Dec  
(10) (10) (17) (203)  
now 75 boats in port  
on Mexico Bank.  $077^\circ$  (M) from CH city  
110 nms.
7. Inversion #2 night 30/31. There were  
a number of layers (0001). S/level, 15,000'  
but above 10,000 extremely dry layer  
but below moist. According to pilots  
but 30/40 Kts westerly 10,000'. Spcl  
W/V L/V available. CH & WN reports.  
↓  
21/21 night 30 Kts westerly over both  
WN & CH. ~~FA~~ fairly moist  
small inversion etc. Unusually moist  
to 20, 30,000'.  
~~FA~~ Satellite 1600 30. Showed  
strong Föhn effect, standing waves //  
to coast about nine streams of cloud.
8. If the object radar 'tracked' SE from WN 22/22 Dec  
was one & same object etc saw — should have been visual  
reports from WN.

John Bording 21/22

Arny Herd

Will call Tue/Wed

Geoff Carter 30/Dec

Night of 5/Jan 78

CR DSIR nest out.

DSIR nest on horizon

early morning - but

frustrate — prepared

to in finally ... a star.

Early morning of 0.80 or so

Ar one and fixed pair

or other and moved

about a bit

" " " " " "

higher of a/c clearance.

also seen

647 506

Mr. Collins

DSIR

MINUTE SHEET

Department: PRO(AIR)

Subject:

File No. \_\_\_\_\_

UFO SIGHTING

Date: 10 Jan 79

To  
 > Aps  
 fbc  
 10/1

1. A. Wellington telephoned on the 5 Jan 79 to make a general report on UFO activities in the Kaitioura area over the past year.

2. She reports seeing a number of lights in the area, and on two occasions a ball-shaped object landed on the hill by her home. It stayed there for three hours, leaving a circular impression in the hillside. Later (dates not confirmed) a large metal saucer with the appearance of opaque glass hovered over her home for some time before it was disturbed by an aerocub aircraft flying round the headland.

3. This is the basis of a ten minute conversation I had with \_\_\_\_\_

K. Rounthwaite (Sgt)  
Asst PRO AIR.

PERSONAL FOR OURS  
OBSERVATIONS OF UNIDENTIFIED RADAR RETURNS  
ON 50 cm HAWKINS HILL RADAR, 8.1.79.

(DOPS (+))

In the early morning of Monday 8.1.79, I kept watch with John Cardy at the Wellington Control Centre. The general consensus of others present before midnight was that there was an inversion - witness echoes from mountains such as Ruapehu to confirm this. In extreme inversions the coast near Wanganui is seen, but it was not seen on Monday morning.

Significant modifications to the radar have taken place since last summer. The effect on the display of anomalous echoes is probably significant, but I have not attempted to verify this assumption.

Anomalous returns which John Cardy could not identify were present all the time, especially between about 1 a.m. and 3 a.m., when there may have been a dozen present at a time. They all had the appearance of aircraft echoes when seen on the MTI (moving target display). I think they were generally absent when viewing "raw video". I suspect that even the "raw video" was pre-processed somewhat.

Early in the morning we attached no significance to movement of the anomalous returns, but on reflection, I think they were moving quickly outwards, because the afterglow was often visible at shorter range. John had pointed this out at some stage.

Most of the anomalous returns were noticed in the area off the Kaikoura-Cape Campbell coast, but others occurred in Cook Strait and over Marlborough Province. They generally appeared suddenly and lasted for a short time, rarely for more than a few minutes.

A persistent group, seen I think only with raw video, occurred about 15 miles from Christchurch. They moved generally northwards over more than 1½ hours.

Between 0450 and 0500 unusual "spotty" echoes covered the coastline at Kaikoura-Clarence R. John Cardy identified these as rain, but there was no rain there at that time.

On the MTI photo at 0219 an echo composed of three spots appears. This was different to all the others seen. It moved northwards and I would identify it as a ship seen on "raw video" photos later, moving at about 11 knots, passing Cape Campbell at about 0340. Another ship was tracked from the Brothers westwards for an hour at about 17 knots - this was visible on MTI.

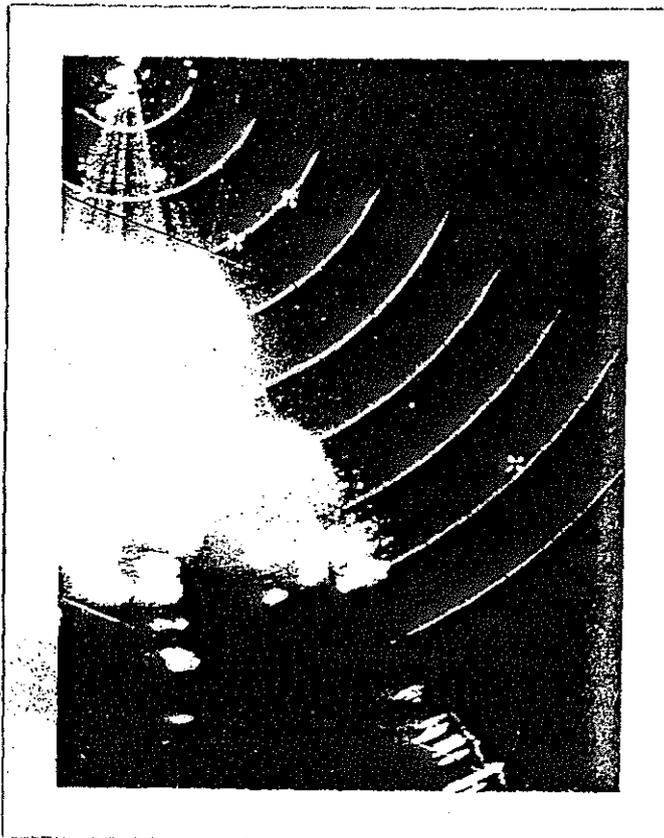
The most interesting example was seen to be moving radially outwards at 172° at an erratic 100-150 knots for 10-15 minutes. It was 50-60 N.MILES from Wellington. Although we did not notice when it first became visible, it disappeared quite quickly at about 0445.

W. Ireland  
9.1.79.



0338, RAW VIDEO, 160 MI.  
BANKS PENINSULA RETURN  
AT MAX<sup>m</sup> RANGE

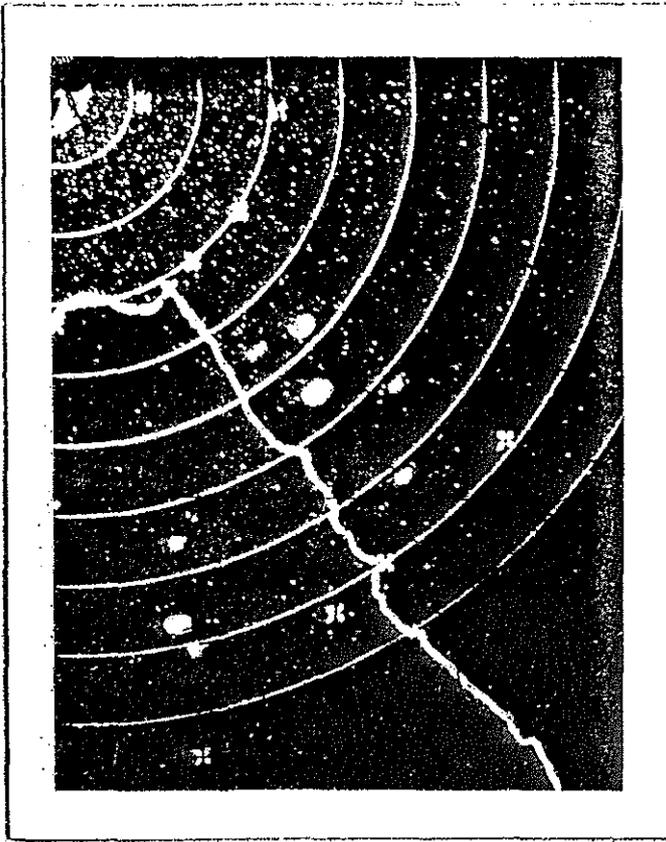
TWO ANOMALOUS ECHOES  
15 MI. NORTH OF BANKS P.



0450, RAW VIDEO 90 MI.

"RAIN" ECHOES OVER KAIKOURA

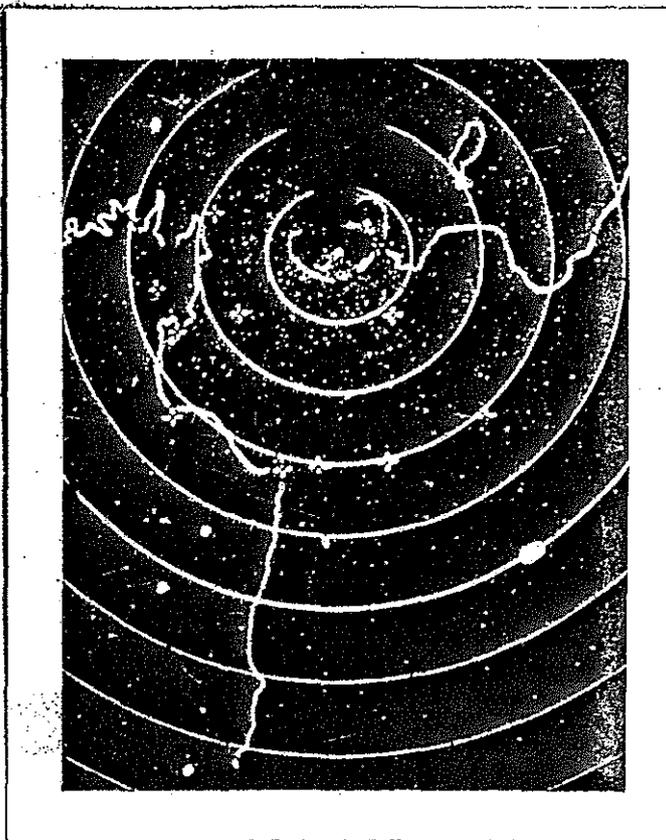
POSSIBLE SHIP AT 18 MI.



0219. M.T.I. 10 MI CIRCLES

TRIPLE ECHO POSSIBLY SHIP  
AT 46 MI.

ALL OTHER ECHOES (8)  
ANOMALOUS.



0436. M.T.I. 10 MI CIRCLE

SHIP OFF SOUNDS 36 MI.

ANOMALOUS ECHO AT 172°(T)  
50 MI, MOVING RADIALLY  
OUTWARDS 100-150 KT.

MINUTE

Defence Duty Officer

UFO SIGHTINGS

1. Any reports from Wellington Air Traffic Control Authorities of unidentified radar contacts are to be reported to D Ops (Wg Cdr Clements) home telephone number 399451 as soon as possible. As much detail as possible should be obtained from ATC including any visual or radar contacts made by aircraft at or about the same time.
2. Any reports from civilians should be recorded with details of time, place, height, description etc and passed to D Ops during normal working hours.
3. Thank you.

5 Jan 79

  
(J.B. CLEMENTS)  
Wg Cdr  
D Ops

# MESSAGE FORM

FOR COMM CEN/SIGNALS USE					SECURITY CLASSIFICATION <i>SECRET</i>						
LINE 1											
LINE 2											
LINE 3 DE											
LINE 4											
PRECEDENCE - ACTION <del>ROUTINE</del> <b>PRIORITY</b>		PRECEDENCE - INFO ROUTINE		DATE - TIME GROUP 030345 Z JAN 79		FOR HQ NZ DEFENCE FORCE MESSAGE INSTRUCTIONS		Date: 26/8/10			
ROUTING INDICATORS		FROM NZAF AIR				DIG/ORIG No. <b>KSY 729</b>					
		TO <i>OPREP 5/2/79</i> <i>Write only one addressee per line</i>									
		<i>On 26/8/10 SUBJECT RAAF AND USMC JETLINE</i>									
		<i>CLASSIFIED BY PD A11 KSY 710 220452</i>									
		<i>REF TO THE INVESTIGATION ACTION FLIGHT PD</i>									
		<i>IS TO BE SCHEDULED PD</i>									
		<i>HOWEVER THE INVESTIGATION IS IN FUTURE</i>									
		<i>CONDUCTED AND INCIDENT RAAF AND USMC</i>									
		<i>SIGNATURE AND OTHER FEATURES PRIOR TO INVESTIGATION</i>									
		<i>ASAP TO IDENTIFY EAR AIRCRAFT INVOLVED UNDER</i>									
		<i>TAKE OVER AND DETERMINE THAT WOULD BE TWO</i>									
		<i>HOURS OR BETTER AS AUTHORITY TO LAUNCH</i>									
		<i>TO BE EVEN 21 30AS PD DESIGNATED RE-CLASS</i>									
		<i>NOT RPT NOT DENIED 174 OFFICER OF DASH</i>									
		<i>AS PREVIOUSLY ARRANGED PD THE SUBJECT IS</i>									
		<i>CONDUCTIVE INVESTIGATION INTO CIRCUMSTANCES</i>									
		<i>PREVIOUSLY 21 AND 30 DEC 78 PD WILL ADVISE</i>									
		<i>MEM OF THE FINDINGS IN THE COURSE PD</i>									
		<i>ALL PD AIR TEND TO BE DIRECTED TO DELIVER 180</i>									
BRING UP		PAGE No.		DRAFTER'S NAME AND TITLE		PHONE No.		REF. FILE No.			
ON .....				<i>OPERATIONS OPS</i>		<i>2754</i>		<i>Am 20/2/05</i>			
TO .....		No. of PAGES		RELEASER'S NAME AND TITLE		SIGNATURE					
INITIALS .....						<i>[Signature]</i>					
FILE											
DATE .....											
INITIALS .....											
REFERS TO MESSAGE											
CLASSIFIED											
<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO											
FOR OPR'S USE	R	DATE	TIME	SYSTEM	OPERATOR	D	DATE	TIME	SYSTEM	OPERATOR	SECURITY CLASSIFICATION
											<i>SECRET</i>

*ATC radar switched on  
on strand leg but not used*

SUMMARY OF INTERVIEW  
WITH CAPTAIN W. STARTUP

*with First Officer Guard were the crew*

1. Captain Startup of a SAFE Argosy that took off Wellington 30 Dec 78 at 2346 hours to proceed via Cape Campbell, abeam Kaikoura thence Motunau Island to Christchurch. The aircraft radar was not used on the South-bound leg to Christchurch.
2. At 310013, while climbing to 14,000 feet the aircraft crew observed four to five lights close to the surface near the coast and with the lights of Kaikoura in the background. The crew asked Wellington ATC Radar controller whether there were any radar returns in that area. Wellington Radar Controller replied that they did have radar contacts 13 nautical miles ahead of the aircraft. The crew saw "a pulsing" type of white light that looked like helicopter search light zooming onto the beach north side of Kaikoura peninsula. The crew could not relate these lights to the Wellington radar returns. (My feeling is that they were the same four or five radar contacts that Wellington Radar was plotting in Clarence River Mouth area).
3. 310018 when the aircraft was about ten miles northeast of the Clarence River Mouth Wellington Radar advised crew that there was a radar return behind them. They orbited and saw nothing.
4. 310042 when the aircraft was about ten miles northeast of Motunau Island Wellington Radar advised that they had a radar target one mile from the aircraft which appeared as a larger radar return than the aircraft and appeared to be tracking the aircraft. Captain Startup carried out a left orbit but neither he nor First Officer Guard saw anything. Christchurch radar was not operating for ATC purposes at this time.
5. Just before crossing the coast near Woodend the crew observed what appeared to be a white light on the starboard side of the aircraft and radar advised (which radar?) that there was a target at three o'clock to the aircraft that "moved off" when the Argosy was on short finals, about 1.5 miles from touchdown.
6. When taxiing to dispersal area the crew and the controllers in the tower observed lights to the right of Sugar Loaf Hill which had the same pulsating characteristics as the lights seen earlier in the flight? (*speculative*)
7. The aircraft departed Christchurch 310216 and climbed out on the 033 degrees radial. Both crew members observed a big white light to the northeast. The aircraft was then seven miles north-east of Christchurch with the aircraft radar on "mapping mode". With the aircraft radar on the fifty mile range the return appeared as a small blip at two o'clock. On the twenty mile scale the image appeared at 18 miles and was  $\frac{3}{8}$ " in length. Thus the radar return was about 25 miles from Christchurch Airport to the north-east. (Some doubt as to whether the light that was observed and the radar contact were one and the same, bearing in mind there would be no background upon which the crew could visually assess the distance of the light.) Slightly before the first officer had observed through the cloud a light which he describes as looking like a "squashed orange". Eventually this light became visible and

measured against the thumb at arms length appeared to be about two inches long, ie, a very large light if it was a long way from the aircraft. The crew observed this light for some time and when at 13,000 feet and between 35 and 40 miles from Christchurch the aircraft captain of his own volition turned towards the light. This necessitated a 90 degree turn onto a heading of about 125 degrees magnetic at about 25 degrees bank. The aircraft speed was 215 knots. The image on the aircraft radar moved to ten nautical miles from the aircraft (the crew cannot say whether this was due to their velocity or the movement of the radar return). The radar image then stayed in the same relative position to the aircraft for a few minutes (as if it were backing at the aircraft speed) and then the light which had been previously observed appeared to go above, behind and below the aircraft as it turned left to regain track and avoid further "confrontation" with the object! This episode concluded when the aircraft was about 53 miles from Christchurch so encompassed a time frame of about 20 minutes.

8. Throughout, Christchurch radar was working but reported nothing. Wellington radar had been observing the aircraft at 153 miles from Wellington when it was at 13,000 feet but apparently did not report any unidentified radar contacts to the aircraft and the aircraft captain decided that he would "keep this particular episode to himself". However it was during this period that the TV film was made so it is possible that distraction in the aircraft precluded ~~much~~ much dialogue with ATC. (Check this with Captain Startup and Wellington ATC).

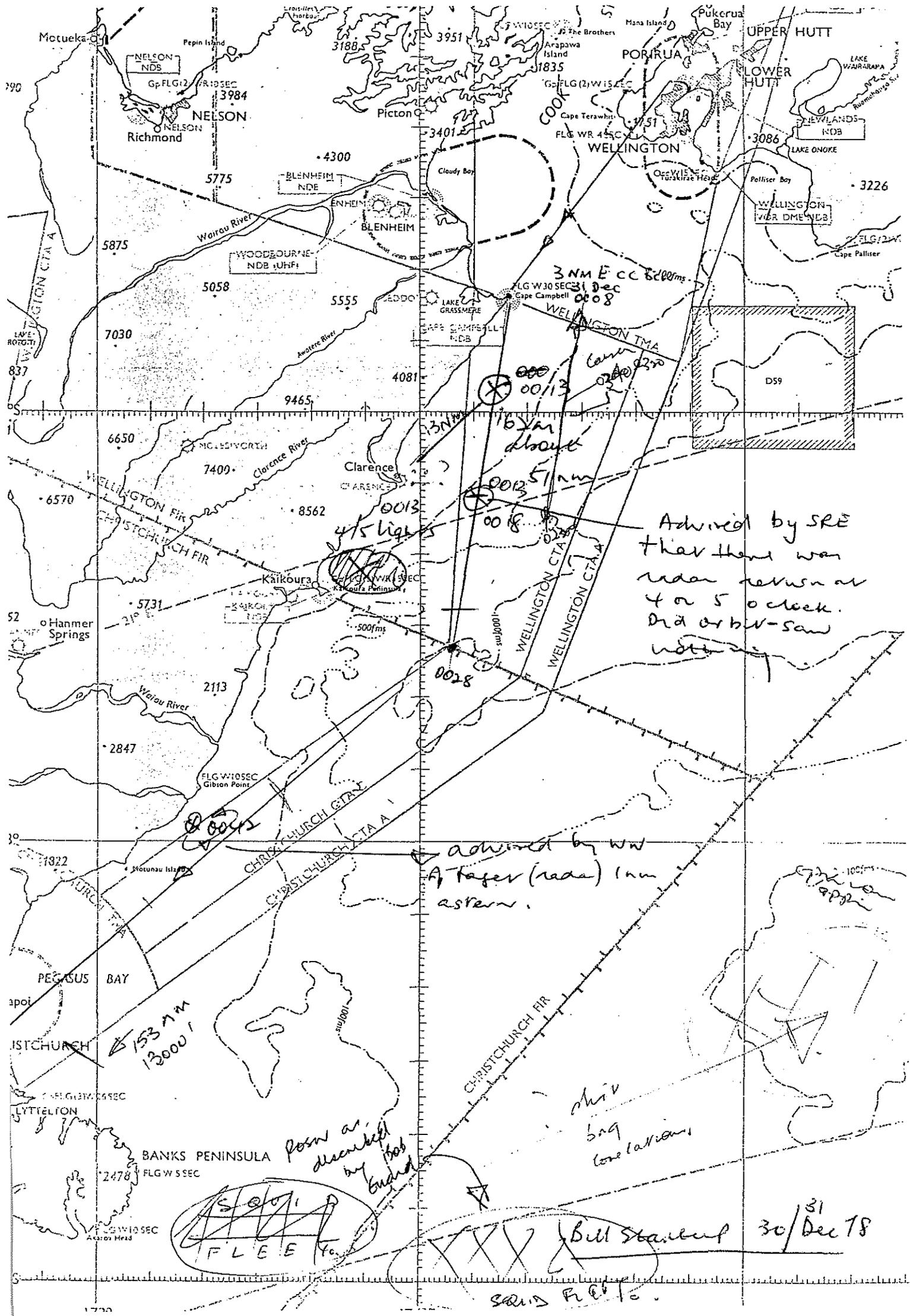
9. As the aircraft approached Kaikoura east two or three radar returns were noted on the aircraft radar at about the ten o'clock position. (These would be consistent with the radar returns Wellington had noted in the Clarence area for most of the period).

10. The aircraft captain observed what he thought was a fishing fleet off Palliser (note: 40 or so Japanese fishing boats sailed from Wellington on the night of 30/31 December to take up their position off Banks Peninsula. And six squid boats have been in position off Banks Peninsula since 21 Dec. (Check with FCC for precise movements of squid fleet.)

11. As the aircraft turned towards Blenheim the First Officer observed what appeared to be orange lights in the Nelson Bay area which ~~seemed~~ seemed to move across the sounds towards Picton.

12. The aircraft landed at Blenheim at 0315.

13. *Weather throughout was clear, little cloud and light variable winds (at altitude, check surface)*



Advised by SRE  
 that there was  
 radar return at  
 4 or 5 o'clock.  
 Did not see - saw  
 nothing

Advised by WW  
 A target (radar) 1nm  
 astern.

this  
 bag  
 contains

Bill Starbuck 30/Dec 78

FLY FLEE

posn as  
 described  
 by [unclear]

SOUND FLEE

1537M  
 13000'

BANKS PENINSULA  
 FLG W 5 SEC

3 NM E CC 6000ms  
 FLG W 30 SEC 31 Dec  
 Cape Campbell

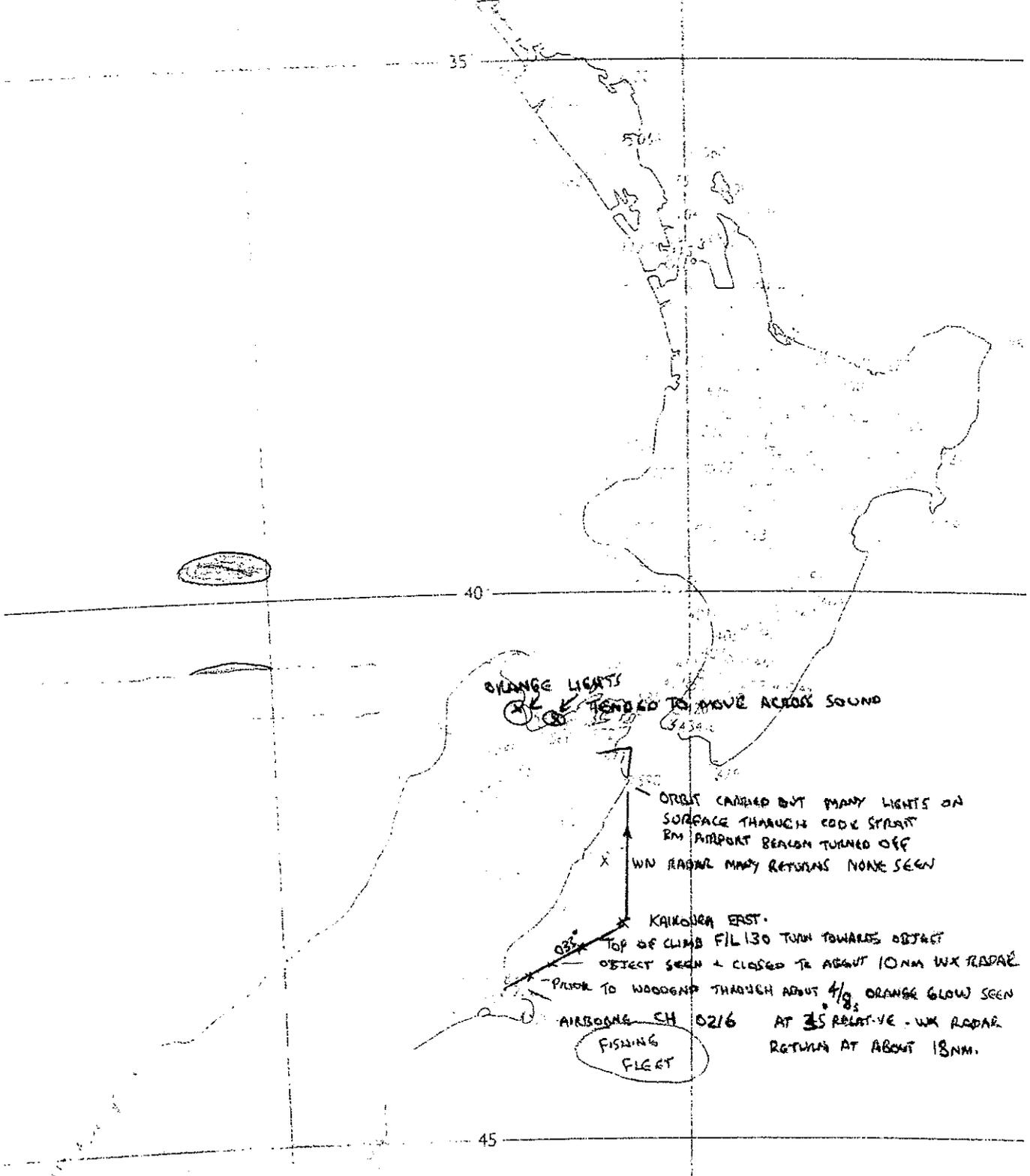
45 lights

0013

0013

0028

30/31  
 Dec 78



ORANGE LIGHTS

X

TENDED TO MOVE ACROSS SOUND

ORBIT CARRIED OUT MANY LIGHTS ON SURFACE THROUGH COCK STRAIT RM AIRPORT BEACON TURNED OFF WX RADAR MANY RETURNS NONE SEEN

X

KAIKOURA EAST

TOP OF CLIMB FIL 130 TURN TOWARDS OBJECT OBJECT SEEN + CLOSED TO ABOUT 10NM WX RADAR PRIOR TO WOODEND THROUGH ABOUT 4/8 ORANGE GLOW SEEN

AIRBORNE CH 0216

AT 35 RELATIVE - WX RADAR RETURNS AT ABOUT 18NM.

FISHING FLEET

Capt. Bill Stewart  
Comd. Bob Grand

G.M.T. 30/31 Dec 78

CLEARED TO CH VIA CC - KIE AT FL 140

35

40

A/BORNE WN ~~2246~~  
2246

C.C. AT 0008 APPROX 10,000 FT C.C.  
0013

X LIGHTS SIGHTED OVER KI - RADAR CONFIRMATION FROM WN

X WN RADAR TARGETS NEAR AW 650 OCCASIONAL GLIMPSE OF LIGHTS ONLY

KAIKOURA EAST.

ORBIT CABLED OUT NEGAM PORT ROBINSON (530METS)  
CH AIRPAC BEACON TURNED OFF  
NEAR WOODHEAD LIGHT ON STEE SIDE FOLLOWED US TO  
APPROX 1.5 AM FINAL CH.

FISHING  
FLOAT

45

Capt. Bill Startup.  
CPLT. Bob Guard.

G.M.T. 30/31 Dec 78

Controller Geoff Causser  
Captain Bill Skankup

Detailed tape of events night 30/31

0013 et seq. <sup>0030</sup> men discussion ATC / ATC  
re echoes in channel area. Started by ATC asking  
~~0017~~ radar to check for lights they had visually "over  
Kri" <sup>of</sup>. 10 or so NE of MOTO. Target at 3-0-clock.  
sub!

ch ch radars not released by controller  
had a look - saw nothing on radar.  
of

### N Band

ATB from ch ch 0216. asked radar  
whether anything N. Ch Lane "never  
seen anything" - but had a good return of Bill's a/c

WV "tracked" target for 20 mins  
10nm S of ~~same~~ <sup>same</sup> averaged 70 KTS. (0230 for 20  
tracked  
up to 10nm)

~~ETAGE~~

(- rail + road  
at this point  
on coast and  
coincident  $\therefore$  poss  
rail or cars going N.)

Bill made no comment to ATC about  
orange orb etc. that they had seen.  
during this period. from atc control  
all the way.

$\alpha$  upward of 20 lights (where by when)  
all through straits. (? squid people)

SUMMARY OF INTERVIEW  
WITH CAPTAIN J. RANDLE

1. Captain Randle was the Captain of a SAFE Argosy that took off from Woodbourne 27 Dec 78 at 0110 for a Woodbourne, Christchurch, Auckland, Woodbourne flight.
2. When going on duty at about midnight he observed what could have been two vehicles on the hills towards the Cape Campbell direction moving in a northerly direction. He thought these could be two landrovers driving fairly fast over very rough terrain. He makes this observation because of the light beams described by the Woodbourne Orderly Officer and Mr Frame.
3. At 0159 on the south-bound leg to Christchurch with Christchurch visible from Cape Campbell and a clear sky he was asked by Wellington radar to check the Clarence River area because Wellington were receiving radar returns from that area. He observed some lights at low level that could possibly have been in the Clarence area. When the aircraft was about 30 miles north the lights appeared to go out or disappear.
4. From Kaikoura east the aircraft plotted on radar a large vessel 17 miles northeast of Motunau about seven miles off the coast. The crew had visual contact with a ships lights in that position. However Captain Randle estimates that for the size of the radar return the ship must have been fairly large (1,000 tons or so), and he considered it unusual that such a large vessel would have been so close to the coast.
5. At 0406 enroute to Auckland from Christchurch Wellington Radar again requested that the Clarence river radar returns be checked. The aircraft captain confirmed that lights were visible in that area out to sea and he got the impression of the lights making a rectangular pattern at irregular frequency. The lights had a beam appearance rather than a point source appearance and seemed to "turn away" rather than turn off. One light appeared to illuminate the surface and Captain Randle assesses that the source of the light could have been at about 1,000 feet.
6. The Clarence returns were the only ones that Captain Randle was asked to look at.
7. Captain Randle has produced two sets of notes, one made during the flight and one afterwards providing his comment/speculation about the incident.

NOTES COMPILED BY CAPTAIN J. RANDLE  
SAFE ARGOSY FLIGHT 22 DEC 78  
WOODBOURNE/CHRISTCHURCH/AUCKLAND

1. South-bound. Lights were seen close to shore which corresponded with Wellington radar returns at ranges of 30 plus miles. These were unusually bright for normal ground lights and in one case appeared to be lighting up the surface in the Kekerenge(?) district. None were continuous. In some/most cases seemed directional (beam not point source). I saw no lights closer than 30 odd miles which were not (most probably) ships.

2. a. Aircraft radar return about Gore Bay about seven miles off coast then lights corresponding to fair size ship.
- b. Three light groups with two defined radar returns about 50/25 nautical miles Christchurch. At points of letter L with about three and eight mile arms. Centre target apparently large ship with floodlit decks.

3. North-bound. No unusual lights, other than known ships. In mid straits a 180° check showed lights corresponding to Wellington radar position off Clarence. These behaved like unexplained lights in para 1, intensity and with switching effect with some possible sea/cloud reflection light not constant in bearing and possibly in altitude - or two plus sources. Wellington radar targets which were close to us both north and south-bound and were not ships, were not seen visually or on our radar i.e. the mystery lights were not observed at less than 30 odd miles. Venus(?) was low and very bright to east and while this would not affect radar it could give some red/white light effects visually. Cloud cover u/u Venus about 4/8 ths. Our radar will not scan normally targets smaller than about 800 tons - say Holm line beats - First Officer noted two light sources which I did not see:

- a. Green light.
- b. Fast white light.
- c. Will differ in some details.

Comment, Speculation.

From inflight notes. My/our sightings were most undramatic and while no accurate count was made, five modern, say Iroquois type helicopters could have produced the whole performance.

When the surface was briefly lit up, in both directions, the illumination was V/V A/C landing lights of about 750 watts stronger and consistent with a light of somewhere up to 2000 watts at about 1,000 feet. While all light sources were consistent with this assumed strength focussing effects could have produced apparent strength, but not surface floodlighting.

The ability of our weather radar to pick up surface ships is based against visual checks on Jap fishing boats during attempts to range, and pot them.. It is always possible that Tom Hood has screwed up the gear a notch and this estimate is invalid..

A normal number of presumed fishing boat lights which did not give returns on our radar were seen. The vessels mentioned were unusual by virtue of their assumed tonnage and area and tracks. There was no other reason to consider them unusual. They were not inconsistent, taken together with a Russian whaling/ shipping fleet where the standard vessels are larger than the Jap ( I have not targeted a Russian size vessel with our radar, this is an assumption)

The only question with MY sightings is not how, for helicopters could easily have reproduced all radar and visual effects, but why. If I dont want to blame anyone Russians or RNZAF they both could, it is illogical to assume either would. The undramatic nature of my sightings does not mean that I have any doubts as to the validity of what others saw( Pilots I mean). Just that I cant comment on what I didnt see.

I would exclude

Mutton birds.... lights and nature and one target too far to sea and speeds given of up to 120knots, surfac wind assumed to be almost calm

Duct propagation. Impossible on angles

Venus. I could see Venus Northbound as well as lights

Meteors.. Stationary ?

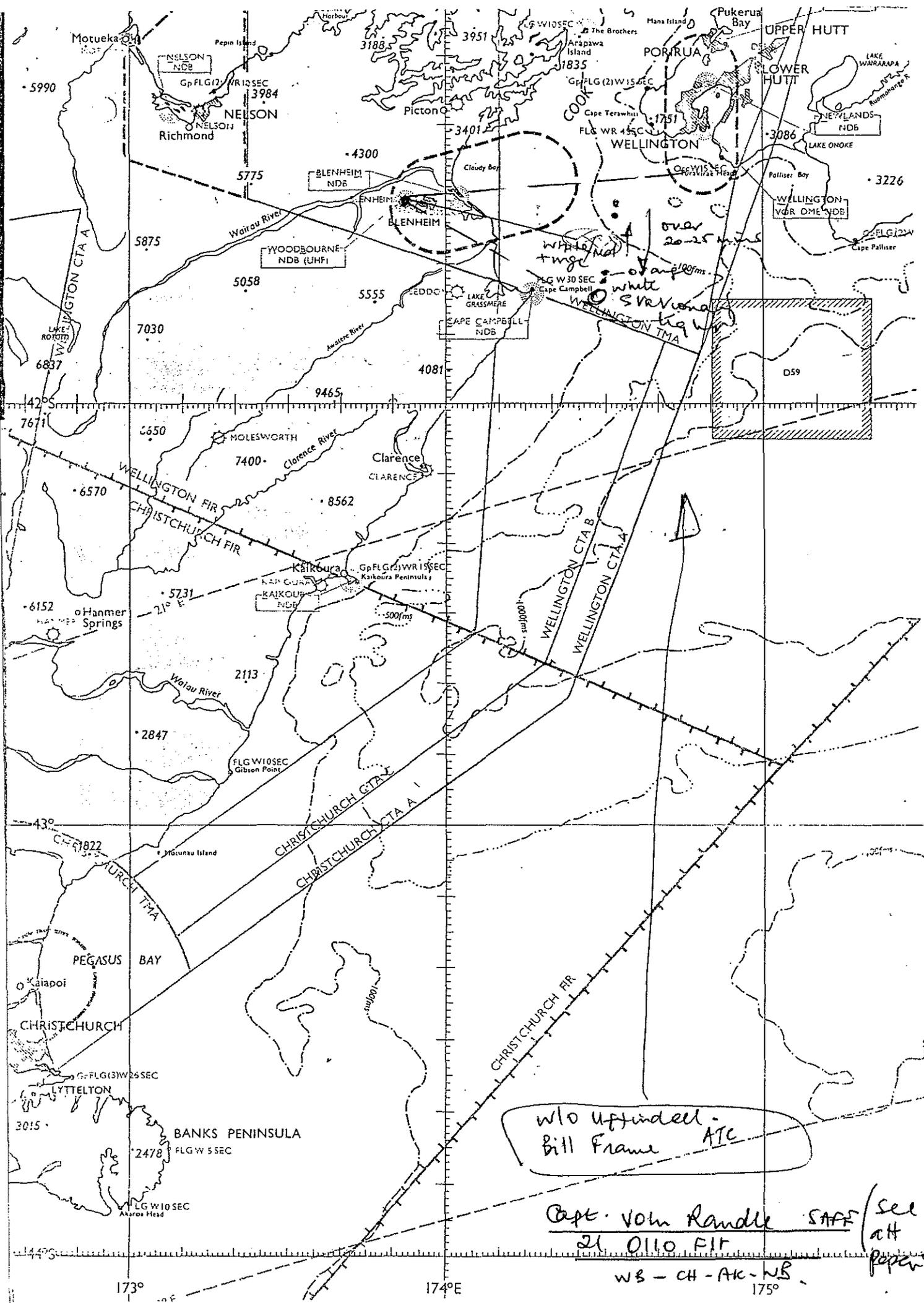
Boats.. May have been related but were not source of " radar" light

Electrical Disturbance... Twenty knot winds at height, near calm no surf line visible on surface. No buildups. Stratiform cloud 8/8 over breaking to 2-4/8 far to East. Near perfect vis under cloud. No cloud below about 15000 southbound and perhaps a bit lower 14000 Northbound in area.

Distress flares, fire orks etc.. Not consistent with these, several sources close, in miles. Does not account for radar.

As noted Venus was at an altitude and Brilliance to give some illusions and at least one ground report on night seemed related to this

Capt  
JCHW  
RANGL  
END



w/o updated -  
Bill Frame ATC

Capt. Volm Randle SAFF (see all papers)  
21 0110 FIT

WB - CH - AK - NB  
175°

SUMMARY OF INTERVIEW WITH  
W/O UFFINDELL AND MR FRAME

1. Messrs Uffindell and Frame were the Woodbourne Orderly Officer and Flight Service Duty Officer on the night 20/21 Dec 78.
2. At 2350 hours Mr Uffindell saw what he initially considered to be the three lights of a Bristol Freighter aircraft three to four miles away from Woodbourne on finals for the airfield. The lights did not get any closer he then checked the lights through binoculars and determined that they appeared to be going to Wellington. Of the three lights the middle one appeared as a white beam pointing northward. The lights appeared to move upward and around in rectangles. He observed the lights for about 50 minutes. The bearing from Woodbourne was about 080 degrees magnetic that is towards Cape Palliser. At one stage the lights appeared to "rush forward". Over a period the lights seemed to move northeast and then gradually faded. He describes the light's appearance as ~~being~~ looking like somebody spotlighting. There was no cloud in the sky.
3. The largest of the three lights was yellowish and the other two were white. They were initially observed beyond Cape Campbell and then ~~over~~ moved north. They were about one inch ~~apart~~ apart when measured at arms length.
4. Mr Frame in company with W/O Uffindell observed the lights from the control tower balcony. He describes the three lights as having one bright orange and two other less intense lights. The large orange light appeared fairly stationary and the other two appeared to move north. A shaft appeared from the two white lights angling down at about 40 degrees in a northerly direction. Using binoculars apparently had no enlarging effect on the lights! Mr Frame notified ATC Wellington of his observations and was told by Wellington that they had five radar targets in the Clarence area. (Apparently nothing to do with the Woodbourne sightings.)
5. The lights appeared to be slightly above the hills to the southeast of Blenheim and all but one disappeared over a period. One of the smaller lights was still visible when the Argosy took off about 0120 hours.
6. At 0325 Wellington phoned Mr Frame to say they had a large target east-north-east of White Bluffs (Wairau Bar). Nothing was visible from the Woodbourne tower.
7. At about 0335 Mr Frame observed a white/red tinged light (alternating) for about five minutes.
8. Messrs Uffindell and Frame will produce a map showing more accurately the bearings from Woodbourne on which they made their observations.

SUMMARY OF INTERVIEW  
WITH CAPTAIN V. POWELL

1. Captain Powell with First Officer Pirie were the crew of a SAFE Argosy from Woodbourne to Christchurch and then Dunedin on 22 Dec 78. The aircraft departed Woodbourne at 0315 hours. The weather throughout the flight was good with a light northeasterly wind and cloud to the east of the South Island. There was no turbulence.
2. At 0330 Wellington ATC asked the crew to investigate the Clarence River area for radar returns that Wellington was picking up. The aircraft crew did not observe any activity either on radar or visually.
3. At 0338 the crew were asked by Wellington Radar to identify a strong radar return that Wellington was receiving about 25 nautical miles to the port of the Argosy. Both the captain and the First Officer observed a very bright light which they variously described as bright orb/pear shaped - reddish tinge then turned white. From the aircraft the object appeared to be stationary by visual observation however by radar the object appeared to "track the aircraft". It appeared to be very close - less than ten miles. (Although the light was on the bearing indicated by the aircraft radar and apparently in the position described by Wellington Radar confirmation is necessary as to whether the light could in fact have been at great distance bearing in mind the crew would have no back-drop to assess distances - query depth perception.) The light passed behind it out of sight and radar contact. (When the crew say the light tracked the aircraft confirmation is necessary that it was seen to move on radar because by visual observation it appeared stationary which in fact would indicate that the light was at a great distance from the aircraft.)
4. At 0400 when 50 miles northeast of Christchurch the Captain observed on the aircraft radar a return that approached the aircraft very rapidly and then veered off sharply to the aircraft's left. During a period of about five seconds about five radar returns were received and in the space of that time the blips passed through a distance of some 15 miles on the radar range scale and then disappeared from the radar screen. (10,000mph per hour!) During this period the aircraft radar was also plotting ships near the coast. Simultaneously the First Officer observed a light he describes as being like a Boeing flashing strobe light which followed the same path as the radar returns. (This episode above all others caused both aircrew mild consternation to say the least!)
5. Captain Powell checked with Christchurch radar whether they had had any radar contacts but were advised that it was "not worth having the radar on". (Check whether Wellington radar observed anything.)



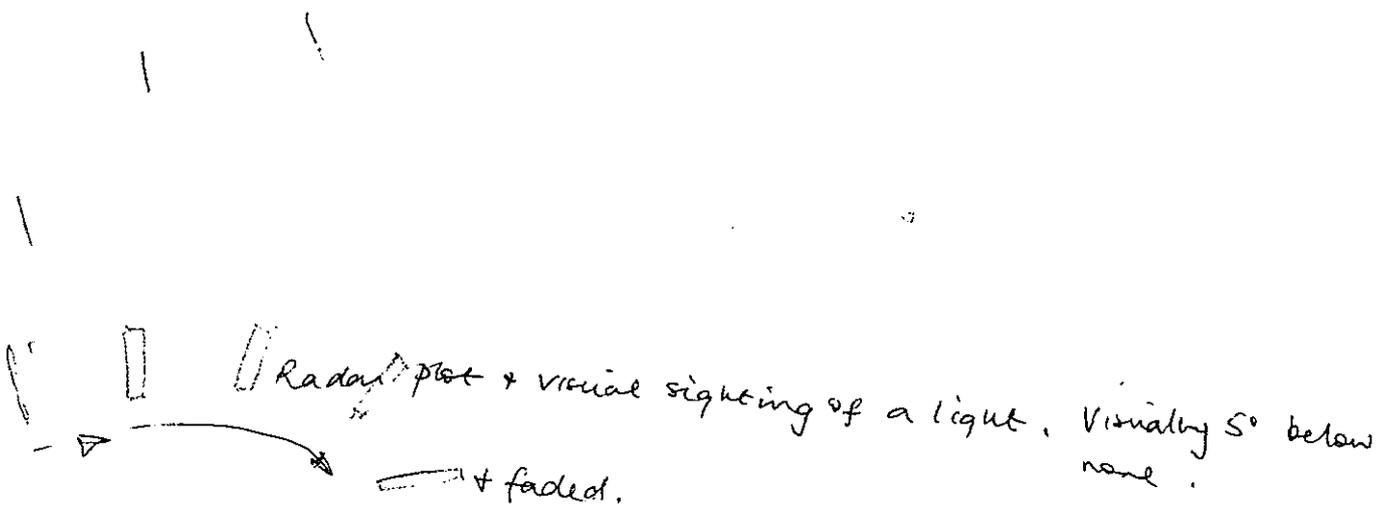
# Argosy Radar

40

30

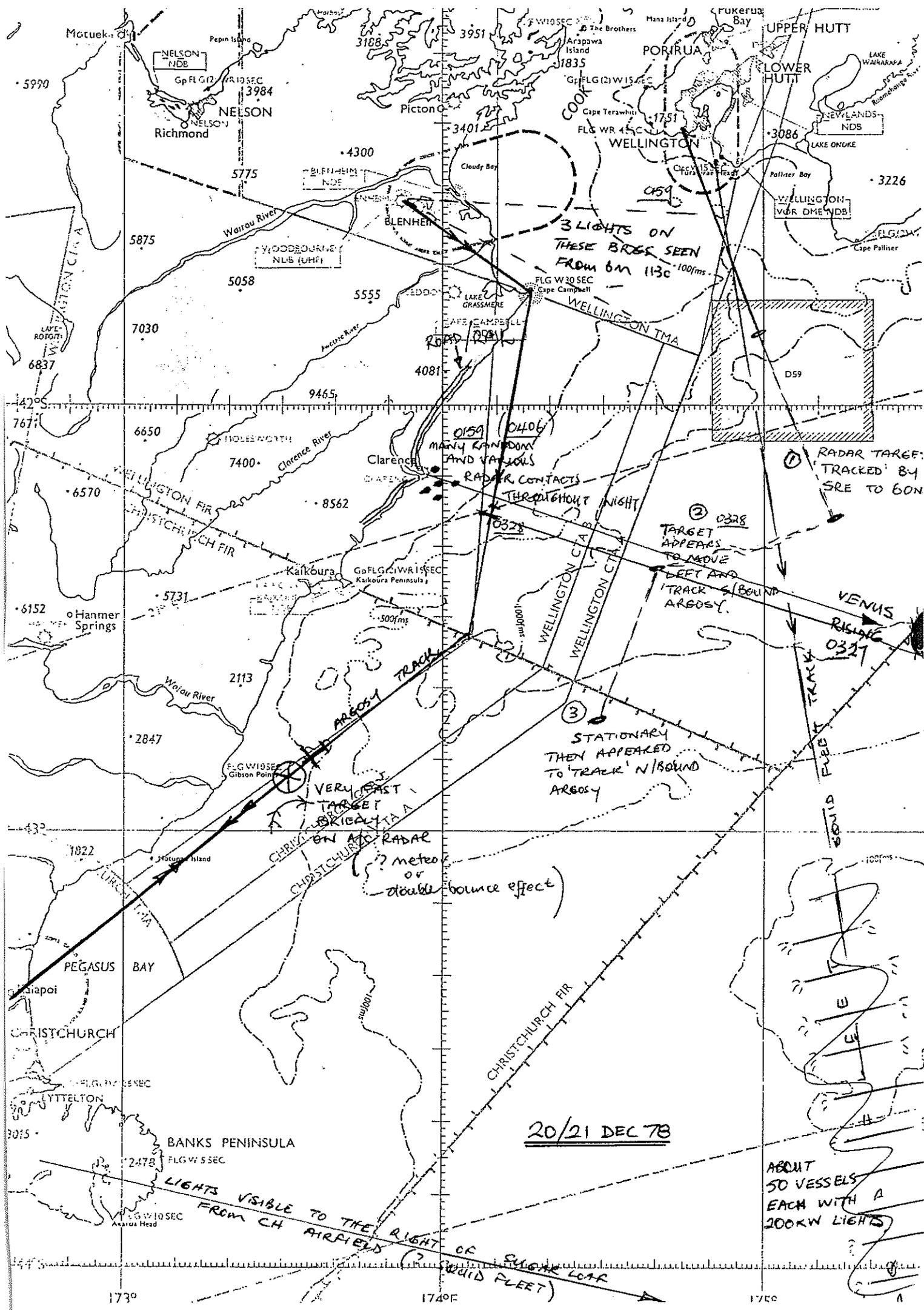
20

10 nm



15nm in 5secs (10,000 mph!)  
10,800 mph.

Argosy radar at 50nm Ch.



3 LIGHTS ON THESE BRGGS SEEN FROM 06M 1130

① RADAR TARGET TRACKED BY SRE TO 0600

② 0328 TARGET APPEARS TO MOVE LEFT AND TRACK S/BOUND AREOSY.

③ STATIONARY THEN APPEARED TO 'TRACK' N/BOUND AREOSY

VERY EAST TARGET ON AOC RADAR (CHRISTCHURCH) ? meteor or double bounce effect

20/21 DEC 78

ABOUT 50 VESSELS EACH WITH A 200KW LIGHTS

LIGHTS VISIBLE TO THE RIGHT OF AIRFIELD FROM CH AIRFIELD (? WOULD FLEET)

~~RESTRICTED~~

<b>DECLASSIFIED</b>	
On	26/8/92
Reference	D. J. D.
Appointment	Kevin Patel

23 DEC 1978  
 M190

UU LKLO18KLA407 HH  
 PP RZYXSD  
 DE RZYXCD 9859 3352320  
 ZNY RRRRR  
 P 220025Z DEC 78 ZZM  
 FM NZDEF AIR  
 TO OPHQ RNZAF  
 BT

AND/OR OMITTED PORTIONS  
 PREVIOUSLY DELIVERED WITH ERRORS  
 CORRECTED VERSION OF A MESSAGE

NO UNCLASSIFIED  
 REPLY OR REFERENCE

~~RESTRICTED~~  
 DIG KSY

710 AIR 20/4/5 SUBJECT UNIDENTIFIED RADAR CONTACTS PD WELLINGTON  
 RADAR HELD FIVE SLOW SPEED CONTACTS IN THE CLARENCE RIVERMOUTH  
 AREA BETWEEN 191100 TO 191500Z DEC 78 PD  
 ONE CONTACT WAS CONFIRMED BY VISUAL SIGHTING OF RED LIGHT BY  
 SAFE ARGOSY PD RNZAF HAS BEEN REQUESTED TO ASSIST IN INVESTIGATION  
 OF THIS ACTIVITY PD OPHQ IS TO BE PREPARED TO RESPOND TO CALL FROM  
 DEF HQ TO INVESTIGATE ANY FUTURE INCIDENT USING AIRCRAFT MOST CAPABLE  
 OF REACHING AREA AND CONDUCTING RADAR/VISUAL SEARCH PD IN ADDITION  
 A PATROL OF THE COASTAL AREA BETWEEN CAPE CAMPBELL AND BANKS  
 PENINSULAR OUT TO 100NMS IS TO BE CONDUCTED BEFORE 27 DEC 78 PD  
 SPECIAL ATTENTION IS TO BE DEVOTED TO OBSERVING AND REPORT ANY  
 UNUSUAL MARINE ACTIVITIES PD ALL SURFACE CONTACTS ARE TO BE RECORDED  
 PD ALL FUTURE COASTAL PATROLS ARE TO REPEAT THIS TASK UNTIL FURTHER  
 NOTICE PD REPORT ANY SIGNIFICANT FINDINGS TO DUTY AIR STAFF OFFICER  
 BT

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NNNN  
 KSY 0  
 ACTION OPS2 11  
 INFO

DISTRIBUTION	20/4/5
Action :	Dops

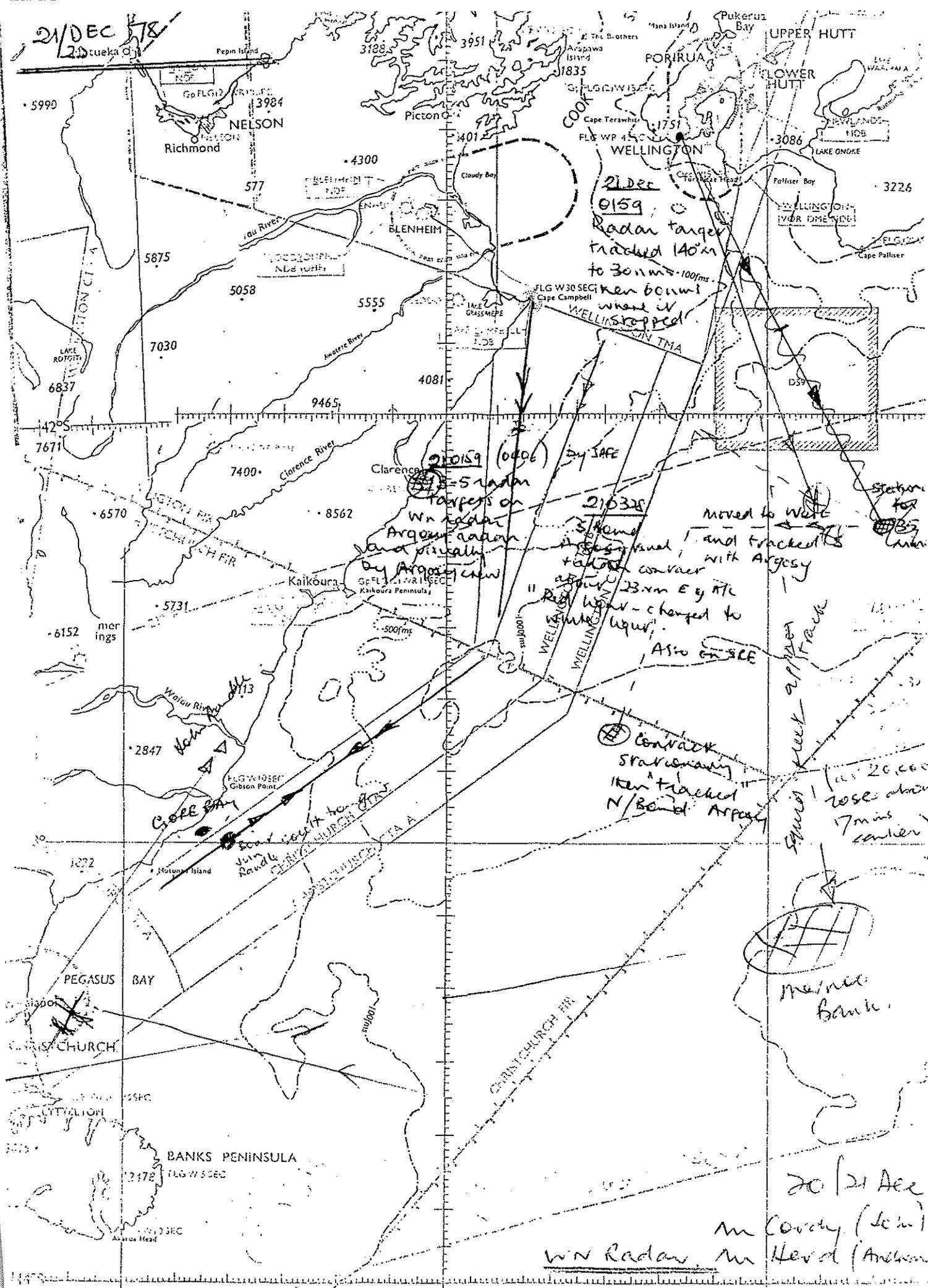
73  
 Paon  
 Squid Fleet.  
 455 175 SSE.

alt. was low level  
 below 5000'

Squid	fm	
OPAKI -	v	
	175.	°
	43	30 °
So	1,000,000	

NIKKO  
 So lights  
 seen  
 high  
 4 Kw  
 = 200 Kw

21/DEC 1978



21 Dec  
0159  
Radar target  
tracked 140m  
to 30nm - 100ms

21 Dec 0159 (0406) by IAF  
572 - 574 radar  
targets on  
Wn radar  
Argosy radar  
and visually  
by Argosy crew

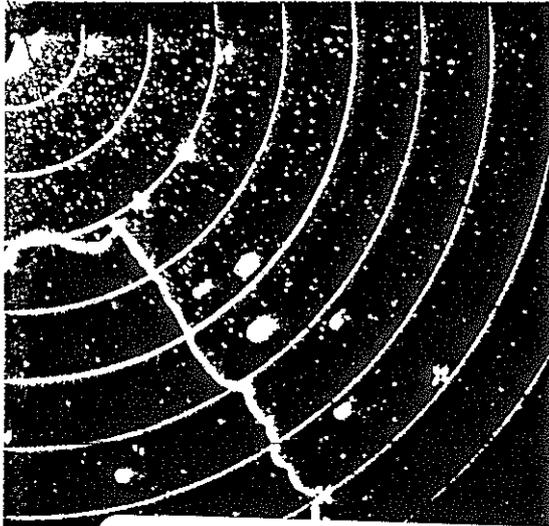
21 Dec 01328  
moved to well  
and tracked  
with Argosy  
target container  
approx 23nm E of TC  
"Red" - changed to  
"blue"  
Argosy on SCE

Contract  
stationary  
then tracked  
N/Band Argosy

Station for  
33  
"Spoon" track  
at track  
at 20,000  
rose above  
7m in  
earlier

Maine  
Bank

20/21 Dec  
in Coody (10m)  
Wn Radar in Herd (Anchored)



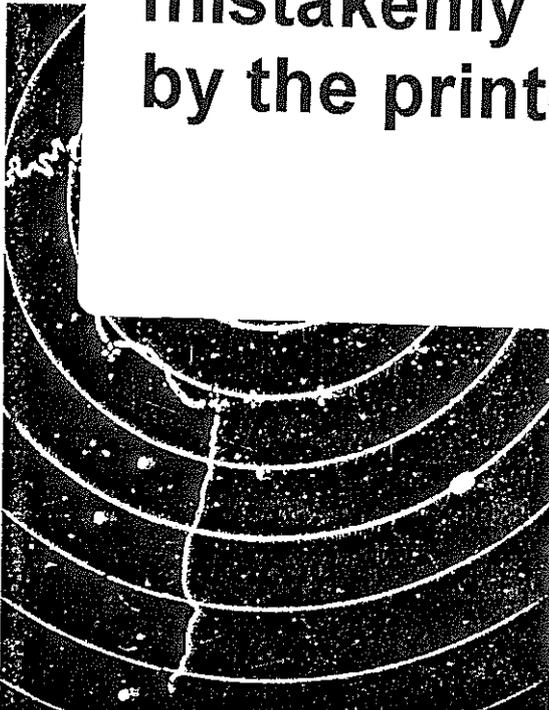
0219. M.T.I. 10 MI CIRCLES

TRIPLE ECHO POSSIBLY SHIP  
AT 46 MI.

ALL OTHER ECHOES (8)  
ANOMALOUS.

## PLEASE NOTE:

The last 17 pages of  
this File have been  
mistakenly repeated  
by the printer.



10 MI CIRCLES

DS 36 MI.

10 AT 172°

RADIALLY

1-150 KT.

~~RESTRICTED~~

DECLASSIFIED

On 26/8/10

Reference J-150

Appointment Brewster

11th January 1979

Air 39/3/3

REPORT ON UNIDENTIFIED VISUAL AND  
RADAR SIGHTINGS EAST COAST SOUTH ISLAND  
DECEMBER 1978

Introduction

1. On the nights of 20/21 December 78 and 30/31 December 78 Wellington ATC Radar, and the crews of SAFE Argosy aircraft (both visually and on radar) made many unidentified sightings off the east coast of the South Island. The first sightings gave rise to much publicity by the media and eventual involvement of the RNZAF when it was decided to conduct an Orion surveillance of the area on the night of 2/3 January 79. At that time it was decided to start a Defence investigation and this report is submitted in accordance with DCAS instructions to provide a report on the events surrounding the various sightings.

2. Air Staff was first advised by Civil Aviation Division of Ministry of Transport (CADMOT) of these events mid-morning 21 December 78. Historically, Defence has adopted a 'low profile' in connection with reports of unidentified sightings. Thus CADMOT has not normally reported unusual sightings to Defence. However, because of the number and nature of reports on the night 20/21 December 78 the Director of Civil Aviation specifically instructed his staff to advise Defence. On the basis of the information received Air Staff decided that should any further similar instances occur we would, if possible, carry out an investigation by the most appropriate aircraft available over the Christmas period. CADMOT were advised to contact the Defence Duty Officer in the event of any more sightings. As it transpired the memorandum from CADMOT Head Office to the ATC Centre was not delivered, thus the events of 30/31 December 78 were not reported to Air Staff until the next day.

3. Other Government agencies, notably DSIR and NZ Meteorological Services, are conducting their own investigations and have provided relevant input to this report. The report is confined to the events of 21 and 31 December 78. It does not take into account the film made by TV1 on 3 January 79 which is now being examined by DSIR and will most probably prove to be a film of Venus and Jupiter rising.

4. When interviewing witnesses it was pointed out to them that this was not a judicial enquiry. The credibility of witnesses' statements was taken at face value. However, witnesses were not necessarily interviewed separately because it was considered that, with a fairly emotive issue such as 'UFOs', corroboration was best achieved by interviewing observers of the same events together.

/Events 20/21 ...

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Events 20/21 December 78 (Refer Chart at Annex A)

5. On 20/21 December 78 there were two SAFE Argosy flights from Woodbourne to Christchurch one of which proceeded to Dunedin and terminated, and the other returned to Woodbourne. The first aircraft departed Woodbourne 210110 NZDT. At 0159 when south-bound to Christchurch the aircraft captain was asked by Wellington Radar to check the Clarence River area because Wellington ATC was receiving radar returns from there. The crew observed lights at low level that could possibly have been off the Clarence River mouth but when the aircraft was about 30 miles north the lights appeared to go out or disappear. During this period Christchurch was visible and the sky was clear. Later in the morning (0406) when the aircraft was northbound the crew was again requested to check the area because Wellington Radar was again picking up radar returns in that vicinity. The aircraft crew confirmed that lights were visible to seaward and the crew got the impression of the lights making rectangular patterns at irregular frequency. The lights had a beam appearance rather than a point source appearance and seemed to turn away rather than turn off. One light appeared to illuminate the surface of the water and the aircraft captain assesses that the source of the light could have been at about 1,000 feet. However, it is the reporting officer's opinion that from the aircraft's height (14,000 feet) it would not be possible to judge accurately the height of lights below the aircraft. One possibility is that the aircraft captain was observing lights from cars or trains because the main road and railway run parallel and very close to the coast for some miles in this area. However, the aircraft captain considers that the sightings could have been produced by four or five helicopters and the whole thing was 'quite undramatic'. The likelihood of such extensive aeronautical activity has not been confirmed by any reports received from the Police or local inhabitants. In fact, no reports have been received and the Police do not have any interest in the area.

6. The second aircraft, which departed Woodbourne at 0315, was also asked by Wellington Radar to look at the Clarence River mouth area because Wellington was picking up radar returns there. That aircraft crew did not observe anything in the region either visually or on radar.

7. Subsequent investigations and scientific observation carried out by DSIR proves conclusively (in the reporting officer's opinion) that Wellington SRE Radar does give anomalous radar returns off the east coast off the South Island. This was proved by DSIR observation of the Wellington radar 8/9 January 79 and taking a series of photographs of the radar presentation throughout the night. Concurrently three field parties were stationed at vantage points along the east coast with radio communications to the Radar Control Centre. On several occasions during the night when many large returns were painting on Wellington Radar the observers on the coast could see nothing either in the air or on the sea in the positions passed to them by the Radar Controller.

/Furthermore

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-3-

Furthermore, from discussions with two or three controllers it is evident that the Wellington SRE has for several months been giving anomalous radar returns in the Clarence area and south of Wellington. It is possible that this could be caused by a modification that was recently made to the radar head at Wellington depressing it one degree. DSIR scientists are following up this possibility and their findings should be available in due course.

8. There is no evidence to suggest that there was any clandestine activity in the vicinity of the Clarence River mouth. It is possible however that surface vessels could have been in the area with or without navigation lights but it is doubtful that such vessels could have given rise to the visual observations made by the aircraft crew. The fact that Wellington Radar 'keyed' both aircraft captains to look for objects in the Clarence area might well have induced observations from the air which might or might not have been related to the Wellington Radar returns.

9. From information supplied by DSIR, the NZ Meteorological Services, and astronomers, it is evident that during this period, and indeed for the last month or so, atmospheric conditions have been conducive to freak propagation of radio and light waves. Thus it is possible that the lights observed by the aircraft captain could have been produced by ships' lights reflected or refracted from afar. Such anomalous propagation (ducting) could also give rise to spurious radar returns. Note: The reporting officer has just received (1155 NZDT) a report from Auckland that ATC has issued a NOTAM that Auckland Radar is giving spurious returns caused by atmospheric conditions.

10. During the period that the Wellington Radar Controller was in dialogue with the aircraft captains about radar returns in the Clarence area the radar was also tracking a steady return on a track of 140°(M) which started at Wellington, proceeded to 30 miles and then, with less consistent radar returns, tracked out to 60 miles where it became stationary for 35 minutes. It then moved west and appeared to 'track' the second southbound Argosy at about 0328. The Wellington Radar Controller alerted the captain that there was a strong radar return about 25 miles to the port of the aircraft. The aircraft crew observed on that bearing a very bright light which they variously describe as a bright orb, pear shaped with a reddish tinge that then turned white. From the aircraft the object appeared to be stationary by visual observation but by the aircraft radar appeared to track the aircraft. The light appeared to be very close - less than ten miles. Although the aircraft radar return and the visual observation of the light were on more or less the same bearing the crew cannot confirm that the range was coincident. It is significant that within a few minutes of the crew's observation, Venus was rising on a bearing that coincided with their visual observation. DSIR optics, physics, and meteorological experts have confirmed that prevailing atmospheric conditions might well have produced most unusual but not unknown phenomena that could have made Venus appear large, bright and orange. There is a plethora of astronomical information that describes this phenomenon. Thus it is highly probable that the aircrew's observation was an unusual view of Venus.

~~RESTRICTED~~ /11. The radar

~~RESTRICTED~~

-4-

11. The radar returns observed on the aircraft radar might have been caused by a natural return by a ship or perhaps could have been anomalous returns caused by the prevailing atmospheric conditions. During the period 19 - 28 December 78 some 50 Japanese squid boats sailed from Wellington to the area of the Mernoo Bank (120 miles east of Banks Peninsula). These vessels departed Wellington in groups of about 10 and their track to their fishing grounds is almost identical to the radar track plotted by Wellington radar. While there is no conclusive proof that these vessels could have caused the fairly steady trace observed by Wellington it is a fact that during the period of all these observations there was no shortage of shipping in the area. Furthermore, once in position and fishing, the squid fleet would have produced an intense light source which coupled with prevailing meteorological conditions could have been responsible for many and varied reflected or refracted light images. (Each boat puts out about 200kw of light.)

12. A further observation (which has not been reported by the media) was made by the crew of this the same Argosy when the aircraft was some 50 miles north east of Christchurch. The captain observed five consecutive blips on the aircraft radar which over a period of five seconds traced a pattern towards the aircraft and then veered off very sharply to its port. Simultaneously the co-pilot observed a flashing white light (which looked like a strobe light) describing the same sort of path. For the brief period that the returns were received on radar the object must have been travelling at about 10,800mph! This sighting, above all others during the night, caused the crew considerable consternation! It is possible that such a phenomenon could be produced by a meteor which are not unknown at this time of theyear. A further possible explanation could be that the effect was caused by a 'double bounce' radar contact produced by ducting. It is note-worthy that an RNZAF Orion crossing Cape Palliser on 9 January 78 at 1652 NZDT observed a radar contact at 15 miles moving fast towards the aircraft. There was no cloud and no surface contacts visible. The radar return crossed the aircraft's track one mile ahead, but there was no visual sighting. The closing speed was calculated at 1,000mph thus the object itself was travelling at some 630 mph. OPHQ staffs have considered the possibilities and assess that the radar return could have been of an object 200 miles north of NZ (perhaps cloud) with freak propagation giving rise to the radar observation made in the aircraft. But for knowing that a Defence enquiry was under way OPHQ would not normally have considered it necessary to pass on this information.

13. A further sighting on the 20/21 December 78 was made by the Orderly Officer and Duty Air Traffic Controller at RNZAF Base Woodbourne. At 2350 the Orderly Officer saw what he considered to be three lights of a Bristol Freighter three to four miles from Woodbourne. However, as no aircraft could be heard and the lights did not appear to get any closer he checked through binoculars and determined that the lights appeared to be going towards Wellington. Of the three lights the middle one appeared as a white beam pointing northward. The lights appeared to move upward

/and around

~~RESTRICTED~~

~~RESTRICTED~~

-5-

and around in a rectangular pattern but at random speed. He observed the lights for about 50 minutes. The bearing from Woodbourne was about 080° (M), i.e., towards Cape Campbell. At one stage the lights appeared to 'rush forward' but generally over the period seemed to move northward and eventually fade. In comparative terms the observer considered that the lights' pattern looked like somebody 'spotlighting'. The Duty Air Traffic Controller observed the same lights from the control tower balcony. His impression was that the lights comprised one bright orange light and two less intense white lights. The large light appeared to remain stationary while the other two seemed to move north. A shaft of light periodically appeared to 'beam down' from the white lights at about 40° in a northerly direction. Using binoculars apparently had no enlarging effect on the lights! This could indicate that the lights were at a great distance from the observer and not in Cook Strait as he imagined. This thesis is supported by the fact that on checking with Wellington Radar the Woodbourne observer was advised that the radar was painting five targets in the Clarence area but no mention was made of any returns in Cook Strait. It is highly improbable that the radar returns and the visual observations were in any way connected.

14. The reporting officer awaits a copy of the taped conversation between the Wellington Radar Controller, the aircraft and the Woodbourne observer and in addition the Woodbourne observer is preparing a sketch map showing bearings, etc, in more detail. When these two pieces of evidence are available they may shed more light on the occurrence!

#### Summary

15. It is the reporting officer's opinion that almost all the sightings made 20/21 December 78 can be explained by natural but unusual phenomena. There were atmospheric conditions that could have produced unusual visual and radar returns. There is no doubt that Wellington SRE was (and still is) giving spurious radar returns in the area under surveillance. With some of the visual sightings of 'beams' of light it is only possible to speculate on possible causes. On-going investigation by DSIR scientists and the reporting officer may help to clarify this in due course. Perhaps the most difficult aspect to explain away is the apparent concern - even apprehension - of the aircrews involved in the sightings. At present they do not seem to be prepared to accept the fact that they might have observed Venus. Thankfully, however, neither do they believe that they saw a visitor from outer space! Perhaps, when more scientific evidence is gathered, their minds will be set at rest.

#### Events 30/31 December 78 (Refer Chart at Arnex B)

16. On 30/31 December 78 an Argosy on a routine flight (but carrying the TV crew that made the film shown on Australian TV) departed Wellington at 2346 to proceed Christchurch and then

/return

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~~RESTRICTED~~

-6-

return to Woodbourne.

17. At 0013 while climbing to 14,000 feet the aircraft crew observed four to five lights close to the surface near the coast of the Kaikoura Peninsula (possibly in the Clarence River area but the crew were not sure and did not confirm with their radar). On checking with Wellington ATC the crew were advised that Wellington Radar had contacts 13 miles ahead of the aircraft (these would have been off Clarence). The crew observed a pulsing type of white light that looked like a helicopter search light zooming on to the beach somewhere north of the Kaikoura Peninsula. Again, it is difficult to explain the lights, short of them being some anomalous type of reflection or refraction, cars, or trains. However it is most probable that the Wellington Radar returns were spurious.

18. At 0018 when the aircraft was about 10 miles north of the Clarence River Mouth, Wellington Radar advised the crew that there was a strong radar return behind them. They orbited and saw nothing. This was almost certainly a spurious radar return.

19. At 0042 when the aircraft was about 10 miles northeast of Motunau Island, Wellington Radar advised the crew that there was a large radar target behind the aircraft that appeared on the radar screen as a blip larger than the aircraft return and appeared to be tracking the Argosy. The aircraft captain carried out a left orbit but neither he nor the first officer saw anything. The crew did not refer to the aircraft radar and Christchurch radar was not operating for ATC purposes at the time.

20. Just before crossing the coast near Woodend the crew observed a white light on the starboard side of the aircraft and Christchurch Radar advised that there was a target at three-o'clock to the aircraft that 'moved off' when the aircraft was about 1.5 miles from touch down. No reports have been received from inhabitants of the area of any unusual lights or aeronautical activity. Thus, again, the natural explanation is that the light and radar return were spurious, possibly caused by some sort of anomalous propagation.

21. It is interesting to note that while taxiing to dispersal both the aircrew on the Argosy and the ATC officers in the control tower observed lights to the right of Sugar Loaf Hill which seemed to have the same pulsating characteristics as the lights observed earlier during the flight. The bearing of these lights would almost certainly coincide with the bearing of the squid fleet from Christchurch and if the lights could be proved to be refracted or reflected returns from the squid vessels much of the mystery would be solved!

22. At 0216 the aircraft departed Christchurch on the 033 radial. When overhead Woodend both crew members observed a large white light to the northeast. They also observed on the aircraft radar a very large target at 18 miles from the aircraft. The crew cannot be positive that the light and the radar return were coincident but that was the appearance that they gave. Slightly before these observations, the first officer had noticed through thin cloud a light which he describes as having the

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appearance of a squashed orange. Eventually this light became fully visible and measured against the thumb at arms length appeared to be about two inches long, that is, a very large source of light. The crew observed this light for some minutes while cruising at 13,000 feet. Between 35 and 40 miles from Christchurch the aircraft captain, of his own volition, turned towards the light. This necessitated a 90° turn onto a heading of about 125° at about 25° bank. The aircraft speed was 215 knots. The image on the aircraft radar moved to 10 miles from the aircraft but the crew cannot say whether this was due to their velocity or the movement of the radar return. The radar image then stayed in the same relative position to the aircraft for a few minutes (as if it were 'backing up' at the aircraft's speed). At this stage the large light appeared to go above, behind, and below the aircraft as the captain turned left to regain track and avoid further 'confrontation' with the object! This series of events occurred over a time frame of about 20 minutes. Throughout, Christchurch radar was working but reported nothing. Wellington Radar had been observing the aircraft during the period but did not report any unidentified radar contact in that area.

23. The visual observation made by the crew is consistent with an unusual view of Venus. The bearing of the observation coincides with the point at which Venus would have been visible. However, this observation was made at about 0225 and Venus did not rise until about 0328. Nevertheless, DSIR scientists have advised that with super refraction it would be possible to see the planet some time before it's actual rising and if it were seen it would have the appearance that the crew described. The last effect of the light passing above, below and behind the aircraft could be explained by an astronomical phenomenon known as the 'troublesome layer'. In the prevailing conditions with a marked inversion above about 10,000 feet, and fairly strong westerly winds with standing waves on the leeward side of the Alps the inversion layer can take on a marked wave form. Thus at the time that the light performed its convolutions around the aircraft it is possible that the aircraft was passing from one side of the inversion layer to the other. The fact that the light was no longer visible tends to support this thesis and it is most probable that the aircraft's radar return was spurious or of a ship, in view of the lack of confirmation of any other targets in the area by the Wellington Radar.

24. As the aircraft approached Kaikoura two or three radar contacts were noted on the aircraft radar at about ten o'clock position. These would be consistent with the radar returns Wellington had noted in the Clarence area for most of the night - and were almost certainly spurious.

25. Approaching Cape Campbell the aircraft captain observed what he thought was a fishing fleet off Cape Palliser. These might well have been part of the squid fleet enroute south.

26. As the aircraft turned towards Blenheim the first officer observed what appeared to be orange lights in the Nelson Bay area which appeared to move across the sounds towards Picton. No explanation can be offered for this observation but it has not

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been confirmed by any sightings made from the ground. The aircraft landed at Blenheim at 0315.

Conclusions

27. The foregoing report has been compiled after interviews with most of the principle witnesses involved with the sightings 20/21 and 30/31 December 1978. The SAFE pilots were most helpful to the reporting officer in the very frank manner in which they related their experiences and the time they spent in interview. It is considered that the reporting officer should, as soon as possible, informally debrief the SAFE aircrew involved on the general tenor of the findings to date.

28. It is evident that because of the interest over these sightings reports will continue to come in from various sources and on-going investigations by DSIR and meteorological officers will probably serve to correlate much of the information. Nevertheless, it is considered that Defence should issue a PR statement fairly soon in order to tone down much of the wild speculation that has existed over recent weeks.

29. In summary the reporting officer has made the following findings:

- a. During the period of the observations, and indeed now, atmospheric conditions over NZ are conducive to freak propagation of radio and light waves.
- b. Venus was rising in the eastern sky and at this time of the year is unusually bright in appearance.
- c. Wellington Radar has been giving spurious indications off the east coast of the South Island for some time but over recent weeks anomalous returns seem to have been more prevalent.
- d. During the period an unusually large number of vessels (the squid fleet) sailed from Wellington, often at night, to position off Banks Peninsula. Not only would these vessels provide a good source for radar returns but the lights that they use when fishing could explain some of the visual sightings of unusual lights.
- e. The reporting officer speculates that the observation of lights in the Clarence area might have been caused by trains or cars.
- f. The reporting officer is of the opinion that the large number of unusual occurrences on

/the nights

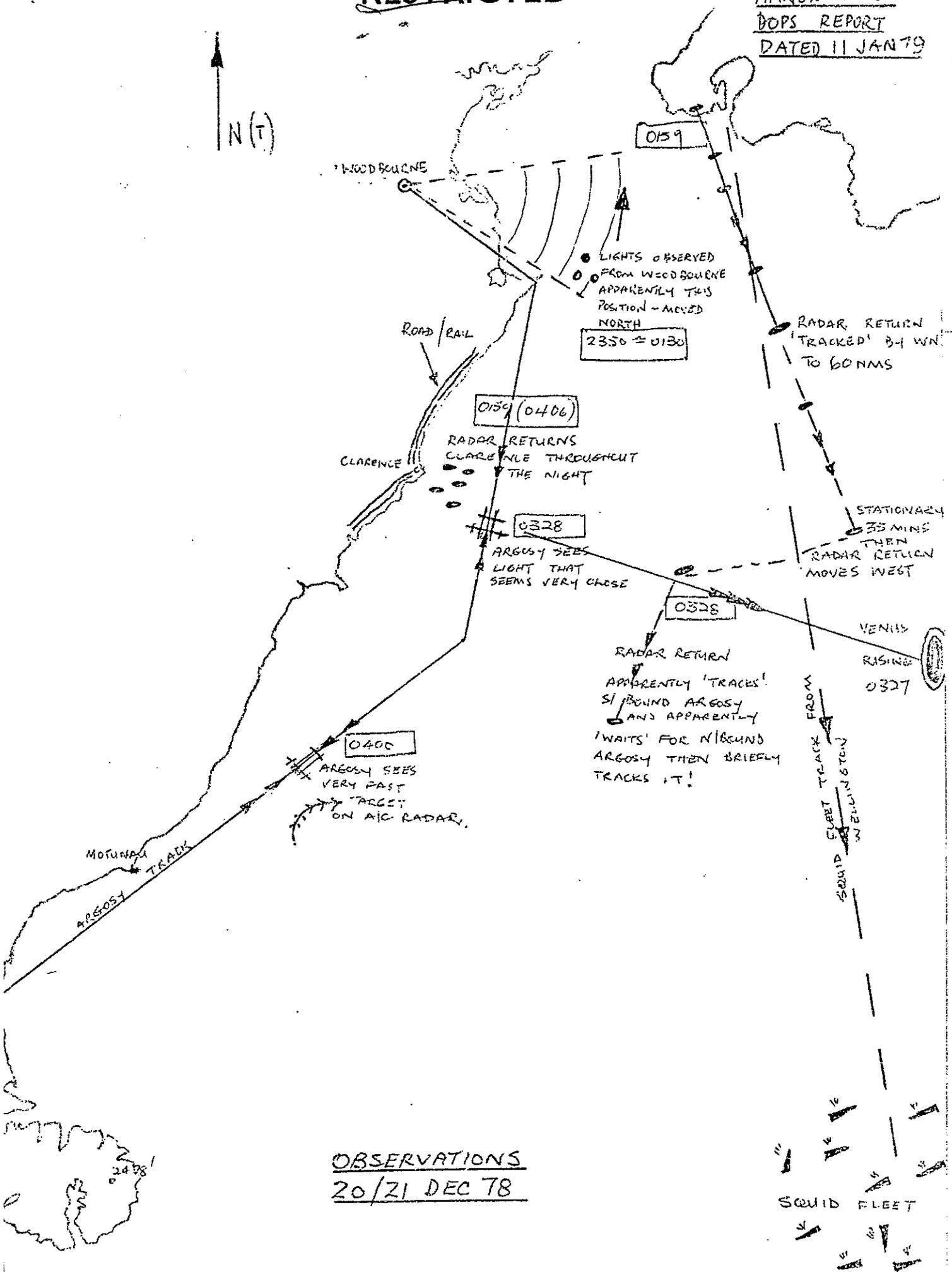
the nights in question made some aircrew and air traffic controllers particularly responsive to the various sightings.

- g. There is no connection between the many sightings in the Clarence area and the larger lights seen to the east (and which were the subject of the much publicised TV films).
- h. Almost all the sightings can be explained by natural but unusual phenomena. The few for which the evidence to date is inconclusive may well be explained in due course when current investigations are completed.

  
(J.B. CLEMENTS)  
Wing Commander  
Director of Operations

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ANNEX A TO  
DOPS REPORT  
DATED 11 JAN 79



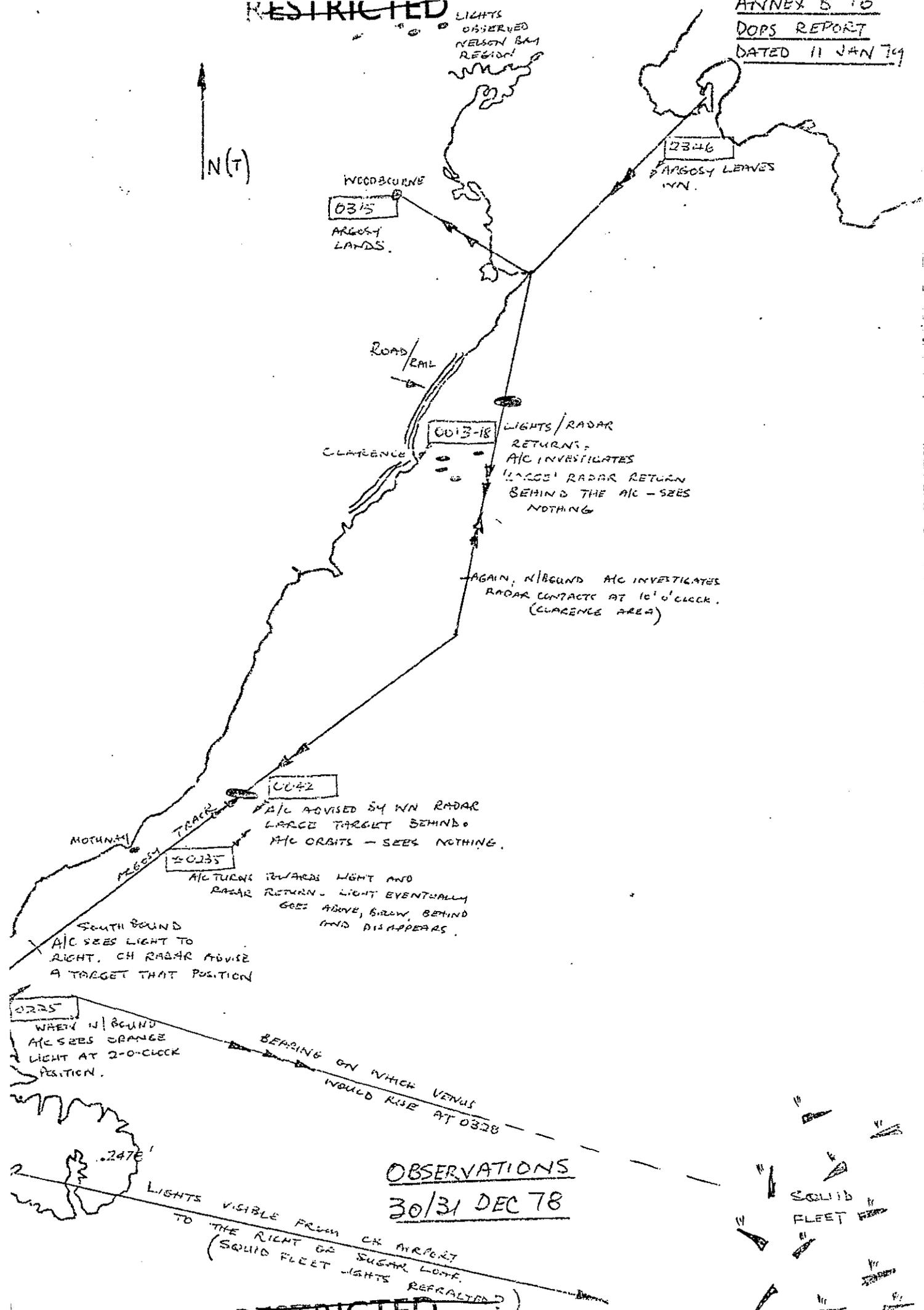
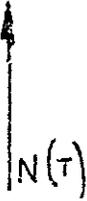
OBSERVATIONS  
20/21 DEC 78

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ANNEX 5 TO  
DOPS REPORT  
DATED 11 JAN 79

LIGHTS  
OBSERVED  
NELSON BAY  
REGION



WOODBURN  
0315  
ARGOSY  
LANDS.

02346  
ARGOSY LEAVES  
WN.

ROAD/RAIL

CLARENCE  
0013-18  
LIGHTS/RADAR  
RETURNS.  
A/C INVESTIGATES  
LARGE RADAR RETURN  
BEHIND THE A/C - SEES  
NOTHING

AGAIN, N/BOUND A/C INVESTIGATES  
RADAR CONTACTS AT 10 O'CLOCK.  
(CLARENCE AREA)

0042  
A/C ADVISED BY WN RADAR  
LARGE TARGET BEHIND.  
A/C ORBITS - SEES NOTHING.

0035  
A/C TURNS TOWARDS LIGHT AND  
RADAR RETURN. LIGHT EVENTUALLY  
GOES ABOVE, BENEATH, BEHIND  
AND DISAPPEARS.

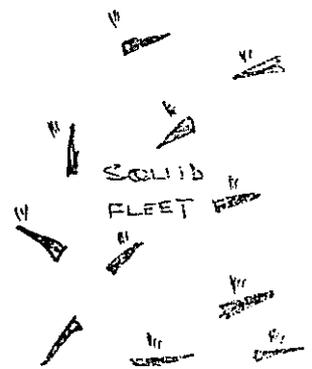
SOUTH BOUND  
A/C SEES LIGHT TO  
RIGHT. CH RADAR ADVISE  
A TARGET THAT POSITION

0225  
WHEN N/BOUND  
A/C SEES ORANGE  
LIGHT AT 2-O'CLOCK  
POSITION.

BEARING ON WHICH VENUS  
WOULD RISE AT 0328

OBSERVATIONS  
30/31 DEC 78

LIGHTS VISIBLE FROM CH AIRPORT  
TO THE RIGHT OF SUGAR LOAF.  
(SQUID FLEET LIGHTS RECALLED?)



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SRE Wexford Road/Hawkins Hill Changes.

- ✓ SRE Notammed RNO 091309 PRF = 400 ±14% 9% & 17%
- SA 120 New aerial reflector, slotted feed and 3/4" co-ax run from rotating joint. Re-conditioned pedestal and rotating joint - data gearbox - no change. Digital turning encoder fitted.
- Radar Rx. Two S2050 solid state receivers installed, old SR100 receivers still in position but switched off and by-passed - can be brought into service if required.
- Processors Two S7100 solid state, digital processors installed. Both SJ1000's removed from HH as well as associated delay cells.
- L/R SRE Max range = 160nm. Range 2/SD 1010 display T.B. amplifiers set to place 80nm range ring under the cursor knobs.  
~~Video map - dots set at 15nm, 1" marks at 145nm.  
Terrain Clearance map - not available - test slide fitted.~~
- Remote switching - No change except DSP S7100/1 and 2 replaces SJ 1000/1 and 2.
- Aerial To be run at half speed. Tilt = ~~14~~<sup>+4</sup> deg.
- MTI Cancelled radar clutter is excessive but levels will be adjusted over the next few weeks.
- Radar Uncancelled radar appears different to previous radar due to use of the S2050 radar receiver log/PLD (pulse length discriminator) video output at HH.
- Faults Until staff are more familiar with the new equipment Ways 2 will look after faults on the S2050 receivers and S7100 data processors - all other faults to be cleared as before the upgrading.

*[Handwritten signature]*

TTO SRE,  
Wellington Airport.

- ① PRF stagger - fixed sequence NOT random  
0 = D which is 2 FODS.  
400 + 14 = C  
9 = B  
17 = A  
DCDBDA - then repeats.
- ② Clearance returns were probably coincident.
- ③ Enhanced video levels. All above noise appear as '1' level.  
same size

PERSONNEL INTERVIEWED

<u>Name</u>	<u>Designation</u>
Capt V. Powell	Captain SAFE Argosy 22 Dec 78 (second acft).
First Off I. Pirie	First Officer SAFE Argosy 21 Dec 78.
Capt J. Randle	Captain SAFE Argosy 22 Dec 78 (first aircraft).
W/O Uffindell	RNZAF Duty Officer Woodbourne 22 Dec 78.
Mr W. Frame	Flight Service Woodbourne 22 Dec 78.
Mr M. Collins	Director Physics Laboratory DSIR.
Mr N. Rumsey	Head of Optics Division DSIR.
Dr D. Phillips	NZ Meteorological Service.
Mr R. Davison	Superintending Engineer Radar CADMOT.
Mr J. Cordy	ATC Radar Controller 22 Dec 78.
Mr A. Herd	ATC Radar Controller 22 Dec 78.
Capt W. Startup	Captain SAFE Argosy 31 Dec 78.
First Off R. Guard	First Officer SAFE Argosy 31 Dec 78.
Mr G. Causer	ATC Radar Controller 31 Dec 78.
Sqn Ldr R. Carran	Orion Captain Jan 79. Fisheries Control Centre, MAF.
Dr Cherry	Lincoln College (Propagation Exp)
Dr Wall	Perth " " (1948)

AIDE MEMOIRE

Possibilities:

Ducting  
Hotspots  
Venus  
Jupiter  
Stars  
Planets  
Clandestine Operations  
Hoax  
'Real UFO'  
Ships  
Birds  
Wave Cap Radar Returns  
Cyclical Patterns?  
Light Waves  
Radio Waves  
Squid Fleet Movement over period?  
Dr Wall Porirua - freak propagation experiment Canterbury 1948.  
Dr Neil Cherry Lincoln College - current study Canterbury NW conditions.  
Clarence TV film - possible planet or star rising?  
DSIR Clarence/Kaikoura theodolite observation star rising. Apparent movement caused by heat from Japanese vessel on horizon in line of sight.  
Coincidence of observations only by SAFE Argosy crews?  
Freak return generated by aircraft itself (mirror, mirage, radar return etc)?  
Squid fleet position 21 Dec 78 onwards.  
Squid fleet lights turn off time.  
Meteorite, asteroid shoals - refer astronomy info.  
Jupiter/Venus rising/setting times.  
ANZ timetables (strobe lights).  
Observations all over water, distances vague except for radar plots.  
Radar plots possibly not coincident with visual sightings.  
Lighthouses, aerodrome, navigation etc beacons.  
Last month extreme clarity of atmosphere.  
Inversion layer (refer T~~h~~ gram).  
Examine films (Sqn Ldr Clarke to arrange).  
DDI interest?  
Customs interest?  
Police interest?  
Fisheries interest?

## SURVEILLANCE RADAR EQUIPMENT

## 1. MARCONI RADAR TYPES S264 AND S264A

## TECHNICAL DATA

Wave Length	50 cms.
Frequency	585 - 610 mcs
Peak Power Output	<del>S264:</del> 50-60KW S264A: 500KW (nominal) ✓
Beam width	2½°
Pulse Length	2 or 4 microseconds ✓
Pulse Recurrence Frequency	S264: 525 - 775 p.p.s. S264A: 500 - 800 pps (2ms pulse) 260 - 385 pps (4ms pulse)
Rate of Scan	5 or 10 r.p.m.
Range Selection	In ratio of 1 : 2 : 3 : 4 according to range available
Antenna System	Parabolic reflector with offset linear wave guide feed.
Wind Limitations	Up to 60 knots at 10 r.p.m. Up to 90 knots at 5 r.p.m.
Presentation	S264: Moving coil 12 in. PPI S264A: Fixed coil 12 in. PPI
Special Facilities	MTI, STC, Swept Gain, Video Mapping, Off centering.

## 2. GENERAL

2.1 The main features of the S264 are its almost complete freedom from weather clutter, the stable and efficient MTI system and the high overall radar performance obtained with comparatively low power. The S264 can be converted to S264A equipment at any time.

2.2 The S264A possesses all the main advantages of the S264 plus the exceptional range and altitude cover. These features make this equipment most suitable for its dual role as both area and approach S.R.E.

## 3. SPECIAL FACILITIES

3.1 MTI

3.1.1 This is a fully coherent system with the transmitter, reference oscillator and trigger pulse generator all crystal controlled. No automatic frequency control is required as the receiver is locked to

$\tau = 2500 \mu s.$

$= 17\% \quad (423.5 \mu s)$

$= 9\% \quad (224.84 \mu s)$

$= 14\% \quad (349.58 \mu s)$

