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2nd Part of Report No.
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15

MINISTRY OF AVIATION

AEROPLANE AND ARMAMENT EXPERIMENTAL ESTABLISHMENT

BOSCOMBE DOWN

ANDOVER C. MK. 2

NAVIGATION AND RADIO FLIGHT TRIALS

[C-MHA]

PRESENTED BY

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2nd Part of Report No. AREE/943

AEROPLANE AND ARMAMENT EXPERIMENTAL ESTABLISHMENT
BOSCOMBE DOWN

29 DEC 1965

(7) Andover C. Mk. 2

Navigation and Radio Flight Trials, (MHA),

(10) ~~Presented by~~
Fitt. Lt. D. J. Castle / ~~And~~ A. V. Russ,
Navigation and Radio Division

A. & A.E.E. Ref: ANR 3U/03. T.I. No. NR.89/64
H.Q. Ref: D.A. Nav. and D.L.R.D.(A) A.L. 10
Period of Trials: August 1964 to August 1965

(14) AREE/943 - Pt-2

Summary

This report covers 59 hours flight testing of the radio and navigation equipment in three different Andover C. Mk. 2 aircraft, all of them fully furnished and equipped. It complements earlier work on a less fully furnished aircraft and includes some check tests of equipment installation modifications and operating temperatures. The main equipment items dealt with are:-

- Decca Navigator Mk. 1 (Air) with cooling to Decca specification,
- G4B Gyro magnetic compass,
- Passenger address equipment, A.R.I. 23145/2, and
- Selective Calling system, A.R.I. 23097.

Recommendations already made for C.A. Release are confirmed or extended, and outstanding work re-stated.

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List of Contents

	<u>Page</u>
1. Introduction	3
2. Navigation Equipment	3
3. Communication Equipment	6
4. Radar Equipment	7
5. Compatibility	7
6. Temperatures	7
7. Conclusions	10
8. Recommendations	11
9. Work Outstanding	12

List of Appendices

	<u>Appendix</u>
Modifications incorporated in XS 794	I
Temperature Elements	II
Work Outstanding	III

List of Illustrations

	<u>Figure</u>
Temperatures. Sortie 1	1 - 4
" Sortie 2	5 - 8
" Sortie 3	9 - 12
" Sortie 4	13 - 16
Position of observers during Passenger Address Trials	17

1. Introduction

Trials on the Andover C. Mk. 2 Military V.I.P. Version of the Civil HSA 748 Series 2 aircraft were requested by M.O.A. H.Q.(D.A.C.T., D.L.R.D.(A) and D.A. Nav.).

Part 1 of Report No. AAEE/943 dated 13th October 1964 covered the trials carried out on Andover C. Mk. 2 XS 789 in June 1964. Since that date, the modifications and further investigations recommended for some of the Navigation and Radio installations have been flight tested in Andovers C. Mk. 2 XS 789, 790 and 791 culminating in U.K. and tropical trials on XS 794 in August 1965, and this later work only is covered in the present report.

2. Navigation Equipment

2.1 Gyro Magnetic Compass

In Part 1 of Report No. AAEE/943 recommendations were made for further investigations of the changes found in coefficient B between ground and air conditions.

2.1.1 Trials of the Gyro Magnetic Compass in XS 789, 790 and 791

Ground swings were carried out in Andovers XS 790 and 791, using external power supplies and internal power supplies with engines running. No significant change in coefficients resulted. Comparison of an air swing with the ground swings on XS 791 shewed no change in coefficient B. A summary of the ground swings completed on XS 791 is given in Table 1; the results of the air swing is at Table 2.

Table 1. Summary of Gyro Magnetic Compass
Ground Swings in Andover C. Mk. 2 XS 791

Coefficient	B	C	D	E	50% Error B-E
External Power	-0.39	-0.2	+0.09	+0.15	Less than 0.02
Internal Power (Both generators)	-0.27	-0.27	+0.07	+0.15	0.029
Internal Power Starboard Generator only	-0.29	-0.14	Ø	+0.27	0.02
Internal Power Port Generator only	-0.27	-0.27	+0.07	+0.15	0.029

Table 2. Results of Air Swing of Gyro Magnetic
Compass in Andover C. Mk. 2 XS 791

B	C	D	E	50% Error B-E
-0.11	-0.30	-0.15	-0.04	0.08

/In

In order to check further the gyro magnetic compass in Andover XS 789 an airborne swing was carried out after the aircraft had been in service for six months. Again a significant change in Coefficient B between air and ground conditions was found.

2.1.2 Trials of Gyro Magnetic Compass in XS 794

Ground and air swings were completed on the installation in Andover C. Mk. 2 XS 794 using standard methods. No significant change in magnetic components existed between ground and air conditions. The results of the swings are given in Table 3.

Table 3. Results of Air and Ground Swings of Gyro Magnetic Compass in Andover C. Mk. 2 XS 794

Coefficient	B	C	D	E	50% Error B-E
Ground Swing	-0.02	-0.16	+0.18	+0.16	0.025
Air Swing	-0.10	-0.14	+0.07	+0.40	0.082

2.2 A.R.I. 23122 Decca Doppler 62M and 9476B Computer

2.2.1 Trials of Decca Doppler 62M in XS 789 and XS 790

The doppler accuracy results obtained during the trials in Andover C. Mk. 2 XS 789 (Part 1, Appendix VII, para. 3.2) were disappointing; the errors could not be satisfactorily explained. The 1.6° left across track error, found during local trials flights, did not agree with the apparent navigational accuracy obtained during the overseas transit flying on XS 789, or the track keeping accuracy achieved during a Queen's Flight route proving flight to Athens in XS 790.

2.2.2 Trials of the 9476B Computer in XS 789 and XS 790

The 9476B computer was not operated satisfactorily in XS 789, whilst the aircraft was at A. & A.E.E. due to component unserviceability and aircraft wiring faults. A good track keeping accuracy was observed during flights in XS 790, but the computer did not work properly, on all legs flown, due to an intermittent wiring fault.

2.2.3 Ground Trials of the 9476B Computer and 9478 Control and Display Unit

The performance of the 9476B Computer and the 9478 Control and Display Unit was evaluated during bench tests at A. & A.E.E. in January 1965. The units were operated for nine hours continuously and the results show that the equipment behaved normally during this period.

2.3 Doppler and Computer Trials in XS 794

One exercise, during the trials on XS 794, was devoted to an assessment of the accuracy of the D.R. navigation sub-system. Five assessable 100 n.m. legs were flown.

/2.3.1

2.3.1 Doppler D.R. Position

The doppler D.R. position was constructed in post flight analysis, using G4B heading, mean indicated doppler drift, and indicated doppler distance gone. The D.R. position was compared with the datum position, obtained from the Decca Mk. 1 Air. The resulting errors, expressed in along and across track co-ordinates, are at Table 4. It will be seen that the unexplained 1.6° error noted on XS 789 was not repeated, and that the subjective assessment made during en-route flying is confirmed.

Table 4. Doppler D.R. Position Error

Run	Across track error (°)	Along Track error (n.m.)
1	0.2 right	0.2 undershoot
2	0.2 left	0.4 undershoot
3	0.3 left	0.2 overshoot
4	0.4 left	0.3 overshoot
5	0.5 left	0.7 overshoot

2.3.2 Computed D.R. Position

The position computed by the 9476B computer was checked by comparing the along and across track indications on the 9478B Indicator, at the end of each 100 n.m. leg, with the track and distance calculated between the datum Decca fixes. The results are shown in Table 5. These accuracy results are satisfactory for a D.R. system based on a G4B/doppler combination.

Table 5. Total D.R. Error

Run	Across track error (°)	Along track error (n.m.)
1	0.8 right	0.5 overshoot
2	0.4 right	0.2 undershoot
3	0.5 right	0
4	0.6 right	0.3 overshoot
5	0.9 right	0.3 overshoot

2.4 A.R.I. 23102/1 Decca Navigator Mk. 1 (Air) and Flight Log

2.4.1 Details of the installation

The receiver system comprises two units, the A unit containing the frequency conversion, oscillator locking and reference systems and the B unit containing the phase comparison and lane identification switching circuits. Modification of the units (Appendix I refers) introduced thermal cut out switches adjusted to switch off the A unit when a temperature of 85°C was reached and switch off the B unit when a temperature of 100°C was reached. The wiring has been spaced out to provide a freer air circulation and heat resistant (P.T.F.E.) insulated wire used for valve heater wiring.

2.4.2 Trials results

Units modified as described were flight tested under tropical conditions when installed in the starboard radio crate with revised cooling arrangements to Decca specification (MCD. 1092)(Appendix I refers). En route between Akrotiri and Bahrain the lane identification facility using the North and South Persian Gulf Decca Chains, gave erratic performance and unit changing effected no improvement. On return to the United Kingdom the lane identi-

/cation

cation facility behaved correctly and it is assumed that the erratic behaviour was due to local conditions at Bahrein. Apart from this comment the installation has provided an accurate datum aid for flights in the United Kingdom and while en route to Bahrein.

3. Communication Equipment

3.1 A.R.I. 23090/2 - H.F.

Part 1 of AAEE/943 recommended a repeat of the tuning capability check on another installation. This was repeated on XS 794 while the aircraft was flying at Bahrein. Voltage standing wave ratios (V.S.W.R's) better than 1.5:1 were obtained throughout the frequency band 2-25 mc/s for measurements taken at 1 mc/s intervals. These results are within the specified limits and are satisfactory.

3.2 A.R.I. 23097 - Selcal

Part 1 of AAEE/943 recommended a repeat check of the range capability of this equipment when used with the A.R.I. 23090/2 - H.F. installation. This was carried out on a Queen's Flight route proving exercise in XS 790 achieving a maximum range of 500 n.m's., still below the H.F. range capability in the A.M. mode. This facility was also used while XS 794 was flying to Bahrein. The best range was obtained when the Selcal light was illuminated 600 n.m's from Rome. Up to 5 calls were required on a busy frequency before the Selcal lamp was illuminated at a range of 360 n.m's from Athens. It was noted that correct Selcal operation could only be obtained at the first call from the ground station if the frequency was quiet and appeared independent of range.

3.3 A.R.I. 23145/2 Passenger Address

3.3.1 Flight trial

During normal cruising flight an experiment was carried out to assess the clarity of transmissions made over the system. 104 words were read out from the first and second pilots' positions with F.A. selected and other services not selected. Additionally V.H.F. and H.F. transmissions were made from the navigator's position.

The position of the observers is shown on Figure 17. Observers changed places during the experiment.

3.3.2 Results

Forward Compartment

The ambient noise level in this compartment is high mainly from engine sounds and hissing from the cabin conditioning air inlets. Observers facing aft heard none of the words correctly, facing forward the observer correctly identified 8% of the words.

Centre Compartment

30% of the words read out were heard correctly and 30% heard were incorrectly identified due to confusion of consonants and sibilants. Engine sounds are less audible in this compartment. With maximum output from the passenger address amplifier the sound level was acceptable but distorted.

Rear Compartment (lounge)

This is the quietest compartment and almost 50% of the words used were correctly identified when the amplifier was on maximum output. This was too loud for the observer seated in the rear armchair.

/Toilets

Toilets

Forward Toilet

Loud ambient noise made the F.A. unintelligible.

Rear Toilet

This compartment is comparable to the rear compartment for ambient noise level and gave similar results.

4. Radar

4.1 A.R.I. 23116/3 Air Search Radar E.190

Part 1 of AAEE/943 recommended that a visor be provided for viewing the display in bright sunlight. XS 794 was fitted with a prototype visor (Mod. 1556) which was satisfactory.

5. Compatibility

5.1 V.O.R./U.A. 60 Intercom

With V.O.R. switched on and beacon signals being received both pilots could hear these signals without having V.O.R. selected on their station boxes.

5.2 H.F. and V.H.F./Passenger address

H.F. and V.H.F. transmissions were broadcast over the passenger address system.

5.3 U.H.F., V.H.F. and H.F./localiser and glidepath

U.H.F., V.H.F. and H.F. Transmissions were made on the following frequencies while flying on Boscombe Down Localiser and Glidepath with no adverse effects -

Service	H.F. in Kc's	V.H.F. in Mc/s	U.H.F. in Mc/s
Localiser (111.7 Mc/s)	11312	134.3 & 134.35	234.7 & 234.75 296.2 & 296.25 357.7 & 357.75
Glidepath (333.5 Mc/s)	19375	118.3 & 118.35 123.6 & 123.65 128.9 & 128.95 121.75 & 121.8	231.1 262.9 & 262.95 301.65 & 301.7 372.25

6. Temperatures

6.1 Temperature Elements

Sixteen temperature elements were fitted in the radio crates so that the radio equipment environment temperatures could be measured in a fully furnished aircraft and be compared with those recorded in XS 789 unfurnished. In addition temperature sensitive strips were placed inside the Decca receiver A and B units. These strips indicate spot temperatures of 65.5°C, 76.7°C, 87.9°C and 104.5°C, by changing colour when the particular temperature is reached. The positions of the temperature elements and temperature sensitive strips are given in Appendix II.

6.2 Trials Area and Period

Four sorties were carried out at Bahrein during the period 26th July to 2nd August 1965. Temperatures were also recorded during the return flight from Bahrein to Akrotiri.

6.3 Trials Method and Results

Prior to each flight the aircraft was subjected to a hot soak of duration approximately 3½ to 4 hours. Doors and windows were closed except during the period of "before flight" inspection. Temperature measurements were taken before the start of the hot soak and recordings started again fifteen minutes before take-off; temperatures were then recorded at approximately ten minute intervals until the end of the sortie. The results of these temperature measurements are shown graphically in Figures 1 to 16. The results of the four sorties flown are surveyed in paras. 6.3.1 and 6.3.2. Sortie conditions are given in Tables 6 a., b., c., d.

Table 6a. Sortie No. 1 - Low Level Sortie, Altitude 2,000 ft. 26-7-65

Event	Time (Local)	O.A.T. °C	Humidity grains of water/ lb. dry air	Comments
Start of hot soak	0900	+36	175	Repeat of sortie required due to failure of the cold air unit one hour after take-off. Before the failure the cabin temperature stabilised at 31°C, rising rapidly to 38°C after the failure. Results in Figures 1-4.
Take-off	1245	+37	152	
In flight (2,000 ft.)		+40		
Land	1505	+37	152	

Table 6b. Sortie No. 2 - Medium Level Sortie Altitude 9,500 ft.-10,000 ft. 28-7-65

Event	Time (Local)	O.A.T. °C	Humidity grains of water/ lb. dry air	Comments
Start of hot soak	0900	+34	129	Results in Figures 5-8
Take-off	1235	+38	102	
In flight (10,000 ft.)		+17		
Land	1425	+38	130	

/Table c.

Table 6c. Sortie No. 3 - Low Level Sortie, Altitude 3,500 ft.-4,500 ft.
29-7-65

Event	Time (Local)	O.A.T. °C	Humidity grains of water/ lb. dry air	Comments
Start of hot Soak	0900	+35	149	Cabin temperature tended to rise in the crew compartment, although the temperature control was set to fully cold. (See Fig. 9). Altitude of sortie governed by met. conditions. Results in Figures 9-12.
Take-off	1230	+37	150	
In flight (3,500 ft.- 4,500 ft.)		+33-36		
Land	1515	+38	158	

Table 6d. Sortie No. 4 - High/Medium Level Sortie, Altitude 17,000 ft.-10,000 ft.
30-7-65

Event	Time (Local)	O.A.T. °C	Humidity grains of water/ lb. dry air	Comments
Start of Hot Soak	0900	+35	132	Results in Figures 13-16
Take-off	1230	+37	116	
In flight 17,000 ft.		- 2		
In flight 10,000 ft.		+16		
Land	1420	+39	100	

6.3.1 Temperature Measurements in Port and Main Radio Crates

The temperature results obtained in XS 794 were compared with those obtained during trials in XS 789.

The temperature difference between the top and bottom of the crates at no time exceeded 7°C in the port crate and 5°C in the main crate, in XS 794. This was an improvement on XS 789, where temperature differences of 12°C existed. The temperature rise through the crates maintained a fairly constant relationship to cabin temperature in the cabin temperature range 25°C to 40°C. The rise in the port crate was about 15°C and in the main crate about 10°C. When the cabin temperature dropped below 25°C, the crate temperature responded slowly, taking one hour to stabilise at a lower level. The temperature recorded at individual components were satisfactory.

6.3.2 Temperature Measurements in the Starboard Radio Crate

In Andover XS 794 modifications were made to the starboard radio rack to comply with the Decca Mk. 1 Air cooling requirements (Mod. 1092). These modifications had not been incorporated in Andover XS 789 at the time of the trials on this aircraft.

Analysis of the temperature results in XS 794 have shown that the temperature rise through the starboard crate maintains a constant relationship to the cabin temperature, in the range 25°C to 40°C, but when cabin temperature is reduced below 25°C there is a long time lag before the crate temperature stabilises at the lower level.

The Decca cooling fan intake temperature was found to be 10°C above that indicated on the cabin temperature thermometer. There are two apparent reasons for this:-

- (a) Warm air rising to the top of the crate is being recirculated by the fan.
- (b) The air inlet to the crate is in the crew compartment, in an area which is known to be 4°C warmer than the cabin temperature.

It was found that there was a rise of 10°C between the Decca fan inlet temperature and the outlet temperature at the Decca receiver A and B units.

Examination of the temperature sensitive strips in the Decca receiver A unit showed that a temperature of 76.7°C had been reached inside the equipment. This temperature is well below that at which the thermal cut-out will operate (85°C). The maximum temperature recorded on the sensitive strips in the Decca receiver B unit was 87.9°C but the strip on the lid was just beginning to darken, indicating that the unit had run very close to the temperature at which the thermal cut-out operates (100°C).

The limiting inlet temperatures for the Passenger Address Amplifier and the E.190 cooling air were not exceeded.

7. Conclusions

7.1 G.4B Gyro Magnetic Compass Installation

The changes in the fore and aft component of hard iron magnetism between ground and air conditions still existed on XS 789 after the aircraft had been in service for six months.

These changes were not found on XS 791 and XS 794 and are not expected to be found on other Andover V.I.P. aircraft. (para. 2.1).

7.2 A.R.I. 23122/2, Decca Doppler 62M, Computer 9476B, Control and Display 9478

The 1.6° track error observed during the trials on XS 789 was not apparent during route flying, or the further tests on XS 794. The overall accuracy of the aircraft D.R. navigation system on XS 794 was satisfactory. (para. 2.3).

7.3 A.R.I. 23102/1, Decca Navigator Mk. 1 (Air) and Flight Log

The Decca Navigator and Flight Log functioned satisfactorily in tropical conditions when installed in a modified crate with improved cooling (Mod. 1092). (para. 2.4).

7.4 A.R.I. 23090/2 - H.F.

The aerial tuning unit functioned correctly. (para. 3.1).

7.5 A.R.I. 23097 - Selcal

The Selective Calling System was triggered by ground station calls, on quiet frequencies, at ranges much less than the maximum expected using the A.M. mode. On busy carrier frequencies the range of successful calls was reduced still further. (para. 3.2).

7.6 A.R.I. 23145/2, Passenger Address

The intelligibility of the passenger address was poor in all compartments. Unacceptably high levels of breakthrough from H.F. and V.H.F. were obtained. (para. 3.3).

7.7 A.R.I. 23116/3, Air Search Radar E.190

The prototype visor provided was satisfactory. (para. 4.1).

7.8 Compatibility

7.8.1 V.O.R. could be heard by both pilots when not selected. (para.5.1).

7.8.2 H.F. and V.H.F. could be heard on the passenger address system in the cabin. (para. 5.2).

7.8.3 Selected V.H.F., U.H.F. and H.F. transmissions had no adverse effect on the I.L.S. while flying on Boscombe Down I.L.S. beam. (para. 5.3).

7.9 Temperatures

The temperatures recorded in the fully furnished aircraft were satisfactory for cabin temperatures up to 40°C. (para. 6.3.1).

The temperatures measured in the starboard radio crate with revised Decca Mk. 1 Air cooling arrangements to Decca specification (Mod. 1092) were satisfactory. The cooling fan, part of Mod. 1092, failed between Akrotiri and Bahrain and was changed. (para. 6.3.2).

8. Recommendations

8.1 G.4B Gyro Magnetic Compass

C.A. release is recommended. The gyro magnetic compass installation is unsatisfactory in XS 789 and the Queen's Flight must be informed accordingly.

8.2 A.R.I. 23122/2, Decca Doppler 62M, Computer 9476B, Control and Display 9478

C.A. release is recommended.

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- 12 -

8.3 A.R.I. 23102/1, Decca Navigator Mk. 1(Air) and Flight Log

C.A. release is recommended for equipment modified as listed in Appendix I installed in a radio crate with Mod. 1092 incorporated. (para. 8.9 refers).

8.4 A.R.I. 23090/2, H.F.

C.A. release is recommended.

8.5 A.R.I. 23097 - Selcal

C.A. release is recommended subject to the Air Staff accepting the limited range capability, and the operators being made aware of this limitation.

8.6 A.R.I. 23145/2, Passenger Address

C.A. release is not recommended.

8.7 A.R.I. 23116/3, Air Search Radar E.190

Modification 1556 introducing a visor for shielding sunlight from the face of the cathode ray tube is recommended for incorporation in all Andover aircraft.

8.8 Compatibility

The incompatibilities reported at para. 7.8 must be eliminated.

8.9 Temperatures

C.A. release is recommended for operation in O.A.T's of 45°C provided Mod. 1092 is incorporated. (Appendix I refers).

The incorporation of Mod. 1092 in Andover C. Mk. 1 and C. Mk. 2 aircraft is recommended.

9. Work outstanding

The statements made in the 1st Part of Report No. AAEE/943 were discussed with H.S.A. Limited at Chadderton on 26th November 1964. The Firm recommended a series of modifications to remedy the criticisms made. Those modifications not incorporated are listed in Appendix III together with recommendations for action by D.L.R.D.(A) A.L. 10 on embodiment loan equipment.

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Appendix I

Modifications Incorporated in Andover C. Mk. 2 XS 794

(a) T.I. Modification 1092

Modifications to the starboard radio rack (Mod. 1092) were incorporated which complied with the Decca requirement and submitted for evaluation as a trial installation in XS 794. In the new arrangement the Decca Mk. 1 Air compartment was isolated from the rest of the radio rack effectively becoming a separate box with its own cooling arrangements within the confines of the starboard radio rack. It included an additional fan, automatically switched off for temperatures below 25°C taking air from the existing air inlet above the navigator's table. The air was ducted into a plenum chamber beneath the A and B units, through and out of the top and rear of the units. The expelled air was exhausted from the bottom of the compartment into the air space below the floor.

(b) Mod. 8706

Introduction of a microphone isolation network to prevent interference from U.H.F.

(c) Mod. 9083

To permit the P.A. system to be used only when the switch is in the R/T position. Incorporated by contractor with Mod. No. 8706.

(d) Mod. 1556

To introduce a visor for the E.190 Air Search Radar.

(e) Mod. 1199

To make the V.S.W.R. meter on the H.F. visible to the navigator. Also covered by command mod. TC/01 Andover.

(f) Modification State of the Decca Mk. 1 Air equipment as known at 29.5.64

R.M.C. No.

7904	Mark 10 suppression.
6761	Change of R cath. R.084. Receiver Sub Assy. M.13, 14, 15, 16.
6870	Switch unit 10F/21091 - Supply Volts.
7348	Palliative remedial measures - Separation of internal irradiated polythene wiring.
7797	PTFE heaters. (rewiring of Valve heaters.)
7798	Combination of 7348 and 7797 when unmodified equipment is returned to manufacturer.

RESTRICTED

Appendix I (Contd.)

- 2 -

R.M.C. No.

- 7871 Modification on failure only. Change S.R.C. Capacitor fitted to No. 1 ferrox assembly. Applies to Osc M40 only (not incorp).
- 7976 Modification on failure only. Replace all silver mica C's by S.T.C. equivalents. (Incorp in part).
- 8408 Case sub Assy "A" box and "B" box.
10P/16288 10P/16289
concerning fitting of Thermal cut outs.
- 8406 Het. osc M39 - Thermal cut outs.
- 8407 Display Output M5 - Thermal cut outs.
- 7264 Use of improved Thermal fuse (20W oven)

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Appendix II

Temperature Elements

Temperature elements were fitted in each of the three radio crates so that temperatures measured in a fully furnished aircraft could be compared with those measured in XS 789 in June 1964 when unfurnished. A trial installation of Decca Mk. 1 Air revised cooling to Decca specification was fitted in the starboard radio crate. Temperatures were measured at the following points.

Navigator's Crate

- In the outlet duct at top of crate
- Under the H.F. Aerial tuning unit
- Under the I.F.F. Mk. 10 Transponder
- Under the Selcal unit
- Under the I.F.F. Coder unit
- Under the radio compass receiver
- Under the Sperry Flight Computer
- At U.H.F. T.R. cooling air intake
- Under Decca Doppler Computer
- At H.F. Tx/Rx Blower motor air intake

Port Radio Crate

- In the outlet duct at top of crate
- In the outlet duct at bottom of crate
- Under No. 1 V.H.F. Tx/Rx
- Under No. 2 V.H.F. Tx/Rx
- Under No. 1 Nav. unit

Starboard Radio Crate

- Under the F.A. amplifier
- A.S.R. Tx/Rx Cooling air intake
- At Outlet from Decca 1 air B unit
- At Inlet to Decca cooling fan
- At outlet from Decca A unit
- Decca F.U. Cooling air outlet

Rear of fuselage

- Doppler Tx (Rx Air Inlet)

Decca Navigator A and B Units

Temperature sensitive strips were placed inside the A and B units. These strips indicate spot temperatures of 65.5, 76.7, 87.9 and 104.5 C, by changing colour when the particular temperature is reached. The strips were positioned as follows:-

(a) A Unit

- (i) On the cable loom above the Purple-Master oscillator, towards the rear of the unit.
- (ii) On the cable loom above the Red-Green oscillator, towards the rear of the unit.
- (iii) Two strips on the lid of the unit, at the rear.

/(b)

- 2 -

(b) B Unit

- (i) On the cable loom above the Red display output sub-assembly, towards the rear of the unit.
- (ii) Vertically beside the output amplifier valve on the Red display output.
- (iii) On top of the cable loom above the Lane Identification Switching unit.
- (iv) On the lid of the unit towards the rear.

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Appendix III

Work Outstanding

The following modification numbers refer to H.S.A. Limited, Avro Whitworth Division, numbering system, and these modifications have not been incorporated in Andover C. Mk. 2 aircraft sent to A. & A.E.E. for trials.

Mod. No.

- | | |
|------|--|
| 1194 | To improve lighting at the navigator's station and provide a switch for a wander light. |
| 1195 | To move the supernumerary crew member's oxygen regulator and intercom outboard and to provide stowage for oxygen mask with hose attached. |
| 1236 | To increase protection of Decca Doppler against ingress of rain and dirt.

To replace the existing I.L.S. marker lampholders with Page type lampholders. |
| 1191 | To introduce the A.Q.M. and A.C. intercom in V.I.F. aircraft. |
| 1226 | To introduce the Air Commodore's station box in Queen's Flight aircraft. |
| 1202 | To introduce feeder cable U.R. 74 for lower I.F.F. aerial. |

Item not classified by H.S.A. Ltd.

E.2B Compass

Changes of deviation between Radio Master switch "Power on" and "Power off" conditions have not been remedied so far. Proposals have been made by H.S.A. Ltd. as a result of their investigation on XS 794 at A. & A.E.E. These proposals need to be L.T.C. approved and submitted to A. & A.E.E. for evaluation.

Action required by D.L.R.D.(A) A.L. 10

Passenger Address

The clarity of the system must be improved and submitted for evaluation. H.F. and V.H.F. transmissions must be suppressed on the P.A. system.

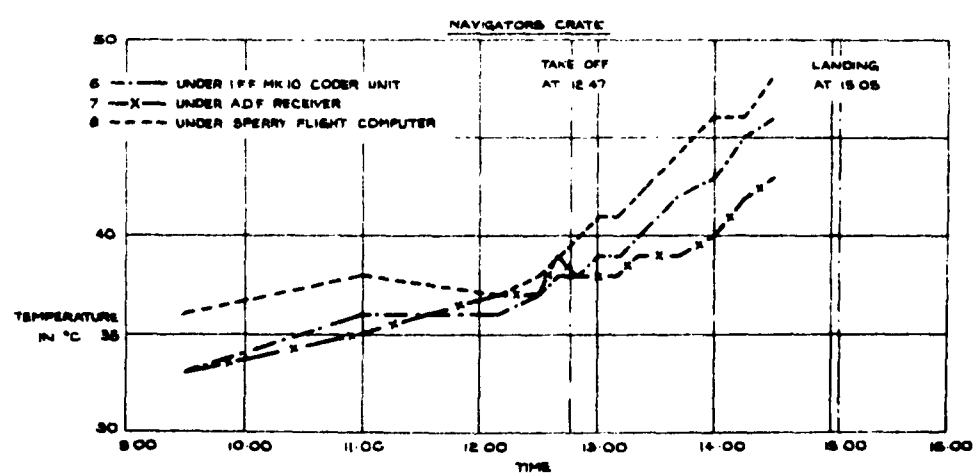
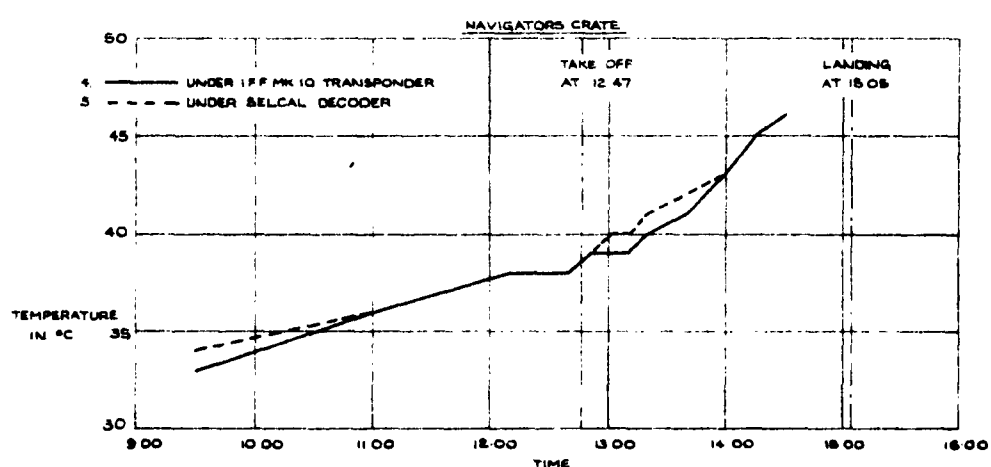
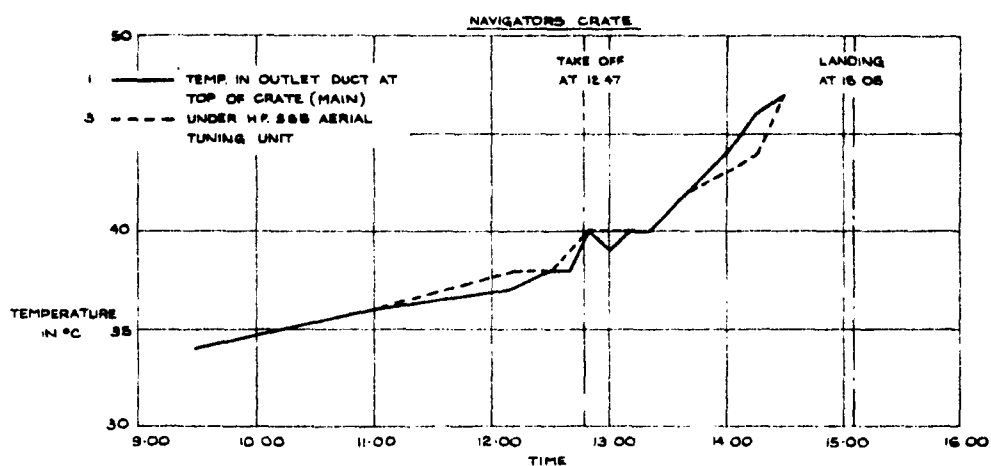
U.A. 601st Intercom

Ultras should be invited to reduce cross talk from V.O.R. when not selected at the pilot's station.

Selcal

The poor performance of Selective Calling should be investigated and remedied.

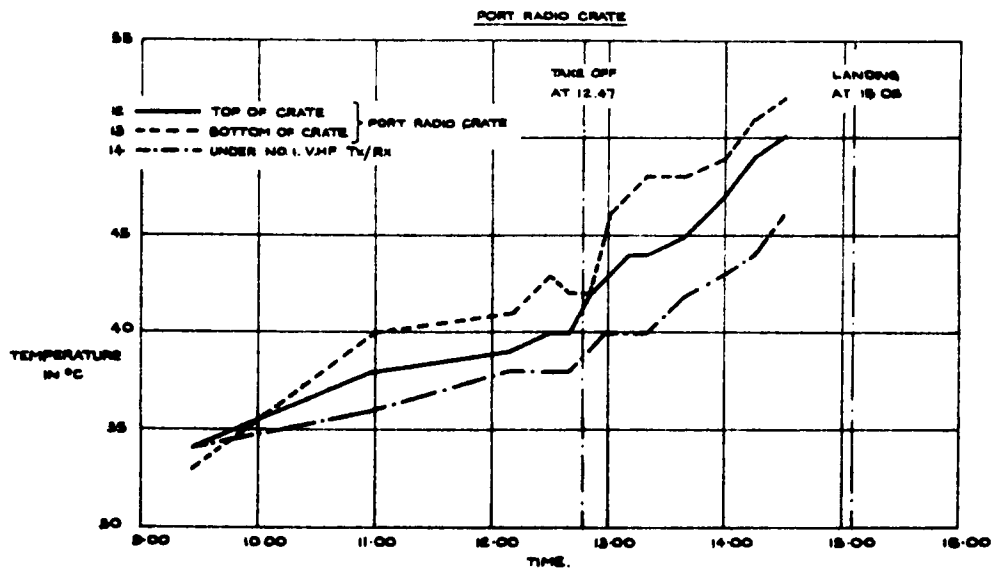
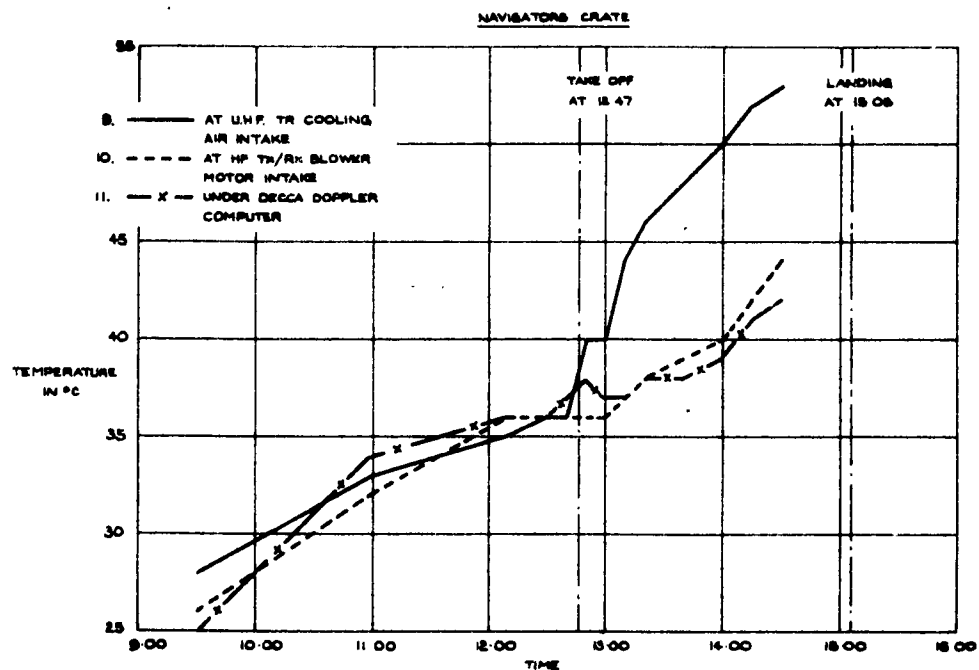
FIG. 1.



TEMPERATURE MEASUREMENTS. 26.7.65
TROPICAL SORTIE N°1 AT BAHRAIN.

FIG.2.

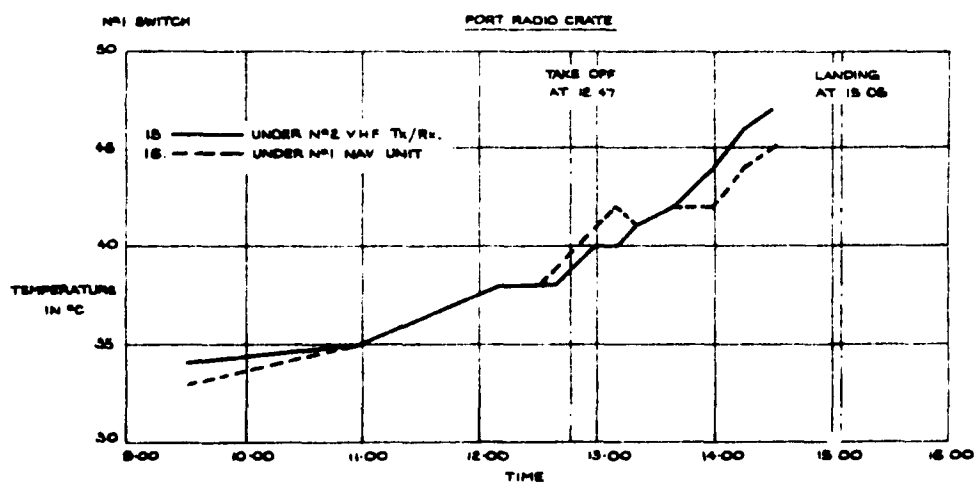
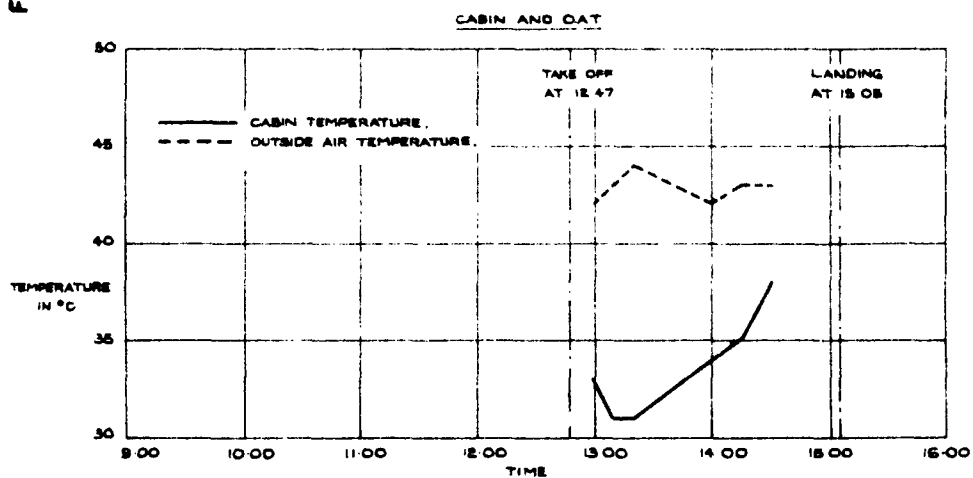
FIG.2.



TEMPERATURE MEASUREMENTS 26.7.65
TROPICAL SORTIE N°1 AT BAHRAIN.

FIG.3.

FIG. 3.



TEMPERATURE MEASUREMENTS 26-7-65
TROPICAL SORTIE N°1. AT BAHRAIN.

FIG. 4.

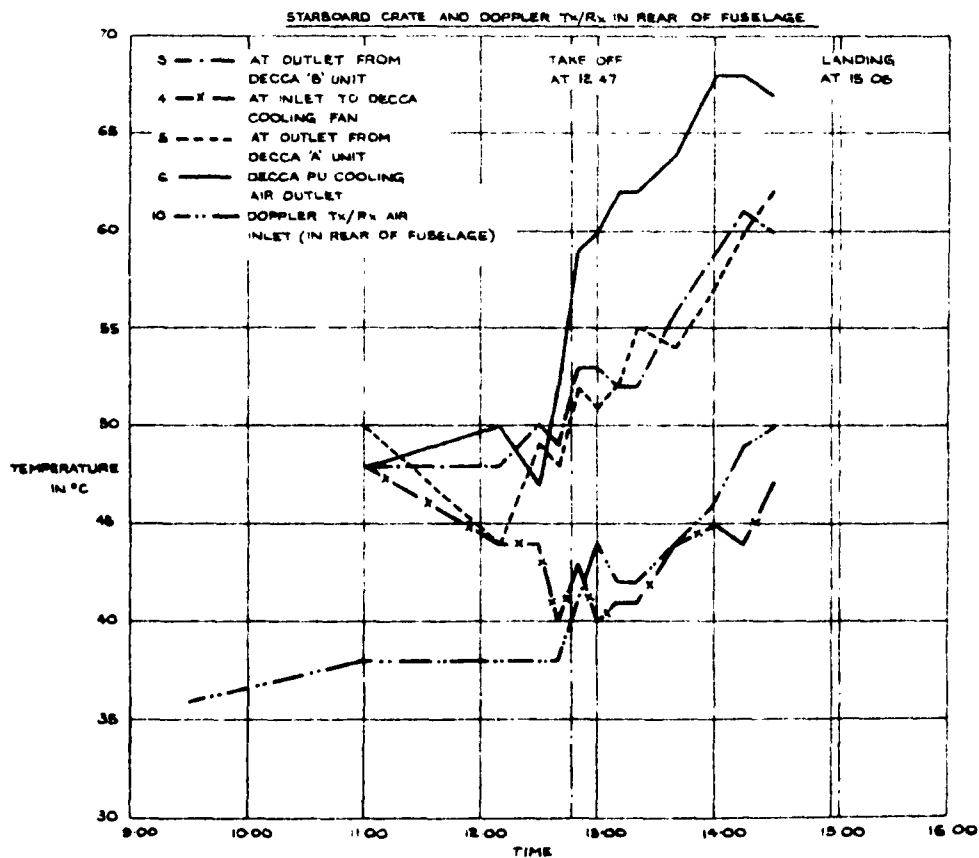
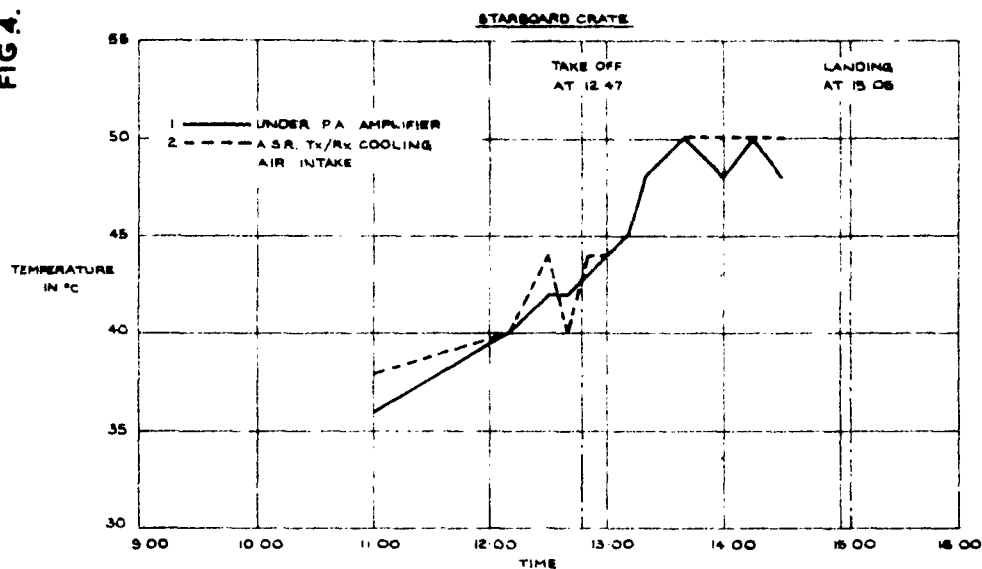


FIG. 4.

TEMPERATURE MEASUREMENTS 26-7-65
TROPICAL SORTIE N°1 AT BAHRAIN.

FIG. 5.

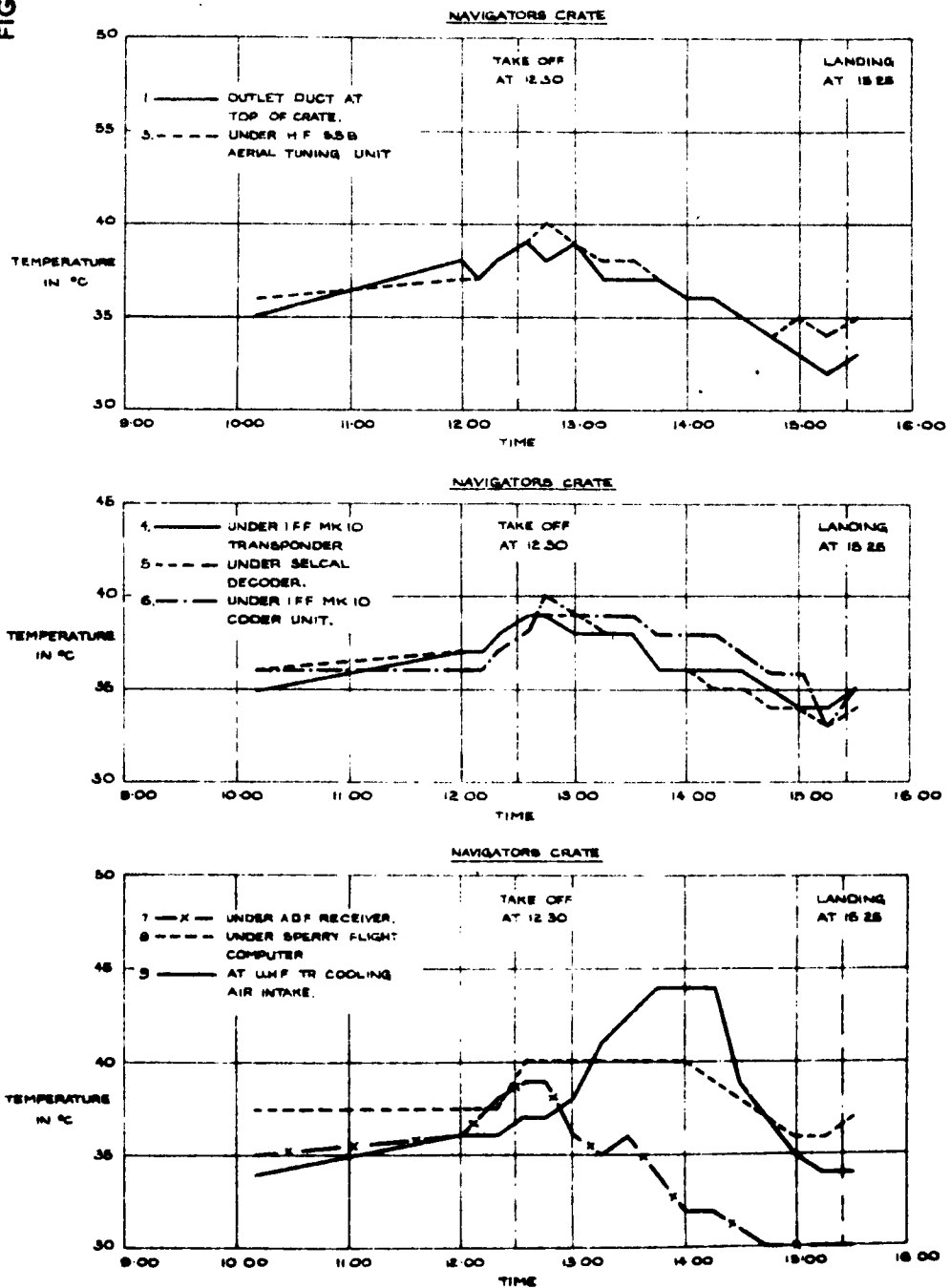


FIG. 5.

TEMPERATURE MEASUREMENTS 28.7.65
TROPICAL SORTIE N°2 AT BAHRAIN.

FIG. 6.

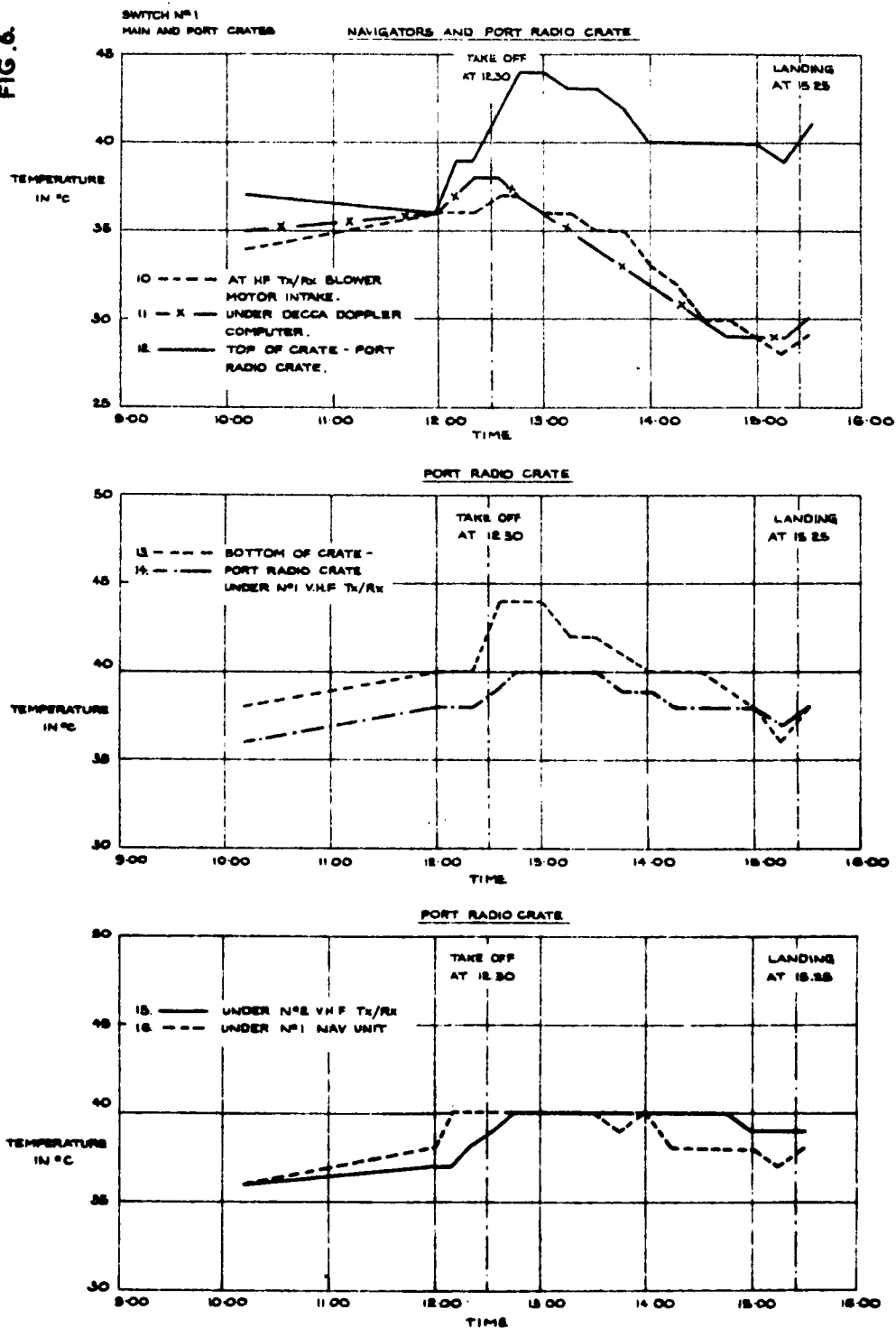
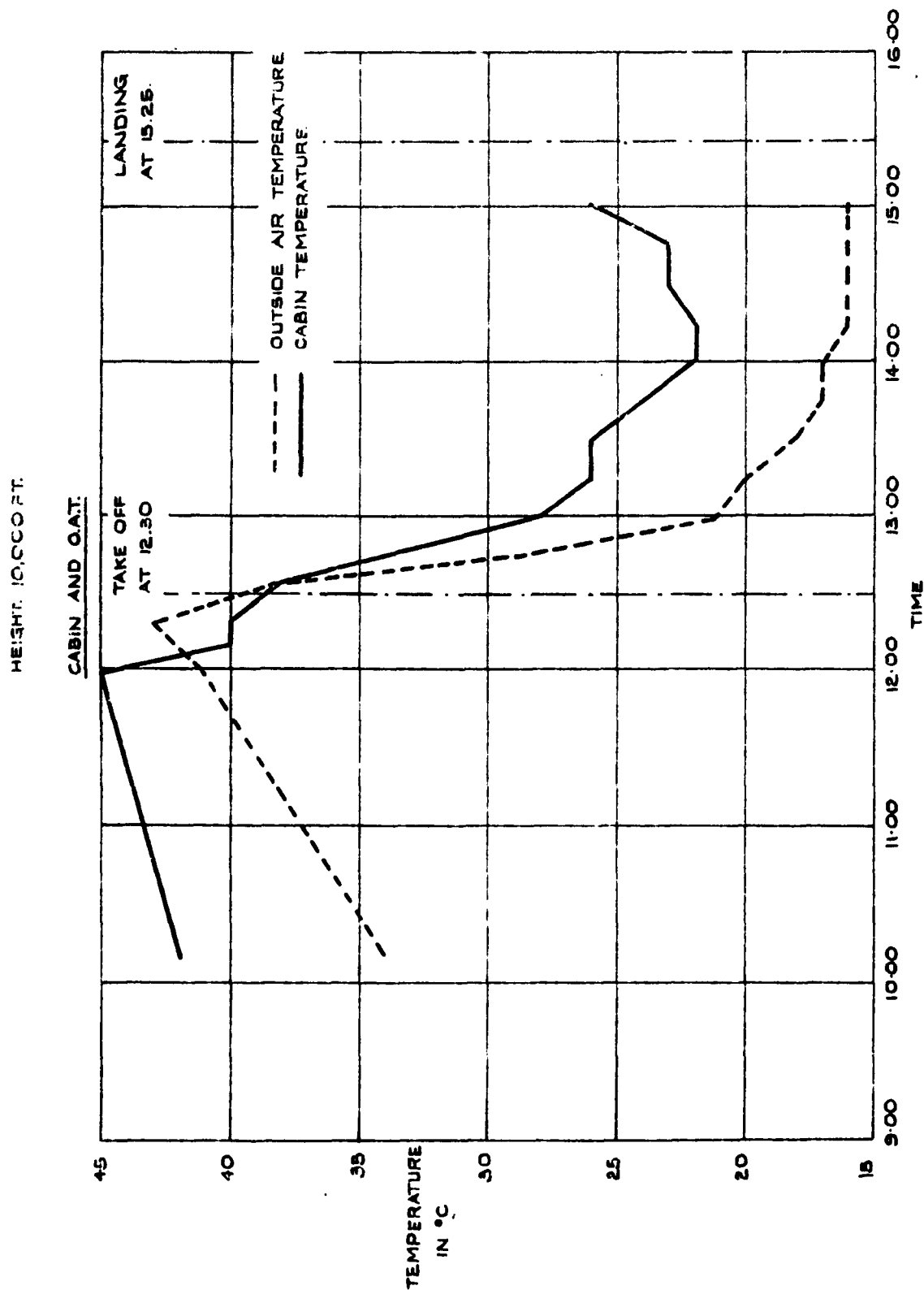


FIG. 6.

TEMPERATURE MEASUREMENTS 26.7.65
TROPICAL SORTIE N° 2 AT BAHRAIN.

FIG. 7.

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TEMPERATURE MEASUREMENT 28.7.65
TROPICAL SORTIE N° 2 AT BAHRAIN.

FIG. 8.

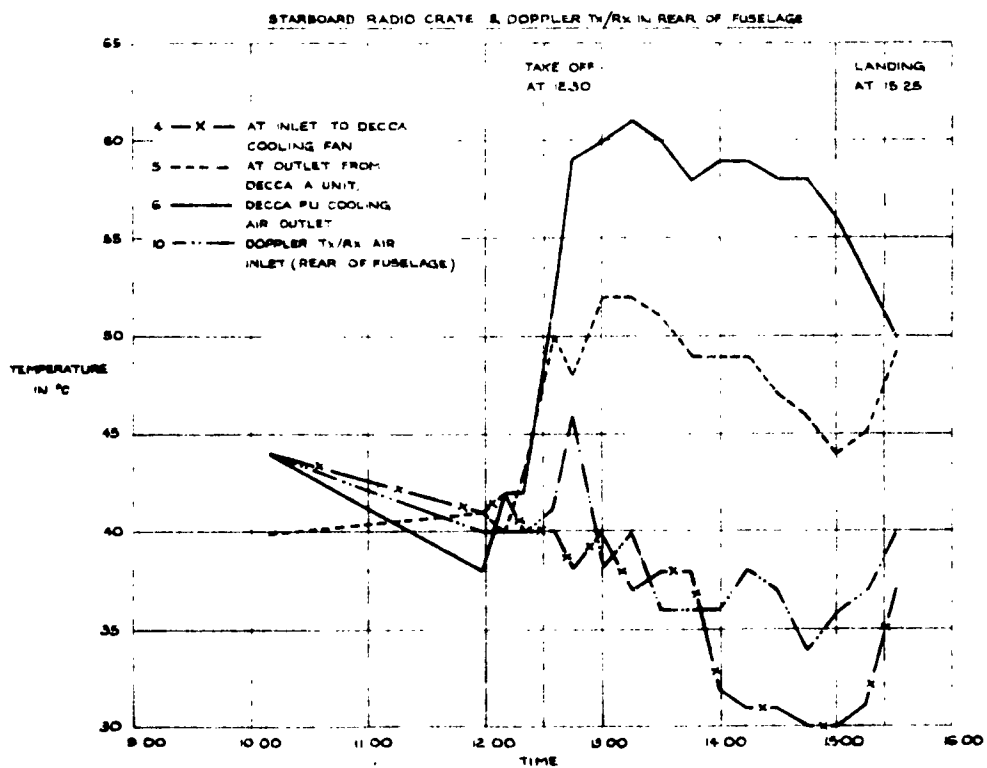
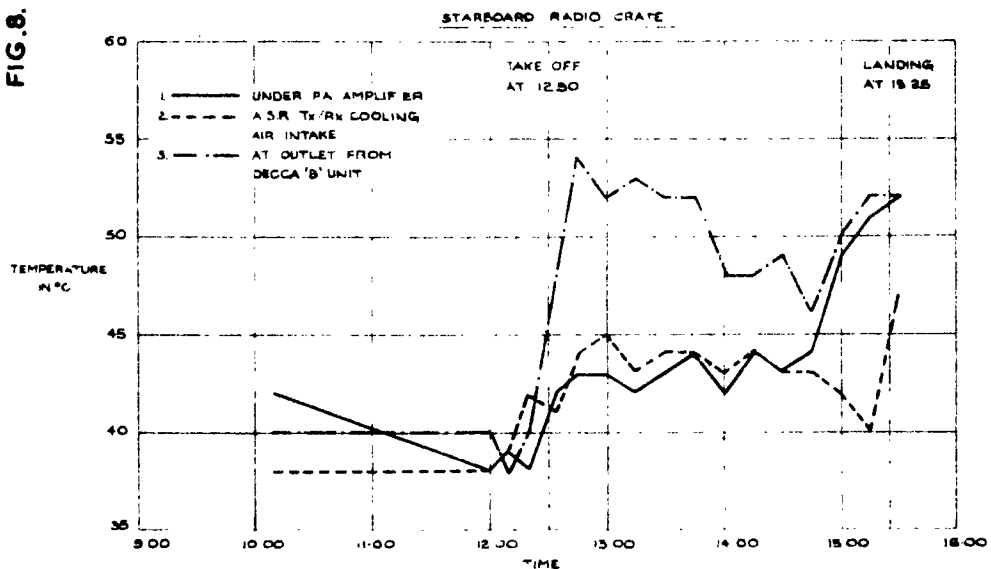


FIG. 8.

TEMPERATURE MEASUREMENTS 28.7.65.
TROPICAL SORTIE N°2 AT BAHRAIN

FIG. 9.

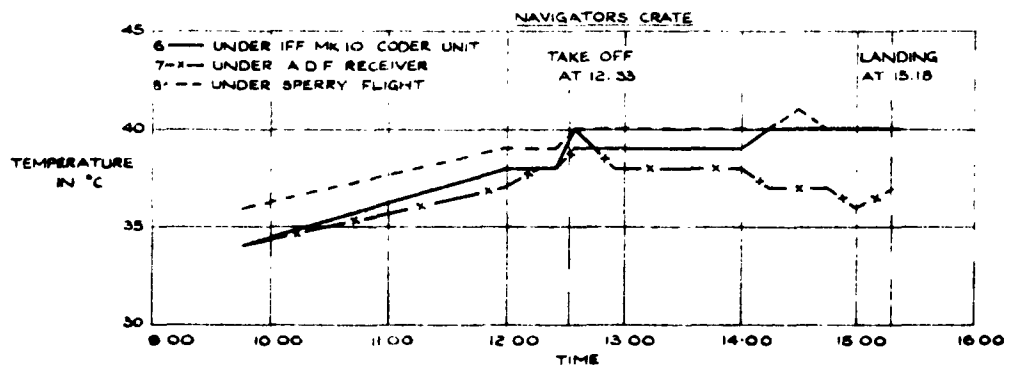
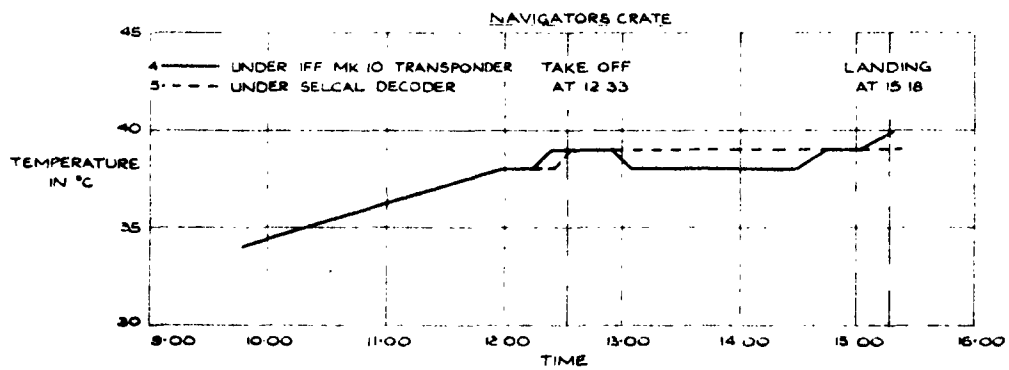
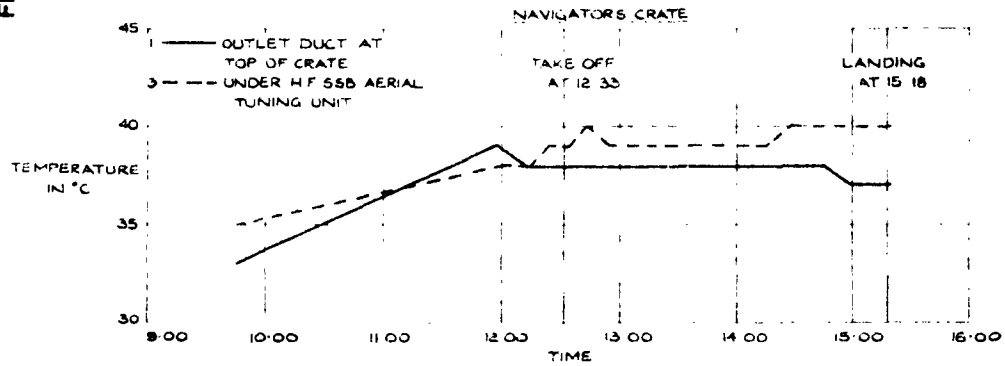
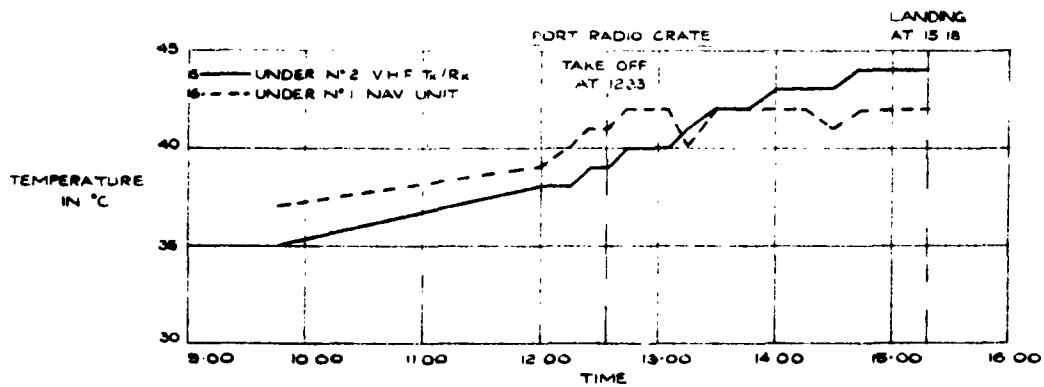
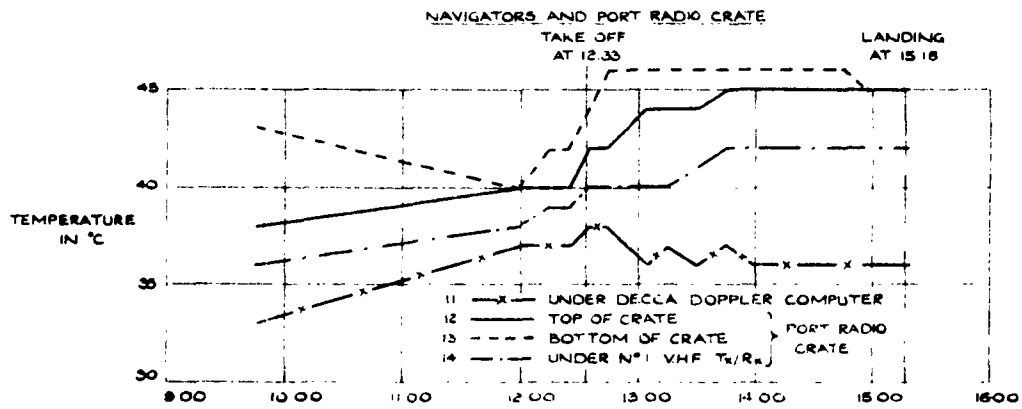
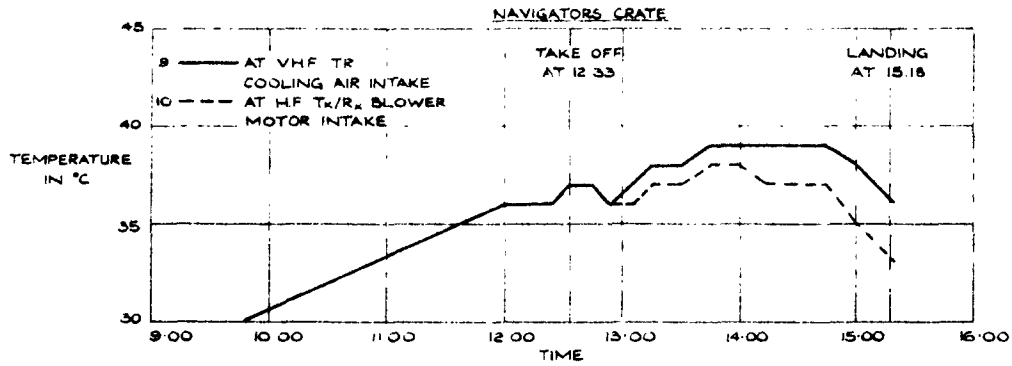


FIG. 9.

TEMPERATURE MEASUREMENTS 29.7.65
TROPICAL SORTIE N° 3 AT BAHRAIN.

FIG. 10.

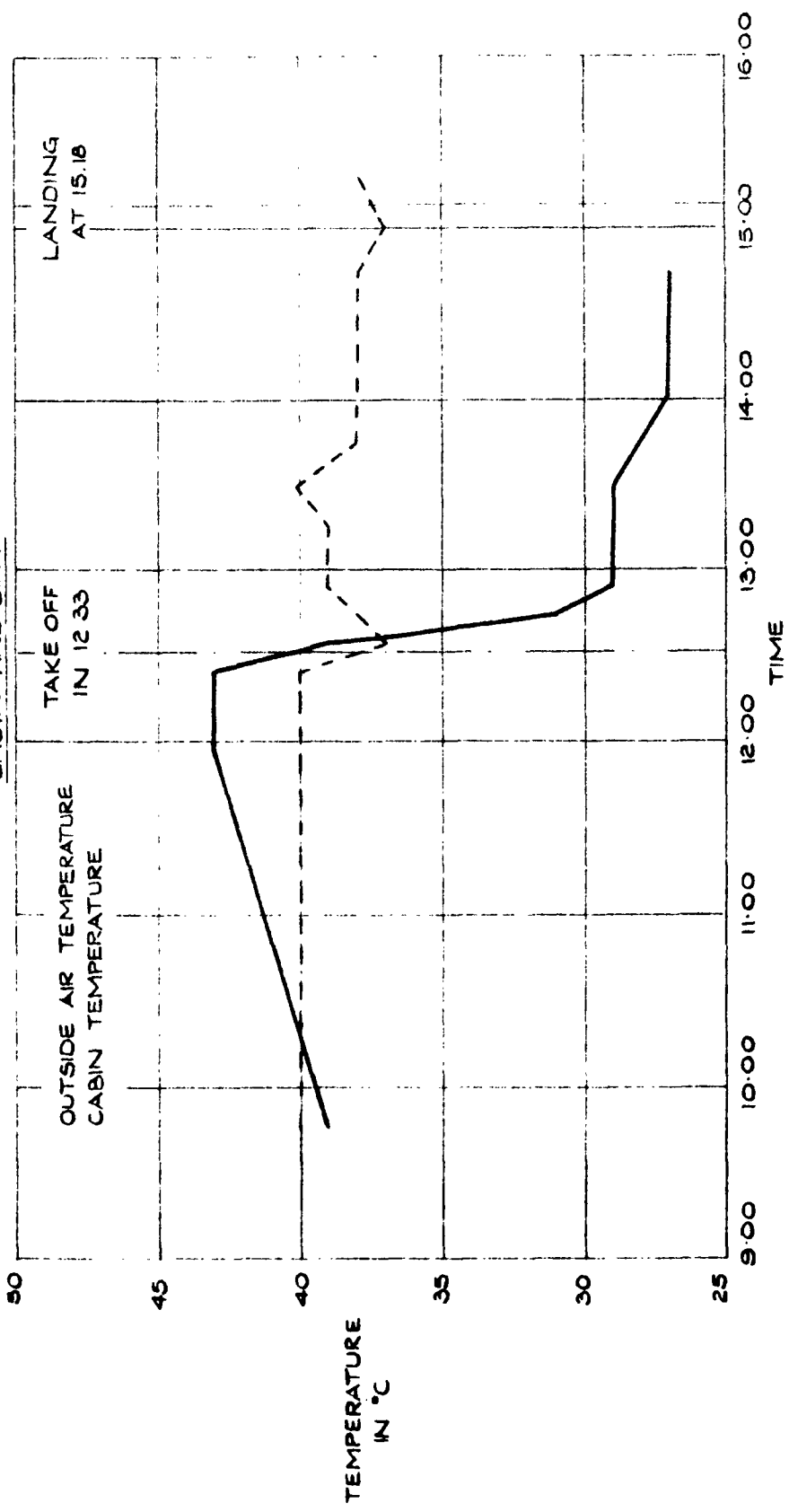


TEMPERATURE MEASUREMENTS 29-7-65
TROPICAL SORTIE N° 3 AT BAHRAIN.

FIG. 11

HEIGHT 3,500 TO 4,500 FT.

CABIN AND OAT

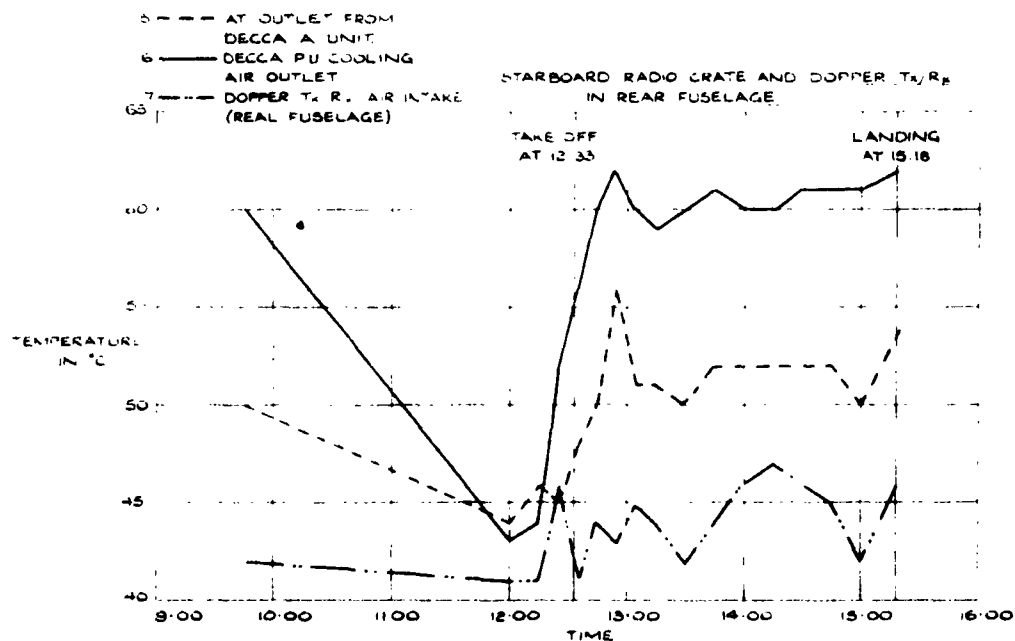
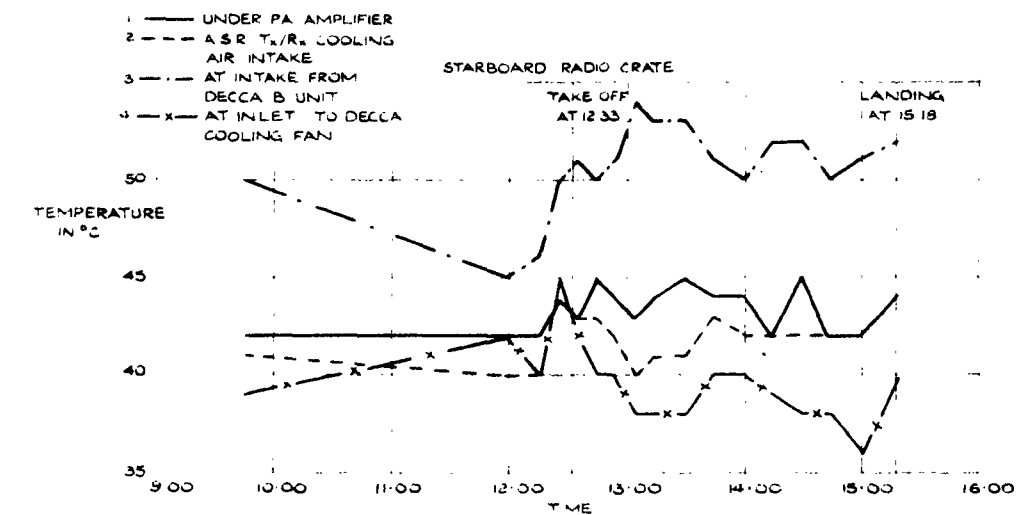


TEMPERATURE MEASUREMENTS 29.7.65
TROPICAL SORTIE N° 3 AT BAHRAIN.

FIG. 12.

SWITCH N° 2 STBD CRATE (EXCEPT 10)

FIG. 12.



TEMPERATURE MEASUREMENTS 29.7.65
TROPICAL SORTIE N° 3 AT BAHRAIN.

FIG 13.

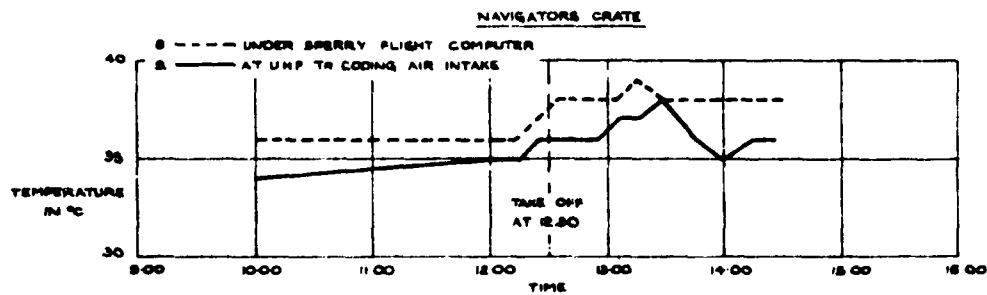
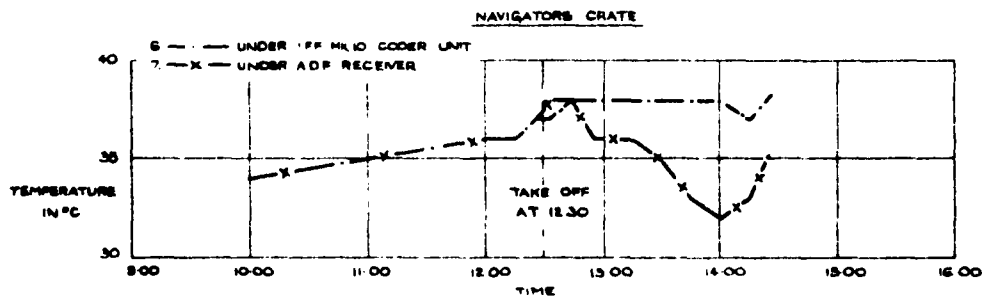
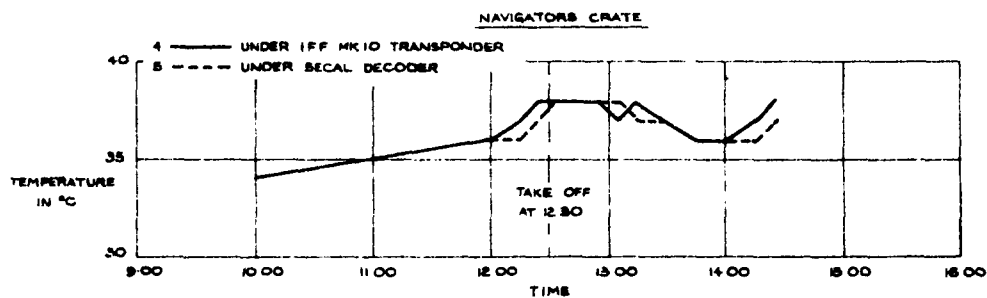
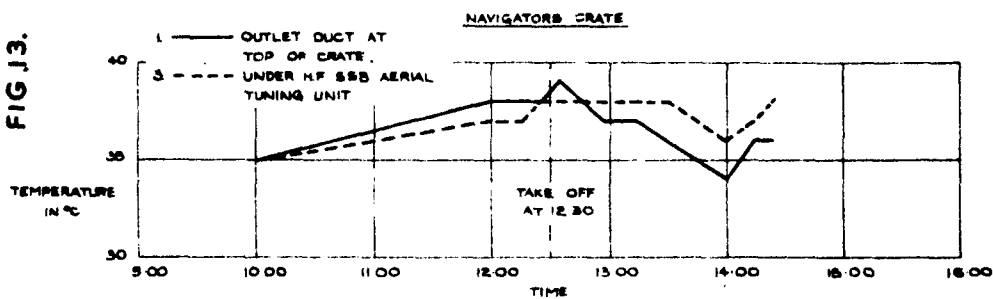
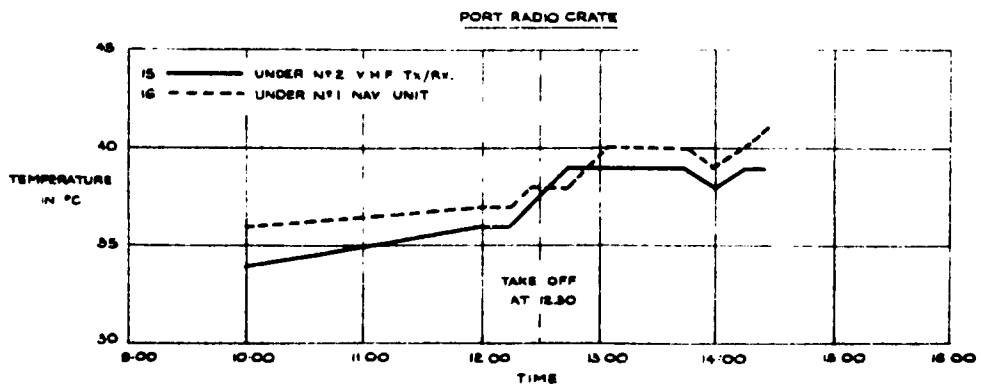
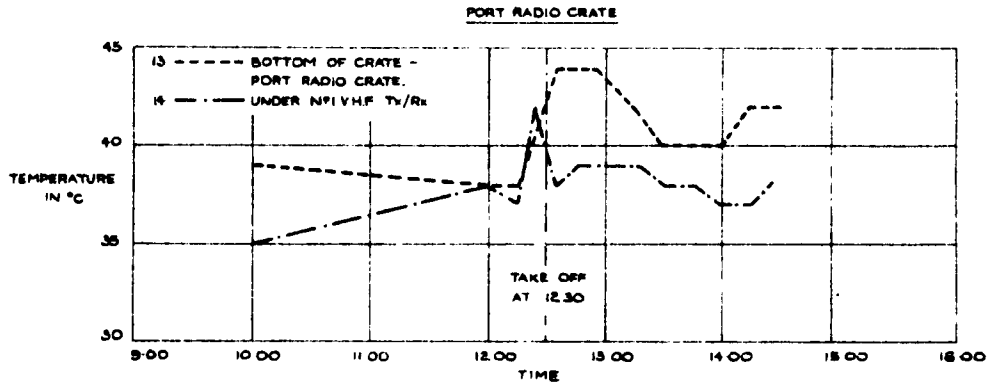
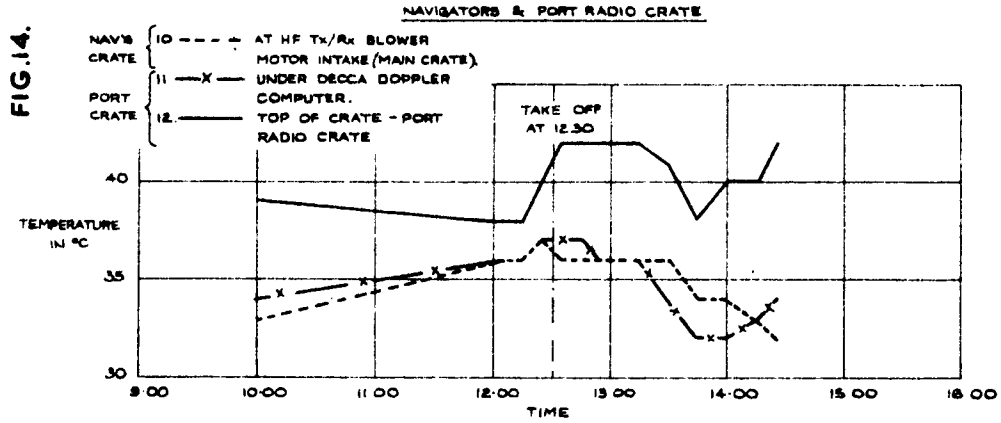


FIG 13.

TEMPERATURE MEASUREMENTS 30.7.65
TROPICAL SORTIE N°4 AT BAHRAIN.

FIG.14.

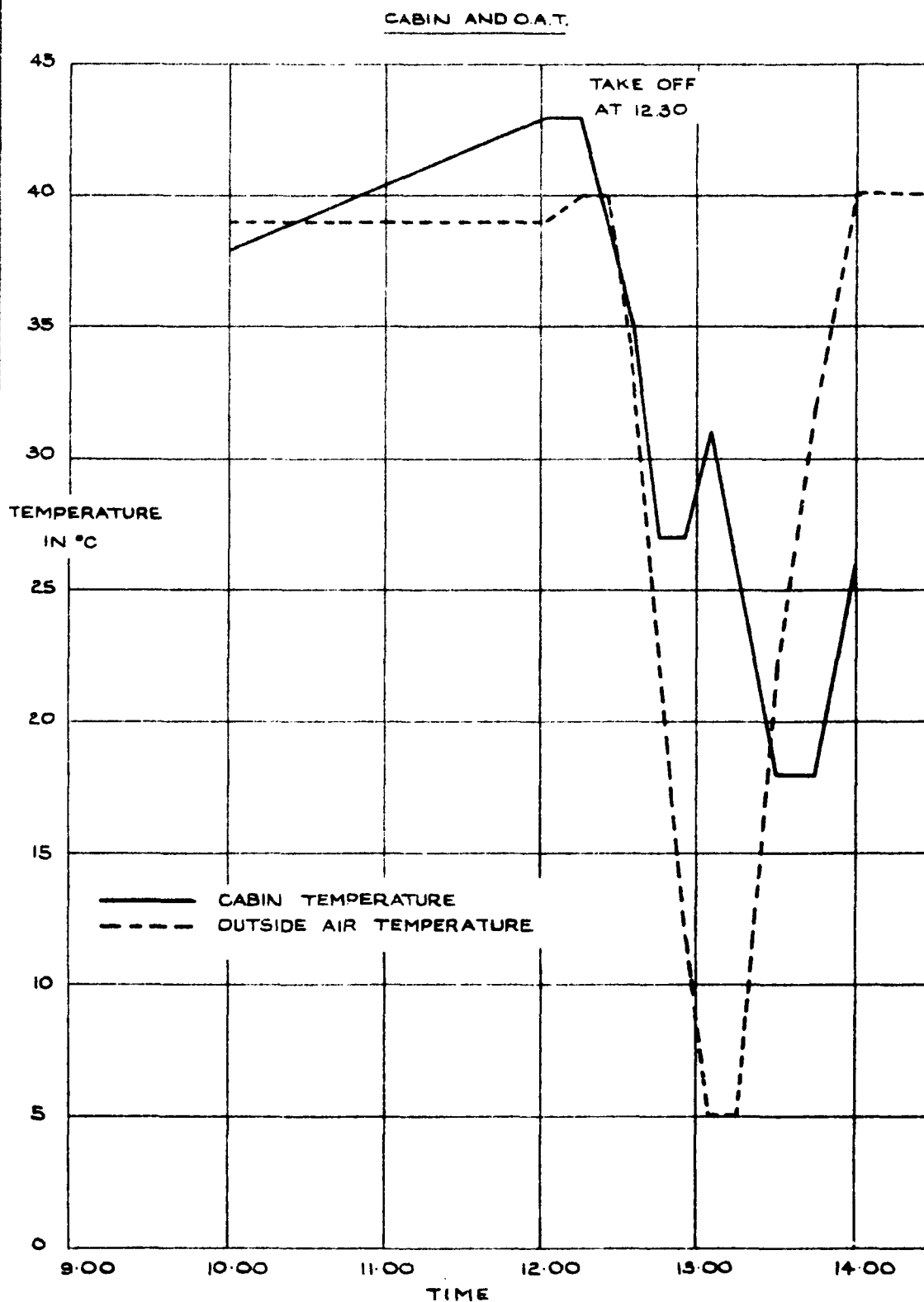


TEMPERATURE MEASUREMENTS 30.7.65
TROPICAL SORTIE N°4 AT BAHRAIN.

SK.B3912 2ND PART OF REPORT Nº A&AEE/943 ANDOVER C MX.2 XS 794 TR SJH. CH MR. WITHERS. APP. RW for S of NR 16.2.65

FIG.15.

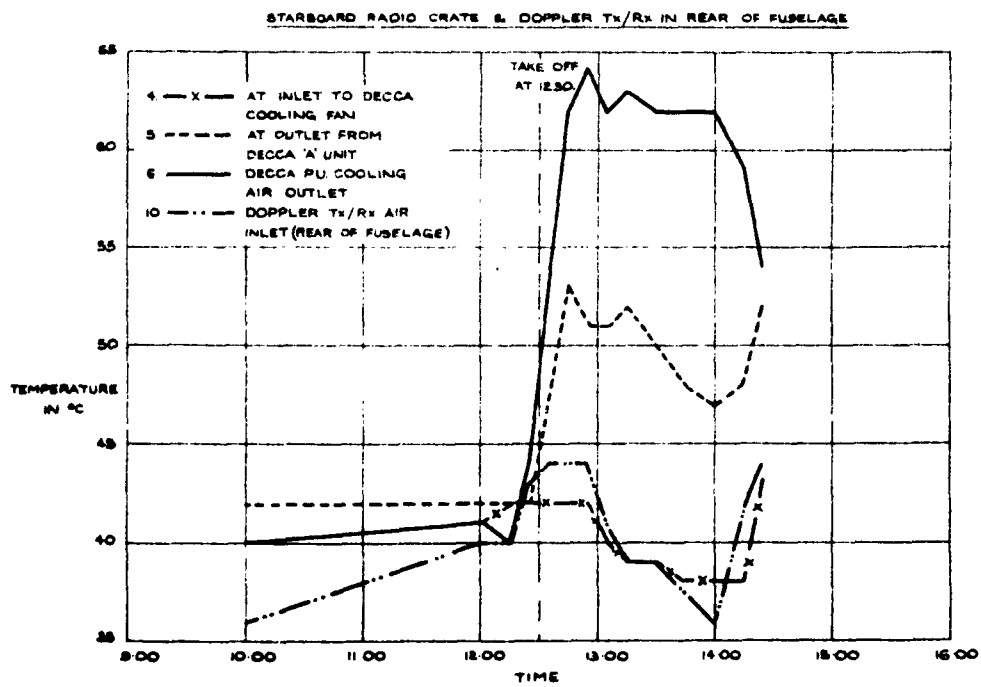
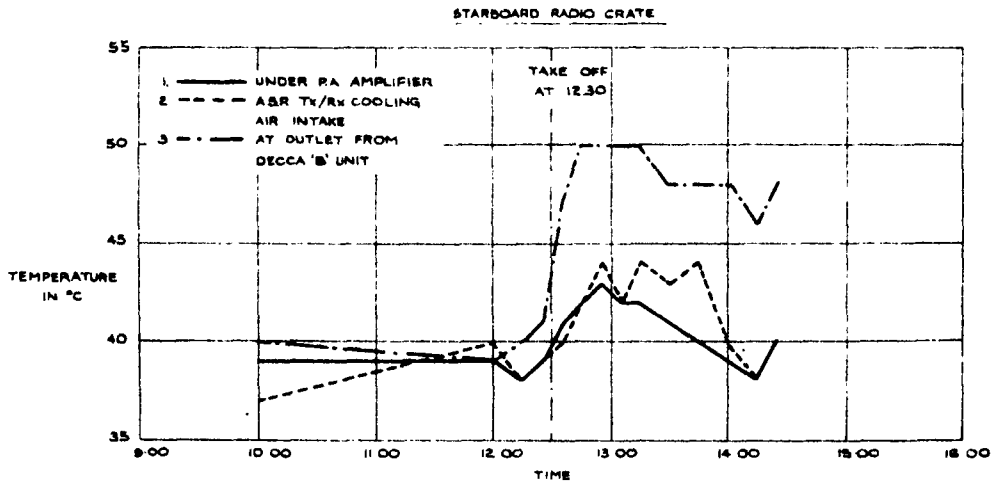
HEIGHT. 17,000 TO 10,000 FT.



TEMPERATURE MEASUREMENTS 30-7-65
TROPICAL SORTIE Nº4 AT BAHRAIN.

FIG.16.

FIG.16.



TEMPERATURE MEASUREMENTS 30.7.65
TROPICAL SORTIE N°4 AT BAHRAIN

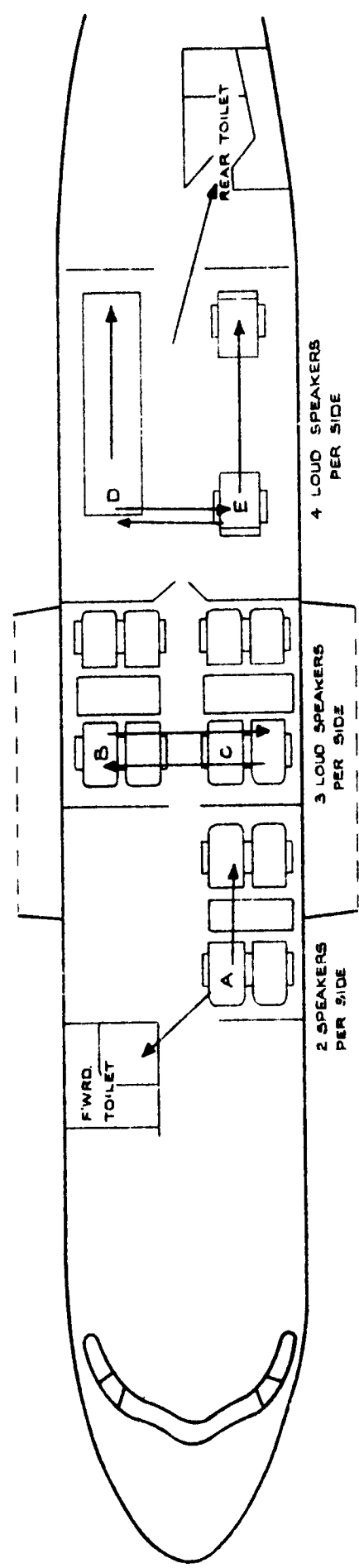


FIG. 17.

POSITION OF OBSERVERS DURING PASSENGER ADDRESS TRIALS
OBSERVERS CHANGED PLACES AS INDICATED

DETACHABLE ABSTRACT CARDS

These abstract cards are inserted in Reports for the convenience of Librarians and others who need to maintain an Information Index.

<u>RESTRICTED</u> 2nd Part of Report No. AMEE/943 AEROPLANE AND AIRCRAFT EXPERIMENTAL ESTABLISHMENT Flt. Lt. D.J. Castle, R.A.F. and A.V. Russ ANDOVER C. MK. 2 - NAVIGATION AND RADIO FLIGHT TRIALS This report covers 59 hours flight testing of the radio and navigation equipment in three different Andover C. Mk. 2 aircraft, all of them fully furnished and equipped. It complements earlier work on a less fully furnished aircraft and includes some check tests of equipment installation modifications and operating temperatures. The main equipment items dealt with are:- Decca Navigator Mk. 1 (Air) with cooling to Decca specification, GJB Gyro magnetic compass, Passenger address equipment, A.R.I. 23145/2, Selective Calling system, A.R.I. 23097. Recommendations already made for C.A. Release are confirmed or extended, and outstanding work re-stated.	<u>RESTRICTED</u> 2nd Part of Report No. AMEE/943 AEROPLANE AND AIRCRAFT EXPERIMENTAL ESTABLISHMENT Flt. Lt. D.J. Castle, R.A.F. and A.V. Russ ANDOVER C. MK. 2 - NAVIGATION AND RADIO FLIGHT TRIALS This report covers 59 hours flight testing of the radio and navigation equipment in three different Andover C. Mk. 2 aircraft, all of them fully furnished and equipped. It complements earlier work on a less fully furnished aircraft and includes some check tests of equipment installation modifications and operating temperatures. The main equipment items dealt with are:- Decca Navigator Mk. 1 (Air) with cooling to Decca specification, GJB Gyro magnetic compass, Passenger address equipment, A.R.I. 23145/2, Selective Calling system, A.R.I. 23097. Recommendations already made for C.A. Release are confirmed or extended, and outstanding work re-stated.
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Title: Andover C Mk2: navigation and radio flight trials
Availability Open Document, Open Description, Normal Closure before FOI Act: 30 years
Former reference (Department) 943 942
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