Chapter 7

◀*Revised up to modifications NDS/57 and RB/23*▶

OPERATION OF THE INTEGRATED SYSTEM

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Introduction

1. This chapter describes the manner in which the dynamic flight instruments are integrated into a sub-system. An introduction to the sub-system, with methods of securing the display units, is given in Chap. 1 of this section. Also included in Chap. 1 is a table which lists the various units and their A.P. references. A summary of each presentation in turn, together with the operation of the instrument as far as the presentation is concerned, is given in Chap. 3 to 6 inclusive. Reference should be made to fig. 7 for the system circuit.

POWER SUPPLIES

Power input supplies and fuses

2. The a.c. and d.c. supplies which are used to energize the integrated flight instrument system are derived from the aircraft's power supply lines via an a.c. distribution box and a d.c. feeder fuse panel respectively. These supplies are fed to the M.R.G. distribution box where they are distributed to the various units of the system (*fig.* 1). Control of the 115V, 400 c/s 3-phase and 28V d.c. supplies to the system is effected by an INSTRUMENT MASTER switch situated on the starboard console (*fig.* 2). The primary a.c. power source is an

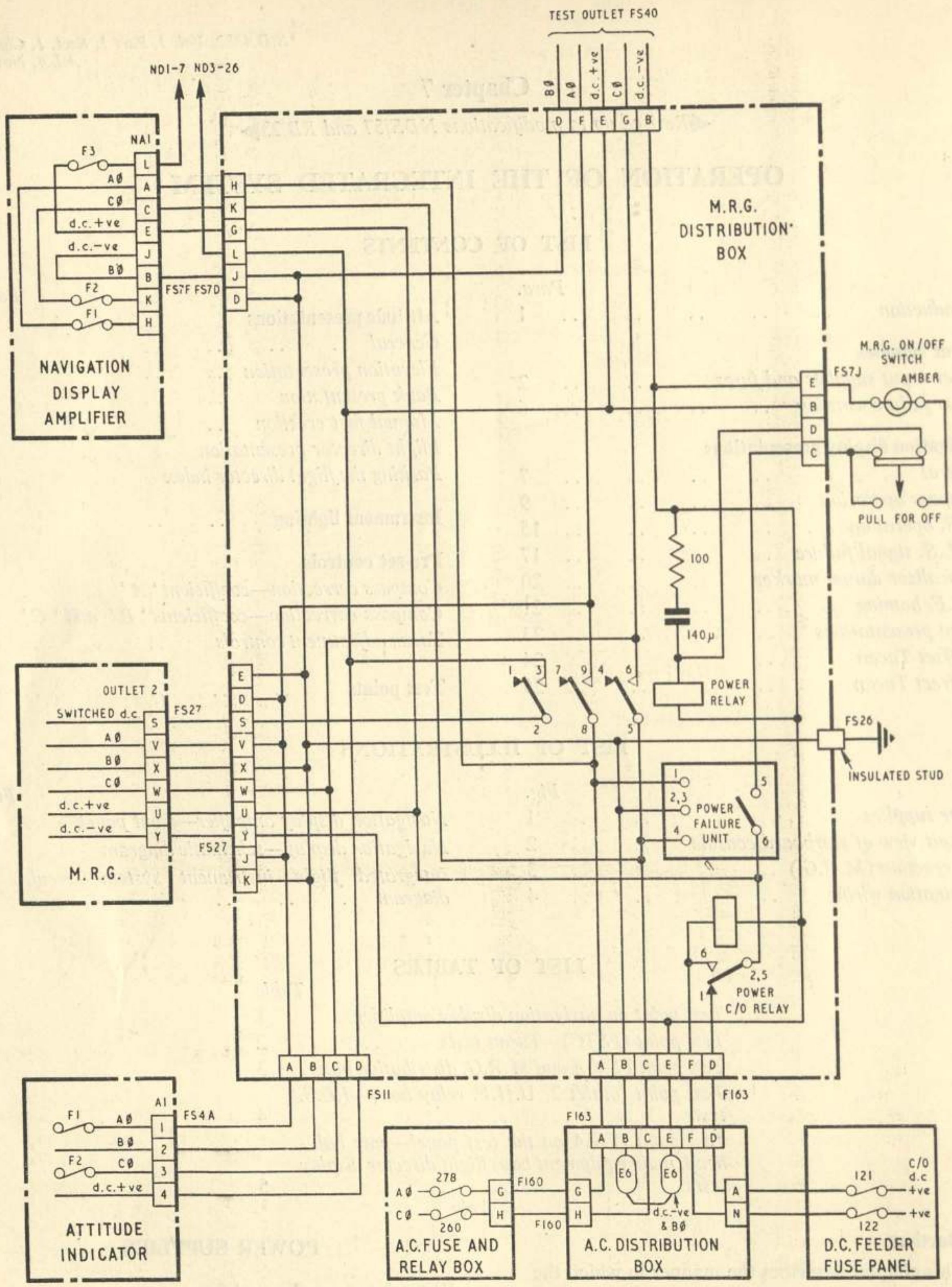


Fig. 1. Power supplies

engine driven alternator. If this fails, power is supplied by a d.c. generator via an inverter. For further details of the aircraft power supplies, reference should be made to A.P.4700B, Vol. 1.

3. Integral with the M.R.G. distribution box is a torque switch. The a.c. supply is first taken to this switch which then actuates a relay, which, when energized, permits the flow to the system of both a.c. and d.c. via its contacts. Thus a.c. is never supplied to the M.R.G. without d.c., a necessary safeguard preventing damage to the M.R.G.

4. The M.R.G. is separately operated by an M.R.G. ON/OFF switch located on the armament control box (*fig.* 2); this switch, which is of the push-pull type, has an integral warning lamp to indicate when the supplies are off. The supplies to the M.R.G. can be switched off (switch pulled out) even with the instrument master switch on.

Fig. 2. Cockpit view of starboard console

5. A thermal timing switch is included in the starting circuit of the M.R.G. and to allow it sufficient time to reset after each operation, the M.R.G. should not be switched on twice within any two minute period. This ensures that when the M.R.G. is switched on it undergoes a full and proper starting cycle and shows the vertical in the shortest possible time.

Power failure warning

6. A 28V d.c. power failure warning device is provided in the attitude indicator. This takes the form of an illuminated translucent orange disc bearing two white arrows. When 28 volts is applied, the disc is obscured by a solenoid-operated black shutter. Should the supply fail, the flag is released and the translucent orange disc is exposed. The 28V d.c. is supplied from the M.R.G. via the relay in the M.R.G. distribution box which cuts off the d.c. supply in the event of either the aircraft a.c. or d.c. supplies failing. This warning also serves the adjacent navigation display to which no separate warning device is fitted.

NAVIGATION DISPLAY PRESENTATIONS

General

7. The navigation display presents the magnetic heading of the aircraft on an annular compass card which is visible and operative whenever the flight system is functioning. Depending on the position of the mode switch, displays of I.L.S. (Instrument Landing System) information, offset Tacan range and bearing and direct Tacan range and bearing are presented by the roller blind and roller blind carriage in the circular space within the annulus of the compass card.

8. The mode switch, which is located on the front of the navigation display, has four positions, viz: COMP, ILS, TAC and DL.◀The mode positions are marked on a window above the switch and this window is illuminated by the same lamps which illuminate the displays.▶Selection of the compass mode (COMP) provides a plain, black background to the compass card to emphasize the card markings and the selected heading pointer. It does not, in any way, influence the compass system which is independent of the mode switch.

◀**Note . . .**

Prior to the inclusion of modification NDS/55, the mode switch markings are not internally illuminated and a window is not included, the mode switch positions being marked directly on the instrument front.▶

Compass operation

9. The detector unit, Type A, situated in the leading edge of the starboard wing, is used as a magnetic reference for the compass system. The output signal voltages from the detector (*fig.* 6), representing sine and cosine components of the magnetic heading, are fed to the stator sine and cosine coils of an a.c. resolver synchro located in the navigation display. The rotor of the resolver is mechanically coupled to the compass card and the signals are resolved as one signal, which corresponds in phase and amplitude with any compass card misalignment. This resultant signal is then suitably amplified and rectified and is used to precess the azimuth gyro in the M.R.G. until the misalignment is zero. When this condition prevails the compass card will show the magnetic heading of the aircraft.

10. A synchro transmitter output from the M.R.G. is fed to the navigation display and represents the heading of the azimuth gyro. This output is fed, via a differential control transmitter, to a compass control transformer, the rotor of which is mechanically coupled to the compass card. The signal from the control transformer is passed to the compass servo amplifier whose output drives the compass card motor to align the card with the azimuth gyro heading. If the gyro drifts the compass card will follow. An error voltage is then produced by the monitoring resolver and the resulting output from the monitoring amplifier precesses the gyro back to its original position.

11. Manual synchronization is provided because the precession rate of the azimuth gyro, under the influence of the monitoring signals, is relatively slow and automatic synchronization could take some time. It is for this reason that a differential control transmitter is used between the azimuth gyro output and the compass control transformer. By depressing and rotating the SYN knob on the front of the navigation display, a suitable electrical angle can be added to the information from the gyro so that the compass card agrees with the magnetic reference.

12. By means of a balanced magnetic system, an indication of the polarity of the monitoring output is shown in the window in the left-hand bottom corner of the navigation display front. This takes the form of a flag displaying a dot or a cross. When the SYN knob is depressed it operates a magnetic lock by means of the annunciator contacts, which engage a ratchet and allows the differential control transmitter to be turned in one direction only, thus preventing the compass card from being set to a reciprocal heading.

13. Operation of the DG switch push-button on the navigation display open-circuits the monitoring amplifier output to the azimuth gyro torque motor, thus enabling the gyro to be used as a directional gyro. When DG is selected a flag bearing the letters DG appears in a small window beneath the switch.

14. The selected heading pointer, which is operative in all positions of the mode switch, is servo-operated and derives its position from a control transmitter in the navigation display. This synchro is coupled mechanically to the selected heading pointer control (HDG) and may be set by pushing in and turning this control. The transmitter is connected to a control transformer which in turn is mechanically coupled to the heading pointer and so operation of the HDG control moves the heading pointer and a future course may be set by means of it. At the appropriate time the pilot turns the aircraft on to the pre-selected heading when, in order to maintain an accurate flight direction, he only needs to ensure that the selected heading pointer remains aligned with the compass lubber.

I.L.S. operation

15. The instrument landing system (I.L.S.) is a landing approach radio aid to provide pilots with a visual instrument indication of the aircraft position relative to the runway. For further details, see Chap. 4 of this section and A.P.2534E and F, Vol. 1.

16. In the I.L.S. mode two parallel white lines represent the runway and the displacement of these lines from the localizer datum shows the position of the aircraft relative to the I.L.S. beam. A horizontal bar, positioned between the compass card and roller blind, indicates the position of the glide path beam relative to the aircraft, whilst a distance marker lamp is used to indicate distance from the touch-down point. When the glide path and localizer indicators cross directly beneath the central index on the bezel glass (representing the aircraft) the correct flight path is being followed.

◀*I.L.S. signal failure*

17. Two I.L.S. signal failure warning devices are fitted behind windows at the top right hand of the display front. The windows are illuminated in the I.L.S. mode only. When the I.L.S. signals are sufficiently large for reliable operation, the windows are obscured by shutters. When the I.L.S. signals fall below operational level, illuminated windows are exposed, each warning being appropriately identified.

Note . . .

Prior to the inclusion of modification NDS/54, the I.L.S. failure warnings consist of two flags fitted behind windows. The flags display the word OFF when the I.L.S. signals fall below operational level. The windows are not integrally illuminated.▶

18. When modes other than I.L.S. are selected, a fixed signal voltage motors the bar to an out-of-sight position behind the compass card and holds it there.

19. I.L.S. receivers in the aircraft receive signals from the ground equipment and the outputs from these receivers are then distributed to the user equipment via a U.H.F. relay box situated in the spine of the aircraft. From the I.L.S. junction boxes JB158 and JB159 on the rear of the receivers, these signals enter the U.H.F. relay box at outlet 2 (connector 8A) and are fed :

(1) via outlet 3 directly to FC4 on the flight control computer ;

(2) via the contacts of the ILS/UHF relay to outlet 1 (connector FS7E) and thence to the navigation display.

Localizer datum marker

20. The HDG control, when pulled outwards and rotated, sets the localizer datum marker against the compass card. This marker, which is a fixed index on the roller blind carriage and is visible through an aperture in the blind, provides the pilot with a plan view of his position relative to the localizer beam during an approach (the QDM of the runway in use having first been obtained).

U.H.F. homing

21. In this aircraft, U.H.F. homing information is presented on the navigation display by the two parallel lines which in the I.L.S. mode, are used as the localizer indicator. To display this information, the mode switch on the navigation display is set to ILS and an ILS/VP switch set to VP. The latter switch is located on the I.L.S. control panel which is below and adjacent to the offset Tacan computer (*fig.* 2, *Chap.* 1 *of this section*). The localizer indicator is deflected to one side of the localizer datum unless the aircraft is heading directly toward the homing transmitter or, in certain circumstances, the homing transmitter is astern. The position of the localizer datum, relative to the compass card is unimportant, it being the position to which the roller blind carriage was last driven. This may cause initial difficulty in interpreting the display but this can be resolved by pulling out and turning the HDG knob, to align the localizer datum with aircraft heading, thereby bringing the localizer indicator into a vertical attitude. Homing indications are in the natural sense, that is, when the indicator is to the right of the datum, the aircraft must be turned to the right to null the steering demand. During the turn the localizer indicator will rotate with the compass card but may be reset to the vertical if required.

22. When the aircraft is relatively close to the homing transmitter, it is possible for an ' on homing course ' indication (localizer indicator and datum coincident) to be given when the aircraft is on a reciprocal heading. To check this, whenever an initial ' on course ' indication is given, the aircraft should be turned through about 20 degrees on to a new heading and the sense of the resulting steering signal checked.

Tacan presentations

23. Tacan is a tactical air navigation system which gives aircraft range and bearing from a radio beacon. For further details, reference should be made to Chap. 5 of this section and to A.P.4685, Vol. 1, Sect. 5, Chap. 5. Transmissions from a selected Tacan ground installation are received in the aircraft and are fed to user equipment via PL4 (connector 3) in the Tacan coupling unit.

Offset Tacan

24. By selecting TAC mode, the position of the aircraft relative to a desired destination (within range of a Tacan beacon) is presented directly on the navigation display. The range and bearing of this offset point, relative to the Tacan beacon in use, are set manually into the offset computer where they are indicated in magnitude on two counters, each appropriately marked. Information derived from the aircraft's Tacan equipment, concerning the range and bearing of the aircraft relative to the beacon, is fed in the form of electrical signals from the Tacan coupling unit, and by means of a resolver synchro network, vectorially added to the information set on the offset computer. After amplification, the output from the resolver synchro responsible for this vectorial addition motors the roller blind and roller blind carriage to their respective null positions. The navigation display then indicates the range and bearing of the offset point from the aircraft so enabling a direct course to be flown without calculation.

Direct Tacan

25. Although direct Tacan can be displayed with the TAC mode selected (by setting the range and bearing in the offset computer to zero), some slight system errors or residual setting up errors may be included. It is therefore recommended that the D.L. mode be selected when a display of direct Tacan is required because the less-complex circuitry of this mode position obviates the incurrence of the errors mentioned. With the mode switch in the DL position, direct Tacan is displayed irrespective of the range and bearing settings in the offset computer. The DL mode position in this aircraft is only used for the foregoing display.

ATTITUDE PRESENTATIONS

General

26. Bank and elevation attitude presentations are displayed on the attitude indicator which also includes facilities for a flight director display. For details, reference should be made to Chap. 6 of this section and to A.P.4685, Vol. 1, Part 2, Sect. 5, Chap. 9. The elevation and bank attitudes are presented by the positioning of a roller blind and roller blind carriage respectively. Slip indication is shown by a ball-in-tube slip indicator which is mounted on the instrument front.

Elevation presentation

27. The roller blind is divided into two sections, one pale grey and the other black, which represent the sky and earth respectively. The line of demarcation between the two sections represents the horizon. Movement of the blind, up or down, shows the elevation of the aircraft with respect to the horizon and is linear with changes of elevation angle which are read directly off an elevation angle

SECT. 2

scale on the bezel glass. In extreme angles of elevation, either a zenith or a nadir star supersedes the horizon as the reference point and these are used to measure the elevation angle. In both instances, the long stem of the star points in the direction in which the horizon lies. For details of elevation, bank and flight director presentations, reference should be made to fig. 2, Chap. 6 of this section.

Bank presentation

28. The roller blind carriage rotates about its centre axis representing, with radial movement of the blind, the movement in bank of the aircraft relative to the horizon. It will be understood that, in flight, the case of the instrument rotates with the aircraft and the horizon line always remains horizontal.

29. Bank and elevation signals are derived from the M.R.G. and by means of servo loops, drive the roller blind and roller blind carriage to indicate bank and elevation angles. These signals are fed from outlet 2 (connector FS27) of the M.R.G. and pass, via connectors FS11 and FS4A, to plug A1 of the attitude indicator, a fixed connector on the bulkhead at the cockpit rear providing the junction between FS11 and FS4A.

Manual fast erection

30. On completing a manoeuvre, the M.R.G. may present a false vertical and to provide for the rapid removal of these errors a manual fast erection switch, located on the armament control box, may be operated. The manual fast erection circuit is shown in fig. 3.

Flight director presentation

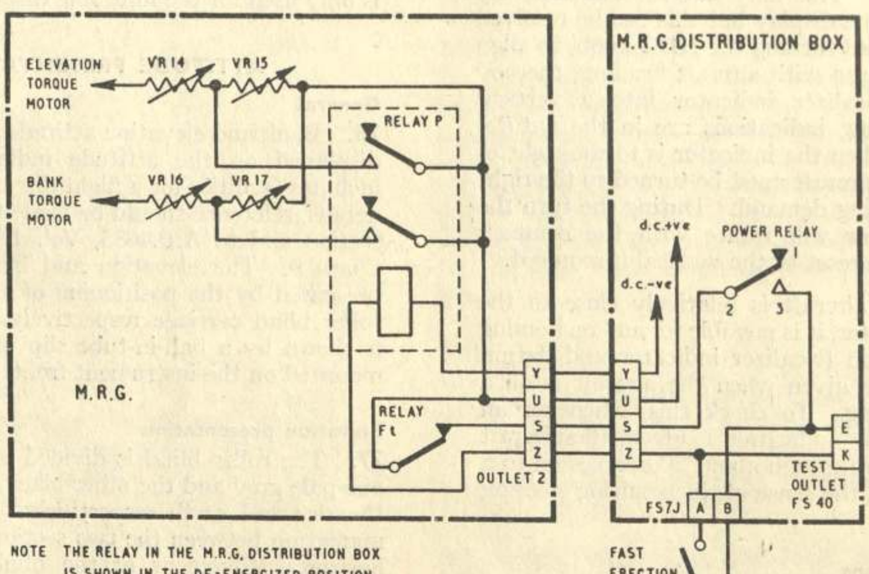
31. The flight director presentation is necessary in order to show the control action demanded to correct aircraft deviation from a computed flight path. The presentation is controlled by a master switch on the pilot's controller and by an engage switch on the control column. Before the engage switch becomes operative, the master switch has to be set to ON. When the engage switch is set to FD, normal manual control of the aircraft is required but when the engage switch is set to AP, the aircraft is automatically controlled on to the flight path.

32. This display consists of an index bead which is driven by a rectilinear arrangement of cross-wires, one a horizontal wire moving in a vertical direction and the other a vertical wire which moves in a horizontal direction. The bead is centrally aligned with the centre datum on the bezel glass when the demanded change has been applied. Demands are made in the natural sense, i.e., if the index moves to 2 o'clock, the pilot moves the control column back and to the right. When the index bead is in use and aligned with the centre datum on the bezel glass, correct flight attitude, in respect to the computed flight path, is indicated.

Parking the flight director index

33. The flight director facility may be switched off at times when it is not required, e.g. when the presence and movement of the index bead could be distracting. This is effected by setting the engage (control column) switch to OFF. The index bead is then driven to a ' park ' position toward the top right-hand corner of the unit and just within the 40 deg. elevation angle scale ring on the bezel glass (*fig.* 2, *Chap.* 6 *of this section*). This gives a definite indication that the facility is inoperative in that a pilot would not follow the index demand blindly at this extreme point without expecting an index movement in response to his control movements.

34. The flight director signals are derived from the flight control computer which is located in the main equipment bay. They leave this computer at connector FC6 and by means of cables FS8 and FS8B and FS4B are fed to the attitude indicator plug A1 via a 6-pole connector on the rear bulkhead of the cockpit.



NOTE THE RELAY IN THE M.R.G. DISTRIBUTION BOX IS SHOWN IN THE DE-ENERGIZED POSITION

Fig. 3. Fast erection (M.R.G.)

INSTRUMENT LIGHTING

35. Each of the appropriate instrument presentations in the integrated flight instrument system are integrally lit. The units concerned are the navigation display, the attitude indicator and the offset Tacan computer. Each lamp is covered with a red filter to ensure a non-glare illumination during conditions of darkness.

36. The navigation display has six lamps wired in two banks of three, with a common line so that alternate lamps are connected to the same bank. The attitude indicator has four lamps connected in two diagonally opposite pairs with a common line. The offset Tacan computer has two lamps, each separately wired with a common line. A 4V–0–4V a.c. supply is employed for lighting the lamps, one set of lamps in each instrument being connected to each side of the supply. In the case of the offset Tacan computer, each lamp is separately supplied. In the event of lamp breakdown, a display will remain sufficiently illuminated for correct interpretation. For details of lamp positioning and internal connections, reference should be made to fig. 4.

37. The 4V–0–4V a.c. supply is derived from a lamp dimming system control box (Ref. No. 5CZ/5962) situated inside the port console. A rotary dimmer control (Ref. No. 5CZ/5963) enables the intensity of the illumination to be varied. This control, which is marked CENTRE PANEL LIGHTING, is located on the starboard support panel adjacent to the starboard instrument panel (*fig.* 2). For further details of the instrument lighting, reference should be made to A.P.4700B, Vol. 1.

◀**37A.** The illumination intensity of the offset Tacan computer and attitude indicator may be varied independently by means of a pre-set potentiometer within each unit. This enables the intensity to be matched to that of other instruments and to be as uniform as possible for any setting of the dimmer control. Adjustment of a potentiometer is made, by means of a screwdriver, through a hole in each instrument case.

Note . . .

Prior to the inclusion of modifications NDS/50 and RB/22, the pre-set potentiometers are not included and so independent variation of illumination intensity is not possible.▶

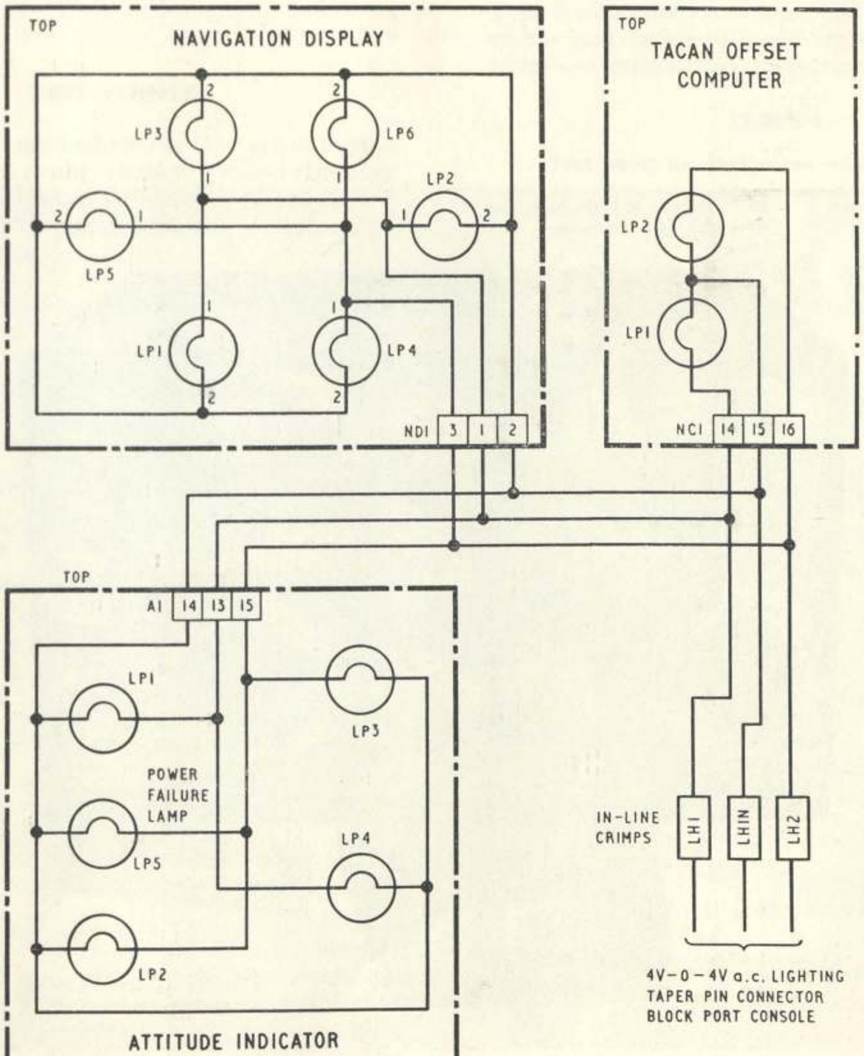


Fig. 4. Illumination wiring

SECT. 2

PRE-SET CONTROLS

Compass correction—coefficient ' A '

38. In addition to the elongated slots in the flange of the detector unit, which permits adjustment of up to ± 10 degrees of ' A ' error from the fore-and-aft alignment datum, a subsidiary correction can be made at the rear of the navigation display (*fig*. 1, *Chap*. 3 of this section). This control makes provision for final adjustment after ' B ' and ' C ' corrections have been made.

39. The stator assembly of the a.c. resolver synchro X14 (*fig*. 6) in the navigation display has a geared periphery and is free to rotate. Meshing with this gear is an idler gear which in turn meshes with a pinion on an extension shaft, the end of which is triangular in form and accepts a compass adjustment key. This shaft carries a white pointer which indicates against a scale marked from $+5°$ to $-5°$ in $1°$ increments.

40. When the shaft is turned with the adjustment key, the resolver stator is rotated relative to its rotor. This alters the null position and the system motors the appropriate amount.

Compass correction—coefficients ' B ' and ' C '

41. Adjustments for ' B ' and ' C ' coefficient corrections are made at the navigation display amplifier unit (*fig*. 5) and are used during compass swinging to compensate for local distortion of the earth's field due to magnetism of the aircraft. The two sets of controls are independent of each other and consist, in each case, of a selector switch and a wire-wound potentiometer. These control the current flowing in the associated correction coils which are contained in the detector unit.

Tacan adjustment controls

42. The five pre-set potentiometers mounted on the front panel of the navigation display amplifier unit (*fig*. 5) are used for setting up the amplifier after installation or after the navigation display, offset Tacan computer or Tacan coupling unit have been changed.

43. Two of the controls, marked OFFSET PHASE and OFFSET CAL, adjust the phase and amplitude of the energizing voltage on the range potentiometer in the offset computer. A further two, marked TAC PHASE and TAC CAL, control the phase and

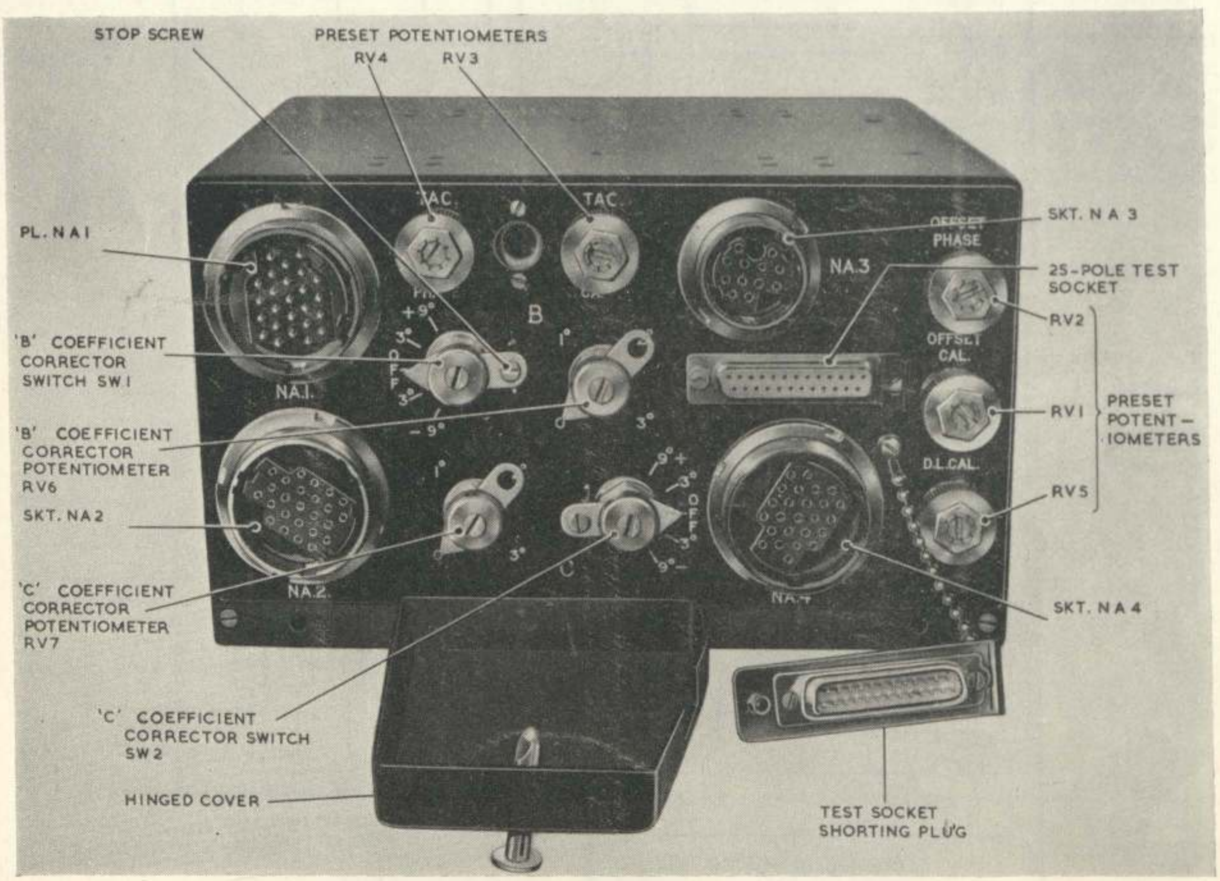


Fig. 5. Navigation display amplifier—front panel

amplitude of the voltage on the roller blind potentiometer in the Tacan mode of the navigation display. The fifth, marked DL CAL, adjusts the voltage on the same potentiometer in the DL mode. The PHASE controls are provided to correct for phase shift of the range voltage from the resolvers in the navigation display, offset Tacan computer and Tacan coupling unit to their respective potentiometers. The CAL controls enable these voltages to be adjusted so that the outputs from the sliders are correctly proportional to range, i.e. 100 mV/mile (Tacan) and 39 mV/mile (DL). The respective voltages for these networks are derived from the power supply unit in the navigation display amplifier.

44. The foregoing adjustments are made with respect to a particular navigation display, offset Tacan computer and Tacan coupling unit (more specifically, with respect to the roller blind and range potentiometer and resolver synchros) and it follows therefore that some readjustments are necessary in the event of any of these units being changed. Once they have been set up and locked at the correct adjustments, these controls must not be disturbed.

TEST POINTS

45. Test points are included in the system so that functions may be readily checked without removing any unit. These points are located at fixed sockets which are either integral with the instrument or fixed to a test panel.

46. The location and purpose of the test points are as follows :—

(1) A 25-pole test socket on the front of the navigation display amplifier unit which is situated in the main equipment bay. This test point (*fig.* 5) is used for checking the operation of the navigation display presentations and is effected by means of a test set, Type 7 (Ref. No. 6C/2197). The test socket is provided with a mating plug which has the necessary short-circuiting connections for the compass correction currents. Details of the socket connections are given in Table 1.

(2) A 12-pole Mk. 4 connector (FS7C) located on the starboard side of the main equipment bay ; it is mounted on a bracket which is on the aft face of the bulkhead. This plug-break provides the test point at which Tacan functions in the subsystem may be simulated by means of a test set, Type 7. To carry out these tests, the cable from the Tacan coupling unit must be replaced with the cable from the test set. Reference should be made to Table 2 for details of the pin connections.

(3) A 12-pole Mk. 4 connector on the M.R.G. distribution box. By means of this, a motoring-off switch can be connected to the M.R.G. which can then be precessed from its normal vertical datum thereby simulating aircraft bank and elevation attitudes and so checking the polarity of the M.R.G. output signals. The connections to this socket are duplicated at a test socket FS40A on a test panel situated on the aft port bulkhead in the main equipment bay. This socket is for use with a test set, Type 8, primarily used for checking functions not included in those of this sub-system with the exception of the motoring-off facility which is included in this Type 8 test set. Reference should be made to Table 3 for details of connections at these test points.

Note . . .
It is possible to simulate the functions of the M.R.G. by means of a test set, Type 1A (Ref. No. 6C/2152). This is connected to the M.R.G. distribution box at outlets 1 and 2 after first disconnecting the cables from the M.R.G. For further details of this and the motoring-off facility, reference should be made to A.P.4685T, Vol. 1, Sect. 1, Chap. 2 and 6.

(4) A 12-pole socket (outlet 2) on the U.H.F. relay box. By disconnecting the cable from this point I.L.S. signals and functions may be simulated by using a test set, Type 7. Reference should be made to Table 4 for details of connections of this test point.

(5) Flight director displays in the attitude indicator may be simulated by means of a test set, Type 8 connected to socket FS14 on the test panel on the port bulkhead in the main equipment bay. Details of connections are given in Table 5.

TABLE 1

Test point on navigation display amplifier

Amplifier connector	Reference
1, 2	' B ' corrector current
3, 4	' C ' corrector current
5, 6	Monitoring amplifier input
7, 8	Fore and aft signal input coil
9, 10	Athwartships signal input coil
11	Compass input
12	Heading input
13	Roller blind amplifier input
14	Roller blind carriage amplifier input
15	Roller blind carriage amplifier output
16	Compass servo amplifier output
17	1 volt 400 c/s
18	Heading amplifier output
19	Roller blind amplifier output
20	Glide path bar amplifier input
21, 22	Monitoring amplifier output
23	Glidepath bar amplifier output
24	A.C./D.C. test
25	−25 volts

SECT. 2

TABLE 2

Test point (FS7C)—Tacan tests

Plug-break connection	Reference
A	Range potentiometer—20V C phase
B	Range potentiometer wiper
C	Range potentiometer—signal earth
D	Resolver stator—S1
E	Resolver rotor—R1
F	Resolver rotor—R2
G	28V d.c. +ve
H	—
J	Resolver rotor—R3
K	—
L	—
M	—

TABLE 3

Test point (FS40A) and M.R.G. distribution box

FS40A connector	M.R.G. dist. box	Reference
Q	A	Monitor cut
R	B	d.c. negative
S	C	Bank test −ve
O	D	B phase a.c.
T	E	D.C. +ve
N	F	A phase a.c.
P	G	C phase a.c.
U	H	Elevation test −ve
V	J	Bank test +ve
W	K	Fast erection
X	L	Elevation test +ve
Y	M	Elevation and bank monitor −ve

TABLE 4

Test point (outlet 2, U.H.F. relay box)—I.L.S. tests

Outlet 2 connection	Reference
A	Localizer beam signal
B	Localizer beam signal
C	Glide path beam signal
D	Glide path beam signal
E	Marker (d.c. +ve)
F	—
G	—
H	—
J	Localizer flag (d.c. +ve)
K	Localizer flag (d.c. −ve)
L	Glide path flag (d.c. +ve)
M	Glide path flag (d.c. −ve)

TABLE 5

Test point (FS14 on the test panel—port bulkhead, main equipment bay) flight director display tests

FS14 connection	Reference
N	Horizontal director
O	Horizontal and vertical director common line
P	Vertical director

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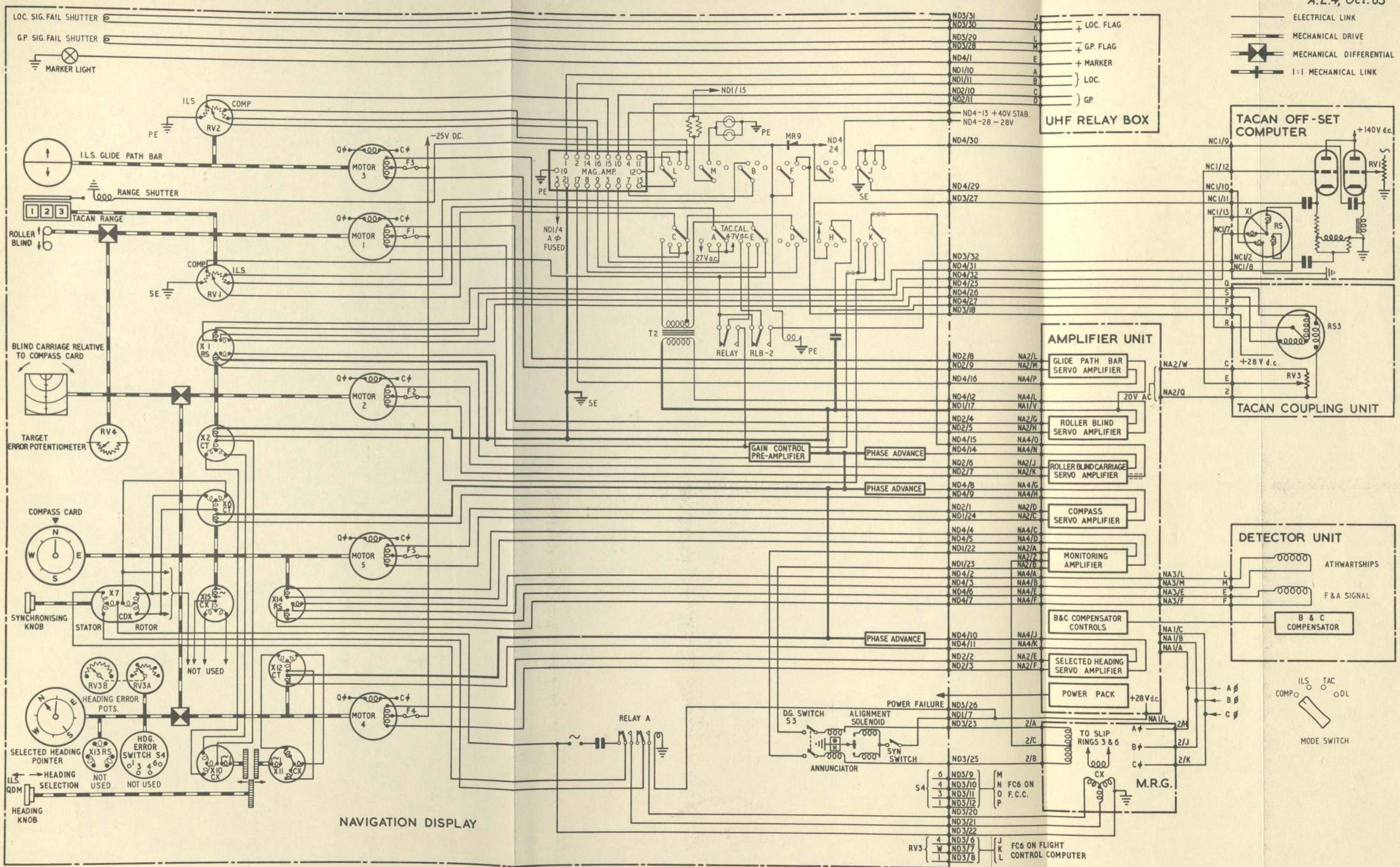

Fig. 6

Navigation display—schematic diagram

Fig. 6

(M.F.P.)

UNIT	CONNECTOR	CABLE
M.R.G.	OUTLET 1 OUTLET 2	FS28 FS27
M.R.G. DISTRIBUTION BOX	F163 FS11 FS27 FS28 FS40 FS7D FS7J	F163 FS11 FS27 FS28 FS40 FS7D FS7J
ATTITUDE INDICATOR	A1	FS4A
AMPLIFIER UNIT	NA1 NA2 NA3 NA4	FS7F FS7G FS29 FS7H
COMPASS DETECTOR UNIT	FREE PLUG	FS30
NAVIGATION DISPLAY	ND1 ND2 ND3 ND4	FS7L FS7M FS7N FS7P
TACAN OFFSET COMPUTER	NC1	FS7Q
TACAN COUPLING UNIT	PL4	3
U.H.F. RELAY BOX	1 3 RT2	FS7E FS2C RT2
I.L.S. SWITCH PANEL	RT1	RT1
FLIGHT CONTROL COMPUTER	FC4 FC6	FS2 FS8
ARMAMENT CONTROL BOX		FS75

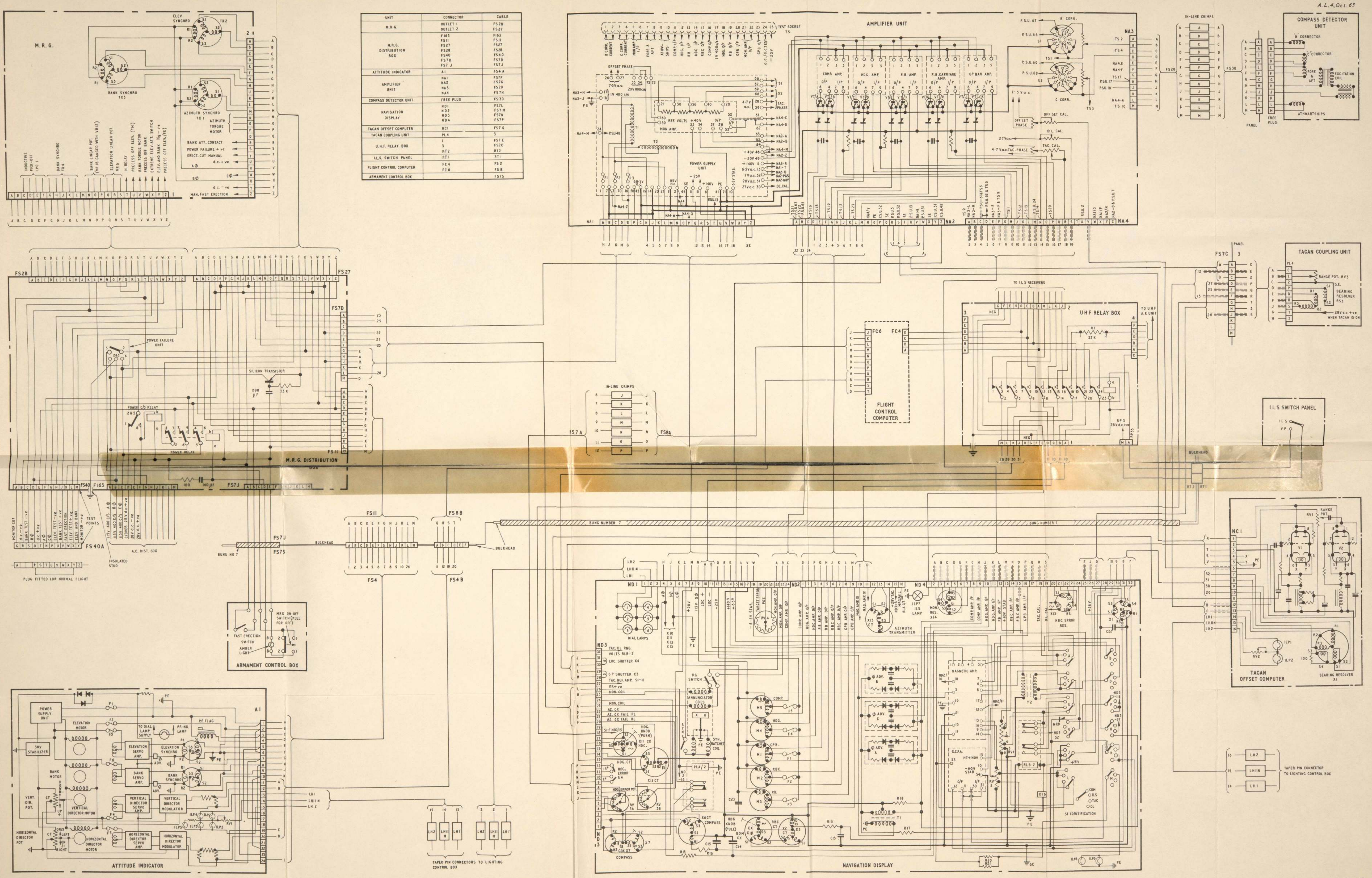

Fig. 7

Integrated flight instrument system — circuit diagram

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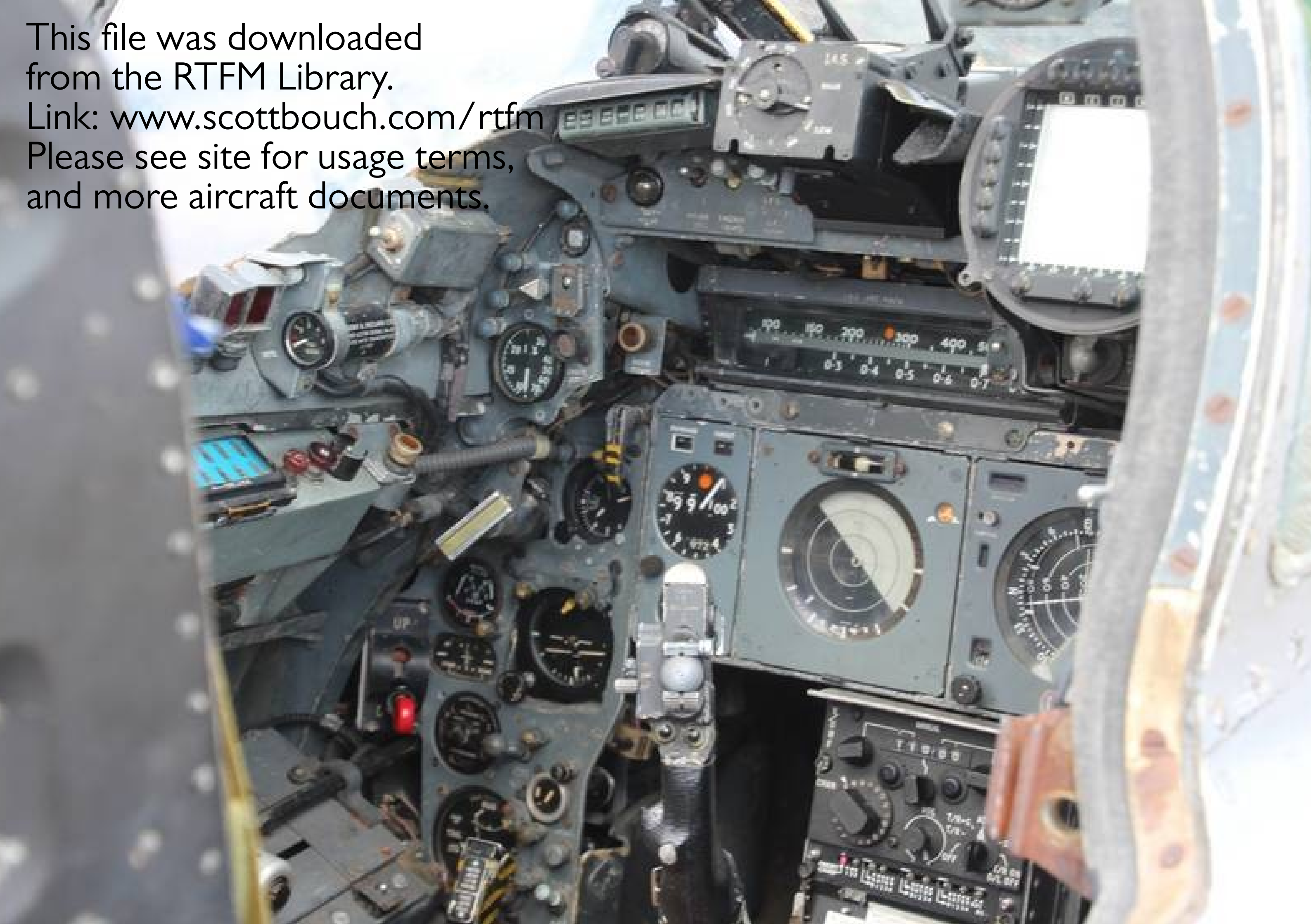
100 150 200 300 400
0·3 0·4 0·5 0·6 0·7
UP