# Avro Lancastrian

A Plane Design Production

# CONTENTS



# INTRODUCTION

We present the first product from **Plane Design** - the **Avro Lancastrian**. This model includes a Virtual Cockpit with fully working controls and instruments with the added reality of animated precipitation effects. Due to the positioning of the radio in the real life cockpit, it has been added as a popup display.

The external model is highly detailed with reflective skins and is fully animated.

Authentic **Rolls Royce Merlin** engine sounds are included, allowing you to experience the mighty Lancastrian to the fullest.

All major components were created using copies of the original **Avro** drawings, allowing us to produce a truly accurate model.

# COPYRIGHT



# CREDITS

| | |
|---|---|
| Visual Models | Ed Walters |
| Aircraft Textures | Ken Scott & Ed Walters |
| Gauge Programming | Ed Walters |
| Sounds | Ed Walters |
| Flight Dynamics | Ken Scott |
| Testing | Ken Scott, Bill Leaming |
| Manual | Ed Walters |

The bubble sextant is included by kind permission of Mark Beaumont and Dave Bitzer. For details on how to use the sextant, please consult the Sextant manual.

# AVRO TYPE 691 LANCASTRIAN HISTORY

The **Avro Lancastrian** was developed from the famous Lancaster bomber. Canadian produced Lancasters were built at **Victory Aircraft** in Toronto. The factory converted British built Lancaster R5727 into a passenger carrying aircraft for the **Trans-Canada Air Lines**. In its new guise, as the **Lancaster XPP**, the aircraft was flown to Britain where it was further modified by **Avro.** The conversion was developed further into the **Lancaster Mailplane**, which was later renamed the **Lancastrian**. In late 1943 **Lancaster DV379** was the first aircraft so converted.

The first aircraft built as Lancastrians (designated the **Lancastrian** Mk 1) were sold to **British Overseas Airways Corporation (BOAC)** for use on a service to Australia. These aircraft had accommodation for nine passengers on seats facing starboard which could be converted into six bunks. Luggage was carried in the nose and tail. The service was flown between Hurn, Hampshire, England and Sydney, Australia. Flights commenced on May 31st 1945, with the war still raging in the Pacific. **BOAC** bought 21 **Lancastrian** Mk Is, and operated them until 1950, latterly on freight and mail services.

The **Lancastrian** C. Mk 2 was essentially similar to the Mk 1 and was produced for **RAF Transport Command**. These aircraft were used for long range flights to India, the Far East and Australia, often as VIP transport.

The Mk 3 **Lancastrian** was developed specifically for **British South American Airways (BSAA)**. The first flight out of Heathrow airport was on January 1st 1946, when **BSAA Lancastrian** G-AGWG **"Star Bright"** set off on a proving flight to Buenos Aires, with Captain D.C.T. Bennett at the controls. By June, a regular service to Santiago had been established. **Lancastrian** 3s were also supplied to **Skyways**, **Flight Refuelling, Silver City** and **Alitalia**. The passenger accommodation in these aircraft was side by side standard airline seats.

Ten **Lancastrian** C. Mk.4s were supplied to **RAF Transport Command**, but soon were passed to civil airlines to fill the shortfall from the failure of the **Avro Tudor**.

The **Lancastrian** 3, G-AGWH **"Star Dust"**, as depicted in this package, was lost in mysterious circumstances in the Andes on a flight to Santiago - the aircraft transmitted a Morse code message at 17:41, announcing an ETA of 17:45, followed by the mysterious word "STENDEC", which was repeated twice. Nothing more was heard from the aircraft, until in January 2000, a **Merlin** engine emerged from a glacier in the Andes. The aircraft had apparently flown into the summit of Mt. Tupangato, and the wreckage had been hidden in the snow.

**Lancastrians** operated by **Flight Refuelling Ltd** and **Skyways** also saw service in the Berlin Air Lift, between June 1948 and August 1949, from Tarrant Rushton in Dorset. Each aircraft carried between 1500 and 2300 gallons of petrol to the beleaguered city. In total, **Flight Refuelling's Lancastrians** and **Lancasters** transported 7 million gallons, making a huge contribution to the effort.

# AVRO TYPE 691 LANCASTRIAN SPECIFICATION

DIMENSIONS:
Span: 102 ft
Length: 76 ft 10 in
Height: 19 ft 6 in
Wing Area: 1297 sq ft

POWER PLANT:
Four 1280 hp Rolls Royce Merlin T24/2 /Merlin 500/2 twelve cylinder vee liquid cooled engines.
Fuel capacity 2,154 Imperial Gallons in wings, 1,020 Imperial Gallons in fuselage.

WEIGHTS:
Tare Weight: 30,426 lb
Weight Loaded: 65,000 lb
Wing Loading: 50.10 lb/sq ft
Power Loading: 12.7 lb/hp

PERFORMANCE:
Maximum speed (at 53,000lb): 295 mph at 3500 ft and 310 mph at 12,000 ft.
Maximum cruising speed (weak mixture): 275 mph at 11,000ft and 285 mph at 17,500 ft
Rate of climb (at 65,000lb): 750ft/min at 9500 ft and 550 ft/min at 16,000 ft.
Service ceiling: 23,000 ft

RANGES (under still conditions at 15,000 ft with no allowance for climb):
At maximum weak mixture cruising speed (265 mph): 3570 miles
At most economical cruising speed (200 mph): 4,501 miles

ACCOMMODATION:
Crew of two pilots, one navigator, one wireless operator, one steward, with thirteen passengers.

# OPERATIONAL PROCEDURES

**Before Starting**

| | |
|---|---|
| [ ] Master Engine Cocks | OFF |
| [ ] Throttles | Cracked open |
| [ ] Propeller Controls | Fully up |
| [ ] Radiator Shutters | Over-ride switches at AUTOMATIC |
| [ ] Fuel tank selectors | No. 2 Tanks |

**Starting**

Press CTRL+E to initiate engine autostart sequence, or:
FOR EACH ENGINE:

| | |
|---|---|
| [ ] Master Engine Cock | ON |
| [ ] Magnetos | BOTH ON |
| [ ] Starter Push Button | |

**Taxi-Warm-up**

| | |
|---|---|
| [ ] Radiator shutters | OVER-RIDE |
| [ ] Brakes | CHECK |
| [ ] Gyro Instruments | CHECK |
| [ ] Altimeter | CHECK |
| [ ] Flight Instruments | CHECK |
| [ ] Carb Heat | CHECK |
| [ ] Navigation Lights | As required |

**Engine run-up**

| | |
|---|---|
| [ ] Parking Brake | SET |
| [ ] Temperatures & Pressures | CHECK |
| [ ] Throttle | 1500 RPM |
| [ ] Suction | CHECK |
| [ ] Magneto | CHECK <100 rpm drop on each; <40 rpm drop between |
| [ ] Throttle | 4 PSI |
| [ ] Propeller Controls | Check RPM falls to 1800 RPM when levers full down |
| [ ] Throttle | 24 PSI |
| [ ] Propeller Controls | Full up |
| [ ] Boost & RPM | Check takeoff settings |
| [ ] Throttle | 9 PSI |

**Pre Take Off**

| | |
|---|---|
| [ ] Auto Controls Clutch | OUT |
| [ ] Pitot Heat | ON |
| [ ] Trim | Elevator slightly forward<br>Rudder neutral<br>Elevator neutral |
| [ ] Flight Controls | FREE AND CORRECT |
| [ ] Flaps | 15° to 20° |
| [ ] Carb Heat | COLD |
| [ ] Heading Indicator | CHECK |

**Take Off**

| | |
|---|---|
| [ ] Brakes | RELEASE |
| [ ] Throttles | FULL |
| [ ] Airspeed | Ease aircraft off the ground at not less than 95 MPH at 50,000lb or 105 MPH at 60,000lb |
| [ ] Landing Gear | UP (when positive rate of climb is established) |
| [ ] Flaps | RETRACT |

**Climb**

| | |
|---|---|
| [ ] Airspeed | 160 MPH for a quick climb. Most comfortable climbing speed 175 MPH |

**After Take off and Climb**

| | |
|---|---|
| [ ] Landing Gear | VERIFY UP |
| [ ] Flaps | VERIFY UP |
| [ ] Temperature/Pressures | CHECK |
| [ ] Landing Lights | AS REQUIRED |
| [ ] Throttles | VERIFY FULL |

**Cruise (Ideally at 15,000 feet MSL)**

| | |
|---|---|
| [ ] Boost | 7 PSI |
| [ ] Airspeed | 170 MPH |
| [ ] RPM | 1800 RPM minimum |

**Descent**

| | |
|---|---|
| [ ] Altimeters | SET |
| [ ] Fuel Quantity | CHECK |
| [ ] Landing Lights | AS REQUIRED |

**Approach**

| | |
|---|---|
| [ ] Auto Controls Cock | OUT |
| [ ] Flaps | 20° on circuit |
| [ ] Undercarriage | DOWN |
| [ ] Propellers | At least 2,850RPM |
| [ ] Flaps | DOWN on final approach |
| [ ] Airspeed | 110MPH-130MPH IAS |

**After Landing**

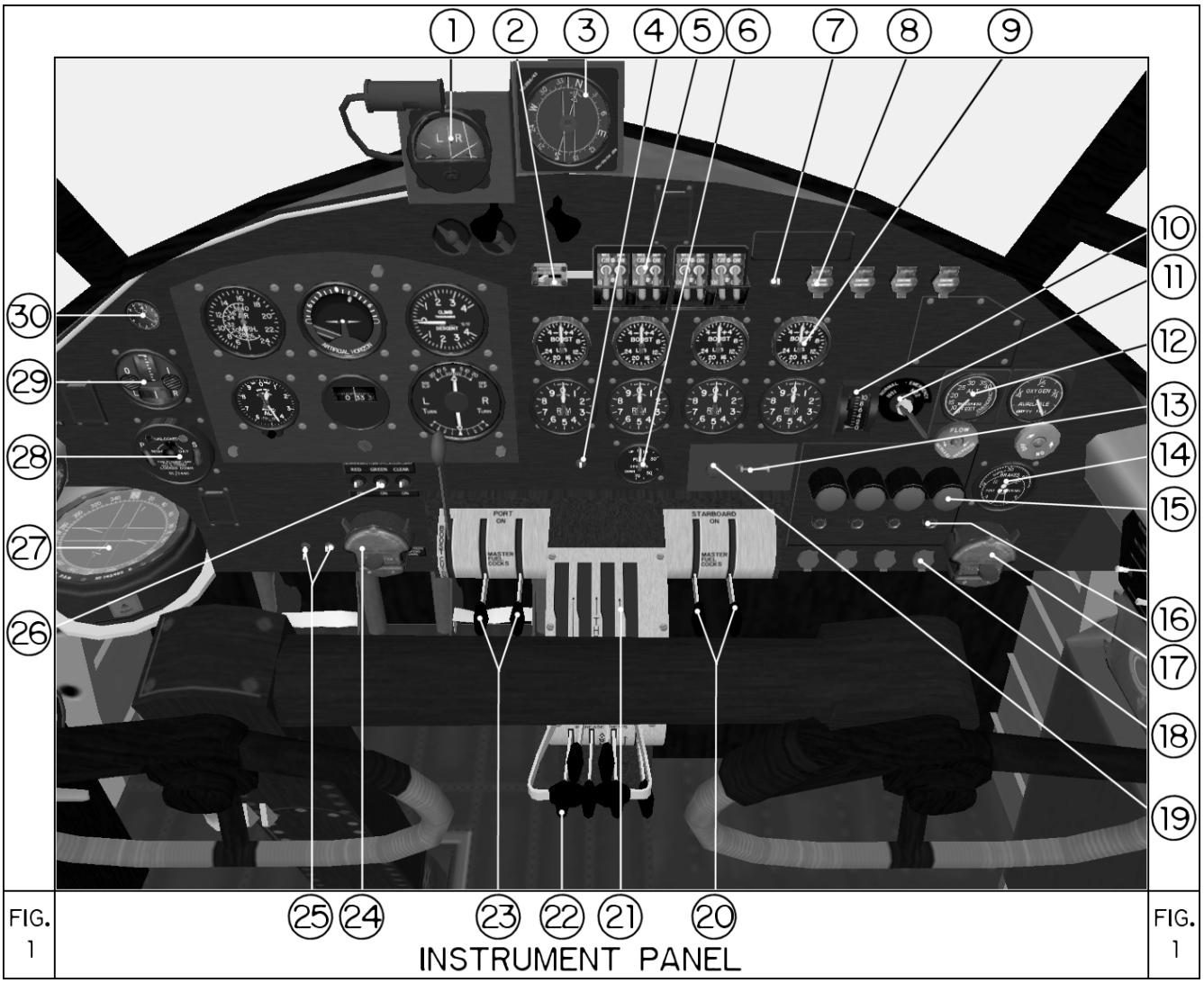
| | |
|---|---|
| [ ] Flaps | UP |
| [ ] Radiator shutters | OVER-RIDE |
| [ ] Landing Lights | AS REQUIRED |

**Engine Shut Down**

| | |
|---|---|
| [ ] Parking Brakes | SET |
| [ ] Navigation Lights | OFF |
| [ ] Master Engine Cocks | OFF |
| [ ] Magnetos | OFF |

NOTE: This aircraft's real-world checklists have been modified for use with Flight Simulator.

# LOCATION OF CONTROLS




1. DF Indicator
2. Undercarriage Indicator switch
3. D.R. Compass Repeater
4. Flaps indicator switch
5. Ignition Switches
6. Flaps indicator
7. Booster coil switch
8. Engine starter push buttons (4)
9. Boost gauges (4)
10. Suction gauge
11. Vacuum change-over cock
12. Oxygen regulator
13. Supercharger control switches (linked together)
14. Air supply and brakes pressure gauge
15. Feathering push buttons (4)
16. Fire warning lights (4)
17. Signalling switchbox (non functioning)
18. Fire extinguisher pushbuttons (4) (non functioning)
19. Superchargers warning light
20. Starboard master fuel cocks (2)
21. Throttle control levers (4)
22. Propeller control levers (4)
23. Port master fuel cocks (2)
24. Signalling Switchbox
25. DR Compass switches
26. Identification lights switches
27. Compass
28. Undercarriage position indicator
29. Beam Approach Indicator
30. Clock

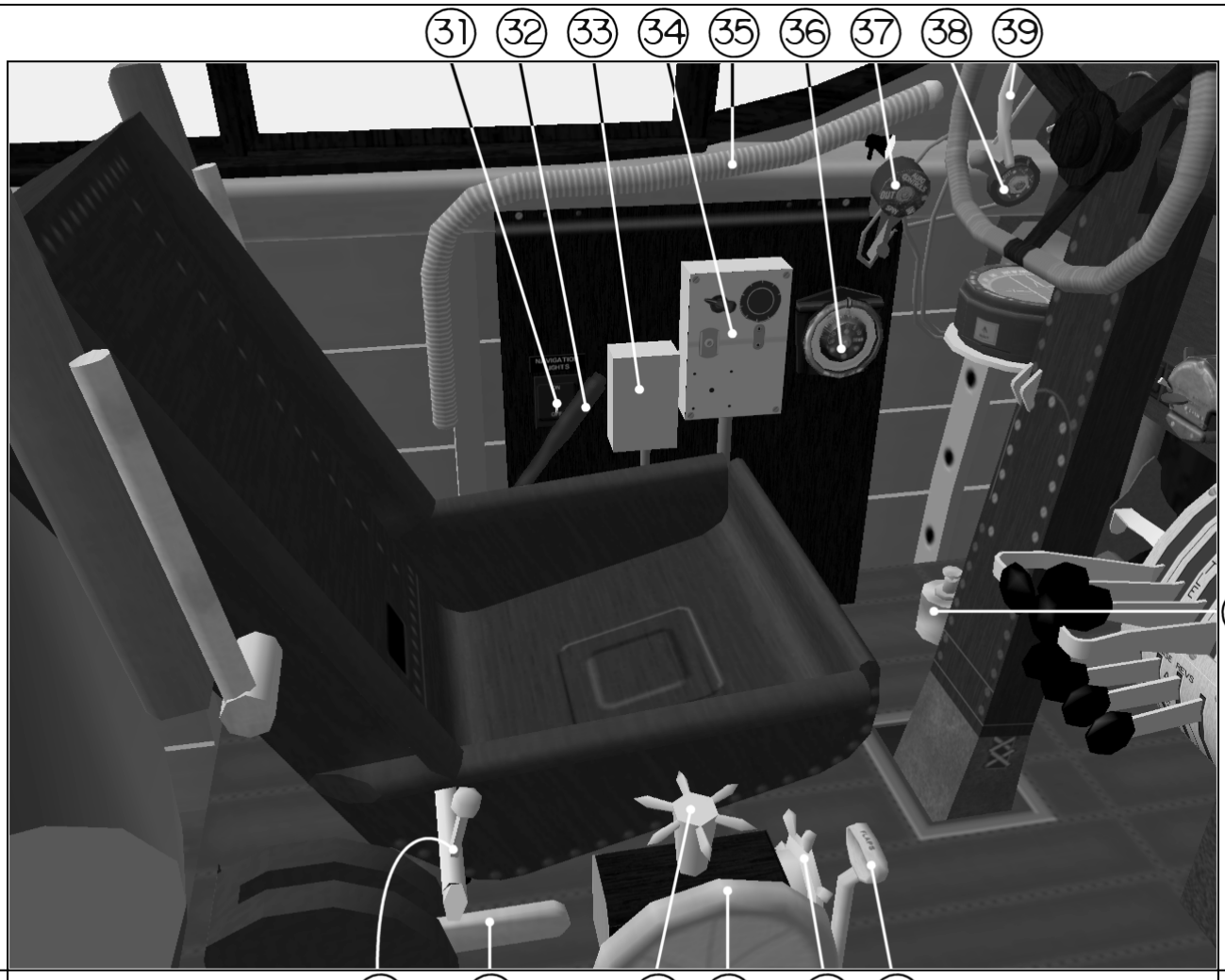



FIG. 2 PORT SIDE OF COCKPIT FIG. 2

31. Navigation lights switch
32. Seat raising lever
33. Mixer Box
34. Beam approach control unit
35. Oxygen connection
36. Auto controls attitude control
37. Auto controls cock
38. Auto controls clutch
39. Brake lever
40. Windscreen de-icer pump
41. Flaps selector
42. Aileron trimming control
43. Elevator trimming control
44. Rudder trimming control
45. Undercarriage control lever
46. Undercarriage control safety bolts

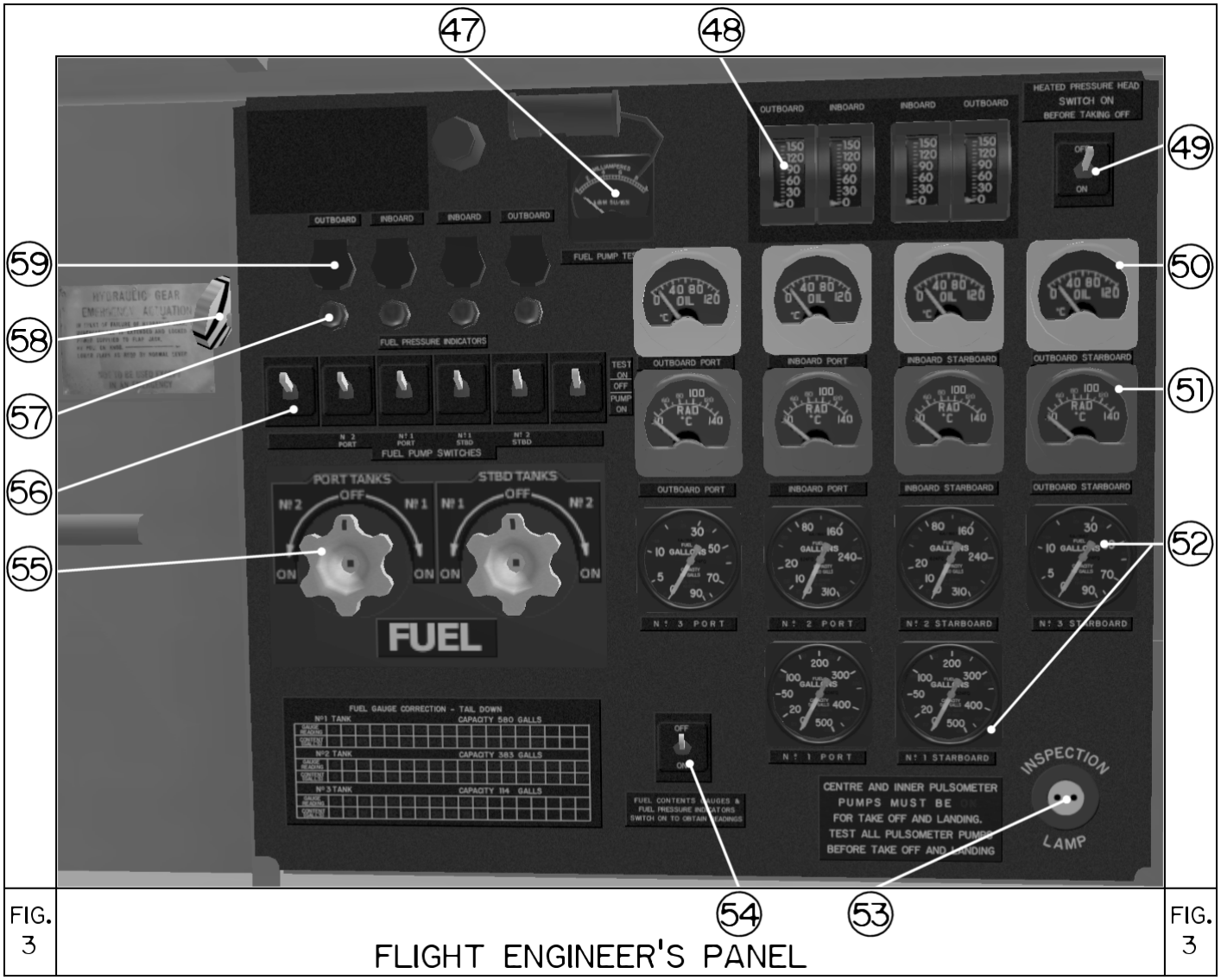



FIG. 3

FLIGHT ENGINEER'S PANEL

FIG. 3

47. Ammeter
48. Oil pressure gauges
49. Pressure-head heater switch
50. Oil temperature gauges
51. Coolant temperature gauges
52. Fuel contents gauges
53. Inspection lamp socket
54. Fuel contents gauge switch
55. Fuel tank selector cocks
56. Fuel transfer switches
57. Fuel pressure warning lights
58. Emergency air control
59. Oil dilution buttons (non functioning)

## CONTROLS NOT SHOWN:

Cross feed cock — Front spar cover, under step
Carburettor Heat — On floor at left of pilot's seat
Radiator shutter switches — On starboard cockpit wall

# FUEL SYSTEM EXPLAINED

The fuel system in the real **Lancastrian** had 3 tanks in each wing and one central fuselage tank, located in the position of the bomb bay in the **Lancaster**.

The engines drew fuel from the no.1 and no.2 wing tanks; fuel could only be transferred from the no.3 tank and fuselage tanks into the no. 2 and no. 1 tanks respectively.

Due to the limitations in FS2004's fuel systems modelling, we have been forced to compromise. The main fuel selector taps allow the selection of the no. 1 and no. 2 tanks (as per the real aircraft), however, when the fuel transfer switches are selected, the engines feed from the fuselage or no. 3 tanks, as outlined by the table below.

| Fuel tap position | Fuel transfer switch | Tank in use |
|---|---|---|
| 1 | Off | 1 |
| 1 | On | Fuselage |
| 2 | Off | 2 |
| 2 | On | 3 |

When either the Fuselage or no.3 tanks are exhausted, the system will automatically switch back to the no.1 or no.2 tanks respectively.

# CONTROLS & INSTRUMENTS DESCRIBED

As the Lancastrian instrumentation is unlike most modern instrumentation, a short description of some of the instruments and controls follows.

1. Autopilot system. In keeping with the aircraft's age, the autopilot is very basic. It will hold the heading and attitude, and is engaged with the "**AUTOPILOT CLUTCH**". The attitude setting can be altered using the "**AUTO CONTROLS ATTITUDE CONTROL**".

2. The "**STANDARD BEAM APPROACH**" system was similar to the ILS system in modern aircraft, and we have modelled it to use the ILS signals in FS2004. The light on the left marked "**O**" is the Outer Beacon marker, and the one marked "**I**" is the Inner Beacon marker. The vertical needle at the bottom shows the lateral offset from the runway centreline and the horizontal needle shows the vertical offset from the glideslope. These needles operate in the same sense as in a conventional ILS gauge, i.e. the needle shows the direction to fly to get onto the glideslope and runway centreline.

3. The "**DF INDICATOR**". This gauge will allow you to home on an ADF beacon. To home on a beacon, tune the main radio (Shift+5) to the frequency of the beacon. Unless you are pointing directly at the beacon,

the needles will flick over to one side, with one needle almost horizontal, and the other needle vertical. Turn towards the vertical needle, i.e. if the right needle is vertical, turn to starboard. Eventually the needles should settle down so they are crossed over the yellow centre line.

4. The "**BRAKE TRIPLE PRESSURE GAUGE"** shows the air pressure to each wheel brake, and the large needle shows the system air pressure.

## THINGS YOU MIGHT NOT HAVE NOTICED...

1. When the engines are shut down and the parking brake is applied, chocks and a starter trolley will appear.

2.. If you click the side window frames, the sliding windows will open and close.

3. If you click the co-pilot's seat and seat back, they will fold.

4. Click the armrests to move them.

## CLOSING REMARKS

We hope that you enjoy our first release. If you have any comments or suggestions, please contact us at suggestions@plane-design.com
We are currently developing an **Avro Lancaster** to complement this package, and we expect this to be released in Q1 2005, and have many exciting projects planned to follow.

Ed Walters & Ken Scott - Plane Design
www.plane-design.com