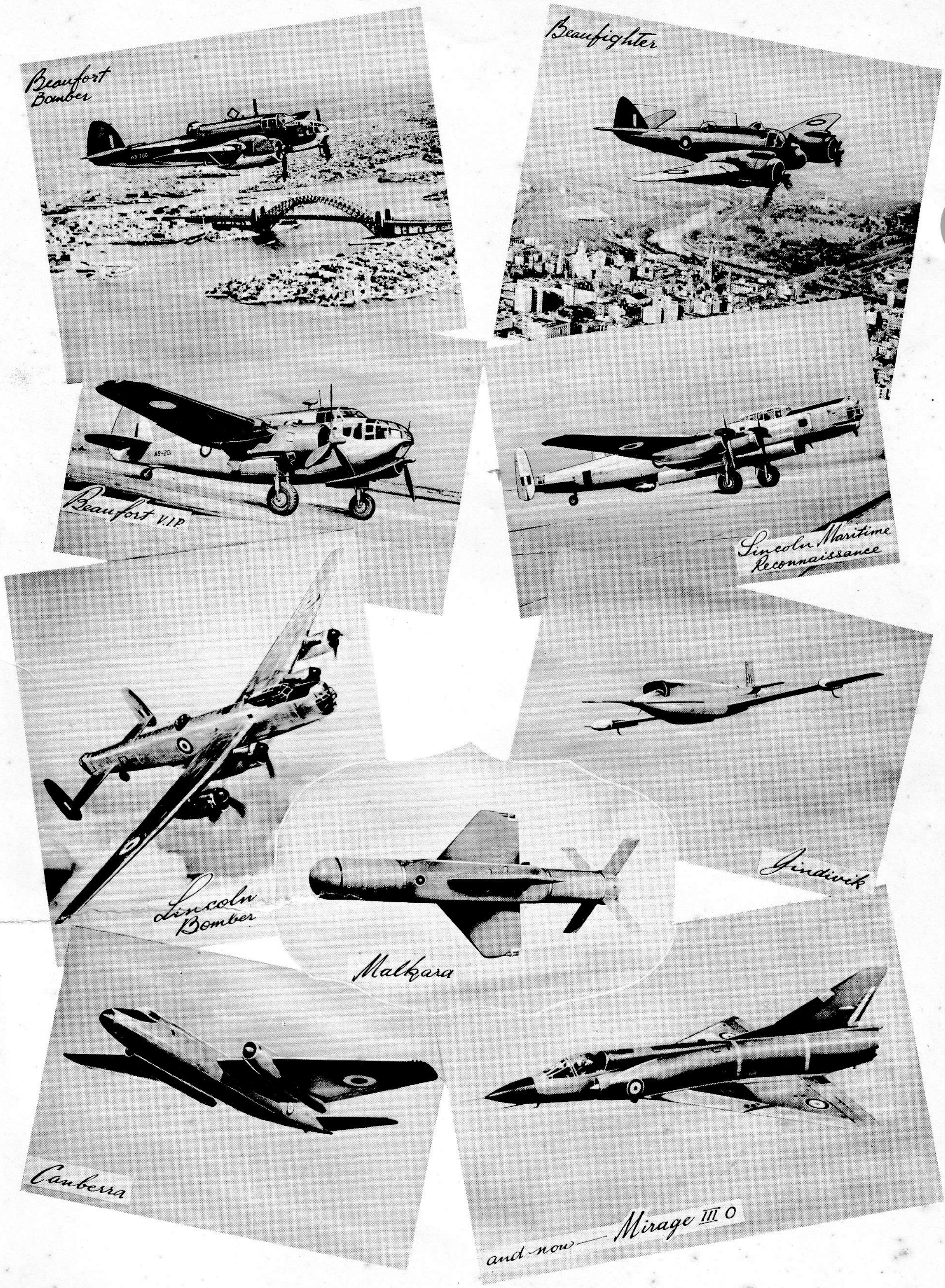


GOVERNMENT AIRCRAFT FACTORIES
PRODUCTS
1939 to 1962

BEAUFORT

BEAUFORT MK 8

Production Details

First Beaufort to arrive in Australia L4448
First Australian Beaufort (T9540) made its maiden flight on 5th May, 1941
First flown by Squadron Leader C.G. Lumsden at .. Fishermen's Bend
Chief Test Pilot .... T. Young
First Australian Beaufort (T9540) accepted by R.A.A.F. on .. 6th Sept, 1941
Serial Numbers of 6 Australian Prototypes T9540, T9541, T9542, T9543,
(Later renumbered to A9-1, A9-2, A9-3, A9-4, A9-5, A9-6) T9544, T9545.
100 Beauforts delivered by .... Aug, 1942
400 Beauforts delivered by .... Aug, 1943
700 Beauforts delivered by .... Aug, 1944
Total number produced 700
Serial numbers .... A9-1 to A9-700

Leading Particulars

Power Plant: Pratt & Whitney Twin Wasp S3C4G-1200H.P. at 4,900 ft (2-off)

Dimensions: Wing Span .... 57 ft. 10 in.
Length .... 44 ft. 2 in.
Height .... 15 ft. 10 in.
Wing Area .... 503 sq. ft.

Weights: Empty .... 12,100 lb.
Normal-Loaded .... 17,200 lb.

Performance: Max. Speed .... 270 knots
Range .... 2,000 miles

Armament: One .303 in. or .5 in. M/G in each wing.
Two .303 in. M/G in rear turret.
Two .303 in. M/G beam mounted.
One torpedo or 2,000 lb. of bombs.

Australian Modifications

Some of the major modifications to Beaufort aircraft introduced in Australia are as follows:-

Engine Change: Substitution of Pratt & Whitney Twin Row Wasp 1,200 h.p. Engines for Bristol Taurus Engines, necessitating redesigning of engine nacelle, cowling panels, engine controls, propellor controls, cowl gill controls, and engine bulkhead, with repositioning of the major accessories and fittings.

Propellor Changes: From Hamilton to Curtiss Electric and later to Hamilton Full Feathering.

Gun Turret: Substitution of Australian designed and manufactured Gun Turret, giving increased rotation from 180 degrees to 240 degrees.

Armament: Design for installation of .5 wing guns (in place of former .303 guns) and rear, nose and upward firing guns.

Armour Plate: Installation of armour plate to protect pilot from rearward and frontal attacks.

Tail Wheel: A special "shimmy damping" arrangement, designed in Australia, entirely eliminated tail wheel "shimmy".

Increased Fin Area: To correct the tendency of the original Beaufort to yaw, the fin was redesigned and the fin area increased by approximately 15%. This modification completely attained its objective.

Ball Bearings: Usage reduced from 303 to 148 by the employment of alternatives.

Torpedo Gear: English torpedo gear extensively redesigned to carry the American torpedo.

Oil Coolers: Australian modifications eliminated all troubles.

Fuel Tanks: Additional sumps added to increase drainage facilities under tropical conditions.

Electrical Installations:

(1) Complete redesign of electrical installations following engine and propellor changeover.

(2) Entire electrical system redesigned to meet R.A.A.F requirements.

Radio Installations: Former radio installations replaced by Australian made equipment; various new types of radio equipment installed.

BEAUFREIGHTER (BEAUFORT MK 9)

Production Details

A9-201 (originally Beaufort Mk 8) converted to V.I.P. Beaufort. Later converted to prototype Beaufreighter (Beaufort Mk 9).

Total number converted to Beaufreighters 46

Modifications

Some of the major modifications introduced to convert 46 Beaufort Bombers Mk 8 to Beaufreighters (Beaufort Mk 9) were as follows:-

Seating: To provide space for 4 airline type seats, the gun turret was removed, the rear fuselage faired in and flying controls re-routed. Batteries relocated to a point aft of the turret position. Previous battery position occupied by a fifth airline type seat.

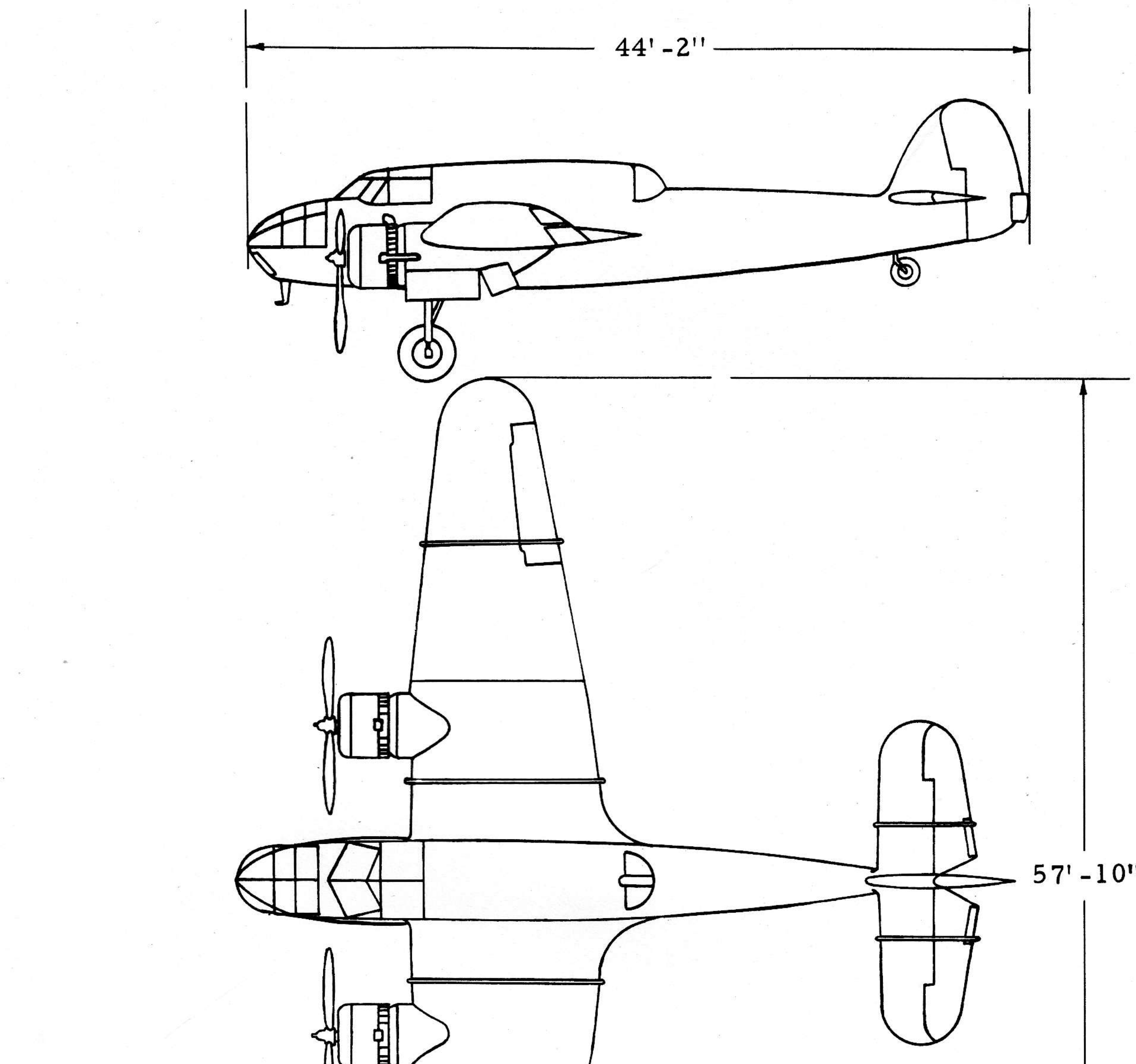
Radar and Radar Installations: Radio aerials and equipment removed. Radio equipment then installed was AT5-AR8 communications equipment, TR 5043 VHF installation and a Radio Compass Type MN26.

Electrical System: Converted from a 2-wire to an earth return system.

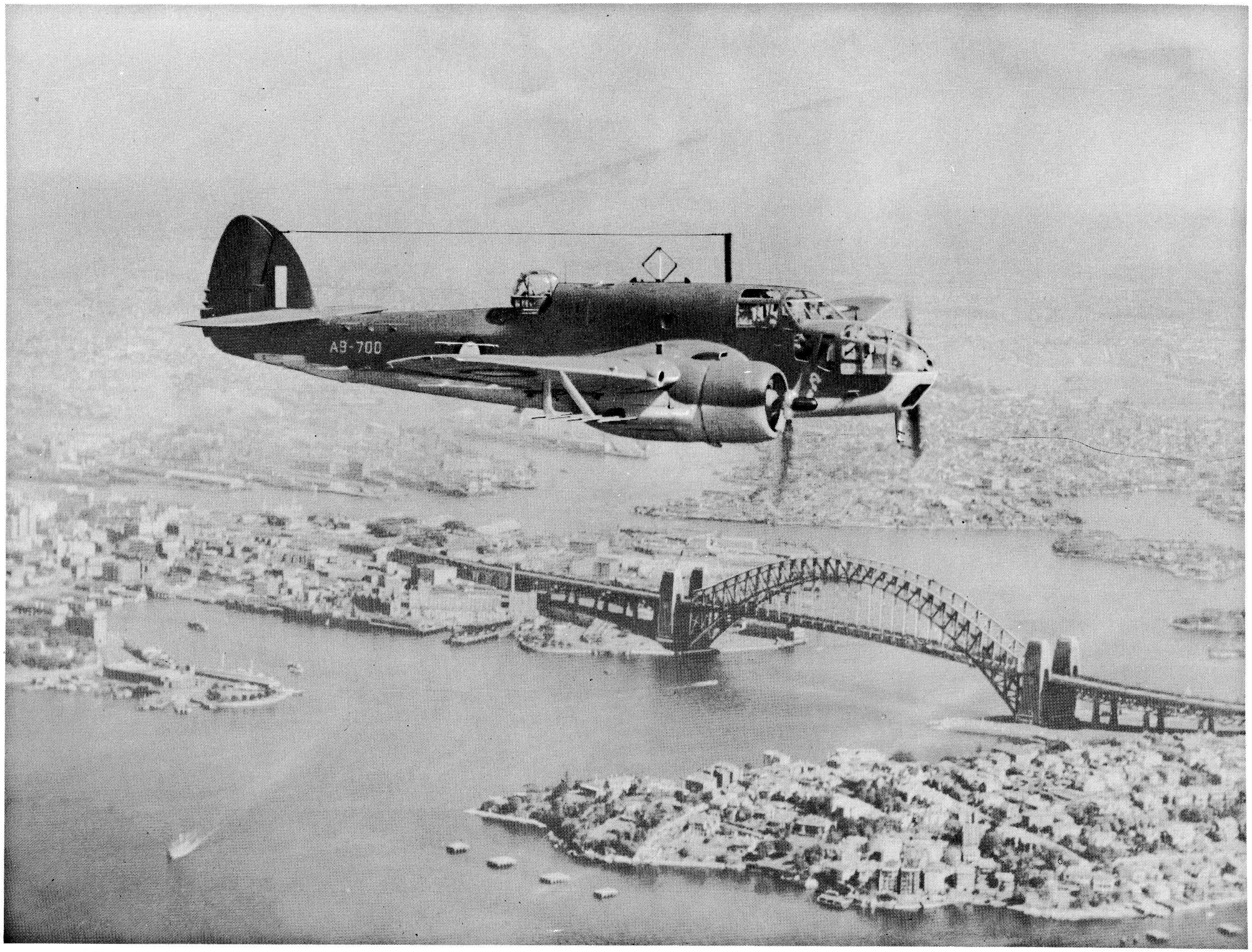
Armament Deletions: Wing guns, armour plate and bombing equipment removed.

Cargo Crate: A cargo crate of tubular construction fitted in bomb bay.

Other Special Modifications: In 1946, the R.A.A.F. converted some Beaufreighters for insect spraying duties. This entailed fitting original bomb bay fuel tanks, fitting them with spray lines and filling them with insect repellant, in an attempt to combat the grasshopper plague.



GENERAL ARRANGEMENT - BEAUFORT MK 8



BEAUFORT MK. 8

BEAUFIGHTER MK 21

Notable English Beaufighters to arrive in Australia were:-

Beaufighter with Wright Cyclone engines	A19-2
"White Elephant"	LX815

First Australian Beaufighter (A8-1) made its maiden flight on	26th May, 1944
First flown by Capt. C. Scott at	Fishermen's Bend
Date of delivery of A8-1	31st May, 1944
Total number produced	364
Serial Numbers	A8-1 to A8-364
Date of delivery of last Beaufighter	Jan, 1946

Leading Particulars

Power Plant: 2 Bristol Hercules XVIII of 1700 H.P. each.

Dimensions:	Wing Span	57ft. 10 in.
	Length	41ft. 4 in.
	Height	15ft. 10 in.
	Wing Area	451 sq.ft.
Weights:	Empty	13,800 lb.
	Normal-loaded	21,000 lb.
	With Torpedo	25,000 lb.
Performance:	Max. Speed	330 mph at 14,000 ft.
	Initial R of C	1850ft./min.
	Nominal Range	1,500 miles
	Service Ceiling	30,000 ft.

Armament:
Four 20 mm cannon in nose.
Two .5 in. M/G in each wing.
One .303 in. M/G for rear defence.
Four rockets on each wing.
2,000 lb of bombs.

Australian Modifications

Some of the major modifications to Beaufighter aircraft introduced in Australia were as follows:-

Wing Guns: Two .5 Browning guns introduced in each wing to replace .303 installation.

Cannon Installation: Pneumatic cocking control substituted for manual selection, enabling better harmonisation.

Torpedo Equipment: Deleted.

Wing Bomb Installation: Designed to enable carriage of bombs under each wing.

Rear Gun Installation: A rearward firing gun of greater range was installed.

Fuel System: Controls repositioned and extensive modifications introduced.

Sperry Automatic Pilot: Redesign carried out to enable installation when required.

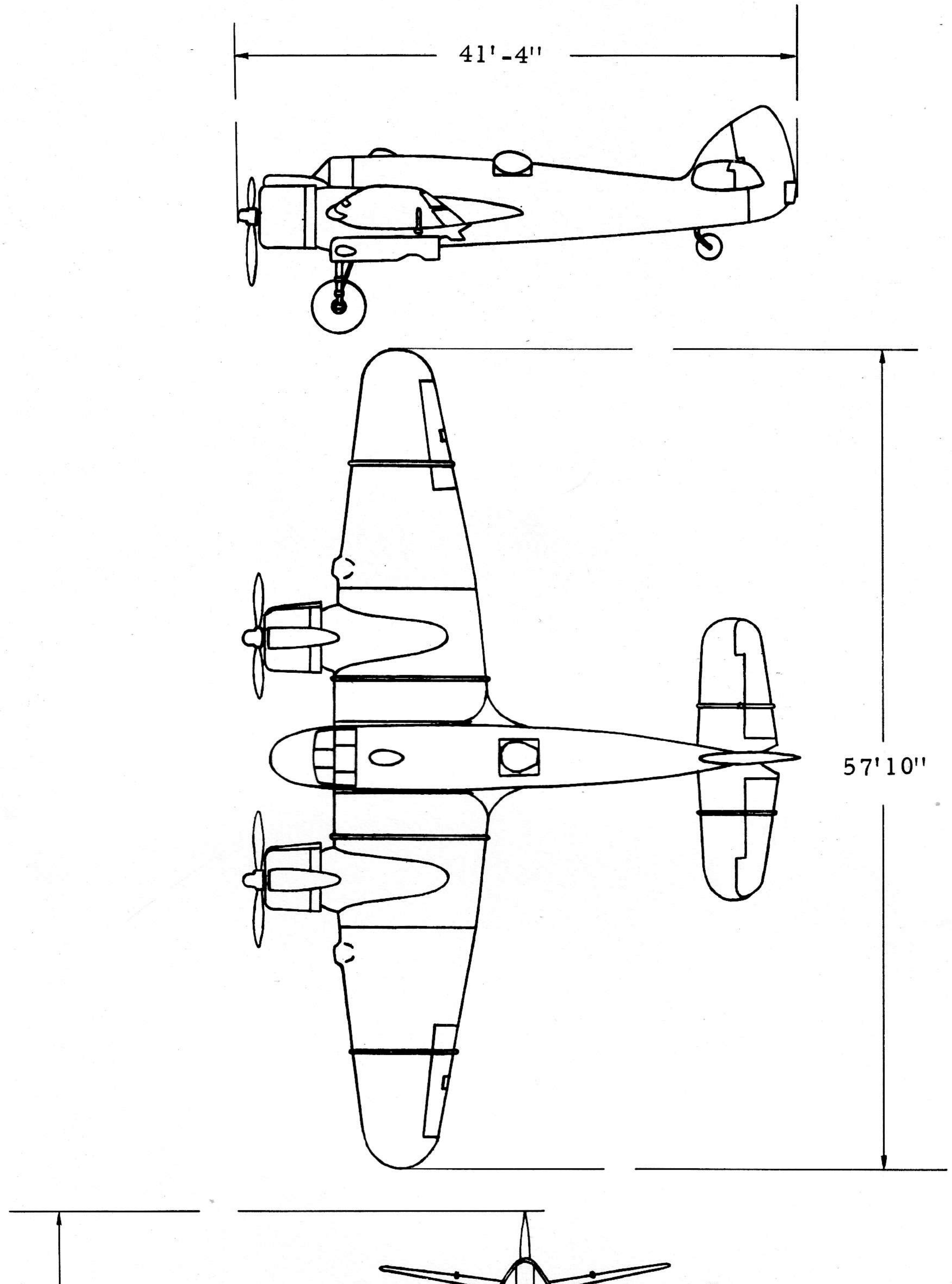
Tail Wheel: Fitted with 'anti-shimmy' device.

Nacelle Doors: Fabricated doors replaced by pressed metal doors.

Alternative Bearings: Ball bearings revised and many alternatives substituted.

Electrical Installation: Redesigned to meet R.A.A.F. requirements.

Radio Installations: Replaced by Australian-made equipment for general purpose operation, and other important changes made.



GENERAL ARRANGEMENT - BEAUFIGHTER MK 21

BEAUFIGHTER MK. 21

LINCOLN MK 30

Production Details

Serial Number of English AVRO Lancaster (Queenie VI) supplied to Australia	A66-1
First Australian assembled Lincoln (A73-1) first successfully flown	12th Mar. 1946
First flown by Capt. C. Scott at	Fishermen's Bend
Date of delivery of A73-1	May, 1946
First fully Australian built Lincoln	A73-6
Date of delivery of A73-6	Nov, 1946
Total number produced	73
Date of delivery of last Lincoln (A73-73)	23rd Sept, 1953
Serial Numbers of the two V.I.P. Lincolns	A73-14, A73-18
Total number of Lincoln Mk 30's modified to L.R.N. aircraft	14
Prototype L.R.N.	A73-38
Serial Numbers of others	A73-31, A73-32, A73-33, A73-34, A73-36, A73-37, A73-39, A73-40, A73-42, A73-43, A73-44, A73-45, A73-46.
Other specially modified Lincoln Mk 30's were	A73-15 which was converted to a long range navigational trainer for Air Navigation School at Sale (by deletion of gun turrets and fitment of fairings)
and	A73-2 ("Nyhuan") specially fitted for Antarctic surveys (Note:-Flown by Wing Commander G. Cuming)

Leading Particulars

Power Plant:
Four 1680 H.P. Rolls Royce Merlin 85's(on early aircraft)
Four 1680 H.P. Rolls Royce Merlin 102's(on later aircraft)

Dimensions:

Wing Span	120 ft.
Length	78 ft. 3 in.
Height	20 ft. 3 in.
Wing Area	1421 sq. ft

Weights:

Empty	44,000 lb.
Max. All-up	82,000 lb.

Performance:

Max. Speed	310 mph
Max. Range	4,000 miles

Armament:
Two .5 inch M/G in nose turret
Two 20 mm cannon in dorsal turret
Two .5 inch M/G in rear turret
Bomb load - 22,000 lb.

General Description

The Lincoln Mk 30 is an all-metal mid-wing monoplane, having four Merlin 85 power plants, fitted with variable-pitch constant speed propellers. The aircraft is designed and equipped for heavy bomber duties and carries a crew of seven consisting of a captain, second pilot, air observer (navigator-air-bomber), two wireless operator-air gunners and two air gunners.

The fuselage is constructed of light alloy and incorporates transverse formers braced with longitudinal stringers covered with a light-alloy skin. Two longerons carry the cross members of the main floor in which the bomb gear is housed. To facilitate transport the fuselage is divided into four sections, viz., front section comprising the nose and front centre sections, the intermediate centre section consisting of the fuselage between the spars and the centre part of the main plane, the rear centre section, and the rear fuselage which carries the tail unit.

The main plane is of the two-spar type and consists of two intermediate planes attached to the centre plane, which is integral with the fuselage centre section, and two outer planes. The intermediate and outer planes are tapered in plan and elevation. The skin covering is of light-alloy sheet. Six fuel tanks are housed in the main plane, one between each inboard nacelle and the fuselage and two in each intermediate plane. The two inboard fuel tanks are the rigid type, and the other four are the collapsible pattern and removable from the top side of the main plane. The main undercarriage units are housed in the inboard engine nacelles.

The tail plane construction is similar to that of the main plane. The twin fins and rudders are attached to the extreme ends of the tail plane, and these and the elevators are covered with light-alloy skin.

The entrance door is on the starboard side of the fuselage just forward of the tail plane. The door opens inwards and entry is made by means of a ladder, fitted with hooks for attachment to the bottom of the door frame.

The flying controls are conventional, pendulum-type rudder pedals operating the rudders and a handwheel type control column operating the ailerons and elevators. Tubular push-pull connections are used, except for the aileron controls in the fuselage, which consist of chains, tie rods and cables. Trimming tabs are inset in the trailing edge of the rudders, elevators and ailerons, and balance tabs are fitted to the elevators and ailerons. Mark V11 automatic controls are fitted. Hydraulically-operated split-trailing edge flaps extend from the fuselage sides to the ailerons.

The undercarriage consists of two retractable main wheel units, one under each inboard engine nacelle, and a fully-castering non-retractable tail wheel unit. Each main wheel unit is retracted backwards into the engine nacelle by means of two hydraulic jacks. When retracted the units are completely faired in by doors which are inter-connected with the shock-absorber struts and automatically close when the wheels retract. A compressed air system is installed for lowering the main wheels in an emergency.

The four engines, which are equipped with two-stage, two-speed superchargers, are mounted on nacelle structures built out from the centre and outer plane spars, and are fitted with Rolls-Royce Bendix carburettors. The fuel supply is by gravity from the main tanks to distributor tanks mounted on the rear face of the inboard engine firewalls, and thence to the engines. Pulsometer pumps are mounted on the base of the distributor tanks. The normal supply to the engines on either side is from the relative tanks but when required all four engines may be fed from one side by means of a cross-feed system. The inboard oil tanks are mounted behind the front spar in the undercarriage compartments, and the outboard tanks in the engine sub-frames.

A single pump mounted on each inboard engine auxiliaries gearbox supplies power for the hydraulic operation of the retractable main wheel units, main plane flaps, bomb door jacks and fuel jettison system. An Arrow type compressor mounted on the port inboard engine auxiliaries gearbox, working at high pressure, operates the pneumatic brake system and the electro-pneumatic power plant controls. The latter comprise radiator shutter, supercharger, slow-running cut-out, air-cleaner controls and hot and cold air intake shutters. Two vacuum pumps on the port inboard engine gearbox operate the bomb sight and computor and another pump on the starboard inboard engine gearbox operates the gyroscopic instruments on the instrument flying panel.

The gun armament consists of two electro-hydraulically operated turrets located in the nose and tail, and one electrically-operated dorset turret. The first two each carry two .5 in. guns; the third is fitted with two 20 m.m. guns. Alternative armament may, in some cases, take the place of the nose turret. Various bomb loads may be carried in the bomb compartment in the lower portion of the fuselage. These include small-bomb containers, mines , and 250 lb. to 4,000 lb. bombs. Provision is made for under-defence when required.

An earth-return wiring system is used. The D.C. power supply is provided by four 30-volt, 6 k.w. generators, driven through the auxiliary gearboxes of each engine. The generators are connected in parallel for the charging of four 12 volt, 40 amp.hr. accumulators, the latter being interconnected to give a 24-volt, 80 amp.hr. supply to operate all the general electrical services. Two power distribution panels, situated port and starboard respectively in the fuselage centre section, carry four Type 23 voltage control regulators, four Type J cut-outs and Type D circuit breakers. The Type 23 regulators are connected in parallel to a master voltage-control regulator, Type 32. Type A circuit breakers control various banks of fuses to the general services. Three distributor boxes are provided. Two 2,000 watt, Type 1V motor driven alternators supply the current for the radio installations. The radio equipment consists of an electrically remotely-controlled transmitter/receiver installation for the pilot, with fire control facilities at the pilot's, air-bomber's and astro-dome stations, I.F.F. at the navigator's station; and a general purpose transmitter/receiver at the wireless operator's station. Inter-communication between members of the crew is provided by independent use of the amplifier and the pilot's transmitter/receiver. Independent fixed aerials are fitted for all sets, and an additional trailing aerial for the general purpose set.

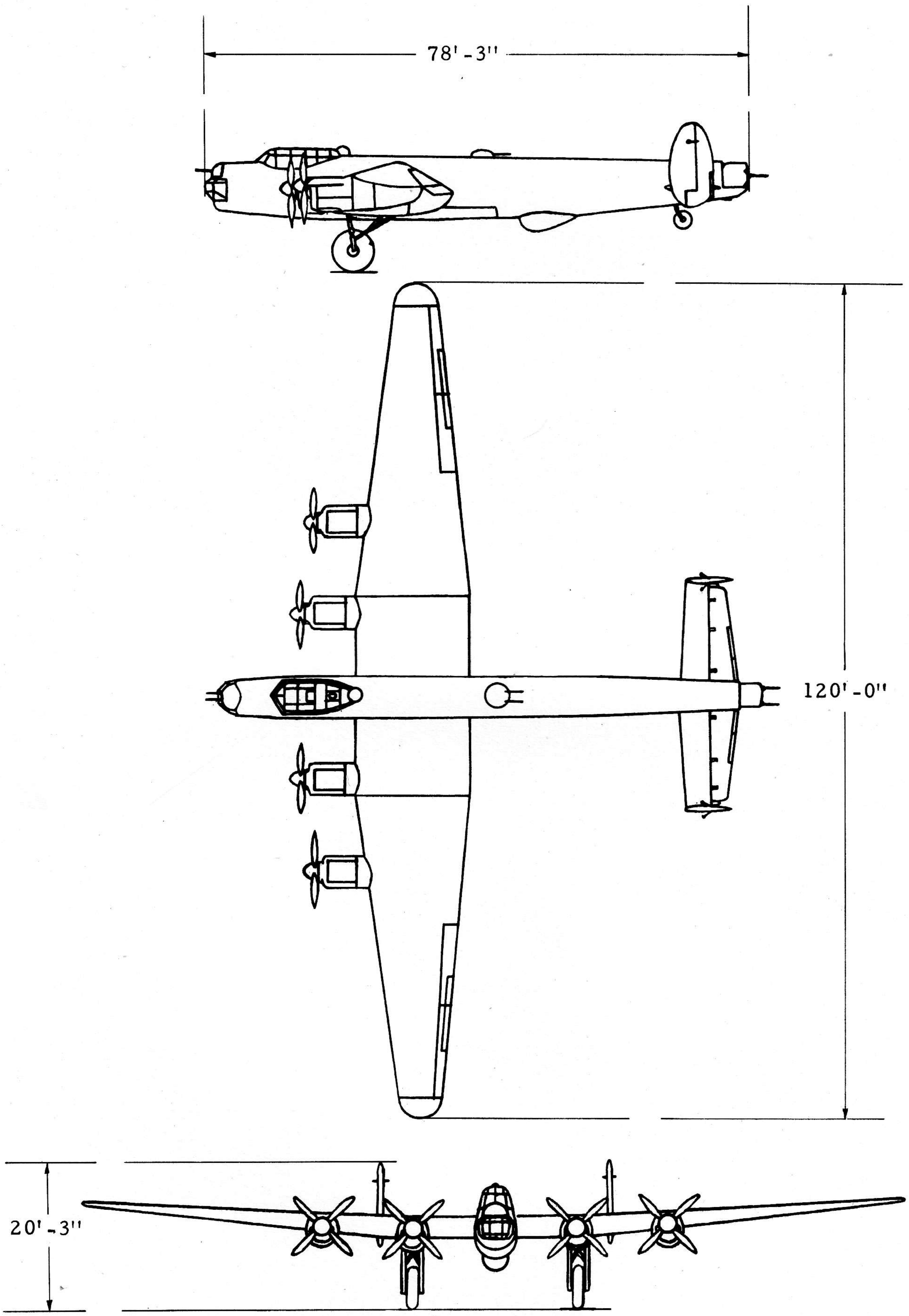
Hand-operated de-icing equipment is provided for the air-bomber's window and the pilot's windscreen.

Provision is made in the fuselage between the main plane spars for the fitting of armour-plate doors if required. The formers at certain positions are reinforced with armour plate. Emergency exits in the roof of the fuselage, and a parachute exit in the floor of the nose are provided.

Other equipment includes portable oxygen apparatus, F.24 camera, signal pistol, hand signal lamp, reconnaissance flares, sea markers, fireman's axes, first-aid outfits, fire extinguishers, Type Q flotation dinghy, Type K dinghies, pigeon containers and an Elsan sanitary closet.

L.R.N. Aircraft

In 1949, 14 Mk 30 Lincolns were modified to Longe Range Navigation(L.R.N) aircraft for special duties. Modifications included the fitment of radio and radar equipment, instrumentation and an extra crew station aft of the mid-upper turret.



GENERAL ARRANGEMENT - LINCOLN MK 30

LINCOLN MK. 30

LINCOLN MK 31

Production Details

Serial Number of prototype long-nose Lincoln (G.R. Mk 31) A73-48
Total Number converted to Mk 31 20
Serial Numbers of these A73-48, A73-28, A73-55, A73-56,
A73-57, A73-59, A73-60, A73-61,
A73-62, A73-63, A73-64, A73-65,
A73-66, A73-67, A73-68, A73-69,
A73-70, A73-71, A73-72, A73-73.
Total Number of Mk 31's converted to Maritime Reconnaissance 10
First M.R. (A73-60) delivered to R.A.A.F. on .... 8th Mar, 1955
Serial Numbers of others .... A73-55, A73-57, A73-61,) Converted
A73-62, A73-65, A73-66,) by
A73-68) G.A.F
A73-28, A73-67 (converted by R.A.A.F)

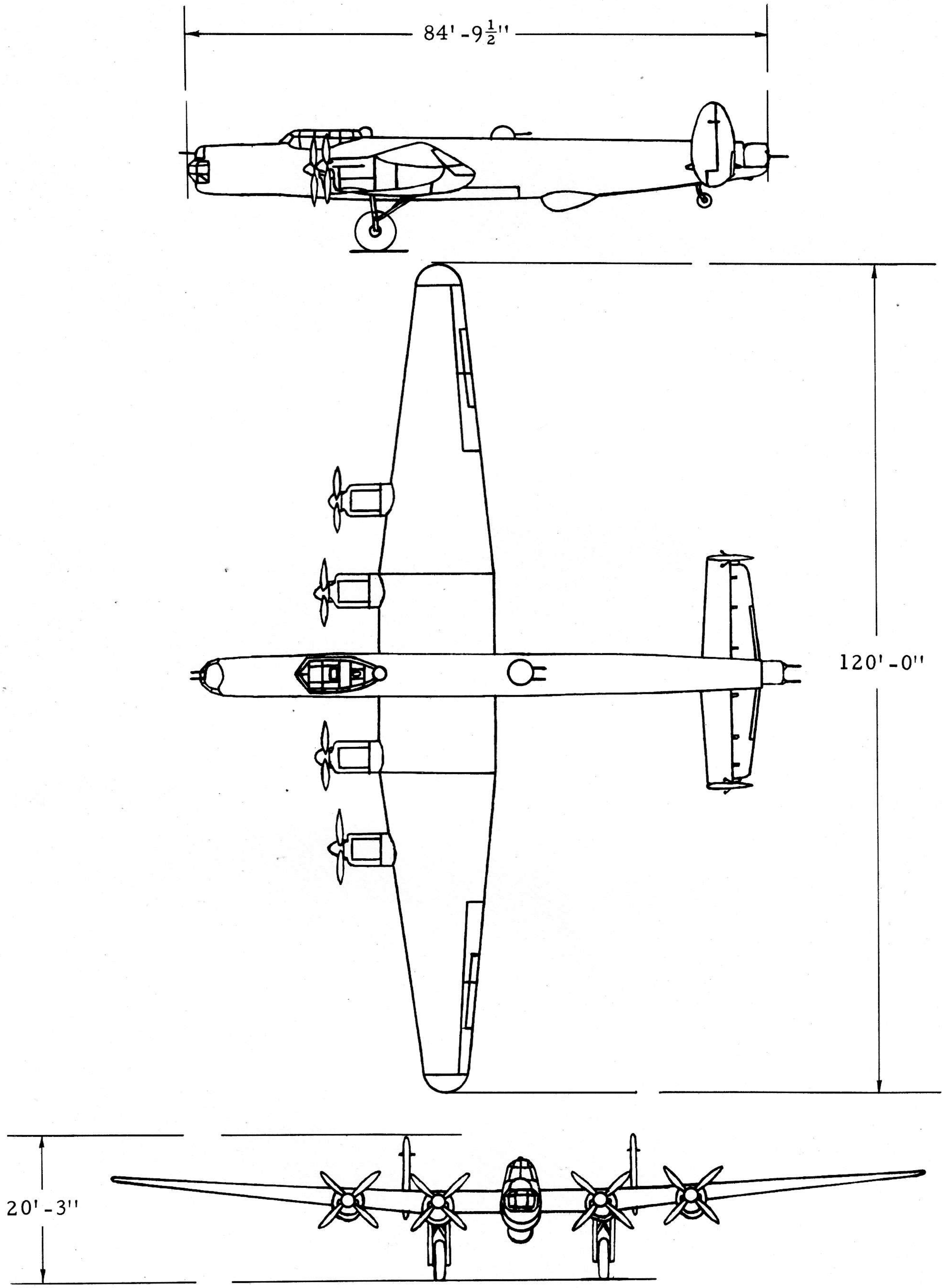
Leading Particulars

As for Mk 30 with the following exceptions:-

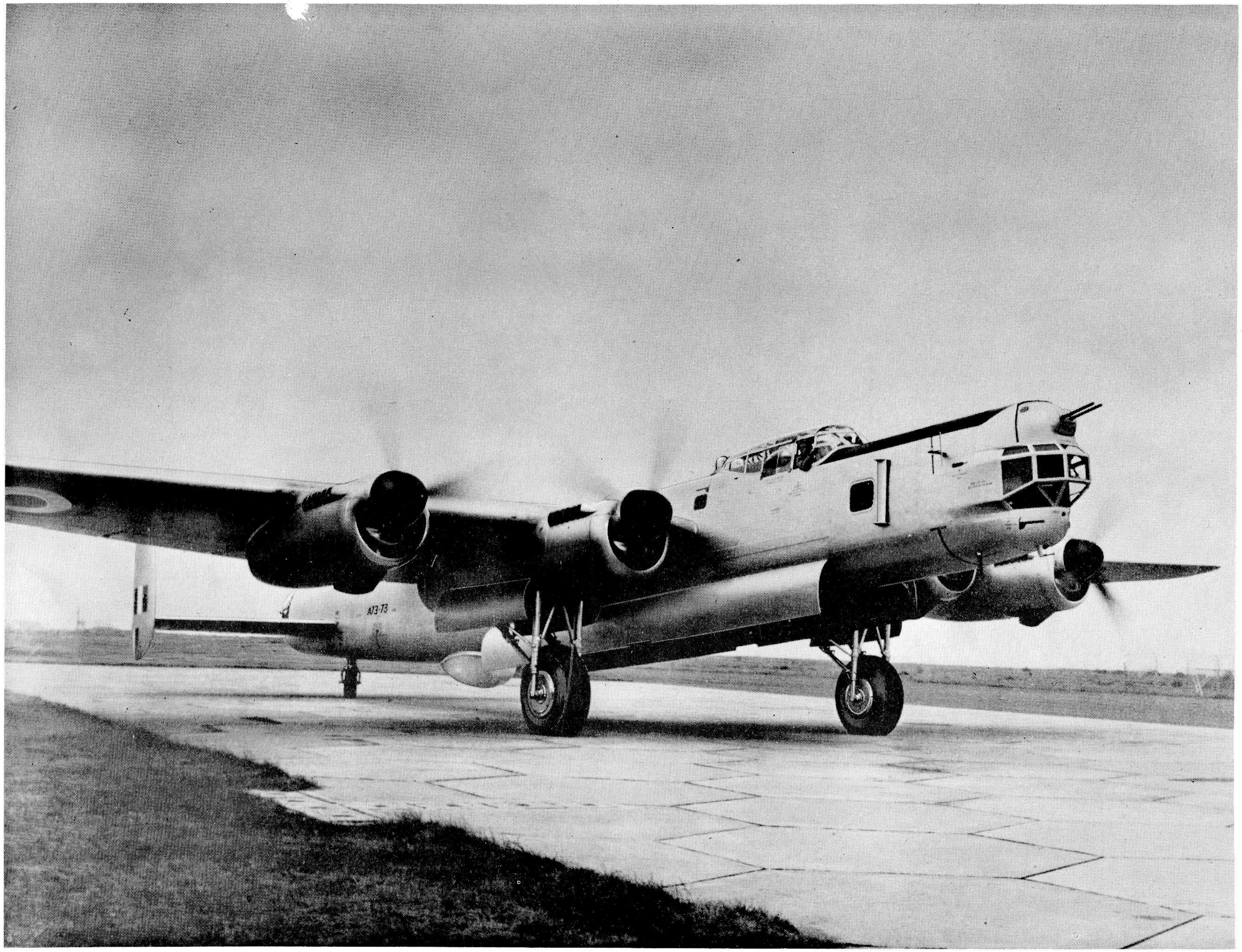
Length: .... 84ft. $9\frac{1}{2}$ in.
Weight (empty) .... 44,900 lb.

General

During 1951, a major redesign to convert 20 Mk 30 Lincolns for general reconnaissance duties, was undertaken by G.A.F. This entailed extending the fuselage 6' 6" to accommodate additional crew members and new equipment for the General Reconnaissance role. These aircraft became Lincoln Mk 31(G.R.) At a later date 10 of these aircraft were fitted with submarine locating equipment and were designated Lincoln Mk 31 Maritime Reconnaissance (M.R.)



GENERAL ARRANGEMENT - LINCOLN MK 31



LINCOLN MK. 31

CANBERRA MK 20

Production Details

Production commenced	1950
Date of first flight (A84-201)	May, 1953
First flown by J. Miles at	Avalon
Date of delivery of first Australian Canberra (A84-201)	1st July, 1953
Total number produced	48
Serial Numbers	A84-201 to A84-248
Date of delivery of last Canberra (A84-248)	30th Sept, 1958

Leading Particulars

Power Plant: Rolls Royce Avon Mk 1 or Mk 109 - 2 off 7,500lb thrust.

Dimensions:	Wing Span	64 ft. 0 in.
	Length	65 ft. 6 in.
	Height	15 ft. 6 in.
	Wing Area	960.3 sq.ft.
Weight:	Empty	24,700 lb.
	Loaded	51,000 lb.
Performance:	Max. Speed	0.83 M
	R. of C. at S.L.	3,800 ft./min.
	Cruise	0.76 M
	Ceiling	48,000 ft.

General Description

The Canberra Mk 20 is a twin engined, jet propelled, high speed, tactical bomber. A mid wing monoplane, with retractable tricycle alighting gear, it is powered by two Rolls Royce Avon Mk 1 (R.A. 3) turbo-jet engines mounted in the main planes. A crew of two is carried, each of whom is provided with an ejection seat.

The all metal fuselage is of semi-monocoque construction consisting of a stressed skin outer covering supported by a structure of longitudinal stringers and transverse frames; to facilitate transport the fuselage is built in three main units, front, centre and rear fuselage. Assembly of the complete aircraft and dismantling into main units, is facilitated by the provision at the ends of the units into which they are built, of junctions in the controls, hydraulic pipes, electrical wiring, etc.

The front fuselage consists of a pressurised cabin and transparent plastic nose, alighting gear nose wheel unit, and equipment hatch. The cabin and nose are sealed off from the remainder of the aircraft by a pressure bulkhead placed diagonally across the fuselage. A door, which may be jettisoned in an emergency, is provided on the starboard side of the cabin for normal entry and exit. The pilot's canopy, and the hatch above the navigator's seat are both jettisonable, and provide emergency escape exits for crew members. To improve visibility, the pilot's seat is offset to the port of centre line of aircraft. The navigator's ejection seat is at the rear of the cabin port side and is backed on to the pressure bulkhead; both the pilot's and navigator's ejection seats are mounted on separate support structures raising them above the level of the main cabin floor. An extension of the cabin floor in the form of a sloping ramp supports the navigator at the prone bomb aiming position. An observation window is fitted in the bottom skin forward of the ramp, and a toughened glass sighting panel is fitted in the transparent plastic nose fairing. The bomb sighting head is mounted inside the plastic nose fairing.

The centre fuselage is divided into fuel and bomb bay by an arched metal floor. Three fireproof tanks are carried in the fuel bay; the forward and centre tanks are self-sealing and rigidly supported by internal bracing structures; the rear tank is a crashproof collapsible fuel bag. A bulkhead between the centre and rear tanks is formed by the main plane centre section forging, which passes through the fuel bay and is an integral part of the fuselage. Of full fuselage width, the bomb bay is closed by two hydraulically operated retracting bomb bay doors. Bulkheads at each end of the bomb bay carry the bomb door jacks and operating linkage, and form separate compartments at each end of the centre fuselage. Provision is made in the aft compartment for the fitment of a camera.

The rear fuselage carries the tail unit, which consists of a metal tail plane, elevators, rudder and a wood and metal fin. The tail plane is fitted with an incidence adjustment unit to give positive control at high Mach. number. Variation of incidence is effected by an electrical actuator which ensures irreversibility of control under flight conditions, enabling rapid changes of fore and aft trim to be effected during take-off, flight and landing. A spring tab is fitted to the port elevator, and a geared fixed ratio tab to the starboard elevator. The fin forward of the spar is of wooden construction, aft of the spar the rudder shroud is constructed of metal. The rudder incorporates a spring tab, which through an electrical actuator acts also as a trim tab; it is so arranged that full travel is available for either function.

The main planes are all metal cantilever structure of symmetrical section, consisting of a stressed skin outer covering supported by span-wise stringers, transverse ribs, a main spar and a sectional rear wall. The power units are mounted mid wing. The main spar is a single web with machined booms, the web cut away and reinforced by ring plates for the accommodation of the engine jet pipes. Four main and seven shear bolts attach the spar root to the main spar centre section forging in the fuselage. The rear wall consists of three pressed sections, the inner and centre section being attached to the forged ring through which the engine jet pipe passes. At the main plane root the inner section is attached by one bolt to a fuselage pick up point. The outer section has a curved web which forms the forward wall of the pressure balance box. The inner leading edge section of the main plane, into which the main undercarriage retracts, is divided spanwise by a diaphragm which forms the forward wall of the wheel well; the diaphragm is attached by one bolt to the fuselage. No fillets are fitted at the intersection of the main plane and fuselage, the skin at the root of the main plane fitting over a joint angle riveted to the fuselage. Each main plane is fitted with air brakes, split flaps and an aileron. Provision is made for fitting jettisonable fuel tanks to the wing tips.

The flying controls are conventional; rudder pedals operating the rudder, and a horn type control operating the ailerons and elevators. All control runs consist of push-pull tubes and levers.

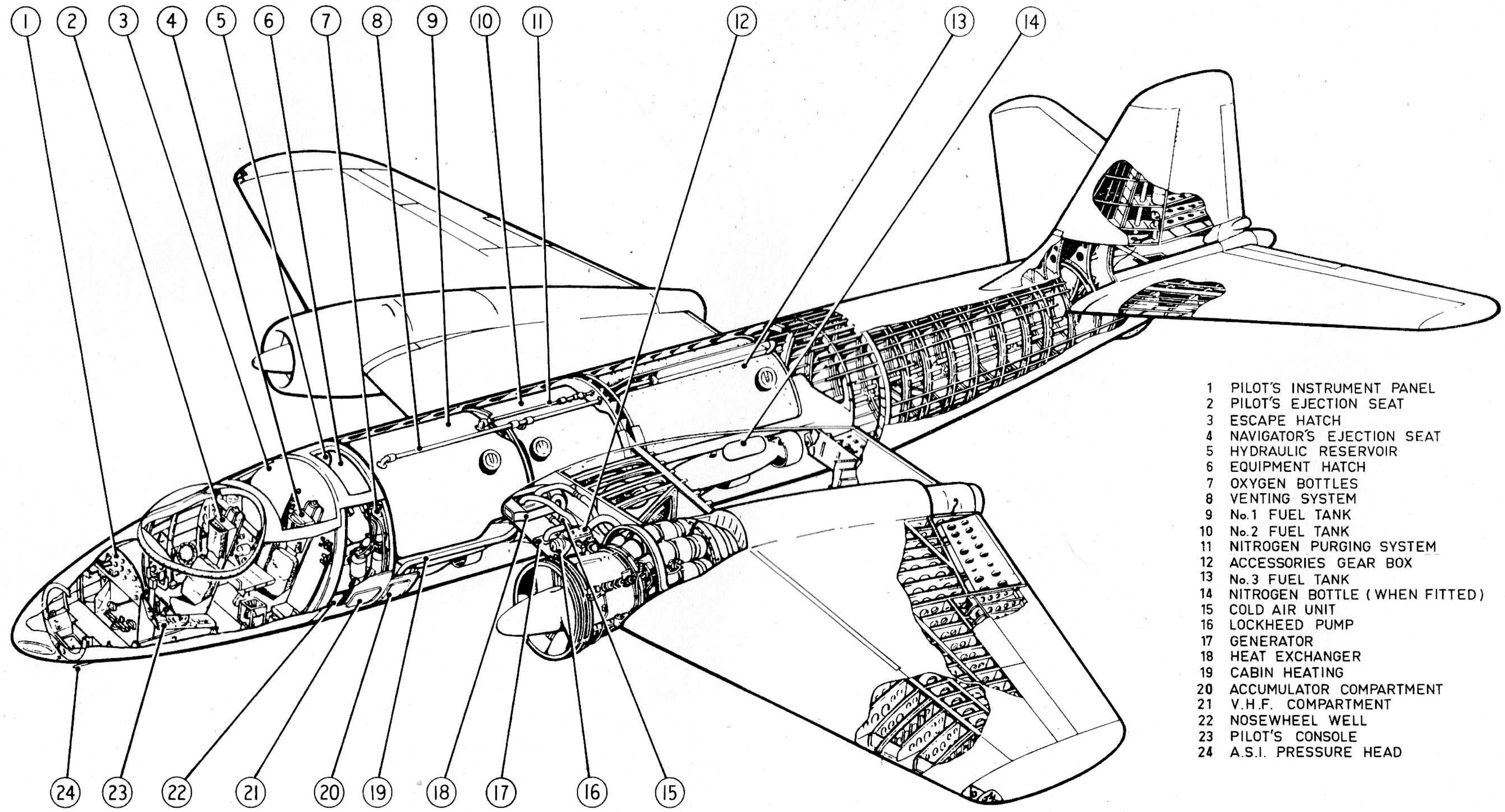
The fully retractable tricycle alighting gear is operated hydraulically through electrically actuated selectors, the main units retracting inwards into the main planes, and the nose wheel unit rearwards into the front fuselage. The main units consist of single wheels fitted with hydraulic disc type brakes, cantilever mounted on oleo pneumatic shock absorber units. The nose wheel unit is a fully castoring self-centering unit, consisting of a levered suspension liquid spring shock absorber, mounting twin nose wheels which are keyed together to eliminate shimmy.

The engines are mounted forward of the spar and off engine ribs. Each is slung on four attachments, all but one of which is designed to take up expansion. All auxiliaries are mounted on gear boxes inboard of the engines. Turbo starters are fitted, the units being faired into the engine air-intakes. Oil is carried in the engine sumps only, and is cooled by fuel cooled oil coolers mounted on the engines.

Fuel galleries connect each engine with the fuel tanks. Two fuel pumps are submerged in each tank; separate switches operate each pump together with its associated low pressure cock. Fuel from the wing tip tanks is transferred to number 3 tank by air pressure ducted from the engine compressor casings. Fuel from the main plane integral tanks may either be fed direct to the engine or by means of a transfer valve, fed to number 3 tank via the wing tank transfer pipe. Electrostatic contents gauges are fitted in all fuselage tanks, and main plane integral tanks. Fuel tank venting and nitrogen purging systems are installed. Flame detectors and spray pipes are installed in the tank bay centre fuselage, and in the engine bays.

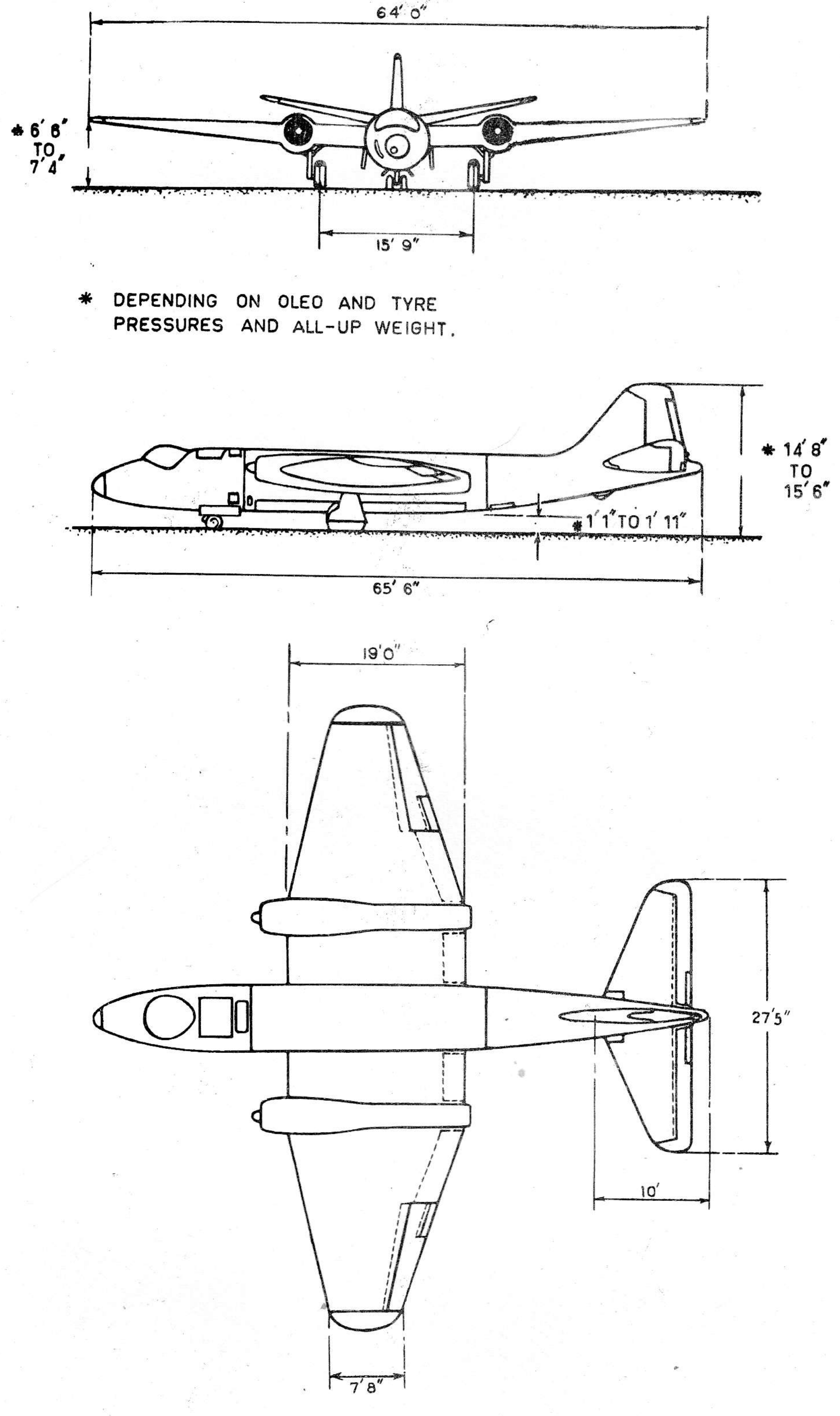
Electrical power is drawn from two 24 volt, 9 kilowatt generators and from four 12 volt accumulators connected in series parallel, to give a nominal capacity of 24 volts, with appropriate inverters for flight instruments and radar equipment. For emergency operation two 12 volt batteries, connected in series and completely independent of the main electrical system, are directly connected to the detonator circuits so that they remain operative if the main aircraft battery is disconnected. These batteries also provide an emergency supply for the turn and slip indicator. In addition to these batteries, a 2.4 volt alkaline battery is used for emergency lighting.

Radio and Radar equipment suitable to the role of the aircraft is installed; controls and associated equipment are installed in positions convenient to the crew member concerned.



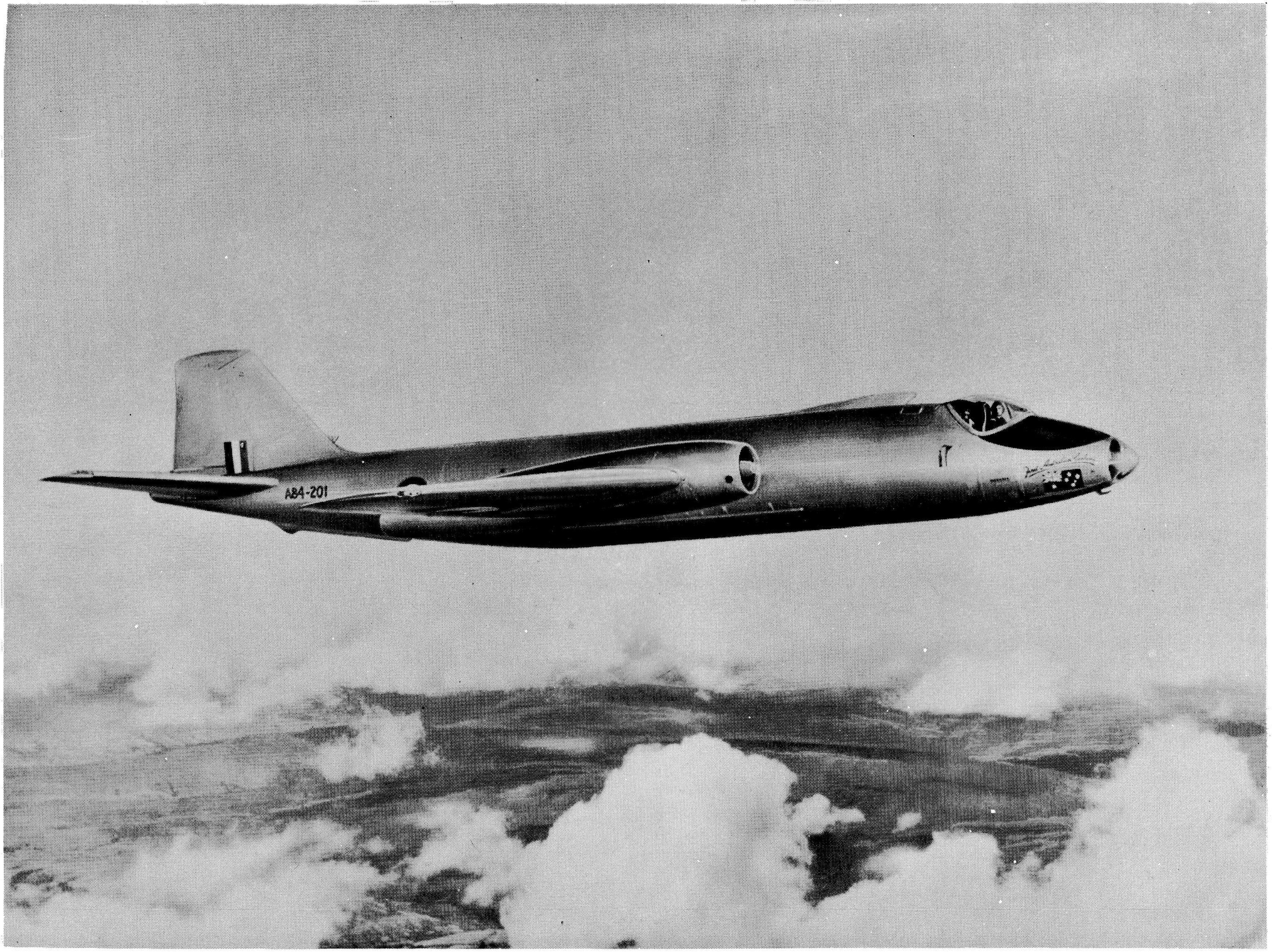
1 PILOT'S INSTRUMENT PANEL
2 PILOT'S EJECTION SEAT
3 ESCAPE HATCH
4 NAVIGATOR'S EJECTION SEAT
5 HYDRAULIC RESERVOIR
6 EQUIPMENT HATCH
7 OXYGEN BOTTLES
8 VENTING SYSTEM
9 No.1 FUEL TANK
10 No.2 FUEL TANK
11 NITROGEN PURGING SYSTEM
12 ACCESSORIES GEAR BOX
13 No.3 FUEL TANK
14 NITROGEN BOTTLE (WHEN FITTED)
15 COLD AIR UNIT
16 LOCKHEED PUMP
17 GENERATOR
18 HEAT EXCHANGER
19 CABIN HEATING
20 ACCUMULATOR COMPARTMENT
21 V.H.F. COMPARTMENT
22 NOSEWHEEL WELL
23 PILOT'S CONSOLE
24 A.S.I. PRESSURE HEAD

CANBERRA MK. 20

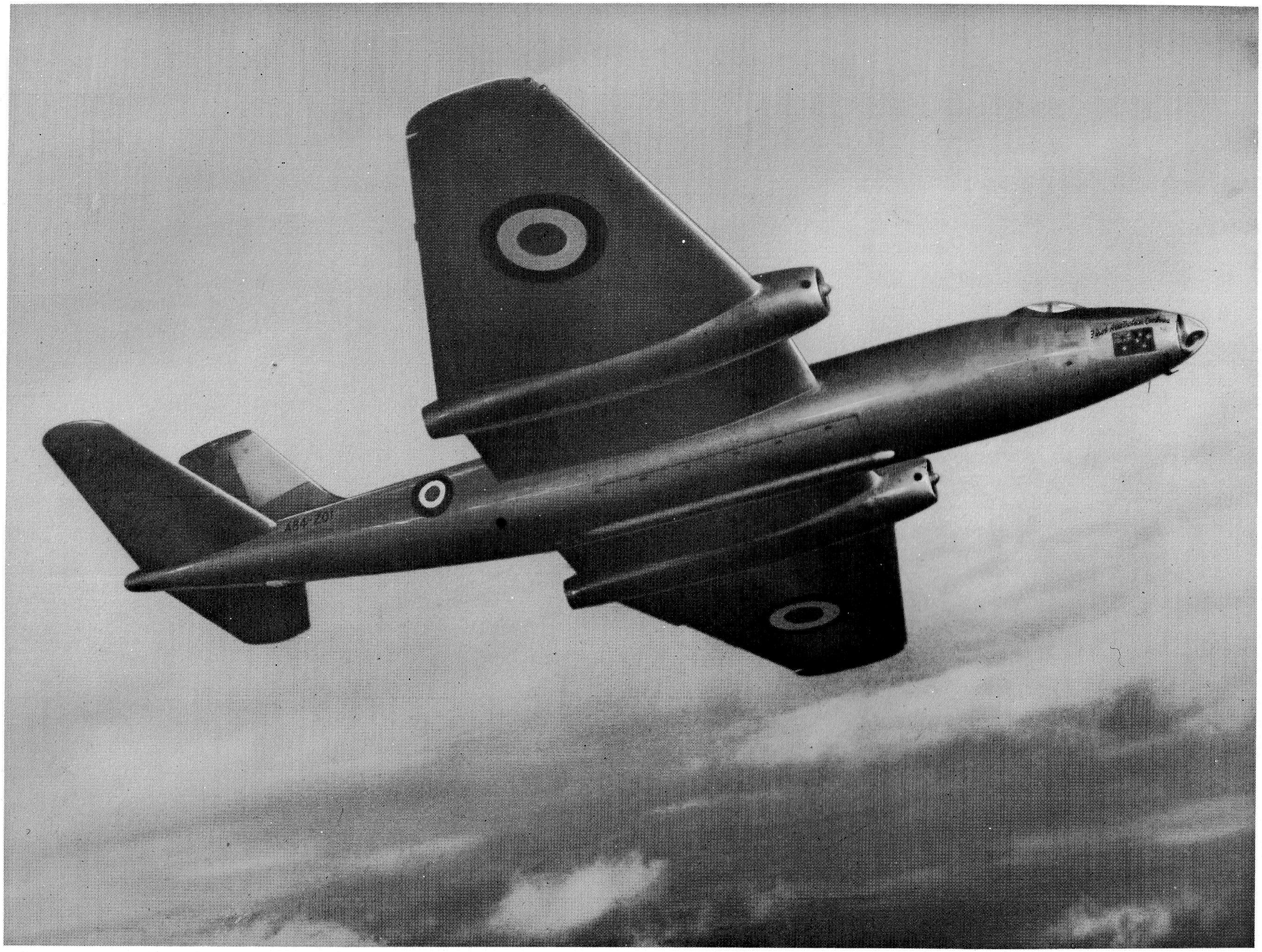


CANBERRA MK 20.

GENERAL ARRANGEMENT



CANBERRA MK. 20



CANBERRA A84-201 FITTED WITH BOMB BAY FUEL TANKS AND
FUEL GALLERY FOR ENGLAND TO NEW ZEALAND AIR RACE (1953)

CANBERRA MK 21

Production Details

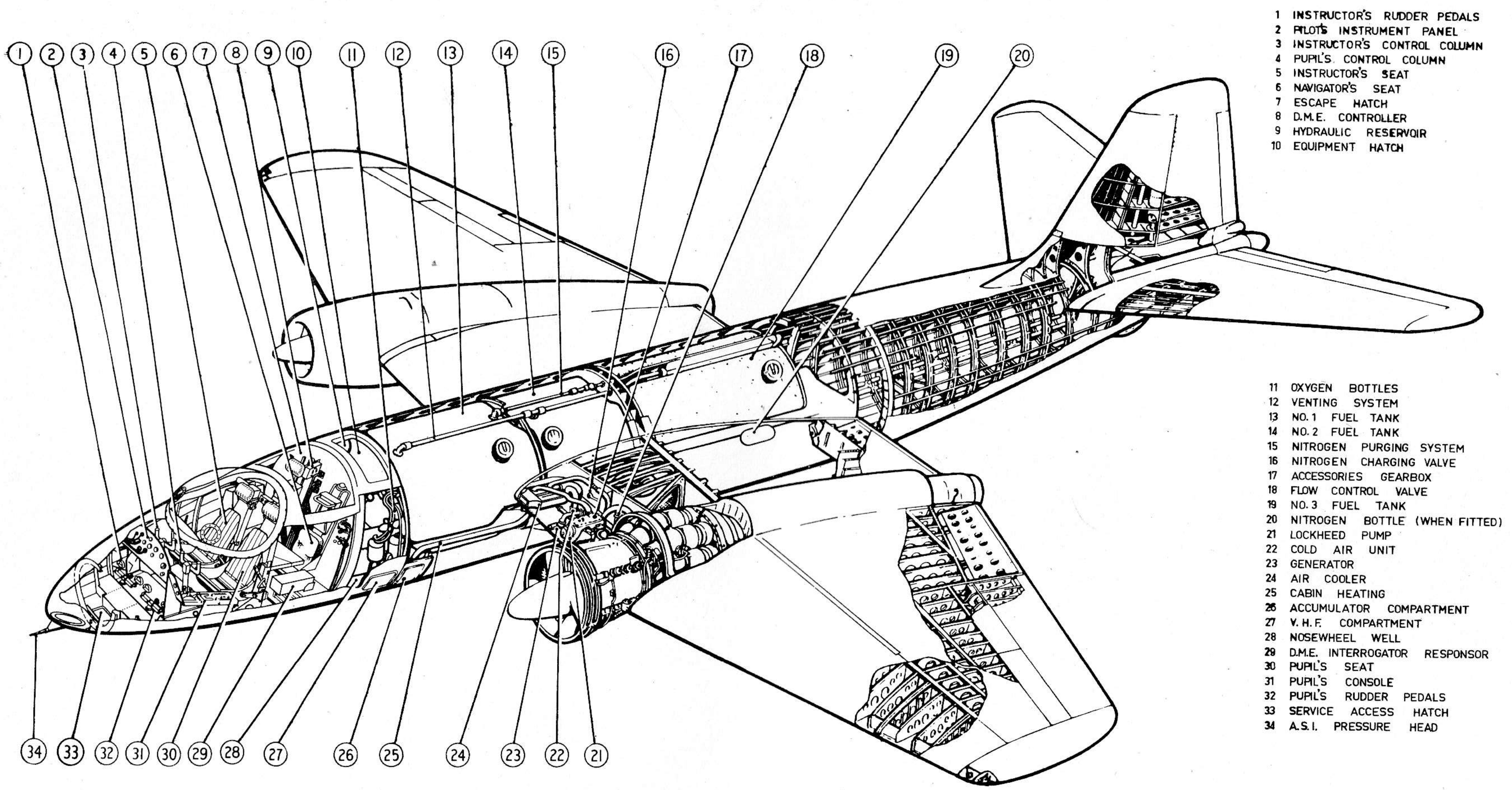
Date of first flight (A84-201)	17th June, 1958
Flown by W. Scott at	Avalon
Date of delivery of first Trainer (A84-201)	4th Sept, 1958
Number of dual control Trainers	7
Serial Numbers	A84-201, A84-203, A84-204, A84-205, A84-206.) Converted from Canberra Mk 20's
and	A84-125, A84-307 (Converted from English B. Mk 2's)
Date of delivery of last Trainer (A84-125)	10th June, 1959

Leading Particulars

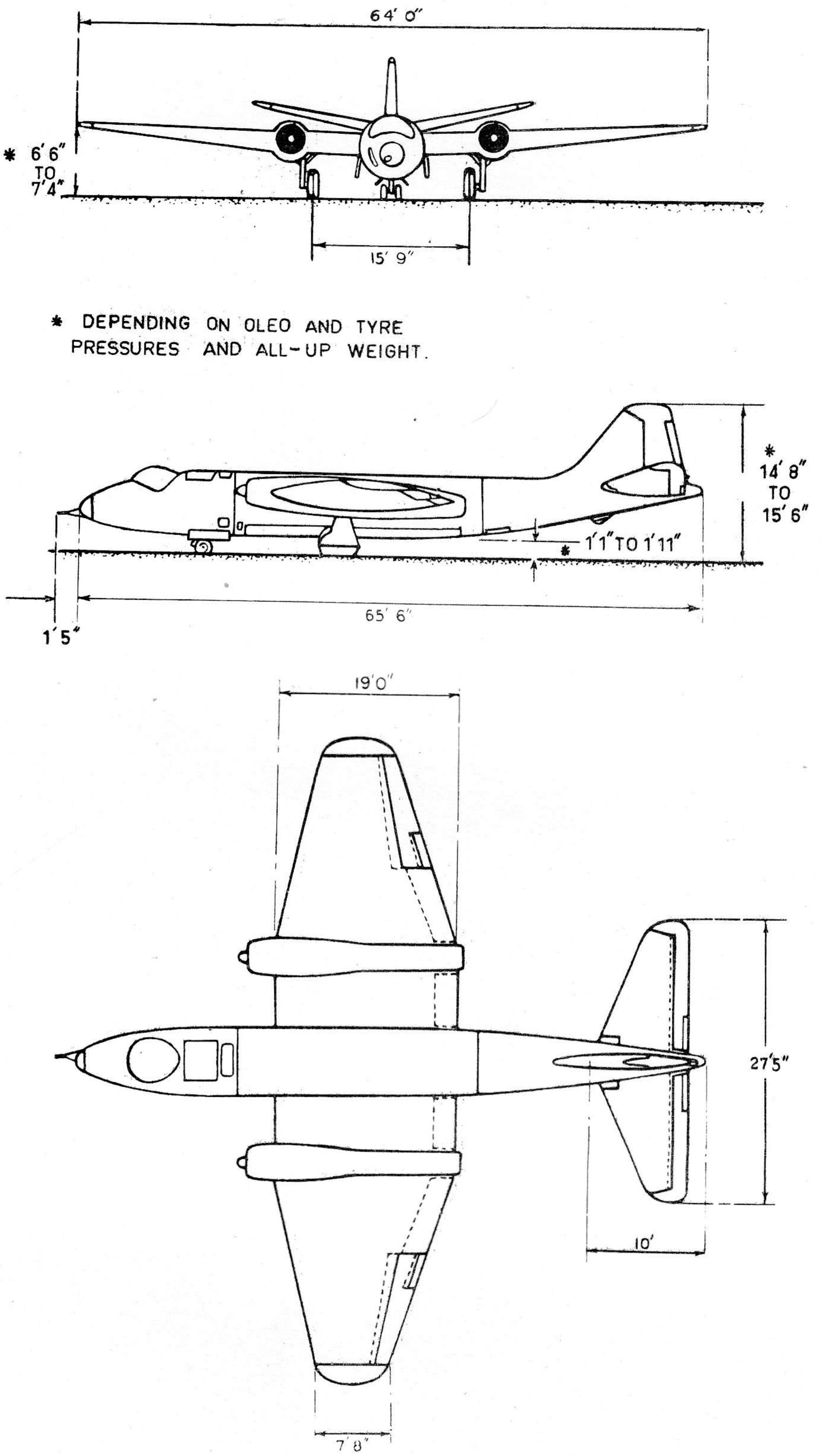
As for Mk 20 except that Power Plant was Rolls Royce Avon Mk 1 only.

General

Conversion of Canberra Bombers to dual-control Trainers entailed duplication of flying and engine controls, modification of front fuselage floor structure, revision of seating to accommodate instructor, modification of instrument panels to facilitate control of aircraft by both pupil and instructor pilots, revisions to hydraulic, air conditioning, electrical, radio and radar installations and the deletion of bombing equipment and integral fuel tanks.



CANBERRA MK. 21



CANBERRA MK. 21.

GENERAL ARRANGEMENT

PIKA (Piloted Version of Jindivik)

Production Details

Date of first successful flight (A93-1)	4th Nov, 1950
Flown by J. Miles at	Woomera
Total number produced	2
R.A.A.F Serial Numbers	A93-1, A93-2
Total number of flights	214
Date of last flight	25th June, 1954

Leading Particulars

Power Plant: One Armstrong Siddeley Adder A.S.A1 turbo-jet of 1050 lb. thrust.

Dimensions:

Wing Span	19 ft.
Length	24 ft. 7 in.
Wing Area	76 sq. ft.

Weights:

All-up Weight	2900 lb.
Empty	2300 lb.

Performance:

Max. Speed	470 mph at 25,000 ft.
R. of C.	4,170 ft./min.
Service Ceiling	32,000 ft.

General Description

Pika is essentially a piloted version of Jindivik Mk 1 built to prove the general aerodynamic and flight characteristics of the pilotless design, and to provide a test bed for checking and setting the initial sets of remote control equipment prior to installation in the pilotless aircraft.

The main components of the Jindivik airframe have been retained except for the centre fuselage where a cockpit equipped with normal flying controls replaces the special equipment bay. The Armstrong Siddeley "Adder" power unit is mounted in the rear fuselage, air being ducted from twin side air intakes adjacent to the cockpit. These entry ducts join immediately behind the pilot's seat and pass, between two semi-circular metal fuel tanks each of 22 imp. gallons capacity, to the engine face. The wing root has been modified forward of the front spar to permit the retraction of conventional main undercarriage wheels and a tail skid is mounted in the rear fuselage.

The free blown perspex canopy is hinged at its rear end to the fuselage and is locked at the front by a single bayonet type fitting which may be released by the pilot for normal ground entry or exit or for jettisoning in a flight emergency.

In Pika, the control runs from the automatic pilot servo-motors to the control surfaces are the same as in Jindivik Mk 1. Normal push-pull control rods link the cockpit to each servo-motor which is modified to include an electromagnetically controlled valve which, when de-energised, opens a passage to by-pass oil from one side of the servo piston to the other, so freeing the motor from the control circuit. There is also a declutching device on the servo-motor arms by which the driven part of the arm is freed from the driving portion if a torque greater than a preset value of about 50 lb. ft is applied.

A switch unit has been provided in the cockpit to enable the pilot to switch in any one or all three of the automatic pilot servo-motors. This unit also contains lights by which the pilot can ensure that the servo-motors are lined up according to the trim of the aircraft before they are switched in. An instinctive cut-out button is provided on the top of the control column to permit immediate release of all three servo-motors in an emergency.

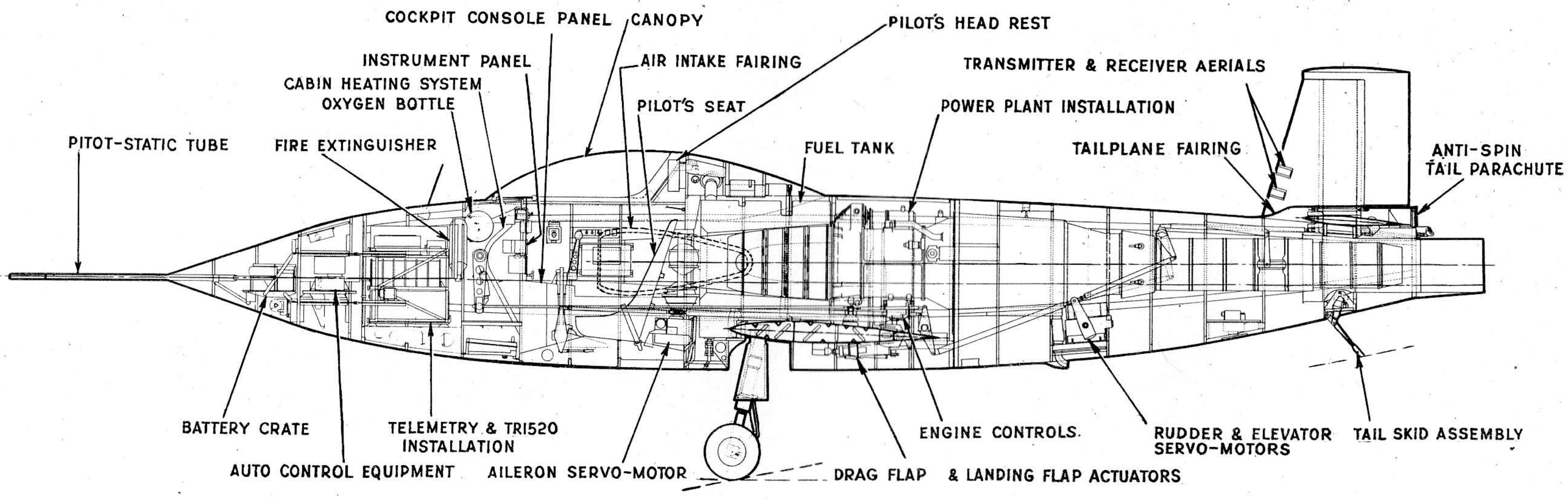
A control supervisory unit located in the cockpit allows the pilot to switch the radio control link in or out at will, and when this link is cut the servo-motors are engaged to operate the aircraft control surfaces and ancillary functions by a series of push buttons. An indicator unit, also in the cockpit, advises the pilot that those circuits peculiar to the pilotless aircraft (e.g. skid-down, fuel cut etc.) are operating satisfactorily or otherwise.

Pika Utilization

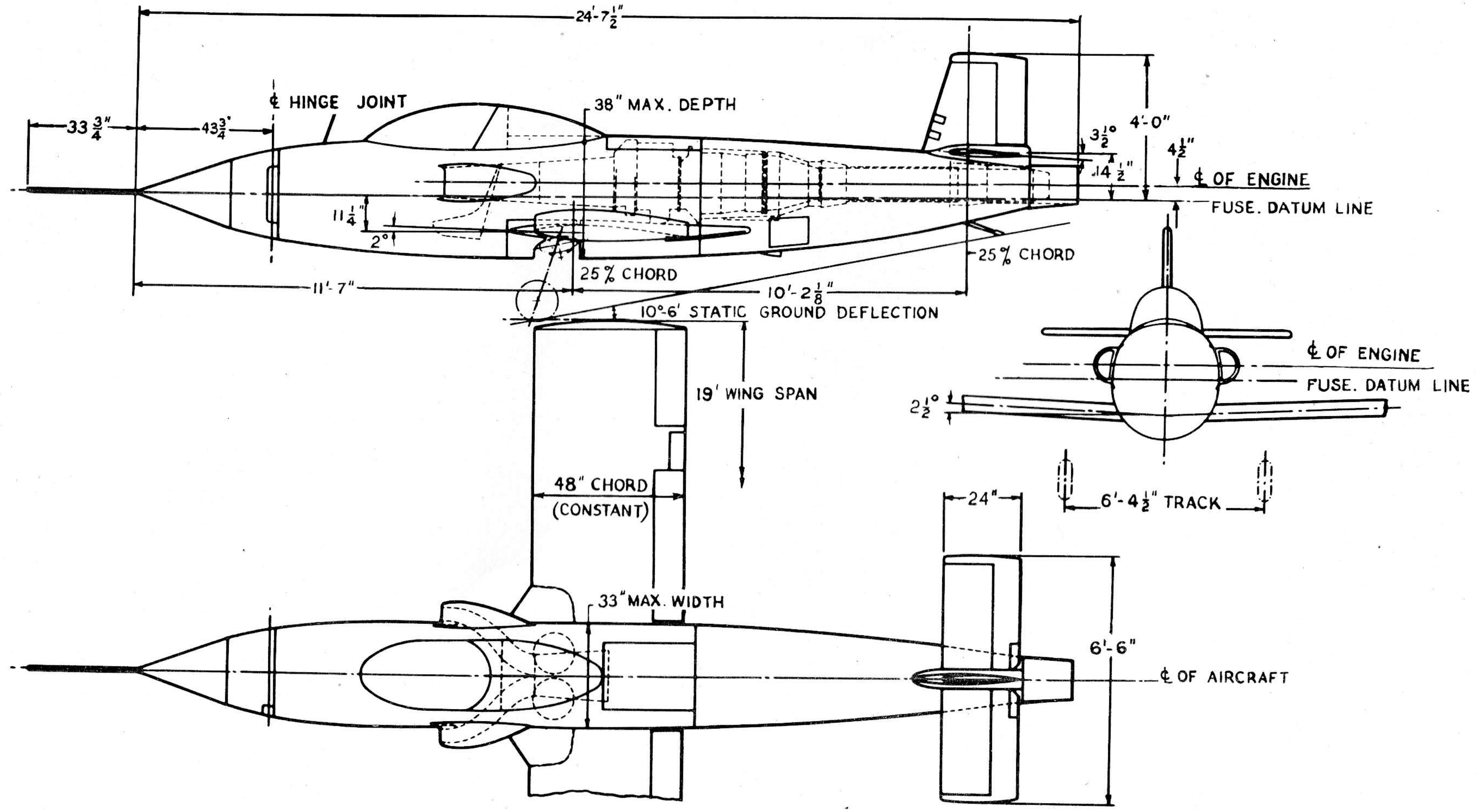
Aerodynamic data obtained from Pika flight trials showed that it was necessary to extend the rear fuselage of Jindivik to obviate elevator-jet pipe efflux interference. It was also discovered that it was possible to perform turns up to specification requirements on ailerons alone, consequently the rudder on Jindivik Mk 1 was locked with a resultant simplification of the radio control system.

The fitment in Pika of Jindivik radio control, telemetry and auto-pilot installations permitted these installations to be fully flight tested, the pilot being able to disengage the auto-pilot as desired. For radio controlled auxiliaries such as fuel ON/OFF valve, throttle actuator, landing skid down and flap operation, equipments which were installed in Pika but not connected to their appropriate systems, a signal box installed in the cockpit allowed the pilot to check the response of these items to the command signals.

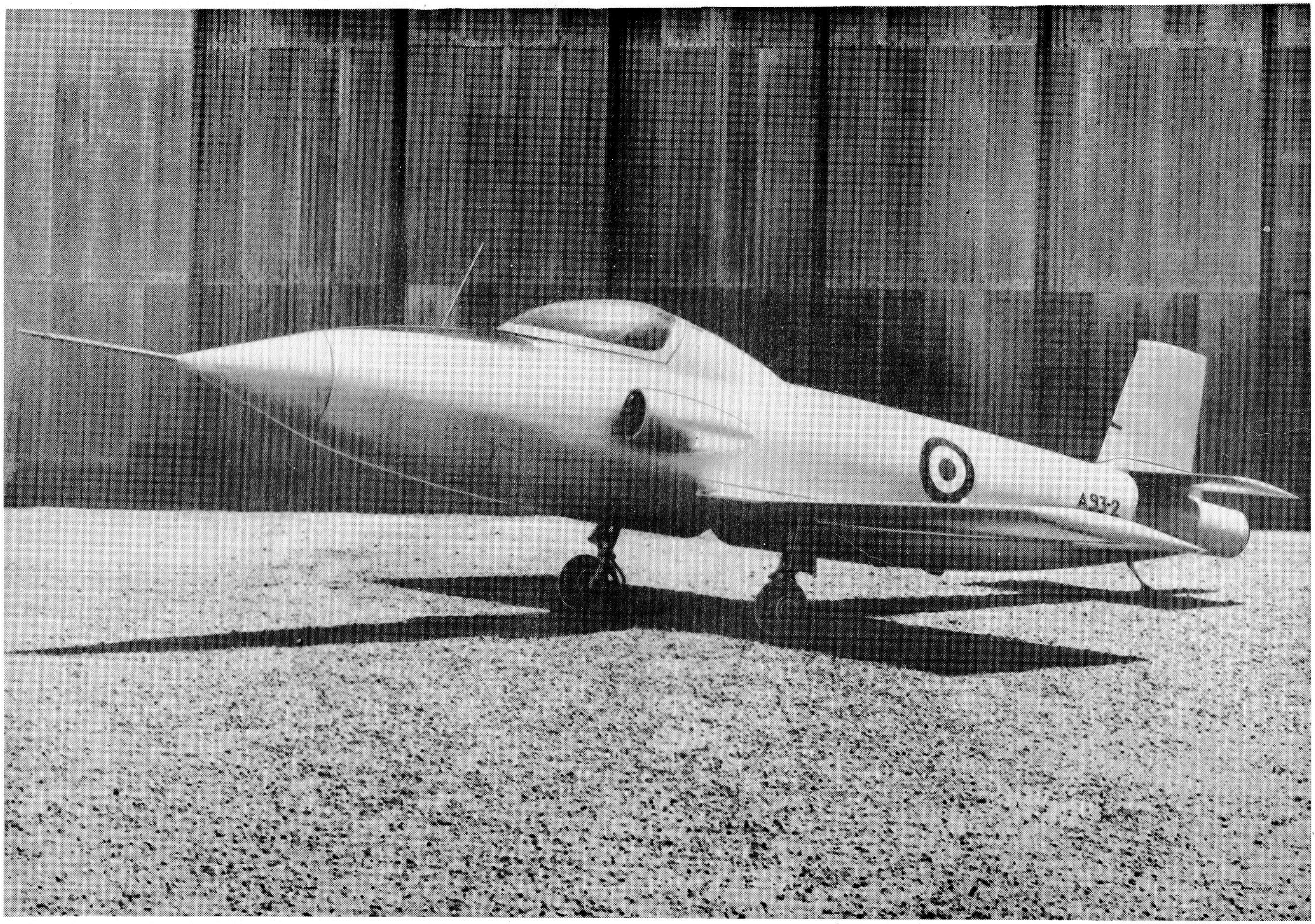
In addition to providing data relative to the development of Jindivik the flights of Pika provided opportunities for the taking of radar echoing measurements, checking of air to air visibility and the training of the ground control crew, in the handling of typical landing approaches.



SIDE ELEVATION - PIKA



GENERAL ARRANGEMENT - PIKA



PIKA

JINDIVIK TARGET AIRCRAFT

JINDIVIK MK 1

Production Details

Date of delivery of prototype (A92-1)	19th Oct, 1951
Date of first flight (A92-5)	28th Aug, 1952
Flown by R.A.A.F. ground crew at	Woomera
Number produced	12
R.A.A.F. Serial Numbers	A92-1 to A92-12
Date of delivery of last Mk 1 (A92-12)	18th May, 1953
Total number of flights	54
Date of last flight	6th Oct, 1954

Note:- Serial Numbers and corresponding Airframe Numbers are given in Table 2.

Leading Particulars

Power Plant: One Armstrong Siddeley Adder A.S.A.1 turbo-jet of 1050 lb thrust.

Dimensions:

Wing Span	19 ft
Length	23 ft. $3\frac{3}{4}$ in.
Wing Area	76 sq. ft

Weights:

All-up Weight	2771 lb.
Empty	2089 lb.

Performance:

Max. Speed	427 knots at 25,000 ft.
Max. Mach No	0.726 at 36,000 ft.
Endurance at 40,000 ft (with full normal allowance)	15 min. at max. rpm plus 54 min. at max. cruise rpm.
Service Ceiling (1000 ft./min Rate of Climb)	35,000 ft
R. of C. at Sea Level	4,770 ft./min.

General Description

The general layout of the Jindivik Mk 1 is conventional, the aircraft having a low set wing of rectangular planform with a 10% thickness/chord ratio. Drag flaps are fitted between the ailerons and normal landing flaps.

Electro-hydraulic servo-motors operate the normal flying controls, but as it was found possible to perform satisfactory turns with aileron alone, the rudder control has subsequently been locked.

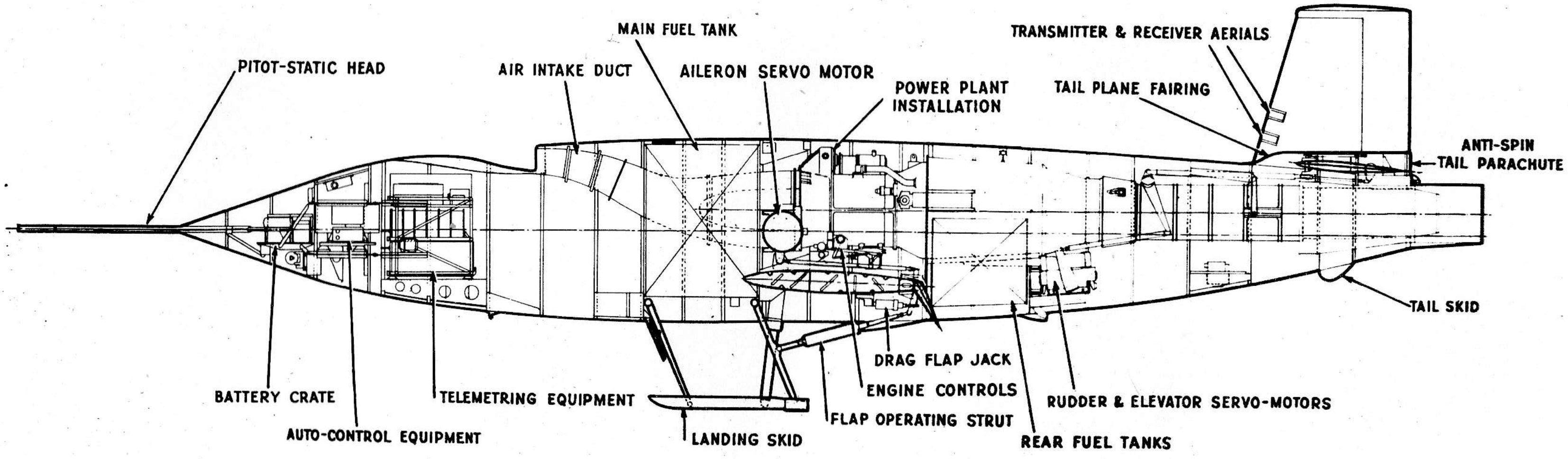
The engine is mounted centrally in the fuselage, air being ducted from a submerged entry above the nose. Fuel is carried in a crashproof rubber bag of $63\frac{1}{2}$ imperial gallons capacity surrounding the intake duct, and in two metal tanks of 10 gallons capacity below the engine.

A non-regenerative pneumatic system operates the landing flaps and the drag brakes, and also lowers the landing skid by charging the oleo shock absorber strut. Electrical power is drawn from a 2000 watt, 24 volt d.c. generator mounted on the engine face.

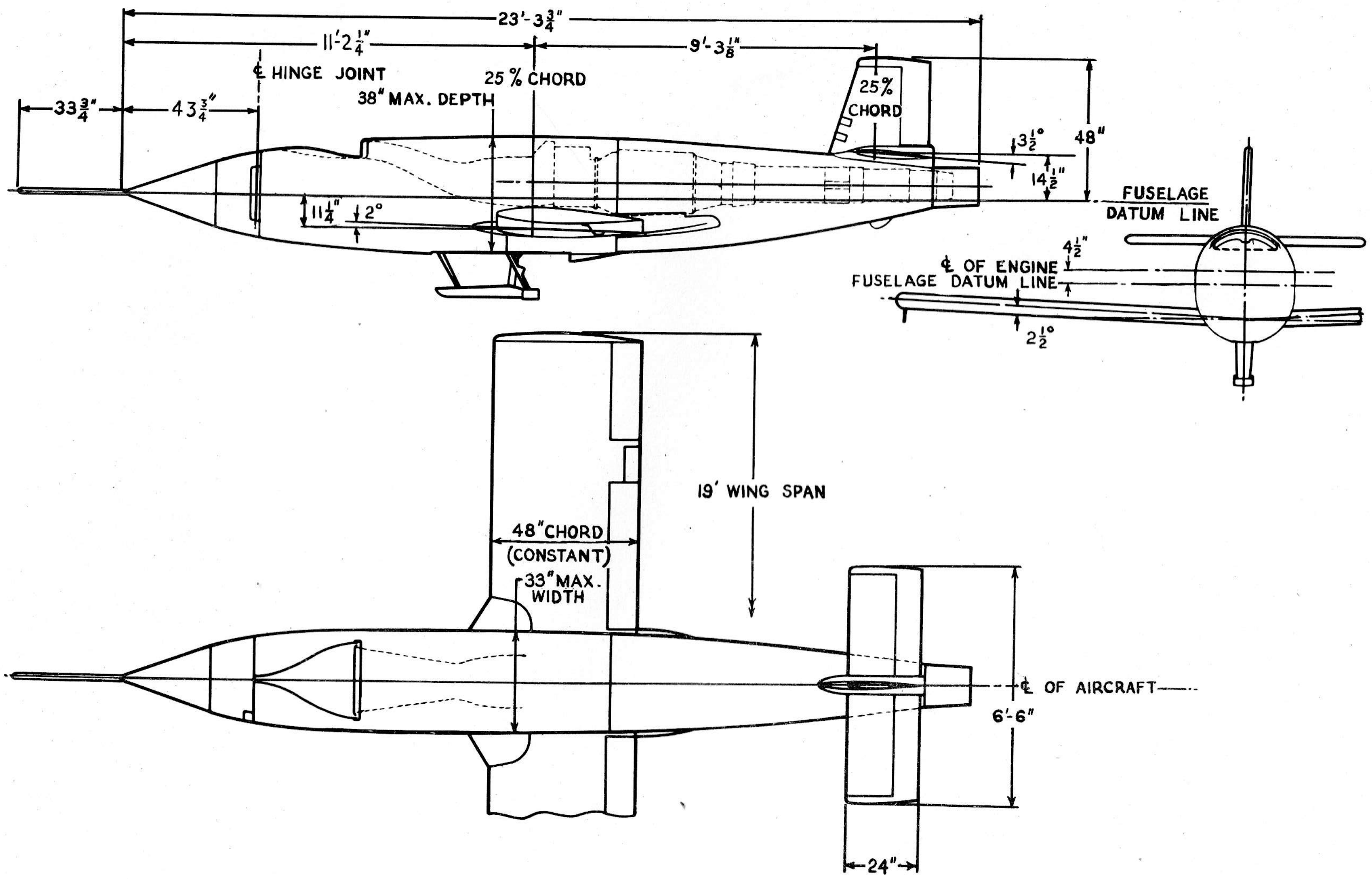
The aircraft is controlled either from a ground station or from an observer in a shepherd aircraft. The radio control signals are detected and decoded by the radio installation in the aircraft and passed to a relay set which controls the automatic pilot and other ancillary functions such as the throttle and flaps. A telemetry system transmits airspeed, altitude and engine rpm back to the ground to provide a record of each flight. The aircraft is tracked by a ground radar installation, a transponder in the aircraft boosting its response.

Take-off is effected under normal engine thrust from a recoverable trolley, and the aircraft is controlled to a conventional landing on a single retractable skid.

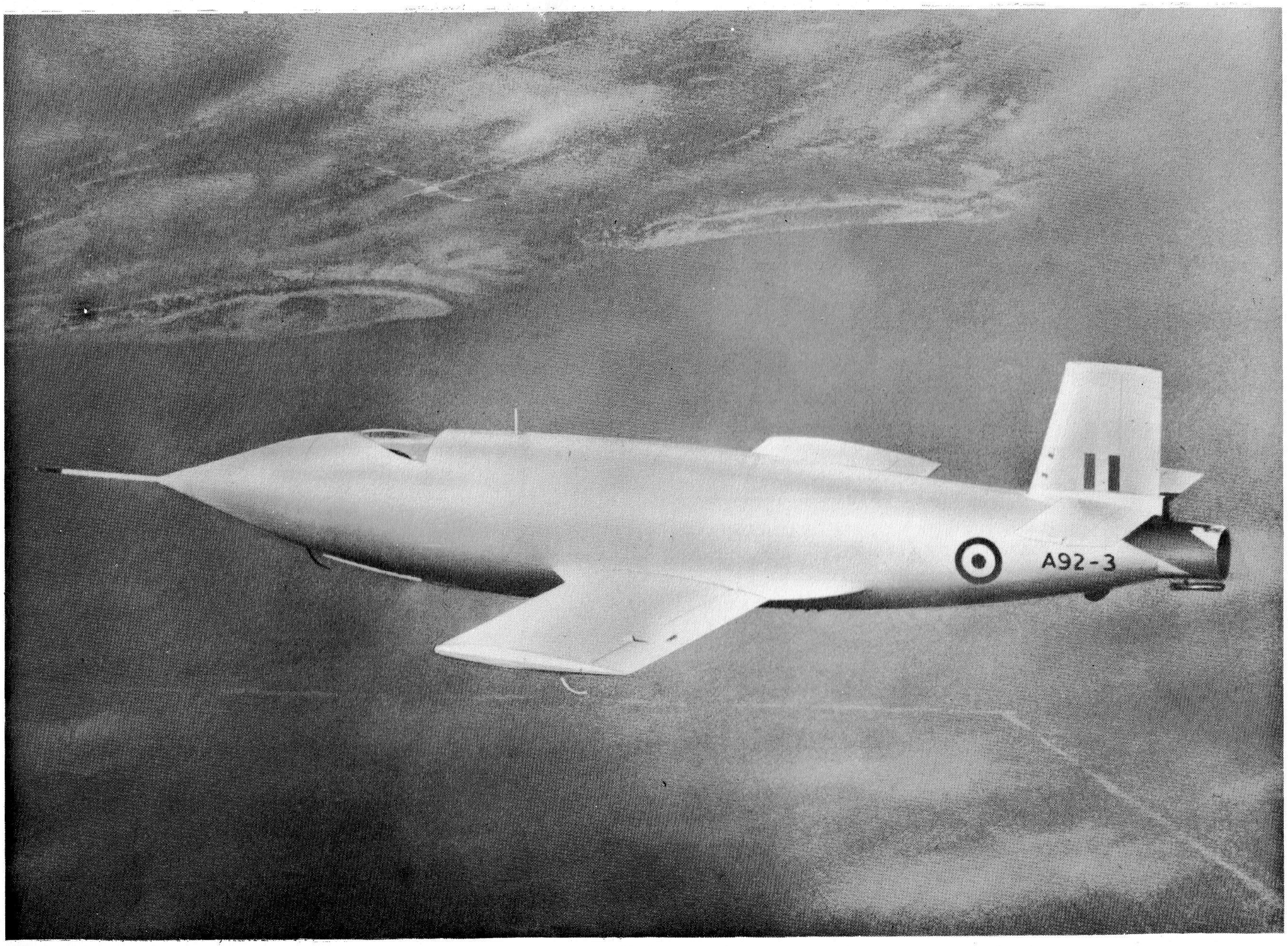
Operational and control equipment is carried in the fuselage nose. A short detachable conical section houses the accumulators and other equipment associated with the main electrical supply. A joint in the fuselage at the beginning of the intake ramp allows the front portion to hinge sideways exposing in the nose bay automatic pilot equipment and in the main fuselage a crate mounted on rails which carries all items of radio control and telemetry equipment, the relay set receiving, transponder and the automatic pilot instrument unit. This equipment may be withdrawn to give access to an equipment bay of 12 cubic feet capacity for installing special trials equipment. At large door in the side of the fuselage also provides access to this bay.



SIDE ELEVATION - JINDIVIK MARK I



GENERAL ARRANGEMENT - JINDIVIK MARK I.



JINDIVIK MK. 1

JINDIVIK MK 2

Production Details

Date of delivery of first Mk 2(A92-21)	16th Nov, 1953
Date of first flight (A92-21)	11th Dec, 1953
Flown by R.A.A.F. ground crew at	Woomera
Number produced for W.R.E.	88
Number produced for U.K.	16
Number produced for Sweden	10
Total number produced	114
Date of delivery of last Mk 2 (A92-124 to U.K.)	1st July, 1959
Date of first flight of U.K. converted Jindiviks (Mk. 102)	April, 1960

Note: Serial Numbers and Corresponding Airframe Numbers are given in Table 2.

Leading Particulars

Power Plant: One Bristol Siddeley Viper ASV3 turbo-jet of 1640 lb. thrust.

Dimensions:

Wing Span (with wing-tip camera pods)	21 ft.
Wing Span (without camera pods)	19 ft.
Length	23 ft. $3\frac{3}{4}$ in.
Wing Area	76 sq. ft
Height on trolley	8 ft. 6 in.

Weights:

All-up weight	2635 lb.
Empty	1752 lb.

Performance:

Max. Speed	472 knots at 38,000 ft.
Max. Mach No.	0.82 at 38,000 ft.
Endurance at 47,000 ft (with full normal allowance)	10 min. at max. rpm plus 33 min. at max. cruise rpm.
Service Ceiling (1000 ft./min. Rate of Climb)	47,000 ft.
Rate of Climb at Sea Level	7,600 ft./min.

General Description:

Jindivik Mk 2 is a single engined, jet propelled, high speed, remotely controlled aircraft. It is a low wing monoplane powered by an Armstrong Siddeley Viper (A.S.V.3) turbo-jet engine of 1640 lb. static thrust, and is equipped with a special retractable landing skid. The all-metal fuselage is of semi-monocoque construction consisting basically of a stressed outerskin covering supported by a structure of longitudinal stringers and longerons and transverse frames. Attachment of stringers to skin is by 'Araldite', rivets and spotwelding, while that of skin to frames is by rivets and in some cases, spotwelding. To facilitate transport, the fuselage is built into three main sections, front, centre and rear fuselage. Assembly of the complete aircraft and dismantling into main sections is facilitated by the provision of junctions in the controls, pneumatic pipes and electrical wiring at the ends of the sections into which they are built.

The front fuselage contains the majority of the control and guidance equipment. The pitot head is carried on a tube extending forward to the nose. To give access to equipment, the front fuselage is divided along its longitudinal centreline, the top half being a detachable canopy, the upper surface of which is shaped to form the entry to the engine intake duct.

The centre fuselage contains the main fuel tank - an annular, crash-proof rubber bag of 64 gallons capacity, - surrounding the air intake duct. Parallel links of the landing skid are attached to the structure below the tank bay. The space aft of the fuel tank bay is occupied by the compressor zone of the engine. Below the engine, the centre fuselage is cut away to accommodate the wing and the pneumatic jack assembly beneath the wing. The opening is covered by an under-wing fairing.

The rear fuselage carries the tail unit which consists of a sheet metal fin, tailplane and elevators. Paper honeycomb cores in the fin structure are glued to the sheet metal skins. Attachment of spars to skins is by 'Araldite'. The rear fuselage houses the bulk of the engine for which an extractor fairing is provided at the end to draw a cooling air flow around the combustion chamber and jet pipe.

Joined on the aircraft centreline, the port and starboard wings are built up of four main sections, the leading edge, inter-spar box, rear box and control surfaces. The only ribs are at the inboard and outboard ends of the inter-spar box; the whole assembly, including skins, is glued with Araldite to form an integral fuel tank of 16 gallons capacity, each side. The leading edge contains a paper honeycomb core and is bonded to the inter-spar box by Araldite. A similar type of attachment is used for the rear box to which the control surfaces are hinged. Each main plane is fitted with a flap and aileron. Flying controls are operated by radio controlled automatic pilot and servo motors. All control runs consist of push-pull tubes and levers.

The rearward retracting undercarriage consists of a single, centrally placed landing skid carried on two parallel links with an oleo shock absorber attached, through a linkage, to the skid. Subsidiary spring steel skids are fitted to the rear fuselage and under each wing tip.

A pneumatic system of the non-regenerative type is provided for operating the flaps and lowering the landing gear. Before the aircraft is placed on the take-off trolley, the oleo is exhausted of its air and locked in the retracted position. In flight, the operation of flaps and landing gear is affected through electro-pneumatic valves which are controlled by appropriate radio signals. When landing, a touch down switch, operated by contact of an extended sting with the ground, causes the flaps to be retracted from the pre-landing position to the landing position.

The engine is mounted on two trunnions near the forward end of the rear fuselage, and further aft is steadied by a turnbuckle attachment to the base of the fuselage. The only engine-driven accessories are the generator and the engine rpm indicating equipment which are located at the front of the engine.

The fuel system is pressurised from a tapping at the rear end of the engine compressor. Fuel is forced from the integral wing tanks to the main tank and thence pumped to the engine. A recuperator tank, located within the main tank, contains a reserve supply of fuel permitting a limited period of inverted flight. The engine consumes 240 gallons of fuel per hour at sea level, but at 50,000 ft. (without camera pods) and 500 knots maximum cruise this comes down to 45 gal. per hour.

All electrical power is drawn from one 28 volt d.c. generator and a single 24 volt accumulator with appropriate inverters for radar equipment.

Radio and radar equipment suitable to the role of the aircraft is installed.

The equipment carried to permit operation under remote control consists basically of :-

(a) A radio installation to accept and decode signals from the controlling station.

(b) A relay set to act as a link between the radio equipment and the auto-pilot, and to control certain of the aircraft actuators not under the influence of the auto-pilot.

(c) An automatic pilot to operate the flying control surfaces.

(d) A telemetry installation to pass back necessary information to the controlling station.

(e) A transponder to boost radar response in order to increase the tracking range.

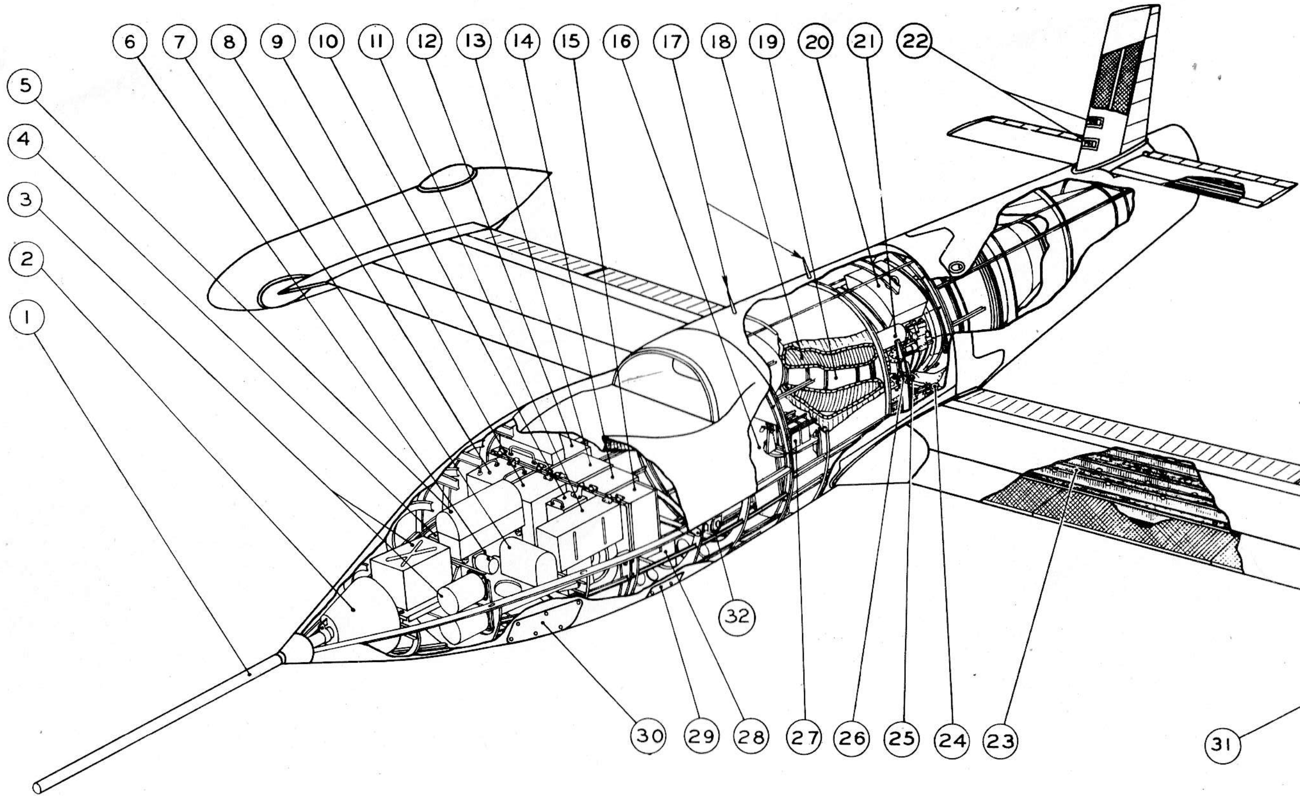
The normal airstrip is used for take-off. The aircraft is mounted on a take-off trolley having a gyro steered nosewheel and braked main wheels. Initially the flaps are set to the streamline position. At take-off speed, the flaps are depressed 20 deg. and the aircraft is automatically released from the trolley. As the aircraft accelerates to a safe flying speed, the flaps rapidly retract and the aircraft sets itself in a steady climbing attitude. The trolley is braked to a stop 3,000 ft. from its starting point. A zero length launching method could be provided where particular operating conditions preclude normal trolley launch.

Although Jindivik may be directed from a shepherd aircraft, it is normally controlled from a ground station. It is operated by a skipper who 'pilots' the aircraft once it is airborne and a navigator to track the flight pattern. A pilot beside the strip has control for take-off.

The remote control system is effective at ranges up to 100 nautical miles from the ground station. Push button selection allows the automatic pilot to provide aileron, elevator and engine rpm conditions for fixed attitudes appropriate to climb, slow level, fast level, left turn, right turn, fast glide and land glide conditions, although intermediate attitudes or engine conditions may be selected by 'beep' control.

The telemetry system provides the ground controller with continuous indications of altitude, speed, rate of climb and engine rpm. A normal approach and landing technique is used with Jindivik. The ground controller, using radar information to give him course data, lines the aircraft up with the strip at a predetermined height and speed. When the aircraft is within binocular visibility, two controllers at the strip take over, one controlling elevation, the other azimuth.

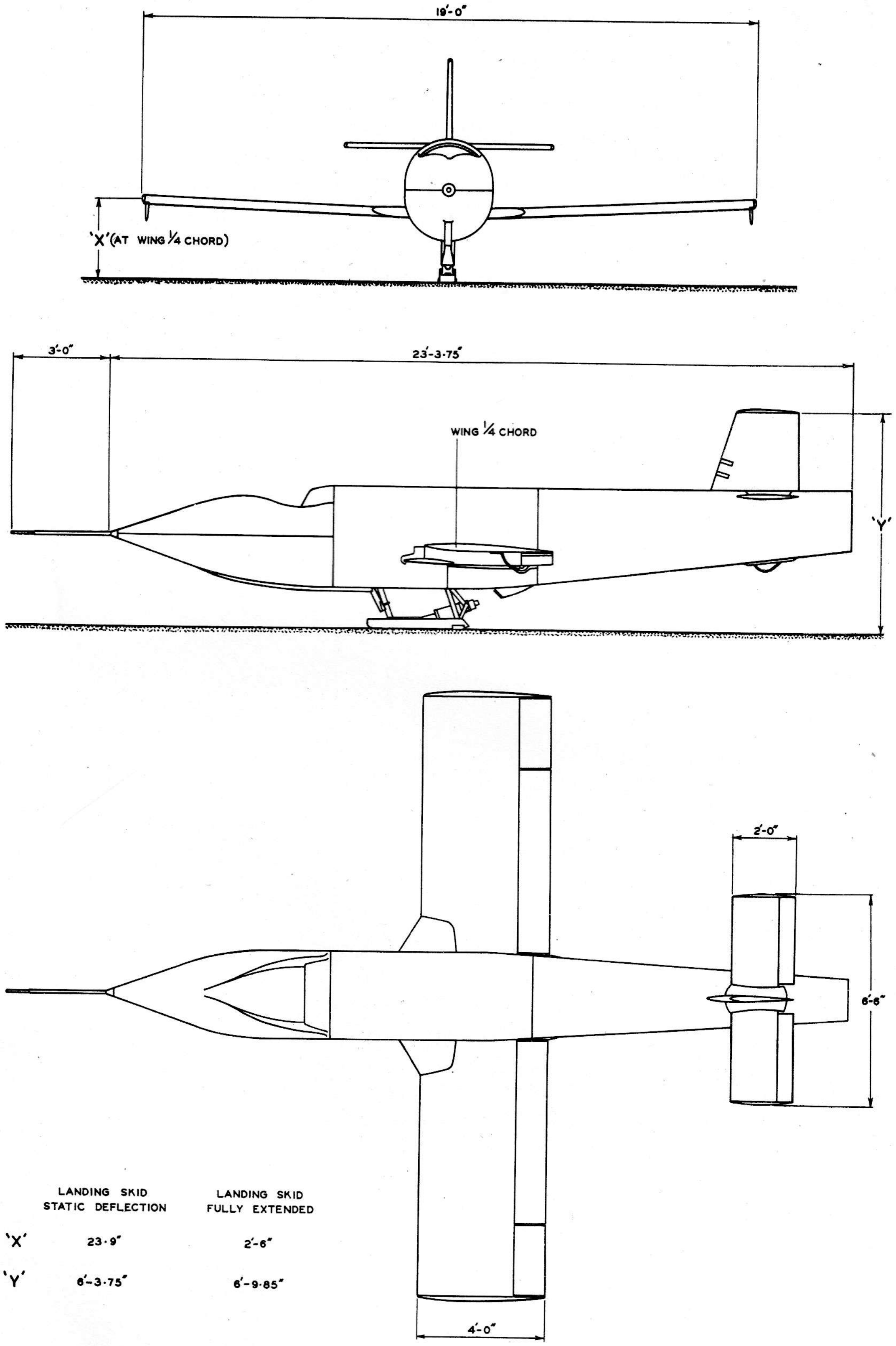
At the point where the aircraft crosses his sightline, the elevation controller signals it to 'land glide' attitude, which lowers the landing skid and flaps, sets the pitch control and reduces engine speed. Pitch and turn corrections are made by the controllers, and slight flare out is achieved just prior to touchdown. When the 'sting', extending below the skid, touches the strip, it cuts the engine, releases the flaps and re-selects 'land glide'. Approach is made at 125 knots. The ground run is uncontrolled, the single skid keeping a consistently true path.



1. PITOT – STATIC HEAD.
2. NOSE BALLAST WEIGHT.
3. FLIGHT INSTRUMENTS (TELEMETRY)
4. AUTO CONTROL JUNCTION BOX.
5. ROLL UNIT.
6 YAW UNIT.
7. PITCH UNIT.
8. RELAY UNIT.
9. RELAY SET RECEIVING.
10. TRANSMITTER.
11. ANCILLIARY JUNCTION & C/B BOX.
12. TRANSPONDER.
13. SELECTOR.
14. RECEIVER.
15. OPERATIONAL BOX.
16. SPECIAL EQUIPMENT BAY.
17. TRANSPONDER AERIALS.
18. MAIN FUEL TANK.
19. DETACHABLE AIR INTAKE DUCT.
20. ENGINE OIL TANK.
21. AIR BOTTLE.

22. TRANSMITTER & RECEIVER AERIALS.
23. INTEGRAL WING FUEL TANK BAY.
24. CENTRAL FLAP & AILERON OPERATING MECHANISM.
25. THROTTLE ACTUATOR.
26. PNEUMATIC SYSTEM CHARGING VALVE.
27. BATTERY CRATE.
28. TAKE – OFF TROLLEY ATTACHMENT HOOK COMPARTMENT
29. GROUND SUPPLY & MASTER BATTERY SWITCH.
30. AUTO PILOT MAIN SWITCH.
31. CAMERA PODS.
32. M.T.S. WAVEGUIDE & AERIAL.

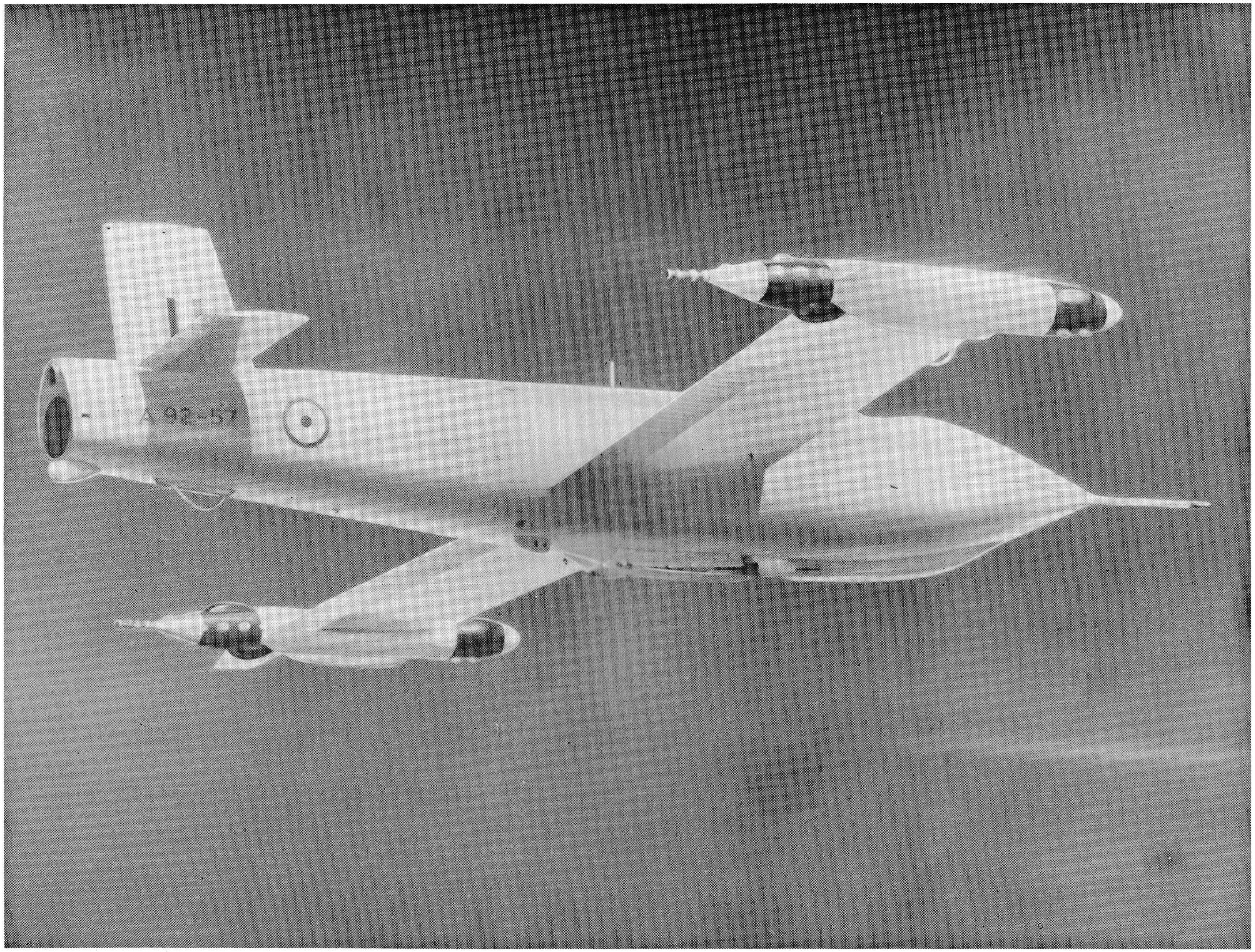
JINDIVIK MK. 2



	LANDING SKID STATIC DEFLECTION	LANDING SKID FULLY EXTENDED
'X'	23·9"	2'-6"
'Y'	6'-3·75"	6'-9·85"

GENERAL ARRANGEMENT.

JINDIVIK MK. 2



JINDIVIK MK. 2

JINDIVIK MK 2A

Production Details

Date of delivery of first Mk 2A (A92-90)	24th July, 1958
Date of first flight (A92-90)	18th Sept, 1958
Flown by R.A.A.F. ground crew at	Woomera
Number produced (W.R.E.)	3
Date of delivery of last Mk 2A (A92-111)	16th Dec, 1958
R.A.A.F. Serial Numbers	A92-87, A92-90, A92-111

Note 1:- These aircraft were converted from Mk 2's.

Note 2:- Serial Numbers and corresponding Airframe Numbers are given in Table 2.

Leading Particulars

Power Plant: One Bristol Siddeley Viper ASV3 turbo-jet of 1640 lb. thrust.

Dimensions:

Wing Span (with Mk 4 Camera Pods)	25ft. 7.2 in.
Length	23ft. 3.75 in.
Wing Area (wing-tip extensions included)	102 sq. ft.
Height on trolley	8ft. 6 in.

Weights:

All-up weight	2650 lb.
Empty	1767 lb.

Performance:(with Mk 4 Camera Pods and wing extensions)

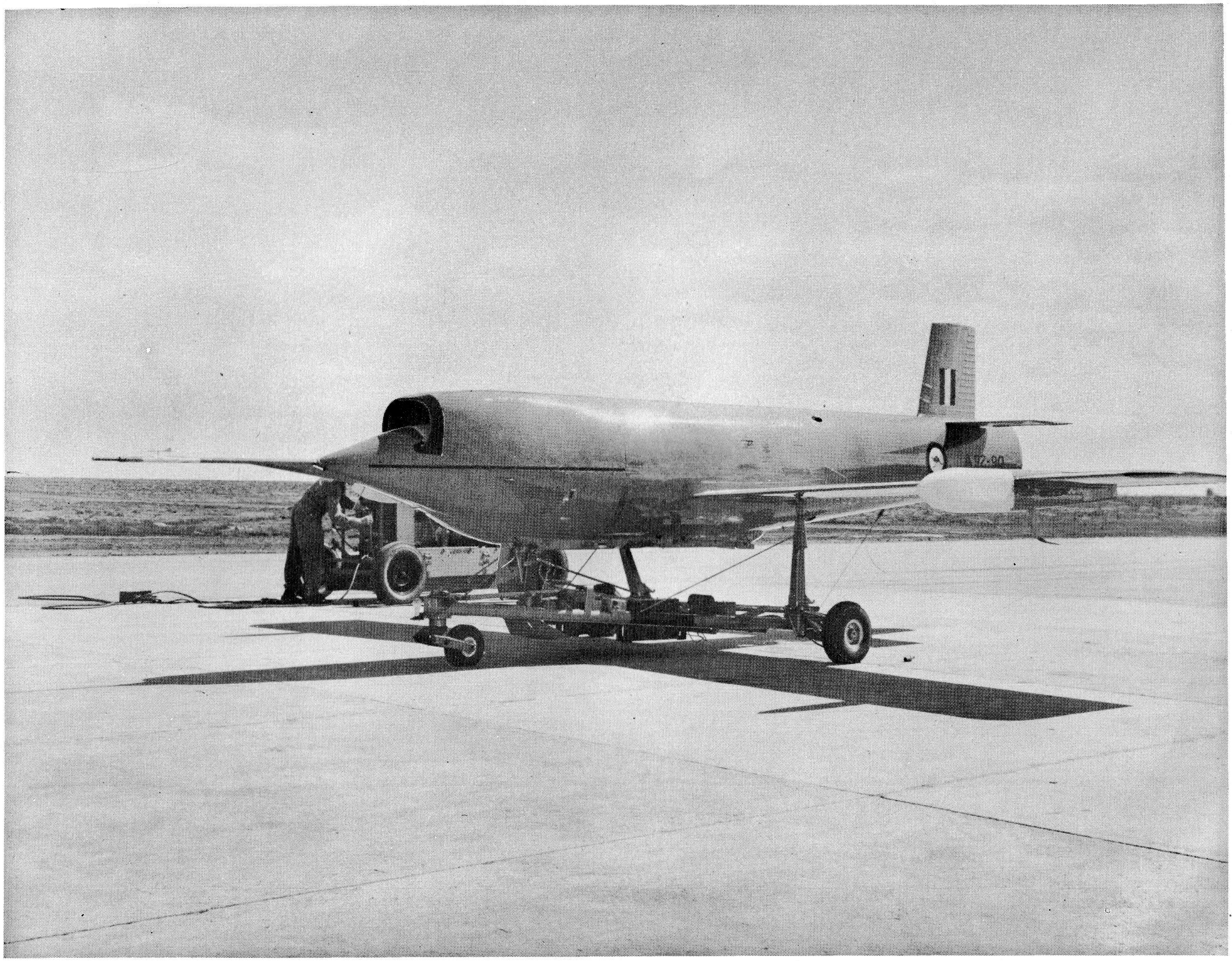
Max. Speed	450 knots at 40,000ft.
Max. Mach. No	0.86 at 40,000ft.
Endurance at 52,000ft (with full normal allowance)	10 min at max. rpm plus 42 min at max. cruise rpm.
Service Ceiling (1000 ft./min. Rate of Climb)	52,000ft.
R. of C. at Sea Level	7,300 ft./min

General Description

This variant was used to assist in the development of the Mk 2B Jindivik which was to be powered by a Viper ASV8 engine. Three development aircraft were prepared for flight evaluation in trials that were carried out between September, 1958 and May, 1959.

Mk 2A Jindiviks still retain the Viper ASV3 engine, but a new fibre-glass canopy, incorporating a pitot type air intake, is fitted. This type of air entry improved the aerodynamic efficiency of the intake at higher Mach numbers.

Other variations from Mk 2 Jindiviks include modifications in the form of slightly drooping flaps with an inbuilt twist to give improved lift distribution at higher altitudes. The fitment of wing extensions and new type camera pods (Mk 4) has resulted in generally improved performance at high altitudes and has enabled the aircraft to achieve a maximum operating altitude of 52,000 feet.



JINDIVIK MK. 2A

JINDIVIK MK 2B

Production Details

Date of delivery of first Mk 2B (A9-201)	31st Aug, 1959
Date of first flight (A9-201)	8th Oct., 1959
Flown by R.A.A.F. ground crew	Woomera
Number produced for U.K. (complete - Mk 2B)	5) 64
Number produced for U.K. (not complete - Mk 2BL).......	29) total
Number to be produced for U.K. (further order-Mk102BL)..	30)
Number produced for W.R.E.	12
Total number produced or on order	76
Date of delivery of first Mk 2B(A92-204) to U.K..........	24th Jan, 1960
Date of delivery of last Mk 2B (A92-208) to U.K..........	19th Feb, 1960
Date of delivery of first MK 2BL (A92-209) to U.K........	19th Feb, 1960
Date of delivery of last Mk 2BL (A92-246) to U.K..........	11th Sept, 1961
Date of delivery of first (Last?) Mk 102BL (A92-247) to U.K......	4th Apr, 1962

Note: Serial Numbers and corresponding Airframe Numbers are given in Table 3.

Leading Particulars

Power Plant: One Bristol Siddeley Viper ASV8 turbo-jet of 1750 lb. thrust.

Dimensions:

Wing Span (wing-tip extensions included)	25ft. 7.2 in.
Length	23ft. 3.75 in.
Wing Area (wing-tip extensions included)	102 sq. ft.
Height on trolley	8ft. 6 in.

Weights:

All-up Weight	2918 lb.
Empty	2135 lb.

Performance:(with Mk 4 Camera Pods and Wing-Tip extensions)

Max. Speed	450 knots at 40,000 ft.
Max. Mach No.	0.86 at 40,000 ft. (elevator trim limit)
Endurance at 54,000 ft .... (with full normal allowance)	15 min. at max. rpm plus 42 min. at max cruise rpm.

Service Ceiling: .... 54,000 ft.
(1000 ft./min Rate of Climb)

Rate of Climb at Sea Level .... 9,100 ft./min.

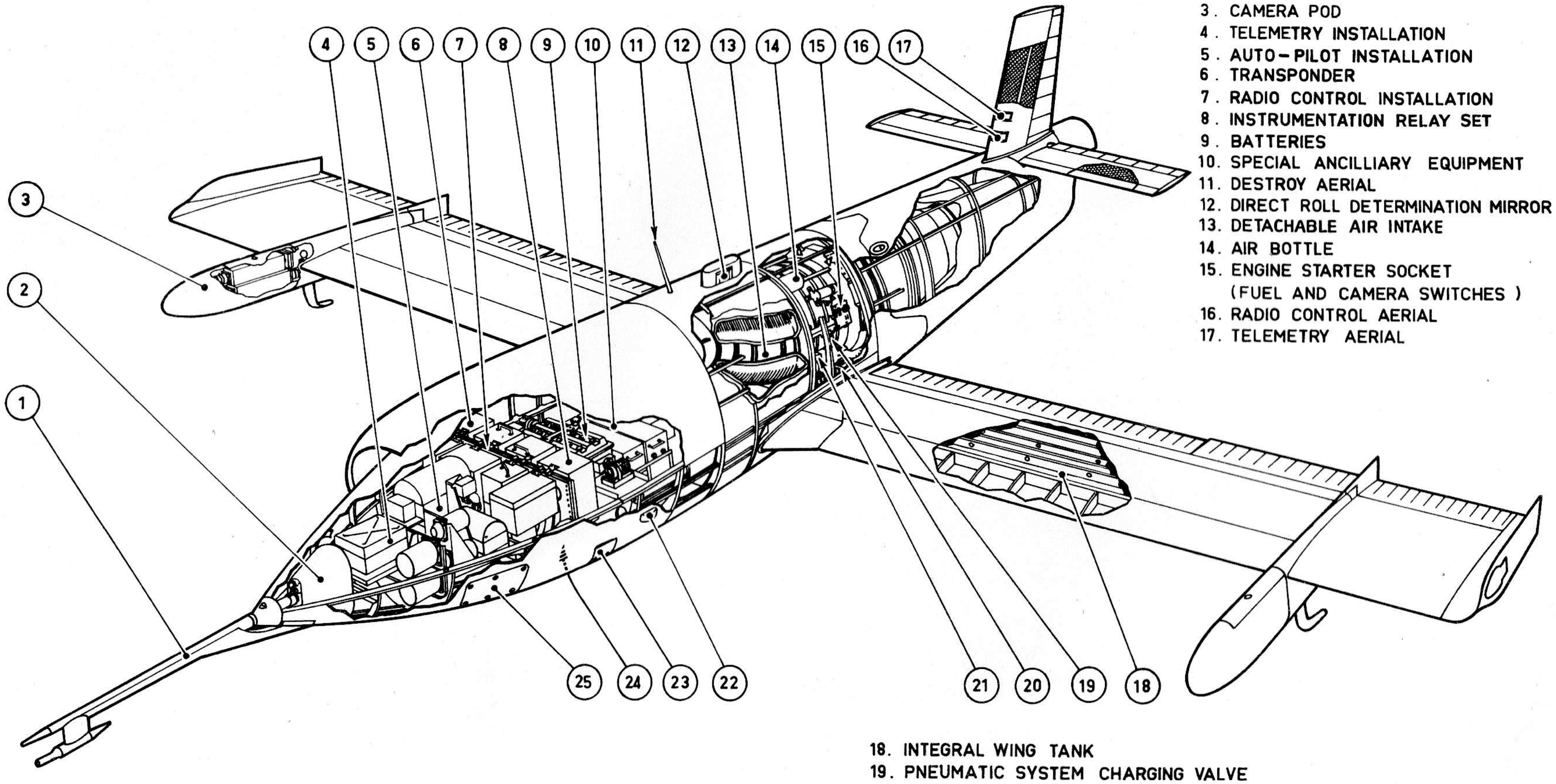
General Description

Jindivik Mk 2B was developed to comply with further demands for increased target operating heights. It has the same configuration as the Mk 2A Jindivik but is powered with the Viper ASV8 engine which develops 1750 lbs. static thrust. Although essentially similar to the Mk 2A in most respects, the Mk 2B variant incorporates redesign of the rear fuselage to cope with the increased diameter of the ASV8 engine jet pipe. The aft end of the fuselage is stopped short, in comparison with the Mk 2 and Mk 2A fuselage, but is fitted with a detachable 'pen nib' shaped jet pipe fairing to keep the jet efflux clear of the downwash on the tailplane and elevators. However, the overall length of the fuselage is unchanged.

The aircraft is fitted with a fibreglass canopy, incorporating a pitot type air intake identical with that used on Mk 2A aircraft. On some Mk 2B aircraft, the leading edge portion of the mainplane is built up of a profiled paper honeycomb core to which the metal leading edge skin is bonded; on other aircraft, the leading edge structure is built up of a preformed metal skin bonded to sheet metal riblets.

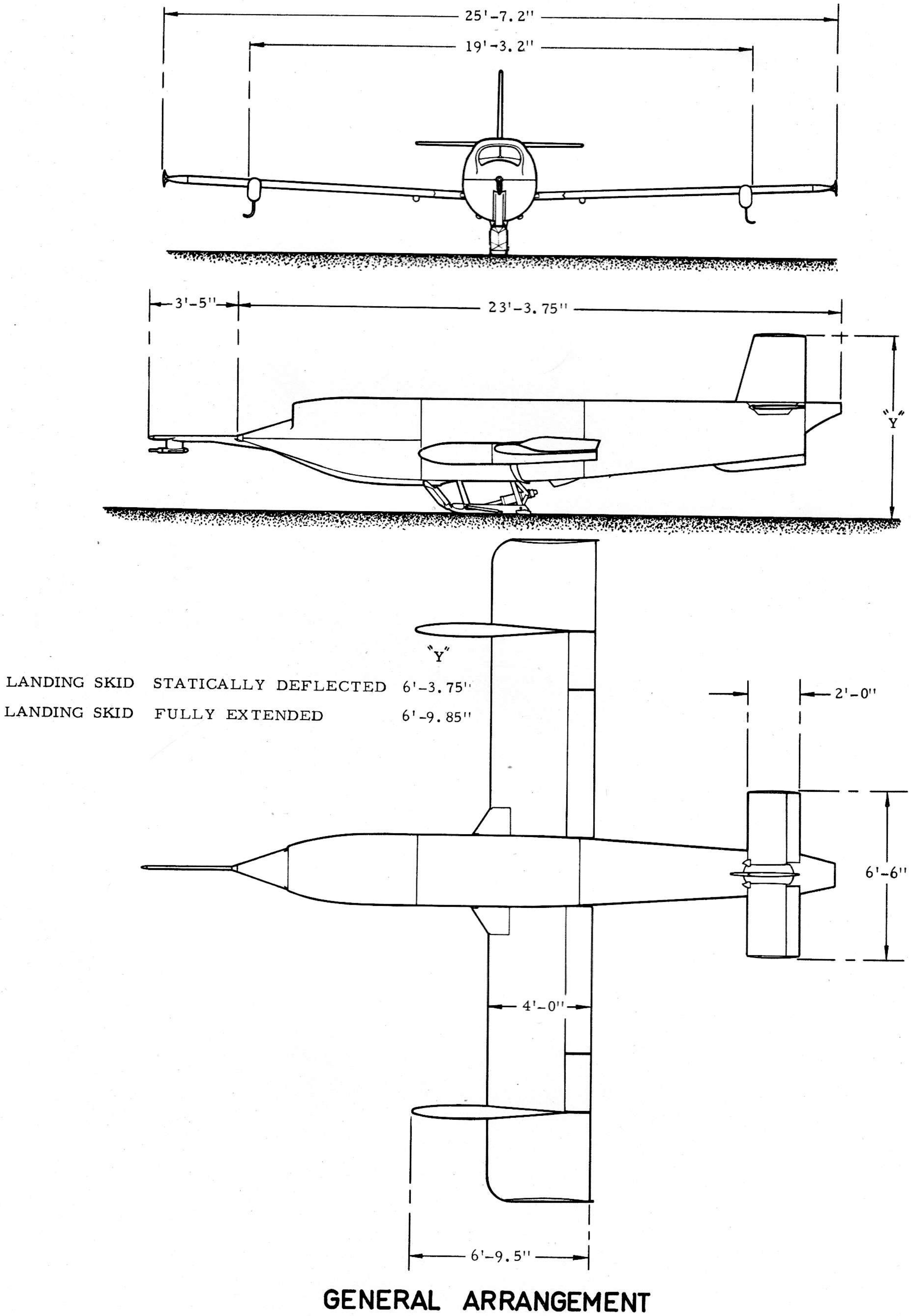
The aircraft is flown at all times with pods fitted to the wing-tips. These pods contain a system of cameras to photograph missiles aimed at the aircraft.

For operation at increased altitudes, extensions bolted to the wing-tips, outboard of the pods, increase the wing area by approximately 35%.



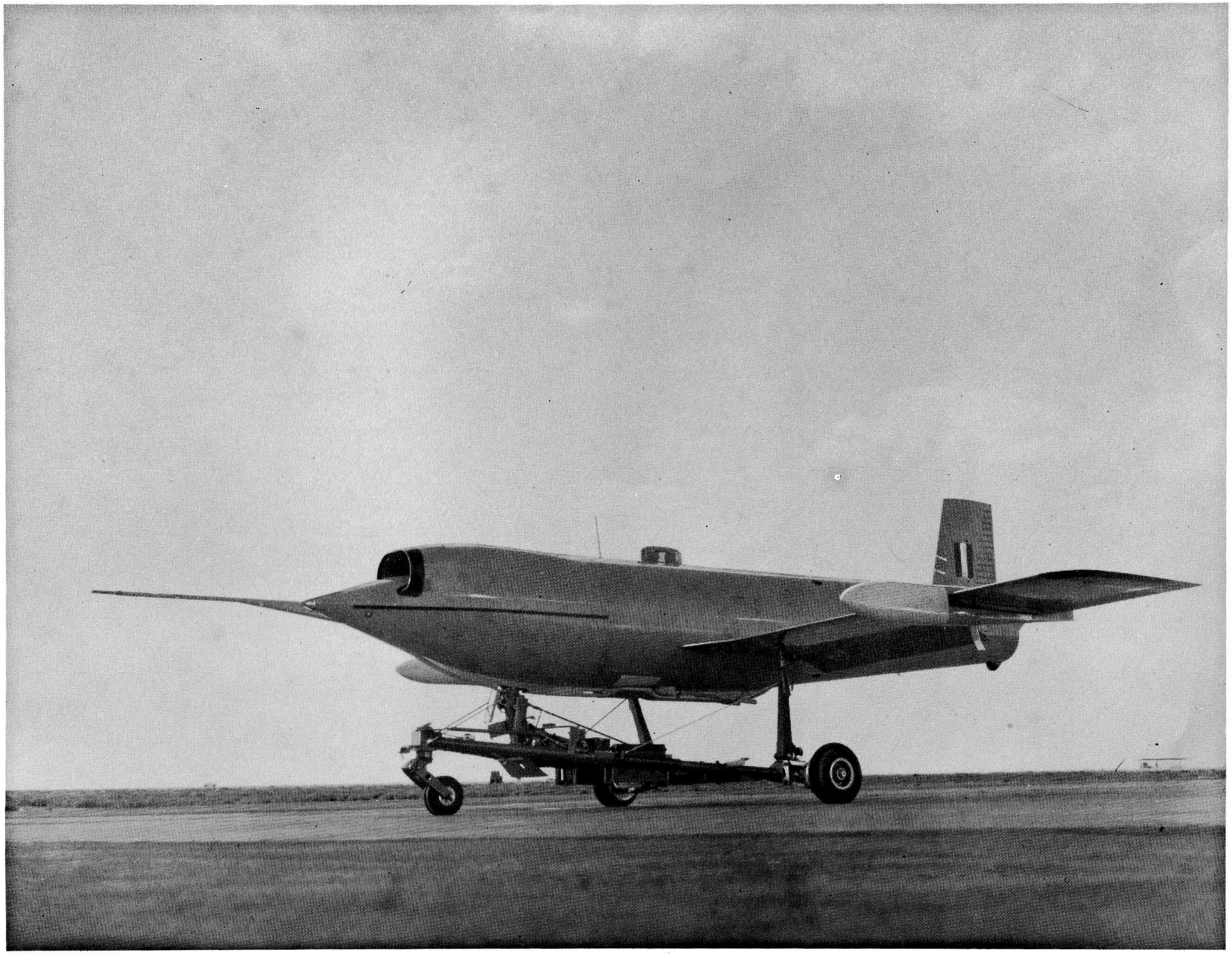
1. WAVE GUIDE AND PITOT
2. NOSE BALLAST WEIGHT
3. CAMERA POD
4. TELEMETRY INSTALLATION
5. AUTO-PILOT INSTALLATION
6. TRANSPONDER
7. RADIO CONTROL INSTALLATION
8. INSTRUMENTATION RELAY SET
9. BATTERIES
10. SPECIAL ANCILLIARY EQUIPMENT
11. DESTROY AERIAL
12. DIRECT ROLL DETERMINATION MIRROR
13. DETACHABLE AIR INTAKE
14. AIR BOTTLE
15. ENGINE STARTER SOCKET (FUEL AND CAMERA SWITCHES)
16. RADIO CONTROL AERIAL
17. TELEMETRY AERIAL
18. INTEGRAL WING TANK
19. PNEUMATIC SYSTEM CHARGING VALVE
20. FLAP AND AILERON OPERATING MECHANISM
21. THROTTLE ACTUATOR
22. M T S AERIAL
23. GROUND SUPPLY SOCKET AND BATTERY MASTER SWITCH
24. TAKE-OFF TROLLEY ATTACHMENT HOOK (UNDER)
25. AUTO-PILOT MAIN SWITCH

JINDIVIK MK. 2B



GENERAL ARRANGEMENT

JINDIVIK MK. 2B



JINDIVIK MK. 2B

JINDIVIK MK 3

Production Details

Date of delivery of first Mk 3 (A92-301)	14th Dec, 1960
Date of first flight (A92-301)	12th May, 1961
Flown by R.A.F. ground crew at	Woomera
Number produced	9

Note: Serial Numbers and corresponding Airframe Numbers are given in Table 3.

Leading Particulars

Power Plant:- One Bristol Siddeley Viper ASV11 turbo-jet of 2,500 lb thrust.

Dimensions:-

Wing Span (wing-tip extensions included)...	25 ft. 7.2 in.
Length	23 ft. 3.75 in.
Wing Area (wing-tip extensions included)..	102 sq. ft.
Height on trolley	8 ft. 6 in.

Weights:-

All-up weight	2931 lb.
Empty	2148 lb.

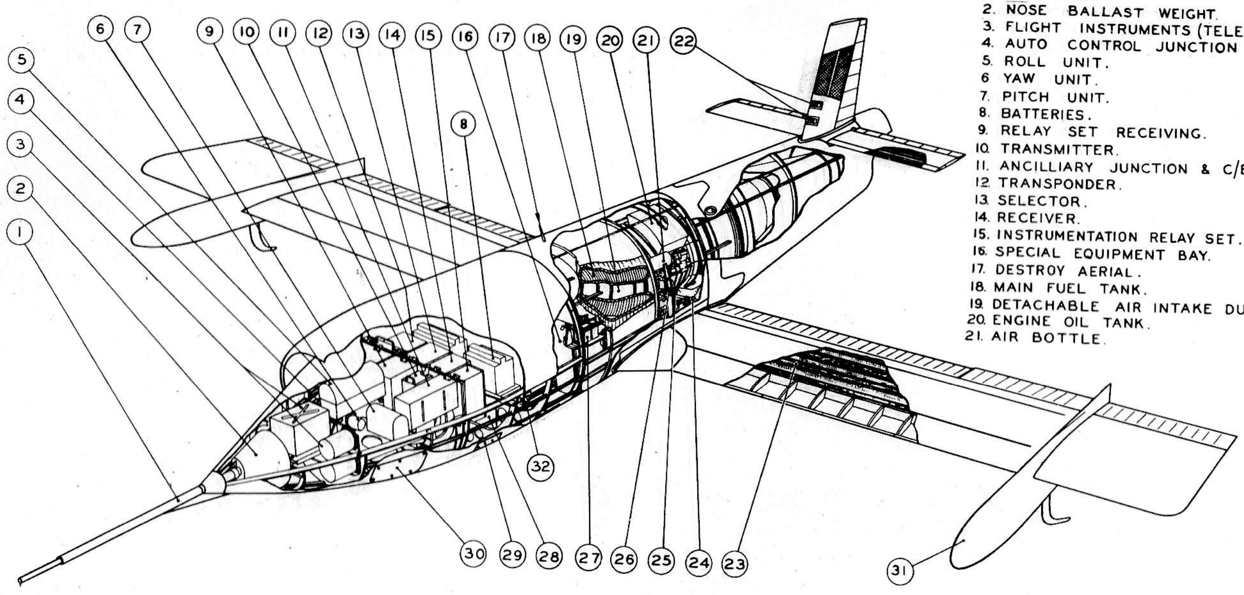
Performance(with Mk 4 Camera Pods and Wing-tip Extensions)

Max. Speed	450 knots at 40,000 ft.
Max. Mach No.	0.86 at 40,000 ft (elevator trim limit)
Endurance at 55,000 ft * .... (with full normal allowance)	15 min. at max r.p.m plus 42 min. at max. cruise r.p.m.
Service Ceiling	55,000 ft *
~~(1000 ft/min. Rate of Climb)~~	
R. of C. at Sea Level	12,000 ft/min. (limited by auto-pilot)

* Auto-pilot, control and telemetry limitations.

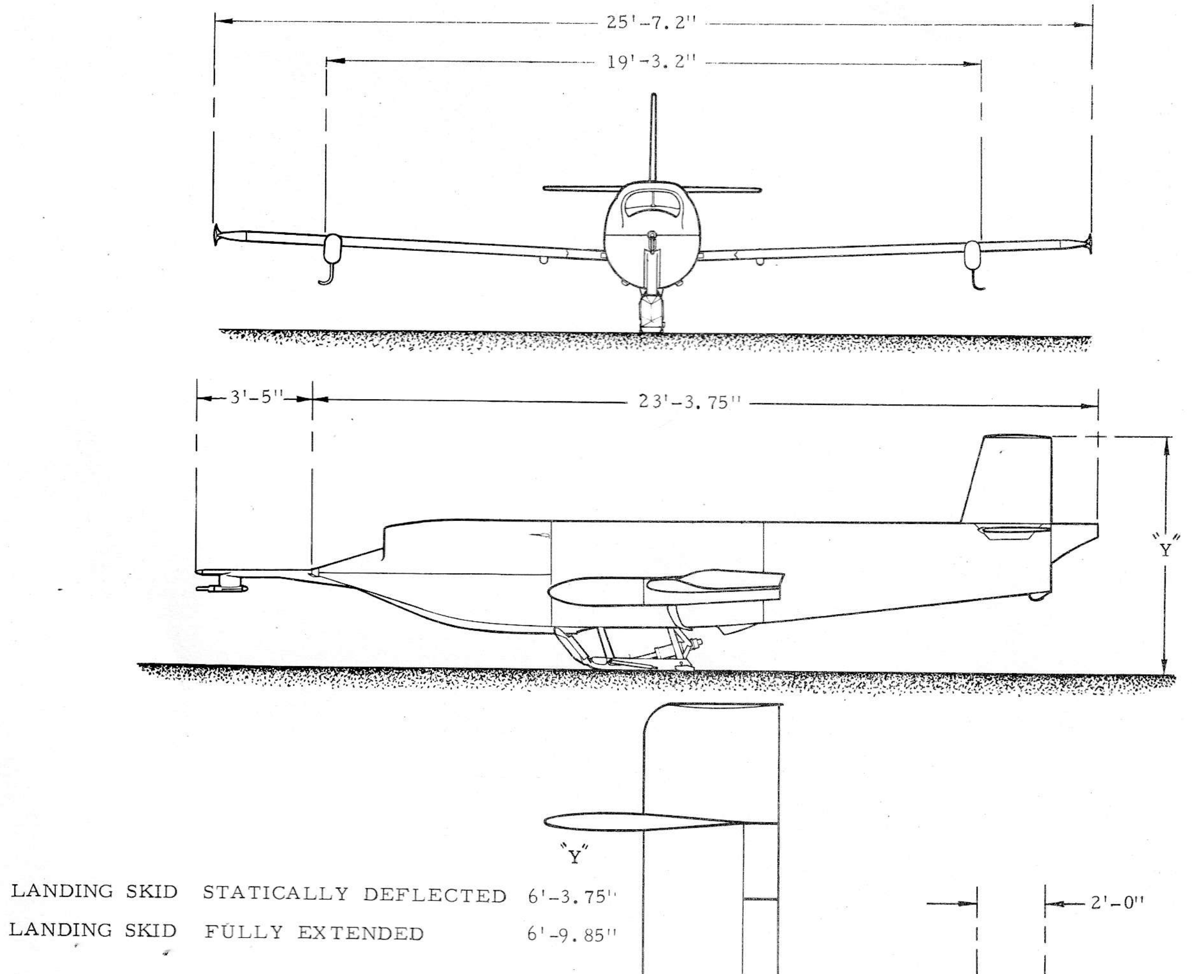
General Description

This aircraft was used to assist in the development of the Mk 3A Jindivik. The Mk 3 aircraft is fitted with the Viper ASV11 engine which provides 2,500 lb. static thrust which is a considerable thrust gain over previous ASV3 and ASV8 engines and an operating altitude of 60,000 ft. was envisaged. However, limitations in the auto-pilot, control and telemetry equipment have resulted in a restricted operating altitude of 55,000 ft. Apart from the engine change, the Mk 3 Jindivik is basically similar to the Mk 2B. Nine aircraft were prepared to the Mk 3 standard for use at Woomera.



1. WAVE GUIDE.
2. NOSE BALLAST WEIGHT.
3. FLIGHT INSTRUMENTS (TELEMETRY)
4. AUTO CONTROL JUNCTION BOX.
5. ROLL UNIT.
6. YAW UNIT.
7. PITCH UNIT.
8. BATTERIES.
9. RELAY SET RECEIVING.
10. TRANSMITTER.
11. ANCILLIARY JUNCTION & C/B BOX.
12. TRANSPONDER.
13. SELECTOR.
14. RECEIVER.
15. INSTRUMENTATION RELAY SET.
16. SPECIAL EQUIPMENT BAY.
17. DESTROY AERIAL.
18. MAIN FUEL TANK.
19. DETACHABLE AIR INTAKE DUCT.
20. ENGINE OIL TANK.
21. AIR BOTTLE.
22. TRANSMITTER & RECEIVER AERIALS.
23. INTEGRAL WING FUEL TANK BAY.
24. CENTRAL FLAP & AILERON OPERATING MECHANISM.
25. THROTTLE ACTUATOR.
26. PNEUMATIC SYSTEM CHARGING VALVE.
27. BATTERY CRATE.
28. TAKE – OFF TROLLEY ATTACHMENT HOOK COMPARTMENT
29. GROUND SUPPLY & MASTER BATTERY SWITCH.
30. AUTO PILOT MAIN SWITCH.
31. CAMERA PODS.
32. M.T.S. WAVEGUIDE & AERIAL.

JINDIVIK MK. 3



GENERAL ARRANGEMENT

JINDIVIK MK. 3

JINDIVIK MK 3A

Production Details

Date of delivery of first Mk 3A (A92-400)	5th June, 1961
Date of first flight	10th Nov., 1961
Flown by R.A.A.F ground crew at	Woomera
Number to be produced for W.R.E. (Mk 3A)	31
Number to be produced for U.K. (complete)(Mk 103A)	1) 50
Number to be produced for U.K. (not complete)(Mk 103AL)	49) total
Total number to be produced	81

Note: Serial Numbers and corresponding Airframe Numbers are given in Table 4.

Leading Particulars

Power Plant: One Bristol Siddeley Viper ASV11 turbo-jet of 2,500 lb. thrust.

Dimensions:

Wing Span (wing tip extensions included)	25ft. 7.2 in.
Length	23ft. 3.75 in.
Wing Area (wing tip extensions included)	102 sq.ft.
Height on trolley	8ft. 6 in.

Weights:

All-up weight	3,152 lb.
Empty	2,228 lb.

Performance (With Mk 4 Camera Pods and Wing-tip Extensions):

Max. Speed	450 knots at 40,000 ft.
Max. Mach No.	.86 at 40,000 ft (Elevator trim limit)
Endurance at 60,000ft. .... (With full normal allowance)	15 min. at max. r.p.m. plus 42 min. at max. cruise r.p.m.
Service Ceiling .... (1000 ft./min. Rate of Climb)	60,000ft.
Rate of Climb at Sea Level	12,000ft/min (Limited by auto-pilot)

General Description

Intended for operation at very high altitudes, this version is fitted with improved control and trials equipment and a Viper 11 turbojet engine. Service ceiling can be extended to 65,000ft (19,800 m.) by fitting a detachable Bristol Siddeley PR37/2 liquid-propellant rocket boost engine.

Type: Pilotless target aircraft

Wings: Mid-wing cantilever monoplane. Wing section NACA 64 Series with constant thickness-chord ratio of 6%. Structure consists of constant-section four-spar box adhesive-bonded to form an integral fuel tank. A light-skinned leading edge is fitted and the two-spar trailing edge structure carries the ailerons and flaps on a continuous piano-hinge. Ailerons operated by electric servo-motor.

Flaps, which also serve as air brakes, are operated pneumatically. Total flap area 11.5 sq.ft. (1.07 m^2). Total aileron area 4.5 sq.ft (.42 m^2). Gross wing area 76 sq.ft (7.06 m^2). Gross wing area with wing-tip extensions 102 sq.ft. (9.48 m^2).

Fuselage: Of light alloy in four main sections - front fuselage, equipment bay canopy, centre fuselage and rear fuselage. Front fuselage carries all automatic control equipment on three removeable trays. A moulded fibre-glass canopy, which lifts off for access, forms the semi-pitot type air intake. Centre fuselage contains a bay for special equipment and the main fuel tank. Rear fuselage carries the engine and jetpipe.

Tail Unit: Cantilever monoplane type. Multi-spar tailplane of light alloy bonded with Araldite. Elevators formed of single wrapped skins stiffened by chord-wise flutes and carried on continuous piano hinges bonded to tailplane. Fin consists of light skin bonded to two spars and stabilized by paper honeycomb filling. There is no rudder. Areas: fin 6.52 sq.ft. (0.61m^2), tailplane 10.28 sq.ft. (0.95m^2). Tailplane span 6ft. 6 in. (1.98m).

Power Plant: One Bristol Siddeley Viper 11 turbojet engine mounted in rear fuselage. An extractor duct surrounds the jet pipe, drawing cooling air through four flush intakes around engine combustion chamber. Main fuselage tank has capacity of 63 gallons (286 litres) and integral wing tanks have total capacity of 32 gallons (146 litres). Wing tanks are pressurised from engine compressor to feed fuselage tank, from where fuel is pumped to the engine. Compressed air is used for starting and throttle is operated by electric actuator.

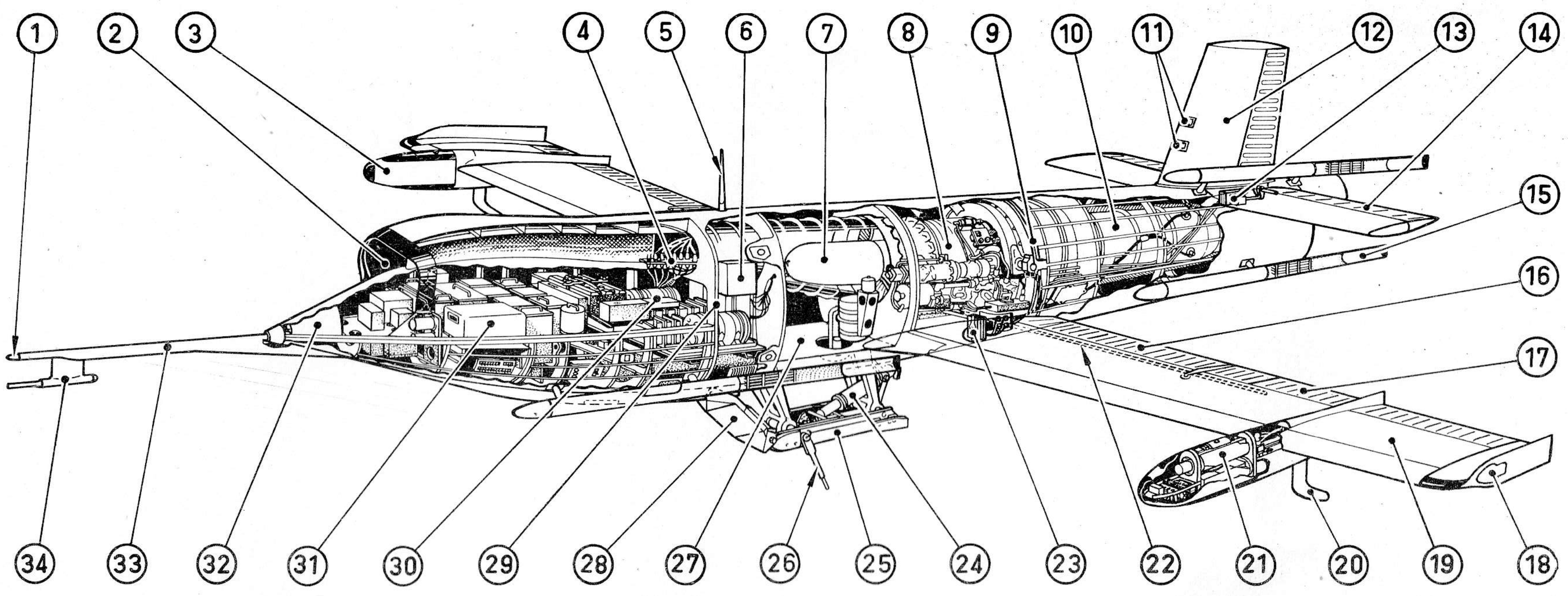
Electrical System: The prime source of electrical power is an engine-driven 9 KVA alternator delivering 208V AC 3-phase at 300-550 c/s. In the event of complete alternator failure a 24V lead-acid secondary battery ensures that essential control and telemetry functions are maintained for 20 minutes.

Remote Control Equipment: Control is effected from either a ground or airborne controlling station. Equipment consists briefly of a radio control receiver, units for interpreting external signals and applying them to control the aircraft, automatic pilot, and a telemetry transmitter for passing essential control information back to ground. Notch aerials in fin leading edge for radio receiver and telemetry transmitter.

Special Trials Equipment: Transponders and micro-wave reflectors are used for trials of active, semi-active or beam-riding missiles. Transponders in the 'X', 'S' and 'C' bands can be fitted for target acquisition and to enable the Jindivik to be tracked at greater range. The aerials for the 'X' band transponders are in the fibre-glass wing-tips, those for the 'S' band are in the fuselage and the 'C' band are in both fuselage and wing pods. Microwave reflectors fitted inside radomes in the wing pods provide a uniform response equivalent to a specific cross-sectional area over a wide angle. When an infra-red heat source is needed, a flare system can be fitted. This is a flare-heated source in which the flare heats a special-alloy metal to provide low frequency I.R. output. Flares are controlled through the normal command link system.

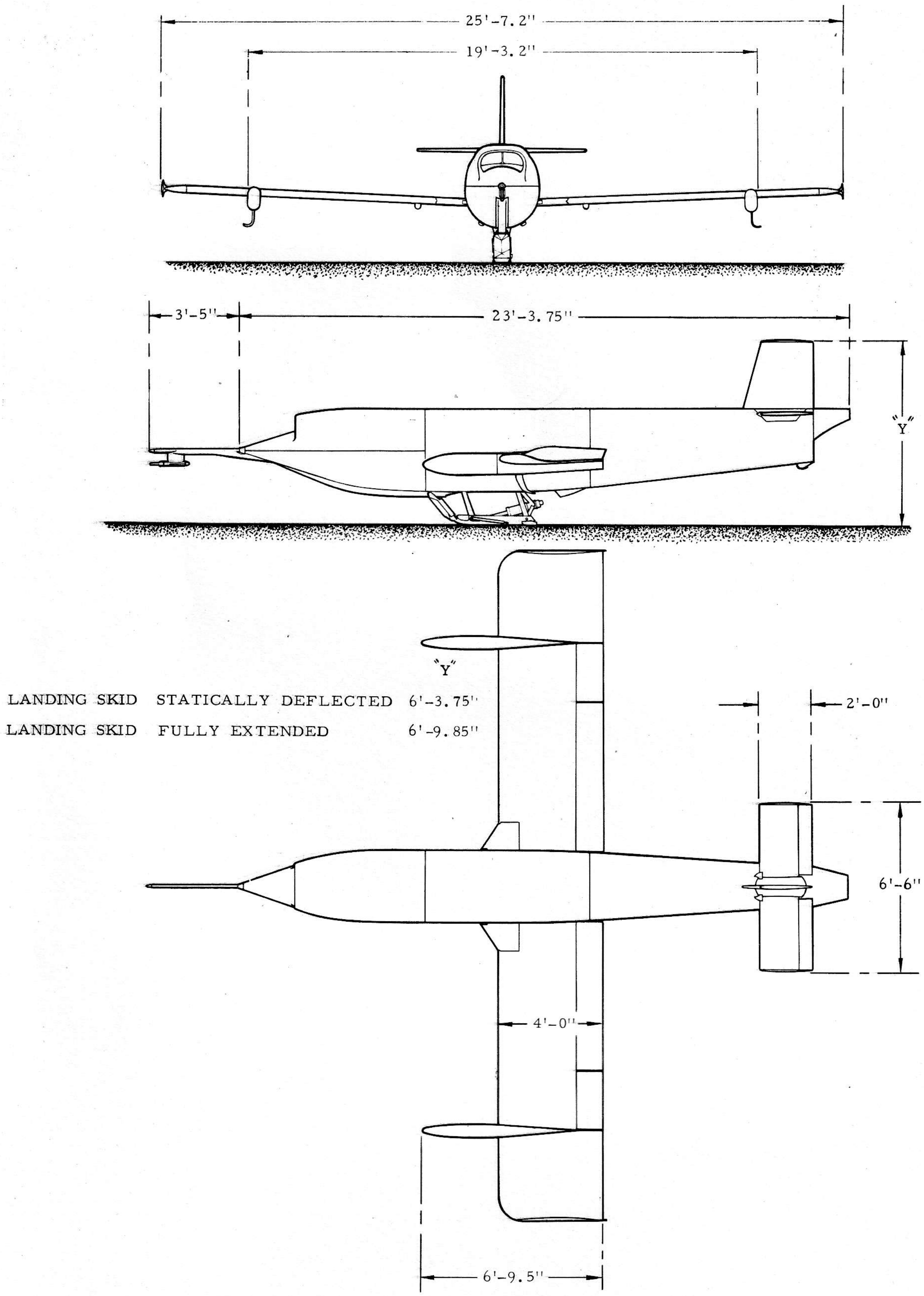
Recording Equipment: Cameras fitted with wide-angle lenses may be mounted in pods on each wing and are used to film the approach and proximity of missiles fired against the target.

Take-off and Landing: For take-off the aircraft is mounted on a tubular-framed trolley with a tricycle wheel configuration. The nose-wheel is steered by a servo-motor. The aircraft accelerates under normal jet power with the flaps retracted. The flaps are lowered automatically when take-off speed is reached and the aircraft is released from the trolley, which is braked automatically. When the aircraft has accelerated the flaps are retracted and the aircraft sets itself in climbing attitude. At take-off central landing skid is retracted in fuselage. When 'undercarriage down' radio signal is sent skid is automatically extended and charged from pneumatic system. At same time flaps are lowered to 20^o landing setting and an auxiliary 'sting' is lowered from landing skid. On touch-down 'sting' functions to cut engine fuel supply and to energise release unit in flap jack to return flaps to streamline to prevent aircraft from floating on rebounding.



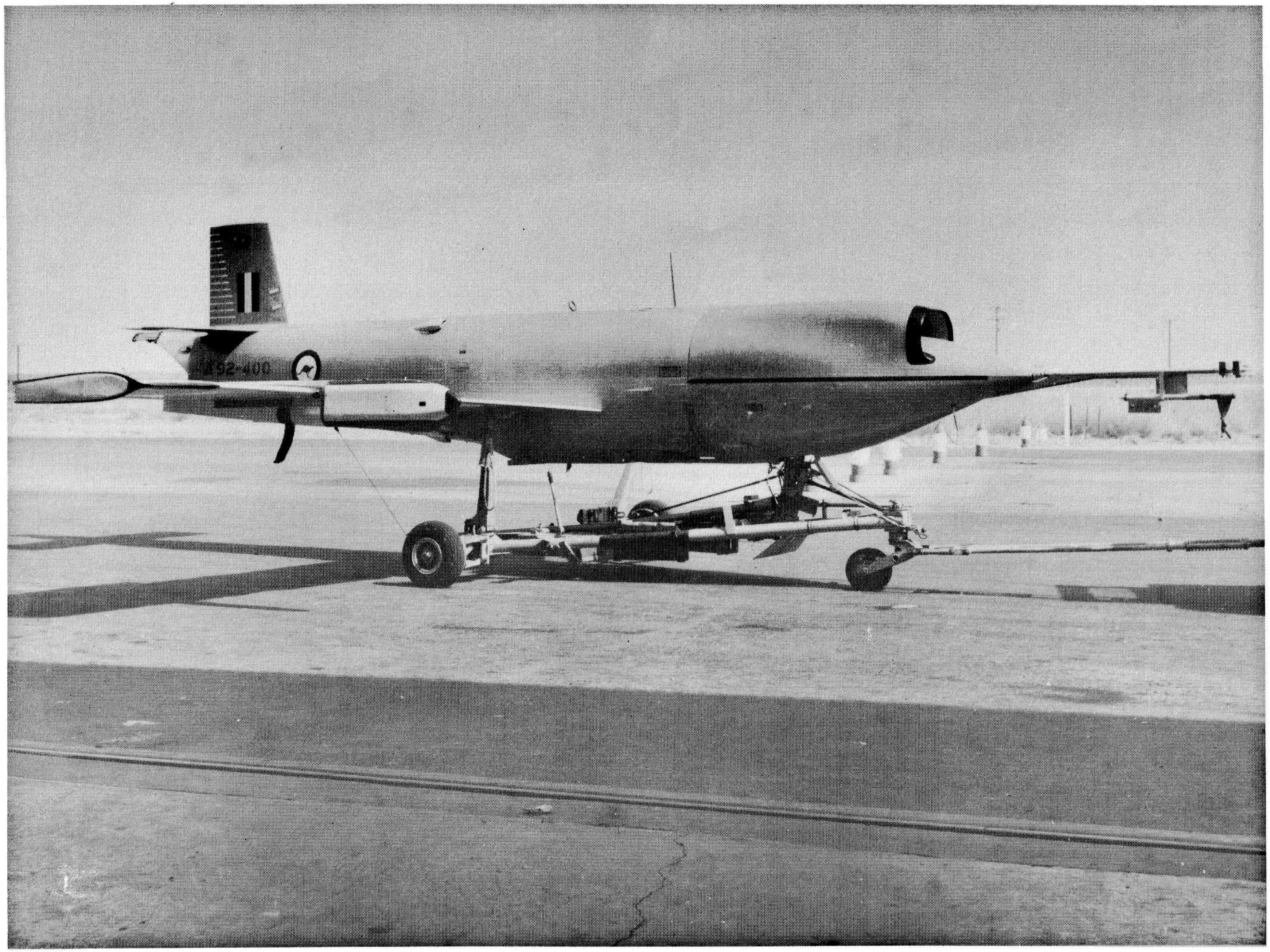
1. 3 CM AERIAL
2. ENGINE AIR INTAKE
3. CAMERA POD
4. ELECTRICAL CONNECTORS PANEL (FRONT & CENTRE FUSES)
5. EMERGENCY CONTROL AERIAL
6. AC DISTRIBUTION BOX
7. ALTERNATOR FAIRING
8. ENGINE
9. BREAK POINT (CENTRE AND REAR FUSES)
10. JET PIPE
11. NOTCH AERIALS
12. FIN
13. ELEVATOR SERVO MOTOR
14. ELEVATOR
15. FLARE (FH SOURCE)
16. FLAP
17. AILERON
18. 3 CM TRANSPONDER AERIAL
19. WING EXTENSION
20. WING SKID
21. CAMERA
22. AILERON CONTROL ROD
23. AILERON SERVO MOTOR
24. OLEO STRUT
25. LANDING SKID
26. TOUCH-DOWN SWITCH 'STING'
27. MAIN FUEL TANK
28. STONE GUARD
29. BREAK POINT (FRONT AND CENTRE FUSES)
30. ANCILLARY EQUIPMENT
31. CONTROL EQUIPMENT
32. NOSE BALLAST WEIGHT
33. PITOT BOOM
34. PITOT HEAD

JINDIVIK MK. 3A

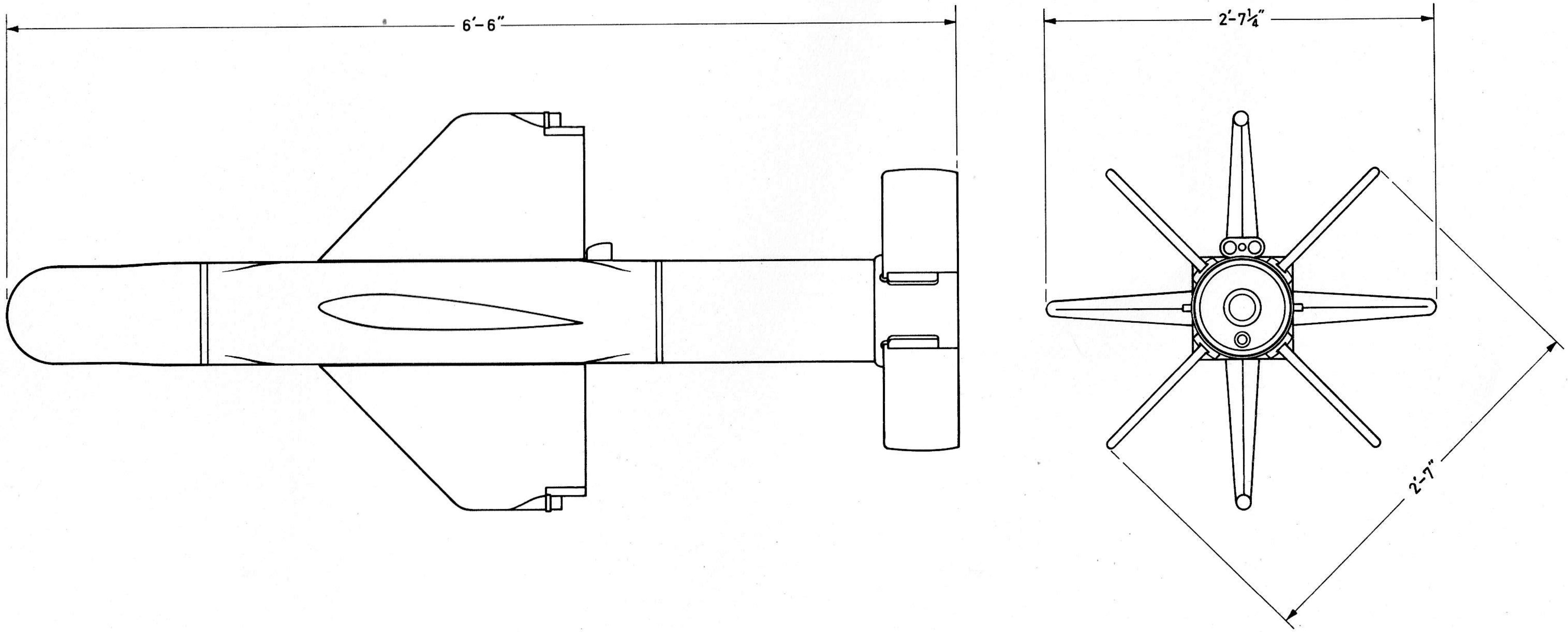


GENERAL ARRANGEMENT

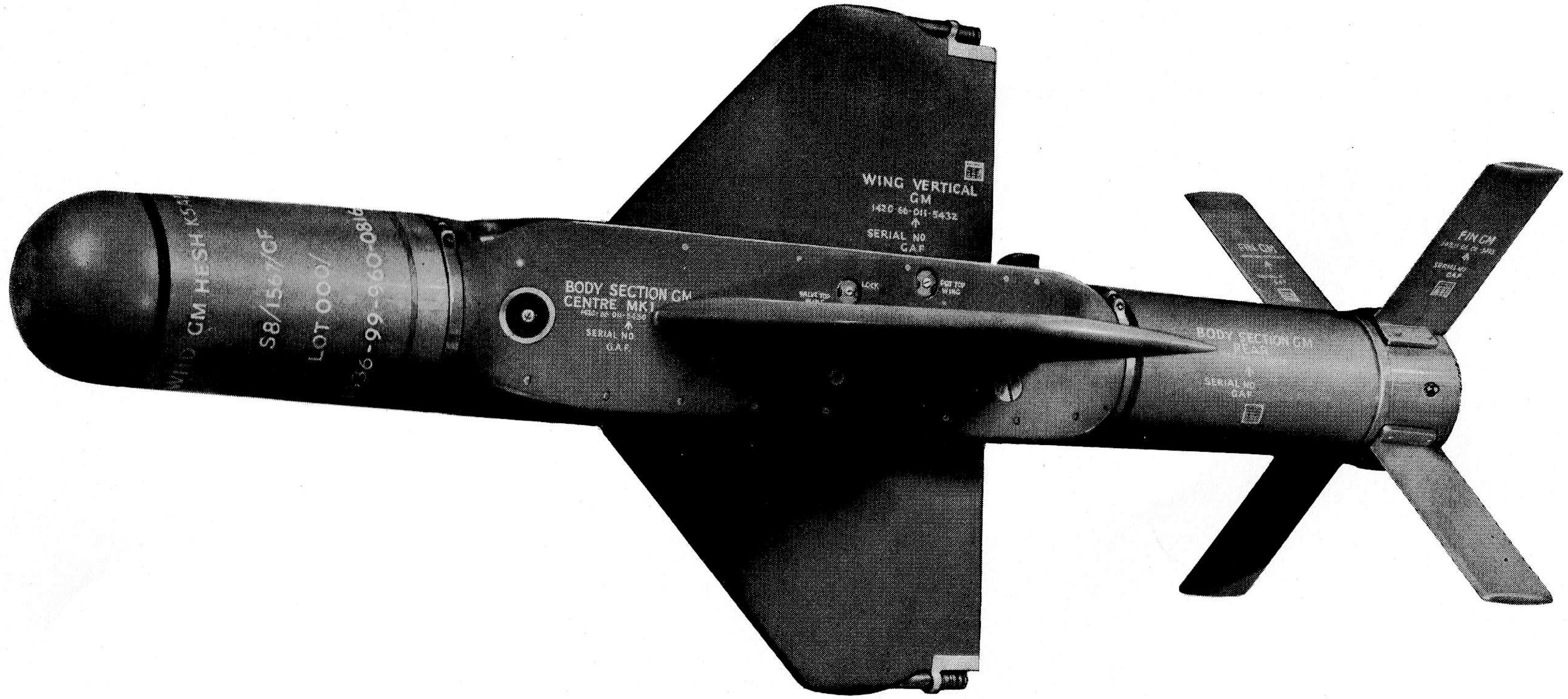
JINDIVIK MK. 3A



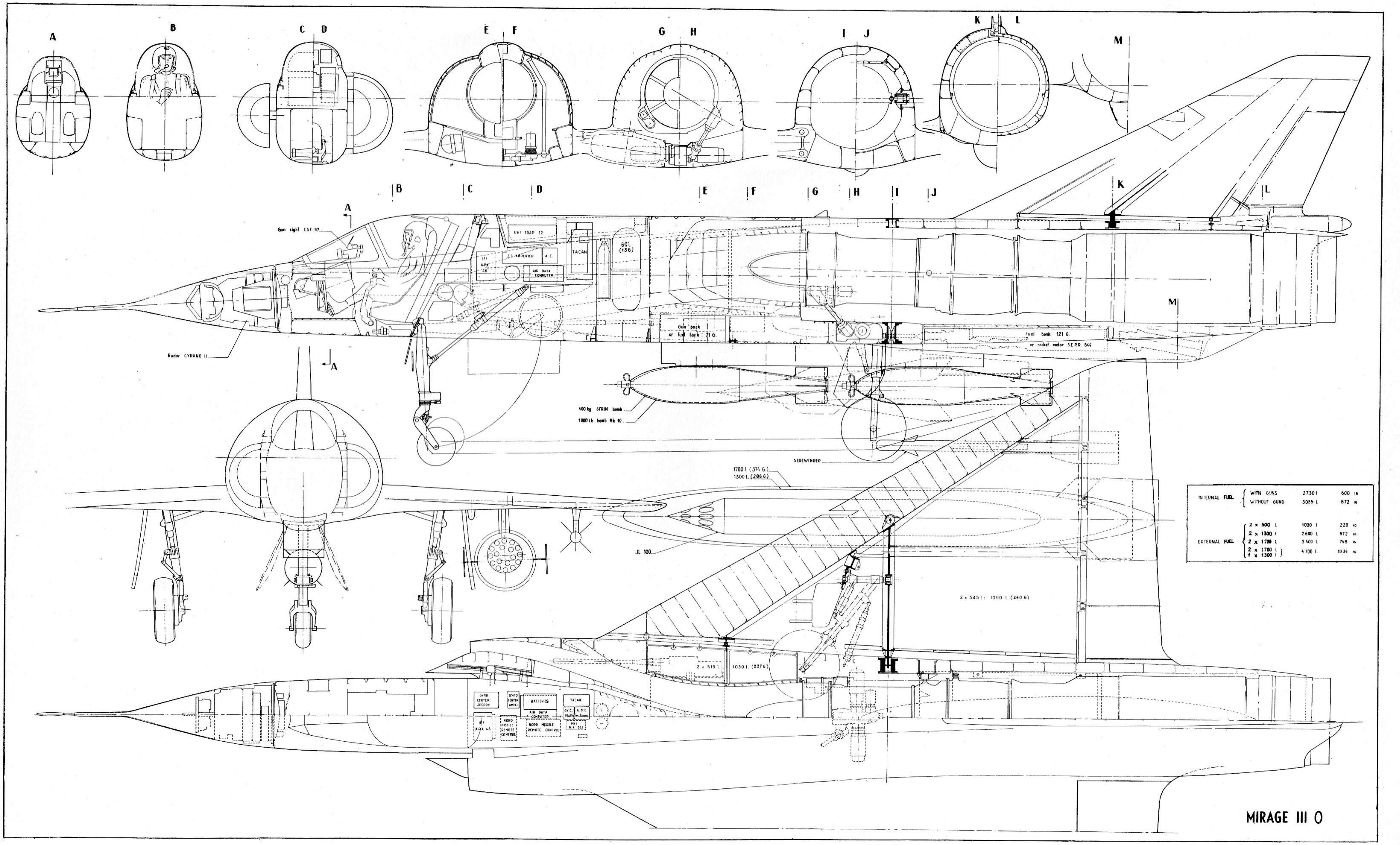
JINDIVIK MK. 3A



GENERAL ARRANGEMENT – MALKARA.

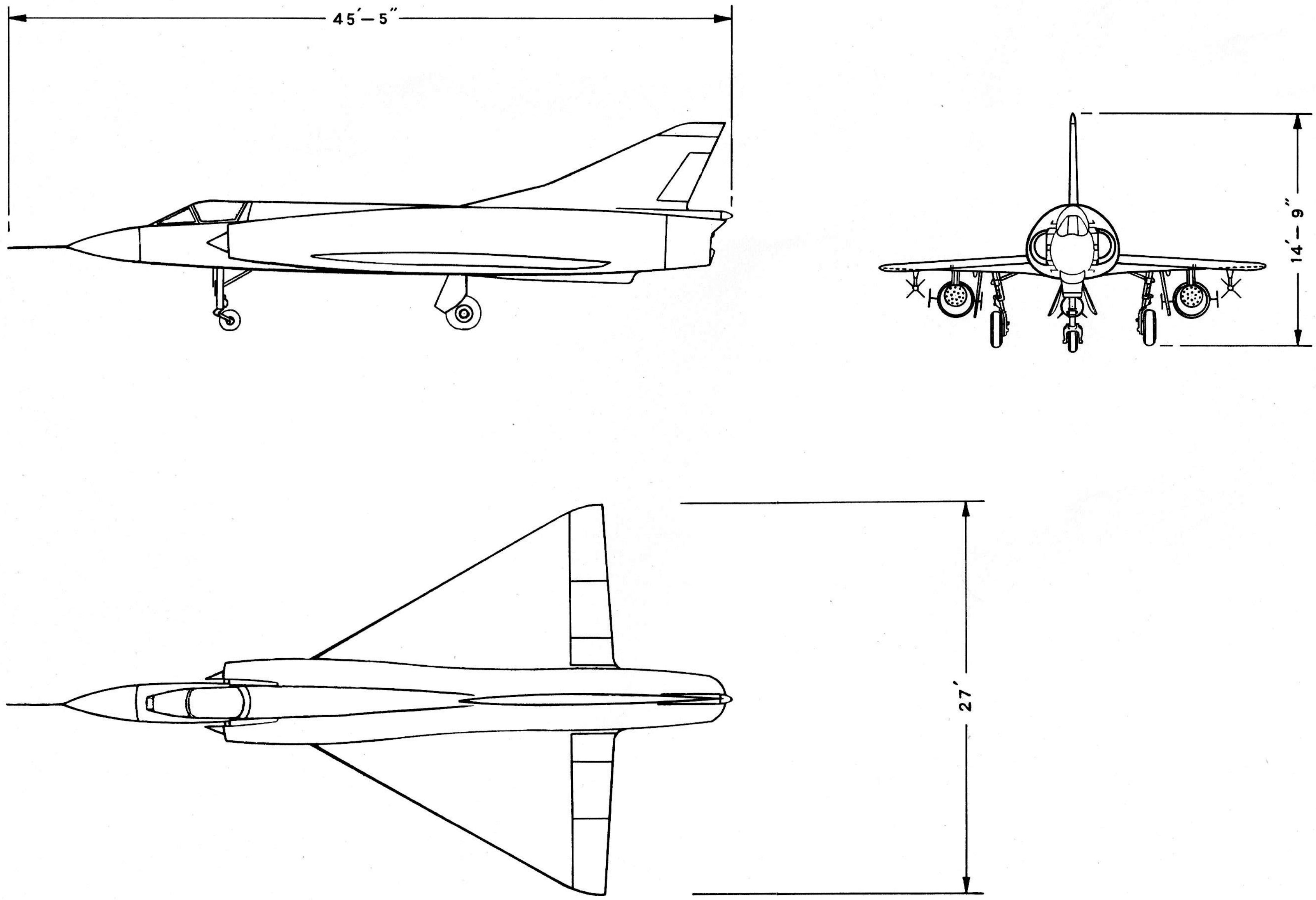

WING VERTICAL
GM
1420-66-011-5432
SERIAL NO
GAF
BODY SECTION GM
CENTRE MK1
SERIAL NO
G.A.F.
BODY SECTION GM
REAR
SERIAL NO
GAF
FIN GM
S8/1567/GF
LOT 000/

MALKARA



INTERNAL FUEL	WITH GUNS	2730 l	600 IG
	WITHOUT GUNS	3055 l	672 IG
EXTERNAL FUEL	2 x 500 l	1000 l	220 IG
	2 x 1300 l	2600 l	572 IG
	2 x 1700 l	3400 l	748 IG
	2 x 1700 l 1 x 1300 l	4700 l	1034 IG

MIRAGE III O



GENERAL ARRANGEMENT – MIRAGE III O

MIRAGE III

TABLE 1

SUMMARY OF TOTAL AIRCRAFT

PRODUCED BY OR ON ORDER FROM GOVERNMENT AIRCRAFT FACTORIES

AIRCRAFT	MARK	CUSTOMER				REMARKS
		RAAF	WRE	UK	SWEDEN	
• Beaufort	8	700				
• Beaufort (Beaufreighter)	9	46				Converted from Beaufort Bomber (incl. in 700)
• Beaufighter	21	364				
• Lincoln	30	73				
• "	GR Mk 31	20				Converted from Mk 30
• "	MR Mk 31	10				Converted from GR
• "	LRN	14				Converted from Mk 30
• "	VIP	2				" " "
• "	Specially Modified	2				" " "
• Canberra	20	48				Bomber version
• "	21	7				Trainer version (Converted from 5 Mk 20's and 2 English B Mk 2's)
• Pika			2			Piloted version of Jindivik
• Jindivik	1		12			
• "	2		88	16*	10	*Includes WRE Gift of 4
• "	2A		3			Converted from Mk 2's
• "	2B		12	5		
• "	2BL			29		Complete less engine and major equipment.
◘ "	102BL			30		Complete less engine and major equipment.
◘ "	3		9			
◘ "	3A		31			
▲ "	103A			1		Modified equipment to suit UK requirements.
▲ "	103AL			49		Complete less engine and major equipment.
Mirage	IIIO	30				

• All aircraft completed and delivered
◘ Some aircraft completed and delivered
▲ None delivered

TABLE 2

JINDIVIK MK 1, MK 2, MK 2A VARIANTS

CUMULATIVE AIRCRAFT PER MARK PER CUSTOMER

Factory Airframe Number	Customer A/C Serial No. A92-	MK 1	MK 2			Factory Airframe Number	Customer A/C Serial No. A92-	MK 2		
		(WRE)	WRE	UK	Sweden			WRE	UK	Sweden
-	1	1				52	72	51		
-	2	2				53	73	52		
-	3	3				54	74	53		
-	4	4				55	75	54		
-	5	5				56	76	55		
-	6	6				57	77	56		
-	7	7				58	78	57		
-	8	8				59	79	58		
-	9	9				60	80	59		
-	10	10				61	81	60		
-	11	11				62	82	61		
-	12	12				63	83	62		
1	21		1			64	84	63		
2	22		2			65	85	64		
3	23		3			66	86	65		
4	24		4			67	87	66(2A)		
5	25		5			68	88	67		
6	26		6			69	89	68		
7	27		7			70	90	69(2A)		
8	28		8			71	91	70		
9	29		9			72	92	71		
10	30		10			73	93	72		
11	31		11			74	94	73		
12	32		12			75	95	74		
13	33		13			76	96	75		
14	34		14			77	97	76		
15	35		15			78	98	77		
16	36		16			79	99	78		
17	37		17			80	100	79		
18	38		18			81	101	80		
19	39		19			*82	102		2	
20	40		20			*83	103		3	
21	41		21			*84	104		4	
22	42		22			85	105		5	
23	43		23			86	106		6	
24	44		24			87	107		7	
25	45		25			88	108		8	
26	46		26			89	109		9	
27	47		27			90	110		10	
28	48		28			91	S.1			1
29	49		29			92	S.2			2
30	50		30			93	S.3			3
31	51		31			94	S.4			4
32	52		32			95	S.5			5
33	53		33			96	S.6			6
34	54		34			97	S.7			7
35	55		35			98	S.8			8
36	56		36			99	S.9			9
37	57		37			100	S.10			10
38	58		38			101	111	81(2A)		
39	59		39			102	112	82		
40	60		40			103	113	83		
41	61		41			104	114	84		
42	62		42			105	115	85		
43	63		43			106	116	86		
44	64		44			107	117	87		
45	65		45			108	118	88		
46	66		46			• 109	119		11	
47	67		47			• 110	120		12	
*48	68			1		• 111	121		13	
49	69		48			• 112	122		14	
50	70		49			• 113	123		15	
51	71		50			• 114	124		16	

NOTE: The three Mk 2A aircraft were converted from Mk 2's .
- * W.R.E. gift to U.K. (4 aircraft).
- • Last 6 aircraft to U.K. despatched without engines and some items of equipment.

TABLE 3

JINDIVIK MK 2B, MK 2BL, MK 102BL, MK 3 VARIANTS

CUMULATIVE AIRCRAFT PER MARK PER CUSTOMER

Factory Airframe Number	Customer A/C Serial No. A92-	Mk 2B		Mk 2BL	Mk 102BL	Mk 3
		WRE	UK	(UK)	(UK)	(WRE)
115	201	1				
116	202	2				
117	203	3				
118	204		1			
119	205		2			
120	301					1
121	206		3			
122	207		4			
123	208		5			
124	302					2
*125						
126	209			1		
127	210			2		
128	211			3		
129	212			4		
130	213			5		
131	214			6		
132	215	4				
133	216			7		
134	217			8		
135	218			9		
136	219	5				
137	220			10		
138	221	6				
139	222	7				
140	223			11		
141	224	8				
142	225			12		
143	226	9				
144	227			13		
145	228			14		
146	229	10				
147	230			15		
148	231	11				
149	232			16		
150	233			17		
151	234	12				
152	304					3
153	235			18		
154	236			19		
155	237			20		
156	305					4
157	238			21		
158	306					5
159	239			22		
160	240			23		
161	307					6
162	241			24		
163	308					7
164	242			25		
165	243			26		
166	309					8
167	244			27		
168	310					9
169	245			28		
170	246			29		
171	247				1	
172	248				2	
173	249				3	
174	250				4	
175	251				5	
176	252				6	
177	253				7	
178	254				8	
179	255				9	
180	256				10	
181	257				11	
182	258				12	
183	259				13	
184	260				14	
185	261				15	
186	262				16	
187	263				17	
188	264				18	
189	265				19	
190	266				20	
191	267				21	
192	268				22	
193	269				23	
194	270				24	
195	271				25	
196	272				26	
197	273				27	
198	274				28	
199	275				29	
200	276				30	

* Converted to Mk 3A Prototype

MARK DEFINITIONS:-

MK 2BL (1959 Order) Engine and major equipment not fitted.

MK 102BL (1961/1962 Order) Engine and major equipment not fitted. Aircraft identical to Mk 2BL

TABLE 4

JINDIVIK MK 3A, MK 103A, MK 103AL VARIANTS

CUMULATIVE AIRCRAFT PER MARK PER CUSTOMER

Factory Airframe Number	Customer A/C Serial No. A92-	Mk 3A	Mk 103A	Mk 103AL
		(WRE)	(UK)	(UK)
125	400	1 (Prot.)		
1	401	2		
2	402	3		
3	403	4		
4	404	5		
5	405	6		
6	406	7		
7	407	8		
8	408	9		
9	409	10		
10	410	11		
11	411	12		
12	412	13		
13	413	14		
14	414	15		
15	415		1	
16	416			1
17	417	16		
18	418	17		
19	419			2
20	420			3
21	421			4
22	422	18		
23	423	19		
24	424			5
25	425			6
26	426			7
27	427			8
28	428			9
29	429			10
30	430			11
31	431			12
32	432	20		
33	433	21		
34	434			13
35	435			14
36	436			15
37	437			16
38	438			17
39	439	22		
40	440	23		
41	441			18
42	442			19
43	443			20
44	444	24		
45	445	25		
46	446			21
47	447			22
48	448			23
49	449			24
50	450	26		
51	451	27		
52	452			25
53	453			26
54	454			27
55	455			28
56	456			29
57	457			30
58	458			31
59	459	28		
60	460	29		
61	461			32
62	462			33
63	463			34
64	464			35
65	465			36
66	466			37
67	467			38
68	468	30		
69	469	31		
70	470			39
71	471			40
72	472			41
73	473			42
74	474			43
75	475			44
76	476			45
77	477			46
78	478			47
79	479			48
80	480			49

MARK DEFINITIONS:-

MK 103A - Aircraft fitted with equipment modified to U.K. requirements.

MK 103AL - Engine and major equipment not fitted.