

PART II

LIMITATIONS

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PART II—LIMITATIONS

Chapter 1—AIRCRAFT AND AIRFIELD
LIMITATIONS

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Release conditions

1 The aircraft is cleared to operate by day and night, within the limits defined in this Part, providing the ambient temperature does not exceed 40°C.

CG limits

2 Configurations excluding 250 gallon UW tanks

<i>AUW</i>	<i>CG inches aft of datum</i>
Up to 33,000 lb	11.8* to 26.6
40,500 lb and above	15.1* to 26.6

*Linear variation between 33,000 and 40,500 lb.

- 3 Configurations including 250 gallon UW tanks**
- | | |
|---------------------|---------------|
| Up to 33,000 lb | 11.8* to 25.2 |
| 35,600 lb and above | 12.9* to 25.2 |
- *Linear variation between 33,000 and 35,600 lb.

Spinning and stalling

4 Spinning. Intentional spinning is prohibited.

5 Stalling. Intentional stalling is prohibited. Investigation into the 1G stall with the aircraft unblown in the 0-0-0 configuration is permitted to the onset of buffet or engine disturbance, whichever occurs first.

WARNING: At speeds below 300 knots at low IMN the buffet warning is reduced. Attention is drawn to the minimum flying speeds in other configurations. The ADD signal is to be used as further indication of approaching stall. Aircraft attitude should be restricted to an incidence not greater than that which will indicate the audio warning steady note.

Inverted flight

6 Inverted flight and flight with negative G. Flight with negative-G is permitted for a period not exceeding 10 seconds. Deliberate sustained inverted flight is prohibited.

Looping manoeuvre

7 Manoeuvres in the vertical plane are restricted to a half loop with a roll off the top. The half loop manoeuvre should be performed either:

1. With the strike sight, to give a 7°/sec pitch rate.
2. By pulling to 4G on entry and holding this until the ADD steady note is reached. Thereafter, the loop is continued on ADD steady note (which should not be exceeded at any time). As the airspeed starts to increase as the nose lowers through the horizon at the top of the loop, a gentle 180° roll should be made to straight flight.

Looping conditions

8 The looping manoeuvre is subject to the following conditions:

- Maximum entry height 7,000 ft pressure altitude
- Minimum entry speed 530 knots
- Maximum AUV 51,000 lb

Using 48,000 lb AUV and 3,000 ft entry height as the datums in ISA conditions, the following corrections should be applied:

Add 1,000 ft/10°C below ISA

Subtract 1,000 ft/10°C above ISA

Add 750 ft/1,000 lb below 48,000 lb AUV

Subtract 750 ft/1,000 lb above 48,000 lb AUV.

◀Rolling

9 *Rolling with no external stores.* The rudder autostabiliser or standby yaw damper must be engaged at all times. Use of rudder in rolling manoeuvres must be kept to a minimum. The application of further forward or back stick from the initial condition during rolling manoeuvres is prohibited.

(a) *Low Speed Gear.* Aileron low-speed gear must not be used above 300 knots. Full aileron may be used in normal circuit manoeuvres.

(b) *High Speed Gear.* The limitations given in Table 1 are subject to a minimum speed limit:

up to 51,000 lb AUV—250 knots

above 51,000 lb AUV—280 knots.

Below these speeds rolling is restricted to gentle manoeuvres only.

Table 1

<i>Normal Acceleration</i>	<i>Rolling Limitation</i>
Less than 1G	Rolls through not more than 90° may be made using up to $\frac{1}{2}$ (half) lateral stick deflection. The roll may be continued through to 180° by gentle use of aileron.
1G	Rolls through 360° may be made using up to full lateral stick deflection.
More than 1G	Rolls through 180° may be made using up to full lateral stick deflection.

NOTE 1: The above limitations also apply for carriage of pylons with or without unloaded tandem store carrier(s). ▶

10 Rolling with pylon mounted stores. Individual clearances given under store carriage limitations must be observed. (See CA Release). Otherwise the limitations quoted in para 9 are applicable, except that in rolls from 1G flight only the first 180° may be made with full aileron and thereafter continued up to 360° with gentle use of aileron.▶

11-19 inclusive—deleted.

Normal accelerations

20 The following maximum normal accelerations must not be exceeded:

Aircraft AUW lb	Below 0.87M indicated G	0.89 to 0.95M indicated G	
		Pre-Mod 1213	Post-Mod 1213
◀Up to 40,500	-3.75 to +6.0	-3.5 to +3.5	-3.5 to +5.0
40,500 to 44,200	-3.4 to +5.5	-3.2 to +3.0	-3.2 to +4.6
44,200 to 51,000	-3.0 to +4.75	-2.7 to +2.5	-2.8 to +4.0
51,000 to 55,000	-2.75 to +4.4	-2.6 to +2.2	-2.6 to +3.7

NOTE 1: A linear relationship exists between 0.87 and 0.89M.

NOTE 2: For pre-Mod 1188 aircraft only: With one forward 500 lb▶ or 540 lb bomb on a tandem store carrier the limiting normal acceleration is the Store Limit, the limit as given above, or 4.5G whichever is least.

Asymmetric limitations

21 The maximum permissible asymmetry is as follows:

(a) Airfield take-off and landing: 1.52×10^5 lb inches rolling moment. (This rolling moment limit will preclude the carriage of 2×500 lb bombs on a *single* outboard tandem store carrier.)

NOTES: 1. SEE ALSO SYMMETRIC LIMITS AND OBSERVE LOWER LIMIT.
 2. CERTAIN WING STORES HAVE LOWER LIMITS. REFER TO STORES LIMITATION TABLES.

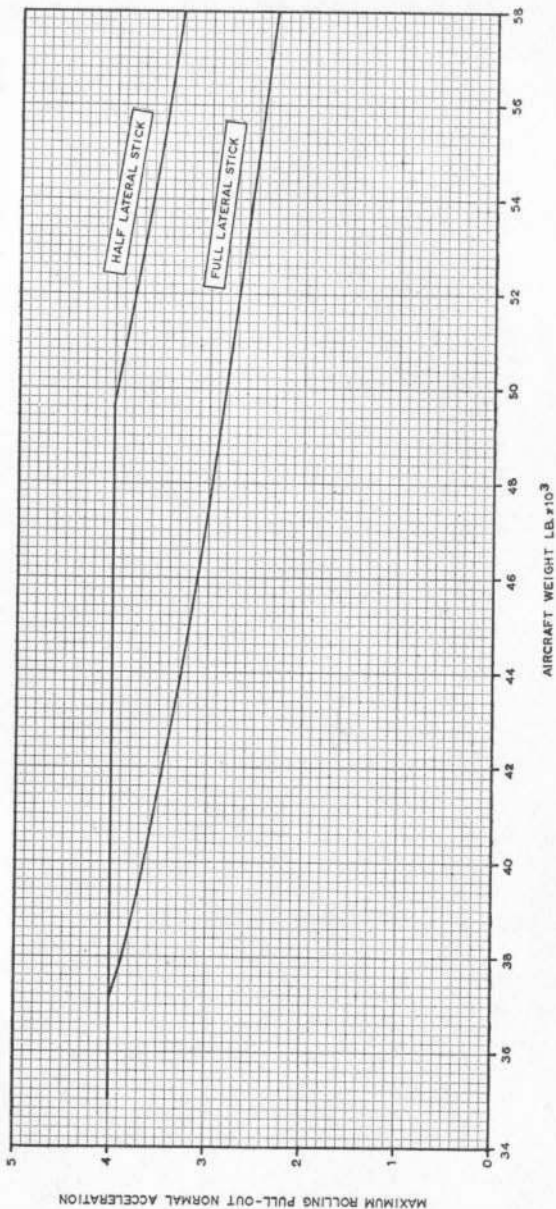


Fig. 1—Maximum accelerations for rolling pull-outs

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AL10)

(b) In flight: no limitation, except on the mixed weapon load configuration permitted.

(c) Bomb bay store: see Ch. 3 paras. 11 to 13.

NOTE: Large asymmetric rolling moments can be acceptable in emergency for landings, the maximum asymmetry being dependent upon the rudder pedal force that the pilot can hold and still adequately control the aircraft, bearing in mind the atmospheric turbulence. This pedal force is decreased by approaching at a higher speed, and in cases of doubt a dummy approach should be made.

(d) The asymmetric limits for carrier operation are given in Ch. 5, para 18.

Maximum speeds

22 The maximum speeds are:

	Knots	Mach No
Clean aircraft, or with pylons without stores or with practice bomb carriers without stores	580	0.95
With tandem stores carriers ...	560	0.85
	400	0.85 to 0.9
Arrester hook lowering ...	400	—
With flying controls integration	350	0.6
Windscreen wiper ...	350	—
With aileron gearing set for low speed ...	300	—
Windscreen rain clearance (in rain only, at not more than 90% Nh) ...	250	—
With undercarriage down ...	225	—
Airbrakes ...		No restriction

Maximum speed: Flaps, aileron droop and tailplane flap

Flap°	Aileron°	Tailplane°	Maximum knots	
			Blow off	Blow on
0	10	10	280	280
15	10	10	280	280
30	10	10	250	250
30	20	20	Not permitted	220
45	10	10	200	200
0	25	25	Not permitted	200
45	25	25	Not permitted	200

Minimum speeds

23 The normal minimum flying speeds in (a) and (b) are shown as approach datum speeds for one or two engines in the circuit. These speeds, and the minimum practice speeds are shown for an AWW of 33,000 lb. For increases in weight above 33,000 lb add 2 knots/1,000 lb increase.

(a) Two engines, full airbrake

<i>Approach configuration</i>	<i>Approach datum speed (Knots)</i>	<i>Minimum practice speed (Knots)</i>	<i>Recommended altitude band for practice (Ft)</i>
Normal approach 45-25-25 BLOW ON	Carrier 127 Airfield 127	122 122	5,000 to 15,000
Alternative approach 30-20-20 BLOW ON	Carrier 130 Airfield 130	125 125	5,000 to 15,000
Alternative approach 0-25-25 BLOW ON	Carrier 139 Airfield 139	135	5,000 to 15,000
Alternative approach 45-10-10 BLOW OFF	Carrier 139 Airfield 146	141 141	Sea level to 15,000
Alternative approach 0-10-10 BLOW OFF	Airfield 158	153	5,000 to 15,000

(b) Single engine, airbrake as required

<i>Approach configuration</i>	<i>Approach datum speed (Knots)</i>	<i>Minimum practice speed (Knots)</i>	<i>Recommended altitude band for practice (Ft)</i>
Normal approach 30-20-20 BLOW ON	Carrier 133 Airfield 133	128 128	5,000 to 7,000
Alternative approach 45-10-10 BLOW OFF	Airfield 146	141	Sea level to 15,000
Alternative approach 0-10-10 BLOW OFF	Airfield 158	NA	NA

NOTE 1: The Approach Datum speeds in (a) and (b) approximate to the ADD steady note except for the two engines 45-10-10, Blow off, Carrier Approach of 139 knots.

NOTE 2: In 30-20-20 configuration, much larger throttle movements may be necessary to reduce excess speed on approach and care must be taken to ensure that the blow pressure does not fall below the allowed minimum of 15 PSI.

NOTE 3: For all other configuration the BLC blow pressure should not be less than 20 PSI.

NOTE 4: Maximum altitude for practice will be limited by blow pressure and engine handling considerations.

Height limitation with autostabilisation engaged

24 See Chapter 3, para 7.

Aircraft approach limitation

25 The aircraft approach limitation using GCA/PAR is 300 ft true height.

Airstream direction detector

26 Calibrated ADD equipment must be fitted and used.

Yaw stabilisation

27 See Chapter 3, para 8.

Canopy limitations

28 (a) *Canopy open.* Flight with the canopy open is prohibited.

(b) *Canopy off.* Flight with the canopy off is permitted to a maximum speed of 550 knots, but the observer may have to lower his seat if the face blind is to be reached when greater than 450 knots. Intercomm is impossible above 200 knots. Normal datum speeds should be used for landing.

Flight in icing conditions

29 Flight in icing conditions should be avoided. Engine and intake anti-icing is fitted and should be used if icing conditions are encountered. Airframe anti-icing is not fitted but in emergency, use of BLC (by selecting 15-10-10) will give considerable leading edge protection of the wings and tail-plane. The speed limitation for this configuration is 280 knots.

Maximum weights

30 The maximum weights for take-off and landing are as follows:

Take-off, blow on or off	...	54,000 lb.
Landing, normal maximum		
blow on or off	39,000 lb.
Landing, emergency	48,000 lb.

WARNING: Landings at weights above Normal Maximum Landing weight should be made on a 3,000 yard runway, and maximum possible use made of aerodynamic braking.

Minimum runway length

31 The aircraft should not normally be operated from runways of less than 2,000 yards in length.

Minimum runway strength

◀**32** Refer to the Operating Data Manual (AP.4744B-OD Pt. 9). ▶

Maximum crosswind

33 Landing and take-off with a crosswind component of more than 25 knots is not recommended.

Airfield arrester gear

34 The aircraft is cleared to use the following types of airfield arrester gear:

Rotary hydraulic gear Mk. 1	(RHAG Mk. 1)
Spray arrester gear Mk. 1	(SPRAG Mk. 1)
Purpose use arrester gear Mk. 21	(PUAG Mk. 21)
Chain arrester gear	(CHAG)
Bliss Mk. 500S	

Arrester gear trampling

35 The aircraft is cleared to trample the supported and tensioned centre spans of the arrester gears in para 34 without restriction.

Airfield arrester barriers

36 The aircraft is cleared to use the following types of arrester barrier:

Mk. 6

Type 12.3 with N55 net fitted.

NOTE: During engagement the top cable will probably cause damage to components situated in the dorsal spine. Externally mounted missiles and underwing pylon fuel tanks are likely to be damaged during arrest, if parking brakes are not applied.

WARNING: The aircraft is *not* cleared for engagement when fitted with a nose refuelling probe as there is then a danger of the top wire being brought down onto and penetrating the cockpit canopy.

PART II—LIMITATIONS

Chapter 2—ENGINE LIMITATIONS

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Spey Mk. 101 engines

1 The principal limitations are shown in Table 1.

WARNING: The limiting maximum condition is that maximum which is achieved first.

Table 1—Principal engine limitations

Condition		Max. TGT °C		HP RPM % MAX.	LP RPM % MAX.	Time Limit (Per Flight)
		Pre- Mod. Spey 3119	Post- Mod. Spey 3119			
Maximum	Without boundary layer control air bleed	655	585	97.5	98.2	15† minutes including not more than five minutes with boundary layer control air bleed
	With boundary layer control air bleed	675	595	97.5	95.0*	
Intermediate		610	545	94.5	97.5	30 minutes
◀Maximum Continuous ▶		585	520	93.0	97.5	Unrestricted
Idling		550	495	50 ± ½	—	Unrestricted
Starting		600	535	—	—	Momentarily (2 secs)

◀†To conserve engine life, it is recommended that a 5 minutes combined limit be observed.

*This speed varies with ambient temperature and altitude but under Sea Level ISA conditions, should not exceed 90%.

NOTE: Whenever possible LP RPM should not be allowed to stabilise between 65 and 80%, this is applicable during ground running or ground manoeuvres. ▶

The minimum HP RPM from which the engines are required to accelerate to 2% less than maximum in 5 secs are:

Blow on 85%

Blow off 70%

NOTE: Prior to engine shut-down, run the engine at ground idling RPM for a period not less than 2 minutes.

Oil pressure warnings

2 The limiting oil pressure indications are shown in Table 2

Table 2—Oil pressure indications

<i>Indication</i>	<i>Limitation</i>	<i>Remarks</i>
LOW	Normally unacceptable	A LOW indication is permissible during <i>aircraft</i> deceleration or, pre-mod. Spey 2725, below 65% HP RPM
Cross-hatched	Acceptable below 75% HP RPM	If cross-hatched is seen above 75% the engine need not be shut down providing HIGH is achieved by 92% HP RPM
HIGH	Must be achieved by 75% HP RPM	

Minimum oil temperature for starting

3 The minimum oil temperature for starting the engine is minus 30°C.

Fuel and oil

4 Table 3 shows the permitted fuel and oil.

Table 3—Fuel and oil

<i>Specification</i>	<i>Designation</i>	<i>Nato Code</i>
<i>Fuel</i>		
D Eng RD 2453	AVTUR FSII	F-34
D Eng RD 2454	AVTAG FSII	F-40
D Eng RD 2486	AVTAG	F-45
D Eng RD 2494	AVTUR	F-35
D Eng RD 2498	AVCAT	F-44
<i>Oil</i>		
D Eng RD 2487	OX 38	O-149
D Eng RD 2493	—	—

NOTE: Fuel system icing inhibitor to Spec. D Eng RD 2451 may be added in the proportion of 0.10 to 0.15% by volume to AVTUR (which is then NATO code F-34) and AVTAG (which is then NATO code F-40).

PART II—LIMITATIONS

Chapter 3—SYSTEMS LIMITATIONS

(Completely Revised)

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Autopilot

1 The autopilot is cleared for use in the following modes subject to the incorporation of the following essential modifications:

Airframe: 438, 670, 671, 691, 698, 707, 882, 988, 993 and 1232.

Computer: 1019 (Type B5 or B6) or 1126 (Type B7).

2 Mach lock mode. This may be used in climb, descent or level flight throughout the speed range 0.70 to 0.85M above 260 knots (275 knots with wing tanks fitted), at heights between 4,000 ft and 35,000 ft ASL, with bank angles not exceeding 30°.

3 Barometric height lock mode. May be used in the speed range 0.70 to 0.83M above 260 knots (275 knots with wing tanks fitted), at heights between 400 ft and 35,000 ft ASL. With the additional provisos that:

(a) Flight between 400 ft and 4,000 ft is restricted to VMC by day over the sea.

(b) Below 1,000 ft altitude the autopilot is disengaged for all turns other than minor corrections i.e. up to about 10° bank angle.

(c) Between 1,000 ft and 25,000 ft altitude the bank angle does not exceed 30°.

(d) Above 25,000 ft only gentle turns are made with the autopilot engaged, because of the large height and speed changes that can occur.

4 *Heading lock mode.* May be used with either mach lock or barometric height lock, no special limits are involved.

5 *Radio height mode.* Unsatisfactory in its present standard and must not be used.

6 *Autopilot height trim facility.* Cleared for use within the limitations quoted above.

Autostabiliser

7 High speed flight below 100 ft ASL should not be attempted with the tailplane autostabiliser engaged, owing to the possible height loss if a malfunction occurs.

8 Either the rudder autostabiliser or the standby yaw damper must be engaged at all times.

Boundary layer control system

9 BLC must not be operated for a total cumulative time of more than 45 minutes in any one sortie subject to engine limitations.

Bomb door

10 Pre-mod. 1125, the bomb door is not to be rotated when carrying one or three 1,000 lb. bombs. When two bombs are carried, they are to be loaded diagonally opposite one another.

11 *Rotation.* The bomb door may be rotated in level flight up to 550 knots or 0.85M.

12 Bomb door open. When locked open, the aircraft may then be accelerated up to 580 knots or 0-90M for clear bomb bay or up to the limiting speeds given under the individual store releases.

13 Bomb door unlocked. If the bomb door fails to lock open or closed, the aircraft may be landed ashore or afloat. The normal acceleration should be limited to +4G above 0-80M when conventional weapons and stores are carried in the bomb bay. If, in emergency, higher accelerations are pulled, then the bomb door and the supporting structure may be huckled or damaged.

14 Carriage of LOX. Mod. 5185 introduces a facility for carriage of spare LOX packs in the bomb bay. With this modification fitted (whether or not spare LOX packs are carried) rotation of bomb bay door in flight is prohibited.

WARNING: LOX packs must not be charged/discharged when installed on the bomb bay door.

Bay temperatures

15 The following temperatures must not be exceeded:

Radio bay 65°C

Bomb bay No restriction other than the limiting temperature for the store carried

Wheelwell Unrestricted

WARNING: During ground running all unessential equipments in the radio bay must be switched off.

Wing folding or spreading with stores in place

16 Folding is permitted with any outboard stores load. Normal spreading is permitted with light outboard stores, only. With Bullpup or 1,000 lb bombs on outboard pylons, wings should be spread with great care using the interrupt position to ensure locking pins being entered in their bushes. Pins and bushes are to be examined for damage at the next wing fold operation.

Flight with wingfold doors removed

17 The aircraft may be flown without limitation with the wingfold doors removed. The wingfold area must be inspected frequently for damage until the wingfold doors are replaced.

Fuel jettisoning

18 (a) *Fuselage tanks.* No restrictions, but at medium and high altitudes fuel balancing may not be possible as the FNA valves may not close when selected to CLOSE.

(b) *Underwing tanks.* The underwing tanks may be jettisoned at speeds up to 160 knots (undercarriage down) or 300 knots (undercarriage up). The contents may be jettisoned in straight and level flight, with or without pressurisation, throughout the speed range.

(c) *Bomb bay tank.* No restrictions. The optimum speed for unpressurised jettisoning is 250 knots.

Air to air refuelling (Receiver)

19 Aircraft fitted with mods. 992 (or 953) and 5089 may refuel in flight from any station with Vixen, Scimitar, Buccaneer S Mk. 2 or Victor tankers equipped with Mk. 20A, 20B, 20C, 20E pods or the Mk. 17 hose drum unit and collapsible drogue within the following limitations:

Speed 230 to 290 knots (260 knots recommended)

Height up to 35,000 ft.

NOTE: Tanker aircraft have a limitation in speed above 25,000 ft, with hose trailed.

WARNING: Engine malfunctioning may occur if the drogue is allowed to approach the engine intakes.

Air to air refuelling (Tanker)

20 (a) A Mk. 20C or Mk. 20E pod may be carried on a mod. 5112 pylon at the starboard inner wing station. Mod. 1056 must be embodied. The carriage limitations are as shown in the following sub-paras.

(b) *Pylon only.* 500 knots/0.9M, with other limitations as for clean aircraft.

- (c) *Hose stowed.* 450 knots up to 0.8M
380 knots from 0.8M to 0.9M
-1.0 to +3.0G
Rolling limits as for full 250 gal wing tanks.
- (d) *Hose trailed.* Minimum speed 230 knots
Maximum speed 290 knots up to 25,000 ft and linearly to 250 knots at 40,000 ft.

WARNING 1: Fuel transfer from the aircraft system to the pod in a climbing attitude may result in fuel venting, and should be avoided.

WARNING 2: It is possible that a strike on the undercarriage door would result if the pod is jettisoned in the undercarriage lowered configuration.

Liquid oxygen system

21 A 10-litre LOX stabilised package is fitted and cleared for use.

WARNING: During and after a high speed flight (above 550 knots) in high ambient temperature (above OAT of 35°C) the contents gauge may be inaccurate and should be checked.

Altimeter

22 Lag in the main (IFIS) altimeter is shown in Figs. 1, 2 and 3.

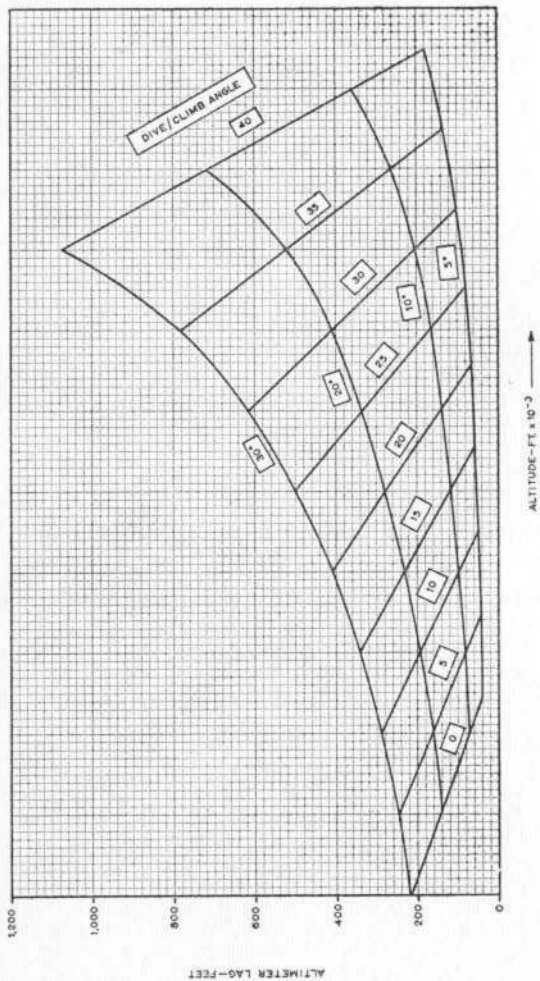


Fig. 1—Altimeter Lag at 550 knots TAS

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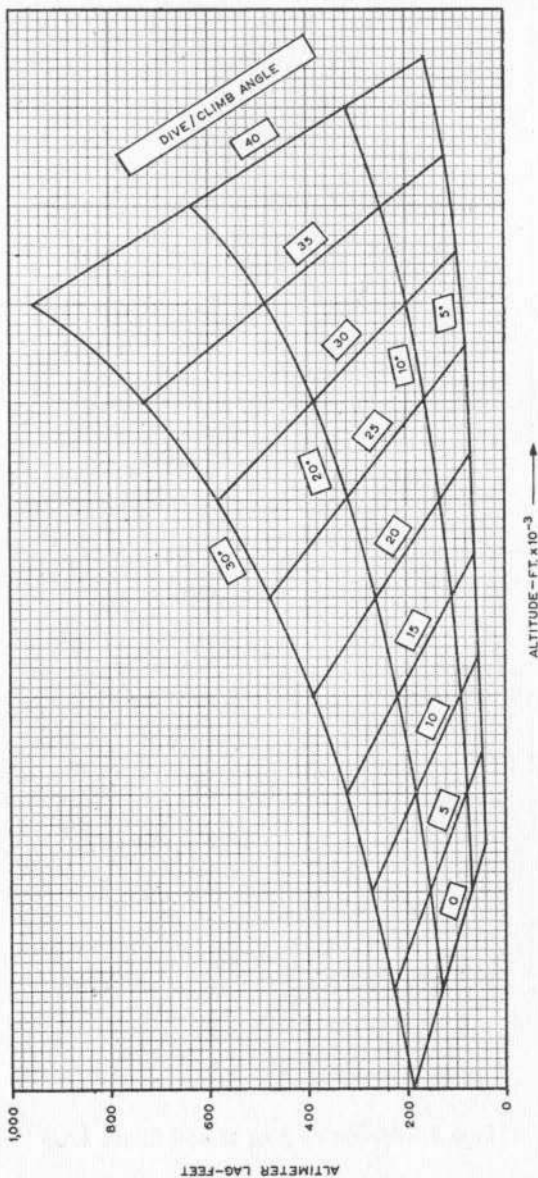


Fig. 2—Altimeter Lag at 500 knots TAS
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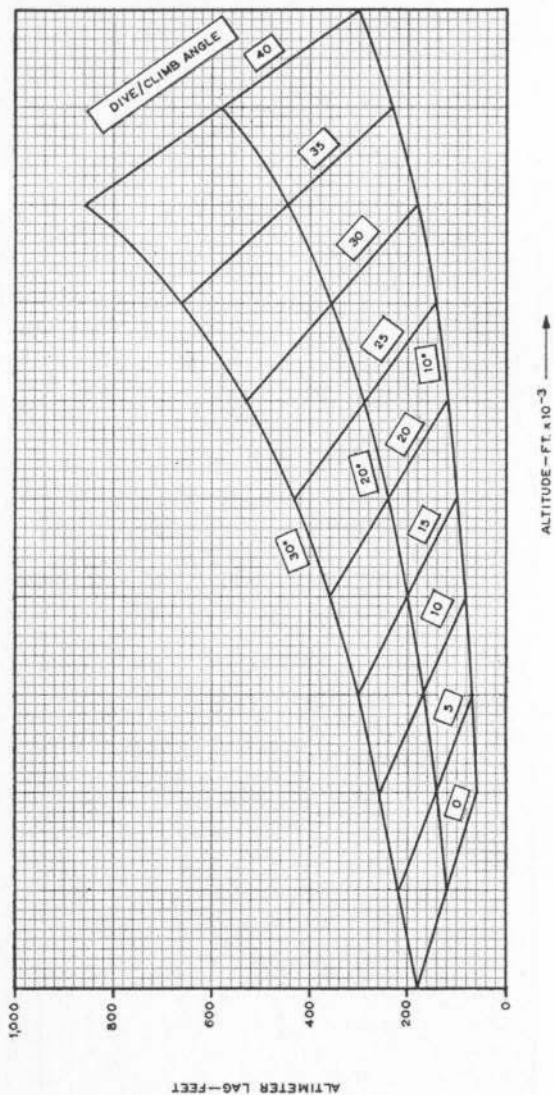


Fig. 3—Altimeter Lag at 450 knots TAS

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PART II—LIMITATIONS

Chapter 4—ELECTRONIC EQUIPMENT

(Completely Revised)

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WARNING: Due to high cockpit noise level, reception and transmission on radio or intercomm. may be unintelligible in excess of 500 knots.

UHF

- 1 ARI 18124/1 AN/ARC 52 UHF is cleared for use.
- 2 ARI 18120/4 UHF homer is cleared for use.
- 3 ARI 23057 Standby UHF is cleared for use. The type M4 should not be used for more than 30 minutes, except in an emergency; the type M6 must have a type D170 radio interference filter fitted.
- 4 ARI 23159 Standby UHF type D403M (mod. 1117) is cleared for use.

NOTE: Rotation of the ADD volume control anti-clockwise when working on emergency causes the side tone to disappear.

HF

- 5 ARI 23090/5 HF SSB is cleared for use up to 40,000 ft.

WARNING: Transmission made above 30,000 ft may result in arcing which will result in decreased reliability of the equipment and an increase in maintenance. The equipment is not to be operated during air to air refuelling.

Centralised audio selector system

6 ARI 23099 CASS is cleared for use.

Telebriefing

7 ARI 18012 Telebriefing is cleared for use.

Tacan

8 ARI 18107 AN/ARN 21 Tacan is cleared for use.

IFF

9 ARI 5848 IFF is cleared for use.

Radio altimeter

10 ARI 23172/1 Radio Altimeter Mk. 7B is cleared for use. The performance and reliability may decrease if the following are exceeded:

550 knots at 40°C ambient temperature

580 knots at 36°C ambient temperature

The radio altimeter will over-read when angle of pitch or bank is more than 20°.

Blue Jacket

11 ARI 5880 Doppler Navigation Radar and roller map is cleared for use.

Blue Parrot

12 ARI 5930 Attack Radar is cleared for use. It must be switched to Standby during carrier launches and arrests and for other landings. This is to prevent the disengagement of azimuth resolver gears which may otherwise occur.

S-Band Homer

13 ARI 18165 S-Band Homer is cleared for use providing the cockpit altitude does not exceed 25,000 ft.

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Chapter 5—CARRIER OPERATIONS

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Catapult Launching

General

1 Catapult launching using the "in trim" technique is permitted in ambient temperatures up to ISA+25°C.

Weight limitations

◀ **2** The aircraft may be catapulted at weights up to 54,000 lb at temperatures up to ISA+10°C. For higher temperatures the maximum weight should be reduced by 400 lb/°C. For pressures other than 1013 mb, maximum weight should be reduced by an additional 500 lb/10 mb decrease in atmospheric pressure below 1013 mb and increased by 500 lb/10 mb increase above 1013 mb. ▶

CG limitations

3 The CG limits are from 15 in. aft of datum to 23 in. aft of datum (0.249 to 0.305 SMC).

Stores loading

4 Subject to the weight and CG limitations, any symmetrical or asymmetrical load, other than partly full underwing and bomb bay tanks, may be catapulted provided:

1. the maximum asymmetry is limited to a rolling moment of 1.52×10^5 lb/in. This rolling moment will preclude carriage of 2×500 lb or 2×540 lb bombs on a single outboard tandem beam carrier.
2. the appropriate opposite rudder and aileron trim settings are set (see Part 3 Chapter 1).

NOTE 1: The controls must be exercised, after setting the trims, to ensure that the control surfaces move to their correct settings.

NOTE 2: If any wing drop occurs immediately after launch it should be corrected with rudder and not with aileron.

Minimum launch speed (MLS)

5 (a) For the full relationship between range of aircraft weights, wind requirements, catapult end speeds, limiting aircraft and catapult accelerations, reference should be made to the current issue of the curves promulgated by NAD, RAE Bedford. It must be emphasised that as launch speed is reduced below the normal minimum launch speed, there is an increasing probability of losing the aircraft, and angles of attack up to 26 units ADD must be expected, accompanied by height losses of about 15 ft. The optimum attitude for flying the aircraft should be increased to 4° above the tensioned attitude for launches below the clean wing MLS (rather than the 2° given in Part 3). It is important that under these conditions any pilot inputs should be made gently and that no attempt is made to correct the initial nose-down nod that is experienced immediately after launch.

(b) The implications of using a launch speed lower than the normal MLS in conditions of operational necessity, must be fully appreciated.

(c) The normal minimum launch speed is the lowest speed that is considered to give adequate margins to allow for an unintentional decrease in launch speed due to a catapult soft shot, a drop in natural windspeed or inaccurate anemometer indications and for out-of-trim effects giving too rapid a rotation after launch for an average Service pilot to maintain the incidence or height loss within safe limits.

(d) For peace-time flying it is recommended that catapult launches are only scheduled at the Normal MLS, or above. In

times of hostility, when operational necessity so dictates, it may become acceptable to increase the risk of losing an aircraft during launch in order to launch at a higher AUV and it is for this reason that recommendations are made for lower launch speeds in cases of operational necessity. Launches have been carried out at the Operational Necessity MLS recommended but these were flown by experienced test pilots under closely controlled conditions and involved incidences near the stall and height losses of the order of 15 ft. Under Service conditions, the use of launch speeds below Normal MLS will involve a progressive increase in risk, impossible to quantify, but at the Operational Necessity MLS, any decrease in the launch speed will result in the loss of the aircraft.

Crosswind

6 Crosswind on catapulting must not exceed 5 knots.

Wingfold doors removed

7 The aircraft may be catapulted with any number of wingfold doors removed without a change in MLS.

Tailplane trim settings

8 The tailplane trim settings are given in Part 3, Chapter 1, paragraph 9.

Aircraft configuration

9 The 45-25-25 configuration is to be used.

Autostabilisation

10 Autostabilisation is to be in operation.

BLC

11 Before launching, the BLC gauges should show a minimum 50 PSI under ISA conditions. For other conditions subtract 3 PSI/20°C increase in temperature, and subtract 1 PSI/20 mb reduction in pressure. For temperatures below and pressures above ISA the minimum BLC indicated pressure should be increased by the corresponding figures.

Catapult shuttle

12 Catapult shuttles must be fitted with the "Fishtail" spreader.

Deck Landing

General

13 For full relationship between aircraft weights, wind requirements, entry speeds and decelerations, reference should be made to the current curves issued by the Naval Air Department, RAE, Bedford.

Normal landings

14 *Approaches with or without stores, but not with unmodified UW tanks.* For normal two engined, BLC on, deck landings in the 45-25-25 configuration a datum speed of 127 knots at 33,000 lb AWW should be used. For increases or decreases in AWW, datum speed should be increased or decreased, respectively by 2 knots/1,000 lb, providing the minimum datum speed is not less than 125 knots (32,000 lb and below).

Reduced datum approaches

15 For all stores configurations, excluding one or two underwing tanks, approaches may be made at up to 3 knots below the datum permitted in para. 14 provided that:

1. The deck pitch is less than $\pm \frac{1}{2}^\circ$.
2. Any natural wind is steady; it is carried out in VMC.
3. The pilot is in good DLP and has practised approaches at this speed.

WARNING 1: Approaches under zero natural wind conditions (i.e. wind along the axial deck) should be made with caution since the handling may deteriorate in flying through the turbulence caused by the ship.

WARNING 2: The ADD must be monitored and not allowed to exceed 24 units.

WARNING 3: It will be impossible to raise the nosewheel whilst on the deck when bolting.

NOTE: The WOD may be reduced by the amount of the reduction in approach speed.

BLC

16 BLC pressures should be maintained at or above 20 PSI during all stages of the approach.

RESTRICTED

Autostabilisers and aileron gearing

17 The autostabilisers must be set to Approach and the aileron gearing to low speed.

Arrests

18 Arrested landings may be made with any permissible symmetric or asymmetric store load provided that the maximum asymmetry is limited to a rolling moment of 1.52×10^5 lb/in and the rolling and yawing moments are fully trimmed out at the datum approach speed.

WARNING 1: Under conditions of large ship pitch angles and/or severe turbulence on the approach it is possible that the available aileron and rudder deflections may be inadequate to maintain a satisfactory glide path. The approach should be abandoned and further attempts made at higher approach speeds; or the stores jettisoned.

WARNING 2: After an arrested landing with fuel in the underwing tanks, the operation of both low level float switches and contents indication should be checked.

Bolters

19 For a bolter it is recommended that the aircraft be rotated to the same attitude as for catapult launch.

Emergency landings

20 For asymmetric loadings, the limitations in Chapter 1, para 21, NOTE and Chapter 5, para. 18, WARNING 1 apply.

21 *Tailplane BLC failed.* With no tailplane blow the two-engined alternative approach 30-20-20 must be used. The datum speed of 130 knots may be used, but whenever conditions permit the approach speed should be increased to as near 139 knots as possible. Any reduction from 139 knots increases the difficulty when bolting due to the inability to raise the nosewheel and the ease of stalling the tailplane.

22 *Single engine.* Single-engine landings should be made in the 30-20-20, blow on configuration at normal datum speeds plus 6 knots. The limiting weight with or without empty underwing tanks in this condition is 35,000 lb under ISA conditions reducing linearly to 34,000 lb at ISA+25°C, the blow pressure to be maintained above 15 PSI.

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