

Part II

Chapter 2—Airframe Limitations

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1 General

(a) The aircraft is cleared for use by day and night in temperate conditions subject to the observance of the limitations imposed in this chapter. Operation above 50,000 feet is not recommended.

(b) Aerobatics, stalling and spinning are prohibited. Speed must not be reduced below that for the onset of pre-stall buffet nor below the recommended threshold speed.

(c) In manoeuvres the aircraft must not be taken beyond the onset of buffet if this occurs below the permitted G limits.

(d) Above 0.90M a bank angle of 30° must not be exceeded, in order to avoid adverse lateral control characteristics i.e. a diminution of aileron control effectiveness and a reversal in the sense of roll induced by sideslip.

2 Weight and CG limitations

Max. take-off

With U/w tanks 223,000 lb.

Without U/w tanks 204,000 lb.

Max. landing (normal) 145,000 lb.

Max. landing (emergency) 200,000 lb.

NOTE 1: For emergency landings vertical velocity at touchdown must be minimised and taxiing should be cautious. The brakes and tyres must be thoroughly inspected subsequently. If 1.9G is exceeded at touchdown, a heavy landing check must be carried out.

NOTE 2: Ground manoeuvres at weights above 204,000 lb. should be cautious.

CG limits (undercarriage down)

	<i>Clean</i>	<i>With U/w tanks</i>
*Forward	140 ins.	140 ins. AOMD
Aft	160 ins.	156 ins. AOMD

◀ * Progressive at 0.5 in. per 10,000 lb. at weights above 130,000 lb. up to 144.5 ins. at 223,000 lb. ▶

3 Speed limitations

(a) *With all PFCU's operative and auto-mach trim ON*

	0—19,000 ft.	Above 19,000 ft.
Clean	350K	325K/o 92M
With empty underwing tanks	350K	325K/o 92M
With full or part full underwing tanks	305K	305K/o 92M

(b) *With auto-mach trim inoperative*

No further restrictions but 0.90M should only be exceeded when essential. (See also para. 1(d)).

(c) *With any one rudder PFC sub-unit, roll damper or yaw damper inoperative*

No additional limitation.

(d) *With any one aileron or elevator sub-unit inoperative*

Gentle manoeuvres only . . . 0.90M or 250 knots
Further failures do not impose further limitation.

(e) The minimum speed at altitudes above those obtainable with 87% RPM is 0.82M.

(f) *Use of the following services*

With airbrakes and bomb doors open No limit
With undercarriage down 235 knots

With flaps down to TAKE-OFF 225 knots
With flaps fully down 195 knots



For operating AAPP scoop 250 knots
With AAPP scoop extended 330 knots

(but see para. 3(a))

With Blue Steel doors open, following release of weapon, pre-Mod. 3674 235 knots

(see also para. 16(a))

When operating Blue Steel fin fold system 235 knots

(g) *Brake parachute*

(i) The normal maximum speed for streaming the brake parachute is 140 knots up to a maximum all-up weight of 160,000 lb. (chute life 25 streams).

(ii) In emergency the following maximum speeds for various all-up weights may be used.

Weight (lb)	Streaming Speed (Knots)	
	Chute age 5 streams or less	Chute age 6 to 24 streams
140,000	160	153
145,000	158	150
150,000	155	148
160,000	151	144
180,000	143	136
200,000	135	129

(iii) Once a parachute has been streamed at emergency speeds it must not be re-used.

4 G limitations

(a) *Positive G*

Speed	Up to 170,000 lb.		170,000 to 195,000 lb.		Above 195,000 lb.	
	With negli- gible aileron	With max. aileron	With negli- gible aileron	With max. aileron	With negligible aileron	With max. aileron
Below 0.90M	2.0G*	1.8G	1.6G	1.5G	1.5G	1.3G
Above 0.90M	1.8G	1.8G	1.6G	1.5G	1.5G	1.3G

NOTE: Above 170,000 lb, the ailerons should be used with care

* 1.8G when bomb-bay load exceeds 23,000 lb.

(b) *Negative G*

Below 275 knots -0.8G
 Above 275 knots -0.25G
 Zero G conditions must be avoided.

(c) The onset of buffet overrides all the above G limitations.

5 Aircraft approach limitations

GCA/Precision radar 250 ft. AGL (300 ft. indicated)
 MFS/ILS and ILS 250 ft. AGL (300 ft. indicated)
 PPI 500 ft. AGL (550 ft. indicated)

6 MFS and auto-pilot

(a) The following settings must be used on the MFS:

Height lock gearing 0.025°/feet
 Height lock time constant 30 seconds
 Wind drift time constant 30 seconds
 Pitch integrator time constant 30 seconds
 Bombing system selector 2.6° error

(b) The auto-pilot is cleared for use, subject to the following limitations:

(i) *Altitude*

Maximum Cruise ceiling at 97% RPM
 Minimum 1,500 feet
 300 feet indicated (Auto-ILS)

(ii) *Speeds*

1 *Maximum*

Mach compensator
 operative 300 knots/0.9M (whichever is the lower)
 Mach compensator
 inoperative 300 knots/0.88M (whichever is the lower)

2 *Minimum*

210 knots/0.82M (whichever is the lower). Speeds as necessary for auto-ILS.

(iii) The auto-pilot must not be used when engine RPM are higher than 97%.

(iv) Both pilots must be strapped in at all times.

(v) Trim must be maintained within ± 1 division on the auto-pilot trim indicator.

(vi) The mach trimmer must be switched OFF.

- (vii) Both yaw dampers must be selected to STANDBY; one must be selected ON for an ILS approach.
- (viii) All three channels must be operating.
- (ix) The roll damper must be switched ON.
- (x) Auto-trim must not be used.

NOTE: The airspeed lock and attitude hold are unsatisfactory at high altitude.

7 Radio and navigation

The following are cleared for use but their reliability cannot be guaranteed:

- ILS (see para. 5)
- VHF/UHF
- IFF Mk. 10*
- Radio compass
- Intercomm.
- Green Satin
- INS Mk. 1
- Radio altimeter Mk. 6A
- NBS Mk. 1A (in manual flight control)
- NBS Mk. 2 (as high level fixing aid in temperate climates only)
- MFS compass system
- True airspeed unit
- Variable air speed unit
- ARI 5874 HF STR 18B
- TACAN

* Overheating of the coder unit may occur above 25,000 feet cabin altitude.

8 Fuel system

- (a) Carriage and use of both bomb-bay tanks is permitted. It is essential to switch off the tank pumps when 2,000 lb fuel remain, to obviate the pumps being uncovered in a 30° climb or dive. This fuel may be included in the landing reserve.
- (b) The carriage and use of underwing tanks is permitted provided that Mods. 19, 800, 853, 2041, 2064, 2139, 2500, 2689, 3494, 3811, 3949 and 4048 are all embodied. If Mods. 853, 2139, 2500 and 3949 are not embodied fuel must not be carried in these tanks. Mod. 3949 is essential for drop tank jettison.
- (c) Fuel filter de-icing is cleared for use, but must be switched off if it malfunctions.
- (d) Fuel tank pressurisation is cleared for use.
- (e) The system operates satisfactorily in negative G conditions.

9 Air conditioning and bomb-bay heating

- (a) The air-conditioning system is cleared for operation to a maximum differential of 9 PSI. Flood flow facility is cleared for use.
- (b) The AVS system may be switched on to obtain ventilation. Full use is not yet permitted.
- (c) The high pressure ducting system is cleared provided that the engine bleed isolation cocks are not opened at engine RPM above 60%.
- (d) Bomb-bay heating is cleared provided that bomb-bay temperatures are monitored to ensure that the limitation for any store carried is not exceeded. ▶◀

10 Airframe and engine intake anti-icing

- (a) The hot air anti-icing system is cleared for use provided Mods. 3850 and 3315 are embodied.
- (b) The electrical anti-icing system is cleared for use.
- (c) Flight in icing conditions should be avoided or kept to a minimum.

11 Hydraulic system

Both pumps must be on for take-off and landing. One pump only must be run continuously in flight. If it fails at altitude the other pump must not normally be switched on but should be kept in reserve for lowering undercarriage and flaps.

12 ECM and Window

- (a) The ECM installation is cleared for use in temperate climates. Armament stores fitted with radio/radar fuses are not to be carried on flights when ECM is to be operated.
- (b) Window launching is cleared for use of types 26, 28, 100 and DAW.
- ◀(c) Flaps must be up when launching window. ▶

13 Electrical system

- (a) The system is cleared for operation in the 2-2 configuration.
- (b) Starting of the Mk. 112 or Mk. 113 AAPP is certain up to 10,000 feet and ability to start at considerably greater altitude is also highly probable. A guaranteed start can be obtained in flight, off load, from 160 to 250 knots.
- (c) The RAT's are cleared for use.

(d) Normal CSDU oil temperature is 95°C. In emergency a maximum temperature of 120°C is permitted for a period not exceeding 2 hours. Negative G is to be avoided pending further trials of the oil tank.

(e) At high ambient temperatures neither TRU is to be loaded above 205 amps, to avoid overheating and failure.

14 Signal pistol

The signal pistol installation is cleared for firing throughout the operating range of the aircraft.

15 Gold film windscreen heating

(a) Pre-Mod. 3698 the system is cleared for use in the "Demist" position only. This position may only be selected in flight, or within five minutes of take-off. The system must be switched off immediately after landing.

◀(b) Post-Mod. 3698 the system is fully cleared for use. DE-ICE must not be selected without first selecting DE-MIST.

(c) The aircraft must not be flown with the system OFF. ▶

16 Blue Steel

(a) The HC Mk. 1 or Practice Inert Trainer missile may be loaded, carried and released in operations or jettisoned in emergency. The maximum speed for release or jettisoning is 290 knots. Pre-Mod. 3674 the doors are to be closed immediately after separation if speed exceeds 235 knots. ECM must not be operated during loading and unloading of the missile.

◀(b) When a weapon is not carried the Blue Steel doors are not to be operated to the open position in flight. They are to be closed as soon as possible following release of a weapon. ▶



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