

Part II
LIMITATIONS

PART II

Limitations

List of Contents

	<i>Para.</i>		<i>Para.</i>
Engine limitations—Avon 204 and 205	1	Bomb doors	(c)
R.p.m. and j.p.t.	(a)	Pressure cabin flood flow system	(d)
Oil pressures	(b)	Anti-icing systems	(e)
Emergency take-off rating	(c)	Nitrogen system	(f)
Flying limitations	2	Auto-pilot	(g)
General	(a)	Water-methanol	(h)
Speed and mach number limitations	(b)	Radio and radar equipment	(j)
Application of G loads	(c)	Window launcher	(k)
Maximum speeds	(d)	Aircraft approach limitations (AAL)	5
Maximum weights	(e)	PR role limitations	6
C.G. limits	(f)	Armament limitations	7
Use of different fuels	3		
Other limitations	4	Illustration	
Powered flying controls	(a)		<i>Fig.</i>
Stalling	(b)	Loading Diagram	1

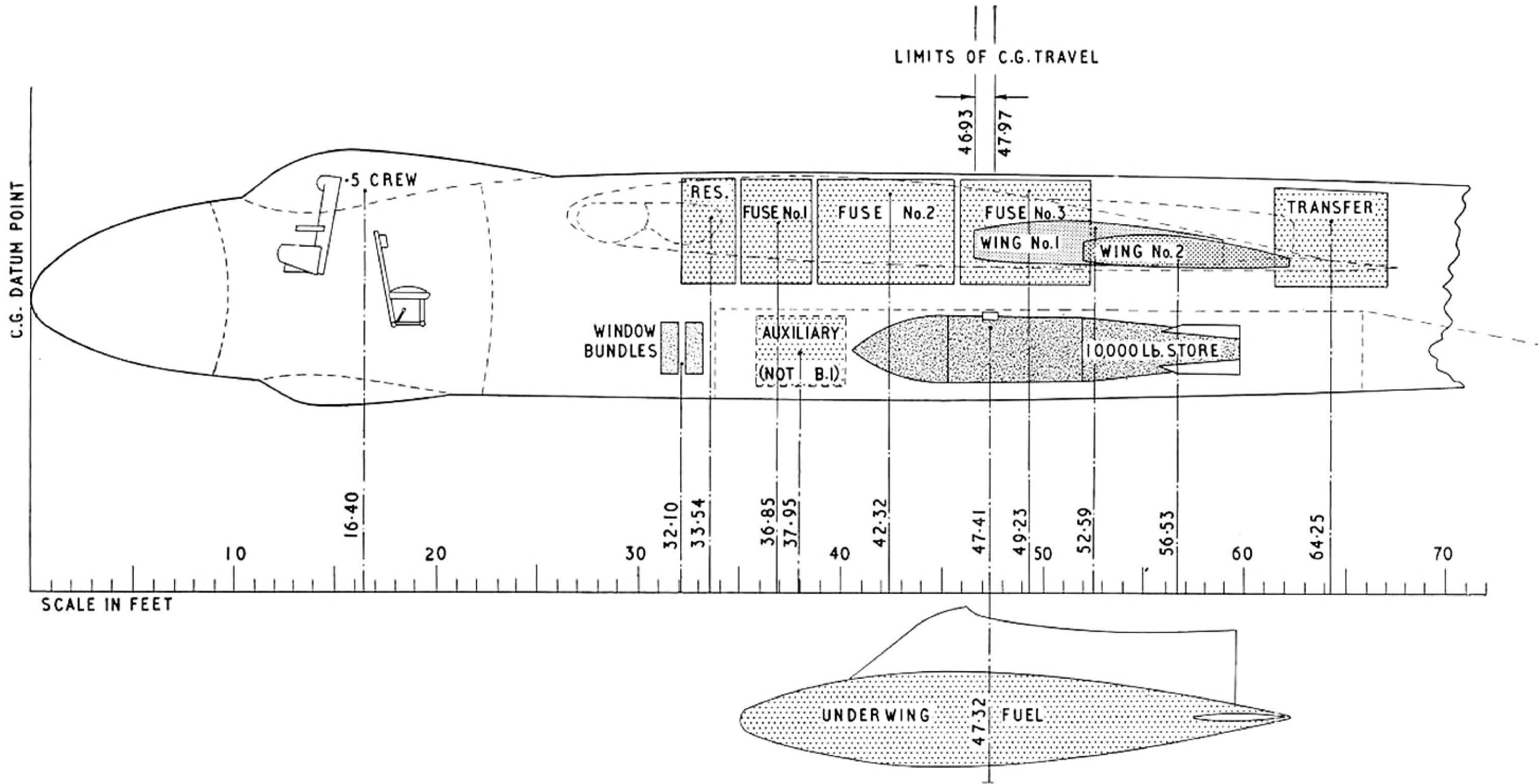


FIG. 1—Loading Diagram

Part II

Limitations

1 Engine limitations—Avon 204 and 205*(a) RPM and JPT*

<i>Condition</i>	<i>Time limit (mins.)</i>	RPM	JPT °C
Take-off using water-methanol (Avon 205 only)	Governed by capacity of WM system	8300 $\begin{smallmatrix} +50 \\ -75 \end{smallmatrix}$	660
Take-off and operational necessity (Without water-methanol)	10	8000 \pm 50	660
Intermediate	30	7800	635
Max. continuous	Unrestricted	7600	610
Ground idling	—	3000 \pm 200	500

NOTE 1: A reduction of up to 150 RPM in the governed speed may occur up to an altitude of about 40,000 feet.

NOTE 2: The governed RPM will vary with a change in the specific gravity of the fuel from that at which the engine settings were made. A higher specific gravity will cause a drop in RPM and vice-versa. Every 0.01 change in SG will cause a corresponding difference of 50 in the governed RPM.

NOTE 3: Unless Avon Mod. 1222 is embodied on Avon 204 engines, RPM must be restricted when flying in low air temperatures (see Part III, para. 28 (c)).

NOTE 4: On initial starting the limiting jet pipe temperature is 660°C.

NOTE 5: On initial starting, whilst the engines are cold, the idling RPM may be as high as 3,400.

(b) Oil pressures

Normal at max. continuous	34 PSI
Minimum at max. continuous and over	25 PSI
Minimum at ground idling	20 PSI

(c) Emergency take-off rating

An emergency take-off rating of 8,200 RPM and 690°C jet pipe temperature may be used with Avon 204 engines only, subject to a time limit of two minutes at this rating. The RPM controllers and JPT controllers (if operative) will have to be adjusted before this rating can be obtained, and should be re-adjusted to the normal settings after flight. This emergency take-off rating is only to be used in cases of operational necessity when the normal take-off thrust is inadequate owing to high ambient air temperature and/or insufficient runway length for the aircraft weight. The decrease in take-off run using this rating (as against the normal take-off rating) is about 6-7% in ISA conditions and about 10-11% in tropical conditions, both at sea level. Reference should be made to the Operating Data Manual.

(d) Post-Mod. 3225 the engines may be run at full throttle (8,200 RPM) for three hours, in the war case only, providing the jet pipe temperature does not exceed 685°C and that the current reconditioning life of 500 hours has not been exceeded.

2 Flying limitations*(a) General*

Spinning and aerobatics are prohibited. With undercarriage up and flaps up or less than 20 degrees, the aircraft must not be flown at speeds below that for the onset of the pre-stall buffet (see Part IV, para. 11(c)).

(b) *Speed and mach number limitations*

(i) The following limitations, which can easily be exceeded in level flight at the lower altitudes, must be observed. Limitations vary linearly between altitudes quoted.

(ii) The Modifications quoted in the following table are:

Mod. 1680 (XD818)—Strengthened pitot heads (Mk. 9B)

Mod. 2332 (XD822)—Pitot heads (Mk. 9C)

Mod. 2086 (WZ397)—Vortex generators on wings

(iii) *Aircraft incorporating Mod. 1680 (or 2332), 2086 and 1850.*

Altitude	With Underwing Tanks		Without Underwing Tanks	
	Bomb Doors Closed	Bomb Doors Open	Bomb Doors Closed	Bomb Doors Open
SL to 10,000 ft. .	320	320	360	360
At 20,000 ft. .	320	320	320	320
At 30,000 ft. .	295 or 0·82M	290 or 0·80M	295 or 0·82M	290 or 0·80M
Above 35,000 ft. .	0·85M	0·82M	0·85M	0·82M

(iv) Aircraft without Mod. 1680 or 2332 are restricted above 30,000 feet to 290 knots IAS or 0·80M.

(v) Aircraft without Mod. 2086 are restricted at 30,000 feet to 290 knots IAS or 0·80M and above 40,000 feet to 0·82M.

(vi) Aircraft without Mod. 1850 (WZ405) are restricted to 320 knots IAS for operation of bomb doors.

(c) *Application of G loads*

The maximum permissible normal accelerometer readings are as follows (see Part IV, para. 12).

Speed up to 0·82M (Bomb doors closed) 2·5G
 Above 0·82M (Bomb doors closed) 2·0G

At weights above 135,000 lb with underwing tanks 2·0G
 At all speeds when operating bomb doors or flying with them open 2·0G

NOTE 1: If heavy buffet is encountered in manoeuvres, G must be reduced immediately.

NOTE 2: When an accelerometer is not fitted, gentle manoeuvres only are permitted and the aircraft must not be flown beyond the threshold of the buffet.

(d) *Maximum speeds*

For lowering the undercarriage 170 knots
 For flying with undercarriage down 195 knots
 For raising the undercarriage 195 knots
 Flaps down to 20 degrees 190 knots
 Flaps down 20 to 58 degrees 150 knots
 Air brakes out No Limitation

(e) *Maximum weights*

	Without tip tanks	With tip tanks
For take-off	138,000 lb	175,000 lb
For normal landing	110,000 lb	110,000 lb
For overload landing	138,000 lb	138,000 lb

NOTE 1: At weights above 98,000 lb, the limiting factors on landing are the rate of descent on touchdown and the capacity of the brakes. The allowable rate of descent is further influenced by the loading condition. Reference must be made to Part IV, para. 18.

NOTE 2: At weights in excess of 170,000 lb turning radius on the ground must not be less than that given by full nosewheel steering lock. The turn must not be assisted by the use of wheel brakes or differential engine thrust.

(f) CG limits

In flight and for take-off and landing 563·2 to 575·7 in. aft of datum (.30 to .35 SMC)
(46·93 to 47·97 ft.)

3 Use of different fuels

(a) The fuel normally used is AVTAG. When obliged to land away from base AVTUR may be used to return to base provided that the operation of bleed valves and swirl vanes is satisfactory. The use of AVTUR for other purposes is only permitted if the engines are re-adjusted (see NOTE 3 to Part II, para. 1 (a)).

(b) When necessary, JP4 fuel may be used instead of AVTAG. No re-adjustment or special precautions are necessary if the SG range of the fuel is within the range of AVTAG normally used.

4 Other limitations*(a) Powered flying controls*

(i) Deliberate reversion to manual. Deliberate reversion to manual control in flight, for practice flying in manual, is permitted subject to the correct drill being followed (see Part IV, para. 25). If the outside temperature is below -26°C the aircraft should not be flown in manual for longer than one hour as it may be difficult or impossible to re-engage power if the power units cool down to this temperature. The power units are self-heating only while in operation. When in manual control the following limitations must be observed:

Maximum speed	.	Normal limitation or 0·76M, whichever is lower
Maximum angle of bank	.	20 degrees
Maximum flap for landing	.	40 degrees

(ii) Failure of power controls. All the above limitations apply in the event of total reversion to manual, i.e. complete failure of all power control motors. In the event of partial failure the above limitations apply as follows:

0·76M	.	Failure of any one motor or more
20 degrees bank	.	Failure of one or both aileron motors
40 degrees flap	.	Failure of <i>both</i> elevator/rudder motors

NOTE: The flaps may be lowered fully if one elevator/rudder motor has failed. Owing to the strong nose-down trim change it is important that the flaps are not selected beyond 40 degrees when *both* elevator/rudder motors have failed, but if the second elevator/rudder motor fails while the flaps are fully down they may be left down.

(b) Stalling

High speed stalling, stalling with flaps up or less than 20 degrees and stalling with underwing tanks fitted when the weight is in excess of 135,000 lb, is prohibited. Stalling is permitted in the circuit and approach configuration, but special note should be taken of Part IV, para. 11.

(c) Bomb doors

The bomb doors may only be opened and closed in straight flight. See also para. 2(c).

(d) Pressure cabin flood flow system

The flood flow system is operative when certain modifications are embodied. (See Part III, para. 42.)

(e) Anti-icing systems

(i) The unmodified airframe anti-icing system may only be used as detailed in Part III, para. 36 and 37.

(ii) Engine anti-icing may be used subject to the precautions detailed in Part III, para. 32 to 35 being observed.

(iii) The modified anti-icing system may be used as detailed in Part III, para. 37A, provided all essential modifications are embodied.

(f) Nitrogen system

The nitrogen system may be used provided that Mod. 2107 (XD857) is embodied.

(g) Auto-pilot

The auto-pilot may be used as a pilot aid and, provided that Mod. 785 and 1489 are embodied, it may also be coupled to the NBS for direct and off-set bombing. It is subject to the limitations detailed in Part III, para. 49.

(h) Water-methanol

The following limitations apply to the use of water-methanol:

(i) The engine RPM and JPT limitations quoted in para. 1(a) must be observed.

(ii) The pumps must not be allowed to run dry. To avoid this, the master switch must be switched off as soon as water-methanol flow ceases, indicated by the engine RPM dropping to 8,000.

(iii) Water-methanol must not be switched on more than 15 seconds after the engines have reached 8,000 RPM. If the system has been switched on, but has not cut in by this time, it must be switched off.

(j) Radio and radar equipment

(i) ILS may only be used for approaches down to 300 feet above the ground as indicated by the altimeter (but see Part III, para. 54(a)).

(ii) If Mod. 2040 (WZ395) is embodied, NBS may be used for direct manual bombing, using any stores which have been cleared (see Part II, para. 5). If Mod. 2040 is not embodied, NBS may be switched on and used for familiarisation and for dropping 100 lb practice bombs only. Navigation exercises may also be undertaken. If Mod. 2190 (XD858) is embodied, the NBS may be used for off-set manual bombing.

(k) Window launcher

The installation may be used for type D10, D21 and D22 chaff provided that:

(i) The port launcher is not used unless Mod. 2779 is embodied.

(ii) Altitude is not less than 35,000 feet unless Mods. 5574 and 5575 are embodied.

(iii) Mods. 89, 576, 698, 1302, 2385, 2407, 2619, 2694, 2801, 2813 are all embodied.

With Mod. 2385 fitted, the release of window will automatically stop as soon as the bomb doors are selected open. Release will start again as soon as the bomb doors are fully closed, if the window launcher is still switched on.

5 Aircraft approach limitations (AAL)

The AAL's are:

Precision radar	200 feet	} Above airfield level
Search radar	400 feet	
Manual ILS	300 feet	
Auto ILS	200 feet	
ILS/Zero reader	200 feet	

6 PR role limitations

(a) Day role

There are no special limitations in the day role, and the normal aircraft limitations apply.

(b) Night role

The normal aircraft limitations apply in the night role, with the addition of the following limitations on the photo-flashes.

(i) Carriage of photo-flashes

28 × 8" photo-flashes No. 1 mark 3 or No. 2 mark 1 may be carried with flash crate doors open or closed within the normal aircraft limitations. When a full load of photo-flashes is carried, the transfer fuel tank must be empty; when a full load of flashes is not carried the combined weight of flashes and fuel in the transfer tank must not exceed the maximum permissible weight of flashes.

(ii) Release of photo-flashes

No. 1 mark 3 flashes may be released at speeds up to 320 knots in straight and level flight.

No. 2 mark 1 flashes may be released in straight and level flight throughout the height range of the aircraft and up to 320 knots or the aircraft speed limitation, whichever is the lower.

Release of photo-flashes results in forward CG movement. Before commencing the release of photo-flashes therefore, use of fuel should be so arranged to allow for this CG movement.

(iii) Jettison of photo-flashes

Photo-flashes can only be jettisoned live. Jettison is permitted at speeds up to 320 knots in straight and level flight

Release of photo-flashes results in forward CG movement. Before commencing the release of photo-flashes therefore, use of fuel should be so arranged to allow for this CG movement.

(iv) Landing with photo-flashes

Landings with photo-flashes on board should be regarded as overload landings, and gentle touchdown made (see Part IV, para. 18).

(c) Camera heating

To ensure efficient camera operation and freedom from misting of the camera windows, the bomb bay temperature should be controlled as in Part III, para. 38.

7 Armament limitations

(a) The following restrictions apply to the carriage of stores in the bomb bay.

(i) When bomb loads in excess of 10,000 lb are carried, the excess bomb load over 10,000 lb and the weight of the bomb gear, must be considered for loading purposes as though it were fuselage fuel. The overriding condition of 30/70% wing/fuselage fuel distribution still applies.

(ii) The fuselage transfer fuel tank must be empty when 5 × 1,000 lb stores are carried on the rear (No. 6) station. If fewer than five are carried on this station the combined weight of stores on this station and fuel in the transfer tank must not exceed 5,000 lb.

(iii) Landings with more than 18 × 1,000 lb stores on board or with more than two stores on the rear (No. 6) station should be regarded as abnormal. Every endeavour must be made to make a smooth, gentle landing.

(b) The air spoilers must not be extended during the release of any stores other than the 10,000 lb MC Mk. 1 bomb.

STORES	LOADING POINTS	CARRIAGE LIMITATIONS	RELEASE LIMITATIONS	JETTISON		REMARKS
				NAVIGATOR'S	PILOT'S EMERGENCY	
10 × 2,000 lb. Mines "A" Mk. 12	On 5-store carriers at L.P. 2 and 5	Within normal aircraft limitations	Between 25,000 and 35,000 ft., in straight and level flight $\pm 5^\circ$. Up to 240 knots at 25,000 ft. reducing to 200 knots at 35,000 ft. T.A.S. not to exceed 350 knots.	As for release.	If lower stores have been released only; otherwise only if risk of damage to aircraft is acceptable. As release limitations but up to 49° climb, 48° dive and 9° roll.	Stores must be released first from No. 2 loading point then from No. 5.
21 × 1,000 lb. M.C. Mk. 6, 11 and 12 bombs	5 each on L.P. 1, 4 and 6 3 each on L.P. 2 and 5	Within normal aircraft limitations	Straight and level flight $\pm 5^\circ$ at the following speeds: S.L. to 10,000 ft. 360 knots 20,000 ft. 320 knots. 25,000 ft. 310 knots. 30,000-40,000 ft. 290k/0.80 M. Above 40,000 ft. 0.82 M. For release of stores from stations 18 and 20, speed is restricted to 310 knots below 25,000 ft.	As for release of stores from stations 18 and 20.	Only if risk of damage to aircraft is acceptable. S.L. to 25,000 ft. 310 k. 30,000-40,000 ft. 290k/0.80 M. Above 40,000 ft. 0.80 M. Max. 25° climb 24° dive 15° roll	During stick bombing the release limitations on stores from stations 18 and 20 must be applied to <i>all</i> stores if stores from stations 18 and 20 are included in the stick to be released.
16 × 1,000 lb. M.C. Mk. 6 bombs <i>and</i> 5 × 1,000 lb. T.I. bombs HA/HS	5 each on L.P. 1 and 6 3 each on L.P. 2 and 5 On L.P. 4	Within normal aircraft limitations	Straight and level flight $\pm 5^\circ$ To normal limitations for flying with bomb doors open. For release of stores from stations 18 and 20, speed is restricted to 310 knots below 20,000 ft.	As for release of stores from stations 18 and 20.	Only if risk of damage to aircraft is acceptable. S.L. to 20,000 ft. 310 k. 30,000 ft. 290k/0.80 M. Above 35,000 ft. 0.82 M. Max. 25° climb 24° dive. 15° roll.	During stick bombing the release limitations on stores from stations 18 and 20 must be applied to <i>all</i> stores if stores from stations 18 and 20 are included in the stick to be released.
15 × 1,000 lb. T.I. bombs HA/HS <i>and</i> 6 × 1,000 lb. M.C. Mk. 6 bombs	5 each on L.P. 1, 4 and 6 3 each on L.P. 2 and 5					
Up to 15 × 1,000 lb. T.I. bombs HA/HS <i>and</i> Remainder (to total 21) of 1,000 lb. M.C. Mk. 6 bombs	T.I. bombs <i>not</i> to be on L.P. 2 or 5 T.I. bombs <i>and</i> M.C. Mk. 6 bombs <i>not</i> to be mixed on same carrier.					

STORES	LOADING POINTS	CARRIAGE LIMITATIONS	RELEASE LIMITATIONS	JETTISON		REMARKS
				NAVIGATOR'S	PILOT'S EMERGENCY	
12 × 1,000 lb. M.C. Mk. 7* bombs	3 each on L.P. 1, 2, 4 and 6	Within normal aircraft limitations	Within normal aircraft limitations	As for release.	Not recommended except in dire emergency.	
21 × No. 38 Clusters	5 each on L.P. 1, 4 and 6 3 each on L.P. 2 and 5	Within normal aircraft limitations	Straight and level flight $\pm 5^\circ$ Within normal aircraft limitations	As for release.	Only if risk of damage to aircraft is acceptable. As for release, but up to 30° climb or dive and 21° roll.	
18 × 100 lb. Practice bombs	On upper stations of lower carriers	Within normal aircraft limitations with bomb doors closed, and up to 300 knots or 0.76 M. with bomb doors open.	Straight and level flight, up to 300 knots or 0.76 M.			
18 × 25 lb. Practice Smoke and Flash No. 1 Mk. 1 Smoke Mk. 1*** and 4 Flash Mk. 3** and 5	On practice bomb carriers carried on upper stations of 1,000 lb. carriers on L.P. 1, 4 and 6	Within normal aircraft limitations.	Between 12,000 and 45,000 ft. in straight and level flight $\pm 5^\circ$. 12,000-20,000 ft. 320 knots. 30,000-40,000 ft. 290k/0.80 M. Above 40,000 ft. 0.82 M.	As for release.	Not recommended except in dire emergency.	

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