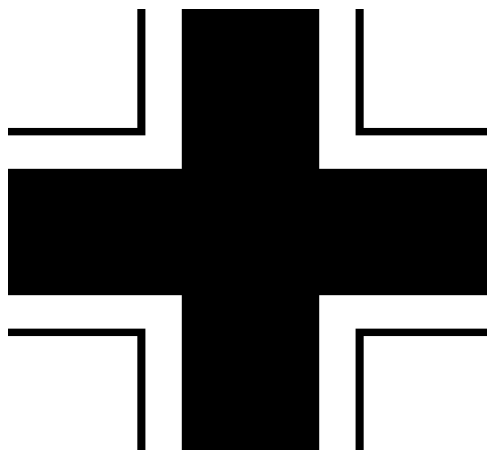


# CLIFFS OF DOVER

## AIRCRAFT

### OPERATIONS CHECKLISTS



**2nd Guards Composite Aviation Regiment**

**OP2GvSAPINST 3710.1A**

**15 July 2011**

# COMBINED STATEMENT

of the Air Ministry and the Reichluftfahrtministerium

*with comments by A Flight  
Ldr, No 257 Sdqn*

*and Gruppe Technischer  
Offizier, III./JG26*

The A.M. and the RLM have published the procedures contained in this document based on proven, tested, and approved aircraft operations. Pilots shall not deviate from these procedures. Non-compliance with the published procedures could result in below-standard performance, increased maintenance requirements, and possible disciplinary action should aircraft damage occur as a result of non-compliance.

*because A.M. procedures are great for parades, but are lousy for combat.*

It has come to our attention that various squadrons and individuals are creating alternate procedures covering all phases of flight. It must be noted, that while these individuals may be considered "aces" or "experten", these procedures have not been tested nor approved by proper channels nor are the authors trained in the proper protocols for procedure generation.

*yeah, Dolfo knows absolutely nothing about fighters...*

The use of these procedures by R.A.F. or Luftwaffe personnel should be considered "use at risk." Additionally, though anecdotal evidence may suggest that these "unauthorized" procedures are more effective, they are not approved for use by the A.M. or RLM. Using these unauthorized procedures could result in damage to one's own aircraft and could possibly lead to Trial by Courts Martial.

*but using the authorized procedures could result in death, take your pick...*

*Exactly. All new pilots who wish to live should stick with what Bob teaches...*

*To all new Pilots - In 71 years, no one will remember the details of ammo loadouts, fuel octane levels, climb and roll rates, or turning radii... they will only remember who lived, and who died.*

## REVISION HISTORY

The following Changes have been incorporated into this Revision

Revision	Date	Description of Revision
3710.1A	15 July 2011	Initial Release

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# READ ME

**Title** Cliffs of Dover: Aircraft Operations Checklists - OPGvSAPINST 3710.1A  
(Who will be the first to guess the origins of the document number?)

**About** These checklists were originally developed for my (2GvSAP Flea) own personal use and for use by the II2-based 2GvSAP online squadron for II2: Cliffs of Dover. They have since morphed into the document you have today. Thanks for the encouraging words and your interest in this document. I hope you find it useful. Come visit us at [www.2gvsap.org](http://www.2gvsap.org) or post on our forums at [www.2gvsap.org/phpbb3/](http://www.2gvsap.org/phpbb3/)

**Format** This document was created in MS Excel. For the aircraft procedures, I mostly converted the narrative style and format of the source manual into a checklist format. I tried to keep original spellings and word usage where appropriate and to provide some basic translation for German terms. All other sections were just crammed into the available space.

**Sources** The sources for the data in the checklists were the historical Pilot's Notes, Aircraft Handbuchs, and other historical manuals. Many of those documents are available at the websites listed below. Unfortunately, in most cases, I have forgotten which sites provided which manuals. Please visit these sites for an enormous amount of WW2 related information. And please hit the tip jar where appropriate.

**References** The majority of my references are pulled from the following websites:  
<http://www.germanluftwaffe.com>  
<http://kurfurst.org>  
<http://www.quarry.nildram.co.uk/miltech.htm>  
<http://spitfiresite.com>  
<http://www.ww2aircraft.net/forum/aviation>  
<http://www.wwiiaircraftperformance.org>

**Copyrights (where known)** Checklists: derived from Bonanza A36 Checklist by Richard Hebert  
Luftwaffe Cockpit Drawings Copyright Erwin Weidmer, [www.GermanLuftwaffe.com](http://www.GermanLuftwaffe.com)

**Special Thanks** For comments, recommendations and encouraging words:  
Fearlessfrog, Freycinet, Senseispcc, Ajay, Ataros, fireship4, White Owl, Blackdog\_kt, many unnamed others, and the 2GvSAP squad.  
I would also like to thank the producers, my agent, and, of course, the Academy for making this all possible. You like me, you really like me!

**Extra Special Thanks** To Oleg and Ilya for their hard work over the years. Keep at it boys, we ain't home yet.

**Game Play Disclaimer** These procedures are derived from the actual aircraft Pilot's Notes and Handbuchs and may not represent the optimum procedures for game play. **Some conditions, controls, or activities included in the checklists may not be available as part of the Cliffs of Dover game.** Additionally, ammunition data were derived from historical references, but I have attempted to incorporate Cliffs of Dover usage into this publication.

**Contact** Compiled by 2GvSAP Flea.  
Posting on SimHQ as 2GvSAP Flea  
Posting on 1C Company as 2GFlea

**DISCLAIMER:** This is not intended to be a postgraduate research project. There are errors in this document either through poor or incomplete research, poor, incomplete or misleading references, bad math skills, and pure laziness. I still think everything presented is pretty darn close to accurate. However, I realize that what is presented here may differ from how things are modelled in game.

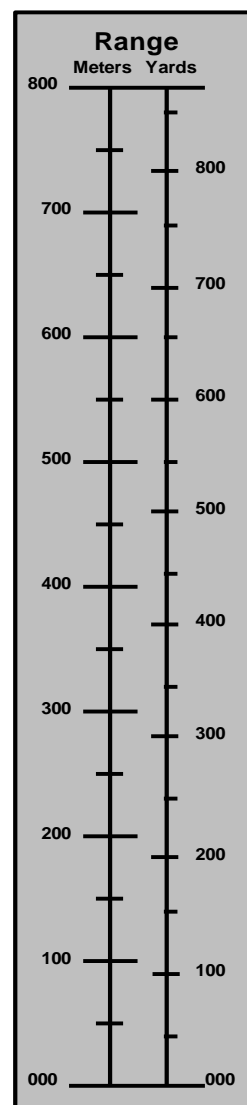
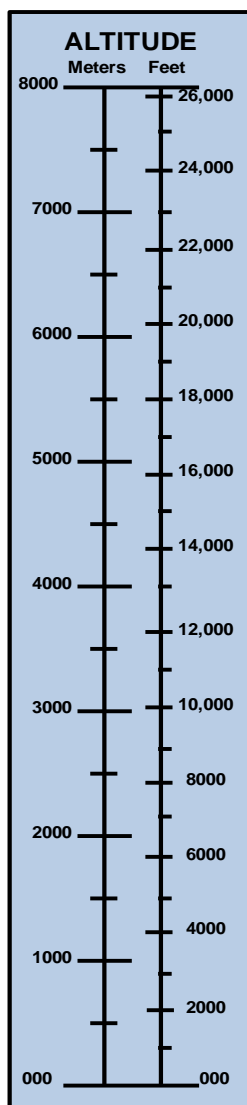
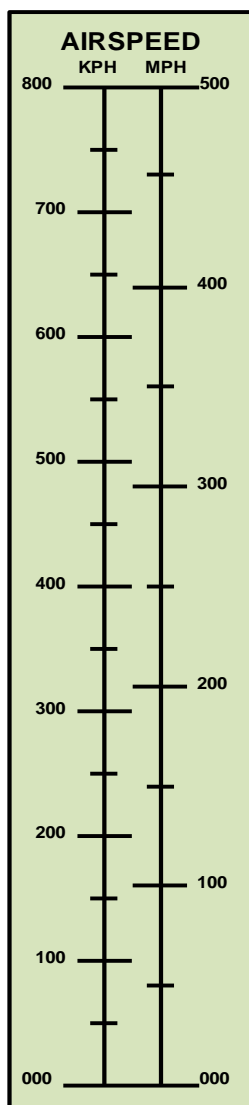
**Oh, and this document is not for use in actually flying Real Life (TM) airplanes.**

**A Note from Flea:** Please let us all remember that we are playing a game for entertainment. Seventy-one years ago, young men took to the skies to fight for their homelands and brothers in arms, lifting off not knowing if they would live to see the sun set. Too many did not. They flew because it was their duty; let us fly to honor them. Semper Fidelis.

ONE

## GENERAL DATA

ONE



Temperature		Altitude Above Sea Level		Absolute Barometer		Absolute Atmos Press	
°F	°C	feet	meters	inches Hg	mm Hg	psia	kg/cm <sup>2</sup>
14	-10	SL	0	29.9	765	14.7	1.03
23	-5	1000	305	28.9	738	14.2	0.997
32	0	2000	610	27.8	711	13.7	0.961
41	5	3000	914	26.8	686	13.2	0.926
50	10	4000	1219	25.8	661	12.7	0.893
59	15	5000	1524	24.9	637	12.2	0.86
68	20	6000	1829	24	613	11.8	0.828
77	25	7000	2134	23.1	590	11.3	0.797
86	30	8000	2438	22.2	568	10.9	0.768
95	35	9000	2743	21.4	547	10.5	0.739
104	40	10000	3048	20.6	526	10.1	0.711
113	45	15000	4572	16.9	432	8.29	0.583
122	50	20000	6096	13.8	352	6.75	0.475
131	55	25000	7620	11.1	284	5.45	0.384

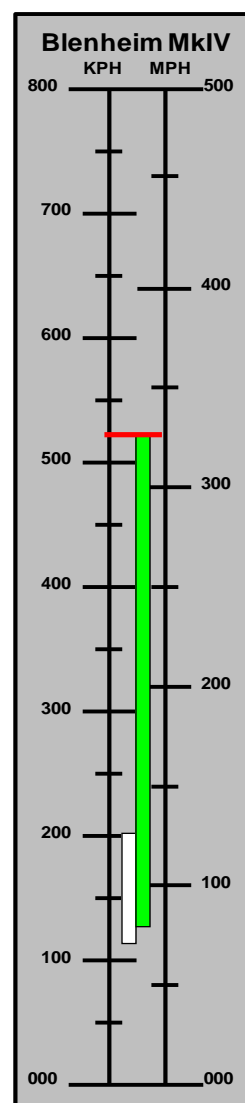
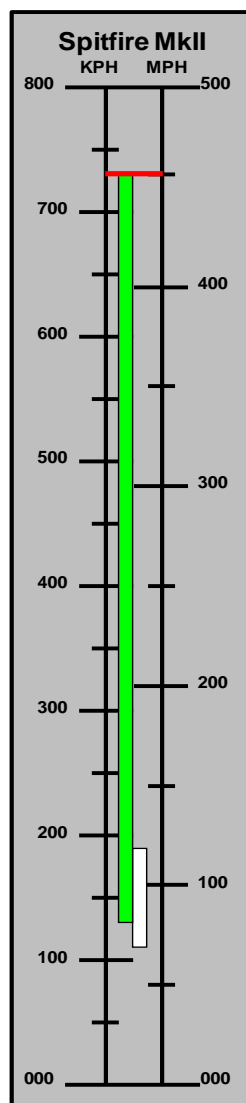
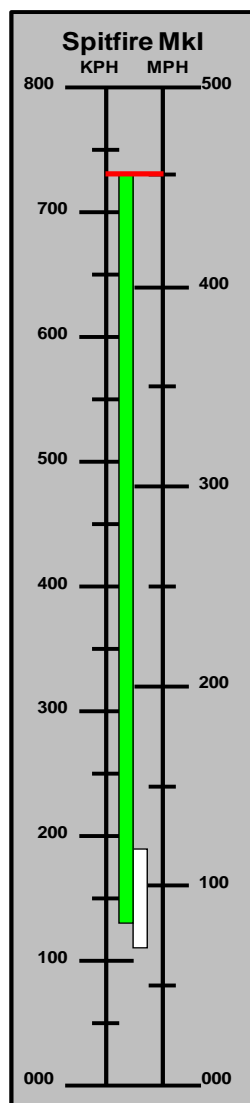
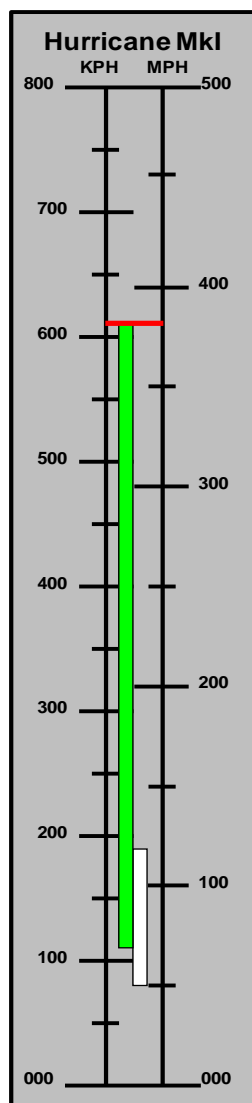
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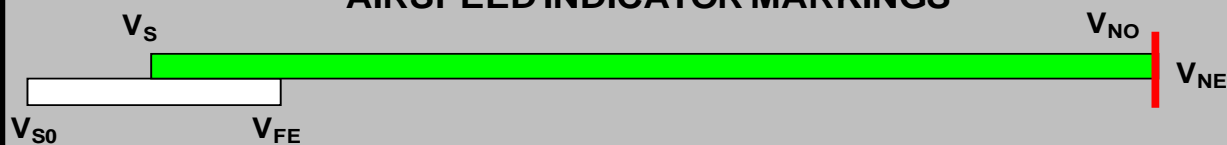
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## RAF AIRSPEED DATA

TWO



## AIRSPEED INDICATOR MARKINGS

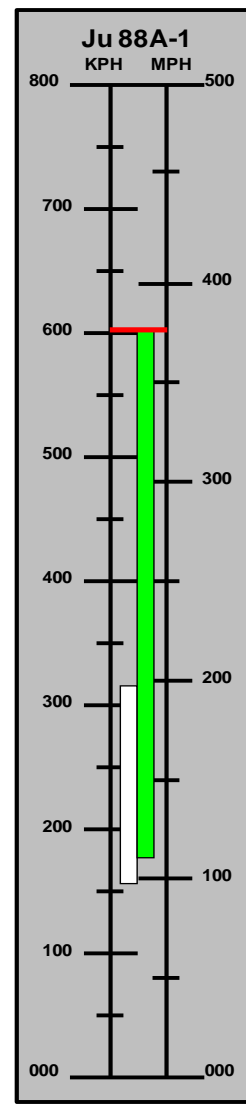
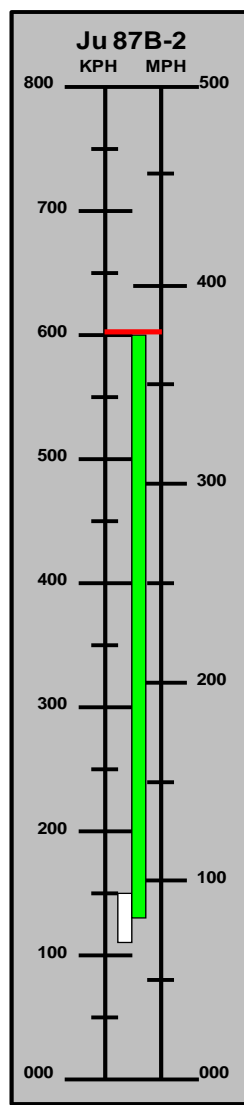
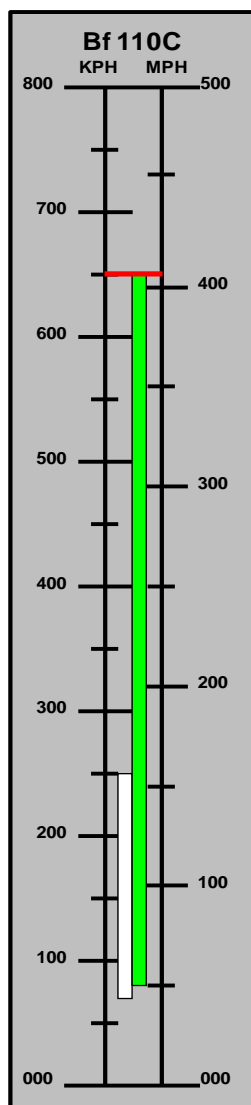
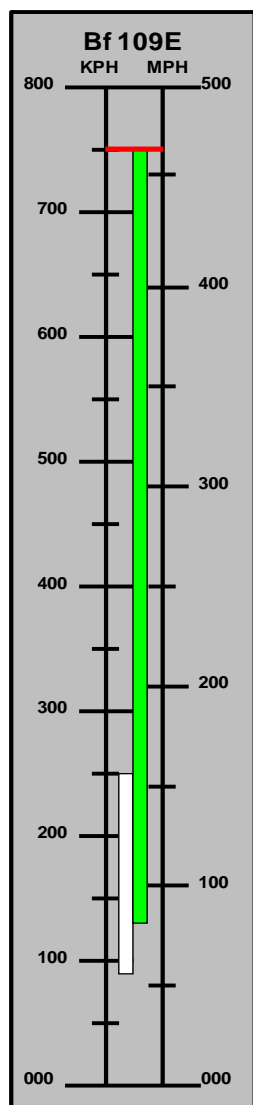


$V_{NE}$	Never Exceed Speed
$V_{FE}$	Max. Flaps Extend Speed
$V_{LO}$	Max Landing Gear Operating Speed
$V_{LE}$	Max Landing Gear Extended Speed
$V_R$	Rotation Speed
$V_{REF}$	Landing Reference Speed
$V_S$	Stall Speed
$V_{S0}$	Stall Speed
$V_Y$	Best Rate-of-Climb
$V_{BE}$	Max Speedbrake Extended Speed

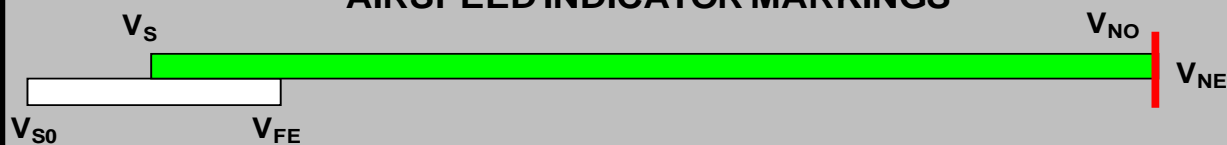
Never Exceed in Any Operation
Do Not Extend Flaps Above this Speed
Do not operate landing gear above this speed
Max speed with gear extended
Speed at which the Airplane Lifts Off
Threshold crossing speed
Min Speed in which the A/C is controllable
Stall Speed in Landing Configuration
Delivers Gain in Altitude in Shortest Time
Do Not Extend AirBrakes Above this Speed

TWO

TWO



### AIRSPEED INDICATOR MARKINGS



$V_{NE}$	Never Exceed Speed
$V_{FE}$	Max. Flaps Extend Speed
$V_{LO}$	Max Landing Gear Operating Speed
$V_{LE}$	Max Landing Gear Extended Speed
$V_R$	Rotation Speed
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$V_{S0}$	Stall Speed
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$V_{BE}$	Max Speedbrake Extended Speed

Never Exceed in Any Operation
Do Not Extend Flaps Above this Speed
Do not operate landing gear above this speed
Max speed with gear extended
Speed at which the Airplane Lifts Off
Threshold crossing speed
Min Speed in which the A/C is controllable
Stall Speed in Landing Configuration
Delivers Gain in Altitude in Shortest Time
Do Not Extend AirBrakes Above this Speed

**AIRSTART****NOTE:**

*Upon Airstart, the pilot must quickly set engine controls for proper flight. Failure to do so in a timely manner WILL result in engine or cooling system damage. Recommend "Cruise" for initial settings.*

1. Throttle -- CRUISE -- Boost
2. Pitch Controls -- CRUISE -- RPM
3. Mixture -- NORMAL or RICH
4. Radiator Flaps -- OPEN
5. Oil Cooler Flaps -- OPEN
6. Radiator and Oil Temperature -- WITHIN OPERATIONAL LIMITS
7. Oil Pressure -- WITHIN OPERATIONAL LIMITS
8. Begin Cockpit Scan
9. Make Other General Preparations For Flight

**PRE-COMBAT CHECKS****NOTE:**

*Pre-combat checks are conducted prior to entering the expected combat area. These checks should be completed BEFORE any anticipated contact with enemy aircraft. Remember SETG-6.*

1. S - Status: Radiator, Oil, and Fuel -- WITHIN OPERATIONAL LIMITS
2. E - Engine Controls -- AS REQUIRED
3. T - Trim -- AS REQUIRED
4. G - Gunsight -- ON
  - 4a. Reticle -- SET -- For Gun Convergence Range
  - 4b. Reticle -- SET -- For Expected Enemy Aircraft Wingspan
5. Check -- SIX

**PREPARATION FOR COMBAT****NOTE:**

*Combat preparations are conducted upon contact or sighting of unidentified or enemy aircraft. These actions are to prepare the aircraft for combat. Though every situation is unique, these actions will prepare you for most encounters. Remember CRAFTS*

1. C - Climb: Set Boost and Pitch to -- CLIMB -- Settings
2. R - Radiators: Coolant and Oil Radiators -- AS DESIRED
3. A - Airspeed and Altitude -- AS DESIRED
4. F - FOV: Field of View -- AS DESIRED
5. T - Track IR: Set Track IR -- CENTER -- As Desired
6. S- Six: Check -- SIX



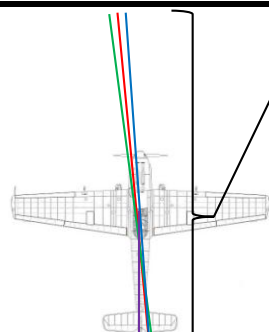
ONE

## ROYAL AIR FORCE SIGHT DATA

ONE

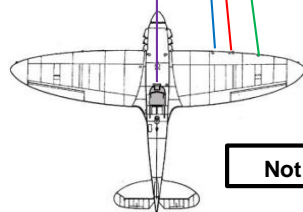
## GM2 MKII SIGHT (118 mils) (Rg in meters)

Target	Rg at Ring	Dia at 170m
CR 42	82	0.48
Bf 109E	84	0.49
Bf 108	89	0.52
G50	93	0.55
Ju 87B	93	0.55
Bf 110C	138	0.81
Do 17Z	153	0.90
Ju 88A	170	1.00
BR20M	183	1.07
He 115B	189	1.11
He 111	191	1.12
He 59C	201	1.18
FW 200C	278	1.64



**Lethal Range:** where cone of fire is less than the width of the fuselage at the cockpit (approx .8m)

**<= .4m from Sight Line is Lethal Area**  
(Approx width of fuselage at Cockpit.)



Not to Scale

## Spitfire Convergence (meters)

## Lethal Range Centered on Convergence

205	240	275
188	220	252
171	200	229
154	180	206
137	160	183
102	120	138

## Spitfire Convergence (yards)

## Lethal Range Centered on Convergence

224	262	301
205	241	276
187	219	251
168	197	226
149	175	201
112	131	150

## Hurricane Convergence (meters)

## Lethal Range Centered on Convergence

193	240	287
177	220	263
160	200	240
144	180	216
136	170	204
128	160	192
96	120	144

## Hurricane Convergence (yards)

## Lethal Range Centered on Convergence

211	262	314
193	241	288
175	219	262
158	197	236
149	186	223
140	175	210
105	131	157

LW Aircraft Wingspan	Meters	Yards	Feet
Fiat CR.42	9.70	10.61	31.8
Bf-109E	9.87	10.79	32.4
Bf 108B-2	10.50	11.48	34.4
Fiat G.50	10.96	11.99	36.0
Ju-87B-2	13.80	15.09	45.3
Bf-110C	16.30	17.83	53.5
Do 17Z-1	18.00	19.69	59.1
Ju-88A-1	20.08	21.96	65.9
Fiat BR20M	21.56	23.58	70.7
He 115B-2	22.28	24.37	73.1
He-111H-2	22.50	24.61	73.8
He 59C-2	23.70	25.92	77.8
FW 200C-1	32.85	35.93	107.8

ONE

ONE

TWO

# LUFTWAFFE SIGHT DATA

TWO

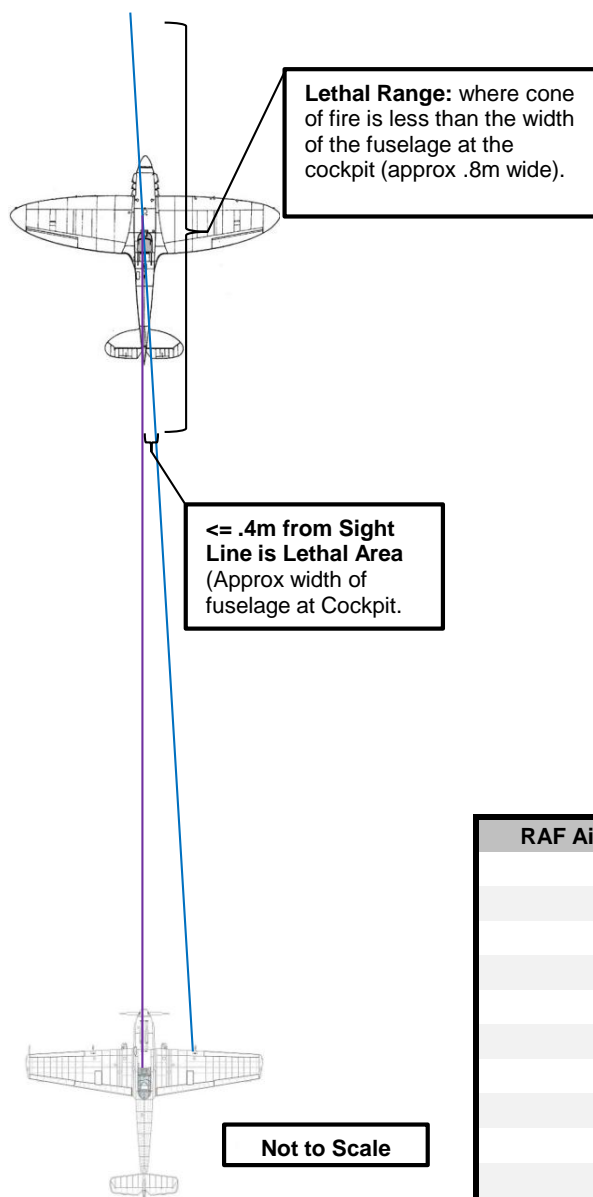
## REVI SIGHT (100 mils) (Rg in meters)

Target	Rg at Ring	Dia at 170m
Tiger Moth	89	0.53
Gladiator	98	0.58
Spitfire	112	0.66
Defiant	120	0.71
Hurricane	122	0.72
Walrus	140	0.82
Blenheim	172	1.01
Anson	172	1.01
Beaufighter	177	1.04
Wellington	263	1.55
Sunderland	344	2.02

## Bf 109E Convergence (meters)

### Lethal Range Centered on Convergence

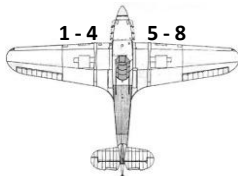
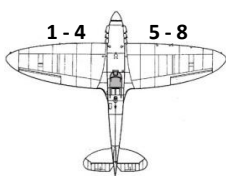
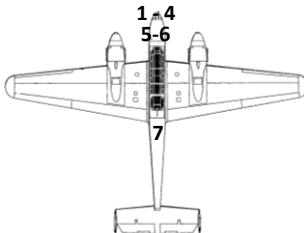
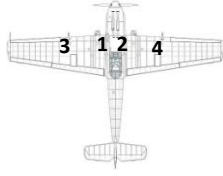
194	240	286
178	220	262
162	200	238
145	180	215
137	170	203
129	160	191
97	120	143



RAF Aircraft Wingspan	Meters	Yards	Feet
Tiger Moth	8.94	9.78	29.3
Gladiator Mk.I	9.80	10.72	32.2
Spitfire MK.I	11.23	12.28	36.8
Defiant MkI	11.99	13.11	39.3
Hurricane Mk.I	12.19	13.33	40.0
Walrus MkI	14.00	15.31	45.9
Blenheim MkI	17.17	18.78	56.3
Anson MkI	17.22	18.83	56.5
Beaufighter MkIF	17.65	19.30	57.9
Wellington MkIc	26.27	28.73	86.2
Sunderland MkI	34.39	37.61	112.8

TWO

TWO

THREE		GUN & AMMUNITION DATA						THREE		
Weapon		Nomen	Type	Fill	Burnout	Tracer Color	Smoke Trail	Notes		
.303 Browning	Mk I	Ball								
	Mk VI	Ball								
	Mk VII	Ball								
	B Mk Iz	Incend		Ph			Yes	Burns		
	B Mk VI	Incend		Mg/Al,Ba(NO <sub>3</sub> ) <sub>2</sub>				Flash		
	G Mk I	Tracer			500 yd	Yellow				
	G Mk II	Tracer			1000 yd	Yellow				
	G Mk III	Tracer			800 yd	Red				
	G Mk IV	Tracer			550 yd	Yellow				
	G Mk V	Tracer			550 yd	Burgandy		Slow Tracer		
	G Mk VIz	Tracer			550 yd	Yellow				
	W Mk Iz	AP							Steel Core	
O Mk I	Observer									
MG 17 7.92mm	SmK v	AP						Steel Core		
	SmK (H) v	AP (Super)						WC Core		
	SmK L'Spur v	AP-T			900 m	Yellow				
	SmK L'Spur v	AP-T			900 m	White				
	SmK Ub m Zer	SAPHE w SD						Flash		
	PmK v	API		Ph			Yes	Burns		
	B Patr v	HEI		Ba				Flash		
MG FF 20mm	Brsprgr L'Spur	HEI-T / SD	PETN, Mg/Thm	1100 m				750m SD		
	Brgr L'Spur	Incend -T / SD		1100 m			Yes	750m SD, Burns		
	Pzbrgr	API / SD						750m SD		
	PzBrgr (Elek)	API / SD	Mg					750m SD		
	Pzbrgr (Phos)	API / SD	Ph					750m SD		
MG FFM	M'gesch.	HE	RDX / Al					750m SD		
German Ammunition	SmK - Spitzgeschoss mit Stahlkern = Pointed bullet with Steel Core									
	v - Verbesserte = Improved - increased propellant for increased muzzle velocity. Aircraft use only									
	L'Spur - Leuchtspur = Tracer									
	Ub. - Ubung = Training Ammo containing a small bursting charge									
	m. Zerl - mit Zerleger = with Burster = SD = Self Destruct Mechanism									
	PmK - Phospor mit Stahlkern = Phosphorus with Steel Core									
	B Patr - Beobachtung Patrone = Observation Cartridge									
	Brsprgr - Brandsprenggranate = Incendiary Explosive Grenade									
	Brgr - Brandgranate = Incendiary Grenade									
	Pzbrgr - Panzerbrandgranate = Armor peircing Incendiary Grenade									
Notes	M'gesch. - Minengeschoß = Mine Projectile - High Capacity HE									
	Fill: Ph (Phosph.), Mg (Magnes.), Al (Alum.), Ba(NO <sub>3</sub> ) <sub>2</sub> (Barium Nitrate), Ba (Barium), WC (Tunsten Carbide), Thm (Thermite)									
	Burns = Incendiary Composition (usually Phosphorus) is ignited on firing and burns during flight									
	Flash = Incendiary Ignition or small HE Burst on impact with target									
Slow Tracer = Delayed tracer ignition for Night use										
Gun Numbering										
Hurricane			Spitfire			Me 110C			Me 109E	
										
THREE									THREE	

FOUR

## BOMB AND FUZE DATA

FOUR

## Available Bombs and Pistols/Fuzes for Player Pilotable Aircraft

## Bombs

Country	Nomen	Type	WT (lbs/kg)	Fuze	Aircraft
RAF	GP 250 MkIV	GP	250 / 113	All	Blenheim MkIV
	GP 500 MkIV	GP	500 / 227	All	Blenheim MkIV
Luftwaffe	SC 50	GP	110 / 50	5, 25B	Ju87B, Ju88, Me109, He111
	SC 250	GP	551 / 250	5, 15, 25B	Ju87B, Ju88, Me109, Me110, He111
	SD 250	Semi-AP Frag	551 / 250	5	Ju87B, Ju88, Me110, He111
	SC 500	GP	1102 / 500	25B	Ju87B, Ju88
	SD 500	Semi-AP Frag	1102 / 500	5	Ju87B, Ju88
Notes	SC - Sprengcylindrische = Cylindrical Explosive: GP - General Purpose HE				
	SD - Spreng Dickenwand = Thick wall Explosive: Semi AP Frag - Thick walled case HE				

## Pistols and Fuzes

Weapon	Nomen	Type		Settings	Bomb Type
RAF Pistols	No 27 MkI	GP		0, .025sD, 1sD, 11sD	GP 250, GP 500
	No 42 MkI	GP		0, .025sD, 1sD, 11sD	GP 250, GP 500
	No 44 MkI	Medium Alt		0, .025sD, 1sD, 11sD	GP 250, GP 500
	No 28 MkIIx	Ever-Ready		0, .025sD, .12sD, 1sD, 11sD	GP 250, GP 500
	No 30 MkIIIx	Unadjustable		NA	GP 250, GP 500
	No 37 MkIV	Delay		6hD, 12hD, 36hD, 72hD, 144hD	GP 250, GP 500
Weapon	Nomen	Type		Settings	Bomb Type
Luftwaffe Fuzes	5	High Alt		0, .8sD	SC50, SC250, SD500
	15	Dive		0, .05sD, 8sD	SC250
	25B	Low Alt		0, .8sD, 14sD	SC50, SC250, SC500
Notes	Settings: 0 = Instantaneous; 8sD = 8 second Delay; 6hD = 1 hour Delay; etc				
	LW High Alt = High Altitude Release - Greater Than 1km				
	LW Low Alt = Low Altitude Release - Less Than 1km				
	LW Dive = Automatic Delay in Dive Release of 14 seconds				

FOUR

FOUR

ONE		Hurricane Mk I				ONE	
Aircraft Type		Engine & Prop		Fuel	Reference		
Hurricane Mk I		Merlin III / Rotol CSP		100 Oct	Pilot's Notes: AP 1564A; Mar 1939		
AIRSPEED LIMITATIONS							
	Design Speeds			MPH			
V <sub>NE</sub>	Never Exceed Speed			380	Never Exceed in Any Operation		
V <sub>FE</sub>	Max. Flaps Extend Speed			120	Do Not Extend Flaps Above this Speed		
V <sub>LO</sub>	Max Landing Gear Operating Speed			150	Do not operate landing gear above this speed		
V <sub>LE</sub>	Max Landing Gear Extended Speed			NA	Max speed with gear extended		
V <sub>R</sub>	Rotation Speed			80	Speed at which the Airplane Lifts Off		
V <sub>REF</sub>	Landing Reference Speed			NA	Threshold crossing speed		
V <sub>S</sub>	Stall Speed			72	Min Speed in which the A/C is controllable		
V <sub>S0</sub>	Stall Speed			55	Stall Speed in Landing Configuration		
V <sub>Y</sub>	Best Rate-of-Climb			157	Delivers Gain in Altitude in Shortest Time		
V <sub>BE</sub>	Max Speedbrake Extended Speed			NA	Do Not Extend Brakes Above this Speed		
AIRSPEED INDICATOR OPERATING RANGES							
ASI MARKING		MPH Range		Description			
White Arc		55 - 120 MPH		Full Flap Operating Range. Lower Limit is Max. Weight V <sub>S0</sub> . Upper Limit Max Speed w/Flaps Extended.			
Green Arc		72 - 380 MPH		Normal Operating Range. Lower Limit is Max. Weight V <sub>S</sub> . Upper limit Is Max Structural Cruising Speed.			
Red Line		380 MPH		Maximum Speed for ALL operations.			
LIMITING OPERATIONAL CONDITIONS							
Condition	Cbt Emer	Take Off	Climb	Max Cruise	Max Cruise	Max Dive	Condition
Limit	Limited	5 min	30 min	Cont	Cont	20 sec	Limit
Boost	+12 PSI	+6.25 PSI	+6.25 PSI	+4.5 PSI	+2.25 PSI	+6.25 PSI	Boost
RPM	3000	3000	2600	2600	2600	3600	RPM
Mixture	Rich	Rich	Rich	Rich	Weak	Rich	Mixture
Oil Pressure		Oil Temperature		Coolant Temperature		Operating Pressures	
Emer Min = 45 PSI		Min = 15° C	Max = 90° C	Normal = 95° C		Fuel = 1.75 - 2 PSI	
Normal = 60 PSI		Emergency Max = 95° C		Min = 70° C	Max = 120° C	Brake >= 120 PSI	
Correction of ASI Reading for Postion Error				Use of +12lb/sqin Boost Pressure: AP1590B/J2-W			
ASI (MPH)	+ / -	Adjustment	CAS (MPH)	1. Requires the use of 100 Octane Fuel.			
80	+	6	86	2. Will maintain +12 PSI boost to about 10k feet. Boost will drop above this height. Max (unregulated) boost = +17PSI			
100	+	3.2	103.2				
120	+	0.5	120.5				
140	-	1.7	138.3				
160	-	4.0	154				
180	-	6.0	174				
200	-	7.5	192.5				
220	-	8.7	211.3				
240	-	9.5	230.5				
260	-	9.7	250.3				
Pilot's Notes General - A.P. 2095 dated April 1943: Variable Pitch Propellors: DH Variable Pitch Propellors (DH 5-20) are directly controlled by the pilot and have TWO settings, FINE and COURSE. FINE should be used for Engine Run Up, Take Off, Low Speed Climb, and Landing with COURSE used in all other stages of flight.							
Note: Hurricane MkI Checklist Based on Pilot's Notes for Hurricane MkI with Merlin II, and Pilot's Notes for Spitfire MkI with Merlin III (Excerpts) and Spitfire MkII with Merlin XII.							
ONE						ONE	

TWO

## Hurricane Mk I

TWO

## PRELIMINARIES

1. Switch on Light Indicator and Check for -- **TWO GREEN** --lights
2. Safety Catch of Hydraulic Selector Covers Chasis -- **UP** -- Position
3. Radiator Flap -- **OPEN** --; In Cold Weather, Keep -- **CLOSED** -- Until Coolant Temperature Rises
4. Movement of the Flying Controls -- **CHECK**
5. Check Throttle Lever Friction Adjustment

## STARTING ENGINE

**NOTE:**

For full Particulars of the Merlin III engine see A.P.1590B, Volume I.

**NOTE:**

For starting purposes, the engine should be supplied from the reserve tank as this provides a gravity feed. If main tanks are less than 1/2 full, run up and take off should be on reserve tank. Do not change fuel distributor cock until take off has been accomplished to prevent interruption of fuel flow.

**\*\*\* IMPORTANT \*\*\***

**To prevent any danger of air locks in the fuel system, do not exhaust the contents of the reserve or main tanks before switching to the other fuel tank.**

1. Check fuel tank levels and determine which to use for run-up and take-off.
2. Fuel Distributer Cock -- **RESERVE**
3. Mixture -- **RICH**
4. Pitch Controls Fully Forward to -- **FINE PITCH**
5. Throttle Lever Forward -- **.5 INCH**
6. Radiator Shutter Fully -- **OPEN**
7. Prime the Cylinders by Injecting -- **FIVE** -- Shots of Fuel
8. Propeller Area -- **CLEAR**
9. Main and Starting Magneto Switches -- **ON**
10. Starting Switch -- **PRESS AND HOLD** -- No More Than -- **30 SECONDS**
11. If Engine Fails to Start Immediately; Then -- **1 OR 2** -- Pumps of Primer
12. Upon Engine START; Starting Magneto to -- **OFF** --; Fuel Distributer Cock -- **MAIN TANK**
13. Oil Pressure -- **SATISFACTORY**
14. Warm at Fast Tick-over Until Oil Temperature -- **15° C** --; Radiator Temperature -- **70° C**

## CHECKING ENGINE AND INSTALLATIONS

**NOTE:**

The throttle may be opened fully only for the shortest periods necessary for the checks to be made.

**\*\*\* IMPORTANT \*\*\***

**The engine should on no account be opened up with the airscrew in coarse pitch (control lever back) as the blade angle is too coarse and severe detonation will result.**

1. Fuel Pressure: Main Tank -- **1.75 - 2 PSI** --; Reserve Tank -- **2.25 - 3 PSI**
2. Check Hydraulic Engine Pump: Operate Flaps; Select -- **FLAPS DOWN** -- then Depress Operating Lever
3. Check Hydraulic Hand Pump: Return Flaps; Select -- **FLAPS UP** -- then Operating Hand Lever
4. Hood -- **OPEN and LOCKED**
5. Harness Release -- **FIXED** -- Position
6. Make Other General Preparations For Flight
7. Open Throttle to -- **RATED** -- Gate. Ensure two men hold down the tail
  - 7a-1. Boost -- **+6.25 PSI**
  - 7a-2. RPM -- **2750 - 2850**
  - 7a-3. Oil Pressure -- **60 PSI** -- at NORMAL Temperature
  - 7b. Test Magnetos: Full Throttle, Pitch Full Forward (Fine) - RPM Drop Less Than -- **80 RPM**
  - 7c. Throttle at RATED Gate; Reduce Pitch Slowly until -- **2400 RPM** --. Throttle Down Slightly to Observe RPM maintained at 2400 RPM. Return Pitch to -- **FULLY FINE**
8. Brake Air Pressure -- **100 PSI**

TWO

TWO

THREE

## Hurricane Mk I

THREE

## TAXYING OUT

1. Parking Brake -- RELEASED
2. Radiator Shutter -- FULLY OPEN
2. Brakes Can Be Used With Confidence
3. Check Brake Pressure During Prolonged Taxying

## FINAL PREPARATION FOR T-O - DRILL OF VITAL ACTIONS

**NOTE:**

*On reaching the take-off position, stop across wind, facing the aerodrome circuit, and carry out the Drill of Vital Actions. Some of this may already have been done, but must invariably be checked before every take-off. A convenient catch-phrase is applied to this drill "TMPF and Flaps".*

1. T - Trimming Tabs: Elevator Trim for Take-off; Indicator In -- CENTRAL -- Position
2. M - Mixture Control -- RICH
3. P - Pitch Control -- FULLY FINE -- (Lever Fully Forward)
4. F - Fuel Distributor Cock -- MAIN -- Tanks
5. Flaps - Depress To -- 28° -- Indicator -- TWO -- Divisions
6. Hydraulic Selector Gate to Uncover -- UP -- Position for Undercarriage Lever

## TAKE-OFF

**NOTE:**

*Turn into wind, steady the aeroplane, and move forward slowly to straighten up the tail wheel; open to full throttle and take-off by holding the aeroplane to a constant attitude. Firm push on Control Column to raise the tail. Correct tendency to swing by coarse rudder control.*

**NOTE:**

*As a safeguard in the event of engine failure, a steep angle of climb should not be attempted. Aim at clearing aerodrome boundary by a small margin.*

## ACTIONS AFTER TAKING-OFF

**IMMEDIATE ACTIONS:** Upon Ensuring Gaining SPEED and ALTITUDE

1. Raise Undercarriage: Select Wheels -- UP --; Press & Hold Operating Lever Until -- BOTH -- Red Lights On
  - 1.a. Return Selector Lever to -- NEUTRAL
2. Throttle -- RATED (+6.25 PSI Boost) --; Pitch -- 2850 RPM
3. Raise Flaps at -- > 90 MPH -- ASI; Select Flaps -- UP -- Press Op Lever Until Flap Indicator Shows -- UP
4. Accelerate to -- 140 MPH ASI -- at -- +6.25 PSI Boost -- Adjusting Attitude to Maintain Speed

**SUBSEQUENT ACTIONS:** Perform When Ready

5. Fuel Distributor Cock -- MAIN -- Tank
6. Oil Pressure -- 60 PSI
7. Hood -- FULLY CLOSE
8. Radiator Shutter -- CLOSE
9. Engine Controls: Adjust Throttle and Pitch as Required
10. Check Radiator and Oil Temperature
11. Begin Cockpit Scan

## CLIMBING

The optimum full throttle indicated climbing speed is 170 MPH.

**Engine Management -- +6.25 PSI Boost, 2850 RPM, 30 Min Limit**

1. Radiator Temperatures -- Max 120° C -- Adjust Radiator Shutter as Required
2. Oil Inlet Temperature -- Max 90° C

THREE

THREE

FOUR

## Hurricane Mk I

FOUR

## APPROACH

1. Reduce Speed to -- **150 MPH** -- ASI
2. Hood -- **OPEN and LOCK**
2. Mixture -- **NORMAL**
3. Maps -- **STOW**
4. Radiator -- **AS REQUIRED**
5. Check Brake Pressure: Before Landing -- **>120 PSI**
6. Flaps Up Approach: Increase Approach Speed by -- **10 MPH** -- ASI

## DRILL OF VITAL ACTIONS FOR LANDING

**NOTE:**

*This should be carried out quickly and decisively when the right moment arrives, when approaching the lee side of the aerodrome. A convenient catch-phrase is applied to this drill, "U.P. and Flaps".*

1. Wheels: Engine Pump: Select Wheels -- **DOWN** ; Press Operating Lever Until -- **GREEN** -- Lamps Light
  - 1.a. Wheels: Hand Pump: Select Wheels -- **DOWN** ; Operate Hand Pump Until -- **GREEN** -- Lamps Light
2. P - Pitch Control -- **FULLY FINE** -- (Lever Fully Forward)
3. Flaps: Select Flaps -- **DOWN** --; Press Oil Valve Operating Lever or Operate Hand Pump

## LANDING

**Non Engine Assisted Approach: 90 MPH ASI**

**Engine Assisted Approach: 80 MPH ASI**

**Brakes -- Use With Confidence**

## MISLANDING

1. Power -- **FULL THROTTLE**
2. Flaps and Gear -- **DOWN**

## SHUTTING DOWN

1. Radiator Shutter -- **OPEN**
2. Taxi to Park; Fuel Cocks -- **OFF** --; Slow Running Cut Out -- **PULL and HOLD** --; Ignition -- **OFF**
3. Switch Undercarriage Indicator -- **OFF**
4. Select Flaps -- **UP**
5. Safety Catch of Hydraulic Selector Covers Chasis -- **UP** -- Position
6. Indicator Lights and Other Electrical Equipment -- **OFF**

## UNDERCARRIAGE EMERGENCY OPERATION

*If difficulty is experienced in selecting wheels "DOWN", or the wheels fail to drop (indicated by the failure of the RED lights to extinguish), select wheels "UP" again and press the operating lever for 15 seconds or operate the hand pump; after which select wheels "DOWN" immediately.*

1. Reduce Speed to -- **90 MPH** -- ASI
2. Press Undercarriage Emergency Release Knobs with -- **BOTH FEET** -- and Select Wheels -- **DOWN**

## ENGINE FAILURE DURING TAKE-OFF

*In case of engine failure during takeoff, the first and foremost essential is maintain ample flying speed.*

1. Attitude -- **NOSE DOWN**
2. Undercarriage -- **UP**
3. Flaps -- **DOWN**
4. Land Straight Ahead; DO NOT ATTEMPT TO TURN
5. Fuel Cocks and Switches -- **OFF**

## FORCED LANDING OWING TO ENGINE FAILURE

*Maintain ample gliding speed, select a landing ground, glide toward it and try to rectify the trouble.*

*If landing without engine is inevitable, act as the following:*

1. Ignition and Fuel Cocks -- **OFF**
2. Undercarriage -- **AS DETERMINED** -- If in Doubt, Land with Undercarriage -- **UP**
3. Approach and Land as Normal; Flaps -- **AS REQUIRED** -- Use Hand Pump

FOUR

FOUR



<b>ONE</b>		<b>Spitfire Mk I</b>				<b>ONE</b>	
<b>Aircraft Type</b>		<b>Engine &amp; Prop</b>		<b>Fuel</b>	<b>Reference</b>		
Spitfire Mk Ia		Merlin III / Rotol CSP		100 Oct	Pilot's Notes: AP 1565A; Date		
<b>AIRSPEED LIMITATIONS</b>							
	<b>Design Speeds</b>			<b>MPH</b>			
V <sub>NE</sub>	Never Exceed Speed			450	Never Exceed in Any Operation		
V <sub>FE</sub>	Max. Flaps Extend Speed			140	Do Not Extend Flaps Above this Speed		
V <sub>LO</sub>	Max Landing Gear Operating Speed			160	Do not operate landing gear above this speed		
V <sub>LE</sub>	Max Landing Gear Extended Speed			NA	Max speed with gear extended		
V <sub>R</sub>	Rotation Speed			NA	Speed at which the Airplane Lifts Off		
V <sub>REF</sub>	Landing Reference Speed			NA	Threshold crossing speed		
V <sub>S</sub>	Stall Speed			79	Min Speed in which the A/C is controllable		
V <sub>S0</sub>	Stall Speed			71	Stall Speed in Landing Configuration		
V <sub>Y</sub>	Best Rate-of-Climb			160	Delivers Gain in Altitude in Shortest Time		
V <sub>BE</sub>	Max Speedbrake Extended Speed			NA	Do Not Extend Brakes Above this Speed		
<b>AIRSPEED INDICATOR OPERATING RANGES</b>							
<b>ASI MARKING</b>		<b>MPH Range</b>		<b>Description</b>			
White Arc		71 - 140 MPH		Full Flap Operating Range. Lower Limit is Max. Weight V <sub>S0</sub> . Upper Limit Max Speed w/Flaps Extended.			
Green Arc		79 - 450 MPH		Normal Operating Range. Lower Limit is Max. Weight V <sub>S</sub> . Upper limit Is Max Structural Cruising Speed.			
Red Line		450 MPH		Maximum Speed for ALL operations.			
<b>LIMITING OPERATIONAL CONDITIONS</b>							
<b>Condition</b>	<b>Cbt Emer</b>	<b>Take Off</b>	<b>Climb</b>	<b>Max Cruise</b>	<b>Max Cruise</b>	<b>Max Dive</b>	<b>Condition</b>
Limit	Limited	5 min	30 min	Cont	Cont	20 sec	Limit
Boost	+12 PSI	+6.25 PSI	+6.25 PSI	+4.5 PSI	+2.25 PSI	+6.25 PSI	Boost
RPM	3000	3000	2600	2600	2600	3600	RPM
Mixture	Normal	Normal	Normal	Normal	Weak	Normal	Mixture
<b>Oil Pressure</b>		<b>Oil Temperature</b>		<b>Coolant Temperature</b>		<b>Operating Pressures</b>	
Emer Min = 45 PSI		Min = 15° C	Max = 90° C	Normal = 100° C		Fuel = 2.5 - 3 PSI	
Normal = 60 PSI		Emergency Max = 95° C		Min = 70° C	Max = 120° C	Brake >= 120 PSI	
<b>Correction of ASI Reading for Postion Error</b>				<b>Use of +12lb/sqin Boost Pressure: AP1590B/J2-W</b>			
<b>ASI (MPH)</b>	<b>+ / -</b>	<b>Adjustment</b>	<b>CAS (MPH)</b>	1. Requires the use of 100 Octane Fuel.			
120	+	7	127	2. Will maintain +12 PSI boost to about 10k feet. Boost will drop above this height. Max (unregulated) boost = +17PSI			
140	+	3	143				
160	-	1	159	<b>Overboost Note</b>			
180	-	3.5	176.5	The Boost Control Cut-Out enables higher boost pressures. The use, in an emergency, of this high boost pressure is a definite overload condition on the engine and therefore all occasions on which it is essential to make use of this +12lb./sq.in. must be reported by the pilot and recorded in the engine log book so that the engineer officer may be able to assess the reduction in life between overhauls and the need for special inspections.			
200	-	6	194				
220	-	7.5	212.5				
240	-	8	232				
260	-	8.5	231.5				
280	-	8.5	271.5				
300	-	8.5	291.5				
<b>Pilot's Notes General - A.P. 2095 dated April 1943:</b> Variable Pitch Propellors: DH Variable Pitch Propellors (DH 5-20) (Spitfire MkI) are directly controlled by the pilot and have <b>TWO</b> settings, <b>FINE</b> and <b>COURSE</b> . <b>FINE</b> should be used for Engine Run Up, Take Off, Low Speed Climb, and Landing with <b>COURSE</b> used in all other stages of flight.							
<b>Note: Spitfire MkI Checklist Based on Pilot's Notes for Spitfire MkI with Merlin III (Excerpts) and Pilot's Notes for Spitfire MkII with Merlin XII for Engine Management and Operation.</b>							
<b>ONE</b>						<b>ONE</b>	

TWO

## Spitfire Mk I

TWO

## PRELIMINARIES

1. Ignition switches -- **OFF**
2. Undercarriage Selector Lever Position -- **DOWN** -- gate; Indicator Shows -- **IDLE**
3. Switch on Light Indicator and Check for -- **GREEN** --lights
4. Flaps -- **UP**
5. Landing Lamps -- **UP**
6. Wheel Brakes -- **ON**
7. Fuel Contents -- **CHECK**
8. Movement of the Flying Controls -- **CHECK**

## STARTING ENGINE

**NOTE:** For full Details of the Merlin XII engine see A.P. 1590B, Volume I.

**NOTE:** Whenever possible the pilot should start the engine himself; this will ensure that he will have ample time to carry out all of the checks, and that unnecessary running of the engine is avoided.

1. Mixture -- **NORMAL**
2. Pitch Controls Fully Forward to -- **FINE PITCH**
3. Radiator Shutter Fully -- **OPEN**
4. Raise Both Fuel Cock Levers to -- **ON**
5. Prime the Cylinders by Injecting -- **FIVE** -- Shots of Fuel
6. Propeller Area -- **CLEAR**
7. Switch Ignition -- **ON** --; Throttle -- **OPEN SLIGHTLY**
8. Starting Switch -- **PRESS AND HOLD** -- No More Than -- **30 SECONDS**

**NOTE:** Do not oscillate the throttle lever, but open it slowly to get the engine running smoothly at a fast tick-over; if the engine begins to fade, or "spit-back", close the throttle quickly and open it up again very slowly.

9. Oil Pressure -- **SATISFACTORY**
10. Warm at Fast Tick-over Until Oil Temperature -- **15° C** --; Radiator Temperature -- **70° C**

## TESTING ENGINE AND INSTALLATIONS

**NOTE:** The engine should not be run at full power for more than a few seconds - just long enough to test magnetos and observe oil pressure, boost and r.p.m.

**\*\*\* IMPORTANT \*\*\***

**The engine should on no account be opened up with the airscrew in coarse pitch (control lever back) as the blade angle is too coarse and severe detonation will result.**

1. Fuel Pressure -- **2.5 - 3 PSI**
2. Brake Pressure - Reservoir Pressure at least -- **120 PSI**
3. Pneumatic Systems - Cycle Flaps -- **DOWN** -- and -- **UP**
4. Set Altimeter and Directional Gyro
5. Hood -- **LOCKED OPEN** --; Emergency Exit Door at -- **HALF COCK** -- Position
6. Harness Release -- **FIXED** -- Position
7. Make Other General Preparations For Flight

**NOTE:** Warming up should not be unduly prolonged, as the temperature rises quickly, and some margin must be kept in hand for taxiing. If it is 130° before the aeroplane taxis out, it will become excessive if there is any distance to taxi downwind. The engine should not idle for any length of time in a light wind, and the aircraft should always face into the wind.

8. Open Throttle to -- **RATED** -- Gate. Ensure two men hold down the tail
  - 8a-1. Boost -- **+6.25 PSI**
  - 8a-2. RPM -- **2750 - 2850**
  - 8a-3. Oil Pressure -- **60 PSI** -- at NORMAL Temperature
  - 8b. Test Magnetos: Full Throttle, Pitch Full Forward (Fine) - RPM Drop Less Than -- **80 RPM**
  - 8c. Throttle at RATED Gate; Reduce Pitch Slowly until -- **2400 RPM** --. Throttle Down Slightly to Observe RPM maintained at 2400 RPM. Return Pitch to -- **FULLY FINE**
  - 8d. Wave Away Chocks

TWO

TWO

THREE

## Spitfire Mk I

THREE

## TAXYING OUT

1. Parking Brake -- **RELEASED**
2. Radiator Shutter -- **FULLY OPEN**
3. Brake Pressure -- **CHECK** --. If failure during taxi, apply FULL Brake immediately.
- 4a. Use the brakes as little as possible in taxiing, in order to save wear
- 4b. Do not relax throttle tension in order to prevent throttle coming back during take off
- 4c. Clear Engine before take off by increasing to moderate rpm against fully held brakes

## FINAL PREPARATION FOR T-O - DRILL OF VITAL ACTIONS

**NOTE:**

*On reaching the take-off position, stop across wind, facing the aerodrome circuit, and carry out the Drill of Vital Actions. Some of this may already have been done, but must invariably be checked before every take-off. A convenient catch-phrase is applied to this drill "TMP and Flaps".*

1. T - Trimming Tabs -- **Elevator One Division Nose Down; Rudder Central**
2. M - Mixture Control -- **NORMAL**
3. P - Pitch Control -- **FULLY FINE** -- (Lever Fully Forward)
4. Flaps -- **UP**

**NOTE:**

*The aeroplane would, however, take-off with flaps down, and if, by a serious omission of drill, the pilot leaves them down, he must on no account raise them until speed is at least 120 mph ASI at a safe height.*

## TAKING-OFF

**NOTE:**

*Turn into wind, steady the aeroplane, and move forward slowly to straighten up the tail wheel; open to full throttle and take-off by holding the aeroplane to a constant attitude. The tail need not be raised much. Correct tendency to swing by coarse rudder control. Hold down to almost level flight.*

## ACTIONS AFTER TAKING-OFF

**IMMEDIATE ACTIONS:** Upon Ensuring Gaining SPEED and ALTITUDE

1. Undercarriage -- **RAISE** -- Check Red Indicator Light -- **UP** -- is On
2. Throttle -- **RATED (+6.25 PSI Boost)** --; Pitch -- **2850 RPM**
3. Accelerate to -- **185 MPH ASI** -- at -- **+6.25 PSI Boost** -- Adjusting Attitude to Maintain Speed

**SUBSEQUENT ACTIONS:** Perform When Ready

4. Oil Pressure -- **60 PSI**
5. Emergency Exit Door -- **FULLY CLOSE** --; Hood -- **FULLY CLOSE**
6. Radiator Shutter -- **CLOSE**
7. Engine Controls: Adjust Throttle and Pitch as Required
8. Check Radiator and Oil Temperature
9. Begin Cockpit Scan

## CLIMBING

**Engine Management -- +6.25 PSI Boost, 2850 RPM, 30 Min Limit**

1. Radiator Temperatures -- **Max 120° C** -- Adjust Radiator Shutter as Required
2. Oil Inlet Temperature -- **Max 90° C**

THREE

THREE

FOUR

## Spitfire Mk I

FOUR

## PRELIMINARY APPROACH

1. Hood -- OPEN and LOCK
2. Mixture -- NORMAL
3. Maps -- STOW
4. Radiator -- AS REQUIRED

## DRILL OF VITAL ACTIONS FOR LANDING

**NOTE:**

*This should be carried out quickly and decisively when the right moment arrives, when approaching the lee side of the aerodrome. A convenient catch-phrase is applied to this drill, "U.P. and Flaps".*

1. U- Undercarriage -- DOWN -- Check Green Indicator Light -- DOWN -- is On
2. P - Pitch Control -- FULLY FINE -- (Lever Fully Forward)
3. Flaps -- DOWN -- On Final Approach

**NOTE:**

*If the undercarriage green indicator light does not come ON, hold the lever hard back in the LOWER position. When the light comes on, release lever to IDLE position. If GREEN indicators do not show fully DOWN and LOCKED, cycle the undercarriage UP then repeat lowering the undercarriage. If indicators still do not show fully DOWN and LOCKED, the EMERGENCY LOWERING SYSTEM should be used.*

## LANDING

**Non Engine Assisted Approach: 90 MPH ASI**

**Engine Assisted Approach: 80 - 85 MPH ASI**

**Brakes -- Use With Care**

## MISLANDING

1. Power -- FULL THROTTLE
3. Flaps -- UP -- After Attaining -- 120 MPH ASI

## PROCEDURE AFTER LANDING

1. Flaps -- UP
2. Radiator Shutter -- OPEN
3. Taxi to Park; Fuel Cocks -- OFF --; Slow Running Cut Out -- PULL and HOLD --; Ignition -- OFF
4. Indicator Lights and Other Electrical Equipment -- OFF

## UNDERCARRIAGE EMERGENCY OPERATION

1. Undercarriage -- DOWN
2. Undercarriage Emergency Lever -- FORWARD and DOWN

**NOTE:**

*After use, replace the CO2 cylinder and seal the lever. Inspect and refill the hydraulic system*

## ENGINE FAILURE DURING TAKE-OFF

**NOTE:**

*In case of engine failure during takeoff, the first and foremost essential is maintain ample flying speed.*

1. Attitude -- NOSE DOWN
2. Undercarriage -- UP
3. Flaps -- DOWN
4. Land Straight Ahead; DO NOT ATTEMPT TO TURN
5. Fuel Cocks and Switches -- OFF

## FORCED LANDING OWING TO ENGINE FAILURE

**NOTE:**

*Maintain ample gliding speed, select a landing ground, glide toward it and try to rectify the trouble. If landing without engine is inevitable, act as the following:*

1. Ignition and Fuel Cocks -- OFF
2. Undercarriage -- AS DETERMINED -- If in Doubt, Land with Undercarriage -- UP
3. Approach and Land as Normal; Flaps -- AS REQUIRED

FOUR

FOUR

ONE		Spitfire Mk II						ONE		
Aircraft Type			Engine & Prop			Fuel		Reference		
Spitfire Mk II			Merlin XII / Rotol CSP			100 Oct		Pilot's Notes: AP 1565B; July 1940		
AIRSPEED LIMITATIONS										
		Design Speeds				MPH				
V <sub>NE</sub>		Never Exceed Speed				450		Never Exceed in Any Operation		
V <sub>FE</sub>		Max. Flaps Extend Speed				140		Do Not Extend Flaps Above this Speed		
V <sub>LO</sub>		Max Landing Gear Operating Speed				160		Do not operate landing gear above this speed		
V <sub>LE</sub>		Max Landing Gear Extended Speed				NA		Max speed with gear extended		
V <sub>R</sub>		Rotation Speed				NA		Speed at which the Airplane Lifts Off		
V <sub>REF</sub>		Landing Reference Speed				NA		Threshold crossing speed		
V <sub>S</sub>		Stall Speed				79		Min Speed in which the A/C is controllable		
V <sub>S0</sub>		Stall Speed				71		Stall Speed in Landing Configuration		
V <sub>Y</sub>		Best Rate-of-Climb				160		Delivers Gain in Altitude in Shortest Time		
V <sub>BE</sub>		Max Speedbrake Extended Speed				NA		Do Not Extend Brakes Above this Speed		
AIRSPEED INDICATOR OPERATING RANGES										
ASI MARKING			MPH Range			Description				
White Arc			71 - 140 MPH			Full Flap Operating Range. Lower Limit is Max. Weight V <sub>S0</sub> . Upper Limit Max Speed w/Flaps Extended.				
Green Arc			79 - 450 MPH			Normal Operating Range. Lower Limit is Max. Weight V <sub>S</sub> . Upper limit Is Max Structural Cruising Speed.				
Red Line			450 MPH			Maximum Speed for ALL operations.				
LIMITING OPERATIONAL CONDITIONS										
Condition	Take-Off	All Out Level	Climb	Max Cruise	Max Cruise	Max Dive	Condition			
Limit	1000' or 3 min	5 min	30 min	Cont	Cont	20 sec	Limit			
Boost	+12 PSI	+9 PSI	+9 PSI	+7 PSI	+3.75 PSI	+9 PSI	Boost			
RPM	3000	3000	2850	2650	2650	3600	RPM			
Mixture	Normal	Normal	Normal	Normal	Weak	Normal	Mixture			
Oil Pressure		Oil Temperature		Coolant Temperature		Operating Pressures				
Emer Min = 45 PSI		Min = 15° C	Max = 90° C	Normal = 100° C		Fuel = 2.5 - 3 PSI				
Normal = 60 PSI		Emergency Max = 95° C		Min = 60° C	Max = 120° C	Brake >= 120 PSI				
Correction of ASI Reading for Postion Error				Use of +12lb/sqin Boost Pressure: AP1590B/J2-W						
ASI (MPH)	+ / -	Adjustment	CAS (MPH)	1. Requires the use of 100 Octane Fuel.						
120	+	7	127	2. Will maintain +12 PSI boost to about 10k feet. Boost will drop above this height. Max (unregulated) boost = +17PSI						
140	+	3	143							
160	-	1	159							
180	-	3.5	176.5							
200	-	6	194							
220	-	7.5	212.5							
240	-	8	232							
260	-	8.5	231.5							
280	-	8.5	271.5							
300	-	8.5	291.5							
								Overboost Note		
								The Boost Control Cut-Out enables higher boost pressures. The use, in an emergency, of this high boost pressure is a definite overload condition on the engine and therefore all occasions on which it is essential to make use of this +12lb./sq.in. must be reported by the pilot and recorded in the engine log book so that the engineer officer may be able to assess the reduction in life between overhauls and the need for special inspections.		
Note: Spitfire MkII Checklist Based on Pilot's Notes for Spitfire MkII with Merlin XII.										
ONE								ONE		

TWO

## Spitfire Mk II

TWO

## PRELIMINARIES

1. Ignition switches -- OFF
2. Undercarriage Selector Lever Position -- DOWN -- gate; Indicator Shows -- IDLE
3. Switch on Light Indicator and Check for -- GREEN --lights
4. Flaps -- UP
5. Landing Lamps -- UP
6. Wheel Brakes -- ON
7. Fuel Contents -- CHECK
8. Movement of the Flying Controls -- CHECK

## STARTING ENGINE

**NOTE:** For full Details of the Merlin XII engine see A.P.1590P, Volume I.

**NOTE:** Whenever possible the pilot should start the engine himself; this will ensure that he will have ample time to carry out all of the checks, and that unnecessary running of the engine is avoided.

1. Mixture -- NORMAL
2. Pitch Controls Fully Forward to -- FINE PITCH
3. Radiator Shutter Fully -- OPEN
4. Raise Both Fuel Cock Levers to -- ON
5. Prime the Cylinders by Injecting -- FIVE -- Shots of Fuel
6. Propeller Area -- CLEAR
7. Cartridge Starting: Switch Ignition --ON --; Throttle -- OPEN SLIGHTLY
8. PRESS -- Starter Button Until Engine is Firing Evenly

**NOTE:** Do not oscillate the throttle lever, but open it slowly to get the engine running smoothly at a fast tick-over; if the engine begins to fade, or "spit-back", close the throttle quickly and open it up again very slowly.

9. Oil Pressure -- SATISFACTORY
10. Warm at Fast Tick-over Until Oil Temperature -- 15° C --; Radiator Temperature -- 70° C

## TESTING ENGINE AND INSTALLATIONS

**NOTE:** The engine should not be run at full power for more than a few seconds - just long enough to test magnetos and observe oil pressure, boost and r.p.m.

\*\*\* **IMPORTANT** \*\*\*

The engine should on no account be opened up with the airscrew in coarse pitch (control lever back) as the blade angle is too coarse and severe detonation will result.

1. Fuel Pressure -- 2.5 - 3 PSI
2. Brake Pressure - Reservoir Pressure at least -- 120 PSI
3. Pneumatic Systems - Cycle Flaps -- DOWN -- and -- UP
4. Set Altimeter and Directional Gyro
5. Hood -- LOCKED OPEN --; Emergency Exit Door at -- HALF COCK -- Position
6. Harness Release -- FIXED -- Position
7. Make Other General Preparations For Flight

**NOTE:** Warming up should not be unduly prolonged, as the temperature rises quickly, and some margin must be kept in hand for taxiing. If it is 130° before the aeroplane taxis out, it will become excessive if there is any distance to taxi downwind. The engine should not idle for any length of time in a light wind, and the aircraft should always face into the wind.

8. Open Throttle to -- RATED -- Gate. Ensure two men hold down the tail
  - 8a-1. Boost -- +9 PSI
  - 8a-2. RPM -- 2750 - 2850
  - 8a-3. Oil Pressure -- 60 PSI -- at NORMAL Temperature
  - 8b. Test Magnetos: Full Throttle, Pitch Full Forward (Fine) - RPM Drop Less Than -- 80 RPM
  - 8c. Throttle at RATED Gate; Reduce Pitch Slowly until -- 2400 RPM --. Throttle Down Slightly to Observe RPM maintained at 2400 RPM. Return Pitch to -- FULLY FINE
  - 8d. Wave Away Chocks

TWO

TWO

THREE

# Spitfire Mk II

THREE

## TAXYING OUT

1. Parking Brake -- **RELEASED**
2. Radiator Shutter -- **FULLY OPEN**
3. Brake Pressure -- **CHECK** --. If failure during taxi, apply FULL Brake immediately.
- 4a. Use the brakes as little as possible in taxiing, in order to save wear
- 4b. Do not relax throttle tension in order to prevent throttle coming back during take off
- 4c. Clear Engine before take off by increasing to moderate rpm against fully held brakes

## FINAL PREPARATION FOR T-O - DRILL OF VITAL ACTIONS

**NOTE:**

*On reaching the take-off position, stop across wind, facing the aerodrome circuit, and carry out the Drill of Vital Actions. Some of this may already have been done, but must invariably be checked before every take-off. A convenient catch-phrase is applied to this drill "TMP and Flaps".*

1. T - Trimming Tabs -- **Elevator One Division Nose Down; Rudder Central**
2. M - Mixture Control -- **NORMAL**
3. P - Pitch Control -- **FULLY FINE** -- (Lever Fully Forward)
4. Flaps -- **UP**

**NOTE:**

*The aeroplane would, however, take-off with flaps down, and if, by a serious omission of drill, the pilot leaves them down, he must on no account raise them until speed is at least 120 mph ASI at a safe height.*

## TAKING-OFF

**NOTE:**

*Turn into wind, steady the aeroplane, and move forward slowly to straighten up the tail wheel; open to full throttle and take-off by holding the aeroplane to a constant attitude. The tail need not be raised much. Correct tendency to swing by coarse rudder control. Hold down to almost level flight.*

## ACTIONS AFTER TAKING-OFF

**IMMEDIATE ACTIONS:** Upon Ensuring Gaining SPEED and ALTITUDE

1. Undercarriage -- **RAISE** -- Check Red Indicator Light -- **UP** -- is On
2. Throttle -- **RATED (+9 PSI Boost)** --; Pitch -- **2850 RPM**
3. Accelerate to -- **185 MPH ASI** -- at -- **+9 PSI Boost** -- Adjusting Attitude to Maintain Speed

**SUBSEQUENT ACTIONS:** Perform When Ready

4. Oil Pressure -- **60 PSI**
5. Emergency Exit Door -- **FULLY CLOSE** --; Hood -- **FULLY CLOSE**
6. Radiator Shutter -- **CLOSE**
7. Engine Controls: Adjust Throttle and Pitch as Required
8. Check Radiator and Oil Temperature
9. Begin Cockpit Scan

## CLIMBING

**Engine Management -- +9 PSI Boost, 2700 RPM, 30 Min Limit**

1. Radiator Temperatures -- **Max 120° C** -- Adjust Radiator Shutter as Required
2. Oil Inlet Temperature -- **Max 90° C**

THREE

THREE



FOUR

# Spitfire Mk II

FOUR

## PRELIMINARY APPROACH

1. Hood -- OPEN and LOCK
2. Mixture -- NORMAL
3. Maps -- STOW
4. Radiator -- AS REQUIRED

## DRILL OF VITAL ACTIONS FOR LANDING

**NOTE:**

*This should be carried out quickly and decisively when the right moment arrives, when approaching the lee side of the aerodrome. A convenient catch-phrase is applied to this drill, "U.P. and Flaps".*

1. U- Undercarriage -- DOWN -- Check Green Indicator Light -- DOWN -- is On
2. P - Pitch Control -- FULLY FINE -- (Lever Fully Forward)
3. Flaps -- DOWN -- On Final Approach

**NOTE:**

*If the undercarriage green indicator light does not come ON, hold the lever hard back in the LOWER position. When the light comes on, release lever to IDLE position. If GREEN indicators do not show fully DOWN and LOCKED, cycle the undercarriage UP then repeat lowering the undercarriage. If indicators still do not show fully DOWN and LOCKED, the EMERGENCY LOWERING SYSTEM should be used.*

## LANDING

**Non Engine Assisted Approach: 90 MPH ASI**

**Engine Assisted Approach: 80 - 85 MPH ASI**

**Brakes -- Use With Care**

## MISLANDING

1. Power -- FULL THROTTLE
3. Flaps -- UP -- After Attaining -- 120 MPH ASI

## PROCEDURE AFTER LANDING

1. Flaps -- UP
2. Radiator Shutter -- OPEN
3. Taxi to Park; Fuel Cocks -- OFF --; Slow Running Cut Out -- PULL and HOLD --; Ignition -- OFF
4. Indicator Lights and Other Electrical Equipment -- OFF

## UNDERCARRIAGE EMERGENCY OPERATION

1. Undercarriage -- DOWN
2. Undercarriage Emergency Lever -- FORWARD and DOWN

**NOTE:**

*After use, replace the CO2 cylinder and seal the lever. Inspect and refill the hydraulic system*

## ENGINE FAILURE DURING TAKE-OFF

**NOTE:**

*In case of engine failure during takeoff, the first and foremost essential is maintain ample flying speed.*

1. Attitude -- NOSE DOWN
2. Undercarriage -- UP
3. Flaps -- DOWN
4. Land Straight Ahead; DO NOT ATTEMPT TO TURN
5. Fuel Cocks and Switches -- OFF

## FORCED LANDING OWING TO ENGINE FAILURE

**NOTE:**

*Maintain ample gliding speed, select a landing ground, glide toward it and try to rectify the trouble. If landing without engine is inevitable, act as the following:*

1. Ignition and Fuel Cocks -- OFF
2. Undercarriage -- AS DETERMINED -- If in Doubt, Land with Undercarriage -- UP
3. Approach and Land as Normal; Flaps -- AS REQUIRED

FOUR

FOUR



ONE

## Blenheim Mk IV

ONE

Aircraft Type	Engine & Prop	Fuel	Reference
Blenheim MkIV	Mercury XV / DH CSP	100 Oct	Pilot's Notes: AP 1530C; Jan 1943

## AIRSPEED LIMITATIONS

	Design Speeds	MPH	
V <sub>NE</sub>	Never Exceed Speed	325	Never Exceed in Any Operation
V <sub>FE</sub>	Max. Flaps Extend Speed	125	Do Not Extend Flaps Above this Speed
V <sub>LO</sub>	Max Landing Gear Operating Speed	140	Do not operate landing gear above this speed
V <sub>LE</sub>	Max Landing Gear Extended Speed	NA	Max speed with gear extended
V <sub>R</sub>	Rotation Speed	90	Speed at which the Airplane Lifts Off
V <sub>REF</sub>	Landing Reference Speed	NA	Threshold crossing speed
V <sub>S</sub>	Stall Speed	80	Min Speed in which the A/C is controllable
V <sub>S0</sub>	Stall Speed	70	Stall Speed in Landing Configuration
V <sub>Y</sub>	Best Rate-of-Climb	130	Delivers Gain in Altitude in Shortest Time
V <sub>BE</sub>	Max Speedbrake Extended Speed	NA	Do Not Extend Brakes Above this Speed

## AIRSPEED INDICATOR OPERATING RANGES

ASI MARKING	MPH Range	Description
White Arc	70 - 125 MPH	Full Flap Operating Range. Lower Limit is Max. Weight V <sub>S0</sub> . Upper Limit Max Speed w/Flaps Extended.
Green Arc	80 - 325 MPH	Normal Operating Range. Lower Limit is Max. Weight V <sub>S</sub> . Upper limit Is Max Structural Cruising Speed.
Red Line	325 MPH	Maximum Speed for ALL operations.

## LIMITING OPERATIONAL CONDITIONS

Condition	Take-Off	All Out Level	Climb	Max Cruise	Max Cruise	Max Dive	Condition
Limit	1000' or 3 min	30 min	30 min	Cont	Cont	20s @ 2750	Limit
Boost	+9 PSI	+9 PSI	+5 PSI	+3.5 PSI	+1.5 PSI	+5 PSI	Boost
RPM	2750	2750	2650	2400	2400	3120	RPM
Mixture	Normal	Normal	Normal	Normal	Weak	Normal	Mixture

Oil Pressure	Oil Temperature (Inlet)		Cylinder Temperature		Operating Pressures
Emer Min = 70 PSI	Min = 5° C	Max = 90° C	Normal = 190° C		Fuel = 2.5 - 3.5 PSI
Normal = 80 PSI	Emergency Max = 95° C		Min	Max = 235° C	Brake >= 100 PSI

## Correction of ASI Reading for Position Error

ASI (MPH)	+ / -	Adjustment	CAS (MPH)
120	+	4	124
140	+	2	142
160	0	0	160
180	-	2	178
200	-	4	196
220	-	4	216
240	-	6	234
260	-	6	254

## 87 Octane Fuel Restrictions

Condition	Take-Off	All Out Level
Limit	1000' or 3 min	5 min
Boost	+5 PSI	+5 PSI
RPM	2650	2750

## Engine Provided Systems

Hydraulic	Pump	Port Engine
Pneumatic	Compressor	Starb'd Eng
Electrical	Generator	Port Engine

Note: Blenheim MkIV Checklist Based on Pilot's Notes for Blenheim MkV.

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TWO

## Blenheim Mk IV

TWO

## PRELIMINARIES

1. Hydraulic Selector -- DOWN --; Undercarriage Operating Lever -- DOWN
2. Undercarriage Indicator -- ON --; Undercarriage Locked -- DOWN
3. Auxilliary Fuel Feed -- CHECK -- If Required

## STARTING ENGINES AND WARMING UP

1. Set Controls as Follows:
  - 1a. Fuel Cocks -- INNER -- Tanks; Balance Cock -- OFF
  - 1b. Throttle Open -- .5 Inch
  - 1c. High Boost Control to -- 5 LBS
  - 1d. Mixture -- NORMAL
  - 1e. Pitch Control -- FULLY BACK
  - 1f. Carburetor Heat Control -- COLD
  - 1g. Cowl Flaps -- OPEN
2. High Volatile Fuel Should be Used When Air Temperature is Below Freezing
3. Prime the Cylinders by Injecting -- ONE to FIVE -- Strokes of Fuel, depending on Air Temperature
4. Ignition and Booster Coil Switches to -- ON
5. Starting Switch -- PRESS AND HOLD -- No More Than -- 20 SECONDS
  - 5a. Wait -- 30 SECONDS -- Between Starting Each Engine
6. Booster Coil Switch to -- OFF
7. After -- ONE -- Minute, Open Up to Fast Tick-over
8. Pitch Control -- FULLY FORWARD

## TESTING ENGINES AND INSTALLATIONS

1. Hydraulic Systems - Cycle Flaps -- DOWN -- and -- UP
2. Open Throttle to -- MAX WEAK CONTINUOUS -- Boost. Check Operation of Propellers
3. Open Throttle -- FULLY --; Check Boost to -- +5 PSI
4. With 100 Octane Fuel: High Boost Control to -- 9 LBS --; RPM -- 2750 - 2850
  - 4a. Return Boost Control to -- 5 LBS -- Before Throttling Back
5. Test Magnetos: Max Rich Continuous Boost - RPM Drop Less Than -- 100 RPM

## TAXYING OUT

1. Undercarriage Locking Pins -- REMOVED -- And -- STOWED
3. Brake Pressure -- 100 PSI

## DRILL OF VITAL ACTIONS FOR TAKE-OFF

## DRILL OF VITAL ACTIONS

1. H - Hydraulic Selector -- DOWN
1. T - Trimming Tabs -- Rudder -- CENTRAL --; Elevator -- ONE INCH BELOW NEUTRAL -- Nose Heavy
2. M - Mixture Control -- NORMAL
3. P - Pitch Control -- FULLY FORWARD
4. Fuel - Check Contents and Cock Settings
5. Flaps -- 20° DOWN
6. Cowl Flaps -- CLOSED
7. Boost Control -- 9 LBS

## TAKE-OFF

1. There is a Slight Tendency to Swing to the Right
2. Apply Steady Backpressure to Lift Off at -- 90 MPH -- at 16,000 Lbs
3. Safety Speed -- 140 MPH
4. After Reaching Safety Speed, Move High Boost Control to -- 5 LBS -- and Set Climbing Boost and RPM
5. Raise Undercarriage and Flaps
  - 5a. Set Hydraulic selector to -- CENTRAL --; or -- UP -- For Turret Operation

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THREE

# Blenheim Mk IV

THREE

## CLIMBING

Engine Management -- +5 PSI Boost, 2650 RPM, 30 Min Limit

1. Cowl Flaps -- **FULLY OPEN**
2. Maximum Rate of Climb -- **130 MPH** -- Up to 10k Feet; Reduce By -- **1 MPH PER 1K FEET** -- Above 10k

## USE OF WARM AND COLD INTAKE

Warm Intake should be used:

1. Boost -- **<= +3.5 PSI** -- Air Temperature -- **<= 15° C**
2. Flight in -- **HIGH** -- Humidity; or In -- **CLOUDS, RAIN, SNOW, SLEET**

Cold Intake should be used:

1. Starting
2. Take-Off
3. Landing; Except in -- **HIGH** -- Humidity; or In -- **CLOUDS, RAIN, SNOW, SLEET**
4. Boost -- **>= +3.5 PSI** -- Air Temperature -- **>= 15o C**

## ECONOMICAL CRUISING

1. Mixture -- **WEAK** --; RPM -- **1900** --; Boost Up to -- **+1.5 PSI** --; ASI -- **140 MPH**
2. If Unable to Maintain -- **140 MPH ASI** -- Increase RPM

## DRILL OF VITAL ACTIONS FOR LANDING

1. H - Hydraulic Selector -- **DOWN**
2. U- Undercarriage -- **DOWN**
3. M - Mixture -- **NORMAL**
2. P - Pitch Control -- **FULLY FORWARD**
3. Flaps -- **DOWN**

## APPROACH

Non Engine Assisted Approach: 100 MPH ASI

Engine Assisted Approach: 95 MPH ASI

## MISLANDING

1. Power -- **FULL THROTTLE**
2. Undercarriage -- **RAISE**
3. Flaps -- **UP** -- After Attaining -- **120 MPH ASI**

## PROCEDURE AFTER LANDING

1. Cowl Flaps -- **OPEN**
2. Flaps -- **UP** --; Hydraulic Selector -- **DOWN**
3. Pitch Control -- **FULLY BACK** -- Open Engine Sufficiently to Change Pitch to Course
4. Slow Running Cut Out -- **PULL and HOLD** -- ; Ignition -- **OFF**
5. Replace Undercarriage Safety Pins

## FUEL CONSUMPTION

	gals/hour @ 10k Feet		RPM				
	Mixture	Boost	2400	2200	2000	1900	
	WEAK	+1 PSI	75	70	65		
		0 PSI	69	65	61	58	
		-1 PSI	66	62	58	54	
		-2 PSI	61	57	53	49	
		-3 PSI	56	52	48	45	
Mixture	Boost	RPM	gals/hr	Fuel Tanks	Capacity	Quantity	Tot Capacity
RICH	+5 PSI	2650	146	Inner	140 gals	2	280 gals
	+3.5 PSI	2400	112	Outer	94 gals	2	188 gals
	+ 1.5 PSI	2400	90				

THREE

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FOUR

## Blenheim Mk IV

FOUR

### ENGINE FAILURE

**NOTE:**

*Aircraft will NOT maintain height on one engine, except when lightly loaded.*

1. Failed Engine Pitch Control -- **FULLY BACK** -- To Positive Coarse Pitch
2. Best Speed -- **100 MPH ASI**

### UNDERCARRIAGE EMERGENCY OPERATION CARTRIDGE SYSTEM

1. Hydraulic Selector -- **DOWN**
2. Lower Flaps with Hand Pump
  - 2a. Undercarriage Selector -- **UP**
  - 2b. Flap Selector -- **DOWN**
  - 2c. Operate Hand Pump
  - 2d. Flap Selector -- **NEUTRAL**
3. Lower Undercarriage with Hand Pump
  - 3a. Undercarriage Selector -- **DOWN**
  - 3b. Operate Hand Pump

**If Hand Pump Fails:**

4. Operate Cartridge System: Tear White Fabric Strip and Pull Handle

### UNDERCARRIAGE EMERGENCY OPERATION HAND PUMP

1. Hydraulic Selector -- **DOWN**
2. Lower Undercarriage with Hand Pump
  - 2a. Undercarriage Selector -- **DOWN**
  - 2b. Operate Hand Pump
3. Lower Flaps with Hand Pump
  - 2a. Flap Selector -- **DOWN**
  - 2b. Operate Hand Pump

FOUR

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ONE

## Me 109E

ONE

Aircraft Type	Engine & Prop	Fuel	Reference
Me 109E-1 / E-3	DB 601A / VDM VP	87 Oct	Betriebs- und Rustanleitung Me109

## AIRSPEED LIMITATIONS

	Design Speeds	KPH	
V <sub>NE</sub>	Never Exceed Speed	750	Never Exceed in Any Operation
V <sub>FE</sub>	Max. Flaps Extend Speed	250	Do Not Extend Flaps Above this Speed
V <sub>LO</sub>	Max Landing Gear Operating Speed	220	Do not operate landing gear above this speed
V <sub>LE</sub>	Max Landing Gear Extended Speed	350	Max speed with gear extended
V <sub>R</sub>	Rotation Speed	110	Speed at which the Airplane Lifts Off
V <sub>REF</sub>	Landing Reference Speed	NA	Threshold crossing speed
V <sub>S</sub>	Stall Speed	125	Min Speed in which the A/C is controllable
V <sub>S0</sub>	Stall Speed	88	Stall Speed in Landing Configuration
V <sub>Y</sub>	Best Rate-of-Climb	250	Delivers Gain in Altitude in Shortest Time
V <sub>BE</sub>	Max Speedbrake Extended Speed	NA	Do Not Extend Brakes Above this Speed

## AIRSPEED INDICATOR OPERATING RANGES

ASI MARKING	KPH Range	Description
White Arc	88 - 250 KPH	Full Flap Operating Range. Lower Limit is Max. Weight V <sub>S0</sub> . Upper Limit Max Speed w/Flaps Extended.
Green Arc	125 - 750 KPH	Normal Operating Range. Lower Limit is Max. Weight V <sub>S</sub> . Upper limit Is Max Structural Cruising Speed.
Red Line	750 KPH	Maximum Speed for ALL operations.

## OPERATING DATA

Condition	Take-Off	Climb	Cruise	Max Dive	Condition	
Limit	5 min	30 min	Cont		Limit	Luftschaubestellungs...
Man Press	1.45 ATA	1.35 ATA	1.3 ATA	IDLE	Boost	Full Course 9:30
RPM	2500	2400	2300	3000	RPM	Full Fine 12:00
Pitch	Manual	Manual	Manual	9:30	Pitch	

Oil Pressure	Oil Temperature (Inlet)		Oil Temperature (Outlet)		Fuel Pressure
Min = 2.5 kg/cm2	Min = 30° C	Max = 75° C	Min = 40° C	Max = 95° C	Min = 1.1 kg/cm2
Max = 6 kg/cm2	Emergency Max = 80° C		Emergency Max = 105° C		Max = 1.5 kg/cm2

Maximum Coolant Temperature						Oxygen
Sea Level	2000 m	4000 m	6000 m	8000 m	10000 m	Begin Use @ 4000 m
Max = 100° C	Max = 95° C	Max = 91° C	Max = 87° C	Max = 82° C	Max = 78° C	Min Pressure= 10 kg/cm2

## Best Airspeed for Climb

Sea Level	1000 m	2000 m	3000 m	4000 m	5000 m	6000 m	7000 m
250 kph	243 kph	236 kph	229 kph	222 kph	215 kph	208 kph	200 kph

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TWO

## Me 109E

TWO

## STARTING ENGINE

1. Cabin -- **CLOSE** -- Cabin Lever to Closed (Zu); Right Cabin Window -- **OPEN**
2. Landing Gear -- **NEUTRAL (Ruhe)**
3. Master Bus -- **ON**
4. Spark Plug Master Switch -- **OPEN (Auf)**
5. Throttle -- **IDLE** ; Gas Pressure Switch to -- **UNPRESSURIZED (Behälter Entlüftet)**
6. Operate Center Fuel Pump to -- **0.5 kg/cm<sup>2</sup>**
7. Wind Up Starter; Crank Handle in Baggage Area, Starter Well on Top Right of Engine
8. Prime the Cylinders by Injecting -- **TWO or THREE** -- Shots of Fuel (Cold = 3-4, Hot = 1-2)
9. Insert Key Into Ignition Switch and Select -- **M 1+2**
10. Pull Sparkplug Handle and -- **HOLD** -- Handle Cannot be Locked
11. Pull Starter Handle
12. Release Starter Handle After Engine Start
13. Oil Pressure (COLD Engine) -- **6-8 kg/cm<sup>2</sup>** -- Within 3-5 Seconds
14. Secure Starter Crank Handle to Luggage Area

**NOTE:** If Engine does not start, wait a few minutes, then repeat.

\*\*\* **IMPORTANT** \*\*\*

**Do not attempt to turn propellers by hand.**

## WARM UP

1. Radiator Flaps Open -- **AS REQUIRED**
2. Oil Cooler Flap -- **CLOSE** -- If Cold
3. Oil Pressure -- **5-6 kg/cm<sup>2</sup>** -- Increase RPM to -- **1000** -- To Maintain Oil Pressure

## ENGINE CHECK DURING WARM UP

1. Check Magnetos - Cycle Magnetos at Different Engine RPM to Ensure Engine Runs Smoothly
2. Fuel Pump Operation - Engine RPM -- **1400**
  - 2a. Cycle Sparkplug Master Switch (P1 and P2) for 30 seconds each
  - 2b. Fuel Pressure -- **NO FLUCTUATION**
3. Electronics Operation - Engine RPM -- **1900**
  - 3a. Master Bus -- **OFF** -- Equipment Switchbox -- **ON**; Check Equipment
  - 3b. Equipment Switchbox -- **OFF** -- Master Bus -- **ON**

## ENGINE RUN UP

**NOTE:** Perform Run UP only if there has been 2 hours since last flight.

\*\*\* **IMPORTANT** \*\*\*

**Point into the wind and weigh down the tail.**

1. Cabin -- **CLOSE** -- Cabin Lever to Closed (Zu)
2. Propeller Pitch -- **12:00**
3. Radiator Flaps -- **OPEN** -- Oil Cooler Flaps -- **CLOSE**

**NOTE:** Perform Run Up only with minimum Oil Temperature of 30°C and maximum Coolant Temperature of 80°C.

5. Controls -- **BACK AND HOLD**
6. Open Throttle to -- **FULL**
  - 6a. RPM -- **2200 - 2250**
  - 6b. Boost -- **1.35 ATA**
  - 6c. Oil Pressure -- **2.5 - 6 kg/cm<sup>2</sup>**
  - 6d. Coolant Temperature -- **94°C** -- Max
  - 6e. Oil Temperature (In) -- **30°C** -- Min
  - 6f. Fuel Pressure -- **1.1 - 1.5 kg/cm<sup>2</sup>**
7. Check Magnetos - Cycle Magnetos -- **50 RPM** -- Drop Max
8. Check the Engine is Running Smoothly and Evenly
9. Reduce Throttle Slowly

**NOTE:** If Coolant Temperature exceeds 94°C, reduce to 1100 RPM until temperature decreases

TWO

TWO

THREE

## Me 109E

THREE

## PILOT ENGINE START

**NOTE:**

See above procedures

1. Cabin -- **CLOSE** -- Cabin Lever to Closed (Zu)
2. Spark Plug Master Switch -- **OPEN (Auf)**
3. Radiator and Oil Cooler Flaps -- **OPEN**
4. Electronics -- **ON**
5. Temperature and Pressure Gauges -- **CHECK**
6. Propellor Pitch -- **12:00**
7. Landing Gear Indicator Lights -- **GREEN** -- Mechanical Indicators -- **CHECK**
8. Elevator Trim -- **0 to 1 DEGREE UP**
9. Pitot Heat -- **ON** -- If High Humidity and Temperature below 0°C

## TAXI

1. Landing Flaps -- **UP**
2. Coolant Temperature -- **94°C** -- MAX
3. For Tight Turns, Add Throttle for Straight-aways, Reduce Throttle and Brake Into Turn

## TAKE OFF

1. Landing Flaps -- **20°**
2. Take Off
3. Set Climbing Speed -- **250 KPH**
4. Landing Gear - Retract - Landing Gear Switch to -- **IN (EIN)**
  - 4a. Switch Automatically Returns to -- **NEUTRAL (Ruhe)**
  - 4b. If Landing Gear Does Not Lock in Retracted Position, Landing Gear Switch to -- **IN (EIN)**
  - 4c. Landing Gear Indicator: Retracted and Locked -- **RED**; Extended and Locked -- **GREEN**

**NOTE:**

Indicator Lights can be turned off, but will automatically turn on when gear are extended. Audible tone if landing gear is not locked down and flaps are extended.

5. Landing Flaps -- **RETRACT**; Trim for Flight

## FLIGHT

1. Observe Operating Limits
2. Use Best Climbing Speeds

\*\*\* ATTENTION \*\*\*

**At High Altitude, if Fuel Pressure drops below 1 kg/cm2, turn on Fuel Pressure Pump**

3. Adjust Propellor Pitch to Maintain Desired Boost and RPM Settings
4. Fuel Gauge - Accurate ONLY in Level Flight; Fuel Warning Light -- **10 MINS** -- Cruise Flight Remaining
5. Radiator Flaps - Operate to Maintain Coolant Temperature Within Limits.

## LANDING

1. Decrease Speed to -- **220 KPH**
2. Propellor Pitch to -- **12:00**
3. Landing Gear - Extend - Landing Gear Switch to -- **OUT (AUS)**
  - 3a. Switch Automatically Returns to -- **NEUTRAL (Ruhe)**
  - 3b. If Landing Gear Does Not Lock in Retracted Position, Landing Gear Switch to -- **OUT (AUS)**
  - 3c. Landing Gear Indicator: Retracted and Locked -- **RED**; Extended and Locked -- **GREEN**

**NOTE:**

Indicator Lights can be turned off, but will automatically turn on when gear are extended. Audible tone if landing gear is not locked down and flaps are extended.

4. Landing Flaps -- **FULL**; Trim for Flight

\*\*\* ATTENTION \*\*\*

**250 KPH Speed Limit With Full Flaps**

5. Glide at -- **150 KPH**

**NOTE:**

The plane will be sharply nose down with a steep decent angle. The plane will lose speed rapidly with a shallower angle with reduced throttle.

6. Left Front Window -- **OPEN** -- If Icing is Present

THREE

THREE

FOUR

## Me 109E

FOUR

## DIVING

1. Trim to Maintain Dive; Best Trim -- 0.5° TAIL HEAVY -- From Cruise Trim Position
2. Throttle -- IDLE
3. Oil and Coolant Temperature -- 40° C MIN
4. Radiator -- HALF OR FULLY CLOSED
5. Propellor Pitch -- 9:30 -- Max RPM -- 3000

## NIGHT FLIGHT

1. Night Lights -- ON
2. If Warning, Control, and Weapons Lamps Are Too Bright, Cover With Isolation Tape
3. Elevator Trim - Set Before Take Off

## HIGH ALTITUDE FLIGHT

1. Dip Cotton Ball in Olive Oil and Plug Nose
2. Ensure Mask Fits Comfortably and Tight
3. Cold Protection Leather To Be Worn Under Cap
4. Start Oxygen at -- 4000m
5. Do Not Interrupt Oxygen Breathing Once Begun
6. Adjust Flow Lever Based on Altitude
7. Observe Oxygen Pressure Gauge
8. Oxygen Pressure Below -- 10 kg/cm2 -- Descend Below -- 4000m
9. After Use, Close All Levers
10. If Flight Above 4000m is Planned, Plug Nose With Cotton Balls and Don Mask Before Take Off

## ENGINE SHUT DOWN

1. Throttle -- IDLE
2. Run Engine at -- IDLE -- For -- 3 minutes
3. Cycle Ignition Through M2, Then M1, Then 0. Coolant Temperature Not To Exceed -- 80°C
4. Close Spark Plug Master Switch Upon Engine Stop
5. Electronic Circuits -- OFF

## LANDING GEAR OPERATION WITHOUT HYDRAULICS

1. Landing Gear Lever to -- OUT (AUS)
2. Pull Landing Gear Emergency Lever with Sudden Motion
3. If Landing Gear Does Not Lock, Lock Through Push Something on Left or right Side

## EMERGENCY LANDING DUE TO ENGINE FAILURE

1. At Low Altitude, Climb Until -- 200 KPH
2. Deploy Landing Flaps; Trim Towards Tail
3. Extend Landing Gear Through Emergency Mechanism

**NOTE:**

*If terrain is not appropriate, it may be safer to land with landing gear retracted.*

*At high altitude, it is appropriate to go a long distance, deploying landing gear and flaps below 1000m.*

4. Propellor Pitch to -- GLIDE
5. Electronic Circuits -- OFF
6. Ignition -- OFF
7. Sparkplug Master Switch -- CLOSED (Zu)

## PARACHUTING

1. At Low Altitude, Climb Until -- 200 KPH
2. Lower Speed if Possible
3. If Possible; Electrics, Ignition -- OFF; Sparkplug Master Switch -- CLOSED (Zu)
4. Red Cabin Eject Lever -- PULL -- Located Over Left Shoulder Strap
5. Unbuckle and Exit Aircraft

FOUR

FOUR



FIVE

## Me 109E

FIVE

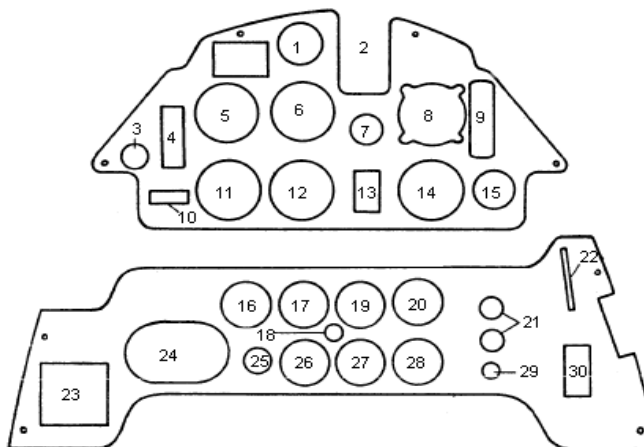
Aircraft Type	Engine Type	Fuel	Reference
Me 109E-1 / E-3	DB 601A	87 Oct	Betriebs- und Rustanleitung Me109

## Upper Panel

## Main Instrument Panel

## Lower panel

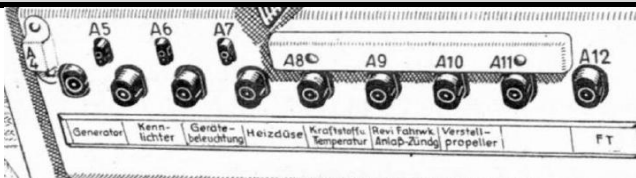
- Clock 1
- Revi C12 2
- Electrical Master Switch 3
- Magneto Switch 4
- Altimeter 5
- Magnetic Compass 6
- Revi Power Socket 7
- Manifold Pressure 8
- Compass Deviation 9
- Pitot Tube Heating Ind 10
- Airspeed Indicator 11
- Turn & Bank Indicator 12
- Prop Pitch Control 13
- Tachometer 14
- Prop Pitch Indicator 15



- 16 Panel Dimmer Switch
- 17 Blank Panel
- 18 Fuel Level Warn Lamp
- 19 Fuel / Oil Pressure
- 20 Landing Gear Indicator
- 21 Landing Gear Handles
- 22 Hand Fuel Pump Lever
- 23 R/T Switch Box
- 24 Weapons Arming Panel
- 25 MG Synch Button
- 26 Fuel Gauge
- 27 Oil Temperature
- 28 Coolant Temperature
- 29 Landing Gear Lock
- 30 Mech Landing Gear Ind

## Main Fuze Panel

- Generator A4
- Navigation Lights A5
- Cockpit Lights A6
- Pitot Heat A7



- A8 Fuel Temperature
- A9 Revi/Gear/Starter/Ingn
- A10 Adjustable Prop
- A11
- A12 Radio

FIVE

FIVE

ONE

## Me 110C

ONE

Aircraft Type	Engine & Prop	Fuel	Reference
ME 110C-4 / C-7	DB 601A / VDM VP	87 Oct	

## AIRSPEED LIMITATIONS

	Design Speeds	KPH	
V <sub>NE</sub>	Never Exceed Speed	650	Never Exceed in Any Operation
V <sub>FE</sub>	Max. Flaps Extend Speed	250	Do Not Extend Flaps Above this Speed
V <sub>LO</sub>	Max Landing Gear Operating Speed	250	Do not operate landing gear above this speed
V <sub>LE</sub>	Max Landing Gear Extended Speed	NA	Max speed with gear extended
V <sub>R</sub>	Rotation Speed	NA	Speed at which the Airplane Lifts Off
V <sub>REF</sub>	Landing Reference Speed	NA	Threshold crossing speed
V <sub>S</sub>	Stall Speed	79	Min Speed in which the A/C is controllable
V <sub>S0</sub>	Stall Speed	71	Stall Speed in Landing Configuration
V <sub>Y</sub>	Best Rate-of-Climb	NA	Delivers Gain in Altitude in Shortest Time
V <sub>BE</sub>	Max Speedbrake Extended Speed	NA	Do Not Extend Brakes Above this Speed

## AIRSPEED INDICATOR OPERATING RANGES

ASI MARKING	KPH Range	Description
White Arc	71 - 250 KPH	Full Flap Operating Range. Lower Limit is Max. Weight V <sub>S0</sub> . Upper Limit Max Speed w/Flaps Extended.
Green Arc	79 - 750 KPH	Normal Operating Range. Lower Limit is Max. Weight V <sub>S</sub> . Upper limit Is Max Structural Cruising Speed.
Red Line	750 KPH	Maximum Speed for ALL operations.

## OPERATING DATA

Condition	Take-Off	Climb	Cruise	Max Dive	Condition	
Limit	5 min	30 min	Cont		Limit	Luftschraubestellungs...
Man Press	1.3 ATA	1.2ATA	1.18 ATA	IDLE	Boost	Full Course
RPM	2300	2300	2200/2400	2500	RPM	Full Fine 12:00
Pitch	12:00	Manual	Manual	Manual	Pitch	

Oil Pressure	Oil Temperature (Inlet)		Oil Temperature (Outlet)		Fuel Pressure
Min = 2.2 kg/cm2	Min = 30° C	Max = 75° C	Min = 40° C	Max = 95° C	Min = 1.0 kg/cm2
Max = 5 kg/cm2	Emergency Max = 105° C		Emergency Max = 105° C		Max = 1.5 kg/cm2

Maximum Coolant Temperature						Oxygen
Sea Level	2000 m	4000 m	6000 m	8000 m	Min Temp	Begin Use @ 4000 m
Max = 100° C	Max = 95° C	Max = 91° C	Max = 87° C	Max = 82° C	Min = 60° C	Min Pressure= kg/cm2

## Best Airspeed for Climb

Sea Level	1000 m	2000 m	3000 m	4000 m	5000 m	6000 m	7000 m

ONE

ONE

ONE

## Ju 87B

ONE

Aircraft Type	Engine & Prop	Fuel	Reference
Ju 87B-2	Jumo 211 D / Ju VS5 VP	87 Oct	Ju 87B-2 Betriebsanleitung Jun 1940

## AIRSPEED LIMITATIONS

	Design Speeds	KPH	
V <sub>NE</sub>	Never Exceed Speed	600	Never Exceed in Any Operation
V <sub>FE</sub>	Max. Flaps Extend Speed	150	Do Not Extend Flaps Above this Speed
V <sub>FO</sub>	Max Flaps Operating Speed	125	Do not operate landing gear above this speed
V <sub>LE</sub>	Max Landing Gear Extended Speed	NA	Max speed with gear extended
V <sub>R</sub>	Rotation Speed	115	Speed at which the Airplane Lifts Off
V <sub>REF</sub>	Landing Reference Speed	150	Threshold crossing speed
V <sub>S</sub>	Stall Speed	130	Min Speed in which the A/C is controllable
V <sub>S0</sub>	Stall Speed	110	Stall Speed in Landing Configuration
V <sub>Y</sub>	Best Rate-of-Climb	215	Delivers Gain in Altitude in Shortest Time
V <sub>BE</sub>	Max Speedbrake Extended Speed	430	Do Not Extend Brakes Above this Speed

## AIRSPEED INDICATOR OPERATING RANGES

ASI MARKING	KPH Range	Description
White Arc	110 - 150 KPH	Full Flap Operating Range. Lower Limit is Max. Weight V <sub>S0</sub> . Upper Limit Max Speed w/Flaps Extended.
Green Arc	130 - 600 KPH	Normal Operating Range. Lower Limit is Max. Weight V <sub>S</sub> . Upper limit Is Max Structural Cruising Speed.
Red Line	600 KPH	Maximum Speed for ALL operations.

## OPERATING DATA

Condition	Take-Off	Climb	Cruise	Max Dive	Condition	
Limit	1 min	30 min	Cont		Limit	Luftschaubestellungs...
Man Press	1.35 ATA	1.15ATA	1.1 ATA	IDLE	Boost	Full Course
RPM	2300	2300	2100	2400	RPM	Full Fine
Pitch	Start/Climb	Start/Climb	Cruise/Dive	Cruise/Dive	Pitch	

Oil Pressure	Oil Temperature (Inlet)		Oil Temperature (Outlet)		Fuel Pressure
Min = 4 kg/cm2	Min = 30° C	Max = 90° C	Min = 40° C	Max = 95° C	Min = 1.0 kg/cm2
Max = 6 kg/cm2	Emergency Max = ° C		Emergency Max = ° C		Max = 1.5 kg/cm2

Maximum Coolant Temperature						Oxygen
Sea Level	2000 m	4000 m	6000 m	8000 m	Min Temp	Begin Use @ 4000 m
Max = 95° C	Max = 95° C	Max = 90° C	Max = 85° C	Max = 80° C	Min = 60° C	Min Pressure= kg/cm2

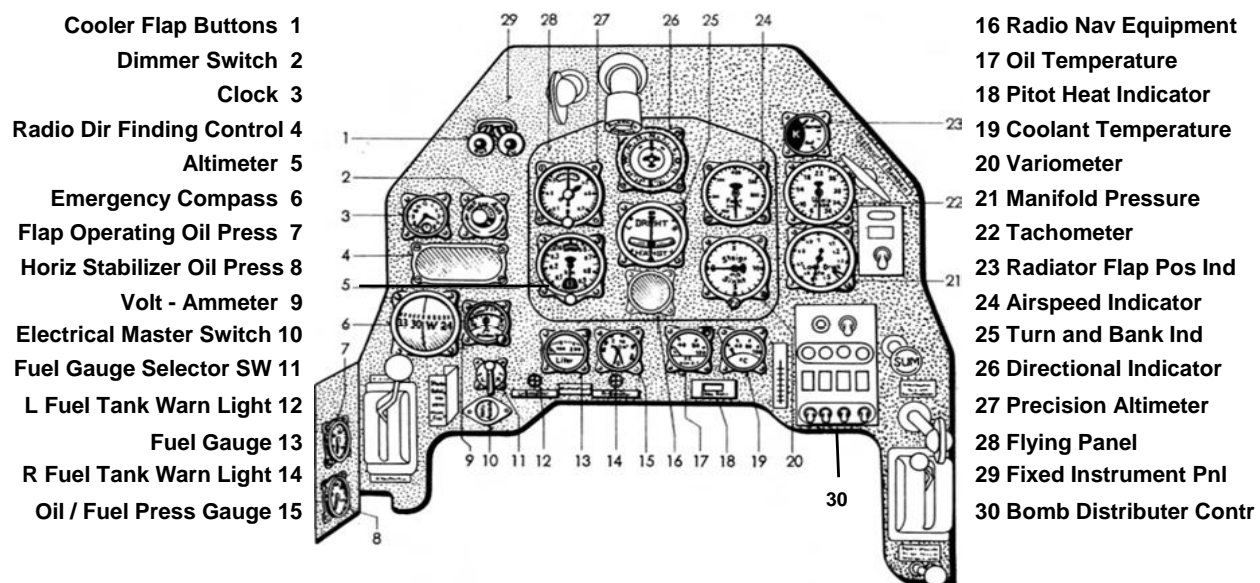
## Best Airspeed for Climb

Sea Level	1000 m	2000 m	3000 m	4000 m	5000 m	6000 m	7000 m
215 kph	205 kph	195kph	185 kph	175 kph	165 kph	155 kph	145kph

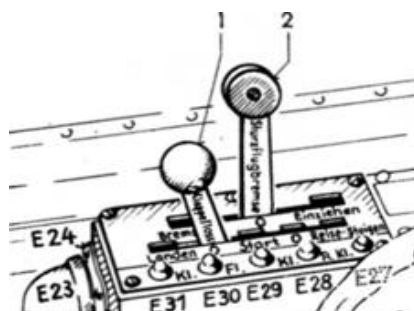
ONE

ONE

Aircraft Type	Engine Type	Fuel	Reference
Ju 87B-2	Jumo 211 D / Ju VS5 VP	87 Oct	Ju 87B-2 Betriebsanleitung Jun 1940
Upper Panel	Main Instrument Panel	Lower panel	



### Flap Controls



- 1 Landing Flap Lever
- 2 Dive Brake Lever

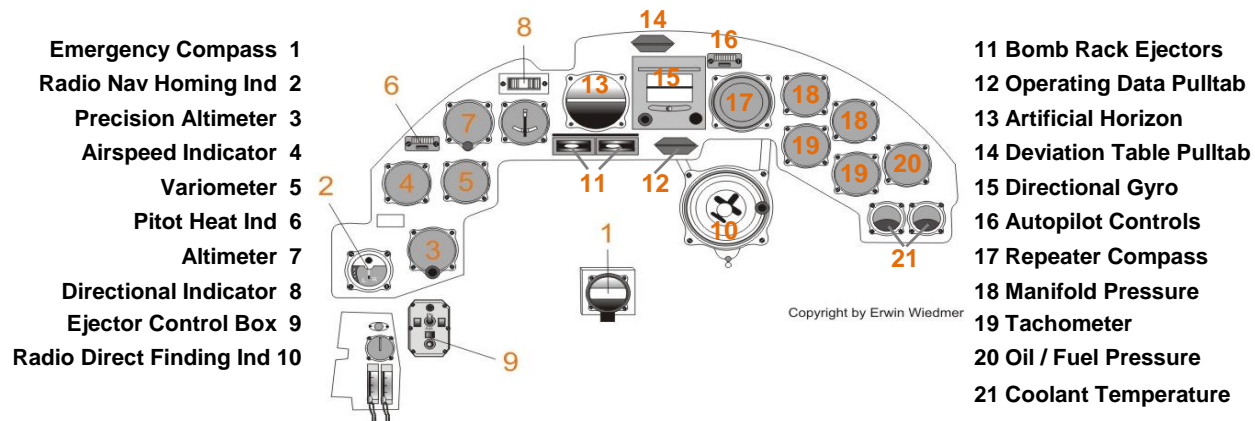
ONE		Ju 88A						ONE	
Aircraft Type		Engine & Prop		Fuel		Reference			
Ju 88A-1		Jumo 211B-1		87 Oct					
AIRSPEED LIMITATIONS									
	Design Speeds			KPH					
V <sub>NE</sub>	Never Exceed Speed (wo/w dive break)			675/575		Never Exceed in Any Operation			
V <sub>FE</sub>	Max. Flaps Extend Speed (25°/50°)			320/275		Do Not Extend Flaps Above this Speed			
V <sub>LO</sub>	Max Landing Gear Operating Speed			NA		Do not operate landing gear above this speed			
V <sub>LE</sub>	Max Landing Gear Extended Speed			265		Max speed with gear extended			
V <sub>R</sub>	Rotation Speed (13k/13.7k kg)			175/180		Speed at which the Airplane Lifts Off			
V <sub>REF</sub>	Landing Reference Speed			210		Threshold crossing speed			
V <sub>S</sub>	Stall Speed			180		Min Speed in which the A/C is controllable			
V <sub>S0</sub>	Stall Speed			160		Stall Speed in Landing Configuration			
V <sub>Y</sub>	Best Rate-of-Climb			250		Delivers Gain in Altitude in Shortest Time			
V <sub>BE</sub>	Max Speedbrake Extended Speed			NA		Do Not Extend Brakes Above this Speed			
AIRSPEED INDICATOR OPERATING RANGES									
ASI MARKING		KPH Range		Description					
White Arc		160 - 320 KPH		Full Flap Operating Range. Lower Limit is Max. Weight V <sub>S0</sub> . Upper Limit Max Speed w/Flaps Extended.					
Green Arc		180 - 600 KPH		Normal Operating Range. Lower Limit is Max. Weight V <sub>S</sub> . Upper limit Is Max Structural Cruising Speed.					
Yellow Arc		600 - 675 KPH		Operation must be above 2000m Altitude					
Red Line		675 KPH		Maximum Speed for ALL operations.					
OPERATING DATA									
Condition	Take-Off	Climb	Cruise	Max Dive	Condition				
Limit	5 min	30 min	Cont		Limit	Luftschraubestellungs...			
Man Press	1.25 ATA	1.25ATA	1.15 ATA	IDLE	Boost	Full Course	9:30		
RPM	2600	2400	2250/2400	2600	RPM	Full Fine	12:00		
Pitch					Pitch				
Oil Pressure		Oil Temperature (Inlet)		Oil Temperature (Outlet)		Fuel Pressure			
Min = 4 kg/cm2		Min = 30° C	Norm = 80° C	Min = ##° C	Max = ##° C	Min = 1.0 kg/cm2			
Max = 9 kg/cm2		Emergency Max = 105° C		Emergency Max = ##° C		Normal = 2 - 2.5 kg/cm2			
Maximum Coolant Temperature					Oxygen				
Sea Level	1000 m	< 4000 m	< 8000 m	Emer <10min	Min Temp	Begin Use @ 4000 m			
Max = 110° C	Max = 110° C	Max = 100° C	Max = 80° C	Max = 120° C	Min = 40° C	Min Pressure= ## kg/cm2			
Best Airspeed for Climb									
Sea Level	1000 m	2000 m	3000 m	4000 m	5000 m	6000 m	7000 m		
250 kph						240 kph			
ONE						ONE			

FIVE

## Ju 88A

FIVE

Aircraft Type	Engine Type	Fuel	Reference
Ju 88A-1	Jumo 211B-1	87 Oct	
Upper Panel	Main Instrument Panel	Lower panel	



FIVE

FIVE

**ERRATA,  
AND  
ADDITIONAL AIRCRAFT**

# Errata

Yeah, this section hasn't been done yet making this entire document a worthless pile of steaming dog doo. I blame bosses, Real Life™, beer (especially that good German stuff like Molson), and hot, humid weather.



ONE

## Hurricane Mk I Early

ONE

Aircraft Type	Engine & Prop	Fuel	Reference
Hurricane Mk I	Merlin II / FP	87 Oct	Pilot's Notes: AP 1564A; Mar 1939

## AIRSPEED LIMITATIONS

	Design Speeds	MPH	
$V_{NE}$	Never Exceed Speed	380	Never Exceed in Any Operation
$V_{FE}$	Max. Flaps Extend Speed	120	Do Not Extend Flaps Above this Speed
$V_{LO}$	Max Landing Gear Operating Speed	150	Do not operate landing gear above this speed
$V_{LE}$	Max Landing Gear Extended Speed	NA	Max speed with gear extended
$V_R$	Rotation Speed	80	Speed at which the Airplane Lifts Off
$V_{REF}$	Landing Reference Speed	NA	Threshold crossing speed
$V_S$	Stall Speed	72	Min Speed in which the A/C is controllable
$V_{S0}$	Stall Speed	55	Stall Speed in Landing Configuration
$V_Y$	Best Rate-of-Climb	157	Delivers Gain in Altitude in Shortest Time
$V_{BE}$	Max Speedbrake Extended Speed	NA	Do Not Extend Brakes Above this Speed

## AIRSPEED INDICATOR OPERATING RANGES

ASI MARKING	MPH Range	Description
White Arc	55 - 120 MPH	Full Flap Operating Range. Lower Limit is Max. Weight $V_{S0}$ . Upper Limit Max Speed w/Flaps Extended.
Green Arc	72 - 380 MPH	Normal Operating Range. Lower Limit is Max. Weight $V_S$ . Upper limit Is Max Structural Cruising Speed.
Red Line	380 MPH	Maximum Speed for ALL operations.

## LIMITING OPERATIONAL CONDITIONS

Condition	Take-Off	All Out Level	Climb	Max Cruise	Max Cruise	Max Dive	Condition
Limit	1000' or 3 min	5 min	30 min	Cont	Cont	20 sec	Limit
Boost	+6.25 PSI	+6.25 PSI	+6.25 PSI	+4.5 PSI	+2.25 PSI	+6.25 PSI	Boost
RPM	2850	3000	2600	2600	2600	3600	RPM
Mixture	Rich	Rich	Rich	Rich	Weak	Rich	Mixture

Oil Pressure	Oil Temperature		Coolant Temperature		Operating Pressures
Emer Min = 45 PSI	Min = 15° C	Max = 90° C	Normal = 95° C		Fuel = 1.75 - 2 PSI
Normal = 60 PSI	Emergency Max = 95° C		Min = 70° C	Max = 120° C	Brake >= 120 PSI

## Correction of ASI Reading for Postion Error

ASI (MPH)	+ / -	Adjustment	CAS (MPH)
80	+	6	86
100	+	3.2	103.2
120	+	0.5	120.5
140	-	1.7	138.3
160	-	4.0	154
180	-	6.0	174
200	-	7.5	192.5
220	-	8.7	211.3
240	-	9.5	230.5
260	-	9.7	250.3

Note: Hurricane MkI Early Checklist Based on Pilot's Notes for Hurricane MkI with Merlin II and 2 Bladed Fixed Pitch  
Airscrew.

ONE

ONE

TWO

## Hurricane Mk I Early

TWO

## PRELIMINARIES

1. Switch on Light Indicator and Check for -- **TWO GREEN** --lights
2. Safety Catch of Hydraulic Selector Covers Chasis -- **UP** -- Position
3. Radiator Flap -- **OPEN** --; In Cold Weather, Keep -- **CLOSED** -- Until Coolant Temperature Rises
4. Movement of the Flying Controls -- **CHECK**
5. Check Throttle Lever Friction Adjustment

## STARTING ENGINE

**NOTE:**

For full Particulars of the Merlin II engine see A.P. 1590B, Volume I.

**NOTE:**

For starting purposes, the engine should be supplied from the reserve tank as this provides a gravity feed. If main tanks are less than 1/2 full, run up and take off should be on reserve tank. Do not change fuel distributor cock until take off has been accomplished to prevent interruption of fuel flow.

**\*\*\* IMPORTANT \*\*\***

**To prevent any danger of air locks in the fuel system, do not exhaust the contents of the reserve or main tanks before switching to the other fuel tank.**

1. Check fuel tank levels and determine which to use for run-up and take-off.
2. Fuel Distributer Cock -- **RESERVE**
3. Throttle Lever Forward -- **.5 INCH**
4. Prime the Cylinders by Injecting -- **FIVE** -- Shots of Fuel
5. Propeller Area -- **CLEAR**
6. Main and Starting Magneto Switches -- **ON**
7. Starting Switch -- **PRESS AND HOLD** -- No More Than -- **30 SECONDS**
8. If Engine Fails to Start Immediately; Then -- **1 OR 2** -- Pumps of Primer
9. Upon Engine START; Starting Magneto to -- **OFF** --; Fuel Distributer Cock -- **MAIN TANK**
10. Warm at Fast Tick-over Until Oil Temperature -- **15° C** --; Radiator Temperature -- **70° C**

## CHECKING ENGINE AND INSTALLATIONS

**NOTE:**

The throttle may be opened fully only for the shortest periods necessary for the checks to be made.

1. Fuel Pressure: Main Tank -- **1.75 - 2 PSI** --; Reserve Tank -- **2.25 - 3 PSI**
2. Check Hydraulic Engine Pump: Operate Flaps; Select -- **FLAPS DOWN** -- then Depress Operating Lever
3. Check Hydraulic Hand Pump: Return Flaps; Select -- **FLAPS UP** -- then Operating Hand Lever
4. RPM -- **2100 - 2200**
5. Boost -- **+6 PSI**
6. Oil Pressure: -- **70 - 95 PSI** -- Initially; -- **60 PSI** -- at NORMAL Temperature
7. Test Magnetos: RPM Drop Less Than -- **80 RPM**
8. Brake Air Pressure -- **100 PSI**

## PREPARATION BEFORE TAKE-OFF

1. Set Elevator Trim for Take-off; Indicator In -- **CENTRAL** -- Position
2. Depress Flaps -- **28°** -- Indicator -- **TWO** -- Divisions
3. Hydraulic Selector Gate to Uncover -- **UP** -- Position for Undercarriage Lever
4. Cockpit Hood -- **OPEN and LOCKED**

TWO

TWO

THREE

## Hurricane Mk I Early

THREE

## TAXYING OUT

1. Parking Brake -- **RELEASED**
2. Brakes Can Be Used With Confidence
3. Check Brake Pressure During Prolonged Taxying

## TAKE-OFF

## NOTE:

The aeroplane should be taken off at full throttle with the mixture control at "Rich".

1. Firm Push on Control Column to Raise the Tail
2. Rotate at -- **> 80 MPH** -- ASI
3. Raise Undercarriage: Select Wheels -- **UP** --; Press and Hold Operating Lever Until -- **BOTH** -- Red Lights On
4. Raise Flaps at -- **> 90 MPH** -- ASI; Select Flaps -- **UP** -- Press Op Lever Until Flap Indicator Shows -- **UP**
5. Fuel Distributor Cock -- **MAIN** -- Tank

## PRECAUTION AFTER TAKE-OFF

As a safeguard in the event of engine failure, a steep angle of climb should not be attempted.  
Aim at clearing aerodrome boundary by a small margin.

## CLIMBING

The optimum full throttle indicated climbing speed is 157 MPH. The radiator flap should be set to fully open.

## APPROACH

1. Reduce Speed to -- **150 MPH** -- ASI
  - 1.a. Hood -- **OPEN and LOCK**
  - 1.b. Wheels: Engine Pump: Select Wheels -- **DOWN** ; Press Operating Lever Until -- **GREEN** -- Lamps Light  
ALT: Wheels: Hand Pump: Select Wheels -- **DOWN** ; Operate Hand Pump Until -- **GREEN** -- Lamps Light
2. Flaps: Select Flaps -- **DOWN** --; Press Oil Valve Operating Lever or Operate Hand Pump
3. For Unsuccessful Landing: Take-off again with Flaps and Gear -- **DOWN**
4. Check Brake Pressure: Before Landing -- **>120 PSI**
5. Flaps Up Approach: Increase Approach Speed by -- **10 MPH** -- ASI

## LANDING

**Non Engine Assisted Approach: 90 MPH ASI**

**Engine Assisted Approach: 80 MPH ASI**

**Brakes -- Use with Confidence**

## SHUTTING DOWN

1. Allow Engine to -- **IDLE** -- For a Short Period
2. Fuel Distributor Cocks -- **OFF**
3. Switches -- **OFF** -- When Irregular Firing Becomes Noticable
4. Switch Undercarriage Indicator -- **OFF**
5. Select Flaps -- **UP**
6. Safety Catch of Hydraulic Selector Covers Chasis -- **UP** -- Position

## UNDERCARRIAGE EMERGENCY OPERATION

If difficulty is experienced in selecting wheels "DOWN", or the wheels fail to drop (indicated by the failure of the RED lights to extinguish), select wheels "UP" again and press the operating lever for 15 seconds or operate the hand pump; after which select wheels "DOWN" immediately.

1. Reduce Speed to -- **90 MPH** -- ASI
2. Press Undercarriage Emergency Release Knobs with -- **BOTH FEET** -- and Select Wheels -- **DOWN**

## FORCED LANDING OWING TO ENGINE FAILURE

1. Undercarriage -- **AS DETERMINED** -- If in Doubt, Land with Undercarriage -- **UP**
2. Flaps -- **AS REQUIRED** -- Using Hand Pump

THREE

THREE

ONE		Hurricane Mk I (87 Octane)				ONE	
Aircraft Type		Engine & Prop		Fuel	Reference		
Hurricane Mk I		Merlin III / RotoI CSP		87 Oct	Pilot's Notes: AP 1564A; Mar 1939		
AIRSPEED LIMITATIONS							
	Design Speeds			MPH			
V <sub>NE</sub>	Never Exceed Speed			380	Never Exceed in Any Operation		
V <sub>FE</sub>	Max. Flaps Extend Speed			120	Do Not Extend Flaps Above this Speed		
V <sub>LO</sub>	Max Landing Gear Operating Speed			150	Do not operate landing gear above this speed		
V <sub>LE</sub>	Max Landing Gear Extended Speed			NA	Max speed with gear extended		
V <sub>R</sub>	Rotation Speed			80	Speed at which the Airplane Lifts Off		
V <sub>REF</sub>	Landing Reference Speed			NA	Threshold crossing speed		
V <sub>S</sub>	Stall Speed			72	Min Speed in which the A/C is controllable		
V <sub>S0</sub>	Stall Speed			55	Stall Speed in Landing Configuration		
V <sub>Y</sub>	Best Rate-of-Climb			157	Delivers Gain in Altitude in Shortest Time		
V <sub>BE</sub>	Max Speedbrake Extended Speed			NA	Do Not Extend Brakes Above this Speed		
AIRSPEED INDICATOR OPERATING RANGES							
ASI MARKING		MPH Range		Description			
White Arc		55 - 120 MPH		Full Flap Operating Range. Lower Limit is Max. Weight V <sub>S0</sub> . Upper Limit Max Speed w/Flaps Extended.			
Green Arc		72 - 380 MPH		Normal Operating Range. Lower Limit is Max. Weight V <sub>S</sub> . Upper limit Is Max Structural Cruising Speed.			
Red Line		380 MPH		Maximum Speed for ALL operations.			
LIMITING OPERATIONAL CONDITIONS							
Condition	Cbt Emer	Take Off	Climb	Max Cruise	Max Cruise	Max Dive	Condition
Limit	Limited	5 min	30 min	Cont	Cont	20 sec	Limit
Boost	+6.25 PSI	+6.25 PSI	+6.25 PSI	+4.5 PSI	+2.25 PSI	+6.25 PSI	Boost
RPM	3000	3000	2600	2600	2600	3600	RPM
Mixture	Rich	Rich	Rich	Rich	Weak	Rich	Mixture
Oil Pressure		Oil Temperature		Coolant Temperature		Operating Pressures	
Emer Min = 45 PSI		Min = 15° C	Max = 90° C	Normal = 95° C		Fuel = 1.75 - 2 PSI	
Normal = 60 PSI		Emergency Max = 95° C		Min = 70° C	Max = 120° C	Brake >= 120 PSI	
Correction of ASI Reading for Postion Error							
ASI (MPH)	+ / -	Adjustment	CAS (MPH)				
80	+	6	86				
100	+	3.2	103.2				
120	+	0.5	120.5				
140	-	1.7	138.3				
160	-	4.0	154				
180	-	6.0	174				
200	-	7.5	192.5				
220	-	8.7	211.3				
240	-	9.5	230.5				
260	-	9.7	250.3				
Pilot's Notes General - A.P. 2095 dated April 1943: Variable Pitch Propellors: DH Variable Pitch Propellors (DH 5-20) are directly controlled by the pilot and have TWO settings, FINE and COURSE. FINE should be used for Engine Run Up, Take Off, Low Speed Climb, and Landing with COURSE used in all other stages of flight.							
Note: Hurricane MkI Checklist Based on Pilot's Notes for Hurricane MkI with Merlin II, and Pilot's Notes for Spitfire MkI with Merlin III (Excerpts) and Spitfire MkII with Merlin XII.							
ONE						ONE	

TWO

## Hurricane Mk I (87 Octane)

TWO

## PRELIMINARIES

1. Switch on Light Indicator and Check for -- **TWO GREEN** --lights
2. Safety Catch of Hydraulic Selector Covers Chasis -- **UP** -- Position
3. Radiator Flap -- **OPEN** --; In Cold Weather, Keep -- **CLOSED** -- Until Coolant Temperature Rises
4. Movement of the Flying Controls -- **CHECK**
5. Check Throttle Lever Friction Adjustment

## STARTING ENGINE

**NOTE:**

For full Particulars of the Merlin III engine see A.P.1590B, Volume I.

**NOTE:**

For starting purposes, the engine should be supplied from the reserve tank as this provides a gravity feed. If main tanks are less than 1/2 full, run up and take off should be on reserve tank. Do not change fuel distributor cock until take off has been accomplished to prevent interruption of fuel flow.

**\*\*\* IMPORTANT \*\*\***

**To prevent any danger of air locks in the fuel system, do not exhaust the contents of the reserve or main tanks before switching to the other fuel tank.**

1. Check fuel tank levels and determine which to use for run-up and take-off.
2. Fuel Distributer Cock -- **RESERVE**
3. Mixture -- **RICH**
4. Pitch Controls Fully Forward to -- **FINE PITCH**
5. Throttle Lever Forward -- **.5 INCH**
6. Radiator Shutter Fully -- **OPEN**
7. Prime the Cylinders by Injecting -- **FIVE** -- Shots of Fuel
8. Propeller Area -- **CLEAR**
9. Main and Starting Magneto Switches -- **ON**
10. Starting Switch -- **PRESS AND HOLD** -- No More Than -- **30 SECONDS**
11. If Engine Fails to Start Immediately; Then -- **1 OR 2** -- Pumps of Primer
12. Upon Engine START; Starting Magneto to -- **OFF** --; Fuel Distributer Cock -- **MAIN TANK**
13. Oil Pressure -- **SATISFACTORY**
14. Warm at Fast Tick-over Until Oil Temperature -- **15° C** --; Radiator Temperature -- **70° C**

## CHECKING ENGINE AND INSTALLATIONS

**NOTE:**

The throttle may be opened fully only for the shortest periods necessary for the checks to be made.

**\*\*\* IMPORTANT \*\*\***

**The engine should on no account be opened up with the airscrew in coarse pitch (control lever back) as the blade angle is too coarse and severe detonation will result.**

1. Fuel Pressure: Main Tank -- **1.75 - 2 PSI** --; Reserve Tank -- **2.25 - 3 PSI**
2. Check Hydraulic Engine Pump: Operate Flaps; Select -- **FLAPS DOWN** -- then Depress Operating Lever
3. Check Hydraulic Hand Pump: Return Flaps; Select -- **FLAPS UP** -- then Operating Hand Lever
4. Hood -- **OPEN and LOCKED**
5. Harness Release -- **FIXED** -- Position
6. Make Other General Preparations For Flight
7. Open Throttle to -- **RATED** -- Gate. Ensure two men hold down the tail
  - 7a-1. Boost -- **+6.25 PSI**
  - 7a-2. RPM -- **2750 - 2850**
  - 7a-3. Oil Pressure -- **60 PSI** -- at NORMAL Temperature
  - 7b. Test Magnetos: Full Throttle, Pitch Full Forward (Fine) - RPM Drop Less Than -- **80 RPM**
  - 7c. Throttle at RATED Gate; Reduce Pitch Slowly until -- **2400 RPM** --. Throttle Down Slightly to Observe RPM maintained at 2400 RPM. Return Pitch to -- **FULLY FINE**
8. Brake Air Pressure -- **100 PSI**

TWO

TWO

THREE

## Hurricane Mk I (87 Octane)

THREE

## TAXYING OUT

1. Parking Brake -- **RELEASED**
2. Radiator Shutter -- **FULLY OPEN**
2. Brakes Can Be Used With Confidence
3. Check Brake Pressure During Prolonged Taxying

## FINAL PREPARATION FOR T-O - DRILL OF VITAL ACTIONS

**NOTE:**

*On reaching the take-off position, stop across wind, facing the aerodrome circuit, and carry out the Drill of Vital Actions. Some of this may already have been done, but must invariably be checked before every take-off. A convenient catch-phrase is applied to this drill "TMPF and Flaps".*

1. T - Trimming Tabs: Elevator Trim for Take-off; Indicator In -- **CENTRAL** -- Position
2. M - Mixture Control -- **RICH**
3. P - Pitch Control -- **FULLY FINE** -- (Lever Fully Forward)
4. F - Fuel Distributor Cock -- **MAIN** -- Tanks
5. Flaps - Depress To -- **28°** -- Indicator -- **TWO** -- Divisions
6. Hydraulic Selector Gate to Uncover -- **UP** -- Position for Undercarriage Lever

## TAKE-OFF

**NOTE:**

*Turn into wind, steady the aeroplane, and move forward slowly to straighten up the tail wheel; open to full throttle and take-off by holding the aeroplane to a constant attitude. Firm push on Control Column to raise the tail. Correct tendency to swing by coarse rudder control.*

**NOTE:**

*As a safeguard in the event of engine failure, a steep angle of climb should not be attempted. Aim at clearing aerodrome boundary by a small margin.*

## ACTIONS AFTER TAKING-OFF

**IMMEDIATE ACTIONS:** Upon Ensuring Gaining SPEED and ALTITUDE

1. Raise Undercarriage: Select Wheels -- **UP** --; Press & Hold Operating Lever Until -- **BOTH** -- Red Lights On
  - 1.a. Return Selector Lever to -- **NEUTRAL**
2. Throttle -- **RATED (+6.25 PSI Boost)** --; Pitch -- **2850 RPM**
3. Raise Flaps at -- **> 90 MPH** -- ASI; Select Flaps -- **UP** -- Press Op Lever Until Flap Indicator Shows -- **UP**
4. Accelerate to -- **140 MPH ASI** -- at -- **+6.25 PSI Boost** -- Adjusting Attitude to Maintain Speed

**SUBSEQUENT ACTIONS:** Perform When Ready

5. Fuel Distributor Cock -- **MAIN** -- Tank
6. Oil Pressure -- **60 PSI**
7. Hood -- **FULLY CLOSE**
8. Radiator Shutter -- **CLOSE**
9. Engine Controls: Adjust Throttle and Pitch as Required
10. Check Radiator and Oil Temperature
11. Begin Cockpit Scan

## CLIMBING

The optimum full throttle indicated climbing speed is 170 MPH.

**Engine Management -- +6.25 PSI Boost, 2850 RPM, 30 Min Limit**

1. Radiator Temperatures -- **Max 120° C** -- Adjust Radiator Shutter as Required
2. Oil Inlet Temperature -- **Max 90° C**

THREE

THREE

FOUR

## Hurricane Mk I (87 Octane)

FOUR

## APPROACH

1. Reduce Speed to -- **150 MPH** -- ASI
2. Hood -- **OPEN and LOCK**
2. Mixture -- **NORMAL**
3. Maps -- **STOW**
4. Radiator -- **AS REQUIRED**
5. Check Brake Pressure: Before Landing -- **>120 PSI**
6. Flaps Up Approach: Increase Approach Speed by -- **10 MPH** -- ASI

## DRILL OF VITAL ACTIONS FOR LANDING

**NOTE:**

*This should be carried out quickly and decisively when the right moment arrives, when approaching the lee side of the aerodrome. A convenient catch-phrase is applied to this drill, "U.P. and Flaps".*

1. Wheels: Engine Pump: Select Wheels -- **DOWN** ; Press Operating Lever Until -- **GREEN** -- Lamps Light
  - 1.a. Wheels: Hand Pump: Select Wheels -- **DOWN** ; Operate Hand Pump Until -- **GREEN** -- Lamps Light
2. P - Pitch Control -- **FULLY FINE** -- (Lever Fully Forward)
3. Flaps: Select Flaps -- **DOWN** --; Press Oil Valve Operating Lever or Operate Hand Pump

## LANDING

**Non Engine Assisted Approach: 90 MPH ASI**

**Engine Assisted Approach: 80 MPH ASI**

**Brakes -- Use With Confidence**

## MISLANDING

1. Power -- **FULL THROTTLE**
2. Flaps and Gear -- **DOWN**

## SHUTTING DOWN

1. Radiator Shutter -- **OPEN**
2. Taxi to Park; Fuel Cocks -- **OFF** --; Slow Running Cut Out -- **PULL and HOLD** -- ; Ignition -- **OFF**
3. Switch Undercarriage Indicator -- **OFF**
4. Select Flaps -- **UP**
5. Safety Catch of Hydraulic Selector Covers Chasis -- **UP** -- Position
6. Indicator Lights and Other Electrical Equipment -- **OFF**

## UNDERCARRIAGE EMERGENCY OPERATION

*If difficulty is experienced in selecting wheels "DOWN", or the wheels fail to drop (indicated by the failure of the RED lights to extinguish), select wheels "UP" again and press the operating lever for 15 seconds or operate the hand pump; after which select wheels "DOWN" immediately.*

1. Reduce Speed to -- **90 MPH** -- ASI
2. Press Undercarriage Emergency Release Knobs with -- **BOTH FEET** -- and Select Wheels -- **DOWN**

## ENGINE FAILURE DURING TAKE-OFF

*In case of engine failure during takeoff, the first and foremost essential is maintain ample flying speed.*

1. Attitude -- **NOSE DOWN**
2. Undercarriage -- **UP**
3. Flaps -- **DOWN**
4. Land Straight Ahead; DO NOT ATTEMPT TO TURN
5. Fuel Cocks and Switches -- **OFF**

## FORCED LANDING OWING TO ENGINE FAILURE

*Maintain ample gliding speed, select a landing ground, glide toward it and try to rectify the trouble.*

*If landing without engine is inevitable, act as the following:*

1. Ignition and Fuel Cocks -- **OFF**
2. Undercarriage -- **AS DETERMINED** -- If in Doubt, Land with Undercarriage -- **UP**
3. Approach and Land as Normal; Flaps -- **AS REQUIRED** -- Use Hand Pump

FOUR

FOUR



ONE	<b>Spitfire Mk I (87 Octane)</b>						ONE																																																
<b>Aircraft Type</b>		<b>Engine &amp; Prop</b>		<b>Fuel</b>	<b>Reference</b>																																																		
Spitfire Mk I		Merlin III / RotoI CSP		87 Oct	Pilot's Notes: AP 1565A; Date																																																		
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	<b>Design Speeds</b>			<b>MPH</b>																																																			
V <sub>NE</sub>	Never Exceed Speed			450	Never Exceed in Any Operation																																																		
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Red Line		450 MPH		Maximum Speed for ALL operations.																																																			
<b>LIMITING OPERATIONAL CONDITIONS</b>																																																							
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Limit	Limited	5 min	30 min	Cont	Cont	20 sec	Limit																																																
Boost	+6.25 PSI	+6.25 PSI	+6.25 PSI	+4.5 PSI	+2.25 PSI	+6.25 PSI	Boost																																																
RPM	3000	3000	2600	2600	2600	3600	RPM																																																
Mixture	Normal	Normal	Normal	Normal	Weak	Normal	Mixture																																																
<b>Oil Pressure</b>		<b>Oil Temperature</b>		<b>Coolant Temperature</b>		<b>Operating Pressures</b>																																																	
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ONE							ONE																																																



TWO

# Spitfire Mk I (87 Octane)

TWO

## PRELIMINARIES

1. Ignition switches -- **OFF**
2. Undercarriage Selector Lever Position -- **DOWN** -- gate; Indicator Shows -- **IDLE**
3. Switch on Light Indicator and Check for -- **GREEN** --lights
4. Flaps -- **UP**
5. Landing Lamps -- **UP**
6. Wheel Brakes -- **ON**
7. Fuel Contents -- **CHECK**
8. Movement of the Flying Controls -- **CHECK**

## STARTING ENGINE

**NOTE:** For full Details of the Merlin XII engine see A.P. 1590B, Volume I.

**NOTE:** Whenever possible the pilot should start the engine himself; this will ensure that he will have ample time to carry out all of the checks, and that unnecessary running of the engine is avoided.

1. Mixture -- **NORMAL**
2. Pitch Controls Fully Forward to -- **FINE PITCH**
3. Radiator Shutter Fully -- **OPEN**
4. Raise Both Fuel Cock Levers to -- **ON**
5. Prime the Cylinders by Injecting -- **FIVE** -- Shots of Fuel
6. Propeller Area -- **CLEAR**
7. Switch Ignition -- **ON** --; Throttle -- **OPEN SLIGHTLY**
8. Starting Switch -- **PRESS AND HOLD** -- No More Than -- **30 SECONDS**

**NOTE:** Do not oscillate the throttle lever, but open it slowly to get the engine running smoothly at a fast tick-over; if the engine begins to fade, or "spit-back", close the throttle quickly and open it up again very slowly.

9. Oil Pressure -- **SATISFACTORY**
10. Warm at Fast Tick-over Until Oil Temperature -- **15° C** --; Radiator Temperature -- **70° C**

## TESTING ENGINE AND INSTALLATIONS

**NOTE:** The engine should not be run at full power for more than a few seconds - just long enough to test magnetos and observe oil pressure, boost and r.p.m.

**\*\*\* IMPORTANT \*\*\***

**The engine should on no account be opened up with the airscrew in coarse pitch (control lever back) as the blade angle is too coarse and severe detonation will result.**

1. Fuel Pressure -- **2.5 - 3 PSI**
2. Brake Pressure - Reservoir Pressure at least -- **120 PSI**
3. Pneumatic Systems - Cycle Flaps -- **DOWN** -- and -- **UP**
4. Set Altimeter and Directional Gyro
5. Hood -- **LOCKED OPEN** --; Emergency Exit Door at -- **HALF COCK** -- Position
6. Harness Release -- **FIXED** -- Position
7. Make Other General Preparations For Flight

**NOTE:** Warming up should not be unduly prolonged, as the temperature rises quickly, and some margin must be kept in hand for taxiing. If it is 130° before the aeroplane taxis out, it will become excessive if there is any distance to taxi downwind. The engine should not idle for any length of time in a light wind, and the aircraft should always face into the wind.

8. Open Throttle to -- **RATED** -- Gate. Ensure two men hold down the tail
  - 8a-1. Boost -- **+6.25 PSI**
  - 8a-2. RPM -- **2750 - 2850**
  - 8a-3. Oil Pressure -- **60 PSI** -- at NORMAL Temperature
  - 8b. Test Magnetos: Full Throttle, Pitch Full Forward (Fine) - RPM Drop Less Than -- **80 RPM**
  - 8c. Throttle at RATED Gate; Reduce Pitch Slowly until -- **2400 RPM** --. Throttle Down Slightly to Observe RPM maintained at 2400 RPM. Return Pitch to -- **FULLY FINE**
  - 8d. Wave Away Chocks

TWO

TWO

THREE

# Spitfire Mk I (87 Octane)

THREE

## TAXYING OUT

1. Parking Brake -- **RELEASED**
2. Radiator Shutter -- **FULLY OPEN**
3. Brake Pressure -- **CHECK** --. If failure during taxi, apply FULL Brake immediately.
- 4a. Use the brakes as little as possible in taxiing, in order to save wear
- 4b. Do not relax throttle tension in order to prevent throttle coming back during take off
- 4c. Clear Engine before take off by increasing to moderate rpm against fully held brakes

## FINAL PREPARATION FOR T-O - DRILL OF VITAL ACTIONS

**NOTE:**

*On reaching the take-off position, stop across wind, facing the aerodrome circuit, and carry out the Drill of Vital Actions. Some of this may already have been done, but must invariably be checked before every take-off. A convenient catch-phrase is applied to this drill "TMP and Flaps".*

1. T - Trimming Tabs -- **Elevator One Division Nose Down; Rudder Central**
2. M - Mixture Control -- **NORMAL**
3. P - Pitch Control -- **FULLY FINE** -- (Lever Fully Forward)
4. Flaps -- **UP**

**NOTE:**

*The aeroplane would, however, take-off with flaps down, and if, by a serious omission of drill, the pilot leaves them down, he must on no account raise them until speed is at least 120 mph ASI at a safe height.*

## TAKING-OFF

**NOTE:**

*Turn into wind, steady the aeroplane, and move forward slowly to straighten up the tail wheel; open to full throttle and take-off by holding the aeroplane to a constant attitude. The tail need not be raised much. Correct tendency to swing by coarse rudder control. Hold down to almost level flight.*

## ACTIONS AFTER TAKING-OFF

**IMMEDIATE ACTIONS:** Upon Ensuring Gaining SPEED and ALTITUDE

1. Undercarriage -- **RAISE** -- Check Red Indicator Light -- **UP** -- is On
2. Throttle -- **RATED (+6.25 PSI Boost)** --; Pitch -- **2850 RPM**
3. Accelerate to -- **185 MPH ASI** -- at -- **+6.25 PSI Boost** -- Adjusting Attitude to Maintain Speed

**SUBSEQUENT ACTIONS:** Perform When Ready

4. Oil Pressure -- **60 PSI**
5. Emergency Exit Door -- **FULLY CLOSE** --; Hood -- **FULLY CLOSE**
6. Radiator Shutter -- **CLOSE**
7. Engine Controls: Adjust Throttle and Pitch as Required
8. Check Radiator and Oil Temperature
9. Begin Cockpit Scan

## CLIMBING

**Engine Management -- +6.25 PSI Boost, 2850 RPM, 30 Min Limit**

1. Radiator Temperatures -- **Max 120° C** -- Adjust Radiator Shutter as Required
2. Oil Inlet Temperature -- **Max 90° C**

THREE

THREE

FOUR

# Spitfire Mk I (87 Octane)

FOUR

## PRELIMINARY APPROACH

1. Hood -- OPEN and LOCK
2. Mixture -- NORMAL
3. Maps -- STOW
4. Radiator -- AS REQUIRED

## DRILL OF VITAL ACTIONS FOR LANDING

**NOTE:** This should be carried out quickly and decisively when the right moment arrives, when approaching the lee side of the aerodrome. A convenient catch-phrase is applied to this drill, "U.P. and Flaps".

1. U- Undercarriage -- DOWN -- Check Green Indicator Light -- DOWN -- is On
2. P - Pitch Control -- FULLY FINE -- (Lever Fully Forward)
3. Flaps -- DOWN -- On Final Approach

**NOTE:** If the undercarriage green indicator light does not come ON, hold the lever hard back in the LOWER position. When the light comes on, release lever to IDLE position. If GREEN indicators do not show fully DOWN and LOCKED, cycle the undercarriage UP then repeat lowering the undercarriage. If indicators still do not show fully DOWN and LOCKED, the EMERGENCY LOWERING SYSTEM should be used.

## LANDING

Non Engine Assisted Approach: 90 MPH ASI

Engine Assisted Approach: 80 - 85 MPH ASI

Brakes -- Use With Care

## MISLANDING

1. Power -- FULL THROTTLE
3. Flaps -- UP -- After Attaining -- 120 MPH ASI

## PROCEDURE AFTER LANDING

1. Flaps -- UP
2. Radiator Shutter -- OPEN
3. Taxi to Park; Fuel Cocks -- OFF --; Slow Running Cut Out -- PULL and HOLD --; Ignition -- OFF
4. Indicator Lights and Other Electrical Equipment -- OFF

## UNDERCARRIAGE EMERGENCY OPERATION

1. Undercarriage -- DOWN
2. Undercarriage Emergency Lever -- FORWARD and DOWN

**NOTE:** After use, replace the CO2 cylinder and seal the lever. Inspect and refill the hydraulic system

## ENGINE FAILURE DURING TAKE-OFF

**NOTE:** In case of engine failure during takeoff, the first and foremost essential is maintain ample flying speed.

1. Attitude -- NOSE DOWN
2. Undercarriage -- UP
3. Flaps -- DOWN
4. Land Straight Ahead; DO NOT ATTEMPT TO TURN
5. Fuel Cocks and Switches -- OFF

## FORCED LANDING OWING TO ENGINE FAILURE

**NOTE:** Maintain ample gliding speed, select a landing ground, glide toward it and try to rectify the trouble. If landing without engine is inevitable, act as the following:

1. Ignition and Fuel Cocks -- OFF
2. Undercarriage -- AS DETERMINED -- If in Doubt, Land with Undercarriage -- UP
3. Approach and Land as Normal; Flaps -- AS REQUIRED

FOUR

FOUR

ONE		Spitfire Mk II (87 Octane)				ONE	
Aircraft Type		Engine & Prop		Fuel	Reference		
Spitfire Mk IIA		Merlin XII / Rotol CSP		87 Oct	Pilot's Notes: AP 1565B; July 1940		
AIRSPEED LIMITATIONS							
	Design Speeds			MPH			
V <sub>NE</sub>	Never Exceed Speed			450	Never Exceed in Any Operation		
V <sub>FE</sub>	Max. Flaps Extend Speed			140	Do Not Extend Flaps Above this Speed		
V <sub>LO</sub>	Max Landing Gear Operating Speed			160	Do not operate landing gear above this speed		
V <sub>LE</sub>	Max Landing Gear Extended Speed			NA	Max speed with gear extended		
V <sub>R</sub>	Rotation Speed			NA	Speed at which the Airplane Lifts Off		
V <sub>REF</sub>	Landing Reference Speed			NA	Threshold crossing speed		
V <sub>S</sub>	Stall Speed			79	Min Speed in which the A/C is controllable		
V <sub>S0</sub>	Stall Speed			71	Stall Speed in Landing Configuration		
V <sub>Y</sub>	Best Rate-of-Climb			160	Delivers Gain in Altitude in Shortest Time		
V <sub>BE</sub>	Max Speedbrake Extended Speed			NA	Do Not Extend Brakes Above this Speed		
AIRSPEED INDICATOR OPERATING RANGES							
ASI MARKING		MPH Range		Description			
White Arc		71 - 140 MPH		Full Flap Operating Range. Lower Limit is Max. Weight V <sub>S0</sub> . Upper Limit Max Speed w/Flaps Extended.			
Green Arc		79 - 450 MPH		Normal Operating Range. Lower Limit is Max. Weight V <sub>S</sub> . Upper limit Is Max Structural Cruising Speed.			
Red Line		450 MPH		Maximum Speed for ALL operations.			
LIMITING OPERATIONAL CONDITIONS							
Condition	Take-Off	All Out Level	Climb	Max Cruise	Max Cruise	Max Dive	Condition
Limit	1000' or 3 min	5 min	30 min	Cont	Cont	20 sec	Limit
Boost	+9 PSI	+7 PSI	+7 PSI	+5 PSI	+2.5 PSI	+9 PSI	Boost
RPM	3000	3000	2850	2650	2650	3600	RPM
Mixture	Normal	Normal	Normal	Normal	Weak	Normal	Mixture
Oil Pressure		Oil Temperature		Coolant Temperature		Operating Pressures	
Emer Min = 45 PSI		Min = 15° C	Max = 90° C	Normal = 100° C		Fuel = 2.5 - 3 PSI	
Normal = 60 PSI		Emergency Max = 95° C		Min = 60° C	Max = 120° C	Brake >= 120 PSI	
Correction of ASI Reading for Postion Error				Use of +9lb/sqin Boost Pressure: AP1565B			
ASI (MPH)	+ / -	Adjustment	CAS (MPH)	1. +9 PSI Boost is availbale with 87 Octane Fuel.			
120	+	7	127	2. Will maintain +9 PSI boost to about 10k feet. Boost will drop above this height. Max (unregulated) boost = +17PSI			
140	+	3	143				
160	-	1	159				
180	-	3.5	176.5				
200	-	6	194				
220	-	7.5	212.5				
240	-	8	232				
260	-	8.5	231.5				
280	-	8.5	271.5				
300	-	8.5	291.5				
The Boost Control Cut-Out enables higher boost pressures. The use, in an emergency, of this high boost pressure is a definite overload condition on the engine and therefore all occasions on which it is essential to make use of this +9lb./sq.in. must be reported by the pilot and recorded in the engine log book so that the engineer officer may be able to assess the reduction in life between overhauls and the need for special inspections.							
Note: Spitfire MkII Checklist Based on Pilot's Notes for Spitfire MkII with Merlin XII.							
ONE						ONE	

TWO

# Spitfire Mk II (87 Octane)

TWO

## PRELIMINARIES

1. Ignition switches -- **OFF**
2. Undercarriage Selector Lever Position -- **DOWN** -- gate; Indicator Shows -- **IDLE**
3. Switch on Light Indicator and Check for -- **GREEN** --lights
4. Flaps -- **UP**
5. Landing Lamps -- **UP**
6. Wheel Brakes -- **ON**
7. Fuel Contents -- **CHECK**
8. Movement of the Flying Controls -- **CHECK**

## STARTING ENGINE

**NOTE:** For full Details of the Merlin XII engine see A.P.1590P, Volume I.

**NOTE:** Whenever possible the pilot should start the engine himself; this will ensure that he will have ample time to carry out all of the checks, and that unnecessary running of the engine is avoided.

1. Mixture -- **NORMAL**
2. Pitch Controls Fully Forward to -- **FINE PITCH**
3. Radiator Shutter Fully -- **OPEN**
4. Raise Both Fuel Cock Levers to -- **ON**
5. Prime the Cylinders by Injecting -- **FIVE** -- Shots of Fuel
6. Propeller Area -- **CLEAR**
7. Cartridge Starting: Switch Ignition --**ON** --; Throttle -- **OPEN SLIGHTLY**
8. **PRESS** -- Starter Button Until Engine is Firing Evenly

**NOTE:** Do not oscillate the throttle lever, but open it slowly to get the engine running smoothly at a fast tick-over; if the engine begins to fade, or "spit-back", close the throttle quickly and open it up again very slowly.

9. Oil Pressure -- **SATISFACTORY**
10. Warm at Fast Tick-over Until Oil Temperature -- **15° C** --; Radiator Temperature -- **70° C**

## TESTING ENGINE AND INSTALLATIONS

**NOTE:** The engine should not be run at full power for more than a few seconds - just long enough to test magnetos and observe oil pressure, boost and r.p.m.

**\*\*\* IMPORTANT \*\*\***

**The engine should on no account be opened up with the airscrew in coarse pitch (control lever back) as the blade angle is too coarse and severe detonation will result.**

1. Fuel Pressure -- **2.5 - 3 PSI**
2. Brake Pressure - Reservoir Pressure at least -- **120 PSI**
3. Pneumatic Systems - Cycle Flaps -- **DOWN** -- and -- **UP**
4. Set Altimeter and Directional Gyro
5. Hood -- **LOCKED OPEN** --; Emergency Exit Door at -- **HALF COCK** -- Position
6. Harness Release -- **FIXED** -- Position
7. Make Other General Preparations For Flight

**NOTE:** Warming up should not be unduly prolonged, as the temperature rises quickly, and some margin must be kept in hand for taxiing. If it is 130° before the aeroplane taxis out, it will become excessive if there is any distance to taxi downwind. The engine should not idle for any length of time in a light wind, and the aircraft should always face into the wind.

8. Open Throttle to -- **RATED** -- Gate. Ensure two men hold down the tail
  - 8a-1. Boost -- **+7 PSI**
  - 8a-2. RPM -- **2750 - 2850**
  - 8a-3. Oil Pressure -- **60 PSI** -- at NORMAL Temperature
  - 8b. Test Magnetos: Full Throttle, Pitch Full Forward (Fine) - RPM Drop Less Than -- **80 RPM**
  - 8c. Throttle at RATED Gate; Reduce Pitch Slowly until -- **2400 RPM** --. Throttle Down Slightly to Observe RPM maintained at 2400 RPM. Return Pitch to -- **FULLY FINE**
  - 8d. Wave Away Chocks

TWO

TWO

THREE

# Spitfire Mk II (87 Octane)

THREE

## TAXYING OUT

1. Parking Brake -- **RELEASED**
2. Radiator Shutter -- **FULLY OPEN**
3. Brake Pressure -- **CHECK** --. If failure during taxi, apply FULL Brake immediately.
- 4a. Use the brakes as little as possible in taxiing, in order to save wear
- 4b. Do not relax throttle tension in order to prevent throttle coming back during take off
- 4c. Clear Engine before take off by increasing to moderate rpm against fully held brakes

## FINAL PREPARATION FOR T-O - DRILL OF VITAL ACTIONS

**NOTE:**

*On reaching the take-off position, stop across wind, facing the aerodrome circuit, and carry out the Drill of Vital Actions. Some of this may already have been done, but must invariably be checked before every take-off. A convenient catch-phrase is applied to this drill "TMP and Flaps".*

1. T - Trimming Tabs -- **Elevator One Division Nose Down; Rudder Central**
2. M - Mixture Control -- **NORMAL**
3. P - Pitch Control -- **FULLY FINE** -- (Lever Fully Forward)
4. Flaps -- **UP**

**NOTE:**

*The aeroplane would, however, take-off with flaps down, and if, by a serious omission of drill, the pilot leaves them down, he must on no account raise them until speed is at least 120 mph ASI at a safe height.*

## TAKING-OFF

**NOTE:**

*Turn into wind, steady the aeroplane, and move forward slowly to straighten up the tail wheel; open to full throttle and take-off by holding the aeroplane to a constant attitude. The tail need not be raised much. Correct tendency to swing by coarse rudder control. Hold down to almost level flight.*

## ACTIONS AFTER TAKING-OFF

**IMMEDIATE ACTIONS:** Upon Ensuring Gaining SPEED and ALTITUDE

1. Undercarriage -- **RAISE** -- Check Red Indicator Light -- **UP** -- is On
2. Throttle -- **RATED (+9 PSI Boost)** --; Pitch -- **2850 RPM**
3. Accelerate to -- **185 MPH ASI** -- at -- **+9 PSI Boost** -- Adjusting Attitude to Maintain Speed

**SUBSEQUENT ACTIONS:** Perform When Ready

4. Oil Pressure -- **60 PSI**
5. Emergency Exit Door -- **FULLY CLOSE** --; Hood -- **FULLY CLOSE**
6. Radiator Shutter -- **CLOSE**
7. Engine Controls: Adjust Throttle and Pitch as Required
8. Check Radiator and Oil Temperature
9. Begin Cockpit Scan

## CLIMBING

**Engine Management -- +9 PSI Boost, 2700 RPM, 30 Min Limit**

1. Radiator Temperatures -- **Max 120° C** -- Adjust Radiator Shutter as Required
2. Oil Inlet Temperature -- **Max 90° C**

THREE

THREE

FOUR

# Spitfire Mk II (87 Octane)

FOUR

## PRELIMINARY APPROACH

1. Hood -- OPEN and LOCK
2. Mixture -- NORMAL
3. Maps -- STOW
4. Radiator -- AS REQUIRED

## DRILL OF VITAL ACTIONS FOR LANDING

**NOTE:**

*This should be carried out quickly and decisively when the right moment arrives, when approaching the lee side of the aerodrome. A convenient catch-phrase is applied to this drill, "U.P. and Flaps".*

1. U- Undercarriage -- DOWN -- Check Green Indicator Light -- DOWN -- is On
2. P - Pitch Control -- FULLY FINE -- (Lever Fully Forward)
3. Flaps -- DOWN -- On Final Approach

**NOTE:**

*If the undercarriage green indicator light does not come ON, hold the lever hard back in the LOWER position. When the light comes on, release lever to IDLE position. If GREEN indicators do not show fully DOWN and LOCKED, cycle the undercarriage UP then repeat lowering the undercarriage. If indicators still do not show fully DOWN and LOCKED, the EMERGENCY LOWERING SYSTEM should be used.*

## LANDING

**Non Engine Assisted Approach: 90 MPH ASI**

**Engine Assisted Approach: 80 - 85 MPH ASI**

**Brakes -- Use With Care**

## MISLANDING

1. Power -- FULL THROTTLE
3. Flaps -- UP -- After Attaining -- 120 MPH ASI

## PROCEDURE AFTER LANDING

1. Flaps -- UP
2. Radiator Shutter -- OPEN
3. Taxi to Park; Fuel Cocks -- OFF --; Slow Running Cut Out -- PULL and HOLD --; Ignition -- OFF
4. Indicator Lights and Other Electrical Equipment -- OFF

## UNDERCARRIAGE EMERGENCY OPERATION

1. Undercarriage -- DOWN
2. Undercarriage Emergency Lever -- FORWARD and DOWN

**NOTE:**

*After use, replace the CO2 cylinder and seal the lever. Inspect and refill the hydraulic system*

## ENGINE FAILURE DURING TAKE-OFF

**NOTE:**

*In case of engine failure during takeoff, the first and foremost essential is maintain ample flying speed.*

1. Attitude -- NOSE DOWN
2. Undercarriage -- UP
3. Flaps -- DOWN
4. Land Straight Ahead; DO NOT ATTEMPT TO TURN
5. Fuel Cocks and Switches -- OFF

## FORCED LANDING OWING TO ENGINE FAILURE

**NOTE:**

*Maintain ample gliding speed, select a landing ground, glide toward it and try to rectify the trouble. If landing without engine is inevitable, act as the following:*

1. Ignition and Fuel Cocks -- OFF
2. Undercarriage -- AS DETERMINED -- If in Doubt, Land with Undercarriage -- UP
3. Approach and Land as Normal; Flaps -- AS REQUIRED

FOUR

FOUR



ONE		Anson Mk I						ONE	
Aircraft Type		Engine & Prop		Fuel		Reference			
Anson MkI		Cheetah IX / FP		87 Oct		Pilot's Notes: AP 1525A; Apr 1943			
AIRSPEED LIMITATIONS									
		Design Speeds		MPH					
V <sub>NE</sub>		Never Exceed Speed		213		Never Exceed in Any Operation			
V <sub>FE</sub>		Max. Flaps Extend Speed		98		Do Not Extend Flaps Above this Speed			
V <sub>LO</sub>		Max Landing Gear Operating Speed		NA		Do not operate landing gear above this speed			
V <sub>LE</sub>		Max Landing Gear Extended Speed		213		Max speed with gear extended			
V <sub>R</sub>		Rotation Speed		NA		Speed at which the Airplane Lifts Off			
V <sub>REF</sub>		Landing Reference Speed		NA		Threshold crossing speed			
V <sub>S</sub>		Stall Speed		57		Min Speed in which the A/C is controllable			
V <sub>S0</sub>		Stall Speed		48		Stall Speed in Landing Configuration			
V <sub>Y</sub>		Best Rate-of-Climb		100		Delivers Gain in Altitude in Shortest Time			
V <sub>BE</sub>		Max Speedbrake Extended Speed		NA		Do Not Extend Brakes Above this Speed			
AIRSPEED INDICATOR OPERATING RANGES									
ASI MARKING		MPH Range		Description					
White Arc		48 - 98 MPH		Full Flap Operating Range. Lower Limit is Max. Weight V <sub>S0</sub> . Upper Limit Max Speed w/Flaps Extended.					
Green Arc		57 - 213 MPH		Normal Operating Range. Lower Limit is Max. Weight V <sub>S</sub> . Upper limit Is Max Structural Cruising Speed.					
Red Line		213 MPH		Maximum Speed for ALL operations.					
LIMITING OPERATIONAL CONDITIONS									
Condition	Take-Off	All Out Level	Climb	Max Cruise	Max Cruise	Max Dive	Condition		
Limit	1000'	5 min	1 hour	Cont	Cont	20s @ 2425	Limit		
Boost	FT	+1.5 PSI	+1.5 PSI	-0.5 PSI	-1 PSI	+1.5 PSI	Boost		
RPM	2100	2425	2300	2100	2100	2910	RPM		
Mixture	Take-Off	Take-Off	Normal	Normal	Weak	Normal	Mixture		
Oil Pressure		Oil Temperature (Inlet)		Cylinder Temperature		Operating Pressures			
Emer Min = 35 PSI		Min = 25° C	Max = 80° C	Normal = 180° C		Fuel = 2 - 3 PSI			
Normal = 70 PSI		Emergency Max = 90° C		Min	Max = 250° C	Brake			
Correction of ASI Reading for Postion Error				Aircraft Systems					
ASI (MPH)	+ / -	Adjustment	CAS (MPH)	Hydraulic	Hand Pump	Cockpit			
70	+	7	77	Pneumatic	Air bottle	Gnd Filled			
88	+	7	95	Electrical	Generator	Each Engine			
108	+	5	113	Fuel Tanks	Capacity	Quantity	Tot Capacity		
135	+	3	138	Port	35 gals	2	70 gals		
170	+	1	171	Starboard	35 gals	2	70 gals		
		gals/hour @ 10k Feet		RPM					
		Mixture	Boost	2400	2200	2000	1900		
		WEAK	+1 PSI	75	70	65			
			0 PSI	69	65	61	58		
			-1 PSI	66	62	58	54		
			-2 PSI	61	57	53	49		
			-3 PSI	56	52	48	45		
		RICH	+5 PSI	2650 RPM		146 gals/hr			
			+3.5 PSI	2400 RPM		112 gals/hr			
			+ 1.5 PSI	2400 RPM		90 gals/hr			
Note: Anson MkI Checklist Based on Pilot's Notes for Anson MkI.									
ONE								ONE	