AIRCRAFT PREPARATION

1	aircraft condition / covers / equipment	checked / removed / checked
2	all empty seats / belts / doors	secured
3	fuel & oil	fuel sys drained, oil+fuel quantities checked
4	gear selector / emergency extension	down / guarded
5	avionics master / electrical switches	set / off
6	circuit breakers	checked
7	pitot/static system	drained as appropriate
8	hourmeter (LH engine)	recorded / checked

ENGINE START

1	cabin	secured
2	ATIS, startup CLR (on COM2)	received
3	parking brake	set
4	battery master	on
5	alternators (2x)	check overvoltage lights – on
6	magnetos (4x)	on
7	anti collision light	on
8	gear lights	checked
9	fuel selectors	on
10	fuel quantity / min fuel	checked / verified
11	cowl flaps	as required (1/2 open - open)
12	alternate air	closed
13	mixture	cut off
14	propeller	high RPM
15	throttle	full forward
16	start LH-RH engine	(first LH then RH engine)

	NORMAL	COLD	HOT	FLOODED
1 fuel pump	on, pressure checked		off	off
2 mixture	full rich until steady fuel flow, then cut off		cut off	cut off
3 fuel pump	off	on	--	--
4 throttle	1cm open		1cm open	full open
5 start engine	CLEAR, starter on max 30“			
6 throttle	--		--	retard as engine fires
7 mixture	advance to full rich as engine starts			
8 check	oil pressure, alternator, suction			

17	fuel pumps (2x)	off
18	fuel selector	LH: crossfeed
19	avionics master	on
20	heater / defroster	set / checked
21	clocks / flight timer	set / reset
22	internal lights / NAV lights	as required
23	autopilot / electrical trim	on / ready / checked
24	flight instruments	set / checked
25	NAV/COM/GPS/XPDR	set according ATC CLR / checked
26	fuel selectors	LH: on, RH: crossfeed

TAXI CHECK

1	time	recorded
2	external lights (nav, wing, landing)	as required (day: wing lights only)
3	brakes	checked
4	gyros / horizons	checked

ENGINE RUNUP

1	parking brake		set	
2	external lights (nav, wing, landing)		as required (day: wing lights only)	
3	fuel selectors		RH: on, check both on	
4	engine instruments		checked, green	
5	power check	2000RPM	magnetos	max 175RPM drop
			alternate air	min 50 RPM drop
			mixture, fuel flow, EGT	check
			propellers	cycle
			anti-ice / de-ice	checked (boots deflated!)
		1500RPM	check prop feathering	
		idle RPM	check, then 1000RPM	

BEFORE DEPARTURE

1	flight controls		checked
2	flaps		checked, retracted
3	mixture		full rich
4	propeller		high RPM
5	friction		checked / set
6	alternate air		off
7	cowl flaps		as required
8	trim		set
9	fuel selectors		checked on
10	ATC clearance		verified
11	NAV/COM settings		verified
12	RA		0ft set
13	take-off briefing	NORM	Vmc 80MPH, Vr 90MPH, climb 105MPH to 2000'AAL', then 120MPH; wind, heading after T/O, then brief normal departure route
		ABN	decision point is gear operation. • in case of engine failure <u>before</u> gear operation: throttles back, pitch down, land, brake in case of fire or structural damage, ON GND EMER • in case of engine failure <u>after</u> gear operation: pitch 7, wings level, rudder to maintain HDG check power check gear up, flaps up, 105MPH identify dead engine (fuel flow indicator) throttle back, prop feather, mixture cut off, cowl fl closed <u>safe altitude</u> (400'/1.5km?), brief EF procedure/route

LINE-UP CHECK		
1	doors & windows	closed
2	external lights (nav, wing, landing)	as required (day: wing lights only)
3	strobe lights	on
4	fuel pumps (2x)	on
5	anti-ice	consider for climb (ELEC load!)
6	approach sector / RWY	clear
7	RWY / HDG	identified / checked
when cleared for take-off (check max x-wind 15kts)		
8	time	recorded
9	pitot heat	on

CLIMB CHECK		
1	altimeters (3x) / RA	set / 1000ft
2	transponder	check ALT (mode C)
3	gear	up
4	flaps	up
5	climb power	25“ / 2500RPM / 14GPH set
6	engine instruments	checked
7	cowl flaps	as required
8	landing lights	off
9	fuel pumps (2x)	off – pressure checked (one at a time)

CRUISE CHECK		
1	altimeters (3x)	set / checked
2	cruise power	set / checked
3	mixture	set / checked
4	engine instruments	checked
5	cowl flaps	as required (closed)
6	fuel status	checked
7	anti-ice / de-ice	as required

DESCENT CHECK		
1	ATIS	received
2	approach briefing	completed
3	circuit breakers	rechecked
4	cabin	secured
5	mixture	enrich
6	anti-ice / de-ice	as required

APPROACH CHECK

1	altimeters (3x) / RA	set / MIN RA set
2	NAV/COM settings	verified
3	external lights (nav, wing, landing)	as required (day: wing lights only)
4	fuel pumps (2x)	on
5	fuel selectors	both on (no crossfeed)
6	fuel quantity	checked
7	wing ice	check

FINAL CHECK

1	gear	down – three greens checked
2	flaps	25° set (short field: 40°)
3	propeller	high RPM (2500RPM)
4	mixture	full rich
5	brake pedals	check pressure, feet away from brakes

AFTER LANDING CHECK

1	time	recorded
2	external lights (nav, wing, landing)	as required (day: wing lights only)
3	strobe lights	off
4	pitot heat	off
5	fuel pumps	off
6	anti-ice	off
7	WX radar	off
8	transponder	check GND
9	cowl flaps	as required (open)
10	flaps	up

PARKING CHECK

1	parking brake	off (! brake will not hold for prolongued time)
2	throttle	1000RPM
3	time / fuel	recorded
4	121.500	check
5	electrical switches	off
6	avionics master	off
7	auto pilot	off
8	mixture	cut off
9	magnetos (4x)	off
9	alternators (2x)	off
10	heater / defroster	off
11	battery master	off
12	avionics master	check off
13	chocks on wheels	on if necessary
14	storm windows, cowl flaps	check closed
15	hourmeter (LH engine)	recorded
16	postflight duties	completed

ENGINE FAILURE: PPAA — LAND ASAP

STANDARD RESPONSE TO ANY FAILURE

1	**F**LY		adjust pitch, wings level, rudder to maintain heading, adjust rudder trim $V_{Y\ SE}$ = 105MPH if able, fly 2° bank to GOOD ENGINE
2	**P**OWER	mixture	enrich
		propeller	high RPM
		throttle	full PWR
3	**P**ERFORMANCE	gear	up
		flaps	up (or according situation)
		speed	105MPH
4	**A**NALYSIS		
	identify DEAD ENGINE		dead foot = dead engine, zero fuel flow
	if time permits, consider troubleshooting:		
	troubleshoot: check		fuel quantity, fuel selectors, fuel pumps mixture, alternate air, magnetos

if troubleshooting unsuccessul, or time critical

5	**A**CTION: ENGINE SHUTDOWN		
	throttle	DEAD ENG	retard
	propeller	DEAD ENG	feather
	mixture	DEAD ENG	idle cut off
	cowl flaps	DEAD ENG	closed
6	INTENTIONS		on where to safely proceed
7	NOTIFY ATC		declare emergency
8	AFTER ENGINE FAILURE CHL		perform

ENGINE FIRE IN FLIGHT – AFFECTED ENGINE SHUTDOWN — LAND ASAP

1	fuel selector	AFFECTED ENG	off
2	fuel pump	AFFECTED ENG	off
3	PPAA	perform, BUT do NOT perform yet	2 POWER: ONLY ON GOOD ENG AFTER ENGINE FAILURE CHL
4	heater / defroster		off
5	AFTER ENGINE FAILURE CHL		perform

PRECAUTIONARY ENGINE SHUTDOWN — LAND ASAP

1	in case of high EGT, OIL TEMP etc.		reduce power on affected engine, increase power on good engine appropriately
2	PPAA	perform, BUT	FIRST mixture DEAD ENGINE idle cut off, THEN propeller DEAD ENGINE feather

AFTER ENGINE FAILURE (ENGINE FAILURE SECONDARY ITEMS)

1	fuel pump	DEAD ENG	off
2	magnetos	DEAD ENG	off
3	cowl flaps		GOOD ENG: as required DEAD ENG: closed
4	alternator	DEAD ENG	off
5	electrical load		check, max 50A – reduce load
6	suction		check min 4.5psi
7	fuel selectors		DEAD ENG: off GOOD ENG: on *or* x-feed if no leak suspected
8	fuel pump	GOOD ENG	off, check fuel pressure
9	flight planning		MOCA, alternate, etc.
10	ATC		notify on status, intentions etc.

*if engine has cooled down, and no structural damage suspected, and time permits, attempt an **ENGINE AIR START**.*

ENGINE AIR START (UNFEATHERING)

1	fuel selectors		on – keep crossfeed on GOOD ENG on (if)
2	fuel pump	DEAD ENG	off
3	throttle	DEAD ENG	open 1cm
4	prop	DEAD ENG	forward to cruise RPM
5	mixture	DEAD ENG	rich
6	magnetos (2x)	DEAD ENG	on
7	ATC		notify on intention to leave FREQ shortly
8	auto pilot		off
9	avionics master		off
10	starter	DEAD ENG	on until prop unfeathered and engine starts
	if engine does not start, prime with fuel pump for 3sec		
11	throttle		idle, warm engine (check CHT green)
12	check		oil pressure, alternator, suction
13	avionics master		on
14	auto pilot		on if appropriate
15	systems		restore (alternator, load, etc.)
16	throttles		adjust appropriately

SMOKE – FIRES

ENGINE FIRE ON GROUND or DURING ENG START

1	starter	continue cranking, or crank if necessary
2	fuel selectors	closed
3	fuel pumps	off
4	mixtures	idle cut off
5	throttles	full open until fire ceases
(6	heater / defroster	off)

if fire continues, perform ON GROUND EMERGENCY.

ON GROUND EMERGENCY

1	fuel selectors	closed
2	fuel pumps (2x)	off
3	mixture	idle cut off
4	throttle	full open for 2sec, then closed
5	magnetos	off
6	ATC	notify
7	battery master	off

SMOKE – ELECTRICAL FIRE — LAND ASAP

1	ATC	inform on status, intentions *consider NAV/COM2 use (avionics master)*
2	battery master	off
3	alternators (2x)	off
4	heater / defroster	off
5	electrical switches, avionics master	off
6	circuit breakers	all off (pulled)
7	circuit breakers LH/RH alternator	reset (push)
8	circuit breakers LH/RH alternator field	reset (push)
9	*attempt to reset electrical consumers, one at a time, battery master on*	

FLIGHT CONTROLS

TRIM RUNAWAY

1	electrical trim switch	off

Note: autopilot is operational; use with trim prompt

ELECTRICAL

BOTH OVERVOLTAGE LIGHTS ILLUMINATE

1	electrical loads	turn all off
2	battery master	check on
3	alternators	off
4	alternators	on, one at a time

◆ *if one alternator shows less output than the other*

5	alternator WITH LEAST OUTPUT	keep on
6	electrical equipment	max 50A

◆ *if both alternators show approx. equal output, and less than 50A*

5	both alternators	on
6	electrical equipment	turn on as required
7	resume normal operation	

ONE OVERVOLTAGE LIGHTS ILLUMINATES

1	electrical loads		reduce to 50A
2	battery master		check on
3	alternator	AFFECTED (LIGHT)	reset (off, then on)

if AFFECTED alternator shows more than 50A

4	alternator	AFFECTED (LIGHT)	off
5	electrical equipment		max 50A

ALTERNATOR FAILURE (LOSS OF OUTPUT)

1	electrical loads	reduce to max 50A
2	circuit breakers LH/RH alternator	check, if tripped, reset ONCE
3	circuit breakers LH/RH alternator field	check, if tripped, reset ONCE
4	alternator	reset (off, then on)

if alternator fails to reset

5	alternator	off
6	electrical load	max 50A

if no alternator can be restored, proceed with ***TOTAL ELECTRICAL FAILURE***

TOTAL ELECTRICAL FAILURE – FLIGHT ON BATT ONLY — LAND ASAP

1	time check	max 15min battery time = time to land
2	electrical load	reduce as much as possible
3	declare emergency	inform ATC about time intentions
4	flight conditions	- avoid icing conditions - when able, proceed VFR
5	when landing / safe flight is assured, consider NAV2/COM2 use	- use avionics master on COM2 - XPDR unavailable

EMERGENCY GEAR EXTENSION

1	circuit breakers	check in
2	battery master	check on
3	alternators	check on
4	navigation lights	off (daytime)

to extend the landing gear

5	airspeed	reduce to 105MPH
6	gear selector switch	down and locked
7	emergency gear extension knob	pull out

if the gear does not extend properly, attempt „improper yawing“ to lock main gear

8	landing gear indications	check 3 greens – check mirror

NOTE *the emergency gear extension knob must remain **out**!*

GEAR UP LANDING

1	approach speed	normal
2	flaps	up

shortly before touchdown

3	throttles	close
4	propellers	feather
5	mixtures	idle cut off
6	fuel selectors	off
7	fuel pumps	off
8	battery master	off
9	magnetos	off

contact the surface with minimum speed, tail slightly low;
prepare to evacuate the cabin in case of crash or fire.

LANDING GEAR UNSAFE WARNINGS

- red light indicates gear in transit
- recycle the gear if the red light continues to be illuminated
- red light will illuminate when the gear warning horn sounds
- the gear warning horn sounds when
  - ✔ the manifold pressure drops to 14“ in either engine or both, and the gear is in the up position
  - ✔ the gear selector is set in the up position when the gear is on the ground

FUEL MANAGEMENT

X-FEED: USE FUEL FROM DEAD ENGINE TANK

1	fuel selector	GOOD ENGINE	x-feed
2	fuel pump	DEAD ENGINE	on
2	fuel selector	DEAD ENGINE	off
3	fuel pump	GOOD ENGINE	off

NOTE *for landing, crossfeed is not allowed: resume normal fuel feed*

OTHER

VACUUM SYSTEM FAILURE (lower than about 4 inHg)

1	propellers	increase to 2700RPM
2	altitude	descend to maintain >4 inHg

PITOT / STATIC SYSTEM MALFUNCTION

1	pitot heat	on
2	alternate static source	open

OPEN COCKPIT DOOR

1	airspeed	slow down to 105MPH
2	cabin vents	close
3	storm window	open
4	upper and side latches	open
5	door	close
6	upper and side latches	close

OVERRUN or IMMINENT CRASH LANDING

1	throttles (2x)	close
2	propellers (2x)	feather
3	mixtures (2x)	idle cut off
4	fuel selectors (2x)	off
5	fuel pumps (2x)	off
6	battery master	off
7	magnetos (4x)	off
8	alternators (2x)	off
9	door	unlatch if possible

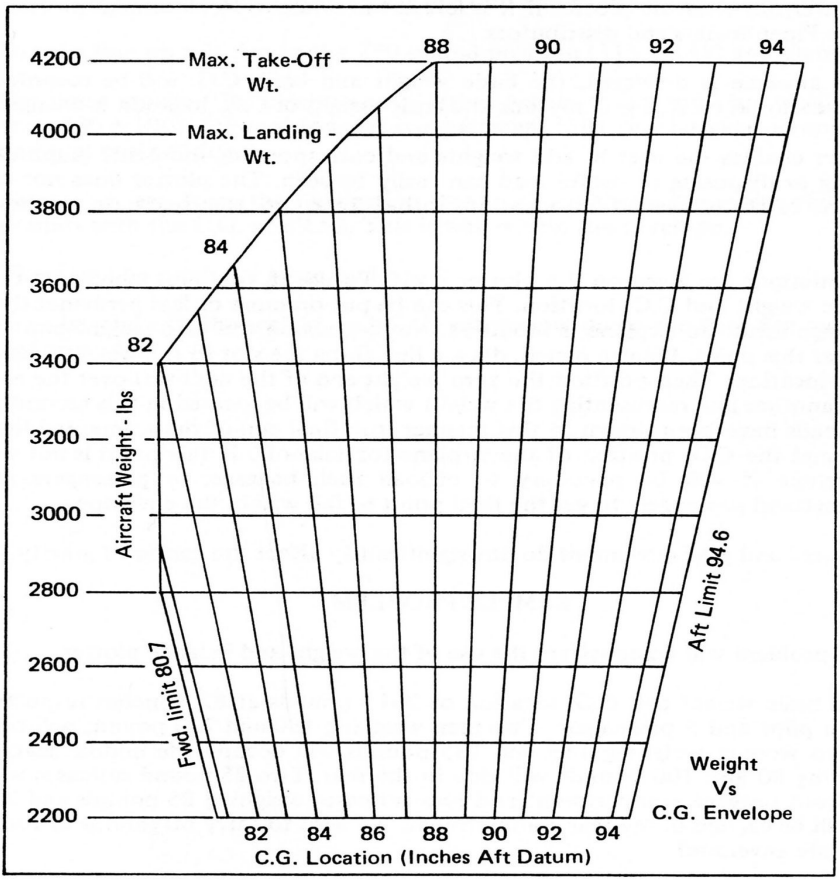
prepare to evacuate the cabin.

WEIGHT & BALANCE

LOADSHEET

basic empty weight (incl. oil, 5USG fuel)		3004lbs	84.7in	254184 inlbs
fuel max 93USG, 5.8lbs/USG		540lbs	93.6in	50544 inlbs
pilot, front pax			85.5in	
pax, center seats			118.1in	
pax, rear seats			155.7in	
baggage, forward			22.5in	
baggage, aft			178.7in	
TOTAL				
MTOW	*1905kg*	4200lbs		
MLW	*1814kg*	4000lbs		(=1:40h Flug!)
max Zuladung	*543kg*	1199lbs		
max Zuladung **full tanks**	*299kg*	659lbs		
pro ausgebauter Sitz	*+5.6kg*	+12lbs		

LOADING GRAPH



LIMITATIONS

SPEEDS

	MPH	*KIAS*	
$V_{X\ SE}$	**93**	*81*	best angle, single engine
$V_{Y\ SE}$	**105**	*91*	best rate, single engine
V_X	**90**	*79*	best angle, all engines
V_Y	**105**	*91*	best rate, all engines
V_S	**76**	*66*	stall speed, clean (4000lbs)
V_{SO}	**69**	*60*	stall speed, landing configuration (4000lbs)
V_{MCA}	**80**	*70*	minimum control speed air
V_{ROT}	**93**	*81*	rotate speed
V_A	**133-146**	*115-127*	design manoeuvring speed 2743lbs-4200lbs
V_{NE}	**217**	*188*	never exceed speed
V_{NO}	**190**	*165*	maximum normal operating speed
V_{GLIDE}	**105**	*91*	best glide angle speed
V_{LE}	**150**	*130*	maximum landing gear extended speed
$V_{LO\ EXTEND}$	**150**	*130*	maximum speed for landing gear extension
$V_{LO\ RETRACT}$	**125**	*109*	maximum speed for landing gear retraction
$V_{FE\ 10°}$	**160**	*139*	maximum flaps 10° operating speed
$V_{FE\ 25°}$	**140**	*122*	maximum flaps 25° operating speed
$V_{FE\ 40°}$	**125**	*109*	maximum flaps 40° operating speed
V_{Pclean}	**125**	*109*	manoeuvring speed clean
$V_{P\ 10°}$	**115**	*100*	manoeuvring speed flaps 10°
$V_{APP\ 0°/10°}$	**115**	*100*	approach speed, flaps 0° (4000lbs)
$V_{APP\ 25°}$	**105**	*91*	approach speed, flaps 25° (4000lbs)
$V_{APP\ 40°}$	**105**	*91*	approach speed, flaps 40° (4000lbs)
$V_{X\text{-}WIND\ MAX}$	**15**	*13*	maximum demonstrated crosswind

WEATHER MINIMA CONSIDERATIONS

visual conditions, recommended for T/O	circling altitude, minimum 400ft / 1.5km

EFCOP CONSIDERATIONS

safe altitude (clear of obstacles)	1000ft AAL
for TAKE OFF	visual conditions strongly recommended
	EFCOP: consider using G/A for approach of T/O RWY consider obstacles for visual circuit, min 400'

PERFORMANCE

ACCELERATE-STOP DISTANCES

Flaps 0° ISA	ALT AMSL	ACC (to 80mph) – STOP distances ft (m)		
		calm	HW 5kts	HW 10kts
4200lbs	4500ft	2800 (853)	2600 (793)	2200 (671)
	1500ft	2150 (655)	1900 (579)	1700 (518)
	SL	2000 (610)	1700 (518)	1550 (472)
4000lbs	1500ft	2050 (625)	1800 (549)	1600 (488)

SE CLIMB GRADIENTS (includes anti-/deice eqpt: -30fpm ROC, -850ft SE SVC CEIL)

105mph, wind calm		4200lbs		4000lbs		3700lbs	
		ROC	CL grad	ROC	CL grad	ROC	CL grad
DA	SE SVC CEIL	2800ft (DA)		4300ft (DA)		6900ft (DA)	
4500ft		0	0	50	0.4	140	1.6
3000ft		40	0.5	100	1.1	190	2.2
1500ft		100	1.1	150	1.6	250	2.8
SL		150	1.7	200	2.2	300	3.4

Climb gradients increase by ca. 5% per 5kts headwind.

LANDING ROLL

<8000ft AMSL, no tailwind, <4000lbs, >ISA+60° not more than 350m / 1050ft.

MINIMUM RUNWAY LENGTH: 1000m (better: 1200m), consider overrun area!

POWER SETTINGS

SIMPLE POWER SETTINGS

	speed	MP	RPM	FF 2x	total FF	
climb to 2000ft AGL	105MPH	25	2500	14	28GPH	106L/H
climb above 2000'	120MPH	25	2500	14	28GPH	106L/H
45% (altn)		18	2400	8	16GPH	60L/H
55%		20	2400	9	18GPH	68L/H
65% (cruise)		22	2400	10	20GPH	76L/H
75%		24	2400	11	22GPH	84L/H
circuit (noise)		22	2200	(enrich)		

POWER SETTINGS RULES OF THUMB

to maintain speed	1“MP = 5MPH in level flight
	1“MP = 100 FPM in climb/descent

POWER SETTINGS, RANGE

CRUISE POWER SETTING TABLE – IO-360-C - 200HP

		110HP / **55%** 2x8GPH = 16GPH				130HP / **65%** 2x9GPH=18 GPH				150HP / **75%** 20 GPH			
PA ft	ISA °C	2100	2200	2300	2400	2100	2200	2300	2400	< RPM >		2300	2400
SL	15	22.9	22	21	20.4	25.9	24.8	23.8	22.9			26.5	25.5
2000	11	22.4	21.5	20.6	20	25.4	24.3	23.3	22.5			25.9	25
4000	7	21.9	21.1	20.2	19.5	24.8	23.8	22.8	22			full	24.4
6000	3	21.4	20.6	19.8	19.1	full	full	22.3	21.5				full
8000	-1	21	20.1	19.4	18.7			full	21				
10000	-5	full	19.7	19	18.3				full				
12000	-9		full	full	17.8								
14000	-13				full				*ΔT*	*+10°*		*0.16*	

TYPICAL RANGE / TAS

4200lbs, flaps 0°, gear up, cowl fl clsd, 93USG usable fuel,
45min reserve @55%, 2400RPM, mixture lean of peak

		55%				**65%**				**75%**			
DA ft	ISA °C	NM	*Km*	MPH	*KTS*	NM	*Km*	MPH	*KTS*	NM	*Km*	MPH	*KTS*
2000										575	*1065*	177	*153*
4000						625	*1160*	172	*150*	590	*1090*	182	*158*
6000		670	*1240*	163	*142*	645	*1195*	177	*153*				
8000		685	*1270*	167	*145*	660	*1220*	182	*158*				
10000		700	*1300*	172	*150*								
12000		720	*1335*	176	*153*								
14000		740	*1370*	180	*156*								

MINIMUM EQUIPMENT LIST

INSTRUMENTS	**RADIOS**
1 attitude indicator (horizon)	2 COM
1 directional gyro	2 NAV, 1 GS
1 T&B indicator	1 DME
1 airspeed indicator	1 ADF / GPS
2 altimeters	1 marker
1 vertical speed indicator	1 transponder
1 stop watch	1 audio panel
1 gyro suction indicator	**VARIOUS**
1 OAT indicator	2 landing lights
1 pitot heat	1 internal light, 1 pocket light per pilot
1 alternate static source	2 headsets (or 1 + 1mic+loudspeaker)