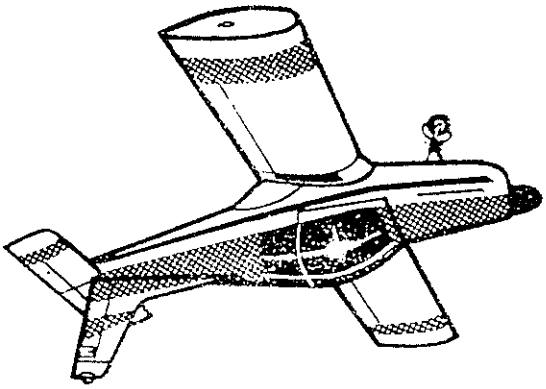


FLIGHT MANUAL OF THE Z-142 AIRCRAFT

MORAVAN K.P. OTROKOVICE · ČSSR ·

F L I G H T M A N U A L

O F T H E

Z 1 4 2 AIRCRAFT

Manufacturer :	MORAVAN, Concern OTROKOVICE, Czechoslovakia
Production No./Series :	_____/_____
Identification Sign :	_____
Category :	AEROBATIC (A) UTILITY (U) NORMAL (N)
Certification Basis :	FAR PART 23 NEW with incorporated changes up to No. 23-13 included

Czech copy is approved by the STATE AVIATION INSPECTION - Prague No. 5326/1254/79/Hý.

Limitations given in Section 2 and 7 must be observed during operation.

Year of Issue 1989

C O N T E N T S

CHAPTER 1

GENERAL

CONTENTS

1. GENERAL

1.1. INTRODUCTION

Validity :

This FLIGHT MANUAL applies only to the aircraft, whose production number is introduced on the page 0.1.

Caution :

The aircraft pilot must be acquainted with the contents of this FLIGHT MANUAL before the flight.

1.2. CHANGES

1.2.1. All changes or supplements of this Flight Manual are performed as follows :

1) The aircraft manufacturer will send the binding bulletin with changes or new corrected pages of the Flight Manual to the holder of the Flight Manual.

2) The holder of the Flight Manual is under an obligation

   a) of recording the obtained change into the LIST OF CHANGES - item 1.2.2.

   b) of carrying out of the change in accordance with the bulletin or of replacing the original pages by new corrected ones marked with date of issue and with abbreviation "REV".

Note :

The changed or supplemented parts of the text will be marked with vertical line.

2.	č-142/01 (MOT. ROLIM, PRLIŽO, OLOŽ.	2-5, 2-7, 2-8, 4-7, 4-8, 4-9, 4-10, 4-12, 4-13, 4-14	2. 2. 1773	10/10/1992	
3.	č. 142/62 A	2-11	3. 3. 1995	10/10/1992	

1.3. ABBREVIATIONS AND DEFINITIONS

CAS - Calibrated airspeed means indicated airspeed of an aircraft, corrected for position and instrument error. Calibrated airspeed is equal to true airspeed in standard atmosphere at sea level.

EAS - Equivalent airspeed means the calibrated airspeed of an aircraft corrected for adiabatic compressible flow effect for the particular altitude. Equivalent airspeed is equal to calibrated airspeed in standard atmosphere at sea level.

IAS - Indicated airspeed means the speed of an aircraft as shown on its pitot static airspeed indicator calibrated to reflect standard atmosphere adiabatic compressible flow effect at sea level uncorrected for airspeed system errors.

TAS - True airspeed means the airspeed of an aircraft relative to undistributed air. True airspeed is equal to equivalent airspeed multiplied by

$$(\varsigma_o / \varsigma)^{1/2}$$

ς_o = specific weight of air at sea level

ς = specific weight of air at specified altitude

ISA - International standard atmosphere

MAC - Mean aerodynamic chord

V_A - Design maneuvering speed

V_{FE} - Maximum flaps extended speed

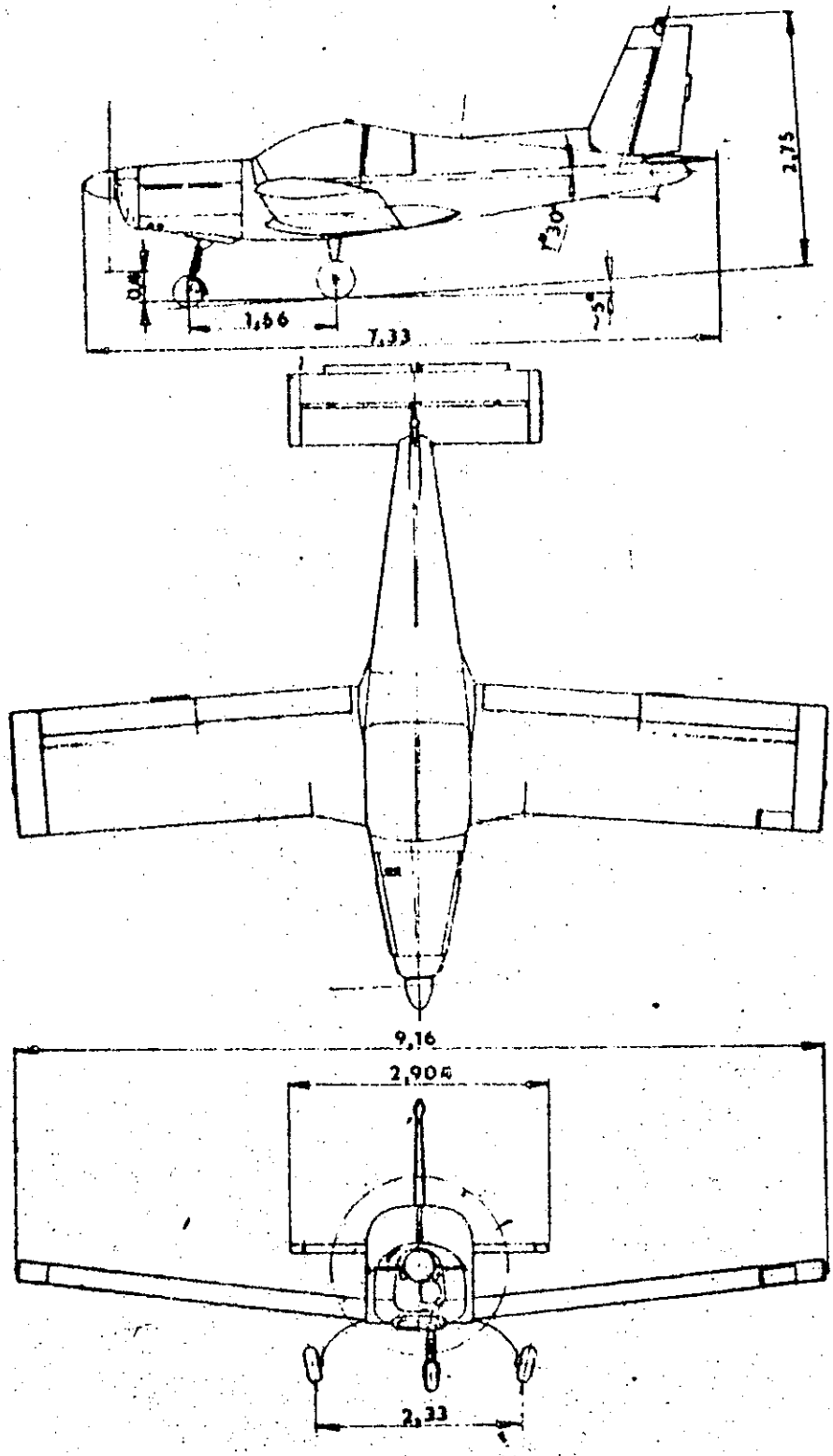
V_{NE} - Max. never-exceed speed

V_{NO} - Max. normal operating limit speed

V_{SO} - Stalling speed in the landing configuration

V_{S1} - Stalling speed or minimum steady flight speed obtained in a specified configuration

1.4. DIMENSIONAL SKETCH OF Z 142 AIRCRAFT



SECTION 1

1.5. SPECIFICATION

1.5.1. General

(a) The Z 142 aircraft is intended for an elementary and advanced pilot's training and for training and execution of aerobatic maneuvers, for training of night and instrument flight and for execution of sailplanes tow.

(b) The Z 142 aircraft is a version of the Z 42 M aircraft. It is a two-seater, single-engined, low wing, cantilever monoplane, equipped with a six-cylinder in-line inverted M 337 AK engine, with a hydraulic-pitch V 500 A propeller.

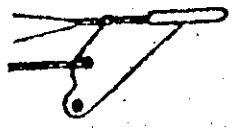
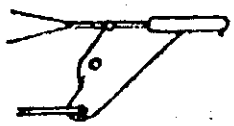
1.5.2. The fuselage is of a mixed structure. The central supporting part is a lattice-work. It is welded of steel tubes and is covered by a fibre-glass body. The aft part is a semimonocoque. The construction of pilot's seats enables the use of back-type parachutes. The pilot's seats in side-by-side arrangment are adjustable into 4 positions. The main pilot's seat is the left one. Behind the seats, the hand-luggage platform is situated. The canopy can be opened by sliding forward and is equipped with device for emergency release. For locking the canopy in partly opened position, the detent serves.

1.5.3. The wing is of all-metal structure with main and auxiliary spar. The structure of the wing is divided at the fuselage. The plan is of a rectangular form and the skin is of duralumin aluminium-clad sheets. Slotted, all-metal ailerons and the flaps are equal in size.

1.5.4. The empennage is of a cantilever all-metal structure, covered with duralumin sheet. Both the rudder and the elevator are partially mass- and aerodynamically balanced. The elevator has a balance tab and a controllable trim tab. The rudder has a fixed trim tab.

Caution :

1. The control lever of the rudder balance tab has two holes.
2. There are two alternatives of attaching the pull rod to the elevator balance tab.

Pull rod attachment	Balance tab travel	Effect	Application
	$30^0 \pm 2^0$	Smaller forces in control lever from elevator	Recommended for aerobatics
	$30^0 \pm 2^0$	Greater forces in control lever from elevator	Recommanded for training flights

3. With the change of pull rod attachement, it is necessary to adapt its length according to Technical Manual of the Z 142 aircraft, item 4.3.

1.5.5. Control System

The aircraft is provided with a dual control. The control system includes elevator and aileron control, rudder control, nose wheel control, wing flaps control, trim tabs control, engine and propeller control. The hand control is of lever type, the rudder control is of a pedal type and is equipped with a main wheel brake actuation. Elevator and ailerons are rod controlled, rudder is rod and cable controlled. The nose wheel control is coupled with the rudder control. Wing flaps and trim tabs are mechanically controlled.
The engine is actuated by a throttle pull rod, a mixture handle and a compressor rod. The propeller rotation is operated by a push-pull rod.

1.5.6. Landing gear has three wheels and consists of the main landing gear and the nose gear. The main gear includes flat steel springs attached to the spar of the centre-section of the wing. The main gear wheels are equipped with hydraulic disk brakes with automatic backlash elimination. The braking plates which are located on the foot control pedals actuate the brakes of the main gear separately. The parking brake actuates simultaneously both main wheel brakes. The nose gear is provided with a hydropneumatic shock adsorber and with a shimmy damper. The nose wheel is steerable through use of rudder pedals.

1.5.7. Power Plant

The aircraft is powered by a piston-type, four stroke, air-cooled, inverted in-line six cylinder, left-hand engine with valve gear and camshaft on the cylinder heads, with a low pressure fuel injection into the space in front of the suction valves. The engine has no reduction gear unit. It includes a charging compressor and is capable of aerobatics and inverted flight.
The V 508 A propeller is a two-bladed hydraulic automatic-pitch constant speed unit. Propeller blades are made of duralumin.

1.5.8. Fuel and Oil System

(1) Fuel System

The main fuel tanks are situated in the front part of the wings near the fuselage (2x40 l). The auxiliary fuel tanks are attached to the wing tips (2x20 l).
Aerobatic fuel tank is located on the aircraft fuselage (5 l).

(2) Oil System

The oil tank is located in the engine compartment in front of the firewall.

(3) The fuel and oil systems enable to execute aerobatic maneuvers and inverted flights (in AEROBATIC and UTILITY categories only).

1.5.9. Equipment

(1) Electrical System is of a single-conductor type (1pole). The earthing conductor (-pole) is formed by the aircraft frame. Rated network voltage is 28 V. The main power source is represented by a 600 W dynamo, driven directly by the engine. The auxiliary energy source is represented by a 25 Ah battery. For the use of an external source, there is a socket located on the left side of the fuselage.

(2) Extinguishing Equipment consists of :

(a) fire-wall, separating the engine compartment from the airframe,
(b) engine fire extinguisher actuated from the cockpit,
(c) cockpit fire extinguisher, located in the cockpit (according to customer's option).

(3) Heating and Ventilating System

The aircraft is equipped with a regulable heating and ventilating system of the cockpit.

(4) Lighting

The aircraft is equipped with the following lights for the night flights :

- taxi and landing lights,
- position lights,
- instrument panel and cockpit lights,
- light for reading the chart,
- anti-collision beacon.

(5) Radiocommunication and Radionavigation Equipment

On customer's wish the aircraft can be equipped with a :

(a) Radio of an approved type,
(b) radionavigation equipment of an approved type.

(6) Tow Gear

A tow gear for sailplane towing can be fitted on the aircraft on customer's wish. The tow gear consists of a cable mount, rear-view mirror and control of the cable disengaging device. The control rod of the disengaging device is situated on the panel between the seats. Maximum take-off weight of the sailplane may be 500 kg.

(7) Instruments

Following instruments for the supervision of the flight, engine and airframe including signalization are mounted in the cockpit.

1.6. PRINCIPAL TECHNICAL DATA

1.6.1. Dimensions

Wing span		9,160 m
Length		7,330 m
Height		2,750 m
Wing :	- depth (constant)	1,420 m
	- dihedral	6^{0}
	- sweep-forward	4^{0} 20'
	- length MAC	1,460 m
	- area	13,15 m^2
Ailerons :	- travel up	$21^{0} \pm 1^{0}$
	down	$17^{0} \pm 1^{0}$
	- area 2 x 0,704 m^2	1,408 m^2

Wing flaps :		
- positions :	RETRACTED	0^{o}
	START	$14^{o} \pm 1^{o}$
	LANDING	$37^{o} \pm 1^{o}$
- area 2 x 0,704 m^2		1,408 m^2
Horizontal Tail Surface (HTS):		
- elevator travel :	up	$34^{o} + 0^{o} - 1^{o}$
	down	$31^{o} + 1^{o}$
- stabilizer area		1,230 m^2
- elevator area		1,360 m^2
- total area HTS		2,590 m^2
Vertical Tail Surface (VTS):		
- rudder travel :	right	$30^{o} \pm 2^{o}$
	left	$30^{o} \pm 2^{o}$
- fin area		0,540 m^2
- rudder area		0,810 m^2
- total area VTS		1,350 m^2
Landing Gear :	wheel track	2,330 m
	wheel base	1,660 m
	wheel-size-main landing gear	420 x 150 mm
	- nose wheel	350 x 135 mm
	tire pressure	
	- main landing gear	190 kPa(1,9 kp/cm^2)
	- nose wheel	250 kPa(2,5 kp/cm^2)

1.6.2. Loadings

Category	Loading					
	Specific wing loading		Specific power loading			
	(N/m^2)	(kg/m^2)	(N/kW)	(kg/kW)	(N/k)	(kg/k)
Aerobatic (A)	723	73,8	61,8	6,3	45,3	4,6
Utility (U)	761	77,6	64,9	6,6	47,7	4,9
Normal (N)	813	82,9	69,4	7,1	50,9	5,2

1.6.3. Weight and C/G Positions

Empty weight	730 kg $\pm$ 3 %
Center of gravity position	19 % MAC + 2% - 1%

Note :

Weight and C/G positions agree for all categories (A,U,N).

1.6.4. Power Plant

The M 337 AK aircraft engine

Bore	105 mm
Stroke	115 mm
Cylinder capacity	5,97 litres
Compression ratio	6,3 : 1
Sense of rotation	anticlockwise

Power - RPM - Manifold Pressure

Power setting	Power kW	Power HP	RPM	Manifold pressure kPa	Manifold pressure at	Note
Maximum take-off	154±2%	210±2,5%	2750±30	118^{+1}_{-2}	$1,2^{+0,01}_{-0,02}$	-
Maximum continuous	125±2%	170±2,5%	2600±3%	98±2	1,0±0,02	-
Maximum cruising	103±2%	140±2,5%	2400±3%	90±2	0,92±0,02	1
Maximum cruising	110 max.	150 max.	2400±3%	90±2	0,92±0,02	2
Short-time operating	132±2%	180±2,5%	2750±30	100±2	1,02±0,02	3

Note :

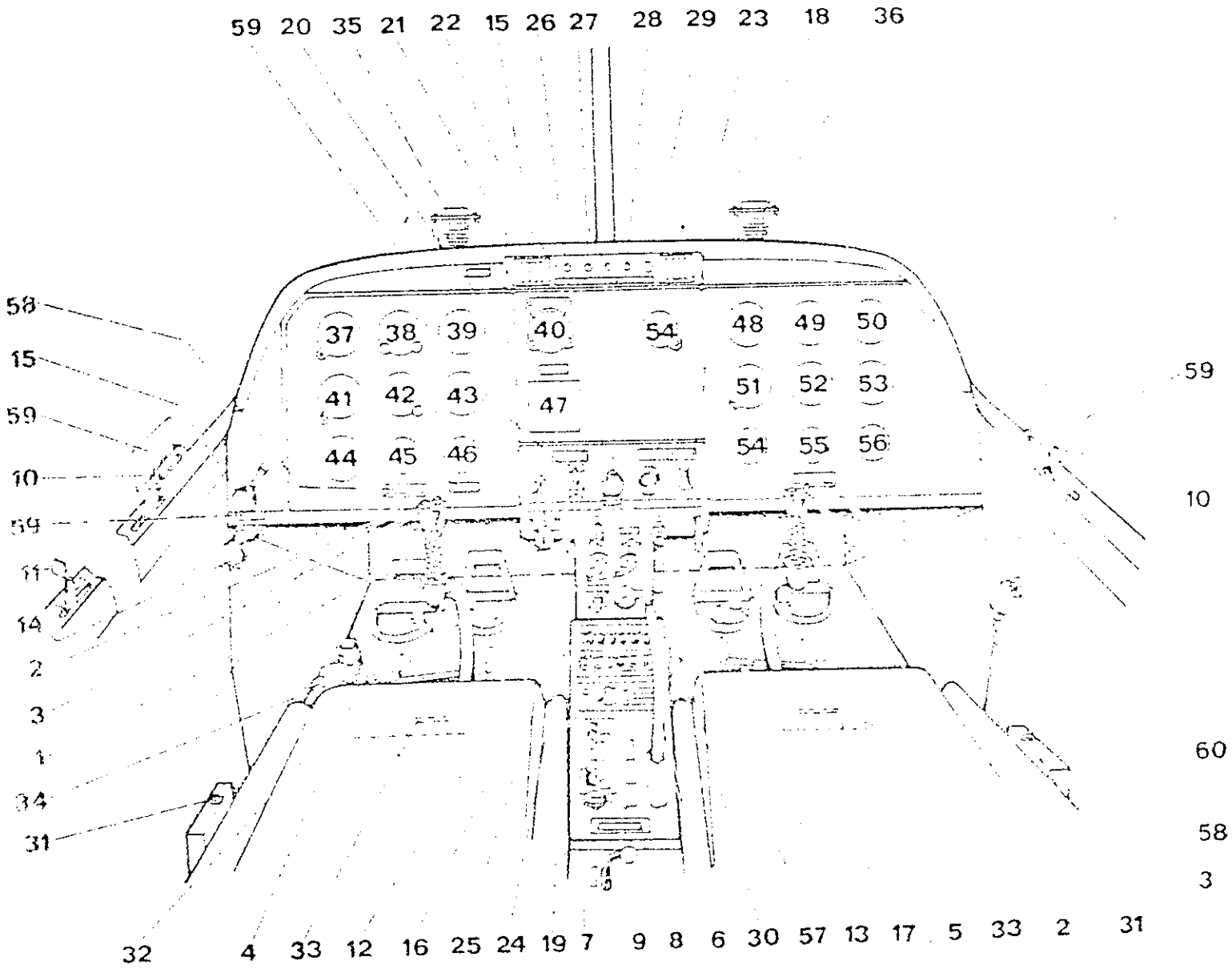
(1) Maximum recommendation cruising power in high = 0 m ISA, with compressor SHUT.

(2) Maximum cruising power in high = 1200 m ISA.

(3) Short-time operating power with compressor SHUT, time limited to max. 5 min.

The V 500 A propeller

Number of blades	:	2
Diameter	:	2000 mm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41 42 43 47 51 52 53
44 45 46 54 55 56
59
10
60
58
3
32 4 33 12 16 25 24 19 7 9 8 6 30 57 13 17 5 33 2 31

1.7.1. Pilot's cockpit - legend

1. Control stick
2. Transmitter pushbutton (VHF)
3. Intercom pushbutton (IC)
4. Braking plates on foot control pedals
5. Parking brake
6. Wing flaps lever
7. Trim
8. Directional trim
9. Control rod of low rope
10. Canopy emergency release handle
11. Canopy arrestment
12. Engine fire extinguisher control rod
13. Hand pump
14. Fuel priming
15. Throttle control lever
16. Propeller pitch control
17. Compressor control
18. Mixture control
19. Fuel shutoff valve
20. Ventilating and heating control
21. Magneto switch
22. Master switch
23. Starter pushbutton
24. Sectionalizing switches
25. Control of instrument lighting intensity
26. Generator function check
27. Signalling of fuel remainder L - R
28. Signalling of Pitot system heating and ram pressure sensing unit
29. Pushbutton of signalling check (stall warning and heating)
30. Fuses
31. Earphone socket
32. Seat
33. Seat adjustment
+34. Board extinguisher
35. Magnetic compass I.
+36. Magnetic compass II.
37. Airspeed indicator
38. Gyro horizon
39. Rate-of-climb indicator
40. Clock
41. Altimeter I.
42. Directional gyro
43. Tachometer I.
44. Three-pointer indicator
45. Cylinder head temperature gauge
46. Manifold pressure gauge I.
+47. Radio (VHF)
+48. Airspeed indicator II.
+49. Turn indicator
+50. Rate-of-climb indicator II.

SECTION 5
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*51. Altimeter II.
 52. Fuel level gauge (quadruple)
*53. Tachometer II.
*54. Accelerometer (location acc. to centre panel equipment)
 55. V2 meter
*56. Manifold pressure gauge II.
 57. Indicator of pressure in spat with relief valve
 58. Compensating pinnace
 59. Pinnace (description and drawing as item 2.2*)
*60. Interior ventilation

Note :

* Optional

SECTION 3

•51. Altimeter II.
52. Fuel level gauge (quadruple)
•53. Tachometer II.
•54. Accelerometer (locating acc. to centre panel equipment)
55. VS meter
•56. Manifold pressure gauge II.
•57. Indicator of pressure in spar with filling valve
58. Compensation pressure
•59. Pitot-tube (description and instructions re item 2.2•)
•60. Interface pressurization

Note :

• Optional

SECTION 2

OPERATING LIMITATIONS

CONTENTS

2.4. [illegible]

[illegible]

2.5. MAXIMUM [illegible]

Category		[illegible]	Maximum landing weight (kg)
Aerobatic	(A)	[illegible]	[illegible]
Utility	(U)	[illegible]	1050
Normal	(N)	[illegible]	1050

Note [illegible]

[illegible]

SECTION 2

2.4. [illegible] PERMISSIBLE PAYLOAD

Category	[illegible]
Aerobatic	
Utility	
Normal	

Caution:

Maximum [illegible]

(1) [illegible]
(2) [illegible]
(3) [illegible]

Note :

Payload check [illegible]

X) In pilot's cockpit [illegible] modifications of payload [illegible]

2.5. CENTRE OF GRAVITY [illegible]

C/G limit position	
Forward	
Aft	

Caution :

(1) C/G limit positions are valid for Aerobatic, Utility and Normal category.

(2) The C/G check procedure is shown in Section 6.

SECTION 2

2.6. POWER PLANT

2.6.1. Propeller and Engine Speed Limitation

Power setting - RPM	RPM	Manifold pressure		Time limitation	Kompressor
		kPa	at		
Maximum take-off	2750 ± 30	118	1,2	max. 5 min.	ON
Maximum continuous	2600 ± 3%	100	1,02	unlimited	ON
Maximum perm.speed	2860	83	0,85	30 s	ON
Maximum instan-taneous speed	3025	100	1,02	1 s	OFF
Maximum short--period	2750 ± 30	100	1,02	max. 5 min.	OFF

Note:

In case of emergency the maximum take-off power may be used within 10 minutes under following conditions:

(1) Operating values of engine do not exceed other maximum operating limits in accordance with Flight Manual.

(2) Extraordinary use of maximum take-off power will be entered in the Engine Log-Book.

(3) Mixture control adjustment for the maximum take-off and continuous power setting.

2.6.2. Compressor Using

(1) During continuous using of switched-on compressor it is necessary to keep the rated manifold pressure in value range, specified for relevant flight power.

(2) During aerobatic maneuvers it is permitted to switch-on the compressor only with the engine maximum continuous power, e.i. with manifold pressure of 100 kPa (1,02 at) and 2600 RPM.

SECTION 2

2.7. ENGINE INSTRUMENT MARKINGS

Instrument name	Unit	Red radial line		Yelow arc	Green arc
Tachometer	RPM	500	3025	2600-2860	500-2600
Manifold pressure gauge	kPa	-	118	98 - 118	39 - 98
	at	-	1,2	1,0 - 1,2	0,4 - 1,0
Oil temperature gauge	°C	25	85	25 - 40 80 - 85	40 - 80
Cylinder head temperature gauge	°C	70	210(x)	70 - 140 185-210(x)	140 - 185
Fuel pressure gauge	kPa	10	50	10 - 30 40 - 50	30 - 40
	kp/cm²	0,1	0,5	0,1 - 0,3 0,4 - 0,5	0,3 - 0,4
Oil pressure gauge	kPa	120	450	120 - 350 400 - 450	350 - 400
	kp/cm²	1,2	4,5	1,2 - 3,5 4,0 - 4,5	3,5 - 4,0
Meaning of instrument markings	Limit values			Increased attention regime	Normal operating range

Caution:

(+) Permitted max. cylinder head temperature of 210°C at take-off till max. 5 minuts only.

2.8. FUEL

Non-ethylated aviation gasoline - min. 78 octane number - or other kinds of the aviation gasoline.

Limitation:

(1) Application of ethylated aviation gasoline is only permitted in case, the T.E.L. content does not exceed the value of 0,06% vol.
(2) In ethylated liquid the ethyl bromid and organic chlorinated compounds must not be contained.

Recommendation:

(1) Following approved kinds of fuel and oil useable for the Z 137 T aircraft operation:
LBZ 78
SHELL 80, ESSO 80 (T.E.L. max. 0,06% vol.)
BP 100 L according to MIL-5572 E, Grade 100/130 (T.E.L. max. 0,06% vol.), AVGAS 100 L (St. 100/130).
(2) Fuel oct. No. 80 is recommended for operation under tropical conditions with ambient temperature above +30°C.

2.9. FUEL QUANTITY DATA

Name	Category	
	Aerobatic (A) Utility (U)	Normal (N)
Main tanks	2 x 60 l	2 x 60 l
Connecting tank	5 l	5 l
Wing tip tanks	-	2 x 50 l
Total fuel volume	125 l	225 l
Unusable fuel	3 l	5 l
Usable fuel	122 l	220 l

2.10. ENGINE OIL

Limitation:
Percentual carbon residue must not exceed o.4 % of weight.

Recommendation:
FOR RUNNING-IN (max. up to 50 hours) a mineral oil - e.g. -AERO SHELL 100- or an equivalent - is rerecommended.
FOR AFTER-RUNNING-IN operation a dispersant ash-free oil is recommended.

FOR TEMPERATE CLIMATIC ZONE -AERO SHELL W 100- or equivalent is recommended.
FOR TROPICAL ZONE -AERO SHELL W 120- or equivalent is recommended.
FOR WINTER OPERATION in polar zone -AERO SHELL W 80- or -AERO SHELL W 65- or equivalent is recommended.

CAUTION:
When operating the mineral oil more than 50 hours, the detergent oil and the dispersant oil must not be used without previous decarbonisation and through engine rinsing.

2.11. OIL QUANTITY DATA

Maximum permissible oil capacity	12 l
Oil capacity for aerobatic flights	9 l
Minimum oil capacity	7 l

2.12. AIRSPEED LIMITATIONS

Airspeed	Abb.	Category			
		Aerobatic Utility		Normal	
		IAS (km/h)	CAS (km/h)	IAS (km/h)	CAS (km/h)
Never exceed speed	V_{NE}	333	315	332	315
Normal operating limit speed	V_{NO}	273	260	272	260
Design maneuvering speed	V_A (A) (U)	284 264	270 252	235	227
Maximum permissible flaps extended speed	V_{FE}	189	185	188	185

2.13. AIRSPEED INDICATOR AND ACCELEROMETER MARKINGS

Instrument name	Red radial line	Yellow arc	Green arc	White arc
Airspeed indicator IAS (km/h)	333	273 - 333	103 - 273	88 - 189
Accelerometer	-3,5 +6	-	-3,5 ÷ +6	-
Meaning of instrument markings	Limit values	Increased attention regime	Normal	Extending flaps
			Operating range	

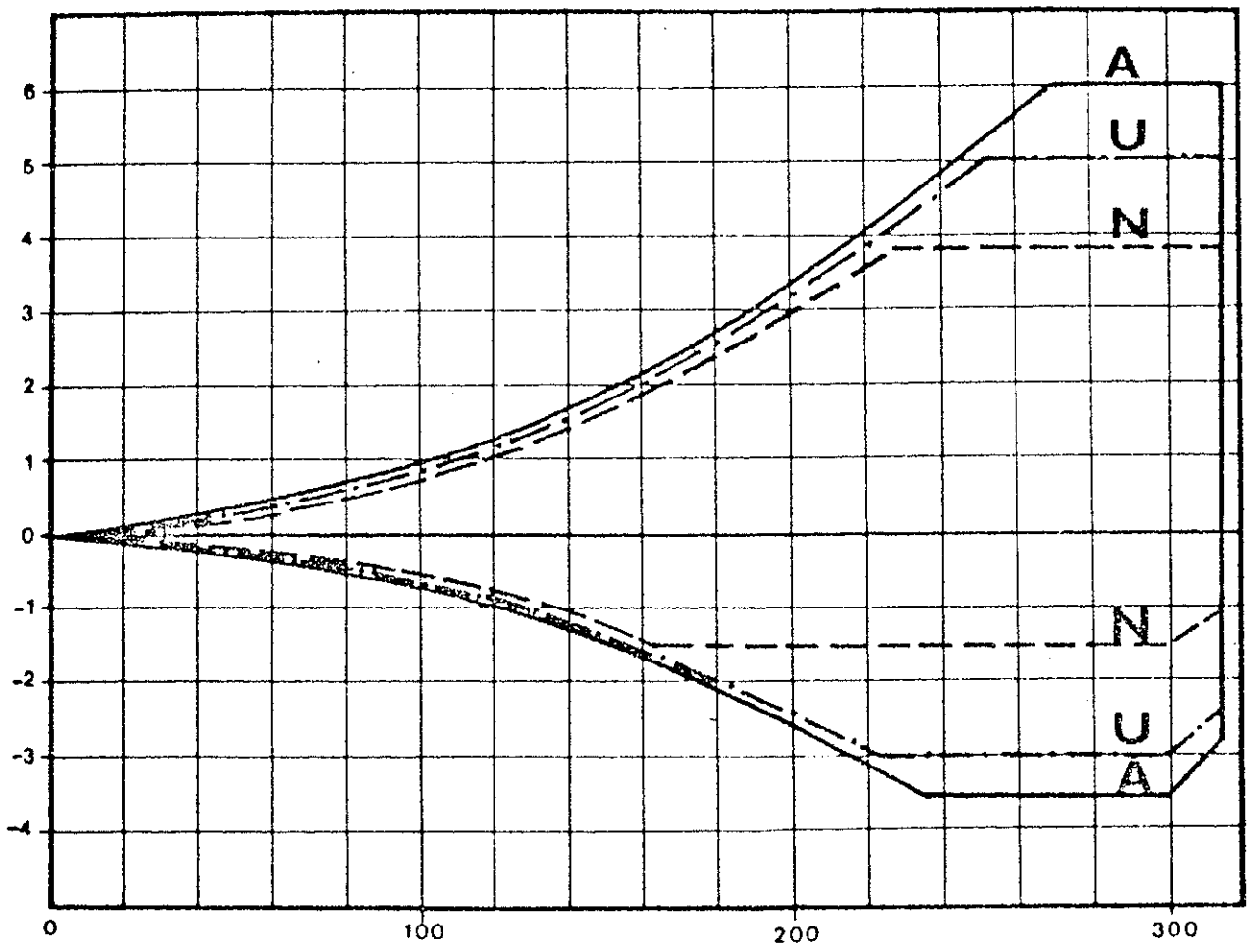
2.14. LOAD FACTORS AND MANEUVERING ENVELOPE

2.14.1. Load Factors

Category	Load factor	
	+	-
Aerobatic	6	3,5
Utility	5	3
Normal	3,8	1,5

2.14.2. Maneuvering Envelope

Load factor



Legend :

——————— A category AEROBATIC

—·—·—·— U category UTILITY

— — — — N category NORMAL

SECTION 2

2.18. AEROBATIC MANEUVERS

2.18.1. Category Aerobatic (A) and Utility (U)

The following is a list of the allowed maneuvers for the aircraft in aerobatic and utility category :

No.	Name	Recomended Entry Speed km/h IAS
1.	Step turn (bank more than 45°)	min. 180
2.	Climbing turn	min. 220
3.	Looping	min. 240
4.	Immelmann turn	min. 250
5.	Half roll and dive out	max. 150
6.	Stalled turn	min. 180
7.	Slow roll	min. 180
8.	Stalling (whip stall)	min. 160
9.	Spin	110
10.	Inverted flight	min. 200
11.	Inverted turn	min. 200
12.	Inverted loop from normal flight	max. 110
13.	Inverted loop from inverted flight	min. 260
14.	Inverted spin	140

Caution :

Aerobatic maneuvers listed above may be performed in single or double man in any arbitrary sequence, flight attitude and combination, provided that following limitations are complied with :

1) Weights and center of gravity position - item 2.3. - 2.5.
2) Power plant limitations - item 2.6. - 2.7.
3) Speed limitations, load factors imitations and maneuvering envelope limitations - item 2.12. - 2.14.
4) Inverted flight - max. 1 min. 30 sec.
5) Spin - a) permissible number of turns : max. 6
   b) intentional spins with wing flaps extended are PROHIBITED.
   c) Intentional power on spins are PROHIBITED.

6. Flick rolls are PROHIBITED.
7. Aerobatic maneuvers are PROHIBITED:
   - with fuel in auxiliary tanks
   - with luggage in luggage compartment

2.15.2. Category normal (N)

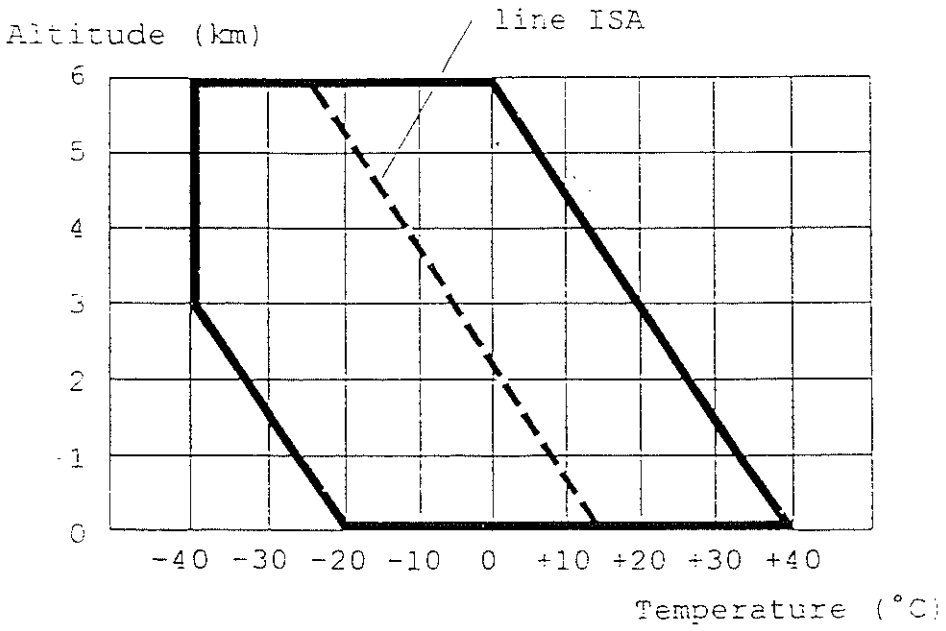
(a) With the aircraft in category NORMAL (weight in excees off 1020 kg or aircraft with fuel in the auxiliary tanks all aerobatic maneuvers including intentional spins and stalls are PROHIBITED.

(b) The following is a list of the allowed flight maneuvers for the aircraft in category NORMAL :

No.	Name	Recomended Entry Speed km/h IAS
1.	Step turn (bank max 45°)	min. 190
2.	Climbing turn	min. 220
3.	Side-slipping	140

2.16. PERMISSIBLE AMBIENT TEMPERATURE

The range of permissible ambient temperature for operating the Z 142 aircraft is indicated by the area outlined by heavy lines in the following diagram :



2.17. MAXIMUM ALLOWABLE WIND COMPONENTS

Take-off and landing

Maximum allowable wind speed component :

a) Opposite to take-off direction 18 m/s
b) Cross wind - 10 m/s (normal to path direction)

Recommendation :

See diagram in item 2.26 for determination of the wind speed component.

2.18. FLIGHTS IN ICING CONDITIONS

Flights in icing conditions are PROHIBITED.

2.19. APPLICATION OF BRAKES

The allowable initial speed for application of brakes is 100 km/h.

2.20. MINIMUM CREW, MAXIMUM NUMBER OF SEATS FOR PASSENGERS

2.20.1. Minimum aircraft crew is 1 pilot.

2.20.2. Maximum number of seats for passengers - 1 (right).

2.21. SMOKING

On board of the Z 142 aircraft SMOKING IS PROHIBITED.

2.22. MINIMUM NITROGEN PRESSURE IN MAIN SPAR FLANGE

Minimum permissible nitrogen pressure in the main spar flange is 150 kPa (1,5 kp/cm^2).

Caution :

(1) At nitrogen pressure drop below specified minimum value, it is necessary to stop further aircraft operation and to remove the defect.
(2) At nitrogen pressure drop below specified minimum value in flight, it is necessary to perform landing on the nearest airport and not to overload supporting structure, if possible.

2.23. NITROGEN PRESSURE IN MAIN SPAR FLANGE-INDICATOR MARKINGS

Coloured marking	Marking meaning	kPa	kp/cm^2
Red radial line	minimum pressure	150	1,5
Green arc	operating range	150-250	1,5-2,5

2.24. TAXIING

During taxiing the wing flaps must be in position FLAPS RETRACTED.

2.25. PLACARDS

Following placards are located in the aircraft cockpit :

2.25.1. Limitations, prohibitions and cautions

(1)

EXCEPT AS MAY BE OTHERWISE INDICATED ON A PLACARD THE MARKINGS AND PLACARDS INSTALLED IN THIS AIRPLANE CONTAIN OPERATING LIMITATIONS WHICH MUST BE COMPLIED WITH WHEN OPERATING THIS AIRPLANE IN THE ACROBATIC CATEGORY. OTHER OPERATING LIMITATIONS WHICH MUST BE COMPLIED WITH WHEN OPERATING THIS AIRPLANE IN THIS CATEGORY OR IN THE UTILITY AND NORMAL CATEGORY ARE CONTAINED IN THE AIRPLANE FLIGHT MANUAL.	APPROVED ACROBATIC MANEUVERS AND RECOMMENDED ENTRY SPEEDS IAS km/h LOOP MIN. 240 IMMELMANN TURN MIN. 250 HALF-ROLL AND DIVE OUT MAX. 150 STALLED TURN MIN. 180 ROLL MIN. 180 SPIN 110 OUTSIDE-LOOP FROM THE NORMAL FLIGHT MAX. 110 OUTSIDE-LOOP FROM THE INVERTED FLIGHT MIN. 260 INVERTED SPIN 140
DESIGN MANEUVERING SPEED V_A IAS km/h 284 SNAP FIGURES ARE PROHIBITED	
INTENTIONAL SPINS WITH FLAPS EXTENDED ARE PROHIBITED SPIN RECOVERY: 1. APPLY FULL RUDDER OPPOSITE TO THE DIRECTION OF ROTATION 2. USE FORWARD PRESSURE ON CONTROL STICK	
FLIGHTS ONLY ACCORDING TO VFR AND NO ICING CONDITIONS	

(5) CANOPY ARRESTMENT

Note :

Placard No. (5) is located at canopy arrestment lever (locking in open position on the ground).

2.25.2. Control Markings

(1) LONGITUDINAL TRIM

AIRCRAFT
NOSE HEAVY TAIL HEAVY

(2) DIRECTIONAL TRIM

DIRECTIONAL TRIM

Note :

Placards No. (1) - (2) are located at trim control.

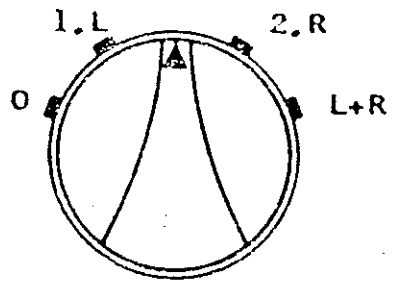
(3) WING FLAPS

FLAPS RETRACTED | FLAPS START | FLAPS LANDING

Note :

Placard No. (3) is located at wing flap control lever and shows corresponding position of wing flaps.

(4) FUEL SHUTOFF VALVE



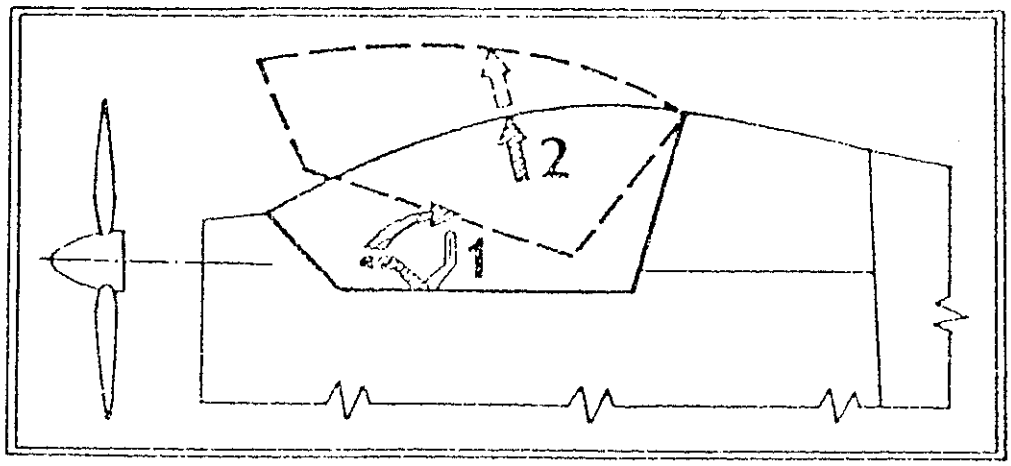
FUEL TANKS		
1.L	MAIN LEFT ACRO	60 L
	AUXILIARY LEFT	50 L
2.R	MAIN RIGHT	60 L
	AUXILIARY RIGHT	50 L

(2) | SPINNING PROHIBITED | | NO AEROBATICS IS ALLOWED WHEN FUEL IN AUXILIARY TANKS, TAKE OFF AND LANDING ON RIGHT TANK. |

Note :

Placards No. (1) (2) are located in the cabin in pilot's viewing field.

(3) EMERGENCY RELEASE OF COCKPIT CANOPY



Note :

Placards No. (3) are located on the L.H. and R.H. cockpit side of emergency release handle.

PROCESS OF COCKPIT CANOPY EMERGENCY RELEASE

1. By pulling the handle on L.H. or R.H. side of cockpit backward the suspensions are unlocked.
2. Force the canopy upwards.

(4) | WITH LUGGAGE AEROBATICS PROHIBITED |

Note :

Placard No. (4) is located in the luggage compartment.

Legends :

1. Auxiliary fuel tanks are connected with main fuel tanks.
2. Fuel shutoff valve position :
   1.L - fuel withdrawal of main left and auxiliary left tank
   2.R - fuel withdrawal of main right and auxiliary right tank
   L+R - fuel withdrawal of all tanks
   O - fuel CLOSED

Note :

Placard No. (4) is located at the fuel shutoff valve and gives a corresponding position of the fuel shutoff valve and capacity of fuel tanks.

(5) [HAND PUMP]

Note :

Placard No. (5) is located at fuel hand pump control.

(6) [PRIMING]

Note :

Placard No. (6) is located at priming control.

(7) [STARTER] [MIXTURE + |]

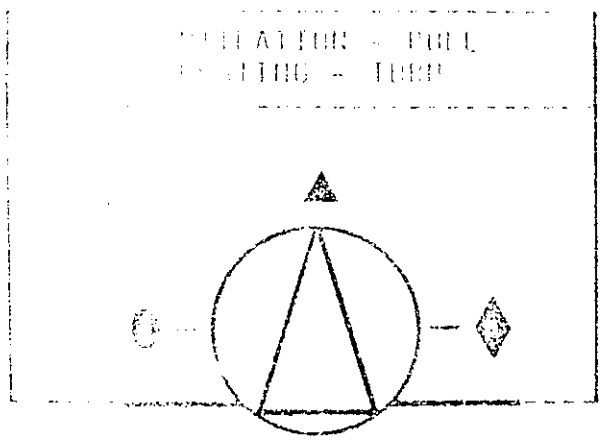
Note :

Placard No. (7) is located at starter pushbutton adn mixture control (+ rich, | lean).

(8) [FIRE EXTINGUISHER PULL]

Note :

Placard No. (8) is located at engine extinguisher control.



Note :

Figure No. (11) is located at ventilation and heating control on the cockpit.

HANDLING INSTRUCTIONS

VENTILATION :

By pulling the fresh air supply is increased first on the front part of windshield, in the position PULL OUT the fresh air flows to the pilot's head space.

Heating :

Function according to arrow position on the control device.

No.	Arrow position	Size on placard	Heating function
1.	left		closed
2.	up		front part of windshield
3.	right		front part of windshield and space for legs
4.	down		space for legs

(12) AIRSCREW REVOLUTION PUSH TO MAX.

Note :

Placard No. (12) is located at airscrew control.
By PUSHING the angle of propeller setting is decreased (higher revolution).
By PULLING the angle of propeller setting is increased (lower revolution).

(13) SUPERCHARGER PUSH-ON

Note :

Placard No. (13) is located at supercharger control.

Positions : ON - (push)
OFF- (pull)

(14) PARKING BRAKE PULL ON

Note :

Placard No. (14) is located at parking brake control.

POSITIONS : ON (pull)
OFF (push)

(15) LANDING LIGHT | TAXIING REFLECTOR | NAVIGATION | FLASHING BEACON | FUEL | DRAIN FOR FUEL

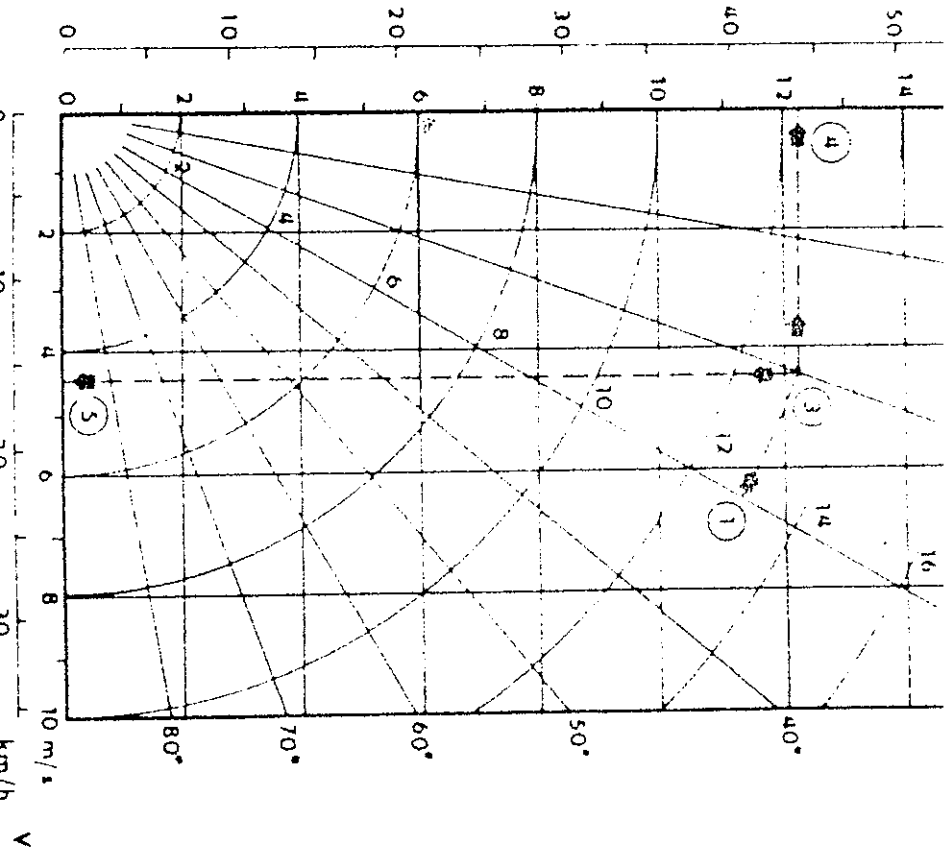
BATTERY | GENERATOR | STARTER | RADIO | FLIGHT INSTRUMENTS | RADIO-COMPASS | PITOT HEATING

Note :

Placards No. (15) are located on panel between pilot seats at sectionalizing switches and show separate electrical circuits.

egend :

' - angle between the wind direction and the runway
- wind speed
- wind speed component perpendicular to runway di
- wind speed component in line with runway direc



SECTION 3

3. E M E R G E N C Y P R O C E D U R E S

CONTENTS

SECTION 3

3. EMERGENCY PROCEDURES

3.1. ENGINE OR FUEL SYSTEM FIRE IN FLIGHT

(1) Fuel shutoff valve - off
(2) Throttle - full OPEN
(3) Master switch - off
(4) Fire extinguisher - on (during engine fire)
(5) Magnetos - off (after stopping the engine)
(6) Glide speed - set to 140 km/h
(7) If the fire has not been extinguished, make alternate side slips to the left and to the right or increase glide speed.
(8) After the fire has been extinguished, execute EMERGENCY LANDING.

Caution :

(1) Do not restart the engine after the fire has been extinguished.
(2) If the fire could not be extinguished at a safe altitude, abandon the aircraft by parachute.
(3) Points 1 - 6 valid for pilot - operating even in a case when flight highdoes not allow abandoning the aircraft by parachute or when the pilot is not equipped with a parachute.

3.2. ABANDONING THE AIRCRAFT BY PARACHUTE

Caution :

(1) During canopy emergency release DO NOT OPEN the lock of of the canopy.
(2) During abandoning it is necessary not to manipulate the aircraft control, for example to strike on the control stick by leg etc.

3.2.1. Abandoning the Aircraft from the Left Seat to the Left

(1) Flight direction - over uninhabited terrain
(2) Trim tab - as required
(3) Magnetos - off
(4) Fuel shutoff valve - off
(5) Master switch - off
(6) Canopy emergency release - pull emergency release level; DO NOT OPEN canopy lock.
(7) Execution of canopy release - push up with hand
(8) Earphone - throw out of the cockpit
(9) Fastening belts - release; throw backward shoulder straps

(10) Put out left hand down and backward from the cockpit, turning the body to the left; lean the outlying hand against the wing.
(11) Topple over the left frame of cockpit, lean the right hand against the wing and put out the right bent leg on the wing.
(12) Take off from the aircraft at angle of min. 30^{o} of aircraft longitudinal axis by the help of hands and the left leg.

Note :

(1) Procedures (1) - (7) can be omitted, if no time is available.
(2) Depending upon the actual situation and conditions, the pilot can make a different decision.

3.7.2. Abandoning the Aircraft from the Left Seat to the Right

(1) Flight direction - over uninhabited terrain
(2) Trim tab - as required
(3) Magnetos - off
(4) Fuel shutoff valve - off
(5) Master switch - off
(6) Canopy emergency release - pull emergency release lever; DO NOT OPEN canopy lock
(7) Execution of canopy release - push with both hands up
(8) Earphone - throw out of the cockpit
(9) Fastening belts - release, throw backward shoulder straps
(10) Turn the body to the right, kneel on the right seat with the right leg holding of by hands the right edge of the canopy.
(11) Put out arms and the left leg on the wing.
(12) Take off from the aircraft at angle of min. 30^{o} of aircraft longitudinal axis by help of hands and the right leg.

Caution :

This procedure of abandoning is possible if the right seat is not occupied.

Note :

(1) Procedures (1) - (5) can be omitted, if no time is available.
(2) Depending upon the actual situation and conditions, the pilot can make a different decision.

3.2.3. Abandoning the Aircraft from the Right Seat

The procedure of abandoning the aircraft from the right seat is similar to the procedure of abandoning the aircraft from the left seat (items 3.2.1. and 3.2.2.). The positions are conform to mirror picture of the aircraft symmetry plane.

3.2.4. Spins

The procedure of abandoning the aircraft in spin is similar to the procedures according to items 3.2.1., 3.2.2. and 3.2.3. The procedures (1), (2) mentioned in items 3.2.1 and 3.2.2. are not executed, the procedures (3), (4) and (5) can be omitted, if no time is available.

3.3. PRESSURE DROP IN MAIN SPAR FLANGE

(1) At nitrogen pressure drop in main spar flange below 150 kPa (1,5 kp/cm^2) perform LANDING on an nearest airport.
(2) If possible, do not overload supporting structure during the flight.

3.4. EXHAUST COLLECTOR BURN-OUT

If smell of exhaust gas experienced in the cockpit, CLOSE HEATING immediately and ventilate the cockpit.

SECTION 5

5. P E R F O R M A N C E S

CONTENTS

SECTION 5

5. PERFORMANCES

5.1. GENERAL

Stated performance figures apply to the Z 142 aircraft in good repair with standard equipment, M 337 AK engine and V 500 A propeller under average piloting technique in still atmospheric conditions.

Legend :

A - Aerobatic category - 970 kg
U - Utility category - 1020 kg
N - Normal Category - 1090 kg

		Category		
		A	U	N
5.2. TAKE-OFF RUN	(m)	220	225	240
Conditions :				
- altitude : 0 m ISA				
- max. take-off power				
- wing flaps in START position				
- runway : level, dry concrete				
5.3. TAKE-OFF DISTANCE OVER 15 m OBSTACLE	(m)	440	475	540
Conditions :				
- unstick speed IAS	(km/h)	90-100		95-105
- safe take-off speed IAS	(km/h)	120		130
- remaining conditions as outlined in item 5.2				
5.4. MAXIMUM RATE OF CLIMB	(m/s)	5,5	5,1	4,4
Conditions :				
- forward speed IAS	(km/h)	140		150
- altitude : 0 m ISA				
- max. take-off power				
- compressor ON				
- wing flaps in RETRACTED position				

5.5. PRACTICAL CEILING

	A	U	N
(m)	5000	4700	4300

Conditions :

- engine power : max. continuous (2600 RPM, manifold pressure 98 kPa, it is 1,00 at, max. throttle above rated altitude).
- compressor - ON
- wing flaps - RETRACTED
- speed - according to item 4.9 (4)

5.6. MAXIMUM GLIDE

Conditions :

Power setting - idling

Wing flaps	Speed IAS (km/h)		Glide
	A,U	N	A, U, N
Retracted	125	134	7,38
Start	118	126	6,80
Landing	98	107	6,33

5.7. LANDING DISTANCE OVER 15 m

	A	U	N
(m)	400	425	460

Conditions :

- approach speed IAS (km/h) 130-140
- altitude : 0 m ISA
- power setting : idling
- wing flaps : in position LANDING
- runway : level, dry concrete
- standard brake application after touch down.

5.8. LANDING ROLL DISTANCE

(m)	190	200	220

Conditions :

As specified in item 5.7.

SECTION 5

5.9. CRUISING SPEEDS

Conditions :

- altitude : 500 m ISA
- wing flaps : in position RETRACTED
- compressor : ON

Power setting	RPM	Manifold pressure		Speed km/h					
		kPa	at	TAS		CAS		IAS	
				A,U	N	A,U	N	A,U	N
Max.continuous	2600	98	1,00	213	208	208	203	215	208
Max. cruising	2400	90	0,92	197	190	192	186	197	189
Economy cruise	2300	82	0,84	179	171	175	167	178	167

5.10. MAXIMUM SPEED IN LEVEL FLIGHT

Conditions :

- altitude : 500 m ISA
- power setting : throttle - max.
  RPM - 2750
- compressor : ON
- wing flaps : in position RETRACTED

Category	Speed (km/h)		
	TAS	CAS	IAS
Aerobatic (A) Utility (U)	231	225	234
Normal (N)	227	222	230

5.11. ENDURANCE

Conditions :

As specified in item 5.9.

Power setting	RPM	Manifold pressure		Speed TAS (km/h)		Endurance	
		kPa	at	A,U	N	Category A,U	Category N
Max. continuous	2600	98	1,00	213	208	2h 00 min.	3h 45 min.
Max.cruising	2400	90	0,92	197	190	2h 40 min.	5h 00 min.
Economy cruise	2300	82	0,84	179	171	3h 20 min.	6h 10 min.

Note :

(1) Endurance is specified in level flight :
- for category aerobatic and utility A,U): without fuel in wing tip tanks
- for category normal (N): with fuel in wing tip tanks.

(2) Fuel required for ground operation, take-off, climb, glide and go-around has been substracted from the total quantity of fuel.

5.12. FLIGHT RANGE

Conditions :

As specified in item 5.9. and 5.11.

Power setting	RPM	Manifold pressure		Speed TAS (km/h)		Flight range	
		kPa	at	A,U	N	Category A, U	Category N
Max. continuous	2600	98	1,00	213	208	435	780
Max.cruising	2400	90	0,92	197	190	525	950
Economy cruise	2300	82	0,84	179	171	595	1050

Note :

Flight range is specified in level flight
- for category aerobatic (A) and utility (U) : without fuel in wing tip tanks.
- for category normal (N) : with fuel in wing tip tanks.

5.13. STALL SPEEDS

Category	Wing flaps position	Stall speed	
		CAS km/h	IAS km/h
Aerobatic (A) (970 kg)	RETRACTED	V_{S1} 113	103
	START	V_{S1} 110	99
	LANDING	V_{S0} 102	88
Utility (U) (1020 kg)	RETRACTED	V_{S1} 116	107
	START	V_{S1} 112	102
	LANDING	V_{S0} 108	95
Normal (N) (1090 kg)	RETRACTED	V_{S1} 120	110
	START	V_{S1} 116	105
	LANDING	V_{S0} 108	95

Conditions :

- engine : idling

Note :

Given speeds valid in whole range of operating flight levels.

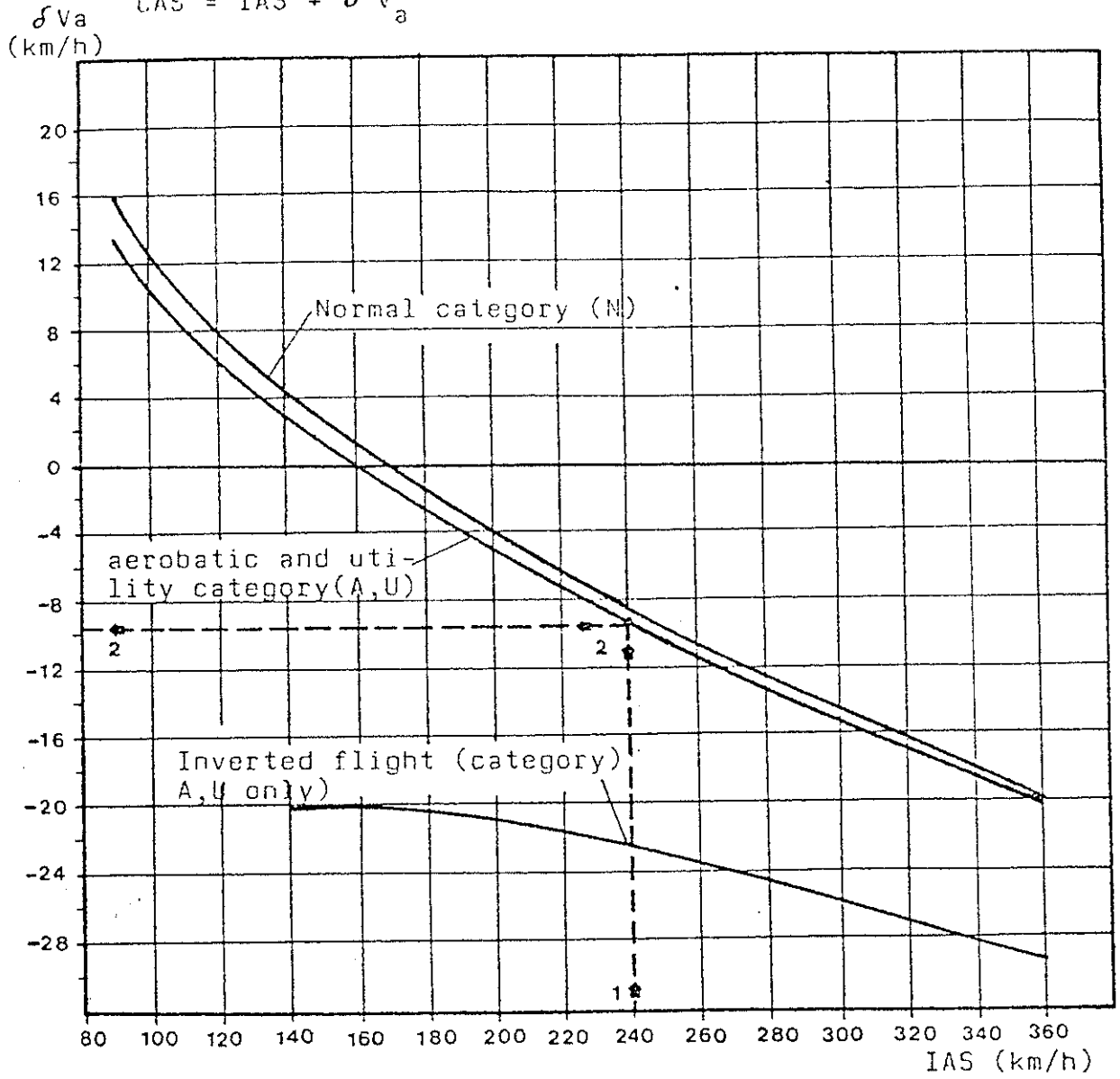
5.14. AIRSPEED CORRECTION CHART

5.14.1. Validity : Corrections valid for :

(1) Normal flight
(2) Inverted flight (lower part of chart)
(3) Categories A, U, N
(4) All positions of wing flaps
(5) Whole range of operating flight levels.

5.14.2. Chart for Airspeed Correction Determination :

CAS = IAS + δV_a



5.14.3. Diagram application (the example is shown with dash line)

(1) Erect a perpendicular line from relevant indicated speed IAS (e.g. IAS = 240 km/h).

(2) From point of intersection of perpendicular line with airspeed correction curve for corresponding category the parallel line is led to left side of chart where airspeed correction δ_{va} is defined. (δ_{va} = -10 km/h)

(3) CAS = IAS + δ_{va} (CAS = 240 - 10 = 230 km/h)

SECTION 6

6. WEIGHT AND BALANCE

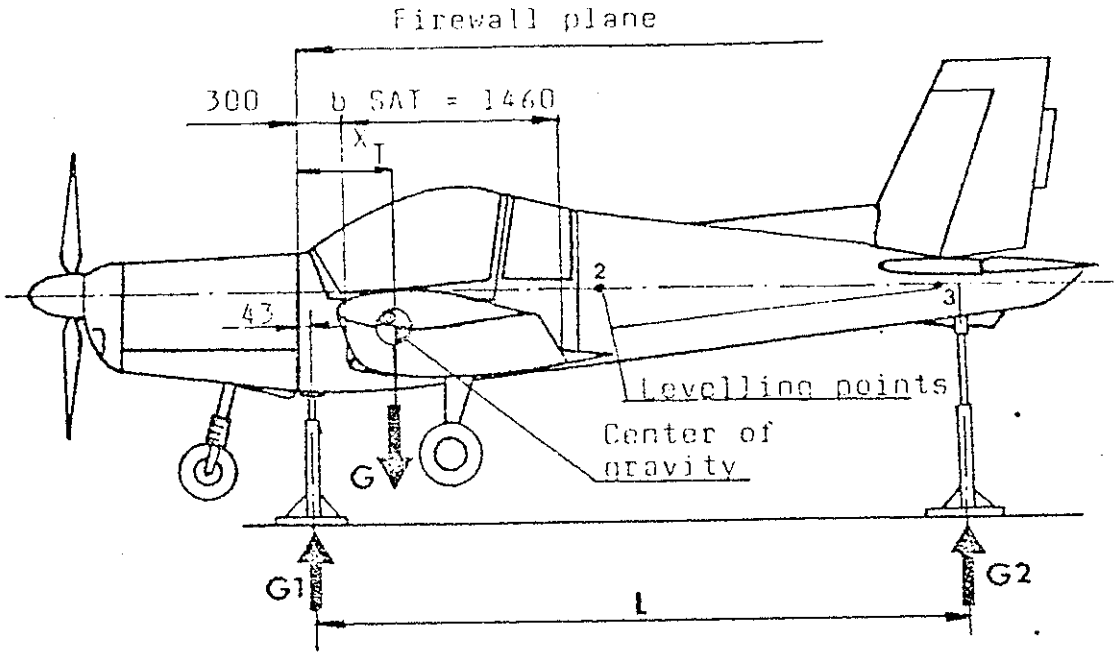
CONTENTS

SECTION 6

6. W E I G H T A N D B A L A N C E

6.1. GENERAL

6.1.1. Definitions, Markings and Used Units



G_1	:	Figure of front weight with jack	(kg)
G_2	:	Figure of rear weight with jack	(kg)
G_3	:	Total $G_1 + G_2$	(kg)
G_4	:	Front jack weight	(kg)
G_5	:	Rear jack weight	(kg)
G_6	:	Total $G_4 + G_5$	(kg)
G	:	Empty weight = $G_3 - G_6$	(kg)
L	:	Distance between jacking points	(m)
S	:	Static moment $S = G \cdot X_T$	(kgm)
b MAC	:	Acrodynamic chord length = 1,460	(m)
X_T	:	Center of gravity arm (measured from reference plane)	(m)
$\overline{X}_T$	:	Center of gravity position	(% MAC)

Reference plane - is consistent with the firewall plane (i.e. it is vertical at aircraft horizontal position).

Weighting the aircraft - is carried out for the purpose of weight and static moment determination. The aircraft is weighed in horizontal position. It is supported by two jacks placed under the first fuselage bulkhead and tail skid spar.

Horizontal position of the aircraft - is determinated by levelling points Nib No. 2-3 on the fuselage shell.

6.1.2. Calculation Formulas :

(1) Empty weight (kg)

$$G = G_3 - G_6$$

(2) Center of gravity arm (measured from reference plane) (m)

$$X_T = L \cdot \frac{G_2 - G_5}{G} - 0,043$$

(3) Static moment (kgm)

$$S = G \cdot X_T$$

(4) Center of gravity position

(a) $$\bar{X}_T = \left(\frac{X_T - 0,300}{1,46}\right) \cdot 100$$ (% MAC)

(b) $$\bar{X}_T = \left(\frac{S/G - 0,300}{1,46}\right) \cdot 100$$ (% MAC)

Caution :

Marking "M" (means weight - mass) is used in further items of this section (kg)

SECTION 6

6.2. WEIGHT AND CENTER OF GRAVITY POSITION OF EMPTY AIRCRAFT

Category	Empty weight M (kg)	Arm X_T (m)	Static moment S (kgm)	C/G $\bar{X}_T$ (% MAC)
Aerobatic (A) Utility (U)	730±3 %	0,563÷0,607	398 ÷ 456	19 $^{+2}_{-1}$ %
Normal (N)	(708-752)			

Caution :

(1) Above-mentioned values apply to the aircraft in following configuration :
- (a) standard model of aircraft
- (b) aircraft system contains - unuseable fuel
  - undrainable oil
- (c) brake system - filled with hydraulic liquid
- (d) category : aerobatic (A), utility (U), normal (N) } aircraft with wing tip tanks - without fuel
- (e) seat position: extreme front (without back cushions)
- (f) canopy : closed

(2) If the manufacturer delivered the aircraft with an ordered optional equipment, the weight and C/G position of empty aircraft are stated (including delivered optional equipment) in the Weighing Certificate and in item 6.7.1 of this Flight Manual.

(3) If the user installed additionally optional or supplementary equipment, the aircraft should be reweighed and the C/G position of empty aircraft should be recounted.

6.3. AIRCRAFT EQUIPMENT

The following is a list of weights (M), arms (X) and static moments (S) of most important both standard and optional equipment for the Z 142 aircraft.

Legenda :

(1) Optional - delivered for custome´s wish
(2) For operating in NORMAL (N) category only

Ord. No.	Name	Type, standard, draw. No.	Weight M (kg)	Arm X (m)	Static moment S (kgm)
1.	Engine with accessories	M 337 AK	157,750	-0,707	-111,353
2.	Propeller	V 500	25,00	-1,507	- 37,675
3.	Light installation	Z 42.2900	0,759	0,336	0,255
4.	Mud-guards of main wheels	Z 42.5610-20	1,634	1,166	1,905
5.	Nose wheel mud-guard	Z 42.5630	0,466	-0,534	- 0,249
6.	Nose wheel spat	Z142.5700	1,800	-0,484	- 0,871
7.	Wing tip tanks 2 pcs	Z142.7271-81	11,431	0,818	9,346
8.	Fire extinguisher	Z142.7900	3,418	0,056	0,191
9.	Parachute seat L.H.	Z 42.8110	7,610	1,071	8,150
10.	Parachute seat R.H.	Z 42.8120	7,624	1,071	8,165
11.	Safety belts, 2 sets	Z142.8130	5,750	1,119	6,434
12.	Blind flying curtains (1)	Z142.8150	0,500	0,766	0,383
13.	Back-rest cushions 2 pcs (2)	Z 42.8160	4,000	1,266	5,064
14.	Curtains	Z142.8170	0,387	1,166	0,451
15.	Medicine chest	Z 42.8261	0,512	1,966	1,007
16.	Board fire extinguisher (1)	Z142.8263	0,600	0,666	0,400
17.	Internal rear-view mirror (1)	Z142.8266	0,100	0,776	0,078
18.	Towing gear (1)	Z142.8400	1,141	4,766	5,438
19.	Intercom push--buttons installation (1)	Z 42.8623	0,200	0,566	0,113
20.	Radio station installation (1)	Z142.8630 LUN 3524.21	4,000	0,551	2,204
21.	Radiocompass installation (1)	Z142.8670	6,000	0,739	4,434
22.	Anti-collision beacon installation	Z142.8970 OSS-61	1,740	4,826	8,397
23.	Cockpit lighting	Z142.8910	0,164	1,411	0,231
24.	Instrument lighting	Z 142.8920	0,934	0,401	0,375
25.	Map lamp	Z 142.8940	0,293	0,761	0,223
26.					
27.	Aircraft coating-standard	Z 142.000-01.00	14,595	1,844	26.913
28.					
29.					
30.					
31.	Airspeed indicator II (1)	LUN 1106	0,415	0,386	0,160

SECTION 6

Ord. No.	Name	Type, standard draw. No.	Weight M (kg)	Arm X (m)	Static moment S (kgm)
32.	Airspeed indicator I	LUN 1107	0,500	0,386	0,193
33.	Altimeter	LUN 1121	0,500	0,386	0,193
34.	Rate-of-climb indicator	LUN 1147	00,500	0,386	0,193
35.	Gyro horizon	LUN 1202	1,450	0,386	0,560
36.	Turn indicator (1)	LUN 1213	1,069	0,386	0,652
37.	Magnetic compass	LUN 1221	0,370	0,386	0,143
38.	Directional gyro	LUN 1272	1,500	0,386	0,579
39.	Tachometer	LUN 1341.2	1,000	0,386	0,386
40.	Cylinder head temperature gauge	LUN 1300	0,360	0,386	0,140
41.	Manifold pressure gauge	LUN 1401	0,220	0,386	0,085
42.	Three-pointer indicator	LUN 1523	0,570	0,386	0,220
43.	Fuel level gauge (quadruple)	LUN 1639	0,700	0,386	0,270
44.	VA meter	LUN 2715	0,400	0,386	0,154
45.	Board clock	AČS-10	0,650	0,386	0,251
46.	Accelerometer (1)	AM-10	0,278	0,386	0,107
47.	Converter installation	PAG-1 TP Z 142.8520	3,739	1,445	5,403
48.	Board battery	PS 12-24	19,000	1,775	33,725

6.4. PAYLOAD

6.4.1. Maximum Permissible Payload

Acrobatic category	(A) :	240 kg
Utility category	(U) :	290 kg
Normal category	(N) :	360 kg

Caution :

(1) Above-mentioned permissible payload applies only to the aircraft with a standard equipment.
(2) If the aircraft is provided with an optional equipment, it is necessary to reduce the permissible payload for not exceeding the weight limits, as outlined in Section 2 - item 2.3.

6.4.2. List of Maximum Permissible Payload

Given below is a list of weights (H_u), arms (X) and static moments (S_u) of maximum permissible payload for the aircraft with standard equipment.

Payload	Specification		Weight H_u (kg)	Arm X (m)	Static moment S_u (kgm)
Pilots	Pilot's seat position	forward middle aft	200,00 200,00 200,00	0,486 0,896 0,946	169,200 179,200 189,200
Fuel	Main tanks	120,0 l	86,40	0,666	57,542
	Wing tip tanks (N)	100,0 l	72,00	0,711	51,192
	Main and wing tip tanks (N)	220,0 l	158,40	0,686	108,734
Oil	Max.filling	12,0 l	11,00	-0,174	- 1,900
Luggage	In category NORMAL only		20,00	1,766	35,320

Caution :

(1) Maximum permissible payload of the pilots seats is given : - in category A-U including parachutes
- in category N without parachutes, including back-rest cushions.

(2) (a) Luggage may be transported in luggage compartment in category N only.
(b) Luggage must be secured against displacement by belt.
(c) Luggage with weight more than 15 kg must be secured by two belts at least.
(3) Total maximum permissible payload must correspond to item 6.4.1 when maintaining the weights limits as outlined in Section 2 - item 2.3.

6.5. WEIGHT AND PAYLOAD CHECK

The pilot is responsible to check maintaining of weight limits according to Section 2 items 2.3 - 2.4 and permissible payload acc. to 6.7.2. before every flight.

Recommendation :

Weight and payload checking procedure is shown in item 6.7. Calculation example is shown in item 6.8.

6.6. CENTER OF GRAVITY POSITION CHECK

For every flight the C/G position must be in specified limits according to Section 2 - item 2.5.

Recommendation :

C/G position checking procedure is shown in item 6.7.4. Calculation example is shown in item 6.8.4.

6.7. WEIGHT, PAYLOAD AND CENTER OF GRAVITY POSITION CHECK PROCEDURE

6.7.1. Weight and Static Moment of Empty Aircraft

If no modification have been performed by the user in equipment arrangement after taking over the aircraft from the manufacturer, following values apply to the determination of empty weight (M) and static moment (S) for the categories (A), (U), (R).

Empty weight M (kg)	Arm X_T (m)	Static moment S (kgm)	Stamp and manufacturer's signature

Caution :

(1) In the event the additional equipment arrangment was performed by the user, it is necessary either to recount or to determine the weight and the static moment of empty aircraft on the basis of weighing.
(2) Weight, arm and static moment list of standard and optional aircraft equipment is shown in item 6.3.

6.7.2. Payload Weight and Static Moment

(1) The payload weight (M_u) is given by a sum of separate payload weights (pilots with parachutes or back-rest cushions + fuel + oil + luggage).
(2) Payload static moment (S_u) is given by an algebraic sum of separate payload static moments (pilots with parachutes or back-rest cushions + fuel + oil + luggage), determined in accordance with the chart No. 1 - item 6.9.

6.7.3. Gross Weight (M_L)

The gross weight (M_L) is given by a sum of empty weight (M) as outlined in item 6.7. + and actual payload (M_u) as outlined in item 6.7.2.

$$M_L = M + M_u$$

6.7.4. Center of Gravity Position (% MAC)

For C/G position determination, use chart No. 2 - item 6.10. as follows :

(1) Mark following values in chart No. 2 - C/G position check:
   (A) on vertical scale - gross weight (M_L), determined in accordance with item 6.7.3 (point A)
   (B) on horizontal scale - total static moment (S_v) - - determined as follows :

   Add the static payload moment (S_u) determined in accordance with item 6.7.2 to the empty aircraft static moment (S) determined in accordance with item 6.7.1.
   The total static moment is given by a sum of both static moment $S_v = S + S_u$ .....(kgm)
   Mark the total static moment (S_v) on the horizontal scale (point B).

(C) Parallel line with total static moments S_V course is led from point B till it intersects corresponding gross weight (M_L) - perpendicular line from point A. Point of intersection - point C - gives centre of gravity position in % MAC.

(2) If point C is situated in the marked area for the corresponding category, the aircraft is airworthy.

Note :

Procedure of the calculation is conformable for all categories - aerobatic, utility and normal. At category normal, the values for fuel in wing tip tanks and luggage must be used in addition for payload.

6.8. WEIGHT, PAYLOAD AND CENTRE OF GRAVITY CHECK EXAMPLE

Conditions :

Category : Aerobatic (A)
Crew : 2 pilots - 160 kg (including parachutes)
Seats position : front
Fuel : main tanks - 120 l
wing tip tanks 0 l (without fuel)
0 l
Oil : 0 (must not be in aircraft in category A-U)
Luggage :

6.8.1. Weight and Static Moment of Empty Aircraft

Following values are determined in accordance with Weighing Certificate, with placard in the aircraft or by reweighing :

(1) Empty weight : M_1 = 719 kg
(2) Static moment of empty aircraft (for category aerobatic)
$S = M_1 . X_1$ = 719 kg . 0,456 m = 327,7 kgm (rounding-off to 328 kgm).

Note :

Above-mentioned values are shown in item 6.7.1.

6.8.2. Actual Payload and Static Moments

In accordance with the chart No. 1 - item 6.9, corresponding static moments are determined according to actual payload as follows (shown with dash line in the chart) :

Payload	Weight (kg)	Static moment (kgm)
2 pilots with parachutes (forward seat position)	150,0	127,0
Fuel - main tanks 120 l	86,0	58,0
Oil 9 l	8,0	-1,4
Total	M_u = 244,0	S_u = 183,6

6.8.3. Gross Weight and Total Static Moment

Gross weight and total static moment are figured by a summation of values (weights and static moments) of empty aircraft and payload as shown in following table :

Value	Weight (kg)	Static moment (kgm)
Empty aircraft	M = 715	S = 398
Payload	M_u = 244	S_u = 184
Total	M_L = 959	S_v = 582

6.8.4. C/G Position Determination

On the basis of value determination in accordance with item 6.8.3, following points should be marked in the chart No.2 - - item 6.10 :

Point A - is on the vertical scale and corresponds to the gross weight :
M_L = 959 kg

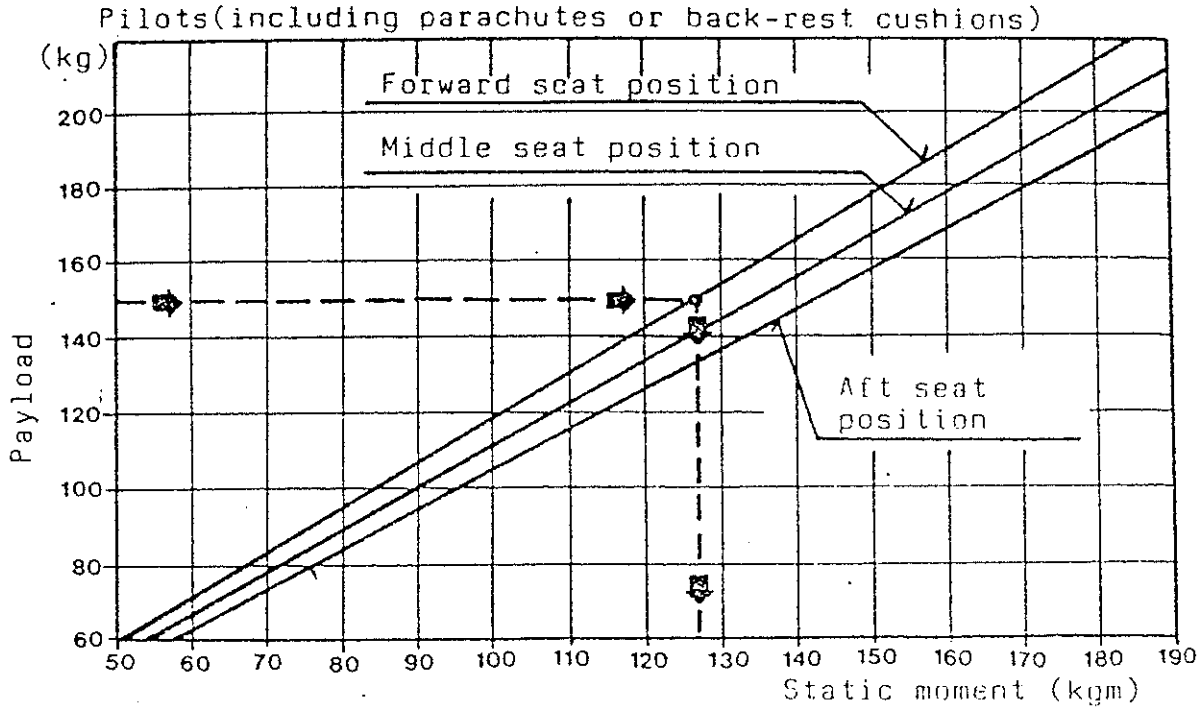
Point B - is on the horizontal scale and corresponds to the total static moment :
S_v = 582 kgm

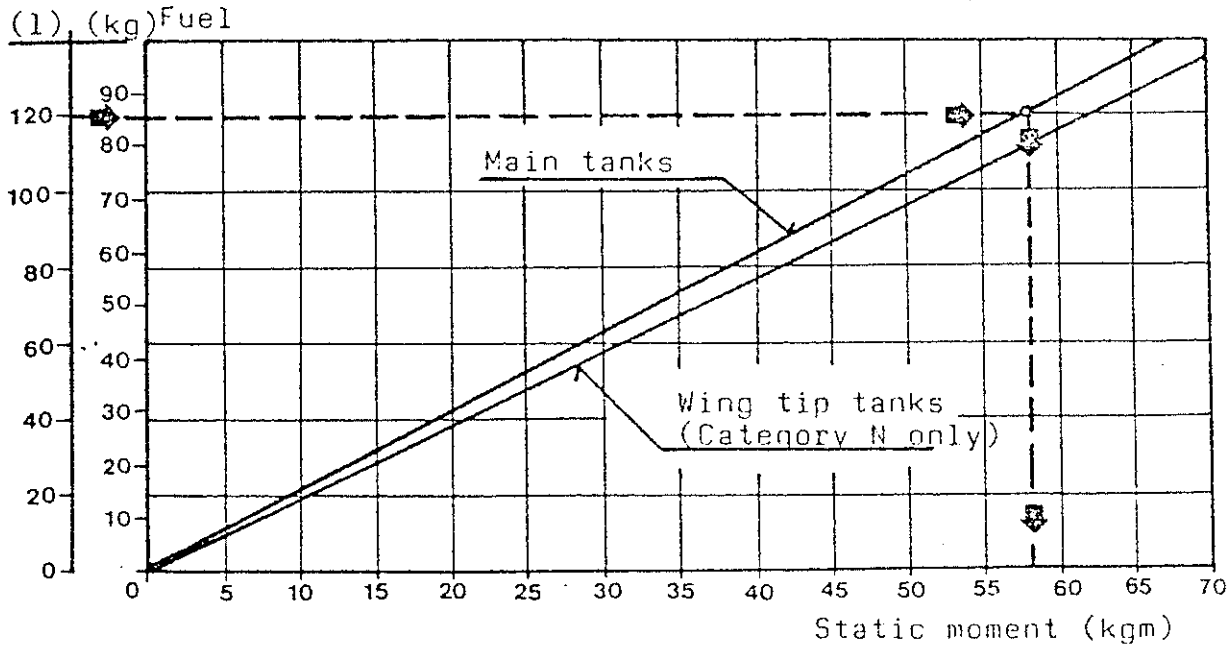
Point C - is point of intersection of parallele line that is led with course of total static moments S_v from point B, with perpendicular line led from point A for gross weight M_L (shown with dash line). Point C gives an actual C/G position for the solved example.

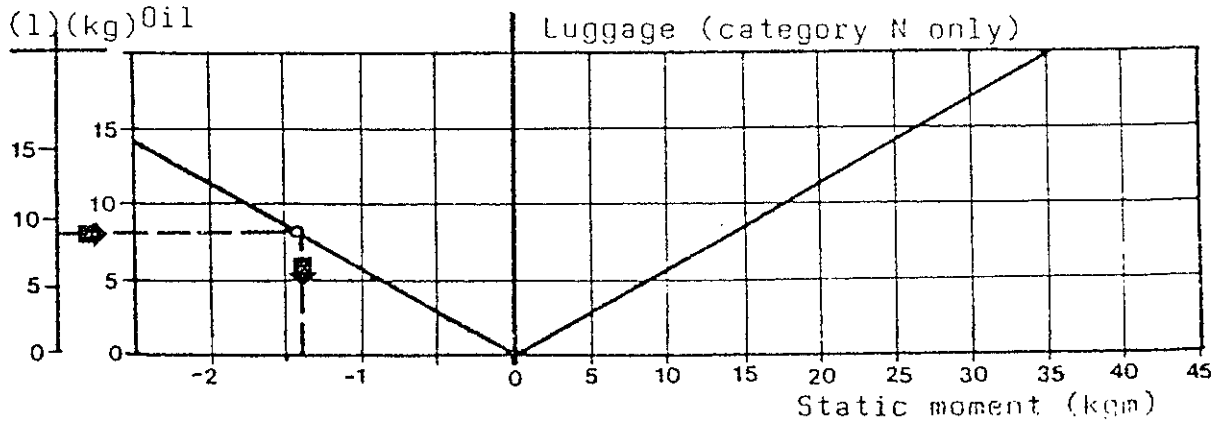
6.8.5. Conclusion

Point C falls within the area of permissible C/G position and weight for the category Aerobatic. The aircraft is airworthy.

6.9. CHART No. 1 - PAYLOAD STATIC MOMENTS

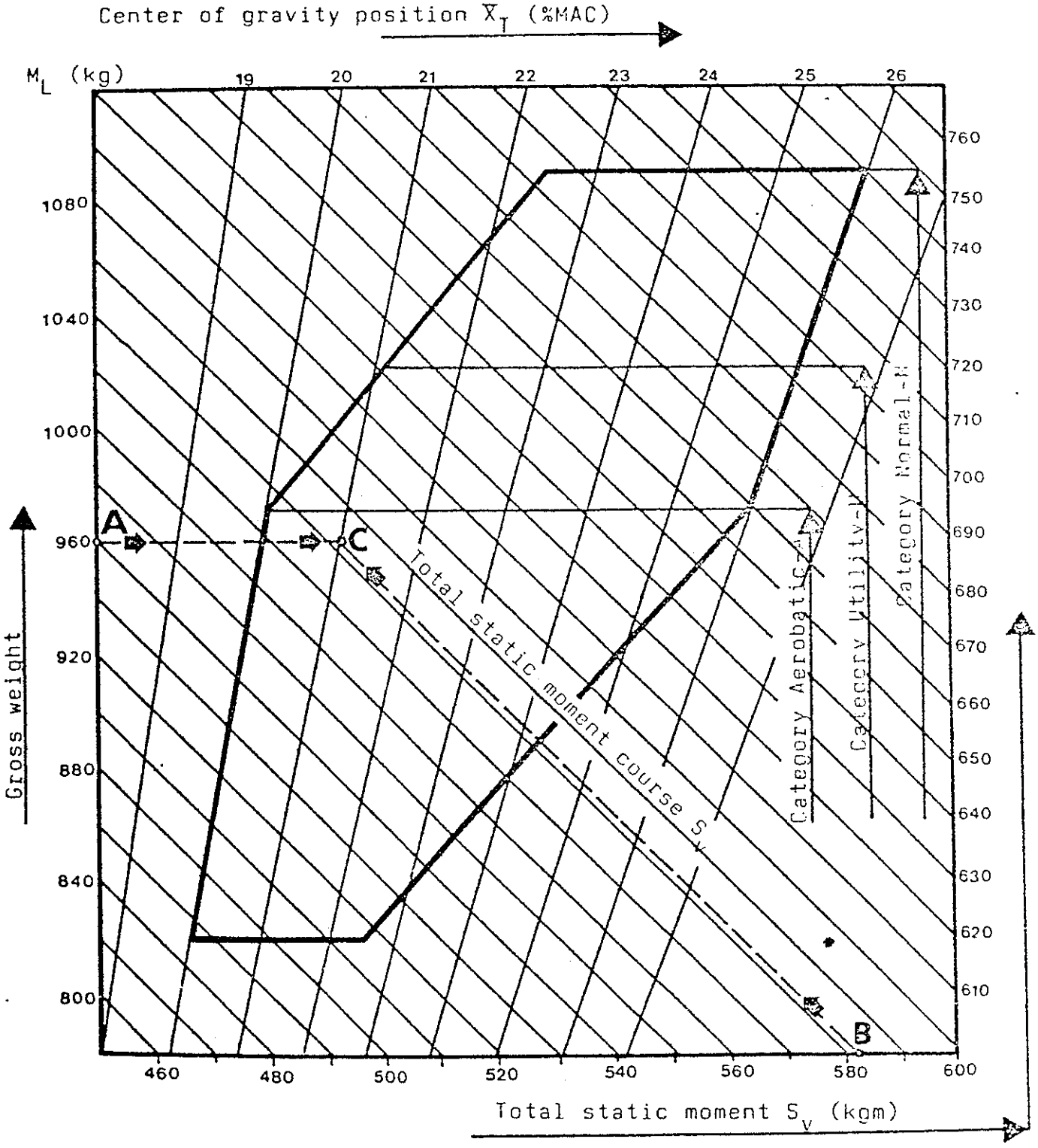






SECTION 6

6.10. CHART No. 2 - CENTER OF GRAVITY POSITION CHECK



SECTION 7

7. SUPPLEMENTS

CONTENTS

SECTION 7

7. SUPPLEMENTS

7.1. GENERAL

This section contains necessary in... limitations and procedures which a... delivered by the manufacturer with... equipment.

...mation, operating ...N to the Z 142 aircraft ...rresponding optional

7.2. VALIDITY

Operating limitations and procedu... apply to Z 142 aircraft with corr... only.

...given in Section 7, ...ding optional equipment

SECTION 7

7.3. Supplement No. 1 - TOW OF SAILPLANES

This supplement contains data for the tow of sailplanes and completes following sections of the Flight Manual.

Section 1 - G E N E R A L

The Z 142 aircraft is approved for the tow of sailplanes. Release lever of the towing gear is located on the central panel between the seats.

Section 2 - O P E R A T I N G L I M I T A T I O N S

When accomplishing following conditions, tows of saiplanes are approved :

(1) Maximum permissible take-off weight of sailplane 500 kg
(2) Maximum permissible take-off weight of aircraft 1020 kg
(3) The Z 142 is equipped with :
    (a) towing gear of the approved type
    (b) rear-view mirror
(4) Maximum permissible load of tow rope is 4900 N (500 kp)

Caution :

(1) When performing the tow of sailplanes, the limitations must be observed in accordance with Section 2 in range for category NORMAL (N).
(2) If tow rope tensile strength exceeds 4900 N (500 kp), breaking piece dimensioned to the tensile strength of 4900 N (500 kp) must be located on the tow rope.

Section 4 - N O R M A L P R O C E D U R E S

(1) Take-off - according to item 4.8
(2) Climbing - according to item 4.9
(3) Climbing speed - 110-130 km/h
(4) Cruising speed - in accordance with limitations of sailplane
(5) Descent - after sailplane releasing, according to item 4.11
(6) Before landing - in safe altitude, throw down the tow rope on the marked place
(7) Approach and landing - according to item 4.12, 4.13.

Recommendation :

(1) Select speed of climbing and descent in accordance with the sailplane type.
(2) Climbing can be executed with wing flaps position "START" or "RETRACTED"

SECTION 7

7.4. Supplement No. 2 - LUN 3524.21 RADIOSTATION

(1) General

The radiostation is installed to permit the air-to-ground communication and also serves as board telephone between the pilots.
The radiostation box is located on the central panel of instrument panel. The VHF push button and IC board telephone push button are placed on the control stick.
Sockets for earphones are on side covers at seats.

(2) Basic specifications

Frequency range :	118,000 - 135,975 MHz
Channel separation :	25 kHz
Total number of channels :	720
Transmitter power :	16 W
Range of operating temperatures :	+60 to -50°C

(3) Radiostation actuators

The radiostation control panel contains :
- noise squelch (SQ) in upper portion
- lighted frequency scale
- two frequency selectors : L.H. for the range in MHz
  R.H. for the range in kHz
- loudness setting knob acting also as a radiostation main switch in lower portion.

(4) Radiostation actuation

(1) Just before turning the radiostation ON, the MASTER SWITCH and the BATTERY switch should be turned ON; during engine run, the GENERATOR switch should be turned ON, too.
(2) Insert the earphone pin plug into the earphone socket.
(3) Turn the RADIO switch ON (also for using the board telephone).
(4) Set required frequency by aid of frequency selectors.
(5) Turn on the radiostation by turning the main switch knob to the right. Reception loudness is adjusted by turning the same knob.
(6) During transmission, push the VHF button, during board telephone using, push the IC button.
(7) In the event of weak signal reception, it is possible to place the noise squelch switch in the position labeled "O" and put the noise squelch out of operation.
(8) In the event of strong signal, it is possible to limit interference in earphones by placing the noise squelch switch in the position labeled "SQ".
(9) Turn off the radiostation by turning the main switch knob to the left.

SECTION 7

Caution :

(1) When starting the engine, disconnect the radiostation from board network with use of a switch located on the control panel.
(2) When not certified external source is connected do not turn on the the radiostation.
(3) Before engine stop, disconnect the radiostation from board network.

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EMERGENCY PROCEDURES ZLIN Z-142

Engine or fuel system fire in flight

1. FUEL SELECTOR	- off
2. THROTTLE	- full open
3. MASTER SWITCH	- off
4. FIRE EXTINGIUSHER	- on
5. MAGNETOS	- off
6. GLIDE SPEED	- 140 - 150 km/h
7. EMERGENCY LANDING	- see below

Emergency landing

1. SPEED	- 140 - 150 km/h
2. LANDING AREA	- select
3. WIND FORCE AND DIRECTION	- check
4. MAGNETOS	- off
5. FUEL SELECTOR	- off
6. FLAPS	- as required
7. SAFETY BELTS	- fastened

Pressure drop in main spar flange

1. Do not overload supporting structure during the flight
2. Perform landing on a nearest airport

Exhaust collector burn-out

If smell of exhaust gas experienced in the cockpit, close heating immediately and ventilate the cockpit.

Generator failure

All eletrical instruments - off (gyro, horizon, beacon)

LIMITATIONS ZLIN Z - 142

Headwind	- 18 m/s
Crosswind	- 10 m/s
V_{IE}	- 189 km/h
V_{NE}	- 333 km/h
V_{NO}	- 273 km/h

Maximal load factor	+6	-3,5	- aerobatics
	+5	-3	- utility
	+3,8	-1,5	- normal

Maximal take-off weight	970 kg	- aerobatics
	1020 kg	- utility
	1090 kg	- normal

Maximal glide (idling, flaps retracted, normal) - 7,38/134 km/h

Oil	12 l	- maximal
	7 l	- minimal
	9 l	- maximal aerobatics

Fuel - 2 x 60 l, 2 x 50 l (before take-off minimal 2 x 20 l)

CHECKLIST ZLIN Z-142 Zahradník

After entering the cockpit

1. SEAT POSITION	- adjusted
2. SEAT BELTS	- fastened
3. CONTROLS	- hand and rudder pedals controls for the movement
4. WIND FLAPS	- function checks
5. TRIM	- elevator and rudder - neutral
6. BRAKES	- check for function by applying toe pressure on brake pedals
7. MASTER SWITCH	- on
8. SECTIONALIZING SWITCHES	- on (battery, generator, starter, flight instruments)
9. CHECK	- engine instruments function
	- signalizing - stallingspeed warning
	- Pitot tube heating

Starting the engine

1. FUEL SHUTOFF VALVE	- set to 2P position (right)
2. THROTTLE AND MIXTURE	- according temperature
3. HAND PUMP	- pressure 0,2 - 0,3 kp/cm²
4. PRIMING PUMP	- prime fuel - according temperature
5. PROPELLER CONTROL	- by pushing to maximum (minimal angle)
6. COMPRESSOR	- on
7. PROPPELER AREA	- free
8. MAGNETOS	- on (1 + 2)
9. STARTER	- push starter button
10. ENGINE SPEED	- set to 1000 RPM
11. OIL PRESSURE	- minimal 1,2 kp/cm² within 10 seconds

Run up

1. BRAKES	- on the grass put chocks under main wheels
2. RPM	a) - 1000 RPM - 2 till 5 min (according to ambient air pressure)
	b) - 1500 RPM - during time necessary for the engine warm up for engine test
	- easy engine run with all position of fuel shutoff valve
	- generator function and battery charging
	- other equipment and instruments (horizon, radio)
3. RUN UP	- cylinder heat temperature - min 120° C
	oil temperature - min 25° C
	oil pressure - min 3,5 kp/cm²
	- manifold pressure - 0,92 at
	- propeller control - set 2 - 3 times to extreme position
	- maximum power setting (compressor off)
	- ignition check (permited RPM drop 30-50 RPM)
	- compressor on (RPM 2700 +0 -100)
	- idling (RPM 550 +-50)

Caution !

1. Perform the grouncheck with aircraft heading into wind
2. Do not perform on rought terrain

Before take-off

1. RPM	*- mininum 1500 (charging)*
2. CONTROL	*- free movement*
3. TRIM	*- neutral*
4. FLAPS	*- set for take-off*
5. FUEL	*- fuel selector - 2P (right)*
	- fuel quantity - check
6. SECTIONALIZING SWITCHES	*- on (battery, generator, starter, radio, flight instruments, beacon, transformer)*
7. NITROGEN PREASURE	*- minimal 1,5 kp/cm²*
8. COMPRESSOR	*- on*
9. PROPELLER CONTROL	*- push to maximum (minimal angle)*
10. MIXTURE	*- lean*
11. MASTER SWITCH	*- on*
12. MAGNETOS	*- on (1+2)*
13. ENGINE INSTRUMENT	*- check*
14. ALTIMETER	*- adjust*
15. SAFETY BELTS	*- locked*
16. COCKPIT	*- closed and secured*

After take-off

1. THROTTLE	*- 1,0 at*
2. PROPELLER	*- 2.600 RPM / when reaching speed 140 km/h*
3. FLAPS	*- up (50 m)*

Downwind checks

1. FUEL SELECTOR	*- 2P (right)*
2. COMPRESSOR	*- on*
3. MIXTURE	*- lean*
4. INSTRUMENTS	*- check*
5. SEAT BELTS	*- fastened*
6. APPROACH AREA	*- check*

Base leg check

1. THROTTLE	*- as required (0,4 - 0,6)*
2. PROPELLER	*- push to maximum (minimal angle)*
3. FLAPS	*- take-off position*
4. SPEED	*- 160 km/h*

Final checks

1. FLAPS	*- landing position*
2. SPEED	*- 140 km/h*
3. RUNWAY	*- clear (clearance received)*

After landing

1. COMPRESSOR	*- off*
2. TRIM	*- neutral*

Stopping the engine

1. TEMPERATURE	*- cool the heads of cylinders below 140- C*
2. THROTTLE	*- idling*
3. GYRO, HORIZON, RADIO	*- off*
4. MAGNETOS	*- off ("0")*
5. MASTER SWITCH	*- off*
6. SECTIONALIZING SWITCHES	*- off*

AEROBATICS

Preflight preparation

1. LOOSE OBJECTS	*- remove, secure, seat belts on unoccupied seat*
2. WEIGHT AND BALANCE	*- check*
3. OIL	*- check (maximum 9 l.)*
4. FUEL	*- check (tip tanks empty)*

Inflight procedure before aerobatics

1. CONTROL	*- check function and trim (neutral)*
2. FUEL SELECTOR	*- 1L (left)*
3. COMPRESSOR	*- on*
4. PROPELLER	*- 2.600 RPM*
5. MIXTURE	*- lean (or as required)*
6. FLAPS	*- up*
7. COCKPIT	*- closed and secured*
8. INSTRUMENTS CHECK	*- engine*
	- main spar flange (minimum 1,5 kp/cm²)
	- accelerometer - set "0"
9. SAFETY BELTS	*- fastened*
10. SAFETY ALTITUDE	*- check*
11. FREE AIRSPACE	*- turn 360°*

Recovery from spin

1. THROTTLE	*- idling*
2. RUDDER	*- full reflection opposite to the direction of rotation*
3. ELEVATOR	*- immediately after finishing the counteraction of rudder push smoothly the control stick at least to the half of deflection between neutral and full pushed position, within 1-2 seconds without use of ailerons*
4. AFTER ROTATION HAS STOPPED	*- rudder - neutral*
	- elevator - pull steadily the control stick to perform the aircraft recovery from the dive

Notes:

1. *After beginning of spin, autorotation motion is characterized by progresive increase of angular speed till the value of 180° per second, that is reached during the 3rd turn, when the spin is considered stabilized*
2. *During recovering the spin after two and more turns it is recomended to use both hands to push the control stick (the force of the stick increased up to cca. 25 kg)*
3. *Altitude loss after executing and recovering the spin:*
   - *after 1 turn cca 300 m*
   - *after 3 turns cca 550 m*
   - *after 6 turns cca 700 m*