Limbach
MOTORENBAU

L I M B A C H
Motorenbau

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E N G I N E - M A N U A L

Engines for Powered Gliders

SPORTAVIA - LIMBACH SL 1700 E

LIMBACH SL 1700 EA

and series

Edition: 8 - 1 - 1976

Approved by Luftfahrt - Bundesamt

Name:

	Table of Contents	Page	Edition
1.	General		
1.1	Table of Contents	2	8 - 1 - 76
1.2	Revisions	4	8 - 1 - 76
2.	Specification	5	5 -15 - 72
3.	Technical Data	6	8 - 1 - 76
3.1	SPORTAVIA - Limbach SL 1700 E SPORTAVIA - Limbach SL 1700 E I	6	8 - 1 - 76
3.2	Limbach SL 1700 EA Limbach SL 1700 EA I	7	8 - 1 - 76
3.3	Limbach SL 1700 EB Limbach SL 1700 EB I	9	8 - 1 - 76
3.4	Note Limbach SL 1700 EC Limbach SL 1700 EC I	10	8 - 1 - 76
4.	Performance		
4.1	Performance Graph (Power curve) SPORTAVIA - Limbach SL 1700 E SPORTAVIA - Limbach SL 1700 E I	11	5 - 9 - 73
4.2	Performance Graph Limbach SL 1700 EA Limbach SL 1700 EA I	12	5 - 9 - 73
4.3	Performance Graph (Power curve) Limbach SL 1700 EB Limbach SL 1700 EB I	13	5 - 9 - 73

2. Specification

- 4-cylinder- 4-stroke engine, horizontally opposed
- ram air cooling
- wet sump pressure lubrication
- single magneto ignition
- direct propeller drive
- electric starter
- alternator
- mechanical fuel pump

3. Technical Data

3.1 SPORTAVIA - Limbach SL 1700 E and E I

Series E I same as series E, except special hub for variable-pitch propeller "Hoffmann HO-V 62"

3.1.1 Dimensions and weight:

Bore	88 mm
Stroke	69 mm
Displacement per cylinder	420 cm^3
Total displacement	1680 cm^3
Compression ratio	8 : 1
Direction of crankshaft rotation	anti-clockwise
Weight, dry, without baffles and exhaust silencer, but with electric starter, alternator, oil cooler and propeller hub	73 kp

3.1.2 Equipment:

Magneto	BENDIX-Scintilla or SLICK 4030
Firing point	30° before TDC
Breaker points spacing for Bendix-Scintilla S4 RN 21 only	0,4 mm
Firing order	1 - 3 - 2 - 4
Spark plugs	BOSCH WB 240 ERT
Electrode spacing	0,4 mm
Ignition harness	SLICK - High - T ture - Harness
Carburetor	STROMBERG - Zeni or 150CD 3 (jet needle No. APG 17.09.001
Fuel pump	FIAT 76-0,5/ 12S
Starter	130 A
Alternator	DUCELLIER 7522-1 or 7532 -12 V /
Propeller hub for series E	according to dra No. 17.03.035 C pitch)
Propeller hub for series E I	according to dra No. 18.03.035 (v pitch)

3.1.3 Performance:

Take-off power (5 min)	68 hp / 3600 rpm
Max. continuous power	60 hp / 3200 rpm

3.1.4	Revs.:	
	Max. permissible revs.	3600 rpm
	max. continuous revs.	see Flight Manual of aircraft
	min. continuous revs.	2300 rpm
	idling about	700 rpm
3.1.5	Fuel and lubricants:	
	Fuel	Aviation fuel 100 L or car fuel super (N. 1)
	Fuel pressure	0.10 - 0.15 kp/cm^2
	Lubricants	see table page 19
	Lubricant capacity	2.5 l (min. 1.5 l)
	Oil pressure	max. 4.0 kp/cm^2 min. 1.0 kp/cm^2 at 2500 rpm
	Oil temperature	max. 120° C min. 50° C favourable about 90° C
3.1.6	Max. permissible cylinder head temperature, measured at hottest cylinder	250° C

3.2 Limbach SL 1700 EA and EA I

Series EA I same as series E, except special hub for variable - pitch propeller "Hoffmann - HO-V 62"

3.2.1 Dimensions and weight:

Bore	88 mm
Stroke	69 mm
Displacement per cylinder	420 cm^3
Total displacement	1680 cm^3
Compression ratio	8 : 1
Direction of crankshaft rotation	anti-clockwise
Weight, dry, without baffles and exhaust silencer, but with electric starter, alternator, magneto and propeller hub	68 kp

3.2.2 Equipment

Magneto	BENDIX-Scintilla S 4RN-21 or SLICK 4030
Firing point	30° before TDC
Breaker points spacing for Bendix-Scintilla S4 RN 21 only	0.4 mm
Firing order	1 - 3 - 2 - 4
Spark plugs	BOSCH W8 240 ERT 1
Electrode spacing	0.4 mm
Ignition harness	SLICK - High - Temperature - Harness
Carburetor	ZENITH 28 RXZ
Main jet	1.50 mm
Mixer tube	2.0 mm
Air venturi	22.0 mm
or carburetor	Stromberg Zenith 150 CD or 150 CD 3 (jet needle 6 A)
Fuel pump	APG 17.09.001 A
Starter	BOSCH 0 001 160 001
Alternator	DUCATI Type 610, 12 V/150 W
or generator	Ducellier 7532 - 12 V/ 22 A
Propeller hub for EA	according to drawing 17.03.035 C (fixed-pitch)
Propeller hub for EA I	according to drawing 17.03.035 A (variable-pitch)

3.2.3 Performance:

Take-off power (5 min.)	60 hp / 3550 rpm
Max. continuous power	56 hp / 3300 rpm

3.2.4

Max. permissible revs.	3550 rpm
max. continuous revs.	see Flight Manual of aircraft
min. continuous revs.	2300 rpm
idling	700 rpm

3.2.5 Fuel and lubricants:

Fuel	Aviation fuel 100 L or car fuel super
Fuel pressure	0.10 - 0.15 kp/cm^2
Lubricants	see table page 19
Lubricant capacity	2.5 l (min. 1,5 l)
Oil pressure	max. 4.0 kp/cm^2 at 2500 rpm
Oil temperature	max. 120° C, min. 50° C favourable about 90° C

3.2.6 Max. permissible cylinder head temperature, measured at hottest cylinder 250° C

3.3 Limbach SL 1700 EB und EB I

Series EB I same as series EB, except special hub for variable - pitch propeller "Hoffmann HO-V 62"

3.3.1 Dimensions and weight:

Bore	88 mm
Stroke	74 mm
Displacement per cylinder	450 cm^3
Total displacement	1800 cm^3
Compression ratio	8 : 1
Direction of crankshaft rotation	anti-clockwise
Weight, dry, without baffles and exhaust silencer, but with electric starter, alternator, oil cooler and propeller hub	74 kp

3.3.2 Equipment:

Magneto	BENDIX-Scintilla S 4 RN-21 or Slick 4030
Firing point	30° before TDC
Breaker points spacing for Bendix-Scintilla S4 RN 21 only	0.4 mm
Firing order	1 - 3 - 2 - 4
Spark plugs	BOSCH WB 240 ERT 1
Electrode spacing	0.4 mm
Ignition harness	SLICK - High - Temperature - Harness
Carburetor	2 Stromberg-Zenith 150 CD or 150,CD-3 (jet needle No. 6 A)
Fuel pump	APG 17.09.001
Starter	FIAT 76-0,5/12 S, 12V/130 A
Alternator or Generator	DUCELLIER 7522 - 12V/22 A 7532 - 12V/22 A
Propeller hub for EB	according to drawing 17.03.035 C (fixed-pitch)
Propeller hub for EB I	according to drawing 18.03.035 (variable-pitch)

3.3.3 Performance:

Take-off power (5 min.)	72 hp/3600 rpm
Max. continuous power	66 hp/3200 rpm

3.3.4 Revs:

Max. permissible revs.	3600 rpm
max. continuous revs.	see Flight Manual of aircraft
min. continuous revs.	2300 rpm
idling about	700 rpm

3.3.5 Fuel and lubricants:

Fuel	Aviation fuel 100 L or car fuel super
Fuel pressure	0.10 - 0.15 kp/cm^2
Lubricant	see table page 19
Lubricant capacity	2.5 l (min. 1.5 l)
Oil pressure	max. 4.0 kp/cm^2 min. 1.0 kp/cm^2 at 2500 rpm
Oil temperature	max. 120° C min. 50° C favourable about 90° C

3.3.6 Max. permissible cylinder head temperature, measured at hottest cylinder: 250° C

3.4 Note:

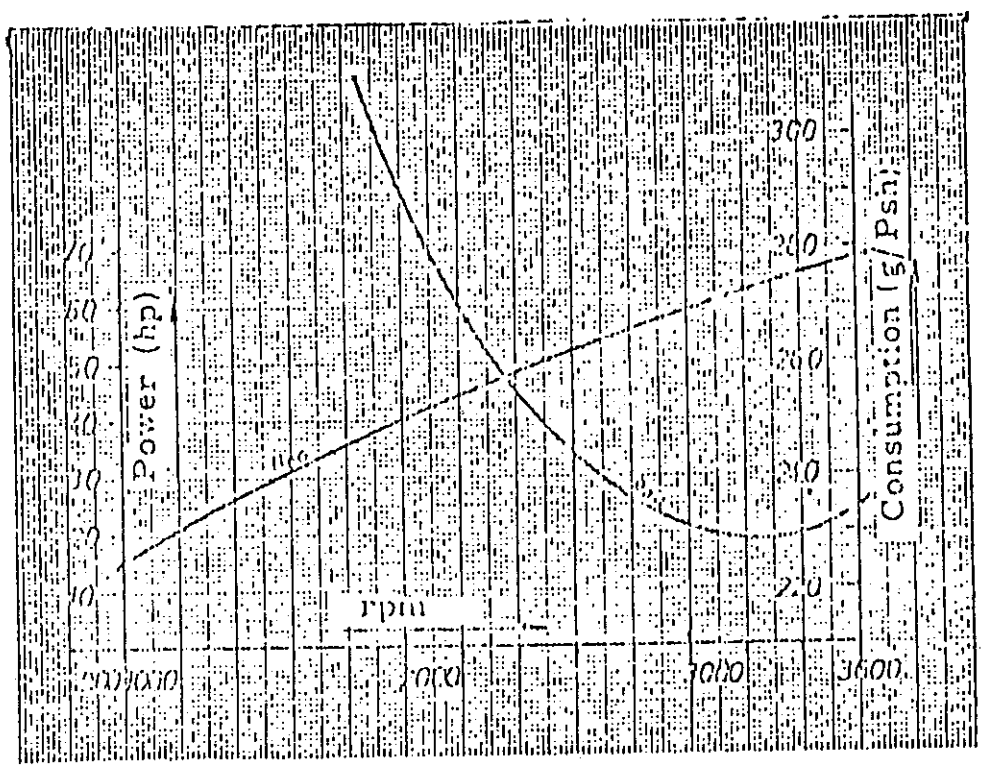
Limbach SL 1700 EC and EC I

3.4.1 Technical Data of series Limbach SL 1700 EC and EC I correspond to those of series SPORTAVIA - Limbach SL 1700 E and E I.

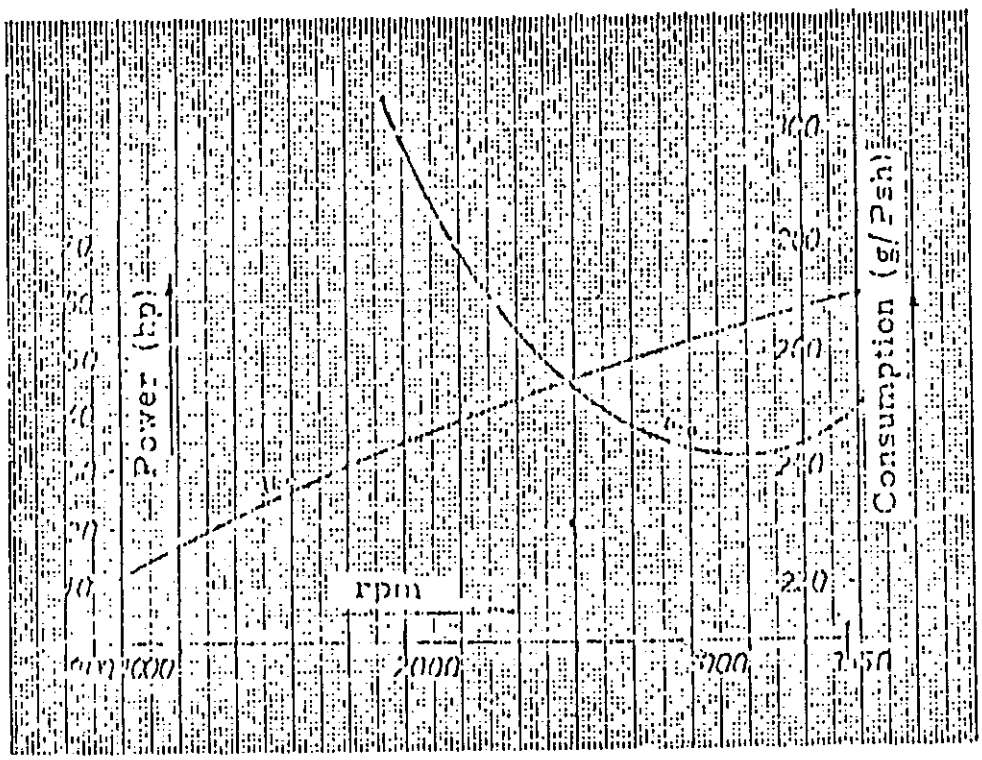
3.4.2 "C" means modification 01-73-4 and concerns modification of intake system, especially for pusher version

4. Performance:

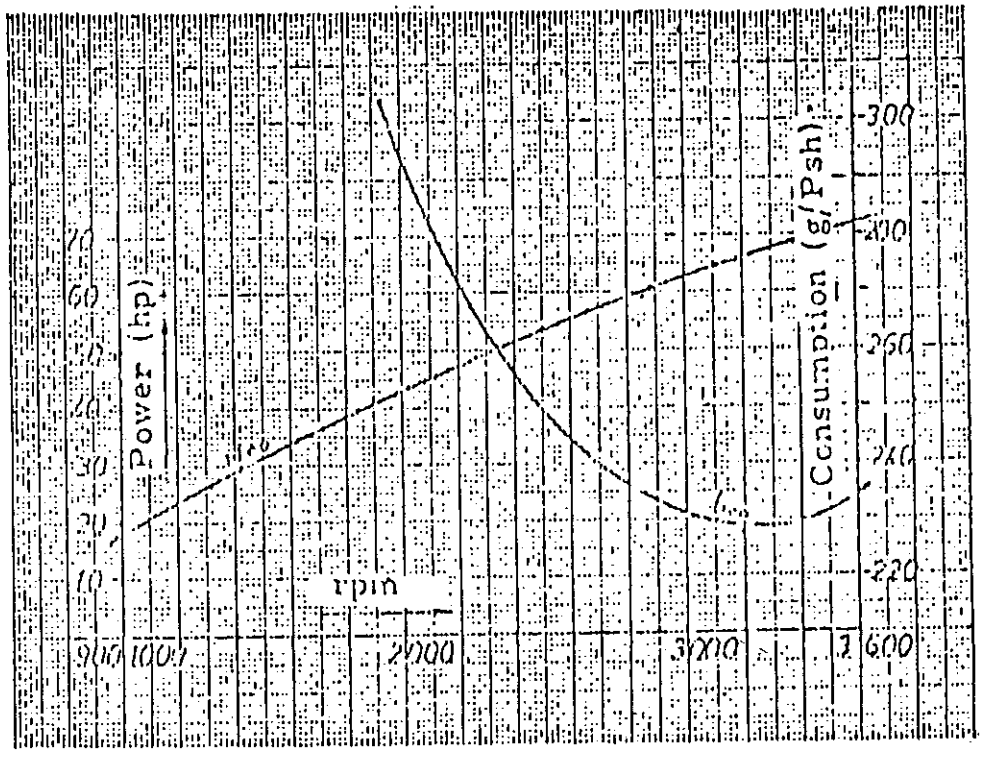
4.1 Performance graph of series SPORTAVIA - Limbach SL 1700 E and E I.



4.2 Performance graph
of series Limbach SL 1700 EA and EA I



4.3 Performance graph
of series Limbach SL 1700 E8 and E8 I



5. Operating instructions

Reliability and efficiency of the engine depends largely on carefull operation and maintenance according to the instructions given in this manual.

5.1 Before starting the engine

Has the daily check been done? (see page 16)
Open throttle fully, check free movement over complete range, close throttle
Open choke fully, check free movement over complete range, close choke.
Ignition OFF
Turn propeller by hand several times and check, if impulse coupling of magneto is working correctly.
Check for any abnormal noise or resistance in turning the engine.

5.2 Starting the engine

Fuel cock	ON
Choke	Pull
Throttle	1/2" forward from idle
Master switch	ON
Ignition	ON
Starter	Push

As soon as engine fires release starter. Power setting for 1000 rpm. Close choke and check oil pressure (indication within 10 secs.)

5.3 Warming - up and run - up

Power setting 1000 rpm for about 2 min., then increase power setting up to 1500 rpm for about 5 - 10 min. according to air temperature, until oil temperature indicator shows 50° C. Indication is rather slow, therefore with 50° C indication the real oil temperature is sufficient.

5.4 Take - off

Smoothly open full throttle and keep this power setting for the initial climb, then reduce power adequately. Check oil temperature and oil pressure, do not exceed the limitations.

5.5 Stopping the engine

Normally the engine has grown cold during descent and taxying, so that you can stop the engine by shutting ignition.

After long or high power taxying you should cool down the engine with about 1000 rpm for two or three minutes.

5.6 Stopping and starting the engine during flight

Reduce power to idle position, airspeed down to about 100 km/h and shut ignition. At higher airspeed the propeller will keep on turning even with ignition OFF (windmilling)

Starting the engine according to same procedure as given in para. 5.2, but leave choke closed as far as engine is still warm.

5.7 Note:

Use of car super fuel may cause trouble in the fuel flow in higher altitude (Vaporing)

6. Maintenance instructions

6.1 Daily check

Open engine cowling.

Check carefully for lost or loose nuts, screws or bolts.

Check securing, baffles, ignition harness and v-belt condition.

Check cowling for cracks and correct fastening.

Chreck free movement of throttle and choke controls.

Check oil level and fill up, if necessary.

Check oil and fuel system for any leakage.

Drain fuel filter.

Engine run-up

Check for immediate firing when pushing starter knob, temperature and pressure readings during warming-up, adequate response to increasing power settings, short run with max. power setting (max. revs. according to Flight Manual of aircraft depending on type of propeller used), cool down the engine if necessary, shut ignition.

6.2 Periodic checks

After the first 25 hours of operation the checks listed in 6.3 and 6.4 are to be performed. The next check is due with 50 hours and following with every 50 hours.

Every 100 hours additionally the checks mentioned under 6.5 are to be performed.

Every 500 hours additionally the checks mentioned under 6.6 are to be performed.

6.2.1 The condition of the diaphragm of the Stromberg-Zenith carburetor must be inspected every 100 hours, at least 6 months after the last 100-hours-check.

All hoses of lubrication and fuel system (hose from fuel pump to carburetor) are to be replaced after 4 years since new.

6.3 First 25 h - check

Adjust valve play (intake 0,2 mm, exhaust 0,2 mm) engine cold

Check oil system

Clean oil filter

Change oil (2,5 l)

Check intake filter: wet filter (metal filter) to be cleaned and soaped with oil

dry filter (cloth filter) to be blown from inside with compressed air

The carburetor has been adjusted on a test bench according to a level of 600 m (about 1800 ft) MSL. According to the altitude of the owner's airfield it could be necessary to correct the carburetor adjustment. This correction must be performed according to our directives by authorized workshops.

Clean and Check spark plugs (spacing 0,4 mm)

Don't use steel or brass bruch for cleaning. Don't use sand-blast. It is recommended to use a plastic brush and cleaner, even better to fly spark plugs clean.

Attention: Remove spark plugs with engine cold only! Use graphit grease for spark plug thread (for instance Champion P/N 2612). Grease must not spoil the electrodes.

Compression test (no limits are given as the indication depends on the type of test set. Always look for the characteristic of indications. Differences in pressure shall be less than 2 kp/cm^2.

General check of securing and connections

Check and grease controls

Clean the engine

Check fuel system for any leakage or chafing

Clean fuel filter

Check wiring for any damage.

Test run: Check starting, warming up, temperature and pressure.
Check response with opening throttle
Short run-up with fill-throttle (check min. rpm according to Flight Manual, depending on type of propeller)
Cool down engine, if necessary and stop it.

6.4 50 h - check

Check valve play

Check oil system

Clean oil filter

Change oil (2,5 l)

Check intake filter: wet filter (metal filter) to be cleaned and soaped with oil

dry filter (cloth filter) to be blown from inside with compressed air

The carburetor has been adjusted on a test bench according to a level of 600 m (about 1800 ft) MSL. According to the altitude of the owner's airfield it could be necessary to correct the carburetor adjustment. This correction must be performed according to our directives by authorized workshops.

Clean spark plugs and check spacing (0,4 mm) (see page 16)

Compression test (see page 16)

General check of securing and connection, especially engine mounting

Check v-belt condition and tension (alternator drive)

Check and grease controls

Clean engine

Check fuel system

Clean fuel filter

Check wiring

Test run of engine

Check oil level of Stromberg-Zenith carburetor, use Zenith-lube-oil only. Follow our service instructions.

It is recommended to change spark plugs every 200 - 250 hours of operation. Follow our service instructions.

6.5 100 h - check

Check condition of diephragm of Stromberg-Zenith carburetor

Check timing of ignition, adjust if necessary (marking on propeller hub or starter disc is to be used for ignition, not for TDC)

6.6 500 h -check

Check breaker points of Bendix magnetos, replace if necessary

Attention: Slick-magnetos must not be disassembled or opened

Replace carburetor float valves on all en gine types.

Pay attention to Service Letter No. 8

Check play of throttle shaft in all SL 1700 EB I engines (ASK 16). With a radial play of more than 0.5 mm shaft is to be replaced. This repair must be performed by authorized workshops only according to our instructions.

7. Overhauling

7.1 Major overhaul is carried out by the manufacturer only. Having reached adequate hours of operation the engine with its log shall be sent to the manufacturer.

Time between overhaul (TBO) at present is 1000 hours. Increase in TBO according to field experience will be published in Service Letters of the manufacturer.

7.2 Major repair and major modifications must be carried out by the manufacturer only, or by authorized workshops.

In case of shock loading the engine must be disassembled and the crankshaft must be inspected. Measuring deformation of either crankshaft or propeller hub without disassembly is incorrect and not sufficient.

Replacement of propeller hub must be regarded as major repair.

7.3 SLICK 4030 magnetos shall be replaced after 1000 hours.

7.4 For series Limbach SL 1700 EB and EB I time between overhaul (TBO) at present is still 600 hours.

8. Lubrication chart

Do not use non-detergent or detergent aviation oil!

Oil	Air temperature	Specification
HD-engine oil of trade marks SHELL, BP, ESSO or else	above 20° C	SAE 40 SAE 30 or multigrade SAE 20 W/50
	from 0° to 20°C	SAE 20 W/50
	below 0° C	SAE 10 W/40 only

9. Table of torque moment

Propeller bolts		1.5 - 1.8 mkp
Cylinder head bolts		3.0 - 3.2 mkp for 10mm diam bolts
		2.4 - 2.5 mkp for 8mm diam bolts
Crankcase bolts	12 Ø	3.4 - 3.6 mkp
Crankcase bolts	8 Ø	2.0 mkp
Crankcase bolts	6 Ø	1.0 mkp
Spark plugs	14 Ø	2.0 mkp

10. Trouble shooting

10.1 Engine does not fire

1.1 Lack of fuel

- fill up fuel tank
- clean fuel lines, filters & cock
- check fuel system for any leakage

1.2	Engine overprimed:	- power setting full throtl - ignition OFF and turn engine several times - ignition ON - start engine
1.3	Defective spark plug:	- replace spark plug or - clean spark plug and chec for correct spacing
1.4	Defective ignition harness:	- check ignition harness by a tester and replace defective line
1.5	Defective or discharged battery:	- install fully charged battery
1.6	Defective breaker points:	- clean breaker points and adjust timing (Bendix magnetos only)
1.7	Water in carburetor:	- empty carburetor and fuel lines, clean filter
1.8	Engine damage:	- if metal chips are found, engine must be disassembled - check oil filter for meta particles
1.9	Insufficient compression (in case of overheating - cylinder head temperature above 250°C - it may happen, that the cylinder causes deformation of cylinder head this resulting to loss of compression in engine cold condition)	- check cylinder heads, if necessary replace. Untighten both cylinder heads and tighten again according to our instructions
2.	Irregular idling	
2.1	Idle mixture:	- adjust correct mixture
2.2	Leakage in intake system:	- tighten all joints of intake system. Replace defective parts
2.3	Ignition trouble:	- check complete ignition system

3.	Low power and irregular run	
3.1	Leakage in intake system:	- tighten all joints of intake system. Replace defective parts.
3.2	Defective spark plug:	- clean spark plug and check for correct spacing
		- replace spark plug
3.3	Wrong type of fuel:	- refuel aircraft with correct type of fuel
3.4	Defective breaker points:	- clean breaker point and adjust timing with Bendix magnetos only
3.5	Defective ignition harness:	- check ignition harness a tester and replace defective line
3.6	Wrong ignition timing:	- check and adjust breaker
3.7	Defective sleeve of spark plug:	- replace sleeve
3.8	Wrong valve clearance:	- adjust clearance
8.9	Fuel filter blocked:	- remove and clean filter
4.	Engine not reaching full power	
4.1	Wrong adjustment of throttle control:	- adjust throttle control
4.2	Leakage in intake system:	- tighten all joints of intake system. Replace defective parts.
4.3	Air intake filter blocked:	- check and clean filter
4.4	Wrong type of fuel:	- refuel aircraft with correct type of fuel
4.5	Defective ignition system:	- tighten all connections
		- check ignition system by a tester
		- check ignition timing
4.6	Inadequate fuel feed:	- check fuel filter, fuel pressure gauge, fuel intake at regulator
4.7	Defective diaphragm of carburetor:	- replace diaphragm
5.	Rough engine run	
5.1	Wrong balance of propeller:	- remove propeller and adjust balance
5.2	Damage of engine:	- check complete engine

6. -	<u>Low oil pressure</u>	
6.1	Low oil level:	- check level and fill up oil
6.2	Oil filter blocked:	- remove oil filter and clean it
6.3	High oil temperature:	- see "high oil temperature"
6.4	Wrong reading of oil pressure gauge:	- replace gauge
6.5	Defective bearing:	- if metal particles are found, engine must be disassembled and overhauled
7.	<u>High oil temperature</u>	
7.1	Inadequate oil supply:	- check oil level and fill up oil, if necessary
7.2	Wrong oil quality:	- change oil. Fill up with correct type of oil
7.3	Oil filter blocked:	- remove and clean filter
7.4	Excessive blow-by of combustion gas along the piston:	- normally caused by worn or seized piston rings. Major overhaul of engine is necessary
7.5	Defective bearing:	- if metal particles are found, engine must be disassembled and overhauled
7.6	Defective oil temperature gauge:	- replace gauge
8.	<u>Excessive oil consuption</u>	
8.1	Wrong oil quality:	- change oil. Fill up with correct type of oil
8.2	Defective bearing:	- if metal particles are found, engine must be disassembled and overhauled
8.3	Worn or installed piston rings:	- normally caused by worn or seized piston rings. Major overhaul of engine is necessary

9.	<u>Engine cannot be stopped</u>	
9.1	Defective ignition switch:	- check earth lines, replace switch
9.2	Engine overheated:	- cool down the engine with about 1000 rpm
10.	<u>Problems with cold weather</u>	
10.1	Cold oil:	- take aircraft into heated hangar, pre-heat the engine
10.2	High oil pressure:	- in very cold conditions oil pressure readings up to about 6.0 kp/cm^2 Do not necessarily indicate malfunction
10.3	Battery too weak:	- install fully charged battery