



SECTION 2

OPERATING CONDITIONS AND LIMITATIONS

1. Airplane Crew

The minimum number of airplane crew are two persons with currently valid authorization for performing aviation operations.

Depending on the kind of flight the airplane crew shall consist of:

- in flights according to VFR rules - two pilots or pilot and navigator or pilot and flight engineer;
- in flights acc.to IFR rules - two pilots or pilot and navigator;
- in agricultural flights - two pilots or pilot and flight engineer.

- NOTE:
1. In case the crew consists of three persons the additional member of the crew should take one of the seats in passenger-cargo cabin.
It is forbidden to rest on safety belts in the cockpit.
 2. The agricultural /working/ flights may be carried out with minimum number of crewmen as specified above.

2. Permissible Kinds of Flights

The airplane is admitted to the following flights:

- /1/ School flights /with limitation of C.G. to 50% MAC/;
- /2/ Training flights.
- /3/ In the night /with C.G. limited to 50% MAC/.



An-2
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PILOT MANUAL

- /4/ Day-light and night flights with or without the visibility of the ground.
- /5/ Flights at low altitudes while observing rules currently in force.

The following are forbidden:

- /1/ Acrobatic flights.
- /2/ Entering the icing hazard zone.
- /3/ Night flights without parachutes.
- /4/ Flight without visibility when the centre of gravity is beyond 30% MAC
- /5/ Night flights with children on board.

3. Operational Data

A. Acceptable overloadings.

Coefficient of acceptable overloading:

- /a/ for agricultural version /with spreader or sprayer/ + 3.0; -1.0
- /b/ for transport or sanitary version + 3.7; -1.0

B. Maximum acceptable altitude of flight:

- with oxygen outfit - not limited;
- the maximum acceptable flight altitude without oxygen outfit is determined by a separate aviation regulation.

C. Acceptable airspeeds V_{pp} /km/h/:

	agricultural version	transport passenger-transport versions
- in stormy air	175	190
- with crude control	180	195
- in diving flight at max. speed of 2200 r.p.m.	250	300
- for opening the flaps	150	150
- with flaps opened at 39,5°	130	130
- with flaps opened at 30°	150	150



An-2
WYTWÓRNA SPRZĘTU KOMUNIKACYJNEGO »PZL - MIELEC«
FLIGHT MANUAL

- minimum acceptable speed in horizontal flight	120	120
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D. Accepted Speed of Engine /r.p.m./

- rated	n = 2100
- maximum	n = 2200
- minimum on the ground	n = 500

E. Limitations Due to Wind

/a/ Take off and landing may be carried out at the following wind speeds /m/s/:

	Normal airstrip	Slippery airstrip
- head wind	up to 16.0	up to 8.0
- cross wind 45 deg	up to 7.0	up to 4.0
- cross wind 90 deg	up to 5.0	up to 3.0
- cross wind 90 deg while landing with flaps extended	down to 4.0	down to 3.0
- slippery airstrip - slippery asphalt or concrete tramped snow, wet grass,		
- normal airstrip - dry asphalt, concrete or grass very wet asphalt or concrete		

CAUTION: Asphalt or concrete is to be considered slippery:

- when it starts raining and individual drops are not joined with each other;
- in the morning when there is a slight frost and dew or rime.

When the asphalt or concrete is coated with a layer of dust, which absorbs rainwater to form a layer of mud.

/b/ Taxiing

It is permissible to taxi at wind of up to 16 m/s when airstrip is normal or up to 8 m/s when airstrip is slippery - indendently of he direction of wind.

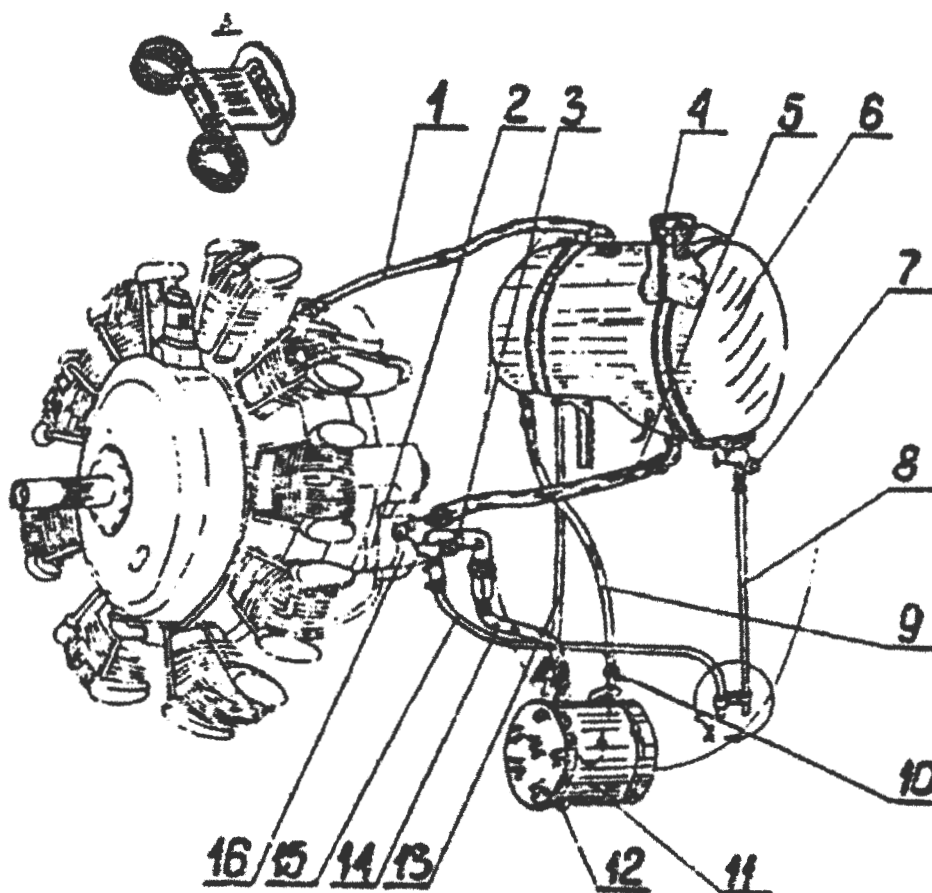


Fig. 1-4. Oil System

- | | |
|--|--|
| 1. Engine Vent Pipe | 10. Stub-pipe for diluting oil with gasoline |
| 2. Oil pump, P22-24 | 11. Oil cooler, 1106/Kr |
| 3. Drain valve | 12. Drain plug |
| 4. Oil filler opening | 13. Drain pipe |
| 5. Tank-pump line | 14. Flexible hose for oil supply to cooler |
| 6. Oil tank | 15. Drain pipe |
| 7. Drain valve | 16. Centrifugal oil-filter TCM-25. |
| 8. Tank drain pipe | |
| 9. Pipe for oil supply from cooler to tank | |



From valve /15/ fuel is directed to cut-off valve /16/. Then it flows through filter /17/ to fuel pump /23/ installed on the engine. From the fuel pump it is delivered to fine filter /26/ and then to carburettor /22/.

The fuel pump BPR-4R /30/ is permanently installed in the fuel system and serves for filling the airplane with fuel in field conditions.

The pump is driven from electric motor supplied with power from board battery.

The amount of fuel in tanks is indicated by the sensors of fuel meter SBES-1447 which are installed in each tank.

C. Oil System /see Fig. 1.4/.

Oil system consists of tank, cooler, pipes and fittings and oil pump. Oil is sucked from the tank by an oil pump and is pumped to the engine. After circulating in the engine, oil is sucked out of engine by the same pump and pumped back to oil tank.

While circulating from engine to the tank, oil passes through a cooler where it cools down.

The oil tank is mounted by means of tapes to a bed located on fire-wall.

The oil cooler is mounted to a special bed under airplane fuselage and guarded by a tunnel with movable curtains shifted by UR-10 electromechanism controlled from cockpit.

D. Heating System in Cabins /see Fig. 1.5/

/1/ Description

This system serves to heat the cockpit, the cargo-passenger cabin and the right front window pane of cockpit windscreen.

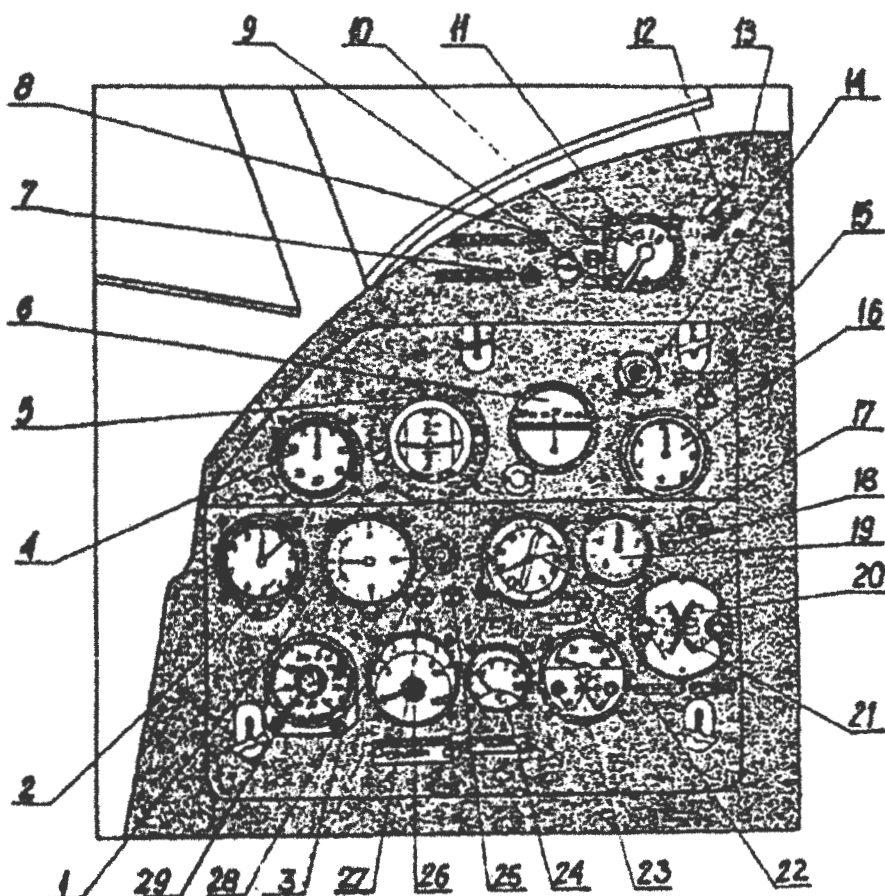


Fig. 1.9. Left Side of Instrument Panel

1-Varimeter, WR-10U; 2-Altimeter, WD-10; 3-Dangerous height warning light; 4-Airspeed indicator, US-35U; 5-Artificial horizon, AGK-47B; 6-Course Indicator, GPK-48; 7-Fire monitor control light; 8-Fire monitor light; 9-Fire extinguishing push-button; 10-AZS /automatic overcurrent switch/ for ignition; 11-Magneto switch, PM-1; 12-Clutch handle for manual starting; 13-Starter push-button; 14-Ammeter, A-1; 15-Converter operation signal light; 16-Manifold pressure gauge, MW-16U; 17-Oil dilution indicator light; 18-Filings warning light, SiM-c1/red/; 19-Indicator, TE-45; 20-Cylinder head thermometer indicator, ZTCT-47; 21-Indicator UGA-1 of compass set GIK-1; 22-Cruise indicator light; 23-Indicator UKZ-1 of engine unit gauge, EMJ-3K; 24-Mixture thermometer indicator TUE-48; 25-Low fuel level warning light for the right group of tanks; 26-Fuel gauge indicator SPES-1447; 27-Low fuel level warning light for the left group of tanks; 28-GIK-1 compass slaving push-button; 29-Indicator A-034-4-16 from A-037 Radio Altimeter Set

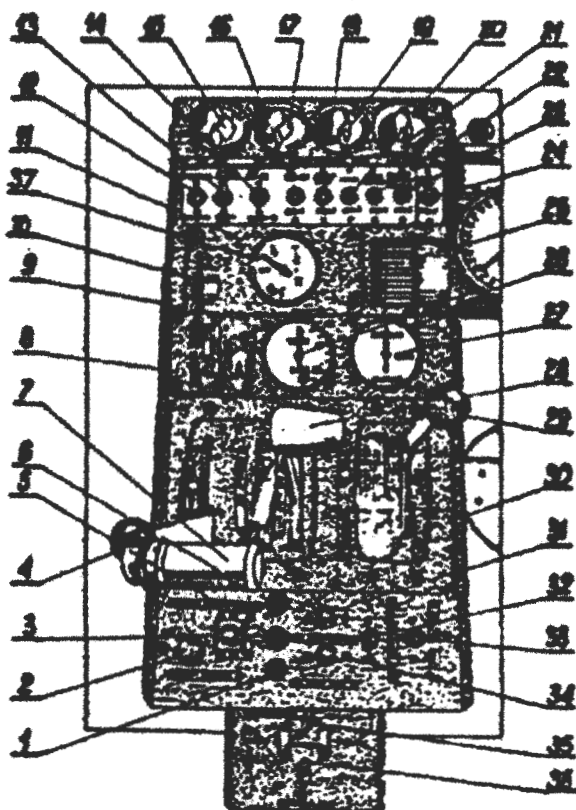


Fig. 1.13. Central Control Desk

1-Signal light for aileron trimming tab; 2-Flap control push-button; 3-Elevator trimming-tab switch; 4-Altitude corrector lever; 5-Signal light for elevator trimming tab; 6-Signal light for rudder trimming tab; 7-Throttle lever; 8-Emergency flap retraction switch; 9-Door signal light; 10-Lever controlling the shutter of air inlet to carburetor /only for T-TP versions/; 11-Blanking plug; 12-Converter switch; 13-Battery switch; 14-Switch for GIK-1 compass and for AGK-47B artificial horizon; 15-Resistor of left UFO lamp; 16-AZS for AGK-47B artificial horizon and for gyro-compass GPK-4E; 17-Resistor of front UFO lamp; 18-AZS for SBES-144 fuel meter, filing signalling device; 17-Resistor of rear UFO lamp; 20-AZS for EMI-3K; 21-Resistor of right UFO lamp; 22-AZS for indicators UZP-47 or UPZ-48; 23-AZS for mixture thermistors TUE-48; 24-AZS-5 for ag. equipment; 25-Frequency schedule; 26-UZP indicator of flap position; 28-Propeller pitch lever; 29-Engine stopping lever; 30-Carburetor heat lever; 31-Elevator trimming tab switch; 32-Oil cooler shutters switch; 34-Aileron trimming tab switch; 35-"Left-right" control switch PPG-15-2s; 36-Switch PPG-15; 37-Elevator trim tab position indicator /optional/.



POWER PLANT

1. Design Description of ASz62IR

The ASz62IR of series XVI is a 9-cylinder 4-stroke air-cooled carburetor-type engine of single row arrangement. It has a planetary reducing gear-box for propeller speed and a single-speed centrifugal supercharger in the fuel supply system. Four-blade metal propeller, AW-2, is installed on the end of engine shaft.

Engine is equipped with the following accessories:

- propeller speed governor R-9SP2 - on reducer cover;
- carburetor AKM-62IRA, fuel pump BTK-12BK and oil filter MFM-25, centrifugal filter TCM-25 - on the rear part of supercharger housing;
- two magnetos BSV-9, electric inertia starter RIM-U-24W, converter GSN-3000P, oil pump MSz-EA, piston compressor AK-50P-12 - on the rear cover;
- two ignition plugs each in cylinder heads.

Engine starting takes place by means of inertia starter RIM-U-24IR supplied with electric power.

2. Basic Technical Data

/1/ Engine type	ASz-62IR
/2/ Cooling System	air
/3/ Number of cylinders	9
/4/ Cylinder numbering	clockwise /looking from the rear; of the engine; top cylinder first/.



An-2
WYTWÓRNA SPRZĘTU KOMUNIKACYJNEGO »PZL - MIELEC«
FLIGHT MANUAL

/c/ The smallest engine speed at high pitch of the propeller /adjusted with speed governor/ must not be smaller than 1450 r.p.m. at manifold pressure max. 800 mmHg.

/6/ Recommended Parameters of Engine Operation

/a/ Cylinder head temperature:

- minimum for starting 5°C,
- recommended during operation 150-215°C.

/b/ Oil Temperature at the Entrance to Engines:

- minimum for starting 5°C,
- recommended during operation 60-75°C

/c/ Fuel Pressure Before Carburetor:

- at any effective power 24.5-34.2 kPa /0.25-0.35 kgf/cm²/
- at idle speed 14.7 kPa /0.15 kgf/cm²/.

/d/ Oil Pressure at Effective Power

measured in rear cover: 390-490 kPa /4-5 kgf/cm²/

/7/ Operational Data of Accessory Units:

/a/ Starter

- rated supply voltage 24 V
- number of consecutive startings /with minimum break between startings of 20s/ - 4
- time of switching on the electric motor - 13 s
- time of turning the starter /manually/ 5-6 min.



An-2

WYTWÓRNIĄ SPRZĘTU KOMUNIKACYJNEGO »PZL-MIELEC«

FLIGHT MANUAL

Normal operating range

green arc 100-225 km/h

Range of operation with flaps

white arc 100-130 km/h

8. Engine instrument indication range

Engine instruments	Red radial	Yellow arc	Green arc	Yellow arc	Red radial
	MINIMUM	PRECAUTIONARY range	NORMAL	PRECAUTIONARY range	MAXIMUM
RPM indicator	550	-	550-2100	2100-2200	2200
Manifold pressure gauge hPa /mm Hg/	-	-	706-1200 /530-900/	1200-1435 /900-1075/	1435 /1075/
Cylinder head temp. indicator /°C/	120	120-150	150-215	215-245	245
Engine unit gauge: - oil temp. °C	50	50-60	60-75	75-85	85
- oil pressure kPa /kG/cm ² /	148 /1,5/	148-390 /1,5-4/	390-490 /4-5/	490-686 /5-7/	686 /7/
- fuel pressure kPa /kG/cm ² /	14,8 /0,15/	14,8-24,5 /0,15-0,25/	24,5-34,5 /0,25-0,35/	-	34,3 /0,35/

January 15/89

2-00
Page 5



3. Starting and Testing Engine in Summer Season

A. Preparing Engine for Starting.

Following operations are to be carried out prior to starting the engine:

- /1/ Switch on the battery and check the voltage in electric system /with power supplied from board battery/.
- /2/ Open the air system valve and brake the wheels with the help of parking brake.
- /3/ Switch on the following switches on central control desk and on instrument boards:
 - fuel meter;
 - for DFI-3X engine unit gauge;
 - for flap position indicator and oil cooler shutters position indicator;
 - for mixture thermometer - ambient temperature thermometer;
 - for oil cooler shutters;
 - for engine cool flaps;
 - for fire fighting equipment;
 - for door position indicator, instrument-board background lighting;
 - for cockpit lighting /if necessary/;
 - for position lights if necessary.
- /4/ Check the efficiency of fire fighting equipment.
A yellow light indicating the efficiency of pyrohead should be on when the fire fighting equipment switch is switched on /see para.3/.



D. Warming up Engine

- /1/ After completing starting, switch on the generator and keep engine at 700-800 r.p.m. until oil temperature at the entrance to engine begins to rise though not less than 3 minutes.
- /2/ Increase engine speed to 1000-1200 r.p.m. /in winter to 1400 r.p.m. and warm up the engine to cylinder head temperature of minimum 100°C and to oil temperature at the entrance to engine of 30°C.
Then increase engine speed gradually to 1600 r.p.m. and continue warming up the engine.
- /3/ While warming the engine up close engine cowl flaps and oil cooler shutters to reach cylinder head temperature of 120°C and oil temperature at the entrance to engine of 50°C.
- /4/ Engine is warmed adequately when cylinder head temperature reaches 120°C and oil temperature at the entrance to engine is minimum 50°C.
Upon reaching above temperatures, start checking engine operation at the effective power ranges.

E. Engine Test

- /1/ Establish the parameters of rated /max. cont./ power
/n=2100 r.p.m., $p_k=1200$ hPa /900±10 mmHg//.
- /2/ Check whether the indications of instruments correspond to following values:
 - oil pressure in the rear cover 390-490 kPa /4-5 kgf/cm²/;
 - fuel pressure at the entrance to carburetor 24.5-34.5 kPa /0.25-0.35 kg/cm²/;
 - temperature of entering oil 60-75°C;
 - cylinder head temperature max. 215°C

Engine must operate uniformly and without jolting.



WARNING: 1. IF ENGINE IS WARMED UP AT HIGH AIR HUMIDITY DRIZZLING RAIN OR SLUSH THE HEATER OF AIR ENTERING THE CARBURETOR MUST BE PUT ON AND THE TEMPERATURE OF FUEL MIXTURE KEPT ABOVE MINIMUM $+3$ to $+5^{\circ}\text{C}$.

2. AVOID, ESPECIALLY IN WINTER, SUDDEN INCREASES OF ENGINE SPEED WHILE STARTING IT WITH COLD OIL TO AVOID BURSTING OF OIL COOLER AND THE TEAR-OFF OF TEXTILE-FIBERREINFORCED PLASTIC PIPES!

/13/ Time required for carrying out engine testing in a given range is 3-4 minutes.

/14/ Diagram for engine test - refer to page 6-00/5.

CAUTION! While carrying out the engine test the control wheel is to be kept in backward position all-through the time of the test.

7. Engine Stopping

/1/ Prior to stopping, cool down the engine to cylinder head temperature of $740-160^{\circ}\text{C}$.

It requires following operations:

/a/ Open completely the engine cowling flaps the oil cooler shutters.

/b/ Adjust propeller to fine pitch.

/c/ Reduce engine speed to 800-900 r.p.m. and keep it this range till the a/s cylinder head temperatures are reached.

WARNING: HOT ENGINE MAY BE STOPPED ONLY IN CASES OF DIRE NECESSITY, SINCE ENGINE STOPPING AT THE CYLINDER HEAD TEMPERATURE ABOVE 160°C CAUSES THE DRIPPING OF OIL FROM CYLINDER



Ln-2

WYTWÓRNIĄ SPRZĘTU KOMUNIKACYJNEGO »PZL - MIELEC«
FLIGHT MANUAL

LINING AND CONSEQUENTLY LEADS TO INCREASED WEAR OF CYLINDER LINING AND CYLINDER RINGS, AND EVEN TO SEIZURE OF PISTONS AT THE NEXT SUBSEQUENT STARTING. BESIDES, THE STOPPING OF HOT ENGINE CAUSES A CONSIDERABLE INCREASE OF TEMPERATURE UNDER COWLINGS /AS A RESULT OF INTERRUPTED BLOWING/, WHICH MAY LEAD TO DAMAGE OF IGNITION PLUG INSULATION.

/2/ Upon cooling the engine, increase engine speed for 1-10 sec. to about 1700 r.p.m. /to restore good burning on ignition plugs/ and then reduce speed to 800-900 r.p.m. and stop engine with shut-off valve.

/3/ On breaking engine operation, switch off the ignition and smoothly open completely the carburetor throttle.

/4/ If engine does not stop with shut-off valve it is to be stopped by switching off the ignition.
This requires following operations:

/a/ Cool down the engine /in similar sequence as when stopping it with shut-off valve/.

/b/ Increase engine speed to about 1700 r.p.m. for 7-10 seconds, then reduce it to 1000 r.p.m., switch off the ignition and smoothly open the throttles.

WARNING: 1. IT IS FORBIDDEN TO STOP ENGINE BY SURGING FUEL OUT OF CARBURETOR i.e. BY CLOSING FUEL VALVE.

2. IF SIGNAL LIGHT LIGHTS ON WHEN PRESS-BUTTON "FILINGS MONITORING" IS RELEASED DURING ENGINE GROUND TEST, STOP ENGINE AND IDENTIFY THE REASON FOR THE LIGHT TO BE ON.



/5/ Procedure After Stopping Engine.

- move the shut-off valve control lever to forward position
- close fuel valve;
- shift the throttle control lever to rear position;
- close oil cooler shutters;
- lock the controls and ailerons.

/6/ When cylinder head temperature becomes reduced to 80°C close the engine cowl flaps and then switch off all electric switches.

4. Engine Starting and Testing in Winter Season

/1/ Starting and warming up the engine with diluted oil does not differ in any way from those operations with undiluted oil. Oil dilution is used at temperatures below -5°C .

/2/ Engine testing with diluted oil is to be started when oil temperature at the inlet reaches the value $+35^{\circ}\text{C}$ and cylinder head temperature is 120°C .

/3/ At ambient temperature down to -15°C , as well as in case of using diluted oil on previous day the engine is to be warmed up only to cylinder head temperature of $20-30^{\circ}\text{C}$ /using the airport heater/.

/4/ In case of still lower temperatures oil cooler is to be warmed up as well as engine.