OPERATOR'S HANDBOOK

BÖLKOW BO 208 C JUNIOR

BÖLKOW - APPARATEBAU GMBH

S. NO. 567-680

This Operator´s Handbook is a translation of:

"BETRIEBS-HANDBUCH BÖLKOW BO 208 C JUNIOR"

AMENDMENTS

The portion of the text affected by the changes is indicated by a vertical line in the outer margin of the page.

Amendment		Number of	Amendment incorporated		Remarks
No.	Date	Pages	Date	Name	
1	Sept. 1965		Sept. 1965	BÖLKOW GMBH	
2	Oct. 1965		Oct. 1965	BÖLKOW GMBH	
3	Aug. 1966		Aug. 1966	BÖLKOW GMBH	Only from serial number 595
4	Jan. 1967	11	Jan. 1967	BÖLKOW GMBH	
5	**July 1968**	**8**	**Dec. 1968**	**BÖLKOW GMBH**	

THIS HANDBOOK DESCRIBES THE OPERATION AND PERFORMANCE OF THE BÖLKOW BO 208 C JUNIOR. THE INFORMATION PRESENTED IN THIS HANDBOOK IS DIVIDED INTO FOUR SECTIONS.

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If data contained in this handbook deviate from those listed in the DVL/PfL approved Airplane Flight Manual or servicing manuals published by the manufacturers of component parts of this airplane the text of the latter two will govern.

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SECTION I

DESCRIPTION

LEADING PARTICULARS

Model		BÖLKOW BO 208 C JUNIOR
Manufacturer		BÖLKOW-APPARATEBAU GMBH Nabern/Teck, Laupheim Plant, Germany WAGGON- UND MASCHINENBAU AG Donauwörth, Laupheim Plant, Germany
Date of Manufacture of Prototype Aircraft		1965
Design		High-wing, strut-braced monoplane, enclosed cabin
Materials		Light metal, glass-fibre reinforced plastic
Purpose		Sport, travel, acrobatics
Airworthiness		CAR. Part 3, Normal and Utility Category
Accomodation		Two seats, side-by-side
Engine		Rolls-Royce O-200 A
	or	Continental O-200 A, air-cooled, four-cylinder opposed piston engine, Rating, continuous power 100 HP at 2,750 rpm
Propeller		Fixed pitch, metal propeller Mc Cauley 1 A 100 MCM 6955.
	or	Mc Cauley 1 A 100 MCM 6950 (climb propeller)
	or	Mc Cauley 1 A 100 MCM 6758
Landing Gear		Tricycle landing gear with steerable nosewheel.

TECHNICAL DATA

Performance Data (1390 lbs. gross weight)

Never-exceed speed on an inclined flight path, no wind	153 kt (176 mph)
Maximum speed, (MSL, full throttle)	120 kt (137 mph)
Cruising speed, MSL, at 2,500 rpm	108 kt (124 mph)
Landing speed, at contact (flaps 35°)	43 kt (49 mph)
Take-off distance (unprepared grass runway, no wind, MSL, ISA)	700 ft.
Take-off distance to clear a 50-ft obstacle	1480 ft.
Landing roll distance	655 ft.
Landing over a 50-ft obstacle	1480 ft.
Rate of climb, MSL at 65 kt (75 mph)	710 ft/min
Service ceiling	13000 ft.

Range

Endurance	See SECTION III
Fuel consumption	Chart "Flight Performance"

Weight

Empty (reference value - standard design)	838 lbs.
Fuel and oil	168 lbs.
Luggage or parachutes	45 lbs.
Occupants	340 lbs.
Maximum all-up weight	
Normal Category	1390 lbs.
Utility Category	1325 lbs.
Wing loading	13.9 lbs./sq.ft.
Power loading	13.9 lbs./HP

Principal Dimensions

Span	26 ft. 4 in.
Length, overall	19 ft.
Height, over rudder	6 ft. 6 in.
Wing Area	100 sq. ft.
Wing Profile	NACA 23009 "droop nose"
Constant Chord	4 ft.
Wing Incidence	1^{o}
Wing Dihedral	1^{o}
Negative Sweep	3^{o}
Aspect Ratio	6.88
Elevator area	16 1/3 sq. ft.
Rudder area	7.8 sq. ft.
Ailerons area	2 x 2.26 sq. ft.
Flaps area	2 x 7 sq. ft.
Wheel track	6 ft. 4 in.
Tyres	low pressure, tubeless
Size: nose wheel	5.00 x 5
main wheels	5.50 x 5
Pressure (main gear)	22.75 psi
(nose wheel)	20 psi
Fuel	80/87 Octane Rating Aviation Fuel
Capacity	22 Imp. Gal. = 26.4 US Gal. = 100 Liter
Usable	21.4 Imp. Gal. = 25.7 US Gal. = 97.5 Ltr.
Oil	
Oil Sump Capacity	4.4 Imp. Qts. = 5 US Qts. = 4.7 Liter
Minimum	1.7 Imp. Qts. = 2 US Qts. = 1.9 Liter

Recommended Oil Grades

Outside Air Temperature below 40°F SAE 30 = AVIATION OIL 65
Outside Air Temperature above 40°F SAE 50 = AVIATION OIL 100

AVIATION OIL 65 Equivalents:

BP Aviation Oil 65
Aero Shell Oil 65
Canadian 3 GP / 60 a
NATO 0-113
US MIL-L-6082 B Grade 1065

AVIATION OIL 100 Equivalents:

BP Aero Oil 100
Aero Shell Oil 100
Esso Aviation Oil 100
British D. ENG. R. D. 2472 B/0
R. A. F. 34 A/9100554
Canadian 3 GP/100 b Am 1
NATO 0-117
US MIL-L-6082 B
MIL-L-6082 Grade 1100
French AIR 3560 C

Aviation Oil 80 Equivalents:

BP Aviation Oil 80
Aero Shell Oil 80
Esso Aviation Oil 80
US MIL-0-6082
NATO 0-115
British D. ENG. R. D. 2472 A/0
R. A. F. 34 A/9100552
Canadian 3 GP / 80 a

Where oil grades SAE 20 and 40 as recommended by the manufacturer are not obtainable, the following may be used:

Winter SAE 40 = Aviation Oil 80
Sommer SAE 50 = Aviation Oil 100

Hydraulic Brake Fluid Equivalents:

Aero Shell Fluid 4
BP Aerohydraulic 1
Esso Aviation Univis J. 43
British DTD - 585
Canadian 3 GP / 26 a
NATO MIL H 5606 A
US MIL H 5606 A

THE ENGINE

The powerplant used in your BÖLKOW BO 208 C JUNIOR is an air-cooled, opposed piston, four-cylinder Continental Model O-200 A or Rolls-Royce O-200 A engine. The maximum rating for continuous power is 100 HP at 2,750 rpm. The engine is made to the highest standards available. Proper operation and care will result in prolonged engine life, maximum performance and dependable service.

To ensure safe and efficient operation the following requirements should be met:

1) Never take-off on a cold engine. Allow engine and oil to warm up properly. (see SECTION II "Warm-up").

2) Do not overspeed the engine by starting a glide or dive without retarding the throttle. Careless engine operation by exceeding the maximum permissible engine speed of 2,750 rpm may damage the engine seriously.

3) Use proper Aviation grade fuels and oils (see "Fuel and Oil Grades") and change oil at regular 25 hour intervals. When flying under particularly unfavourable conditions, such as dust, blowing sand, extreme humidity, it is recommended to change oil at 20 hour intervals or even more frequently as dictated by the circumstances.
Use of other than specified Aviation grade fuels and oils may cause trouble.

4) Comply with prescribed 100 hour inspection (see MAINTENANCE HANDBOOK SECTION II).

5) Never exceed the maximum permissible oil temperature of 107°C (224°F) or (if such an instrument is provided) a cylinder head temperature of 275°C (527°F). This is especially important during a climb, and glider or banner towing operations.

6) The maximum rated rpm of the engine is 2,750, however during takeoff we recommend to use maximum power only as necessary for safe operation of the airplane, reducing power as soon as pratical. This procedure should be followed especially during the first 50 hours of operation.

Retard throttle as soon as the desired altitude is reached and proceed at 75 % power for cruise (see SECTION III Performance Data). During idling, settings below 600 rpm must be avoided, as sufficient lubrication of the engine is not present under these conditions. During prolonged waiting periods on the ground not less than 1,500 rpm should be maintained to provide for adequate cooling of the engine.

For detailed maintenance, adjustment and assembly instructions of Continental-built O-200 A engines refer to MAINTENANCE AND OVERHAUL MANUAL, Form No. A-C40 of Continental Motors Corporation, dated July 1962, for Rolls-Royce-built O-200 A engines refer to both "C 90 and O-200 OPERATING AND FIELD INSTRUCTIONS" T. S. D. Publication 2041 of Rolls-Royce Ltd. and MAINTENANCE AND OVERHAUL MANUAL, Form No. A-C40 of Continental Motors Corporation as applicable.

LUBRICATION SYSTEM

The engine utilizes a wet sump oil system. The oil sump has a capacity of 4.2 Imp. quarts, 1.7 Imp. quarts of which are considered unusable. Oil should be topped up if below 3.5 quarts, especially before undertaking cross-country flights and after acrobatics.
The oil filler is located on the right side of the engine. Access is through a door in the engine cowling. A dipstick is fastened to the oil filler cap, to permit the reading of the oil level.
At locations where extremely cold temperatures prevail, it is advisable to drain and pre-heat the engine oil, until a temperature of 40° C (104° F) is obtained.

FUEL SYSTEM

The filler neck protrudes above the canopy roof (starboard side). The fuel tank is located in the fuselage compartment aft of the seats below the roof and is held in place by two belts.
Fuel flows by means of a mechanically driven fuel pump through a fuel shutoff valve and fuel strainer to the carburetter. An electrically operated auxiliary fuel pump supplies fuel, if the engine pump fails to operate.
The drain plug on the bottom of the fuel filter bowl near the main firewall is used to drain all fuel from the system, when it is turned in the slots and latches. To drain water before the initial flight of the day, it is sufficient to push the plug momentarily upwards against the spring to allow a 0.3 cu. in. quantity of fuel to drain.
When topping up fuel, allow for adequate venting. Fuel spillage may prematurely occur during topping up, while the tank is not filled to capacity.

Continue to service fuel more slowly until fuel is draining from the vent line on the fuselage underside (indicating that the tank is filled).

Service with 80/87 octane rating Aviation fuel. The tetraethyl lead content of the fuel should not exceed 0, 03 cu. in. per gallon.

When fuel is serviced from barrels place a clean chamois over the funnel to filter the fuel.

On the left side of the instrument panel adjacent to the fuel quantity indicator a fuel warning light is installed, which lights up when the fuel is consumed to a reserve of 2, 2 Imp. Gal. (corresponding to an endurance of approx. 20 minutes).

Check the function of the warning light (on the occasion of an adequately emptied tank) and on principle function and indication of the fuel quantity indicator.

AIRFRAME AND LANDING GEAR

Fuselage, wings, and tail section are made of light metal. The tips of wings, rudder and vertical fin and the lower section of the engine cowling and the engine nose fairing are made of plastic.

The wing is divided into two sections, each is connected at two points to the upper fuselage structure and supported by two struts fastened to the lower fuselage structure. The main wing spar is located at 30 % M. C., the rear wing spar at 75 %.

Fuselage and wings have several access and inspection plates for maintenance of interior parts and holes for free water draining.

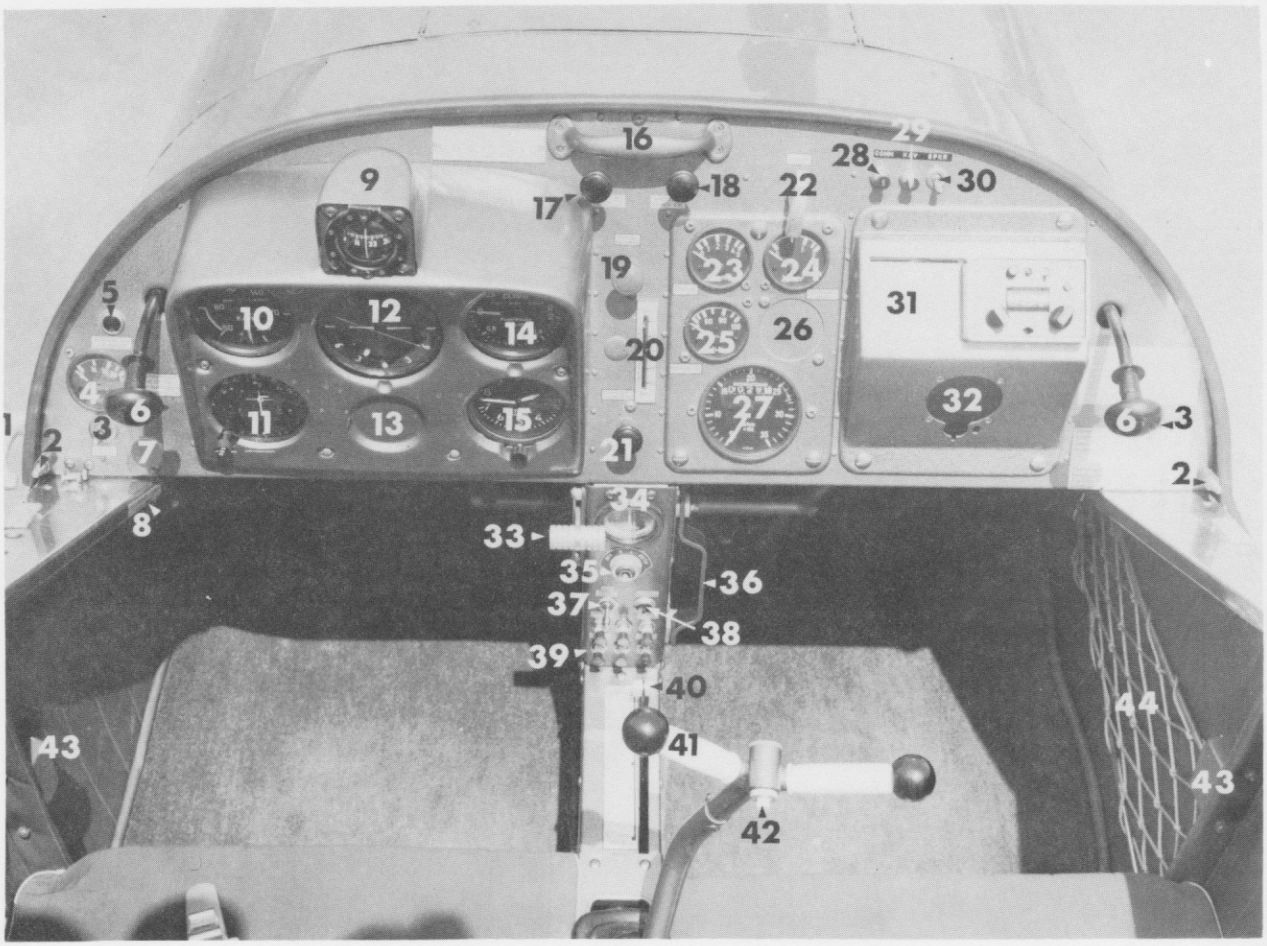
To jack the airplane use the two foot rests and the tail. The main landing gear supports the airplane' s weight by means of single maintenance - free tapered steel rods, the nosewheel incorporates steel springs encased in a telescopic strut and a hydraulic shock absorber.

The main wheels incorporate disk brakes. The nosewheel is steerable through an arc of approximately 30 deg. each side of neutral and is linked with the rudder.

Nosewheel and rudder are returned to neutral position by coil spring action. The coil spring is part of the stabilizer strut.

The V-shaped torque links keep the lower strut aligned with the upper strut, the captive cable limits spring travel. All wheels are equipped with tubeless tyres. For type inflation use the filling needle supplied at delivery.

Before injection of the filler needle carefully remove dirt from the valve cage by blowing compressed air. Avoid the use of pointed or sharp tools. The filler needle should be coated with glycerine before it is injected.



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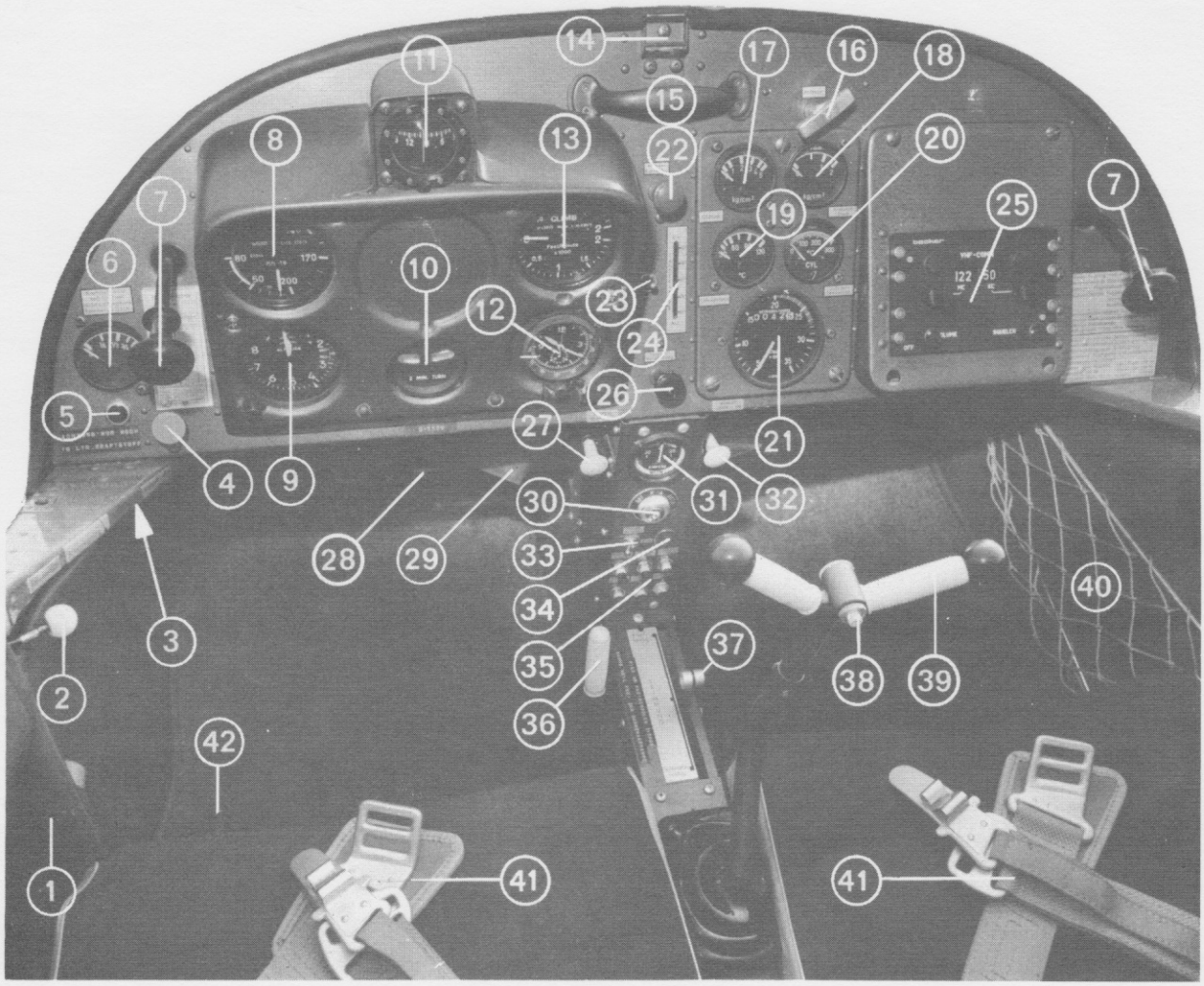
CABIN



1 HEAD-SET CONNECTION
2 CANOPY STRUT - RELEASE CATCH
3 FUEL SHUT-OFF VALVE
4 FRICTION CONTROL, THROTTLE
5 FUEL WARNING LIGHT
6 FUEL QUANTITY INDICATOR
7 THROTTLE
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23 FLAP CONTROL SELECTOR SWITCH
24 FLAP POSITION INDICATOR
25 VHF-TRANSCEIVER
26 CARBURETTER AIR HEAT BUTTON
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VHF-TRANSCEIVER, AUXILIARY FUEL PUMP, ELECTRICAL INSTRUMENTS, FLAPS, TURN AND BANK INDICATOR, NAVIGATION LIGHTS
36 BRAKE LEVER
37 ELEVATOR TRIM
38 MICROPHONE PLUG
39 CONTROL STICK
40 MAP RACK
41 BELTS
42 TOW COUPLING LEVER

CABIN

THE CABIN

Instrument Panel

All flight and engine instruments are mounted on the panel.

Airspeed indicator, calibrated in knots or mph
Sensitive altimeter, calibrated in feet
Magnetic compass
Turn and bank indicator (optional)
Recording engine tachometer
Oil pressure gauge
Fuel quantity indicator with warning light
Oil temperature gauge
Fuel pressure gauge
Cylinder head temperature gauge (optional)
Clock (optional)
Flap position indicator
Rate of climb indicator
Ammeter
Generator control light
Also radio communication equipment, gyro horizon and VOR (optional).

Throttle

Dual throttle controls are provided. They are linked by a hinged control tube. Adjustable friction locks may be used to control movement of the throttle. Clockwise turns increase friction, anticlockwise motion will reduce friction.

Throttle

Pulled OUT	-	Idling
Pushed IN	-	Full throttle

The throttle also acts as an engine primer. If the engine does not start at the first attempt, actuate the primer by pushing the throttle all the way in, then pull it all the way out. Do this as often as decessary, thereby supplying an initial charge of raw fuel to the cylinders. Do not tamper with the primer to avoid flooding the engine.

> NOTE
>
> To keep the engine running avoid sudden bursts of the throttle.

Carburetter Air Heater

The control knob to operate the carburetter air heat is located low in the centre of the panel.

knob pulled OUT - Carburetter air heat ON
knob pushed IN - Carburetter air heat OFF

In the carburetter a temperature drop of 25° C (77°F) as compared to the ambient air temperature may develop due to fuel vaporization, which leads, especially with high humidity, even with warm ambient air, to ice accretion and thus to insufficient fuel supply. This together with high humidity may lead to carburetter icing followed by insufficient fuel metering. The engine will respond by losing power (loss in rpm), rough running, sputtering and finally come to a complete stop.

To avoid carburetter icing and to remove ice that may have formed, heated unfiltered air is supplied to the carburetter, if the knob is pulled out. The air is heated inside the jackets mounted on the right side exhaust pipes.

Under relevant conditions ice may form during warm-up, while taxying or during run-up. Use carburetter heat during the periods described and carefully observe the oil and cylinder head tempera tures unless there is the possibility of dust entering the carburetter by way of the unfiltered air supply.

Under such circumstances use carburetter air heat at full throttle immediately before take-off.
This procedure will ensure that the carburetter is free of ice and the engine will deliver full take-off-power. Take-off as such is made normally with carburetter air heat turned off.
If, during the course of your flight, carburetter icing is encountered or becomes apparent due to low ambient air temperatures, high humidity or unavoidable flight through rain or snow showers, pull the carburetter air heater knob until the engine runs smoothly again and find a setting by trial and error at which the carburetter receives as much heated air as is required to avoid icing.

At outside air temperatures below $0^{o}C$ ($32^{o}F$) use either full or no carburetter air heat. When only partly open chances for critical icing will increase.

As a rule full carburetter air heat should be used before the throttle is retarded for a glide or landing.
During an approach maintain an rpm setting will above idling to ensure that the engine will respond properly if an overshoot must be executed. In order to have full engine power the carburetter air heater must be switched off before approach.

Ignition Switch

The key-operated ignition switch controls the dual magneto ignition system. The switch has four positions labelled clockwise:

"OFF" "R" "L" "BOTH"

For starting and during operation the ignition key must point to "BOTH".

CAUTION

Be certain personnel have cleared the propeller and obstructions are out of the way before the iginition switch is actuated.

Starter

The T-shaped starter handle is located near the centre of the instrument panel. Turn ignition switch on and pull out the starter handle until the engine fires. Then release the starter handle.
Do not pull the starter handle for periods longer than 10 seconds. If the engine does not fire at the first attempt, wait a few minutes before pulling the handle again.

CAUTION
Exercise caution to avoid possible hazards while operating the starter. Do not pull on the starter handle when the propeller is turning. Engaging the starter with the engine rotating may damage the starter drive.

Mixture Control

The mixture control is used to control the relative fuel quantity in the fuel/air mixture. Due to a reduction in air density with increasing altitudes the relative fuel quantity in the air/fuel mixture would increase, the mixture would become too rich resulting in loss of engine power and rough running. For best engine economy the mixture must be corrected so that the rpm rate is increased. If the rpm count is not increased, the reduction in strength of the mixture will lead to overheat and thus damage the engine.

If there are indications of the kind mentioned above, move out the control slowly towards the LEAN position until rpm (after an initial increase) drops slightly and the engine again is running rough. Then turn the control knob slowly until the maximum rpm, observed while moving the control out, is nearly obtained. As a result the mixture has been "leaned".
For each change in throttle setting, altitude and carburetter air heat, move the mixture control toward the FULL RICH position and readjust.

> NOTE
> Adjustments of the mixture control should be made at altitudes above 5,000 feet only. Frequently check oil and cylinder head temperatures, because the engine tends to become hot if the mixture is leaned.

Prior to landing the mixture control must be in FULL RICH position. Stopping the engine should be by use of the mixture control, which, placed in the full LEAN position at approx. 1,000 rpm, acts as an idle cut-out. Wait until the engine comes to a stop and then turn the ignition switch off.

Control knob pushed IN - mixture FULL RICH

Cabin Heat and Ventilation

The control knob for warm and fresh air is on the right below the instrument panel, and the knob for ventilation is on the left next to the central column.

Left knob pushed IN - Ventilation switched on
Left knob pulled OUT - Ventilation shut off
Right knob pushed IN - fresh air
Right knob pulled OUT - warm air

Regulate by means of intermediate settings.

Electrical Switches

A centrally mounted circuit breaker panel below the instrument panel is equipped with electrical switches, the ignition switch, the ammeter and the generator control light.

The Master Switch, a toggle switch, controls the entire electrical system of the airplane except the magneto-powered ignition system. Electrical power is admitted to the system if the toggle switch is pushed upward (on some S/N airplanes to the right). Then the red Generator Control Light next to it will be ON, indicating that the system is receiving current from the battery. The light should fade out at approximately 1,000 rpm, showing that the generator is functioning properly and is supplying current to the system. Failure of the light to illuminate or fade out will either indicate a malfunctioning generator, regulator or lamp.

In flight such trouble should be of no immediate concern, if the battery is sufficiently charged. However, all unnecessary electrical equipment should be turned off and the malfunction should be investigated and corrected after the next landing.
The function of ammeter indication is similar to that of the generator control light. Description see "Maintenance Manual", Part VI, Page 49.

Below the master switch Push-Button Switches are grouped together to operate:

Engine and flight instruments
Turn and bank indicator or gyro horizon
Navigation lights
Radio equipment and VOR
Auxiliary fuel pump
Flaps

The switches act as automatic fuses, that will trip out in case of a malfunction in a particular circuit. They can be re-set following a brief interval to allow for cooling off. If a fuse tends to trip out repeatedly turn off the particular circuit. Steps for corrective action should be taken as soon as possible.

The Auxiliary Fuel Pump is electrically operated. Check it for proper function before the initial flight of the day. If, despite adequate fuel supply and fuel shut-off valve open, the engine fails to operate and the fuel pressure is decreasing, it is likely that the engine-driven pump is not properly working. The auxiliary fuel pump switch should then immediately be actuated. For security the auxiliary fuel pump should be connected during take-off and landing. After reaching the safe-level or after landing roll the pump is to be disconnected. The pump is located to the left and in front of the firewall.

The Stall Warning Indicator on the right behind the instrument panel is set to give audible warning approximately five to eight knots above the stalling speed, regardless of attitude, whenever a stall is imminent. During a properly executed landing the indicator should give a signal shortly before touching down. A series of short beeps while taxying is of no further importance. The stall warning transmitter, located on the leading edge of the port wing should be kept free from dirt or paint. The indicator does not operate, when the master switch controlling the electrical equipment is turned off.

Fuel Shut-Off Valve

The fuel shut-off valve is located on the left hand cabin side.
Two positions are provided:

Pulled all the way back	-	Closed
Pushed all the way forward	-	Open

> CAUTION
> Be certain that the fuel shut-off valve is open before you take off.

Brake System

The two wheels of the main undercarriage are fitted with hydraulically operated disk brakes. The lever is located to the right side of the left seat and is linked to the brake master cylinder, that serves as the brake fluid container.
When parking the airplane pull the brake lever upward till it engages in the teeth.

> CAUTION
> Before starting to taxi and prior to landing make sure the lever is in its lowest position thereby releasing the brakes.

Operate the brake lever gently not violently.
Pulling the lever sharply will result in loss of brake effectiveness, lengthened ground run and unnecessary tyre wear.
Turns are difficult to make if the brakes are set.

Flight Controls

The BÖLKOW BO 208 C JUNIOR is equipped with a stick protruding from the centre aisle between the seats, and rudder pedals for both seats. Control movements are transmitted to the control surfaces by means of rods and cables.
Rudder and aileron are of conventional design, and, like the elevator, weight-balanced.
The rudder pedals are linked to the nosewheel to provide control during taxying.

The elevator is non-stabilized and is equipped with an elevator trim tab to make the controls felt (anti-servo tab). The elevator trim tab deflects in the same manner as does the elevator, when used as anti-servo tab.

Trim

The anti-servo tab is also used - by deflecting it upward and downward - for trimming the plane about the lateral axis. The trim lever is just forward of the seats, adjusts trim by setting the tab for nose-up or nose-down attitude.

Trim lever forward - nose-down trim
Trim lever reaward - nose-up trim

A friction control in the aft fuselage section permits adjustments for proper response.
Take-off should be made with the tab position indicator set at the neutral position. Use of nose-up trim for landings is at the pilot's discretion. It is not essentially necessary.

Flap Control System

The two flaps are electrically operated after connecting the circuit breaker on the switch panel by one of the two three-position toggle switches underneath the throttles on the instrument panel. Correct operation is as follows:

To lower the flaps press the toggle switch down
To retract the flaps push the switch upward

Whenever the switch is released, it returns to neutral position. The flaps may be lowered to any setting between 0^{o} and 35^{o}.
The flaps must not be lowered nor remain in extended position whenever the airspeed is mor than 91 mph, 79 kt (pointer no longer within the white sector on airspeed indicator).

If and how much use of flaps is appropriate during take-off or landing will depend upon field and weather conditions encountered.

The minimum take-off distance may be obtained when setting the flaps to eight degrees. The use of flaps is not recommended under conditions of strong crosswind or severe gusts - adequate field length permitted.

Cockpit Canopy

The cockpit canopy is made of plexiglass and should be treated with care. To clean the plexiglass use special agents (such as "Plexiklar") or soap and moderately warm water. Rubbing with a dry or rough cloth will cause scratches on the glass that will impair visibility.
A bad waether window is provided on the left hand side.
The latch striker plate above the instrument panel keeps the canopy roof secured. To open it from the outside pull the door handle - equipped with the door lock - and open up the roof, which is then secured by a locking rod. To close the cockpit canopy pull out the knob on the lefthand cockpit wall while simultaneously lifting the canopy slightly upward. The canopy then moves slowly downward. Pull the handle of the canopy down firmly until the lock engages. If the canopy does not move smoothly to the closed position, slightly lift the canopy upward before closing again. Do not use force. The speed with which the canopy closes can be set by means of an adjusting screw at the rop of the strut damping system. When locking the cockpit canopy, the studs on either side of the plexiglass canopy frame must engage in their respective retainers.
The central lock must latch over both lips of the latch striker plate (pull the handle down firmly). The small red securing lever shall be pushed downward so that the label "LOCKED" is visible. Check if properly secured.
To open the canopy from inside push securing lever and canopy handle upward and swing canopy roof upward until the strut engages.

Baggage Compartment

The baggage compartment located aft of the seats is accessible by folding the seat-back forward. Maximum capacity is 45 lbs. (20 kg).

Seats

The two seats are not adjustable. However the height of the seats can be regulated by means of the air cushions underneath the seat cushions, and the back of the seats can be tipped forward. The use of parachutes is possible when the seat cushions have been removed. Lap belts and shoulder harness are provided.

Ancillary Equipment

Personal items, maps, etc., may be placed in the map racks or below the plexiglass canopy on the upper part of the fuselage.
The fuel filler neck protruding through the plexiglass canopy is accessible from outside.
Entry into the cockpit is from either side of the airplane by use of foot rests.

NAVIGATION LIGHTS

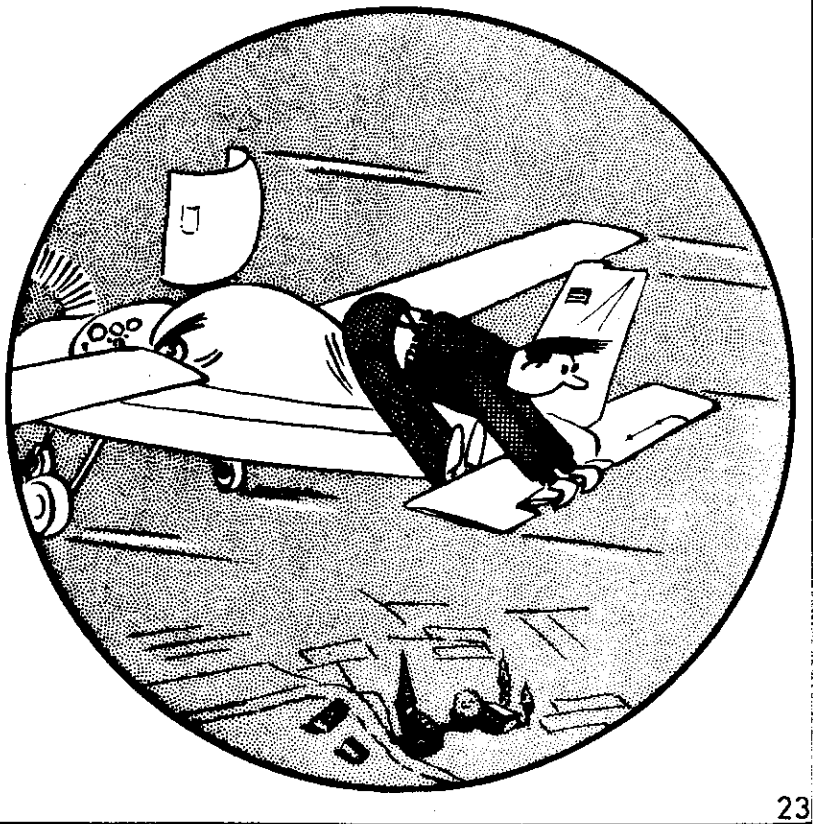
Conventional wing and tail lights are standard equipment.

PITOT TUBE AND STATIC PORT

The Pitot tube is mounted midway on the left wing strut. The barometric pressure is obtained from a static port located on the left forward side of the fuselage, immediately below the cockpit canopy. Instruments connected to the Pitot-static system include the airspeed indicator, altimeter and rate-of-climb indicator. Pitot tube and static port should be kept free of dirt, paint or polish, since the instruments depend on reliable sources of pressure for proper operation. Whenever the airplane is parked, install the Pitot tube cover. At the lowest point of the Pitot tube, at the junction of strut and fuselage, a short piece of plastic tubing is fitted over the Pitot tube. To drain the Pitot system push the tubing aside until the opening in the Pitot system is exposed. Replace the tubing when the water has been drained off.

SECTION II

OPERATION



BEFORE TAKE-OFF

Exterior and Interior Inspection

> NOTE
> Inspect your Bölkow Junior daily before the first take-off according to Check List I, and prior to each flight according to Check List II.
> Your and your passenger's safety will depend upon a careful inspection.

The following items should be checked:

1) Flight controls - proper deflections of surfaces and rudder, wire-safetying.
2) Tyres - condition and air-pressure, springing distance of nose gear.
3) Fuel supply, fuel filler cap secured.
4) Oil supply, oil filler cap secured.
5) Engine cowling - secured.
6) Pitot tube cover - removed.
7) Brakes - for proper operation.
8) Electrical system - for proper function.

With ignition switch OFF and full throttle turn the propeller through a few revolutions by hand. Check compression of all cylinders and be on the alert for abnormal engine noise.

Before the initial flight of the day drain free water from both fuel filter bowl by pushing the plug momentarily and pitot system by sliding cover hose at static pressure line entrance in fuselage . Replace cover hose after draining.

CAUTION

Make sure ignition is OFF and parking brake is set or chocks are in place before you turn the propeller. Stand clear of the propeller to avoid possible injuries in case the engine starts firing accidentally.

Before Entering the Airplane

1) Weather briefing - received
2) Flight plan - submitted
   Logbook - cleared
3) Flight route - Check all available information on destination aerodrome, location of alternative airfields, prohibited areas, etc.
4) Required documents - Flight Manual, Flight Logbook, Airplane Logbook, Engine Logbook, Propeller Logbook (if necessary), Insurance Policy, Aircraft Holder' s Licence, Airworthiness Certificate, Engine Test Certificate, R/T Licence, Pilot' s Licence.
   When planning flights to foreign countries be sure to include carnet de passages, passport and fuel credit card.
5) Exterior inspection - completed in accordance with Check List I ?
6) Taxying - Know how to get to the runway in use?
7) ATTENTION!
   The airplane must be loaded in a manner which does not adversely affect the safety of the flight. Proper loading is the responsibility of the pilot.
8) Head your airplane into the wind.

Before Starting the Engine

Inspect and perform the following:

1) Cabin - free of foreign objects.
2) Passenger - fasten seat belt.
3) Cockpit canopy - secured.
4) Baggage - safely stored.
5) Controls - operate, check proper function.
6) Parking brake - set, or chocks in place.
7) Auxiliary fuel pump - check for proper operation.
8) Fire extinguisher - on hand.
9) Outside - check for possible obstructions ahead.

Starting the Engine

1) Fuel shut off valve - ON, auxiliary fuel pump switched on.
2) Carburetter air heat - COLD.
3) Mixture control - FULL RICH.
4) Throttle - advance slightly from idle stop.
5) Master switch and electrical switches for instruments ON. (except the turn and bank indicator).
6) Ignition key - turn to BOTH.
7) Starter handle - pull out, when engine fires let go.
8) Oil pressure - check. If within 30 seconds no pressure indicated, stop engine immediately.
9) Throttle - accelerate to 800 rpm.

If the engine is cold or does not start at the first attempt prime the engine by two or three rapid throttle movements fore and aft. Do not actuate the starter for more than ten seconds. Switch on auxiliary fuel pump until just before starting.

If necessary make a second starting attempt after some time. If the engine again fails to start, remove ignition key, turn fuel shut-off valve OFF, apply full throttle and have the propeller inversely turned about ten times by hand.
At very cold temperatures, we recommend to turn the engine with the starter while ignition is OFF. With the engine rotating, move the throttle several times from idle stop to full speed stop. After approximately ten revolutions turn ignition switch ON.
The lower the outside air temperature the more priming is necessary. At extremely low temperatures preheating of engine or oil (40°C = 105°F) may prove necessary before starting.

Warm-up

Engine warm-up should be performed at 800 rpm for one to three minutes. This speed should not be exceeded, as long as no oil temperature is indicated. To avoid prolonged running at low rpm settings and overheating of the engine while on the ground, we recommend to start taxying following warm-up and to run up in holding position, if traffic permits. The engine will continue to warm up sufficiently during taxying and be ready for take-off after completion of run-up.
If for some reason take-off after run-up is delayed, allow the engine to run at 1,500 rpm. This will provide adequate cooling and avoid fouling of the spark plugs. The airplane should be heading into the wind.
Even at extremely cold temperatures take-off can be made following a 5-minute warm-up period, provided the engine is operating properly, the oil temperature reading remains constant within the green arc and transition is smooth, even though the required minimum oil temperature is not fully obtained.

If danger of icing exists, carburetter air heat should be used during warm-up and taxying, unless it is likely that dust or sand particles will enter the carburetter in excess.

Run-up

> CAUTION
>
> Do not run up if the airplane is parked in a puddle or on loose cinder or gravel or icy surface. Before run-up make sure the propwash is not directed toward persons, other airplanes or an open hangar.

1) Parking brake - set.
2) Carburetter air heat - OFF.
3) Mixture control - FULL RICH.
4) Oil pressure - green sector.
5) Apply full throttle - 2350 rpm.
   (Mc Cauley propeller 1A 100 MCM 6955)
6) Generator control light dark, ammeter indication in the right (+)section?
7) Magneto check - at 1700 rpm.
   Rpm drop, when turning from "BOTH" to "R" or "L" respectively should not be more than 100 rpm and the difference between "L" and "R" should not be more than 50 rpm. If the rpm drop is greater, stop and investigate.
8) Carburetter air heat - check for proper function. When using full carburetter air heat rpm may drop by 250.
9) Transition and idling - check. Idling speed is 600 rpm.
   At less than 600 rpm insufficient lubrication of the engine is provided.

Taxying

1) Switch on anti-collision light.
2) If radio contact with the control tower has been established, request taxi clearance, adjust clock to correct time and altimeter to QNH or 1013.2mb. (29.92 inches).
3) Be sure runway is clear.
4) Release parking brake or have chocks removed.
5) Check funktioning of brakes immediately airplane starts taxying.
6) Provided that dust and sand are not present while taxying, use carburetter air heat if danger of icing exists.
7) Taxi slowly, especially on uneven terrain, and if forward visibility is impaired, S-turn.
8) During taxying push stick slightly.

NOTE
Caution should be exercised when strong, particularly quartering tail winds exist. Avoid sudden bursts of the throttle or sharp brake movements. Use ailerons against direction of wind, when strong crosswinds prevail.

Before Take-off

1) Cockpit canopy	-	closed and secured.
2) Safety belts	-	fastened.
3) Elevator trim	-	0^{o}
4) Flaps	-	as necessary.
5) Fuel shut-off valve	-	OPEN.
6) Oil and fuel pressure	-	green sector.
7) Oil temperature	-	check reading.
8) Carburetter air heat	-	as necessary.
9) Mixture control	-	FULL RICH.
10) Take-off clearance	-	received.
11) Auxiliary fuel pump	-	switched on.

If approach sector and runway are clear (even when checked by radio with the control tower, take an extra look), taxi into position and line up with the runway and check compass against QFU. If icing conditions prevail, apply full throttle and use full carburetter heat momentarily with parking brake set. If extreme danger of icing exists and field length definitely adequate, take-off with carburetter air heat ON may be advisable. The take-off run will then however be considerably longer than with carburetter heat off.

TAKE-OFF

Normal Take-off

1) Flaps - 0^{o}.
2) Smoothly apply full throttle.
3) With airplane rolling apply slight back pressure on the control stick to decrease load on the nosewheel, espacially on uneven runways. Otherwise the take-off run will be lengthened by 10 per cent.
4) Unstick at 58 - 68 mph and allow the airplane to accelerate juste above the ground. A slight buffet after the airplane has taken off, may be controlled instantly by applying the brakes.

Obstacle Clear Take-off

1) Flaps - 8^{o}.
2) Parking brake - set.
3) Throttle - full open.
4) Parking brake - release.
5) Unstick as soon as practical (approx. 54 mph) in slightly tail low attitude.
6) Level off momentarily to accelerate to a safe airspeed.

Take-off in Strong Crosswind or Gusty Conditions

1) Flaps - retracted (0^{o}) if field length will permit.
2) Hold nosewheel on the ground during take-off roll. Use sufficient aileron into the wind to maintain the wing level.
3) Keep the airplane on the ground until a take-off speed of 69 mph, 60 kt,or more is reached.
4) Take off abruptly to prevent the airplane from settling back on to the runway.

CLIMB

1) After take-off, when obstacles have been cleared, retract flaps, auxiliary fuel pump switch off.
2) Best rate of climb at 75 mph, 65 kt.
3) Carburetter air heat as necessary.
4) Check engine instruments for proper readings.

CRUISE

1) Elevator trim - trim for cruise.
2) Carburetter air heat - as necessary.
3) Mixture control above 5, 000 ft as required.
4) Make a routine check of all instruments such as fuel pressure, oil pressure, oil temperature, cylinder head temperature and fuel quantity.
5) Check airspace for other traffic.

Consult tables in SECTION III to find best rpm settings and range at lowest rate of fuel consumption applicable to chosen altitude. Be sure to include prevailing wind.

GLIDE

1) Mixture control - FULL RICH.
2) Apply full carburetter air heat.
3) During a prolonged glide maintain sufficient rpm above idling and accelerate momentarily at 60-second intervals ("gun" the engine) to prevent engine from cooling off excessively and forming of ice in the carburetter.

NOTE

Maximum permissible gliding speed in calm air 176 mph, 153 kt. Under strong gusts do not exceed the manoeuvering speed of 122 mph, 106 kt.

BEFORE LANDING

First cross the airfield at approx. 2000 ft. above ground, keeping air space under constant observation (if no other height or approach procedure is specified in the AIP or no other instructions are given by radio). Familiarize yourself at this stage with runway in use, wind speed and direction (wind cone), possible display of signals on ground, light gun from the tower as well as other aircraft in pattern or on the ground.

Prior to landing be sure to fasten safety belts.

On Downwind

1) Mixture control - FULL RICH.
2) Use full carburetter heat.
3) Reduce speed to 91 mph = 79 kt and extend flaps half-way if required.

On Final Approach

1) Auxiliary fuel pump switched on
2) Flaps, as required
3) Elevator trim - trim for glide, maintain between 75 - 81 mph, 65 - 70 kt.
4) Parking break released
5) In order to have full engine performance in case an overshoot is necessary, especially on small airfields, it is recommended that the carburetter heat be off when the throttle is put into idling position (i. e. shortly before touch-down).

CAUTION

The flap extension speed regime is marked by white sector on the A. S. I. Adhere to these speed recommendations.

OVERSHOOT

1) Apply full throttle
2) Ease the control stick
3) Carburetter air heat OFF
4) Retract flaps to 0^{o} at speeds above 63 mph = 55 kt.
5) Climb at 75 mph = 65 kt.

LANDING

A Normal Landing

1) Lower flaps up to 35°.
2) The flare-out must be made close to the ground. Plan your approach accordingly, flare-out, and pull the control stick, in order to land on main wheels first. It is not necessary to apply full back pressure.
3) The nosewheel should not touch down before speed has been reduced sufficiently.

B Short Field Landing

1) Apply full flaps.
2) Use throttle and minimum speed as you approach the field.
3) Retard throttle completely after touch down.
4) Apply brakes gently.

C Landing in Strong Crosswind and Gusty Conditions

1) Lower flaps 8°.
2) Use speed above normal, when approaching the ground.
3) Use wing low method of drift correction.
4) Land as outlined under A.

CAUTION

With fully extended flaps the glide angle is steep. Maintain a speed of approx. 81 mph (70 kt) until sufficiently close to the ground for flare-out and hold-off.

The following table lists surface winds for direction against runway in use and speed that meet the conditions for the maximum permissible cross wind component of 20 kt.

Cross Wind Direction against RWY in use	Wind Speed
20°	58 kt
30°	40 kt
40°	31 kt
50°	26 kt
60°	23 kt
70°	21 kt
80°	20 kt
90°	20 kt

AFTER LANDING

1) Retract the flaps after completion of landing roll.
2) Switch off auxiliary fuel pump.
3) If, due to an excessive amount of taxying, the engine has become hot, allow it to cool by idling at 1000 rpm until a cylinder head temperature of less than 160° C (320°F) is obtained.
4) Pull mixture control knob fully OUT at 1000 rpm.
5) After engine has stopped, turn ignition switch OFF turn all other switches to OFF and set parking brake.

Record in your maintenance log items found unsatisfactory, including possible hard landing.

USE CAUTION WITH PROPWASH

As you may be cleared for take-off or landing behind an airliner or a jet plane the tower will transmit this or a similar warning as an additional safety precaution to avoid such an aircraft's prop/jet wash and wing tip vortex.

It is, however the pilot's responsability to maintain the appropriate spacing that will render big plane wash harmless.

Wait at least three minutes, especially if wind velocity is less than 15 knots, before following behind such an aircraft. If for some reason this is not possible, do not lower the flaps and during take-off keep your airplane on the ground longer than is normal during its run.

After the airplane has become airborne make a turn as soon as practicable. During the landing phase use a higher approach speed.

Under no circumstances should another aircraft's flight path be crossed at the same level. If it is no longer possible to change your altitude, the best course of action is to reduce airspeed to less than 106 knots = 122 mph. Do not try to forcefully balance any up and down movements once you are in another plane's wake.

STALLING BEHAVIOUR

Stalling characteristics of the BÖLKOW JUNIOR are remarkably docile. After flow break-away has occured the airplane will develop a nose-down attitude and accelerate.
Aileron effectiveness is being maintained throughout, even if the control stick is pulled back for full elevator deflection. If the stall has fully developed and the airplane is in a pronounced yaw attitude then the JUNIOR will slowly begin to spin.

MANOEUVERING SPEED

If full, abrupt deflections of control surfaces are intended in the presence of heavy turbulence, there is danger that the airplane's structure be damaged, when the manoeuvering speed is exceeded. Do not, under such weather conditions, fly at speeds in excess of 122 mph, 106 kt. This limitation is also applicable under conditions of icing, where it is recommended frequently to move the controls fully to avert the formation of ice on control surfaces in order to maintain their full range travel.

AEROBATICS

> CAUTION
>
> The maximum weight for the utility category airplane is 1320 lbs (600 kg).

In this category the following aerobatics are permitted:

CHANDELLE	SPINS
LAZY EIGHT	AILERON ROLL
STEEP TURNS	INSIDE LOOP
IMMELMANN TURNS	

Do not extend the flaps during aerobatics including spins.

Spins

> CAUTION
>
> Check for correct loading. The C.G. position has considerable influence on the spin characteristics of an airplane.

Entry

Entry into a spin can be effected with power on or off. When using power on, the throttle should be retarded as soon as the airplane begins to spin. Do not, however, retard the throttle completely to idling position, as the engine might then stop during the spin. After reducing speed to 65-70 knots = 75-81 mph at the foremost C.G. position, or 55 knots at the rearmost C.G. position, apply full back pressure abruptly on the stick and apply full rudder in the required autorotation direction.

Recovery

The JUNIOR recovers, depending on the number of spins executed, after no more than one and a half rotations, if one applies full rudder in opposite direction of autorotation and sets elevator in neutral position, where it should remain for the time being. When autorotation has ceased pull out gently, remembering not to exceed the maximum gliding speed of 176 mph (153 knots). Remember, a rough pull-out may not cause the flow to re-attach, and lead to buffeting. When first attempting spins, we recommend starting with right-hand spins, as the spins stop even when the controls are let go and the machine does not continue rotating as long as with left-hand spins.

Aileron Roll

Since the engine is not certified for inverted flight, positive g-rolls (barrel rolls) only should be performed, whereby in the inverted attitude the stick should not be eased up. We recommend a turning speed sufficient to perform the figure within 6 to 8 seconds.

Oil Consumption

After landing inspect the oil level. Top up if necessary. Oil loss is highest for rolls, with an average of 1 l (1 US qt.) per 10 rolls. It is therefore recommended to restrict the number of rolls per flight to not more than 20 to 30.

Static line attachment

The parachute static line will be fastened to the triangular hook used as attachment for the lap belt to the no. 3 main bulkhead, aft of the seats. In the left seat use the hook to the far left, in the right seat use the hook to the far right. Be sure the static line is not excessively pulled from the parachute pack.

GROUND HANDLING

Moving on the Ground

Push or pull the airplane using sections of heavier skins, e. g. handles on tail, struts or leading edge. When turning the airplane, lower the tail by pushing down on appropriate handles in order to raise the nose wheel off the ground.

Hangar Storage

When parking in a hangar lock wheels by use of chocks. Do not set the parking brake, so that the airplane may be moved without the need for other personnel to open the canopy.

Outside Parking and Mooring

During strong winds or ovemight we recommend that the airplane be tied down. Handles on tail, nose wheel, and strut fittings on lower wing side may be used as fittings for tie-down.

Tie the control stick back with the pilot' s safety belt.

If you prefer to cover up your airplane or the canopy, make sure that the plexiglass is not scratched by the canvas or dirt clinging to it.

Covering the airplane with a canvas immediately after landing is not recommended since the difference between the airplane' s temperature and the ambient temperature may lead to the formation of free water which in turn can cause shorts in the electrical circuits. Top up fuel after the last flight of the day to avoid formation of condensation water in the tank.

SECTION III

PERFORMANCE DATA

TAKE-OFF RUN

Based on: No wind, AUW 1,390 lbs, ISA, Propeller McCauley 1A 100 MCM 6955

Runway	Pressure Altitude ft	Outside Air Temperature °C / °F	-15 / 5	0 / 32	+15 / 59	+30 / 86	+40 / 104
Concrete ft	0		655	775	816	905	997
	1000		757	805	880	975	1070
	2000		784	850	940	1043	1150
	3000		816	915	1019	1125	1240
	5000		950	1095	1218	1385	1485
Turf ft	0		748	883	931	995	1135
	1000		863	915	1005	1110	1220
	2000		891	969	1072	1189	1312
	3000		932	1042	1159	1284	1414
	5000		1080	1250	1389	1540	1695

LEVEL FLIGHT PERFORMANCE DATA (IN KNOTS)

Based on: No wind, AUW 1390 lbs, Fuel 26.4 US Gal. = 22 Imp. Gal., no reserve and irrespective climbing, ISA, Propeller McCauley 1A 100 MCM 6955

Pressure Altitude ft	Engine Speed rpm	% Rated Power	IAS kt	TAS kt	Fuel Consumption/hr Imp. Gal.	Fuel Consumption/hr US Gal.	Endurance hrs	Range st. M	Range NM
0	2200	51.8	90	90	4.52	5.43	4.9	507	440
	2300	58.8	96	95	4.88	5.86	4.5	495	430
	2400	66.0	101	100	5.23	6.28	4.2	483	419
	2500	74.0	106	105	5.63	6.76	3.9	470	409
	2600	84.0	112	110	6.26	7.52	3.5	443	385
2500	2200	49.3	85	89	4.31	5.17	5.1	523	455
	2300	55.8	90	94	4.64	5.58	4.7	512	444
	2400	62.6	95	98	4.98	5.98	4.4	500	434
	2500	70.0	101	104	5.35	6.43	4.1	489	425
	2600	79.0	106	109	5.92	7.11	3.7	465	404

Pressure Altitude ft	Engine Speed rpm	% Rated Power	IAS kt	TAS kt	Fuel Consumption/hr Imp. Gal.	Fuel Consumption/hr US Gal.	Endurance hrs	Range st. M	Range NM
5000	2200	47.0	80	87	4.11	4.94	5.4	537	466
	2300	53.1	85	92	4.43	5.32	5.0	528	459
	2400	59.4	90	97	4.74	5.69	4.6	520	451
	2500	66.1	96	102	5.07	6.09	4.3	511	444
	2600	74.0	101	108	5.57	6.69	4.0	489	425
7500	2200	44.5	75	85	3.90	4.68	5.6	555	482
	2300	50.0	80	91	4.18	5.02	5.3	550	478
	2400	55.7	85	96	4.46	5.35	4.9	545	474
	2500	61.8	91	101	4.76	5.72	4.6	540	469
	2600	68.0	96	107	5.18	6.22	4.3	522	454
10,000	2200	42.0	70	84	3.68	4.42	6.0	576	500
	2300	46.8	75	89	3.92	4.71	5.6	578	502
	2400	51.8	81	95	4.16	4.99	5.3	579	503
	2500	57.1	86	101	4.42	5.31	5.0	576	500
	2600	63.0	91	106	4.78	5.74	4.6	561	487

LEVEL FLIGHT PERFORMANCE DATA (IN MPH)

Based on: No wind, AUW 1390 lbs, Fuel 26.4 US Gal. = 22 Imp. Gal., no reserve and irrespective climbing, ISA, Propeller McCauley 1A 100 MCM 6955

Pressure Altitude ft	Engine Speed rpm	% Rated Power	IAS mph	TAS mph	Fuel Consumption/hr Imp. Gal.	Fuel Consumption/hr US Gal.	Endurance hrs	Range st. M	Range NM
0	2200	51.8	104	104	4.52	5.43	4.9	507	440
	2300	58.8	110	110	4.88	5.86	4.5	495	430
	2400	66.0	116	115	5.23	6.28	4.2	483	419
	2500	74.0	122	120	5.63	6.76	3.9	470	409
	2600	84.0	128	126	6.26	7.52	3.5	443	385
2500	2200	49.3	98	102	4.31	5.17	5.1	523	455
	2300	55.8	104	108	4.64	5.58	4.7	512	444
	2400	62.6	110	113	4.98	5.98	4.4	500	434
	2500	70.0	116	119	5.35	6.43	4.1	489	425
	2600	79.0	122	125	5.92	7.11	3.7	465	404

Pressure Altitude ft	Engine Speed rpm	% Rated Power	IAS mph	TAS mph	Fuel Consumption/hr Imp. Gal.	Fuel Consumption/hr US Gal.	Endurance hrs	Range st. M	Range NM
5000	2200	47.0	92	100	4.11	4.94	5.4	537	466
	2300	53.1	98	106	4.43	5.32	5.0	528	459
	2400	59.4	104	112	4.74	5.69	4.6	520	451
	2500	66.1	110	118	5.07	6.09	4.3	511	444
	2600	74.0	116	124	5.57	6.69	4.0	489	425
7500	2200	44.5	86	98	3.90	4.68	5.6	555	482
	2300	50.0	92	105	4.18	5.02	5.3	550	478
	2400	55.7	98	111	4.46	5.35	4.9	545	474
	2500	61.8	104	116	4.76	5.72	4.6	540	469
	2600	68.0	111	123	5.18	6.22	4.3	522	454
10,000	2200	42.0	81	96	3.68	4.42	6.0	576	500
	2300	46.8	87	103	3.92	4.71	5.6	578	502
	2400	51.8	93	109	4.16	4.99	5.3	579	503
	2500	57.1	99	116	4.42	5.31	5.0	576	500
	2600	63.0	105	122	4.78	5.74	4.6	561	487

TABLE OF TRUE AIRSPEEDS

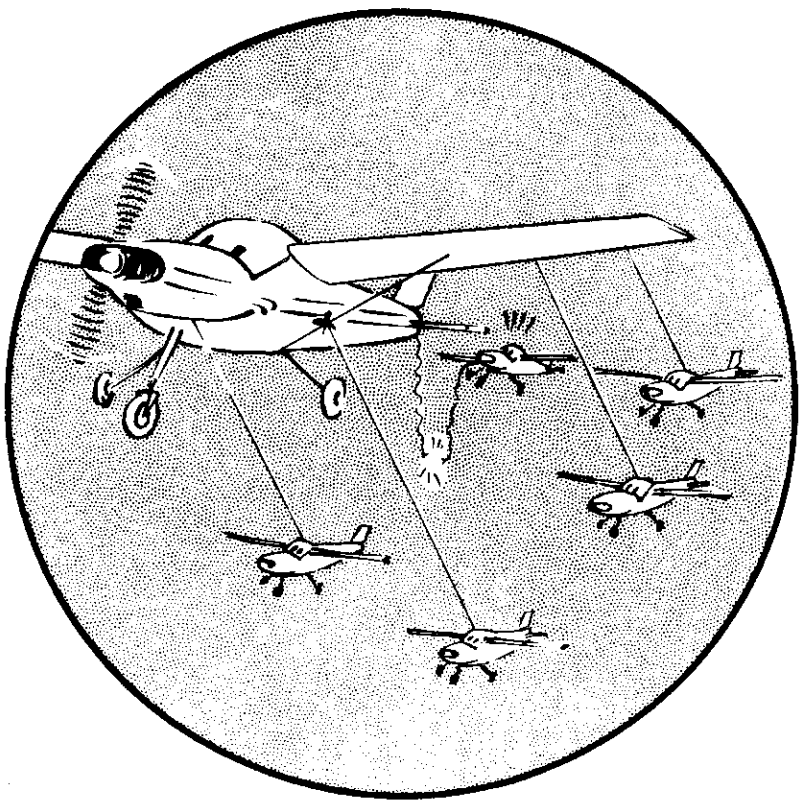
(Corrected for instrument, position errors and altitude at standard temperatures)

Indicated Airspeeds (IAS) in Knots		70	75	80	85	90	95	100	105	110	115	120	125	130
True Airspeeds in Knots	Altitude above SL in feet 0	72	76	81	85	90	95	99	104	108	113	117	122	127
	1000	73	77	82	86	91	96	100	106	110	115	119	124	129
	2000	74	78	83	88	93	98	102	107	111	116	121	126	131
	3000	75	79	85	89	94	99	104	109	113	118	122	128	133
	5000	78	82	87	92	97	102	107	112	116	122	126	131	137
	7000	80	84	90	94	100	106	110	116	120	126	130	136	141
	9000	83	87	93	97	103	109	113	119	124	130	134	140	146
	12000	86	91	97	102	108	114	119	125	130	136	140	146	152

Indicated Airspeeds (IAS) in mph		81	86	92	98	103	109	115	121	127	132	138	144	149
True Airspeeds in mph	Altitude above SL in feet 0	83	87	93	98	103	109	114	120	124	130	135	140	146
	1000	84	89	94	99	105	111	115	122	127	132	137	143	148
	2000	85	90	95	101	107	113	117	123	128	133	139	145	151
	3000	86	91	98	102	108	114	120	125	130	136	140	147	153
	5000	90	94	100	106	112	117	123	129	133	140	145	151	158
	7000	92	97	104	108	115	122	126	133	138	145	149	156	162
	9000	95	100	107	112	118	125	130	137	143	149	154	161	168
	12000	99	105	112	117	124	131	137	144	150	156	161	168	175

SECTION IV

APPENDIX



Sailplane Towing Group Categories

Towing Group A				Towing Group B			
T. C. Data Sheet No.	Type	G_F kp	V_T km/h	T. C. Data Sheet No.	Type	G_F kp	V_T km/h
141	Mü 22 Bgr. 2	400	160	68	Weihe 50	335	110
	Bgr. 3	340	160	105	L-Spatz	250	110
143	HKS I	562	120		L-Spatz	265	110
169	D 34	250	125		Spatz 55	245	110
172	Zugvogel I	345	140	111	Kranich III	520	130
	ab W-Nr. 1004	365	140	115	Condor IV	510	100
175	Geier I	360	120	167	Lo-150 and Lo-150 b	310	150
	Geier II u. II B	370	140	216	K8 and K8B	310	130
200	HKS III	377	140	225	LZD 9 Bocian 1D	510	140 calm
205	Ka6, Ka6/0, Ka6B, Ka6BR, Ka6BR-Pe, Ka6C, Ka6CR, Ka6CR-Pe	300	140	225	LZD 9 Bocian ID	510	100 gusty
207	FS 24 Phönix	265	105				
	FS 24 Phönix TO	300	125				
	FS 24 Phönix T	330	125				
212	Zugvogel II	345	140				
214	Zugvogel III	365	140				
217	Zugvogel IV	335	140				
228	Lom 57 Libelle	340	130				
230	Standard Austria	334	140				
232	SF 26 Standard	310	140				
235	Standard Austria S	334	140				
252	Phöbus	350	200				

Towing Group C				Towing Group D			
T. C. Data Sheet No.	Type	G_F kp	V_T km/h	T. C. Data Sheet No.	Type	G_F kp	V_T km/h
30	Kranich	465	100	49	Baby II b	250	100
59	Gö Minimoa	350	100	66	Baby III	260	90
63	Mü 13 D	260	100	67	Hütter 17 a	180	100
70	Olympia-Meise	290	100	101	DoppelraabIV	350	110
					Doppelraab V	350	110
72	Mü 17	310	120		DoppelraabVI	420	120
104	Mü 13 E	430	120				
	Bergfalke II	430	120	101.7	Doppelraab 7	420	120
	Bergfalke II 55	440	120	102	ES 49	480	120
				103	Cumulus II F	250	90
105	A-Spatz	220	110	116	Hütter 17 b	210	100
	B-Spatz	245	110	118	Ka 1	195	100
112	Goevier III	410	110	138	Specht	390	130
129	Lo 100 Zwergreiher			142	Hd 53	480	110
	Bgr 3 BVS	245	150	154	Ka 3	195	100
	Bgr 2 BVS	265	150	157	Ly 532	420	120
140	Ka 2	460	130	160	Baby V	420	130
148	Greif 1	275	115	162	Sp 1	255	220
159	AV-36-C	225	120	164	RhönlercheII	400	120
202	Ly 542 K Stösser	475	160	209	Sperber	400	130
203	Ka 2 B	480	130	221	Kaiser K 9	230	120
208	L-10 Libelle	244	100	575	Krähe	340	120
211	K 7	480	130	581	Motorspatz	345	140

G_F = Maximum permissible all-up weight

V_T = Tow speed

1 ROPE PLACED ON CAST-OFF BOOM
2 CAST-OFF BOOM
3 REAR-VIEW MIRROR
4 ANCHOR

BANNER-TOWING EQUIPMENT

ADDENDA

Turn and Bank Indicator

When taxying round sharp corners the turn and bank indicator may be damaged, when in operation. For this reason do not switch the instrument on until you are in take-off position, and turn it off after you have landed.

Tyre Valves

When parking the airplane for an extended period of time, the wheels should be turned until the tyre valves are in top centre position, as a precaution against possible air-escape form the tyres.