SECTION VIII

HANDLING AND MAINTENANCE

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INTRODUCTION

The pilot's general knowledge of his airplane should also include those procedures related to ground handling, inspection, maintenance and care of the airplane. This section provides information on those procedures that should be known to the pilot or being carried out by the pilot himself. Compliance with the instructions provided by this section will save you a lot of maintenance time and minimize aircraft down time.

Inspection or maintenance required on the airplane that may not be performed by the pilot himself shall be accomplished by an authorized service and maintenance station. Here, all the technical documents required for maintenance and inspection and the airworthiness directives applicable to your airplane are available to ensure maximum utilization and safe operation of your airplane.

It is the owner's or operator's responsibility to ensure compliance with all airworthiness directives applicable to his airplane and that maintenance is accomplished by licensed personnel only.

In order to ensure that your letters will be replied immediately and correctly by the authorized dealer or the airplane manufacturer, all correspondence concerning inspection and maintenance of your airplane should include the airplane model and serial number. This information may be obtained from the identification plate located on the aperture of the left cabin door near the baggage compartment door release button.

TECHNICAL DOCUMENTATION

An FAA approved airplane flight manual and an FAA approved maintenance manual are furnished in the airplane when delivered from the factory. An Owner Follow-Up System informs you on any revision of these manuals. In addition, the owner receives permanent notification in the form of service and maintenance information (e.g. Service Letters, Service Bulletins, and Service Information as well as information on available kits). For a small fee, an illustrated parts catalogue is available from your dealer or the airplane manufacturer. Any catalogue revision will be notified automatically.

Note

It is the responsibility of the airplane owner to ensure that his complete address and subsequent address changes are made available to the authorized dealer or the airplane manufacturer after the airplane has been delivered.

AIRPLANE INSPECTION INTERVALS

1. Regular inspections after every 50 and 100 flight hours.

2. Special inspections after the first 25 flight hours, rough landings or lightning stroke.

For detailed informationen refer to the Maintenance Manual, Section 5 "Service Intervals/Maintenance Inspections".

GROUND HANDLING

The three view drawing in Section I shows the dimensions of the standard airplane. Please refer to these dimensions for proper hangaring.

CAUTION

In order to ensure propeller clearance at any time, nose gear strut and tires must always show the correct pressure.

TOWING

The airplane should be moved on the ground with the aid of the nose wheel towing bar provided with the airplane. The tow bar is designed to attach to the nose wheel axle (see Fig. 8-1). Never exceed the nosewheel turning angle limit of 15° to either side of the center. There is a perceptible stop at the maximum turn limits. For pulling, do not attach the tow bar to other nose gear components than the nose wheel axle.

CAUTION

1. Do not push or pull on propeller blades or control surfaces or try to lift them up.

2. Do not attach any weight to the tail to lift the nose wheel.

3. For moving the airplane on the ground, always use the tow bar provided with the airplane.

4. Do not apply unreasonably high loads to the airplane while towing it. Jerky movements must be avoided.

In case the nose and main gear sank into the snow or mud, lift the airplane up and place boards or planks etc. underneath the wheels. Then pull the airplane with the aid of the tow bar.

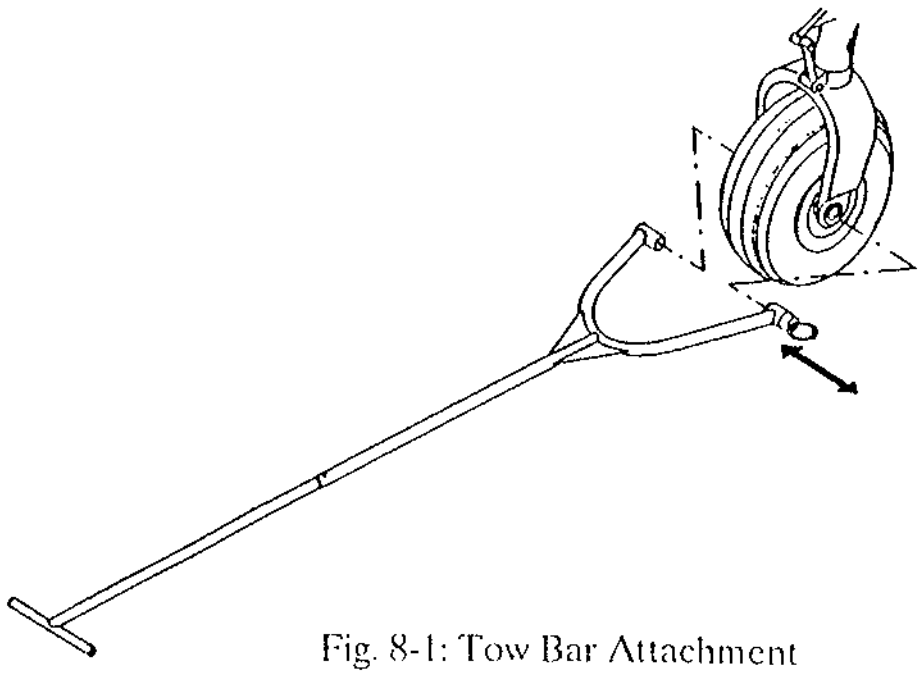

Fig. 8-1: Tow Bar Attachment

PARKING

Head the airplane into the wind if possible. Set parking brake, close engine cowl flaps and install pitot tube cover and engine air intake protective cover.

The parking brake operating knob is located on the left side of the fuselage below the instrument panel. Parking brake setting is by applying the brake and simultaneously pulling the parking brake knob. The parking brake knob remains pulled and the brake pedals may be relased. To release the parking brake, unlock the parking brake knob and push it in.

CAUTION

When leaving the airplane unattended, chock the main and nose wheels instead of setting the parking brake. Temperature variations may result in a decrease or an unacceptable rise in brake pressure.

Do not set the parking brake when the brakes are overheated, wet or during cold weather (32°F (0° C) or less) when accumulated moisture may freeze the brakes.

If the airplane is parked for a longer period of time it must be tied down in any case.

TIE-DOWN

It is recommended to hangar the airplane when not in use to minimze all harmful effects of wind and weather on the airplane. If the airplane is parked in the open it must be tied down securely. To tie-down the airplane securely, proceed as follows (see Fig. 8-2):

1. Head airplane into the wind if possible. Install control lock.
2. Place chocks in front of and behind each wheel and secure them. Release parking brake.
3. Screw the tie-down fittings in the jacking points provided on the underside of the right and left wing.
4 Secure the wing and tail tie-down fittings with one rope each and attach the ropes to the respective ground anchors.

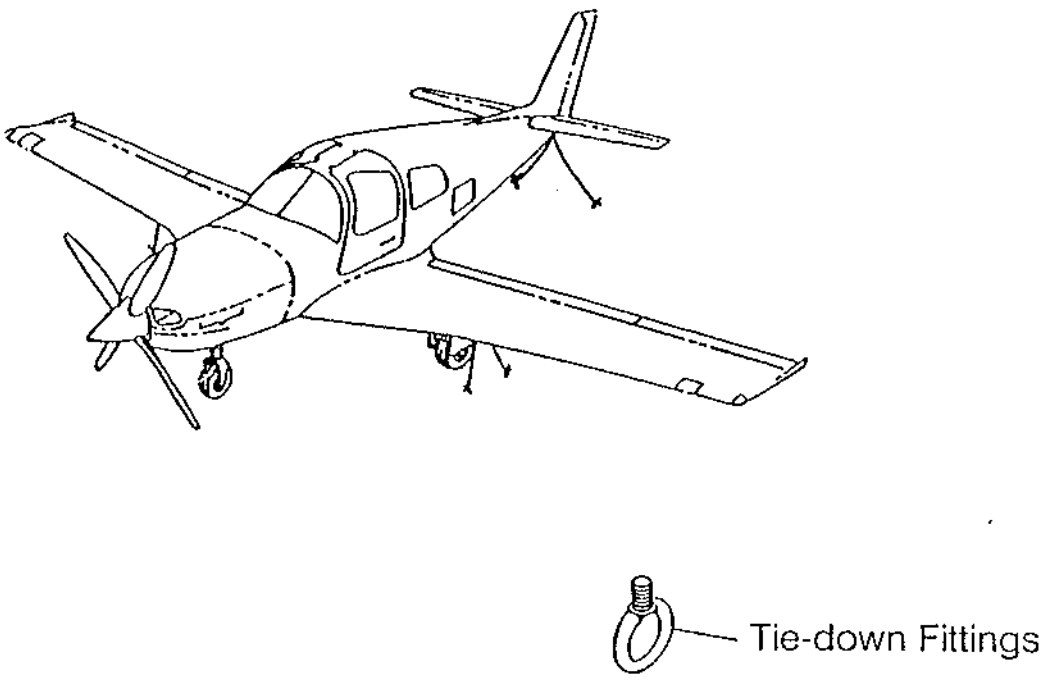

Fig. 8-2: Airplane Tie-Down

CAUTION

Do not tighten the rope but let it slightly sag to prevent the airplane from stressing. A tail tie-down rope that is tightened too fast may lift the nose of the airplane. The increased angle of attack will have a lift-increasing effect in case of gusts.

In stormy weather , place an additional support underneath the tail skid.

JACKING

The airplane should be always jacked inside a hangar except when there is no wind at all. To jack the airplane, proceed as follows (see Fig. 8-3):

1. Screw the two centering bowls in the jack points provided on the lower surface of each wing near the main gear struts.

2. Place one lifting jack each underneath the two centering bowls and extend the jacks until fitting into the centerings bowls.

3. The tail skid has a bore provided for yoke end adaptation. The yoke end is used to attach a balance weight of at least 440 lbs (200 kg) to the tail.

4. After the balance weight has been attached to the tail, lift up the two jacks slowly and simultaneously until the gear struts are completely extended and the wheels are free. If it is intended to perform landing gear operating tests sufficient ground clearance must be available. Secure the lifting jacks against lowering.

CAUTION

When lowering the airplane, see to it that the two lifting jacks are lowered simultaneously and that the wings are kept horizontally. Before lowering the airplane, make sure that the landing gear is down and locked and that the parking brake is released.

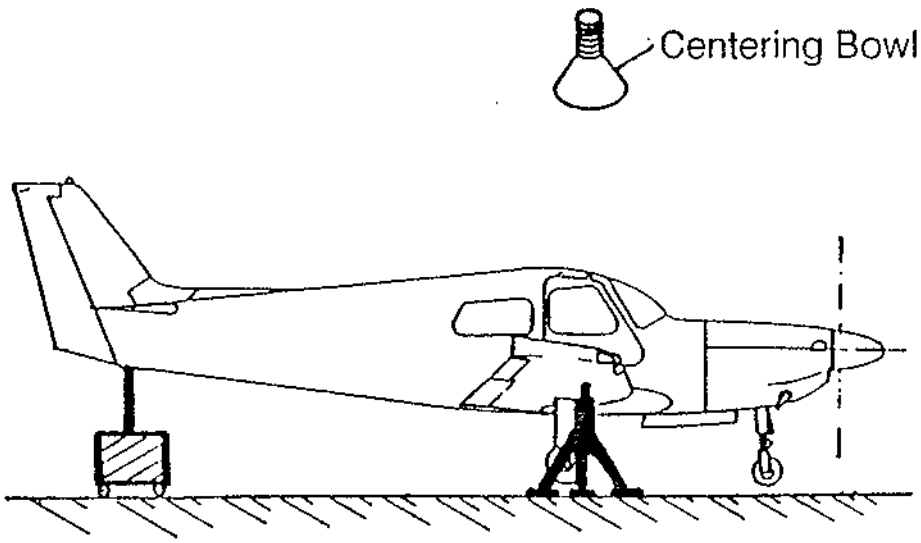

Fig. 8-3: Airplane Jacking

SERVICING

FUEL SYSTEM

Refer to Section I for approved fuel grades.

REFUELING

To avoid fuel contamination refuel the airplane at fuel stations only that are provided with filters to remove contaminants and water from the fuel. If there is no filter available use a dry and clean chamois leather to filter the fuel.

Each of the wings is equipped with an integral tank. The two tanks have a fuel capacity of 66.0 US Gal (125 l) each (usable fuel 62.3 US Gal (118 l)). The filler cap covers are located on the top surface of each wing tank. Open the filler cap covers by pulling a release button located inside the cabin below the cabin door. Below the filler cap cover there is the filler cap. Open the cap by a 1/4 turn to the left.

WARNING

Always ground the airplane before refueling. Do not allow smoking inside the cockpit or in the vicinity of the airplane while fueling. The master switch must be switched off.

As the tanks are separated by splash walls with discharge openings, refueling at high filling rates is not possible. From approx. 50 l onward, refueling has to be done slowly to avoid early overflowing.

Maximum filling capacity is reached when the fuel level is at the bottom of the filler neck and does not change within the next 30 seconds.

CAUTION

The fuel gauges in the cockpit do not provide precise information on the actual fuel capacity in the tanks. Deviations up to 25 % between indicated and actual fuel capacity are possible.

To facilitate partial refueling, the filler necks are provided with specific markings indicating the actual level of the fuel contained in the tank. The accuracy of indication, however, is largely dependent on the airplane's attitude and only reliable if the the airplane is positioned horizontally.

FUEL DRAIN VALVES

After refueling has been finished, take fuel samples from the fuel drain valves by using a transparent container.

WARNING

After refueling, wait at least 5 minutes before draining fuel from the fuel drains to allow water and contaminants to sink to the fuel tank sump.

A fuel drain valve is located on the lower surface of each wing. A little transparent container is provided with the airplane for fuel sampling. Push the pin of the fuel sampler into the center of the fuel drain valve to open it for a short period of time and to take a fuel sample. Water contained in the sample can be seen from a sharp line separating the water from the fuel inside the transparent fuel sampler. As water is heavier than fuel, it will sink to the bottom of the fuel sampler with the coloured fuel above. If water or contamination are detected, continue draining until all water or contamination has been removed.

WARNING

After draining has been completed, check all fuel drain valves for tightness.

ENGINE LUBRICATION SYSTEM

The new Lycoming engine has been already run in and tested thoroughly at the factory. It may be operated within the operating limits established in Section II. The oil level has to be checked prior to each flight and aviation oil has to be added if necessary.

Before checking the oil level allow the oil to have sufficient time to run down to the oil sump (at least 10 min.) after stopping the engine. The inspection cover which gives access to the dip stick is located at the top of the engine cowling. For approved oil grades, refer to Section I.

For new or recently overhauled engines, straight aviation mineral oil has to be used during the first 50 h of operation. The usual 50 h engine inspection has to be performed after the first 25 h of operation. This must include draining of the engine oil, cleaning of the oil screen in the oil sump and changing of the oil filter, which is mounted to the rear of the engine. The oil sump has to be refilled again with straight aviation mineral oil. After the first 50 h of operation or after the oil consumption has stabilized, the mineral oil has to be drained and replaced by ashless dispersant aviation oil (HD-oil).

TIRES AND LANDING GEAR

The landing gear tires must be checked for correct filling pressure at regular intervals:

Nose Wheel Tire and Pressure:	5.00-5 6 PR	5.0 psi	(3.4 bar)
Main Wheel Tire and Pressure:	15×6.00-6 6 PR	6.4 psi	(4.4 bar)

A correctly adjusted filling pressure serves for reducing tire wear and penetration of foreign objects and thus extends tire life. Check tires for cracks, damage, and correct position of the rim markings during each preflight check. Avoid high taxiing speeds, heavy braking or rapid direction changes. Prior to each flight, any accumulation of snow, slush, and ice has to be removed from the landing gear and exposed parts of the retraction mechanism to prevent the landing gear from being hindered or blocked while extending or retracting.

The landing gear warning horn can be checked during flight by either running the engine at idle with the landing gear retracted (throttle lever in full aft position) or by setting the wing flaps to 30°. In both cases, the warning will sound intermittently.

GROUND POWER ELECTRICAL SUPPLY

If an external power receptacle is installed it is vital to observe the following precautions when using it:

1. The airplane must be equipped with a battery.

2. The electrical power distribution has a negative ground. So inverse polarity has to be avoided under any circumstances. Take care to connect the positive contact of the external power source plug to the positive contact of external power receptacle and the negative contact of the external power source plug to the negative contact of the external power receptacle installed in the airplane. A positive voltage must be applied to the little guide pin of the external power source receptacle, too.

3. No voltage may be applied while connecting the external power source in order to avoid sparking.

4. Before connecting the external power source, master and avionics switches must be switched off to protect the surge arrester and related equipment against voltage peaks.

5. Before switching the electrical power distribution, make sure that the voltage of the external power source is constant.

CAUTION

A poor voltage control of the external power source or overvoltage peaks may damage the electrical equipment run by it.

CLEANING AND CARE

PAINTED SURFACES

Prior to cleaning the painted exterior surfaces of the airplane, the wheels and particularly the brake disks have to be covered. Cover all openings or seal them with suitable plugs. Take special care to cover the two static ports before cleaning or waxing the airplane.

CAUTION

Never use steam-jet or high- pressure apparatuses to clean exterior surfaces. Never use silicone containing cleaners or polish.

Before washing the surfaces, rinse thoroughly to remove loose dirt. Always use cold or hand-hot water, mild soap and soft cloths or a chamois. Heavy contamination may be pretreated by using an appropriate cleaner. Never use harsh or abrasive soaps or cleaning agents in order to avoid scratches on the surface. After washing, rinse thoroughly to remove the soap. Residual soap may dull the varnish. Wax the exterior surfaces with a car wax, if necessary.

Within a period of 90 days after the airplane has been delivered, no wax should be applied to the exterior surfaces which would exclude air from the finish and thus preventing it from curing. If cleaning is required during this curing period, use cold or hand-hot water and mild soap only.

WINDOWS

The cabin windows are made of plexiglass. Special care must be exercised to avoid scratches or other damages. Clean the windows by washing them carefully with a mild soap and clean water.

CAUTION

Never use silicone, alcohol, or solvent containing cleaning agents because they will attack the plastic material and cause damages.

Never clean the plexiglass windows with a dry cloth in order to avoid scratches and building up of an electrostatic charge which attracts dust particles in the air. If the surface is scratched after the dirt has been removed it should be waxed with a good grade of commercial plexiglass wax. Apply a thin, even coat of wax and bring it to high polish by rubbing carefully with a soft cloth. Rub a short time only because the heat generated by rubbing may soften the plexiglass and cause optical distortion. Never use a power buffer to clean the windows.

ENGINE

The engine should be cleaned, using an approved standard solvent. Use only those solvents that do not cause damages to aluminium or magnesium alloys. Before cleaning the engine, ensure protection is afforded to all openings to prevent solvent from entering engine components.

CAUTION

The engine has to be cold before cleaning.

Spray or brush the engine with the solvent. Dry the engine with a cloth. Remove excessive solvent by means of compressed air.

CAUTION

Solvent should not be allowed to enter magnetos, starter, alternator, or housings of essential components. Protect all engine components by means of a plastics foil or another suitable cover.

Do not run the engine before it is absolutely dry.

PROPELLER

For maintenance and care of the MTV-14-B/190-17 propeller, refer to the applicable manual.

WARNING

For maintenance and care of the propeller, it is vital that iginition is off and the engine has cooled down completely.
STAND CLEAR OF ARC OF PROPELLER BLADES WHEN ROTATING THE PROPELLER MANUALLY. ALWAYS ROTATE THE PROPELLER OPPOSITE TO THE DIRECTION OF ROTATION.
But despite all precautionary measures, there is always the possibility that one cylinder is firing when rotating the propeller.

LANDING GEAR

When cleaning landing gears and wheel wells, cover wheels and brakes thoroughly. Use water and soap to clean the landing gears and wheel wells. Use an appropriate cleaner to remove heavy and oily dirt. These cleaning agents usually contain solvents which might affect rubber (tires) even if they are applied for a short time only. In this case, rinse the affected areas immediately with a lot of clean water. After cleaning the landing gears, wipe the exposed shock strut pistons with a clean, dry cloth. Use water and a brush to clean the tires. When cleaning landing gears and wheel wells in cold weather, dry them carefully to avoid any formation of ice.

CAUTION

Ensure that squat switches and landing gear limit switches are absolutely dry before flight.

INTERIOR CARE

Use a standard household cleaner to clean the interiors. Clean seats and carpets with a vacuum cleaner. Heavy dirt and spots may be cleaned with normal cleaners designed for fabric, carpet, or leather. Before using any cleaning agent, read the instructions on the container thoroughly and test the cleaner on an obscure place on the material to be cleaned.

Spatter enamelled interior surfaces may be cleaned with water, soap and a soft brush. Heavy dirt such as oil and grease can be removed with spirit or gasoline used for cleaning purposes. Do not allow the solvent to come into contact with the plexiglass windows.

CAUTION

Silicone, alcohol, or solvent containing cleaning agents will attack the plastic material of the windows and cause damages.

CARE AFTER LONGER PERIODS OF STORAGE

TEMPORARY STORAGE

If the airplane is stored for period of less than 28 days no specific preservation measures are required for airframe and installations. Prepare for storage as follows:

1. Keep fuel tanks full and fill up oil to maximum. Check tires for correct pressure.

2. Set fuel selector to the OFF position.

3. Switch off all electrical equipment.

4. Seal all air intakes including pitot static tube and static ports.

5. Install control column lock and tie down the airplane if it is stored outside.

6. Manually rotate the propeller several times opposite to the direction of rotation every seven days. Make sure that ignition is OFF before rotating the propller manually.

WARNING

For maintenance and care of the propeller, it is vital that iginition is off and the engine has cooled down completely.
STAND CLEAR OF ARC OF PROPELLER BLADES WHEN ROTATING THE PROPELLER MANUALLY. ALWAYS ROTATE THE PROPELLER OPPOSITE TO THE DIRECTION OF ROTATION.
But despite all precautionary measures, there is always the possibility that one cylinder is firing when rotating the propeller.

LONG-TERM STORAGE

If the aircraft will not be flown for more than 28 days, prepare for storage as follows:

1. Prepare for storage according to the instructions for temporary storage of less than 28 days.

2. For engine preservation, refer to the instructions provided in Section "Installation and Storage" of the Lycoming Operating Manual.

3. Clean and polish the airplane thoroughly to prepare the airframe for storage.

4. Turn the tires a little every four weeks to prevent the tires from pressing flat.

RETURN TO SERVICE AFTER STORAGE

If the airplane had been stored according to the appropriate storage instructions, prepare for reservice as follows:

1. If the engine had been preserved, refer to the Lycoming Operating Manual for proper reservice procedures.

2. Remove all seals from the air intakes.

3. Make a thorough preflight check.

4. Before starting the engine, rotate the propeller by hand several times opposite to the direction of rotation. Make sure that ignition is OFF before rotating the propeller manually.

WARNING

For maintenance and care of the propeller, it is vital that iginition is off and the engine has cooled down completely.
STAND CLEAR OF ARC OF PROPELLER BLADES WHEN ROTATING THE PROPELLER MANUALLY. ALWAYS ROTATE THE PROPELLER OPPOSITE TO THE DIRECTION OF ROTATION.
But despite all precautionary measures, there is always the possibility that one cylinder is firing when rotating the propeller.

SECTION IX

SUPPLEMENTS

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ABSCHNITT IX

SUPPLEMENTS

INTRODUCTION

Section IX of the Airplane Flight Manual provides supplemental information about optional items, which are not included in the standard equipment of the airplane. Operating limitations, normal and emergency procedures as well as the effect on airplane performance and handling qualities, if applicable, are described for any additional equipment installed in the airplane. Some optional systems have been described already in Section VII and will not be covered by this section.

LIST OF ATTACHED SUPPLEMENTS

Supplement No.	Item	Revision Status	Attached *
1	Operating Instructions Audio System KING KMA 24	0, March 94	
2	Operating Instructions COMM/NAV SYSTEM KING KX155/165	0, March 94	
3	Operating Instructions ADF SYSTEM KING KR 87	0, March 94	
4	Operating Instructions TRANSPONDER KING KT 79	0, March 94	
5	Operating Instructions PICTORIAL NAVIGATION INDICATOR KING KI 525 A	0, March 94	
6	Operating Instructions DME SYSTEM KING KN 63 WITH KDI 572 MASTER INDICATOR	0, March 94	
7	Operating Instructions TRANSPONDER KING KT 76 A	0, March 94	
8	Operating Instructions DME SYSTEM KING KN 62 A	0, March 94	
9	Operating Instructions CKAS	3.0, 04/08/91	
10	free position		

All supplements listed above are LBA approved:

* Marking: x = attached; o = not attached

LIST OF ATTACHED SUPPLEMENTS (Cont.)

Supplement No.	Item	Revision Status	Attached *
11	Autopilot System KING KAP 100	0, March 94	
12	Operating Instructions FUEL COMPUTER SHADIN MINIFLO-L	0, March 94	
13	Operating Instructions INTER-COMM SYSTEM TELEX PRO COM 4	0, March 94	
14	Operating Instructions INTER-COMM PS Eng. PM1000	0, March 94	
15	Autopilot System KING KFC/KAP 150	0, March 94	
16	Operating Instructions ALTITUDE AND VERTICAL SPEED SELECTOR KING KAS 297B	0, March 94	
17	Operating Instructions ELECTRONIC TACHOMETER HORIZON P 1000	0, March 94	
18	EMERGENCY LOCATOR TRANSMITTER POINTER 3000	0, March 94	
19	SATELLITE BASED NAVIGATION SYSTEM (GPS) KING KLN 90	0, March 94	

All supplements listed above are LBA approved:

* Marking: x = attached; o = not attached

LIST OF ATTACHED SUPPLEMENTS (Cont.)

Supplement No.	Item	Revision Status	Attached *
20	SATELLITE BASED NAVIGATION SYSTEM (GPS) ARNAV STAR 5000	0, March 94	
All supplements listed above are LBA approved:			

* Marking: x = attached; o = not attached

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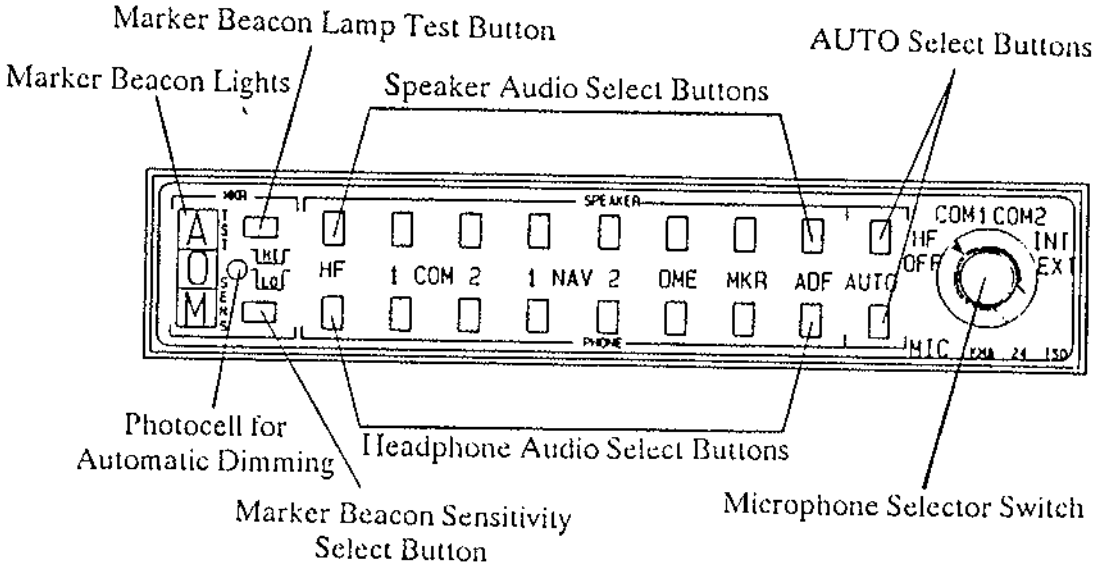
Operating Instructions

AUDIO CONTROL SYSTEM
KING KMA 24



Audio Control System:

The rotary switch on the right side selects the desired transmitter for the cockpit microphones (COM1 or COM2). The next positions provide for connecting the microphone to an HF-transceiver, intercom (INT) or an external ramp hailer speaker (EXT), if installed. In the OFF position, speaker amplifier and marker beacon receiver are switched off. The headphone amplifier operates whenever the aircraft electric power is on. The INT position permits the flight crew to communicate.

Note

If the microphone selector switch is set to the INT position, receiving incoming radio calls is only possible with the respective COM1 or COM2 pushbuttons engaged.

Two rows of pushbuttons control the audio selection of 6 receivers. The top row of pushbuttons controls the selection for the speaker, and the bottom row selects audio for the headphones. The selections are independant, and any audio input can be selected for speaker or headphones or both. To listen to a specific receiver, simply press the corresponding headphone or speaker button "in". To disconnect the receiver, press the button again. It will return to the "out" position.

The transmitter selected with the microphone selector switch will be matched automatically with the appropriate COMM or HF receiver audio on either headphone or speaker, or both, by simply pressing the desired headphone and/or speaker "AUTO" push button. If the microphone selector is in the "INT" position COM1 or COM2 buttons in the upper or lower row must be engaged for listening to incoming radio calls.

Marker Beacon Receiver:

The marker beacon receiver built into the KMA 24 gives you an accurate visual and aural signal when you pass over a 75 MHz beacon. The blue, amber, and white lights on the faceplate - as well as the audio tone - identify the beacon type (outer, middle or airway/inner marker). Either the speaker or headphone MKR button or both must be "in" for the marker beacon receiver to provide an audio signal at beacon passage.

The horizontal pushbutton labeled SENS on the lower left side of the console gives you the choice of two receiver sensitivities. When the button is "in", the sensitivity is on HI. During an approach, this setting should permit you to hear the outer marker tone about one mile out. At this point you may select LO to dampen the tone. It will start to sound again when you are closer to the marker, giving you a more precise indication of its location.

Pressing the top horizontal button marked "TST" simply applies voltage to all three lamps to show that they are functioning.

CAUTION

The TST button should not be pressed to test the lamps when autopilot coupled on an ILS approach inside the outer marker. This is due to the fact that some autopilots use marker annunciation to change the sensitivity of the autopilot.

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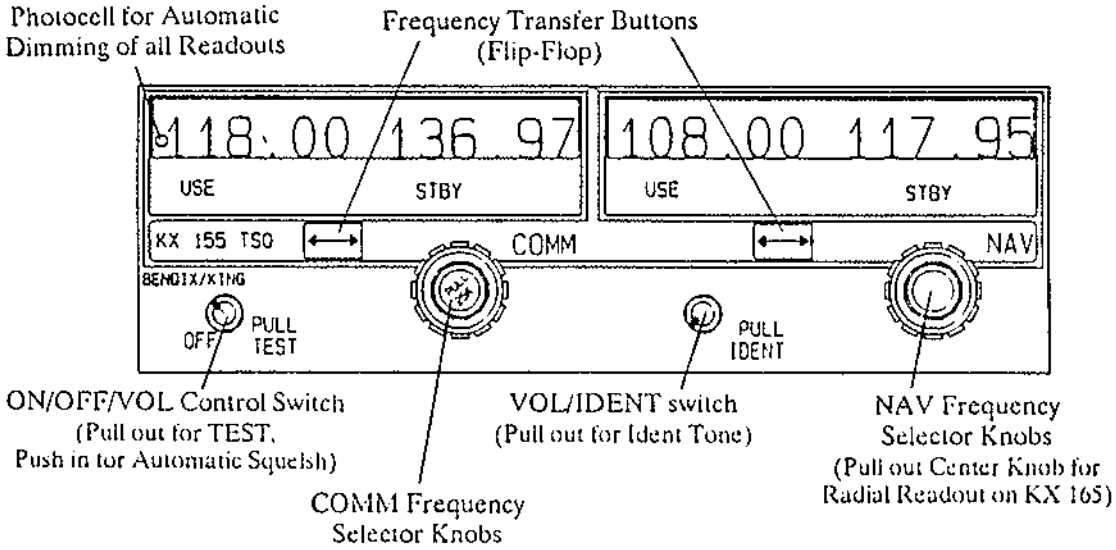
Operating Instructions

COMM/NAV SYSTEM
KING KX 155/165



Turn On:

Rotate the ON/OFF/Volume Control knob clockwise from the detented "OFF" position. Power will be activated and the unit will be ready to operate. No warm up time is required. A non-volatile memory stores "active" (USE) and "standby" (STBY) frequencies during power shutdown. So, when turned on, the "USE" and "STBY" windows will display the same frequencies that were selected before shutdown.

The KX 165's digital "Radial" readout will only function when receiving a valid VOR signal.

NOTE

As with all avionics, the KX 155 and KX 165 should be turned on only after engine start-up. In addition, the KX 155 and KX 165 should be turned off prior to engine shutdown. These simple precautions will help protect the solid-state circuitry and extend the operating life of your avionics equipment.

Frequency Selection:

By rotating the concentric COMM frequency selector knobs either clockwise or counterclockwise, the desired frequency can be entered into the "STBY" display window. A clockwise rotation of the knobs will increase the displayed frequency number, while a counterclockwise rotation will decrease it.

The outer, larger selector knob is used to change the MHz portion of the frequency display; the smaller knob changes the kHz portion. This smaller knob is designed to change the indicated frequency in steps of 50 kHz when it is pushed in, and in 25 kHz steps when it is pulled out.

At either band-edge of the 118.000 - 136.975 MHz frequency spectrum, an off-scale rotation will wrap the display around to the other frequency band-edge (i.e. 136.00 MHz advances to 118.00 MHz).

To tune the COMM transceiver to the desired operating frequency, the selected frequency must first be entered into the "STBY" display window and then activated by pushing the "flip-flop" transfer button. This will interchange the frequencies in the "USE" and "STBY" displays, and the transceiver will be tuned to the operating frequency appearing in the "USE" display.

As you can see, this feature makes it possible to display two COMM frequencies - one each in the "USE" and "STBY" displays - and then switch back and forth between them just by pressing the transfer button.

Transmit Indicator:

Whenever the microphone is keyed, a lighted "T" will appear between the "USE" and "STBY" displays to indicate the transceiver is operating in the transmit mode.

Volume Adjustment Test:

To override the automatic squelch for audio test, or to aid in receiving a distant station, simply pull the volume control knob out and rotate to the desired listening level. Push the knob back in to activate the automatic squelch.

NAV Frequency Selection:

By rotating the concentric NAV frequency selector knobs either clockwise or counterclockwise, the desired operating frequency can be entered into the "STBY" display window.

An off-scale rotation of the NAV frequency band-edge will wrap the display around to the other edge of the frequency band (i.e 117.00 advances to 108.00). Remote DME and internal glideslope channeling are also controlled by these knobs.

To tune the NAV receiver to the desired operating frequency, the selected frequency is first entered into the "STBY" display and then "flip-flopped" into the "ACTIVE" status by pushing the transfer button.

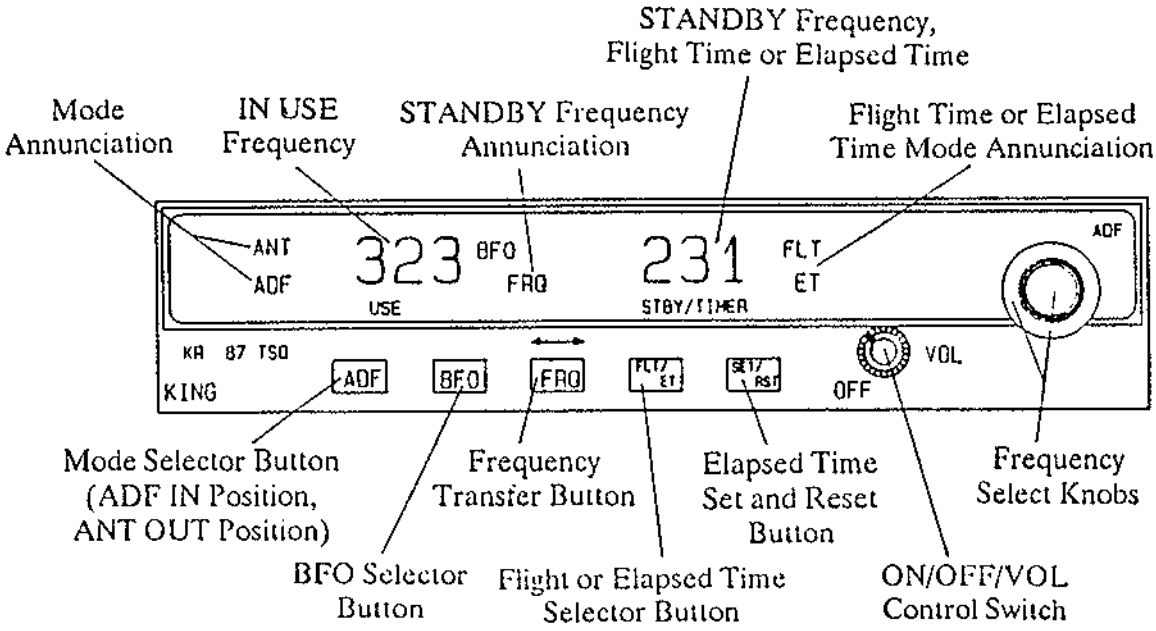
VOR "Radial" Mode:

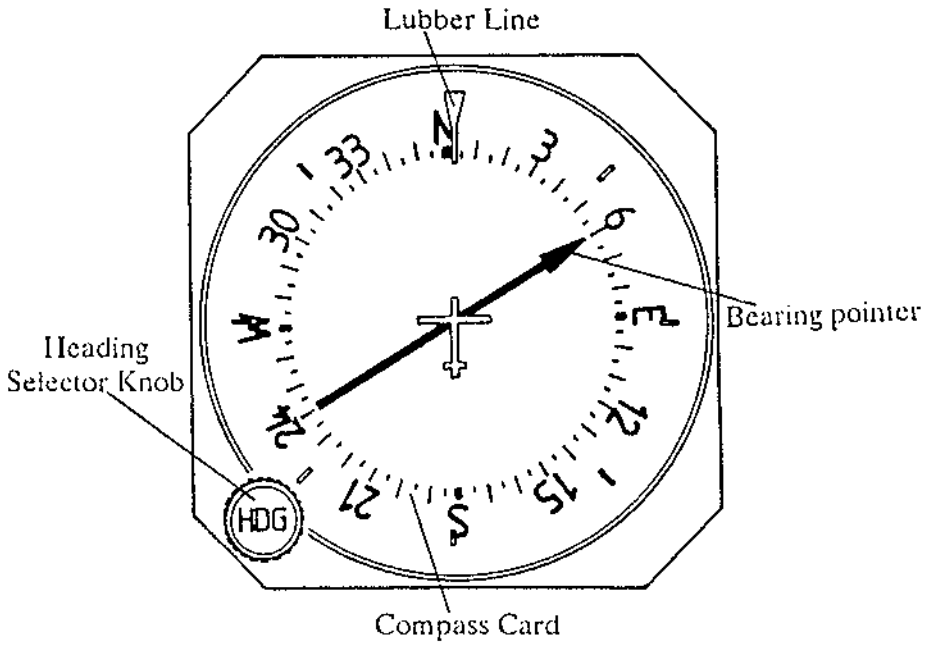
When the smaller NAV kHz frequency selector knob is pulled out on the KX165 model, the VOR radial "FROM" the station in "USE" is digitally displayed in the "STBY/RAD" window. The "STBY" frequency will go into non-displayed storage from which it can be "flip-flopped" into "USE" at a press of the transfer button. While in the "RADIAL" mode, rotation of the frequency selector knobs will channel the active frequency directly in the "USE" window display. If the VOR signal is too weak to provide a radial readout, a "warning flag" is activated consisting of three dashes displayed in the "STBY/RAD" window. Also, when an ILS frequency has been selected, the digital flag "---" will appear in the "STBY/RAD" window.

This digital "RADIAL" mode is not provided on the lower-cost KX155 model; therefore, with the inner NAV frequency select knob pulled out, three dashes "---" will always appear in the right NAV window.

Operating Instructions

ADF RADIO COMPASS
KING KR 87





Turn On:

Rotate the ON/OFF/VOL knob clockwise from the detent "OFF" position. The unit will be activated and will be ready to operate.

CAUTION

As with all avionics, the ADF should be turned on only after engine start-up.

Rotation of the ON/OFF/VOL knob also adjusts audio volume. The KR 87 has "audio muting" which causes the audio output to be muted unless the receiver is locked on a valid station.

Frequency Selection:

The active frequency (to which the ADF is tuned) is displayed in the left side of the window at all times. A standby frequency is displayed in the right side when "FRQ" is annunciated. The standby frequency is placed in "blind" memory when either FLT (Flight Time) or ET (Elapsed Time) mode is selected.

With "FRQ" annunciated, the standby frequency is selected using the frequency select knobs which may be rotated either clockwise or counterclockwise. Pull the small inner knob out to tune 1's. Push the small inner knob in to tune 10's. The outer knob tunes the 100's and the 1000's up to 1799.

The standby frequency selected may then be put into the active window by pressing the "FRQ" button. The standby and active frequencies will be exchanged (flip-flopped), the new frequency will become active and the former active frequency will go into standby.

Operating Modes:

Antenna (ANT) mode is selected and annunciated when the "ADF" button is in the "out" position. ANT provides improved audio reception from the station tuned and is usually used for identification. The bearing pointer in the KI 227 indicator will be deactivated and immediately turn to the 90° relative position and remain there during ANT reception.

The ADF mode is selected and annunciated when the "ADF" button is in the depressed position. ADF activates the bearing pointer in the KI 227 indicator, causing it to move without hesitation to point in the direction of the station relative to the aircraft heading. The compass card on the KI 227 may be rotated as desired by using the heading knob.

Note

The KI 227-01 or KI 228-01 indicators, when installed with a King KCS 55A Compass System have a slaved compass card.

Magnetic heading of the aircraft will be under the lubber line. The indication of this compass card should be compared with that of the KI 525 A master indicator from time to time. Check especially after steep bank turns or taxi turns. If a descrepancy between the two readings exists, the KI 227-01 or KI 228-01 compass card should be synchronized to the KI 525A compass card by rotating the "SYNC" knob on the indicator.

Outside of the United States some stations are unmodulated and use an interrupted carrier for identification purposes. The BFO mode, activated and annunciated when the "BFO" button is depressed, permits the carrier wave and the associated morse code identifier broadcast on the carrier wave to be heard.

ADF Test (Preflight or Inflight):

Select ANT mode. This will cause the bearing pointer to move directly to the parked 90° position. Make sure the unit is tuned to a usable frequency. Now select ADF mode and the needle should move without hesitation to the station bearing. Excessive sluggishness, wavering or reversals indicate a signal that is too weak or a system malfunction.

Operating the Timers:

Flight time and elapsed time are both activated whenever the system is turned on. Both timers may run up to 59 hours, 59 minutes. Flight time and elapsed time are displayed in the right side of the window, instead of the preselected "standby" frequency. The standby frequency is placed in a "blind" memory and may be called back by pressing the FRQ button.

Flight time and elapsed time are displayed and annunciated alternatively by depressing the FLT/ET button. The flight timer continues to count up until the unit is turned off. The elapsed timer may be reset back to :00 by depressing the SET/RST button. It will then start counting up again.

Note

Pressing the SET/RST button will reset the elapsed timer whether it is being displayed or not.

The elapsed timer also has a "countdown" mode. To enter the countdown mode, the SET/RST button is depressed for about two seconds, or until the "ET" annunciation begins to flash. It is now in the ET set mode, and a time up to 59 minutes, 59 seconds may be preset into the elapsed timer with the concentric knobs. The preset time will be displayed and remain unchanged until SET/RST is pressed again,

which will start the elapsed timer counting down from the preset time. When the timer reaches :00 it will start to count up as the display flashes for 15 seconds and an aural alarm, if installed, is activated for about 1 second.

The standby frequency which is in memory while flight time or elapsed time modes are being displayed may be called back by pressing the FRQ button, then transferred to active use by pressing the FRQ button again.

While FLT or ET is displayed the "in use" frequency on the left side of the window may be changed, by using the frequency select knobs, without any effect on the stored standby frequency or the other modes. This feature is especially useful when searching for stations with unknown frequencies.

Erroneous ADF Bearings due to Radio Frequency Phenomena:

When using AM broadcast stations, certain weather conditions, such as night effect, may cause signals from stations with identical frequencies to overlap. This should be taken into consideration when using AM broadcast stations for navigation.

Sunspots:

and atmospheric phenomena may occasionally distort reception so that signals from two stations on the same frequency will overlap. For this reason it is always wise to make positive identification of the station being tuned, by switching the function selector to ANT and listening for station call letters.

Electrical Storms:

In the vicinity of electrical storms, an ADF Indicator pointer tends to swing from the station tuned toward the center of the storm.

Night Effect:

This is a disturbance particularly strong just after sunset and just after dawn. An ADF Indicator pointer may swing erratically at these times. If possible, tune to the most powerful station at the lowest frequency. If this is not possible, take the average of pointer oscillations to determine relative station bearing.

Mountain Effect:

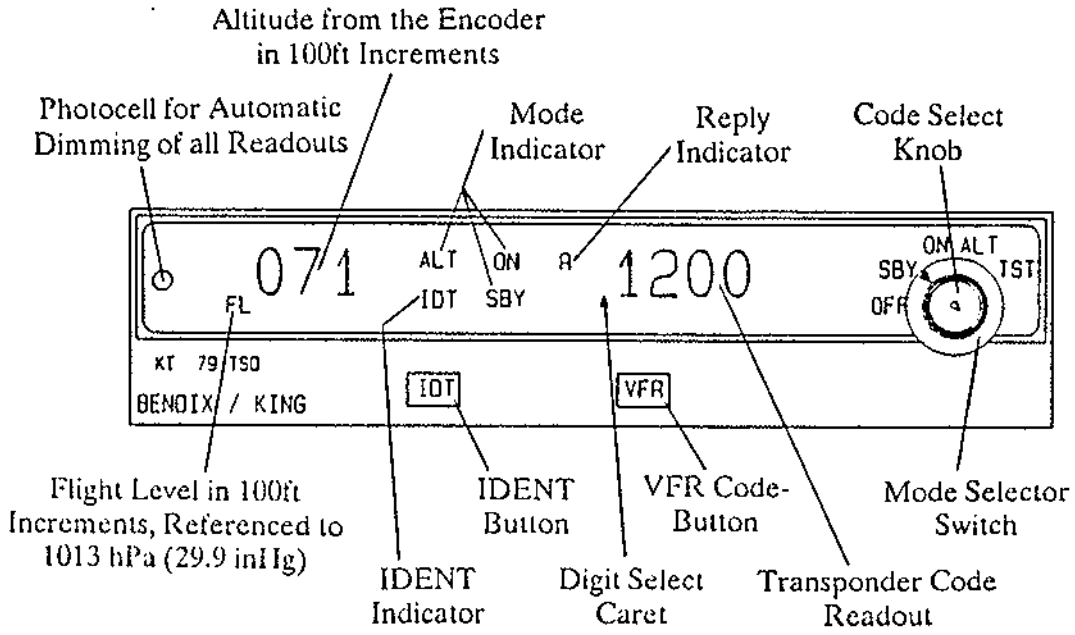
Radio waves reflecting from the surface of mountains may cause the pointer to fluctuate or show an erroneous bearing. This should be taken into account when taking bearings over mountainous terrain.

Coastal Refraction:

Radio waves may be refracted when passing from land to sea or when moving parallel to the coastline. This should be taken into account when operating near coastal areas.

Operating Instructions

TRANSPONDER
KING KT 79



KT 79 Operation:

ATC ground radar sends out "interrogations" to any aircraft within its area at 10 to 15 second intervals.

Your KT 79 receives this interrogations at 1030 MHz, and these trigger a coded response of radar pulses, which are transmitted back to ATC at 1090 MHz. The return reinforces your aircraft's image or "blip" on the controller's radar screen.

The KT 79 can reply to radar in any of 4096 preselected codes. Each code is identified by a unique group of pulses. When the KT 79's IDENT button is pressed, the blip representing your aircraft will flash, or "bloom". This enables the controller to positively identify you and your location. With either an encoding altimeter or blind encoder, your KT 79 also provides ground radar with a continuous report of your altitude. A flashing "R" reply indicator tells you your transponder is working properly and is replying to interrogations from ground radar.

Operating Procedure:

After engine start-up, turn the function selector to the Standby (SBY) position. Then select the proper reply code by rotating the code select knob to change the first digit. A momentary push on the code select knob will move the code select "caret" to the next digit which again is set by rotating the code select knob. Follow this procedure until all four digits in the reply code have been selected. There is no need to move the "caret" back to the first digit; it will automatically return after about five seconds. The KT 79 will retain the reply code through power shutdows if the code has not been changed during the 5 seconds prior to removing power.

Just before you take off, switch the function selector to ON. Your KT 79 is now operating in "Mode A", or normal mode. To operate in "Mode C", or altitude reporting mode, turn the function selector to ALT (for aircraft equipped with altitude encoding equipment).

Your encoded altitude will appear in the left portion of the display. This numerical readout indicates the altitude output from your altitude encoder and is transmitted and displayed in 100-foot increments. A readout of 145, for example, corresponds to a flight altitude of 14500 ft, while a readout of 071 would correspond to an altitude of 7100 ft. (If the aircraft is not equipped with an altitude encoder, or if this function is inoperable, dashes will appear in the altitude portion of the display.)

Please note that the displayed altitude may not agree exactly with the aircraft's altimeter when flying below 18000 feet because encoders are preset to 29.92 inches mercury (1013.2 hPa). An encoder's altitude transmission is automatically corrected for proper altimeter setting by a ground computer so as to present the correct altitude to the controller.

When the VFR code is required, simply press the VFR push button and "1200" will appear in the reply code window. "1200" is the VFR reply code for the United States. For other countries this code might be different (e.g. "0022" in Germany above 5000 ft).

If a preset reply code other than the factory set 1200 is desired, a new code may be programmed using the following procedure:

1. Turn the function selector to SBY.

2. Select the code desired.

3. While holding the IDENT button in, briefly depress the VFR push button.

The code now stored in "VFR" will remain the same until changed again with the above procedure.

Codes:

Code 7700. For emergencies only. This code tells ATC you require immediate assistance. If possible, make sure that the respective VHF frequency is tuned on your COMM transceiver.

Code 7600. This code tells ATC your COMM radio is malfunctioning.

Code 1200. For all VFR flights (May be different outside the US). ATC assigns specific codes for IFR.

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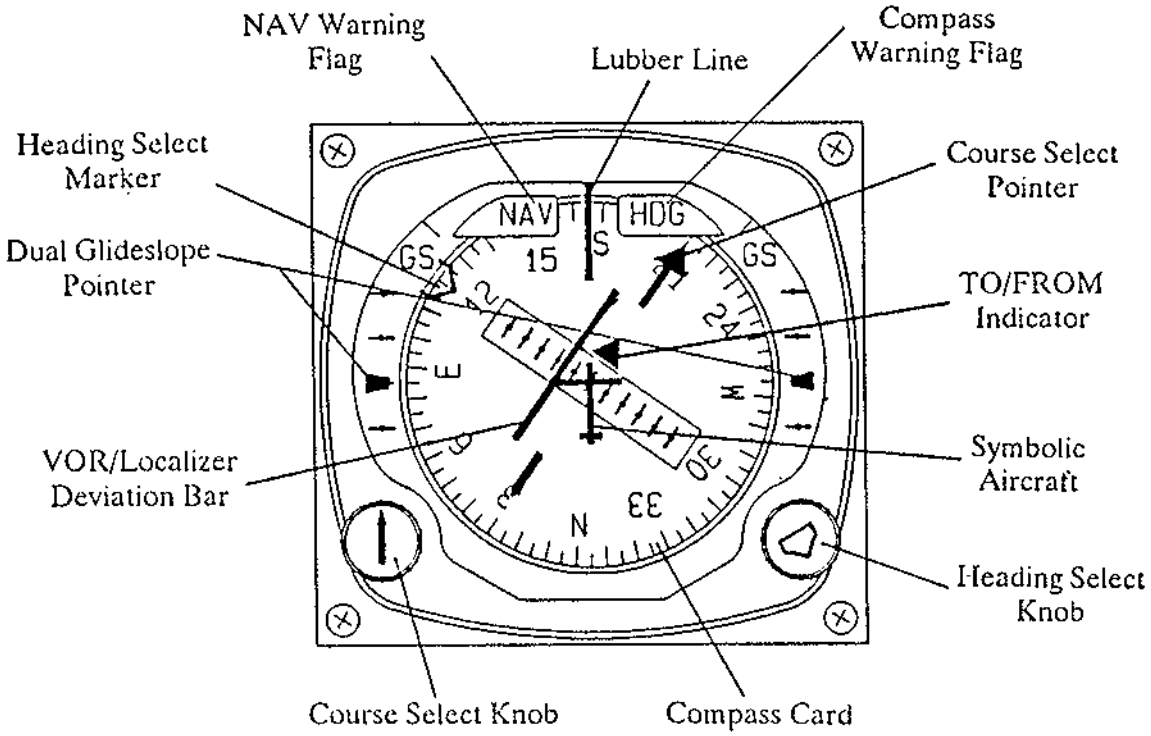
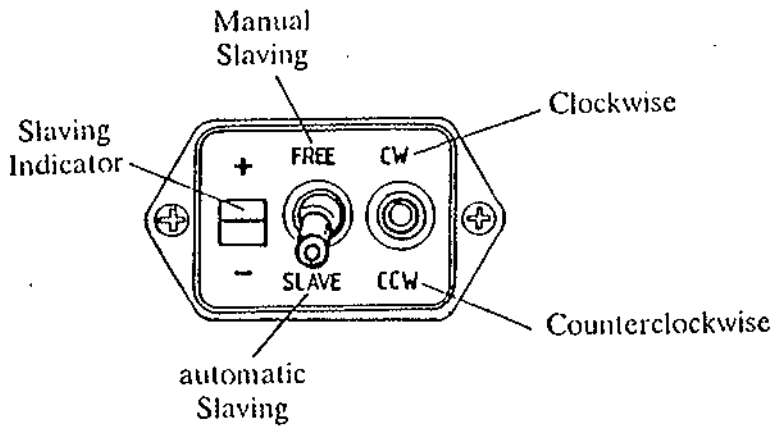
Operating Instructions

PICTORIAL NAVIGATION INDICATOR
KING KI 525 A



The King KI 525A Pictorial Navigation Indicator combines the information you would normally receive from a directional gyro and a VOR/LOC/Glideslope deviation indicator.

A directional gyro, which is slaved by a magnetic flux detector and mounted in the fuselage, controls the cockpit indication of the instrument. If slaving fails, the compass card may be synchronized manually with the magnetic compass like a normal directional gyro.



If automatic slaving fails, which is annunciated by the compass warning flag HDG, you may switch the slaving control unit from SLAVE to FREE. The spring loaded dip switch provides for synchronizing the compass card of the gyro with the magnetic compass indication during unaccelerated level flight. CW means turning the compass card clockwise, CCW turning it counterclockwise.

Use the Heading Select Knob to set the Heading Bug to the desired heading. With the autopilot coupled (HDG mode), the Heading Bug defines the selected heading.

VOR-(NAV)-Function:

The indicator features an integrated VOR/LOC/Glideslope deviation indicator.

The VOR frequency is selected at the NAV receiver, e.g. KX 155/165. The Course Select Knob provides for setting the Course Select Pointer to the desired "TO" or "FROM" radial. The VOR/LOC Deviation Bar indicates the position of the radial relative to the airplane symbol.

Due to the fact that any VOR radial as well as the magnetic heading is related to Magnetic North, the PNI gives a true picture of the horizontal flight situation.

The VOR/LOC Deviation Bar is a command indication. If the Deviation Bar is left of the airplane symbol, a left heading change is required to return to the radial and vice versa. During VOR failure or receiving a too weak signal the NAV warning flag appears in the upper left corner of the instrument.

Description of the Depicted Situation:

The symbolic airplane is flying at a heading of 175°. The VOR Course Select Pointer is set to radial 030. The Course Select Arrow points to 210° "TO" (30° + 180°). The airplane is located right of the radial and is intercepting the radial with an intercept angle of 35° (210° - 175°).

ILS Approach - Front Course:

The required ILS frequency must be selected at the KX 155/165 and activated (USE). Set the Course Select Pointer to the ILS approach course (front course). The Localizer is now intercepted and followed like a VOR radial.

The Glideslope pointers come into view when approaching the Glideslope. The Glideslope pointers constitute command indicators, too. The Glideslope pointers above the center of the instrument indicate the airplane flying too low and request a climb to return to the Glideslope. If the Glideslope pointers are below the center of the instrument, an increased descent rate is required. The sensitivity of the indicator is increased with approaching the runway.

ILS Approach - Back Course:

At some airports it is possible to fly a back course approach opposite to the main approach direction. Usually no Glideslope indication is available in this case.

In order to get a true Localizer indication, the Course Arrow has to be set to the inbound front course. Example: Back Course Approach to RWY 06, Approach course 058°, Course Select Pointer set to 238°, i.e. the course arrow is pointing backwards during approach.

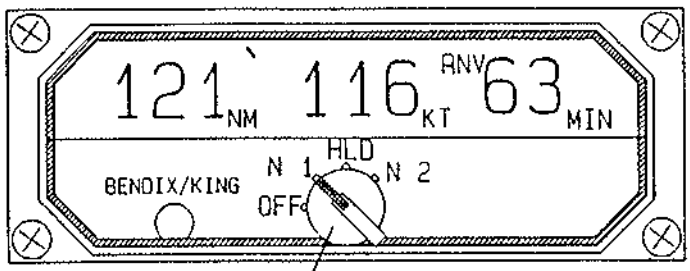
Warning function:

If the VOR or ILS station is out of service or the reception in the aircraft is disturbed, the NAV Warning Flag will appear in the upper left corner of the instrument.

If the magnetic slaving of the directional gyro fails, the Compass Warning Flag (HDG) will appear in the upper right corner of the instrument.

Operating Instructions

DME SYSTEM
KING KN 63
WITH KDI 572 MASTER INDICATOR



Function Selector Switch

Turn-On Procedure:

As with all avionics, power to the KN 63 DME should be turned on only after engine start-up.

The rotary function switch on the KDI 572 master unit is used to turn on the system and to select the desired NAV channeling source (N1 or N2). Prior to station lock-on, "dashes" will appear in the window of the DME panel display. Search time is usually 1 second or less. Once the system has locked on, the distance readout will appear - followed quickly by groundspeed and time-to-station computations.

DME Operation:

After the KN 63 has locked on to the selected VORTAC station, DME distance will be displayed in 0.1 nautical mile increments up to 99.9 nm; then in increments of one nautical mile to 389 nm.

Groundspeed up to 999 knots and time-to-station up to 99 minutes are displayed simultaneously.

The effective range of a DME system depends on several factors, including the altitude of the aircraft.

As a standard operating practise it is desirable to positively identify the selected VORTAC station frequency by listening to its coded identification audio signal through the aircraft headphone or speaker.

In order to generate precise DME data, the KN 63 electronically converts into distance the elapsed time required for signals to travel to and from the ground station. The resulting computation is then presented in nautical miles on the DME panel display. This distance, commonly referred to as "slant range" distance, should not be confused with actual along-the-ground distance. The difference between actual ground distance and slant range distance is smallest at low altitude and long range and greatest at close range to the VORTAC facility. However, if the range is 3 times the altitude or greater, slant range error is negligible.

Groundspeed calculations are based on the rate of change in DME slant range distance with time. Time-to-station is computed by dividing the slant range distance by the computed ground speed. To obtain accurate groundspeed and time-to-station readouts, the aircraft must be tracking directly to or from a selected station or RNAV waypoint.

Channeling:

The KN 63 DME can be channeled automatically from most NAV receivers. When the function switch is turned to the "N1" position, the DME will be channeled from the NAV1 frequency selector. In "N2" position the DME channels from the NAV2 receiver.

Thus, whenever the NAV receiver in use is tuned to a new frequency - or a different NAV receiver is selected on the DME function switch - the KN 63 will retune itself immediately to the newly selected VORTAC station. However, when the DME function switch is placed in the "HOLD" position, the KN 63 will remain channeled to the last selected frequency, even though the NAV frequency selectors are subsequently changed.

This feature is most useful during instrument approaches when both NAV receivers may need to be tuned to an ILS frequency without DME. The KN 63 can be tuned to a nearby VORTAC station before the approach is begun, and then placed in "HOLD" mode to provide DME information throughout the approach.

When the KDI 572 function switch is placed in the "HOLD" position, a "1H" or "H2" annunciation will be displayed to indicate the channeling source being held.

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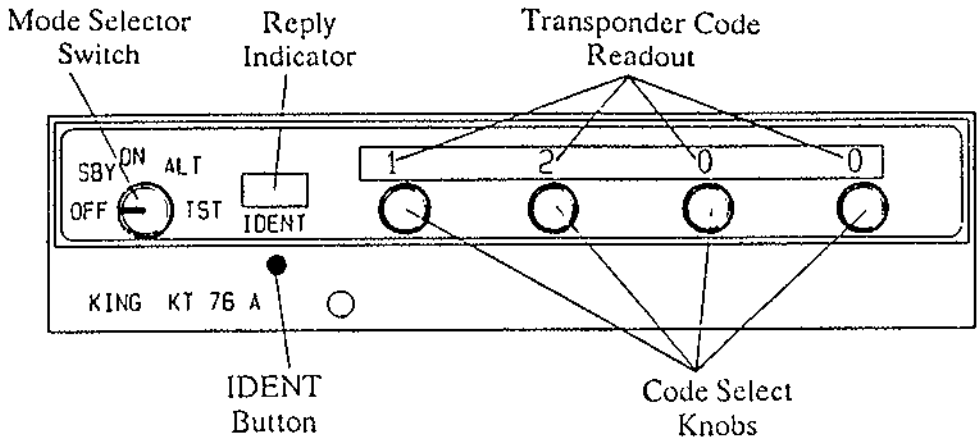
Operating Instructions

TRANSPONDER
KING KT 76 A



KT 76A Operation:

ATC ground radar sends out "interrogations" to any aircraft within its area at 10 to 15 second intervals.

Your KT 76A receives this interrogations at 1030 MHz, and these trigger a coded response of radar pulses, which are transmitted back to ATC at 1090 MHz. The return reinforces your aircraft's image or "blip" on the controller's radar screen.

The KT 76A can reply to radar in any of 4096 preselected codes. Each code is identified by a unique group of pulses. When the KT 76A's IDENT button is pressed, the blip representing your aircraft will flash, or "bloom". This enables the controller to positively identify you and your location. With either an encoding altimeter or blind encoder, your KT 76A also provides ground radar with a continuous report of your altitude.

Operating Procedure:

Be sure your function selector is turned to the OFF position before starting aircraft engines. Select the proper reply code by rotating the control knobs.

After engine start-up, turn the function selector to the Standby (SBY) position. It will take approximately 47 seconds for your Transponder to warm up and become operational.

Just before you take off, switch the function selector to ON. Your KT79 is now operating in "Mode A", or normal mode. To operate in "Mode C", or altitude reporting mode, turn the function selector to ALT (for aircraft equipped with altitude encoding equipment). This is all you do to have the added capability of automatically reporting your altitude to the controller. This is done electronically in 100 foot increments from minus 1000 feet up to 63000 feet. Please note that the displayed altitude may not agree exactly with the aircraft's altimeter because encoders are preset to 29.92 inches mercury (1013.2 hPa). An encoder's altitude transmission is automatically corrected for proper altimeter setting by a ground computer so as to present the correct altitude to the controller.

Reply Light:

During normal operation, the flashing reply light indicates the transponder is functioning properly and replying to interrogations from ground radar. Interrogations occur at 10 - 15 second intervals, with each sweep of the search radar. Frequently the reply light will blink almost continuously. This means the transponder is responding to interrogations from several radar stations.

Codes:

Code 7700. For emergencies only. This code tells ATC you require immediate assistance. If possible, make sure that the respective VHF frequency is tuned on your COMM transceiver.

Code 7600. This code tells ATC your COMM radio is malfunctioning.

Code 1200. For all VFR flights (May be different outside the US). ATC assigns specific codes for IFR.

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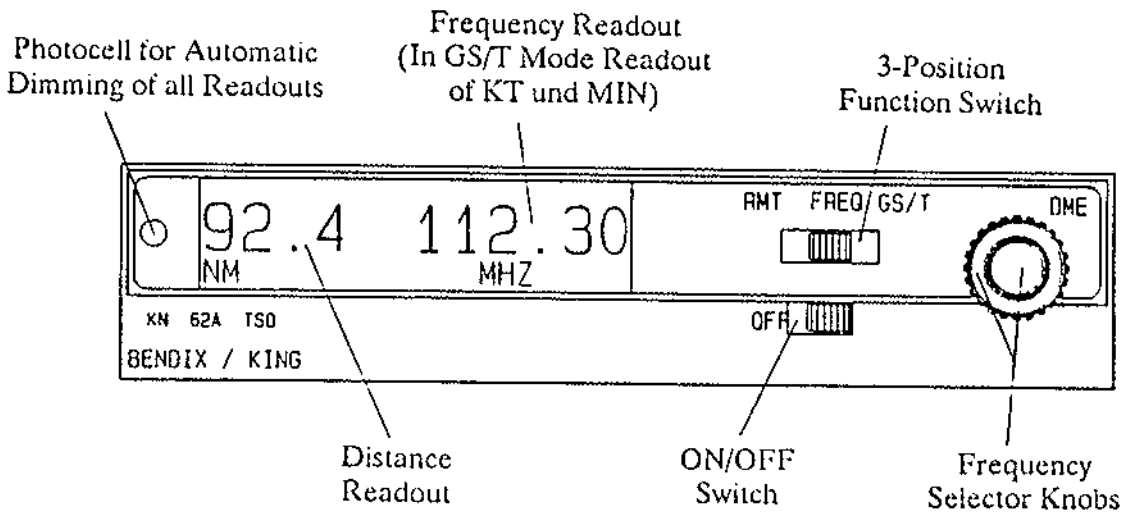
Operating Instructions

DME SYSTEM
KING KN 62 A



Turn-On Procedure:

As with all avionics, power to the KN 62A DME should be turned on only after engine start-up and turned off prior to engine shut-down. These precautions will protect the solid-state circuitry from short duration high voltage spikes and extend the life of your avionics.

DME Operation:

The 3-position function switch determines both the information displayed and the channeling source. Place the function switch on Frequency (FREQ). The KN 62A is channeled internally with its own two concentric frequency selection knobs.

The smaller of the two knobs has an "in" and an "out" position. When in the "in" position, this smaller knob changes the 0.1 MHz digit (0.0, 0.1, 0.2, etc.). When pulled "out", it adds 0.05 MHz to the frequency and tunes in 0.1 MHz steps (0.05, 0.15, 0.25, etc.). Pushing the smaller knob "in" subtracts 0.05 MHz from the displayed frequency.

The outer, larger knob changes the larger digits (1 MHz, 10 MHz).

In FREQ mode the KN 62A will display distance and the selected frequency. Now move the function switch to the Groundspeed/Time-to-Station (GS/T) position. The KN 62A will hold the internally selected frequency and will display distance, groundspeed and time-to-station. Rotating the frequency selector will have no effect on the display, because the DME is in "Frequency Hold".This frequency hold feature in the GS/T mode prevents accidental rechanneling of the DME when the frequency is not displayed.

Place the function switch in the Remote (RMT) position, and your DME will be channeled when you select your NAV frequency on the NAV receiver. If two NAV receivers are installed, a selector switch will be installed in the instrument panel to select the NAV receiver which will be remote channeling the DME. Search time is about one second. When the KN 62A locks on a ground station, it will display distance, groundspeed and time-to-station.

Note that you have two frequencies available at all times (one remotely selected on the NAV receiver and one internally selected with the KN 62A controls).

Operational Notes:

As a standard operating practise it is desirable to positively identify the selected VORTAC station frequency by listening to its coded identification audio signal through the aircraft headphone or speaker by pressing the respective DME pushbutton on the audio system.

In order to generate precise DME data, the KN 62A electronically converts into distance the elapsed time required for signals to travel to and from the ground station. The resulting computation is then presented in nautical miles on the DME panel display. This distance commonly referred to as "slant range" distance, should not be confused with actual along-the-ground distance. The difference between actual ground distance and slant range distance is smallest at low altitude and long range and greatest at close range to the VORTAC facility. However, if the range is 3 times the altitude or greater, slant range error is negligible.

The effective range of a DME system depends on several factors, most important being the altitude of the aircraft. Other contributing factors are the location and elevation of the station, DME transmitter power output, and receiver sensitivity.

Groundspeed calculations are based on the rate of change in DME slant range distance with time. Time-to-station is computed by dividing the slant range distance by the computed ground speed. To obtain accurate groundspeed and time-to-station readouts, the aircraft must be tracking directly to or from a selected station.

Groundspeed up to 999 knots and time-to-station up to 99 minutes are displayed simultaneously.

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CAUTION

The CKAS is no primary instrument. It substitutes neither the fuel flow indication of the combination gauge nor the indication of the fuel quantity gauges.

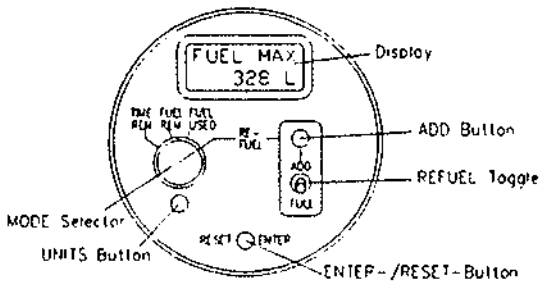
CKAS - Pilot's Manual CKAS
(9.1) Single Engine Fuel Computer

PRE-FLIGHT RE-FUELing Modes

- turn MODE-Selector to REFUEL

Message displayed:

```
XXX GAL
ON BOARD
```



* No Re-Fueling:

-REFUEL-toggle: neutral
-press ENTER to verify

```
SELECT
MODE
```

-turn MODE-Selector to the mode desired, e.g. FUEL USED

* Fill Up:

-hold REFUEL-toggle in FULL position (spring loaded)
-Display shows max. usable fuel

```
FUEL MAX
XXX GAL
```

continue holding FULL, press ENTER simultaneously
-turn MODE-Selector to the mode desired, e.g. FUEL USED

* Add partial fuel load: e.g. 23 Gallons

-move REFUEL-toggle to ADD (holds)
Message

```
FUEL ADD
??? GAL
```

appears

-press **ADD**-button to select HUNDREDS

```
FUEL ADD
??0 GAL
```

press **ENTER** to verify

-press **ADD**-button to select TENTHS

```
FUEL ADD
?02 GAL
```

press **ENTER** to verify

-press **ADD**-button to select UNITS

```
FUEL ADD
023 GAL
```

press **ENTER** to verify

Message

```
SELECT
MODE
```

appears

-turn MODE-Selector to the mode desired, e.g. FUEL REM

...In case you put in a wrong amount of fuel...

* Correction of fuel entered:

-turn MODE-Switch to **PRE-FLIGHT**
-**REFUEL**-Toggle to **ADD**
-Enter fuel quantity of 000 and **ENTER** to recall the last correct fuel status (procedure same as "add partial fuel")
-Display shows **ENTER CORRECT** for 1.5 sec
-Repeat "add partial fuel" procedure with correct fuel quantity.
-turn MODE-selector to mode desired, e.g. FUEL REM

Please note: Your CKAS is configured to use either GALLON or LITER as primary measurement unit and the other one as secondary. Refueling modes always use the primary unit, the In-Flight modes are either in primary or secondary units at your choice.

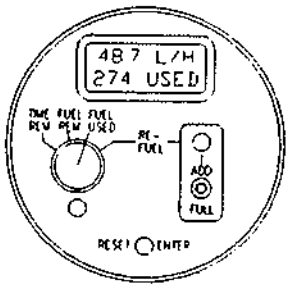
Made in Germany by Ingenieur-Büro Friedrich Rehkopf - Kellersteig 5 - D-85658 Egmating

CAUTION

The CKAS is no primary instrument. It substitutes neither the fuel flow indication of the combination gauge nor the indication of the fuel quantity gauges.

CKAS - Pilot's Manual CKAS
(3.1) Single Engine Fuel Computer

In-Flight MODEs



CKAS is designed to handle either metric units (Liter, Liter/h) or anglo-american units (GAL, GAL/HOUR). Switching between units is done by pushing the button below the MODE selector. You can toggle between units anytime during In-Flight-Modes

FUEL FLOW

- will be displayed at all times in the **upper row** of the display as

Liter/hour (L/H) `47.3 L/H` or US-Gallons/h (GPH) `12.5 GPH`

Use FUEL FLOW indication for
==> Power setting acc. to P.O.H.
==> Leaning acc. to engine manual or P.O.H.

FUEL USED

- turn MODE-Switch to **FUEL USED**
- Display shows LITER or US-GALLONS

`47.3 L/H` `144 USED` or `12.5 GPH` `038 USED`

-press **RESET** to zero the fuel used memory.
This does not affect the fuel remaining data. This feature is useful to measure fuel burned on particular legs or flight segments, e.g.climb
- FUEL USED is set to **000** automatically, when FILL UP function was used during Pre Flight procedure

FUEL REM (Fuel remaining)

- turn MODE-Switch to **FUEL REM**
-Display shows the fuel remaining in LITER or US-GALLONS

`47.3 L/H` `178 REM` or `12.5 GPH` `047 REM`

- FUEL REM may **not** be changed by pressing RESET

TIME REM (Time remaining)

-turn MODE-Switch to TIME REM
-shows the time remaining

`47.3 L/H` `03:45` or `12.5 GPH` `03:45`

REMARK: TIME REMaining is calculated on the basis of the actual fuel flow and the fuel remaining. This must be considered when using the TIME REM function during climb or descend

NOTE:
The CKAS does not sense the the quantity of fuel in your tanks. It relies on information supplied by the pilot. The accuracy of the displayed data is only as reliable as the information fed into the CKAS before flight

AUTOPILOT SYSTEM

KING KAP 100

CONTENTS: ..... Page

This is a compulsory supplement to the instructions for the safe operation of the aircraft. It is an integral part of the airplane flight manual and must be carried on board at all times, if the KING KAP 100 Autopilot System is installed.

LIST OF REVISIONS

Revision No.	Revised pages	Reason for revision/ Remarks	LBA Approval date	LBA Approval stamp

Note: Those parts of the text affected by the revision are marked with a vertical line in the margin of the page.

LIST OF EFFECTIVE PAGES

Page	Revision status	Page	Revision status	Page	Revision status
		15	0, March 94		
1	0, March 94	16	0, March 94		
2	0, March 94	17	0, March 94		
3	0, March 94	18	0, March 94		
4	0, March 94	19	0, March 94		
5	0, March 94	20	0, March 94		
6	0, March 94	21	0, March 94		
7	0, March 94	22	0, March 94		
8	0, March 94	23	0, March 94		
9	0, March 94	24	0, March 94		
10	0, March 94	25	0, March 94		
11	0, March 94	26	0, March 94		
12	0, March 94	27	0, March 94		
13	0, March 94	28	0, March 94		
14	0, March 94				

GENERAL

This supplement to the airplane flight manual contains all the information and operating limitations required for the proper operation of the KING KAP 100 autopilot system as it is installed in the aircraft Ruschmeyer R 90-230 RG. The autopilot must be operated within the limitations included in this supplement. The KAP 100 system is approved for this aircraft as a one-axis autopilot with control over the roll axis. The various instruments and controls are displayed in Figures 1 to 6.

As an option, the KAP 100 autopilot can be equipped with an electrical elevator trim. In the text below, reference to an electrical trim should be understood as reference to this optional electrical elevator trim.

The trim is designed in such a manner that flight can be safely continued should a single malfunction occur. Such a defect in the electrical trim will be signalled both visually and acoustically.

An electrical gate prevents the activation of the autopilot if the preflight check has not been completed successfully.

The autopilot will automatically be disengaged if one of the following occurs:

1. Loss of power.

2. Internal malfunction of the autopilot computer.

3. With a KCS 55A compass system installed: Loss of compass signal (HDG warning flag appears). The autopilot is switched off if a mode is in operation which requires the HDG signal. With the HDG warning flag visible, the autopilot will only operate in the basic wings level mode.

SYSTEM DESCRIPTION

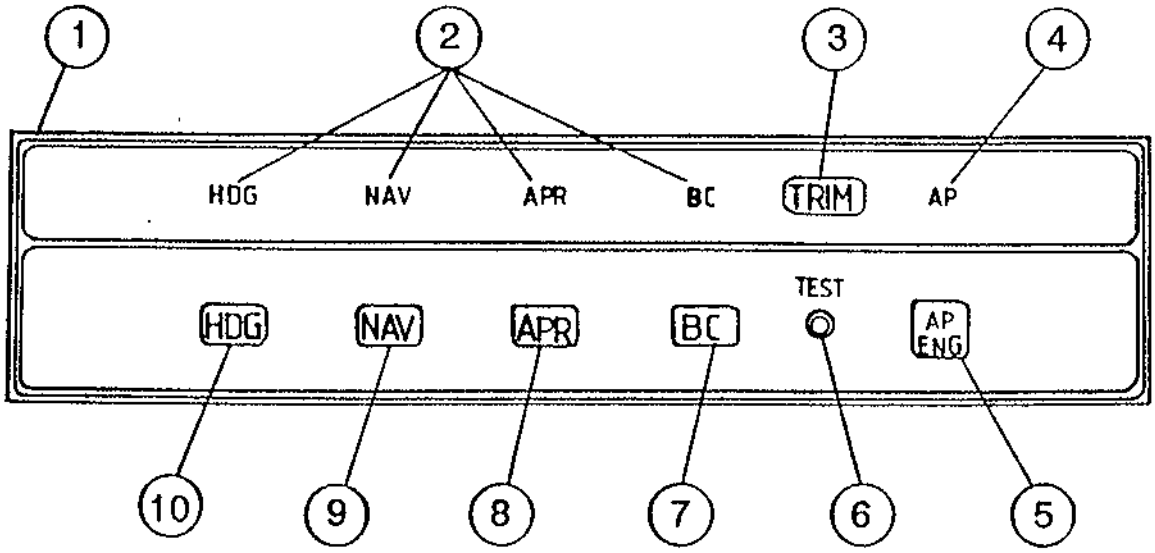


Figure 1: KC 190 Autopilot computer

1. Autopilot computer KING KC 190
with mode annunciator and controls.

2. Mode annunciator
The annunciator illuminates after a mode has been chosen by pressing the appropriate button (press once ⇨ ON, press again ⇨ OFF).

3. Trim warning display
The warning display illuminates as long as trim has been turned off or the preflight test has not been carried out. The trim warning display will illuminate and an acoustic warning will be given if the electrical elevator trim (if installed) malfunctions (e.g. trim runs without being activated).

4. Autopilot display (AP)
The AP display illuminates as long as the autopilot is in operation. The display will flash about 12 times after the autopilot has been disengaged (the acoustic warning is sent for approx. 2 secs.).

5. Autopilot engage button (AP ENG)

If the button is pressed, the autopilot will be switched on once all prerequisites have been fulfilled.

6. Preflight test button (TEST)

Once the button has been pressed, the preflight test sequence is activated. All display lamps will illuminate for a short time for test purposes. The roll rate control unit is checked as are the voltage and control unit of the electrical trim (if installed) as well as the operation and disengagement logic of the autopilot.

Once the preflight test has been completed successfully, the AP display will flash for approx. 6 seconds and an acoustic signal will be given. The autopilot cannot be engaged until the preflight test has been completed successfully.

7. Back course mode (BC)

Back course mode means that a LOCALIZER signal from the opposite direction is used for an approach (e.g. ILS Runway 27, approach on LOC Runway 09). The BC button must be pressed to select the BACK COURSE mode. This mode operates similarly to the approach mode (APR), the reaction to the LOCALIZER signal simply being turned by 180°. This conversion means that the correct command signal is used during LOCALIZER BACK COURSE approach.

8. Approach mode (APR)

The APR button must be pressed to select the approach mode. This allows the localizer to be intercepted at any angle if a PNI (HSI) is installed or at a set angle of 45° if a standard directional gyro is used. It also allows the automatic coupling and automatic piloting of courses based on VOR, RNAV or LOC signals.

Signal amplification used while following programmed courses is greater in the APR mode than in the NAV mode. The APR display flashes until automatic coupling with the programmed course has been initiated.

9. Navigation mode (NAV)

The NAV button must be pressed to select the navigation mode. This allows the intercept of VOR, RNAV or LOC signals at any angle if a PNI (HSI) is installed or at a set angle of 45° if a standard directional gyro is used. Under the NAV mode, courses based on VOR, RNAV or LOC signals will be coupled and piloted automatically.

10. Heading mode (HDG)

The HDG button activates the heading mode which brings the aircraft to a preset heading and holds it there. Headings can be programmed by setting the heading bug.

A new heading can be selected at any time. The aircraft will immediately turn to the new heading with a maximum bank of 22° and a maximum roll rate of 5° per second.

By selecting the HDG mode, the NAV, APR or BC modes will be automatically disengaged.

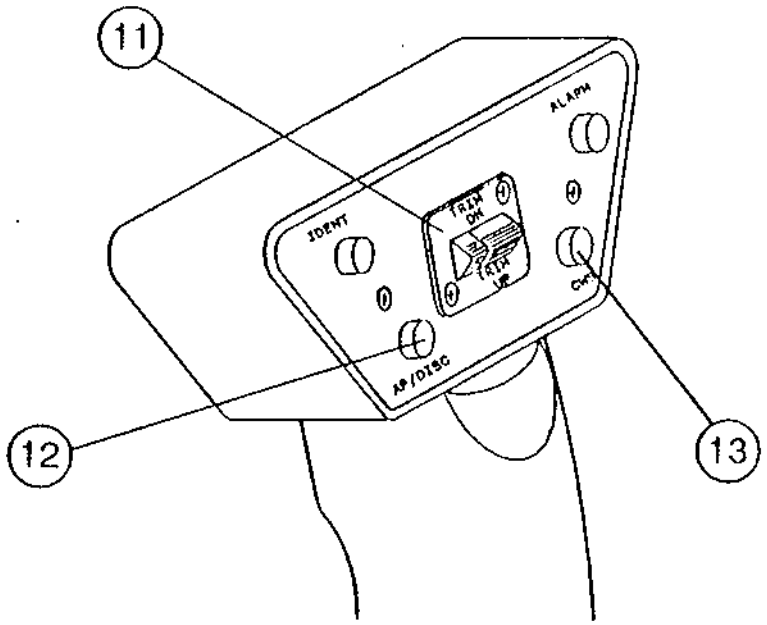


Figure 2: Control stick grip R 90-230 RG

11. Manual, electrical trim switch (if installed)

A two-piece switch, the left half of which activates the clutch of the trim servo motor. The right half controls the direction of movement of the servo motor. Both halves of the switch must be pressed simultaneously to trim in the desired direction.

12. Emergency disconnect autopilot/trim AP DISC (red)

Emergency switch to disengage the autopilot (and to switch off the electrical trim, if installed). By pressing and immediately releasing the button all autopilot functions and modes are disengaged. If the button is pressed and held pressed, the electrical trim will be disconnected (the servo motor comes to a stop) and all autopilot functions and modes are disengaged.

13. Control wheel steering switch (CWS)

If the button is pressed and held pressed, the aircraft can be manually piloted without having to disengage the autopilot. Once the button has been released, the autopilot will regain control.

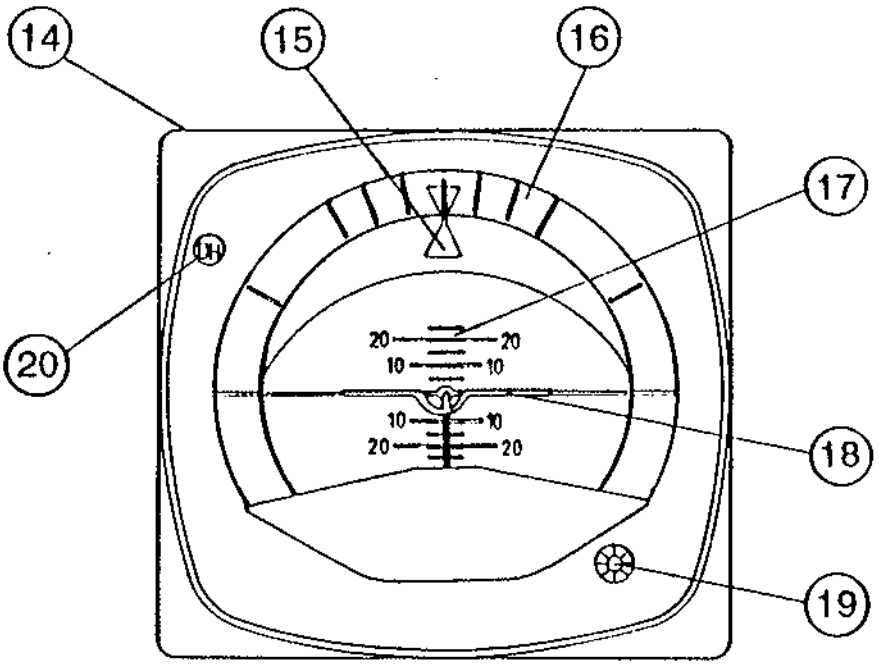


Figure 3: Artifical horizon KING KG 258

14. Artifical horizon KING KG 258 (vertical gyro)
The artifical horizon depicts the aircraft attitude with respect to the horizontal plane. The gyro operates pneumatically (with suction).

15. Bank indicator
It shows the angle of bank on an appropriate scale.

16. Bank angle scale
Scale intervals 0°, ± 10°, ± 20°, ± 30°, ± 60°, ± 90°.

17. Pitch scale
It is the scale and not the aircraft symbol that moves and shows the angle of pitch. Scale intervals 0°, ± 5°, ± 10°, ± 15°, ± 20° and ± 25°.

18. Aircraft symbol

The aircraft symbol is stationary. Bank and pitch angles are displayed relative to this stationary symbol.

19. Adjustment button for the aircraft symbol

This button allows adjustment to be made to the aircraft symbol for horizontal flight under any loading condition.

20. Decision height (DH)

Decision height can be displayed if a radar altimeter is installed.

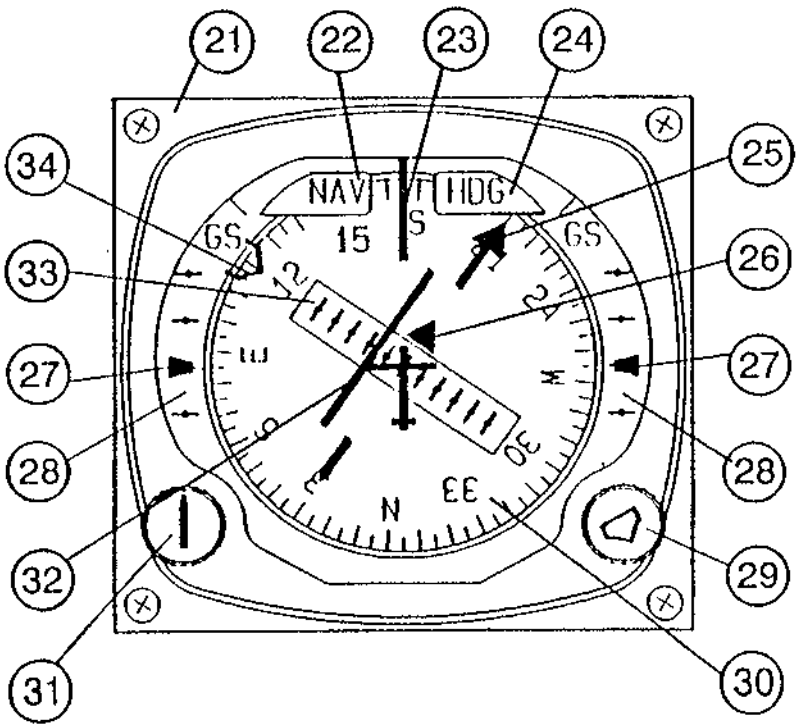


Figure 4: Pictorial Navigation Indicator KING KI 525 A

21. Pictoral Navigation Indicator KING KI 525A

This instrument is better known as a Horizontal Situation Indicator (HSI). It indicates the horizontal situation of the aircraft with respect to the VOR radial or the LOC beam. It also shows deviation from glideslope and gives magnetic heading information.

22. NAV warning flag

The warning flag appears if the VOR/LOC signal at the receiver becomes too weak. The autopilot is not automatically disengaged when the flag is visible. The pilot must watch the warning flag to ensure that the autopilot is receiving adequate VOR/LOC information to control the aircraft.

23. Lubber line

The lubber line shows the magnetic heading on the compass rose.

24. HDG warning flag

If this flag is visible heading indication is unreliable. If the HDG warning flag appears while the HDG, NAV, APR or BC mode is selected, the autopilot will be automatically disengaged and can now only be operated in the basic wings level mode. The CWS button can be used to alter the heading.

25. Course bearing pointer

The pointer shows the selected VOR or LOC course on the compass rose. The selected VOR radial or localizer course moves with the compass rose.

26. To/From indicator

The small triangle shows the direction of the VOR station with respect to the selected heading.

27. Dual glideslope pointer

Deviation from the center of the glideslope is shown on the glideslope scale by two yellow trapezoidal pointers. Both pointers appear once an adequate glideslope signal has been received.

28. Glideslope scale

It shows deviation from the center of the glideslope. Full deflection over the two scale marks indicates a deviation angle of 0.7° above or below the center of the glideslope beam.

29. Heading select button

The heading bug on the compass rose can be set by this button. The heading bug moves with the compass rose.

30. Compass rose

Shows the aircraft heading with respect to the lubber line.

31. Course select button

Sets the course bearing pointer (25) on the compass rose.

32. VOR/LOC deviation bar

The inner part of the bar moves laterally and thus shows the position of the aircraft with respect to the selected radial or course. In the case of VOR radials and localizer courses deviation is shown in degrees whereas nautical miles are used for deviation from RNAV courses.

33. Course deviation scale

Course deviation covering one scale mark represents the following actual deviation: VOR ± 2°, LOC ± 0,5°, RNAV "APR" 0,25 Nm und RNAV "Enroute" 1 Nm. Deviation is defined as deviation from the center of the beam.

34. Heading bug

It can be set to the selected heading by the heading select button (29).

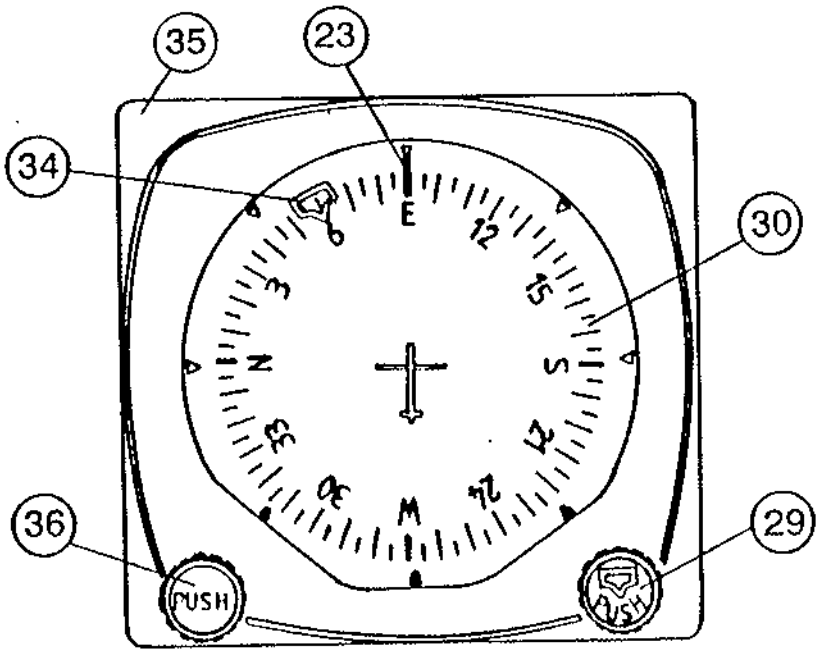


Figure 5: Directional gyro KING KG 107

35. Directional gyro KING KG 107 (non-slaved)

This instrument displays aircraft heading. The gyro operates pneumatically (with suction).

36. Gyro adjust button

By pressing this button the pilot can turn the compass rose and set it to magnetic heading. The non-slaved directional gyro must be repeatedly reset during stable horizontal flight according to the magnetic compass in order to compensate for precession errors in the gyro.

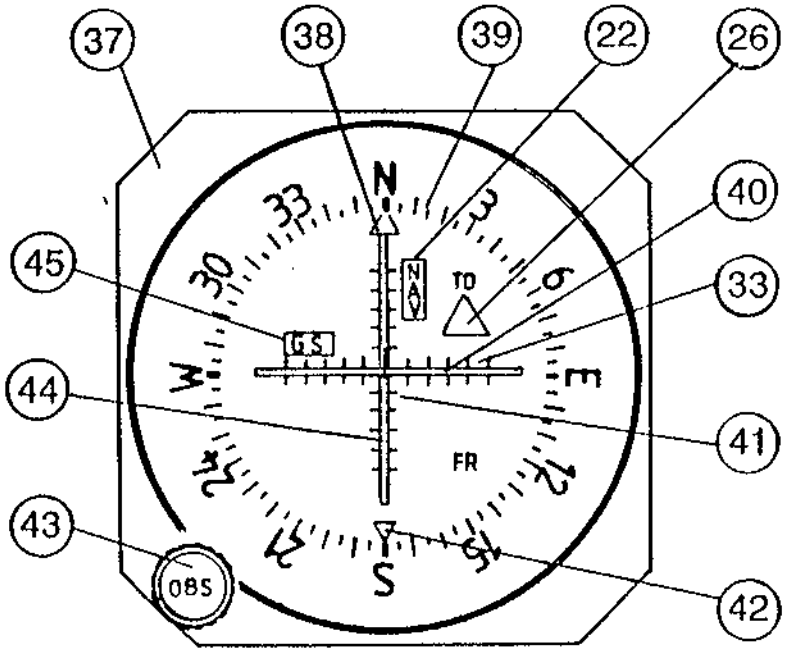


Figure 6: VOR/LOC/glideslope indicator KING KI 204/206

37. VOR/LOC/glideslope indicator KING KI 204/206

This instrument shows deviation of the aircraft from the VOR radial, localiser beam and glideslope.

38. Course index

It shows the selected VOR course on the course rose.

39. Course rose

The selected VOR course can be read off this course rose with the help of the course index (38).

40. Glideslope deviation needle

It indicates deviation from the ILS glideslope.

41. Glideslope scale

The scale indicates deviation from the center of the glideslope beam. Deviation over 5 scale marks (maximum deflection) indicates a deviation of 0.7° above or below the center of the beam.

42. Reciprocal course index

It shows the reciprocal to the VOR course.

43. Omni bearing selector (OBS)

It is used to turn the compass rose to the desired course or radial.

44. Course deviation needle

It shows deviation from the selected VOR course or from the center of the ILS localizer beam.

45. Glideslope (GS) flag

The warning flag appears if the glideslope signal is too weak.

POWER SUPPLY

The split master switch (BAT/ALT) remains unchanged. In an emergency the autopilot can be disconnected from the power supply by this switch.

The avionics master switch (and the avionics emergency switch) supplies power to the avionics bus to which the autopilot is connected. This switch can also be used to disconnect the autopilot.

The following circuit breakers are installed to protect the relevant components of the KING KAP 100 autopilot system:

Name	
A/P	supplies power to the computer KC 190, the roll servo motor and the elevator trim circuit breaker.
ALERTER	supplies power to the acoustic autopilot warning.
PITCH /TRIM	supplies power to the electrical elevator trim (if installed) through the AP circuit breaker.
GYRO	supplies power to the KCS 55A compass system (if installed).

LIMITATIONS

All limitations listed in Chapter II of the airplane flight manual are valid with the autopilot engaged. In addition, the following limitations are valid when the autopilot is in operation:

Maximum altitude	16000 ft	Maximum permissible altitude with autopilot in operation.
Minimum altitude approach	500 ft 200 ft	Minimum permissible altitude above ground below which the autopilot may not be engaged. The autopilot must be switched off during takeoff and landing.
Maximum airspeed	180 KIAS	Maximum permissible speed with autopilot in operation.
Minimum airspeed	90 KIAS	Minimum airspeed below which the autopilot may not be engaged.
Maximum fuel unballance	50 Liter	Greatest permissible difference between amount of fuel in the right and left wing tanks.

EMERGENCY PROCEDURES

AUTOPILOT MALFUNCTION

In the case of an autopilot malfunction, steps 1 and 2 should be carried out simultaneously:

1. Control stick - Hold firmly and take over control of the aircraft.
2. A/P DISC button on the control stick - Press to switch off the autopilot.

WARNING

During an autopilot malfunction the following bank angles and losses of altitude may be experienced:

	Change in angle of bank		Loss of altitude
	after 4 secs.	after 2 secs.	
Climb	60 °	-	200 ft
Cruise	60°	-	200 ft
Descent	60°	-	200 ft
Turn	-	45°	150 ft
Approach	-	45°	150 ft

ELECTRICAL TRIM MALFUNCTION (if installed)

1. A/P DISC button - press and hold.
2. TRIM circuit breaker - pull.
3. Aircraft - trim manually.

NORMAL PROCEDURES

PREFLIGHT CHECK

After starting the engine:

1. AVIONICS master switch - ON.

After the gyros are stable (approx. 3 - 4 minutes):

2. AUTOPILOT test button - Press.

3. Proper test function sequence - Check:

   a. All displays illuminate, the trim warning light flashes.
   b. After approx. 5 seconds all displays extinguish excepting the AP control lamp which flashes about 12 times before going out. An acoustic warning sounds for about 2 seconds while the lamp flashes.

Note

If the AP control lamp does not flash the preflight test has not been completed successfully. The autopilot cannot be engaged. In this case, an appropriate maintenance shop should be consulted.

If the TRIM warning display does not extinguish the preflight test of the electrical trim has not been completed successfully. The autopilot can, however, be engaged after the PITCH/TRIM circuit breaker has been pulled.

4. Manual electrical trim - Check (if installed):

   a. Switch the left half of the split TRIM switch back and forward. The trim wheel in the center console should not move. Hold the left half of the switch pressed - either to the back or the front (trim servo motor clutch engaged). Manually turn the trim wheel against the engaged clutch to check that the servo motor can be overridden.

   b. Switch the right half of the split switch back and forward. The trim wheel should not move. The wheel must be easy to move by hand (clutch not engaged).

   c. Press the A/P DISC button on the control stick and hold. Switch on the electrical trim. The trim should neither run "nose down" nor "nose up".

5. AP ENG button - Press to switch on the autopilot.

6. Control stick - Move to the left and right to ensure that the autopilot can be overridden.

7. A/P DISC button - Press and check that the autopilot can be switched off and that all modes are deleted.

8. Trim - Set for takeoff.

AUTOPILOT OPERATION

BEFORE TAKEOFF

1. A/P DISC - Press to ensure that the autopilot is switched off during takeoff.

IN FLIGHT

ENGAGE (BASIC MODE)

1. A/P ENG button - Press.

2. AP display - Check that it illuminates. If no other mode is selected the autopilot will operate in the basic mode, i.e. wings level mode.

Manual course change with autopilot engaged:

3. CWS button - Press and hold.

4. Aircraft - Manually pilot the aircraft to the desired course.

5. CWS button - Release. The autopilot will hold the wings level.

Note

The heading can be lost in the basic mode through mistrim and turbulence.

HDG MODE (Holding the heading)

1. Heading bug (34) - Set desired heading with the heading select button (29).

2. HDG button - Press.

3. HDG display - Check. The autopilot automatically pilots the aircraft on the selected heading.

Heading changes in HDG mode:

4. Heading bug (34) - Set desired heading with the heading select button (29). The autopilot immediately turns to the new heading.

NAV MODE

A. PNI(HSI) KING KCS 55A installed:

1. Course bearing pointer (25) - Set to desired radial or LOC approach course.

Note

If the system is equipped with a NAV1/NAV2 switch and NAV2 is in use, the desired radial must be set in NAV2.

2. Heading bug (34) - Set intercept heading with the heading select button (HDG mode).

3. NAV button - Press.
If the VOR/LOC deviation bar (32) is more than 2 or 3 dots away from the center, the autopilot will continue to operate in the HDG mode. The NAV display will flash until coupling has been completed. The HDG display will extinguish and the NAV display illuminate continously. The autopilot intercepts and proceeds along the selected radial.
If the VOR/LOC deviation bar is less than 2 or 3 dots away from the center, the coupling procedure will be initiated immediately after the NAV mode is engaged. The HDG display will extinguish immediately and the NAV display illuminates continously.

B. Standard directional gyro KING KG 107 installed:

1. Course index (38) - Set desired radial or LOC approach course on the VOR/LOC/glideslope indicator (37) with the omni bearing selector (43).

2. NAV button - Press.

3. Heading bug (34) - Using the heading select button (29) set heading bug on standard directional gyro KG 107 to the same value as the selected radial or VOR/LOC approach course.

Note

After selecting the NAV mode, the autopilot will switch for approx. 5 seconds from the HDG mode to the basic mode (wings level). An intercept angle of 45° with respect to the heading bug (34) setting will then automatically be followed.

If the VOR/LOC course deviation needle (44) is more than 2 or 3 dots away from the center, the autopilot will continue to operate in the HDG mode. The NAV display will flash until the coupling procedure has been completed. The HDG display will then extinguish and the NAV display illuminate continously. The autopilot intercepts and follows the selected radial.
If the VOR/LOC course deviation needle (44) is less than 2 or 3 dots away from the center, the coupling procedure will be initiated immediately after the NAV mode is engaged. The HDG display will extinguish immediately and the NAV display will illuminate continously.

APR MODE (Approach)

A. PNI(HSI) KING KCS 55A installed:

1. Course bearing pointer (25) - Set to desired radial or LOC approach course.

Note

If the system is equipped with a NAV1/NAV2 switch and NAV2 is in use, the desired radial must be set in NAV2.

2. Heading bug (34) - Set intercept heading with the heading select button (HDG mode).

3. APR button - Press.
If the VOR/LOC deviation bar (32) is more than 2 or 3 dots away from the center, the autopilot will continue to operate in the HDG mode. The NAV display will flash until coupling has been completed. The HDG display will extinguish and the NAV display illuminate continously. The autopilot flies along the selected radial.
If the VOR/LOC deviation bar (32) is less than 2 or 3 dots away from the center, the coupling procedure will be initiated immediately after the NAV mode is engaged. The HDG display will extinguish immediately and the NAV display illuminates continously.

B. Standard directional gyro KING KG 107 installed:

1. Course index (38) - Set desired radial or LOC approach course on the VOR/LOC/glideslope indicator (37) with the omni bearing selector (43).

2. APR button - Press.

3. Heading bug (34) - Using the heading select button (29) set heading bug on standard directional gyro KG 107 to the same value as the selected radial or VOR/LOC approach course.

Note

After selecting the APR mode, the autopilot will switch for approx. 5 seconds from the HDG mode to the basic mode (wings level). An intercept angle of 45° with respect to the heading bug setting will then automatically be followed.

If the VOR/LOC course deviation needle (44) is more than 2 or 3 dots away from the center, the autopilot will continue to operate in the HDG mode. The APR display will flash until the coupling procedure has been completed. The HDG display will then extinguish and the APR display illuminate continously. The autopilot follows the selected radial.
If the VOR/LOC course deviation needle (44) is less than 2 or 3 dots away from the center, the coupling procedure will be initiated immediately after the APR mode is engaged. The HDG display will extinguish immediately and the APR display will illuminate continously.

BC MODE (Back course approach)

A. PNI(HSI) KING KCS 55A installed:

1. Course bearing pointer (25) - Set to ILS front course (normal approach course).

Note

If the system is equipped with a NAV1/NAV2 switch and NAV2 is in use, the ILS front course must be set in NAV2.

2. Heading bug (34) - Set intercept heading (HDG mode) with the heading select button (29).

3. BC button - Press.

If the VOR/LOC deviation bar (32) is more than 2 or 3 dots away from the center, the autopilot will continue to operate in the HDG mode. The HDG and BC displays will illuminate continously and the APR display will flash until coupling has been completed. The HDG display will extinguish and the APR and BC displays will illuminate continously. The autopilot will follow and hold the localizer back course.
If the VOR/LOC deviation bar (32) is less than 2 or 3 dots away from the center, the coupling procedure will be initiated immediately after the BC mode is engaged. The HDG display will extinguish and the APR and BC displays will illuminate continously. The autopilot will follow and hold the localizer back course.

B. Standard directional gyro KING KG 107 installed:

1. Course index (38) - Set ILS front course with the omni bearing selector on the VOR/LOC/glideslope indicator (37).

2. BC button - Press.

3. Heading bug (34) - Using the heading select button (29) set heading bug on standard directional gyro KG 107 to the same value as the selected radial or ILS front course.

Note

After selecting the BC mode, the autopilot will switch for approx. 5 seconds from the HDG mode to the basic mode (wings level). An intercept angle of 45° with respect to the heading bug setting will then automatically be followed.

If the VOR/LOC course deviation needle (44) is more than 2 or 3 dots away from the center, the autopilot will continue to operate in the HDG mode. The HDG and BC displays will illuminate continously and the APR display will flash until the coupling procedure has been completed. The HDG display will then extinguish and the APR and BC displays will illuminate continously. The autopilot follows and holds the localizer back course.
If the VOR/LOC course deviation needle (44) is less than 2 or 3 dots away from the center, the coupling procedure will be initiated immediately after the BC mode is engaged. The HDG display will extinguish immediately and the APR and BC displays will illuminate continously. The autopilot follows and holds the localizer back course.

MISSED APPROACH

1. A/P DISC - Press to disengage autopilot.

2. Missed approach - Carry out manually.

3. AP ENG button - Press if the autopilot is to be reengaged.

4. AP display - Check.

BEFORE LANDING

1. A/P DISC button - Press to disengage autopilot.

WARNING

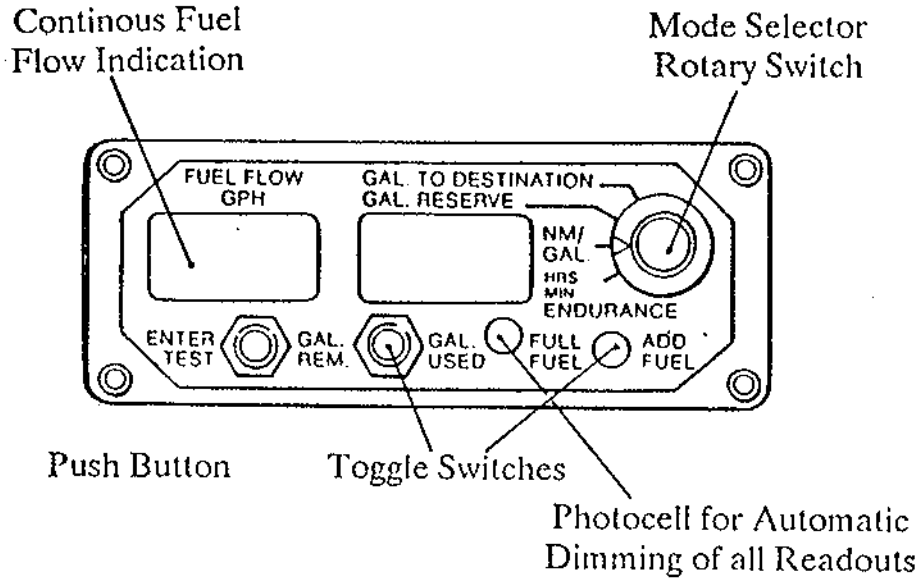
The preflight test button may not be pressed if the autopilot is switched on as the autopilot will then switch itself off automatically.

PERFORMANCE

Not affected.

Operating Instructions

FUEL COMPUTER
SHADIN MINIFLO-L



CAUTION

The fuel computer MINIFLO-L is not a primary instrument. It neither replaces the fuel gauges nor the fuel flow indicator in the combined instrument.

Note

The SHADIN fuel computer MINIFLO-L is either available with display units in US Gallons or Liters. The figure above shows the unit scaled in US Gallons. The following supplement is valid for both versions.

Note

The fuel computer can measure fuel flow but not fuel amount. It is thus unable to determine the amount of usable fuel available in the tanks. It is, therefore, essential to programme the computer with the actual amount of usable fuel in the tanks before each flight in order to ensure exact information.

FIRST-TIME OPERATION OF THE INSTRUMENT

1. Switch on the instrument using the avionics master switch.

2. Move right switch to "FULL FUEL" and hold it there during the steps described below.

3. Move left switch to "FUEL REM" and simultaneously press and hold the left button "ENTER/TEST" for 30 seconds.

4. "FUL" will appear in the left "Flow" display while in the right display the current programmed amount of full usable fuel in the general units of display (US Gallons or Liters) is shown. Release the left "FUEL REM" switch and the "ENTER/TEST" button. Hold right switch at "FULL FUEL".

5. Move left switch to "FUEL REM" to increase the maximum amount of usable fuel. To reduce the maximum amount of usable fuel, move switch to "FUEL USED". The longer the switch is held, the faster the resetting procedure.

Note

If three decimal points appear between the digits in the display, then the number is in the thousands.
Example: The display "2.3.6." does not mean 236 but 2360 (US Gallons or Liters).

6. On reaching the correct value for the maximum amount of usable fuel (cf. Page 2-15) press the "ENTER/TEST" switch. The fuel computer stores this value as its reference for full tanks. The word "FUL" is deleted and the fuel computer switches to its working mode. The right switch "FULL FUEL" can now be released.

7. By pressing and holding (min. 10 secs.) the "ENTER/TEST" button the instrument test sequence is activated. The fuel computer carries out a test and on completion the word "GooD" will appear. After successful completion of the test the maximum usable fuel value will be displayed.

BEFORE FLIGHT

No fuel added:

No action required as the previous value is still stored.

Maximum usable fuel (full tanks):

1. Right switch to "FULL FUEL" and hold. The maximum amount of usable fuel with full tanks will appear in the right display.

2. Press "ENTER/TEST" button.

3. Right switch back to center position.

4. Left switch to "FUEL REM" to check that the maximum amount of usable fuel with full tanks appears in the right display.

Partial fuel added:

1. Right switch to "ADD FUEL" and hold.

2. Left switch to "FUEL REM" and hold to increase the amount of fuel. Release left switch once the correct display of the fuel added appears. If the amount on the display should unintentionally exceed the amount of fuel added, it can be reduced to the correct value by moving the left switch to the opposite position "FUEL USED".

3. Once the correct display is achieved, press the "ENTER/TEST" button.

4. Move right switch from the "ADD FUEL" position back to the center position. The fuel computer automatically adds the amount of fuel filled into the tanks to the amount already in the tanks and the sum is shown as the amount of usable fuel currently available (FUEL REM).

5. Left switch to "FUEL REM" to check that the currently available amount of usable fuel appears in the right display.

Correction of input errors:

If a mistake is made when programming the maximum amount of usable fuel so that it exceeds the correct value, switch and hold the left switch in the "FUEL USED" position and press the "ENTER/TEST" button at the same time. The "FUEL USED" value will disappear and remaining fuel value (FUEL REM) will appear for four seconds in the right display. This value can be reduced while the button and switch are held. The longer they are held, the faster the reduction. On reaching the correct value, release button and switch.

In order to prevent repetition of the four second long display during resetting, the left switch should be held in the "FUEL USED" position and the "ENTER" button used to control counting.

Instrument test:

The fuel computer has an internal test sequence which is activated by pressing and holding (min. 10 secs.) the "ENTER/TEST" button. An "8" appears in all parts of the display for about 10 seconds. Once the test has been completed successfully, "GooD" will appear in the display. If "BAD" appears, the instrument cannot be operated until corrective measures have been taken. Resetting the maximum amount of usable fuel in the right display may rectify the situation.

Note

Activating the test sequence with the engine running will result in a loss of fuel measurements for 18 seconds.

IN-FLIGHT MODES

FUEL FLOW - current consumption

Fuel flow is shown continually in the left display.

ENDURANCE - remaining flight time

If the right knob is turned to "ENDURANCE" the remaining flight time in hours and minutes appears in the right display.

FUEL USED - fuel used

If the right switch is moved to "FUEL USED" and held, the amount of fuel consumed since the last setting will appear in the right display.

FUEL REMAINING - remaining amount of fuel

If the left switch is moved to "FUEL REM" and held, the amount of fuel currently available will appear in the right display.

Note

The following three functions are only available if the fuel computer is attached to a GPS at the appropriate interface. If no signal is received from a GPS, "LoF" will appear.

NAUTICAL MILES per US GALLON (or 5 LITERS) - specific range

If the right knob is turned to "NM/Gal" (or "NM/5 LIT."), the range for 1 US Gallon (or 5 litres) of fuel will appear in the right display.

FUEL TO DESTINATION - amount of fuel needed to reach destination

If the right knob is turned to "FUEL TO DESTINATION" the amount of fuel required to reach the next active GPS waypoint will appear in the right display. This value is calculated under the assumption that ground speed and fuel consumption will remain unchanged. Values shown dur-ing climb or descent are not valid.

FUEL RESERVE - fuel reserve after reaching destination

If the right knob is turned to "FUEL RESERVE" the fuel reserve on reaching the destination will appear in the right display. The destination is defined as the active GPS waypoint. The value shown is only valid under the assumption that ground speed, fuel consumption and altitude remain constant. Values shown during climb and descent are not valid.

WARNINGS

FUEL TO DESTINATION

If the right display flashes while the knob is turned to "FUEL TO DESTINATION", there is not enough fuel available to reach the next active GPS waypoint. The missing amount of fuel is shown with a minus sign in front of the value.

FUEL RESERVE

The right display will flash if, on reaching the active GPS waypoint, a 45 minute fuel reserve is not still available.

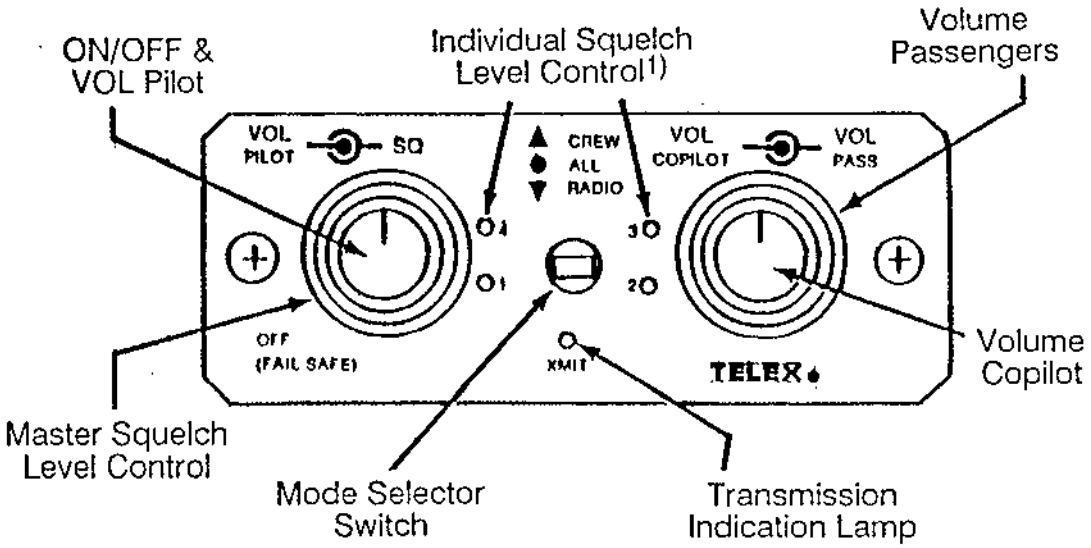
ENDURANCE

If the right display flashes while the knob is turned to "ENDURANCE", maximum possible endurance at the selected perfor-mance settings is less than 30 minutes.

EMERGENCY PROCEDURE

The fuel computer is inoperative during a loss of power or once the avionics master switch has been switched off. Once power returns or the avionics master switch is switched on, the instrument will display the correct fuel flow value, all other values are, however, misleading.

Operating Instructions
INTERCOM SYSTEM
TELEX PRO COM 4



1) Pilot (1), Copilot (2) und Passengers (3 and 4).
Clockwise rotation reduces squelch level.

General:

The intercom system Telex Pro Com 4 (PC 4) controls internal aircraft and radio communication. Voice-activated, interference-free communication between pilot, copilot and passengers is thus possible.

An audio unit is located in the instrument panel comprising the following elements: an ON/OFF switch (in the OFF position the pilot's headset and microphone is connected directly to the radio system - emergency function (fail safe)), a mode annunciator, separate volume controls for pilot and copilot, a single volume control for the passengers and a central squelch control knob. In addition, it is possible to individually set the squelch level for the pilot (1), copilot (2) and the passengers (3 and 4). These controls are accessible through the instrument front panel and can be adjusted with a small screw driver.

The following table lists the functions of the individual modes:

MODE	INTERNAL COMMUNICATION	RADIO RECEIVE	RADIO TRANSMIT
Radio (pilot isolated)	Copilot & Passengers	Pilot	Pilot
All	Pilot & Copilot & Passengers	Pilot & Copilot & Passengers	Pilot & Copilot
Crew	Pilot & Copilot on the same channel Passengers on a separate channel	Pilot & Copilot	Pilot & Copilot

Transmission:

The pilot can transmit during all modes after pressing the pilot microphone button. The copilot can transmit after pressing the copilot microphone button in the ALL and CREW modes. The pilot has transmission priority and can, therefore, override the copilot. A yellow control lamp in the front plate of the PC 4 indicates transmission.

Reception:

The pilot can receive radio communications in all modes whereas the copilot can only receive in the ALL and CREW modes and the passengers only in the ALL mode.

Internal communication:

In the RADIO mode the pilot is completely cut off from all internal communication. The copilot and passengers can talk to each other. In the ALL mode all occupants of the aircraft can talk to each other. The CREW mode allows the pilot and copilot to communicate with each other on one channel while the passengers can talk to each other on another channel.

Emergency operation:

If there is a loss of power to the PC 4, turn the ON/OFF switch to the OFF position (turn counterclockwise). The pilot's headset and microphone are switched automatically to the aircraft's radio.

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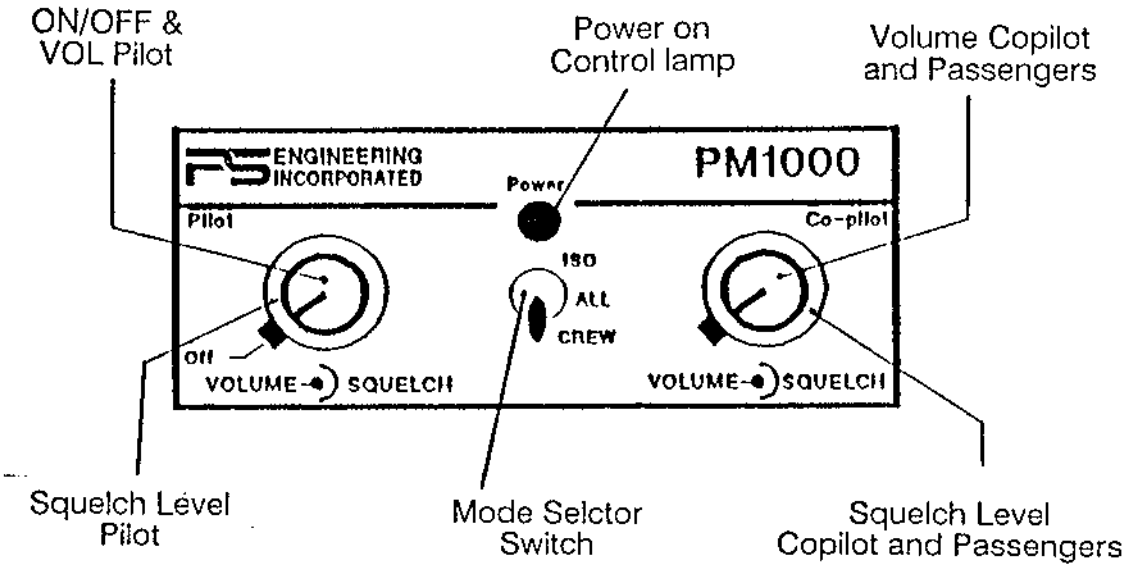
Operating Instructions
INTERCOM SYSTEM
PS Eng. PM1000



General:

The intercom system PM1000 from PS Engineering, Inc. controls internal aircraft and radio communication. Voice-activated, interference-free communication between pilot, copilot and passengers is thus possible.

An audio unit is located in the instrument panel comprising the following elements: an ON/OFF switch (in the OFF position the pilot's headset and microphone is connected directly to the radio system - emergency function (fail safe)), a mode annunciator, a volume control knob for the pilot and another for the copilot and passengers and a squelch control knob for the pilot with another one for the copilot and passengers.

The following table lists the functions of the individual modes:

MODE	INTERNAL COMMUNICATION	RADIO	
		RECEIVE	TRANSMIT
Iso (pilot isolated)	Copilot & Passengers	Pilot	Pilot
All	Pilot & Copilot & Passengers	Pilot & Copilot & Passengers	Pilot & Copilot
Crew* (if available)	Pilot & Copilot on the same channel Passengers on a separate channel	Pilot & Copilot	Pilot & Copilot

*The CREW mode is only available if an additional extension module is installed.

Transmission:

The pilot can transmit during all modes after pressing the pilot microphone button. The copilot can transmit after pressing the copilot microphone button in the ALL and CREW (if available) modes.

Reception:

The pilot can receive radio communications in all modes whereas the copilot can only receive in the ALL and CREW (if installed) modes and the passengers only in the ALL mode.

Internal communication:

In the ISO mode the pilot is completely cut off from all internal communication. The copilot and passengers can talk to each other. In the ALL mode all occupants of the aircraft can talk to each other. The CREW mode (if installed) allows the pilot and copilot to communicate with each other on one channel while the passengers can talk to each other on another channel.

Emergency operation:

If there is a loss of power to the PM1000, turn the ON/OFF switch to the OFF position (turn counterclockwise). The pilot's headset and microphone are switched automatically to the aircraft's radio.

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AUTOPILOT SYSTEM

KING KFC/KAP 150

CONTENTS: ..... Page

This is a compulsory supplement to the instructions for the safe operation of the aircraft. It is an integral part of the airplane flight manual and must be carried on board at all times, if the KING KFC/KAP 150 Autopilot System is installed.

LIST OF REVISIONS

Revision No.	Revised pages	Reason for revision/ Remarks	LBA Approval date	LBA Approval stamp
Note:	Those parts of the text affected by the revision are marked with a vertical line in the margin of the page.			

LIST OF EFFECTIVE PAGES

Page	Revision status	Page	Revision status	Page	Revision status
1	0, March 94	16	0, March 94	31	0, March 94
2	0, March 94	17	0, March 94	32	0, March 94
3	0, March 94	18	0, March 94	33	0, March 94
4	0, March 94	19	0, March 94	34	0, March 94
5	0, March 94	20	0, March 94	35	0, March 94
6	0, March 94	21	0, March 94	36	0, March 94
7	0, March 94	22	0, March 94		
8	0, March 94	23	0, March 94		
9	0, March 94	24	0, March 94		
10	0, March 94	25	0, March 94		
11	0, March 94	26	0, March 94		
12	0, March 94	27	0, March 94		
13	0, March 94	28	0, March 94		
14	0, March 94	29	0, March 94		
15	0, March 94	30	0, March 94		

GENERAL

This supplement to the airplane flight manual contains all the information and operating limitations required for the proper operation of the KING autopilot systems KFC 150 and KAP 150 as installed in the aircraft Ruschmeyer R 90-230 RG. The autopilot must be operated within the limitations laid down in this chapter. The KFC/KAP 150 autopilot is approved for this aircraft as a two-axis autopilot with control over the roll and pitch axes. The various instruments and controls are displayed in Figures 1 to 7.

The KFC/KAP 150 autopilot is equipped with an electrical elevator trim. In the text below, reference to an electrical trim should be understood as reference to this electrical elevator trim. The electrical trim can be operated manually when the autopilot is not engaged as long as the preflight test has been completed successfully.

The trim is designed in such a manner that flight can be safely continued should a single malfunction occur. Such a defect in the electrical trim will be signalled both visually and acoustically.

An electrical gate prevents the activation of the autopilot if the preflight check has not been completed successfully.

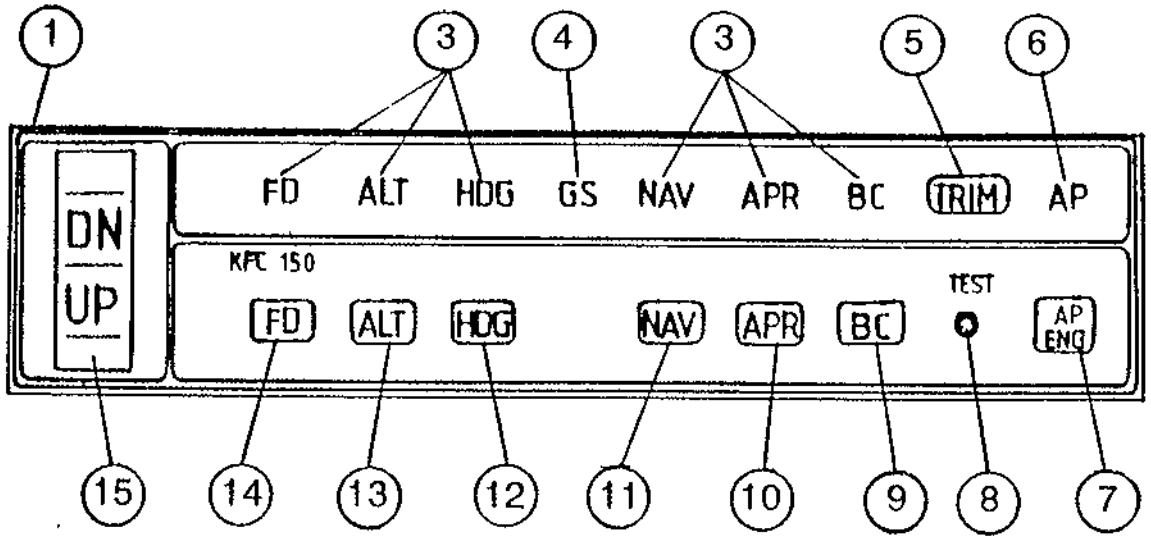
The autopilot will automatically be disengaged if one of the following occurs:

1. Loss of power.

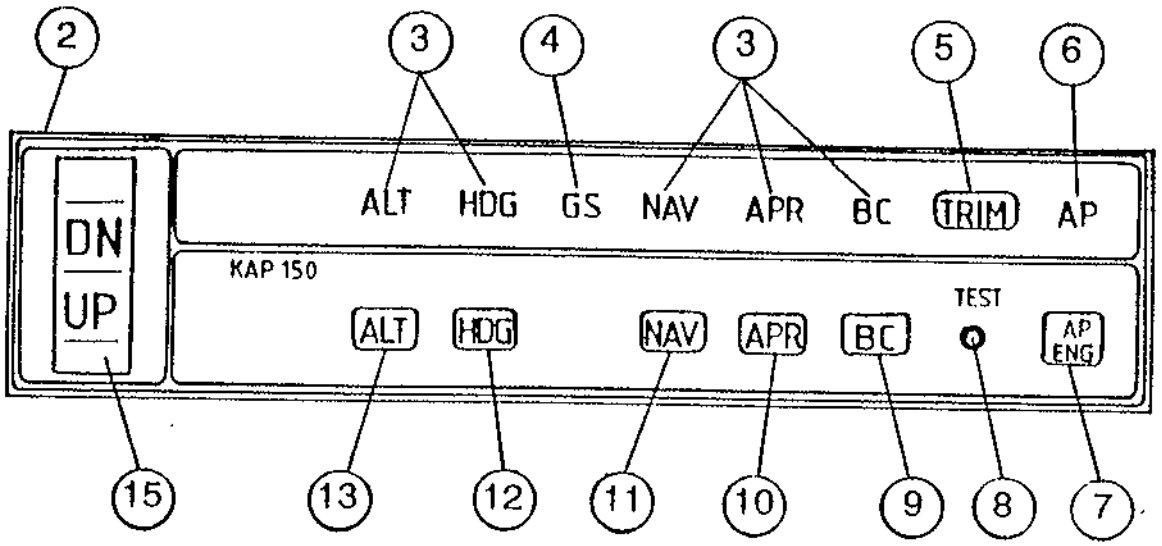
2. Internal malfunction of the autopilot computer.

3. With a PNI(HSI) KI 525A installed: Loss of compass signal (HDG warning flag appears). The autopilot is switched off if a mode is in operation which requires the HDG signal. With the HDG warning flag visible, the autopilot will only operate in the basic wings level mode. The vertical modes are still available.

SYSTEM DESCRIPTION



KC 192 Autopilot computer
(KFC 150 system)



KC 191 Autopilot computer
(KAP 150 system)

Figure 1: KING Autopilot computer

1. Autopilot computer KING KC 192 (KFC 150)
   with mode annunciator and controls.

2. Autopilot computer KING KC 191 (KAP 150)
   with mode annunciator and controls.

3. Mode annunciator
   The annunciator lights up after a mode has been chosen by pressing the appropriate button (press once ⇨ ON, press again ⇨ OFF).

4. Glideslope (GS) mode display
   The display flashes if the autopilot is not coupled to the glideslope signal and approach mode is selected.

   The display illuminates continously once the autopilot has coupled with the glideslope signal. If the glideslope signal becomes too weak, the display will flash (and the GS warning flag appears in the VOR/LOC/GS indicator or, in the case of a KI 525A HSI the glideslope pointer disappears). The autopilot automatically switches to pitch hold mode. If the glideslope signal reappears within 6 seconds the autopilot will automatically recouple with the glideslope. If the signal is too weak for more than 6 seconds, recoupling is only possible if strong enough signal is received and the aircraft is flown through the center of the glideslope. The autopilot can then couple again with the signal.

5. Trim warning display
   The red warning display illuminates if there is no power to the trim or if the preflight test has not been completed successfully. If the manual electrical elevator trim malfunctions, the trim warning will illuminate and an acoustic warning will sound. The manual trim is checked for servo motor malfunction (e.g. servo motor runs without trim activation).

If the automatic trim system malfunctions the trim warning display will illuminate and an acoustic warning will be given. The following will cause an automatic trim warning to be given:

- trim servo motor runs without appropriate command,
- trim servo motor does not run despite appropriate command,
- trim servo motor runs in the wrong direction.

6. Autopilot display (AP)

The yellow AP display illuminates as long as the autopilot is in operation. The display will flash about 12 times after the autopilot has been disengaged (the acoustic warning is sent for approx. 2 secs.).

7. Autopilot engage button (AP ENG)

If the button is pressed, the autopilot will be switched on once all prerequisites have been fulfilled.

8. Preflight test button (TEST)

Once the button has been pressed, the preflight test sequence is activated. All display lamps will illuminate for a short time for test purposes. The roll and pitch control units are checked as are the voltage and the control unit of the electrical trim as well as the operation and disengagement logic of the autopilot.

Once the preflight test has been completed successfully, the AP display will flash for approx. 6 seconds and an acoustic signal will be given. The autopilot cannot be engaged until the preflight test has been completed successfully.

9. Back course mode (BC)

Back course mode means that a LOCALIZER signal from the opposite direction is used for an approach (e.g. ILS Runway 27, approach on LOC Runway 09). The BC button must be pressed to select the BACK COURSE mode. This mode operates similarly to the approach mode (APR), the reaction to the LOCALIZER signal simply being turned by 180°. This conversion means that the correct command signal is used during LOCALIZER BACK COURSE approach. It is not possible to couple with a glideslope signal while the autopilot is in this mode.

10. Approach mode (APR)

The APR button must be pressed to select the approach mode. This allows the localizer to be intercepted at any angle if a PNI (HSI) is installed or at a set angle of 45° if a standard directional gyro is used. It also allows the automatic coupling and automatic proceeding along headings based on VOR, RNAV or LOC signals. Glideslope coupling is also possible in this mode.

Signal amplification used while following programmed courses is greater in the APR mode than in the NAV mode. The APR display flashes until automatic coupling with the programmed course has been initiated.

11. Navigation mode (NAV)

The NAV button must be pressed to select the navigation mode. This allows the intercept of VOR, RNAV or LOC signals at any angle if a PNI (HSI) is installed or at a set angle of 45° if a standard directional gyro is used. Under the NAV mode, courses based on VOR, RNAV or LOC signals will be coupled and followed automatically.

12. Heading mode (HDG)

The HDG button activates the heading mode which brings the aircraft to a preset heading and holds it there. Headings can be programmed by setting the heading bug.

A new heading can be selected at any time. The aircraft will immediately turn to the new heading with a maximum bank of 22° and a maximum roll rate of 5° per second.

By selecting the HDG mode, the NAV, APR or BC modes will be automatically disengaged.

13. Altitude hold mode (ALT)

The altitude hold mode is selected by pressing the ALT button. The autopilot automatically retains the barometric pressure altitude at the time of selection. This mode can be selected during climb, cruise or descent. In the approach mode APR the altitude hold mode ALT is automatically disengaged once the autopilot has coupled with the glideslope GS. This procedure only runs automatically if the glideslope is intercepted from below.

14. Flight director mode (FD) (KFC 150 only)

Flight director mode is activated by pressing the FD button. Command bars appear in the KI 256 (artifical horizon) and give the appropriate commands in order to carry out the relevant manoeuvres with respect to the mode selected. If the autopilot is not engaged the pilot must manually "pilot" the triangular aircraft symbol into the V-bar on the command indicator.

In the case of the KFC 150 the flight director mode must be selected before engaging the autopilot.

15. Vertical trim switch

A spring-loaded switch which always returns to the neutral position and which allows slight altitude changes in the altitude hold mode ALT and slight changes in angle of pitch in the pitch hold mode. On activating this switch the glideslope mode GS will be automatically disengaged. To couple again with the glideslope, the aircraft must be flown through the center of the glideslope.

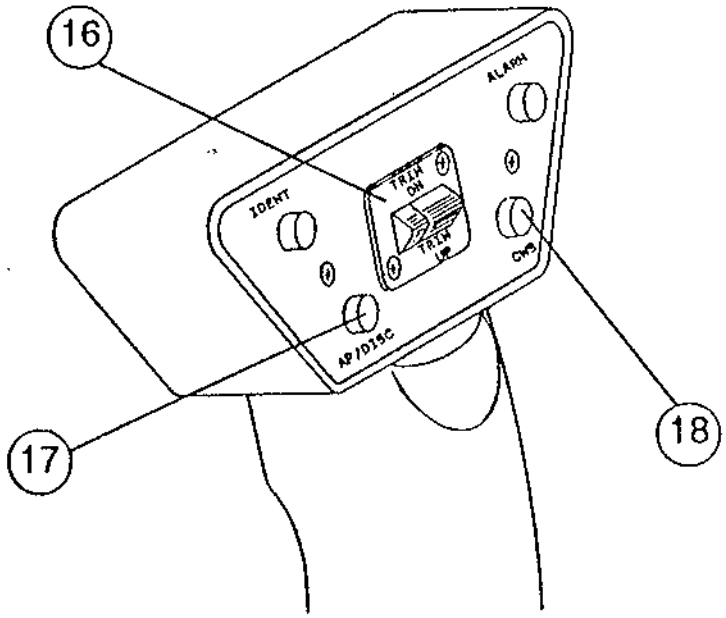


Figure 2: Control stick grip R 90-230 RG

16. Manual, electrical trim switch

A two-piece switch, the left half of which activates the clutch of the trim servo motor. The right half controls the direction of movement of the servo motor. Both halves of the switch must be pressed simultaneously to trim in the desired direction. Even if the autopilot is not engaged the pilot can electrically trim the aircraft as long as the preflight test has been completed successfully. Activation of the manual electrical trim switch with the autopilot engaged results in the immediate disengagement of the autopilot.

17. Emergency disconnect autopilot/trim AP DISC (red)

Emergency switch to disengage the autopilot (and to switch off the electrical trim). By pressing and immediately releasing the button all autopilot functions and modes are disengaged. If the button is pressed and held pressed, the electrical trim will be disconnected (the servo motor comes to a stop) and all autopilot functions and modes are disengaged.

In the case of the KFC 150 the flight director mode FD can also be switched off using the AP DISC switch if the autopilot is not engaged.

13. Control wheel steering switch (CWS)

If the button is pressed and held with the autopilot engaged, the aircraft can be manually piloted without having to disengage the autopilot. Once the button has been released, the autopilot will regain control. The autopilot retains the angle of pitch being flown when the CWS switch was released. In the altitude hold mode the autopilot retains the barometric pressure altitude at the time of release. In the glideslope mode GS activation of the CWS switch will result in a decoupling of the glideslope. To ensure automatic recoupling with the glideslope, the aircraft must be flown through its center.

In the case of the KFC 150 the flight director mode can be activated by means of the CWS switch as long as the autopilot is not engaged. If flight director mode has already been selected, activation of the CWS switch will result in the command bars being set to the current angle of pitch.

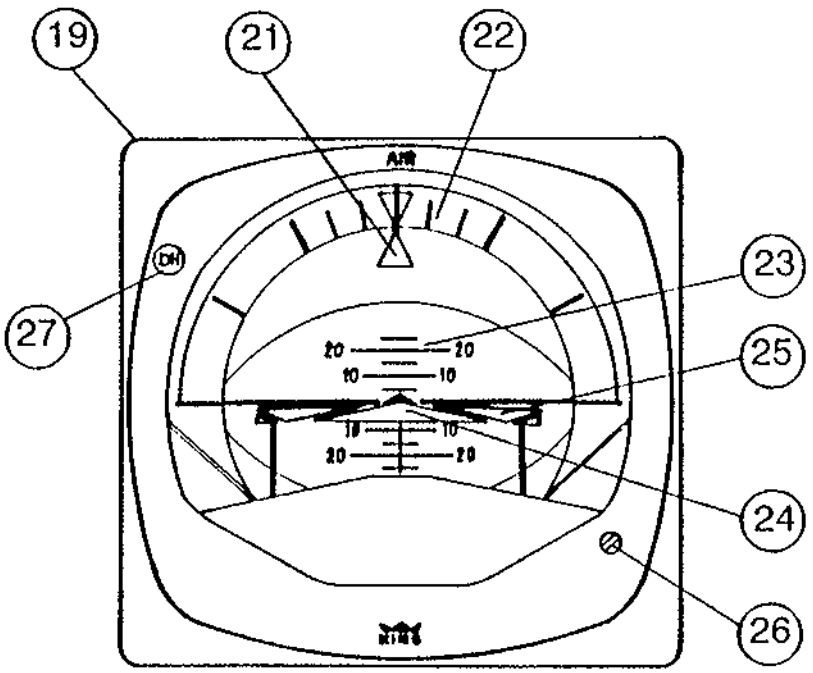


Figure 3: Artifical horizon KING KI 256
with flight director

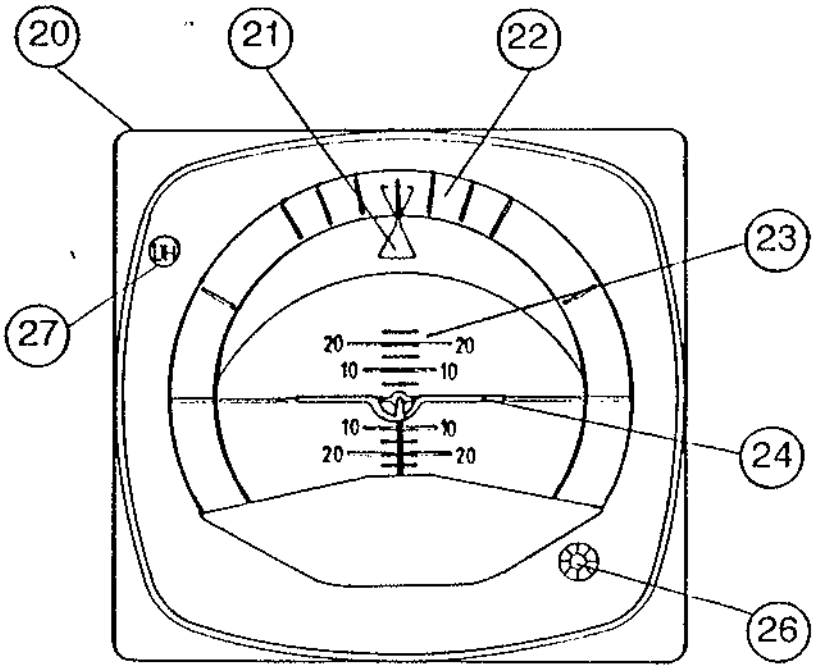


Figure 4: Artifical horizon KING KG 258

19. Artifical horizon KING KI 256 (flight command indicator)
The artifical horizon depicts the aircraft attitude with respect to the horizontal plane and includes command bars for the flight director mode. The gyro operates pneumatically (with suction).

20. Artifical horizon KING KG 258 (vertical gyro)
The artifical horizon depicts the aircraft attitude with respect to the horizontal plane. The gyro operates pneumatically (with suction).

21. Bank indicator
It shows the angle of bank on an appropriate scale.

22. Bank angle scale
Scale intervals 0°, ± 10°, ± 20°, ± 30°, ± 60°, ± 90°.

23. Pitch scale

It is the scale and not the aircraft symbol that moves and shows the angle of pitch. Scale intervals 0°, ± 5°, ± 10°, ± 15°, ± 20° and ± 25°.

24. Aircraft symbol

The aircraft symbol is stationary. Bank and pitch angles are displayed relative to this stationary symbol.

25. Command bars

They show the commands determined by the autopilot relative to the aircraft symbol. They are only visible if the flight director mode FD (KFC 150 only) has been selected. They disappear if the autopilot signal is unacceptable or after the flight director mode FD has been deleted.

26. Adjustment button for the aircraft symbol

This button allows adjustment to be made to the aircraft symbol for horizontal flight under any loading condition.

27. Decision height (DH)

Decision height can be displayed if a radar altimeter is installed.

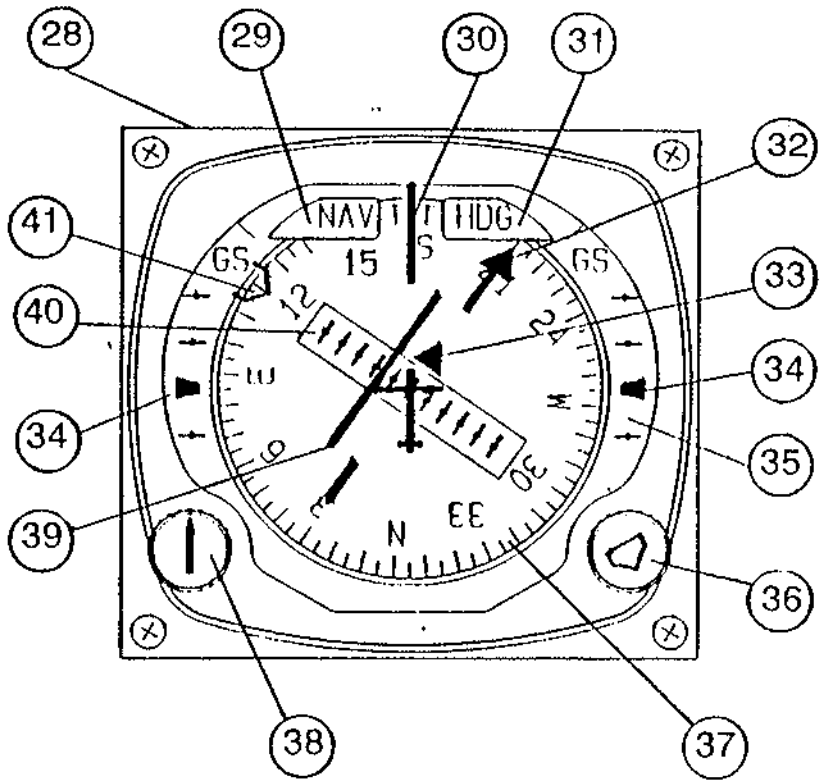


Figure 5: Pictorial Navigation Indicator KING KI 525 A

28. Pictoral Navigation Indicator KING KI 525A

This instrument is better known as a Horizontal Situation Indicator (HSI). It indicates the horizontal situation of the aircraft with respect to the VOR radial or the LOC beam. It also shows deviation from glideslope and gives magnetic heading information.

29. NAV warning flag

The warning flag appears if the VOR/LOC signal at the receiver becomes too weak. The autopilot is not automatically disengaged when the flag is visible. The pilot must watch the warning flag to ensure that the autopilot is receiving adequate VOR/LOC information to control the aircraft.

30. Lubber line

The lubber line shows the magnetic heading on the compass rose.

31. HDG warning flag

If this flag is visible heading indication is unreliable. If the HDG warning flag appears while the HDG, NAV, APR or BC mode is selected, the autopilot will be automatically disengaged and can now only be operated in the basic wings level mode. The CWS button can be used to alter the heading and any of the vertical modes can be selected.

32. Course bearing pointer

The pointer shows the selected VOR or LOC course on the compass rose. The selected VOR radial or localizer course moves with the compass rose.

33. To/From indicator

The small triangle shows the direction of the VOR station with respect to the selected heading.

34. Dual glideslope pointer

Deviation from the center of the glideslope is shown on the glideslope scale by two yellow trapezoidal pointers. Both pointers appear once an adequate glideslope signal has been received.

35. Glideslope scale

It shows deviation from the center of the glideslope. Full deflection over the two scale marks indicates a deviation angle of 0.7° above or below the center of the glideslope beam.

36. Heading select button

The heading bug on the compass rose can be set by this button. The heading bug moves with the compass rose.

37. Compass rose

Shows the aircraft heading with respect to the lubber line.

38. Course select button

Sets the course bearing pointer (32) on the compass rose.

39. VOR/LOC deviation bar

The inner part of the bar moves laterally and thus shows the position of the aircraft with respect to the selected radial or course. In the case of VOR radials and localizer courses deviation is shown in degrees whereas nautical miles are used for deviation from RNAV courses.

40. Course deviation scale

Course deviation covering one scale mark represents the following actual deviation: VOR ± 2°, LOC ± 0,5°, RNAV "APR" 0,25 Nm und RNAV "Enroute" 1 Nm. Deviation is defined as deviation from the center of the beam.

41. Heading bug

It can be set to the selected heading by the heading select button (36).

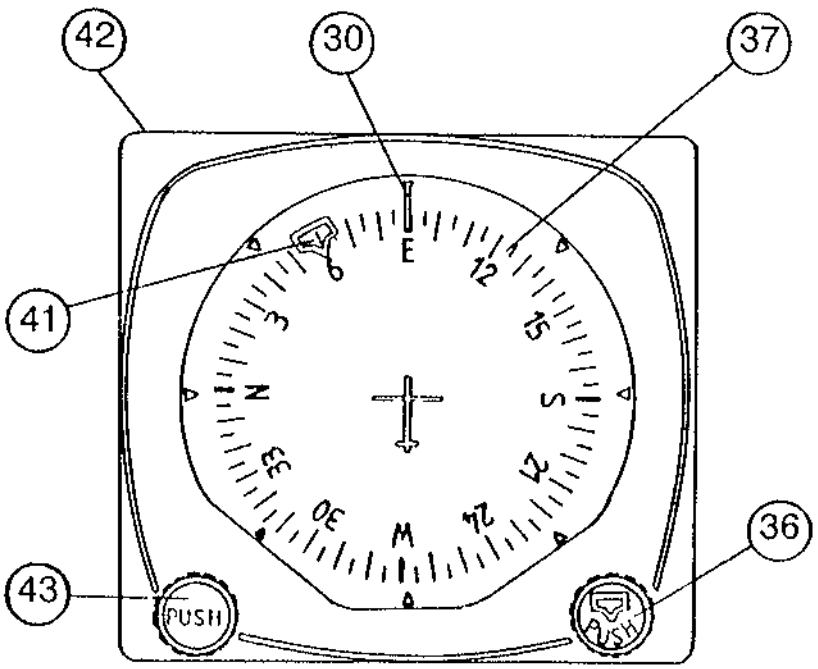


Figure 6: Directional gyro KING KG 107

42. Directional gyro KING KG 107 (non-slaved)

This instrument displays aircraft heading. The gyro operates pneumatically (with suction).

43. Gyro adjust button

By pressing this button the pilot can turn the compass rose and set it to magnetic heading. The non-slaved directional gyro must be repeatedly reset during stable horizontal flight according to the magnetic compass in order to compensate for precession errors in the gyro.

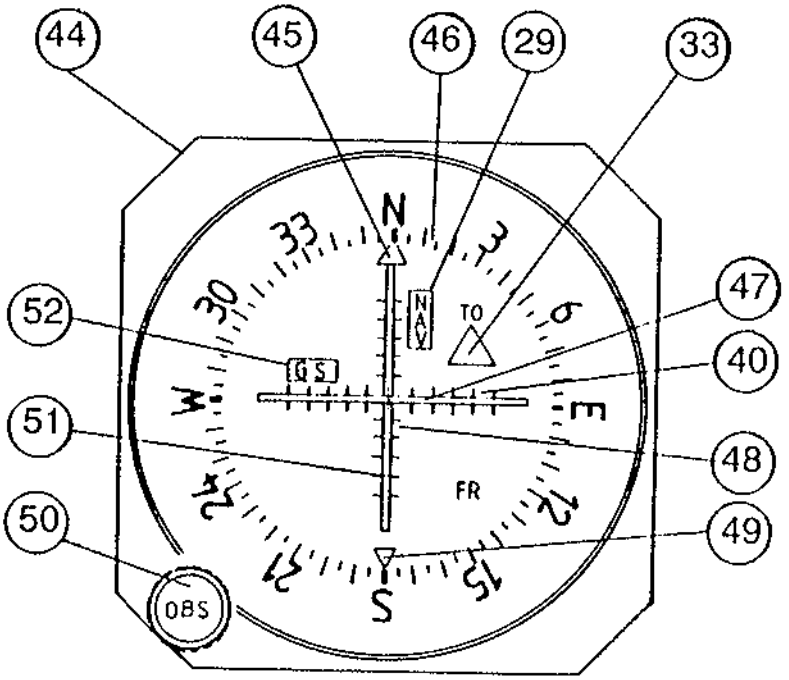


Figure 7: VOR/LOC/glideslope indicator KING KI 204/206

44. VOR/LOC/glideslope indicator KING KI 204/206

This instrument shows deviation of the aircraft from the VOR radial, localiser beam and glideslope.

45. Course index
It shows the selected VOR course on the course rose.

46. Course rose
The selected VOR course can be read off this course rose with the help of the course index (45).

47. Glideslope deviation needle
It indicates deviation from the ILS glideslope.

48. Glideslope scale
The scale indicates deviation from the center of the glideslope beam. Deviation over 5 scale marks (maximum deflection) indicates a deviation of 0.7° above or below the center of the beam.

49. Reciprocal course index
It shows the reciprocal to the VOR course.

50. Omni bearing selector (OBS)
It is used to turn the compass rose to the desired course or radial.

51. Course deviation needle
It shows deviation from the selected VOR course or from the center of the ILS localizer beam.

52. Glideslope (GS) flag
The warning flag appears if the glideslope signal is too weak.

POWER SUPPLY

The split master switch (BAT/ALT) remains unchanged. In an emergency the autopilot can be disconnected from the power supply by this switch.

The avionics master switch (and the avionics emergency switch) supplies power to the avionics bus to which the autopilot is connected. This switch can also be used to disconnect the autopilot.

The following circuit breakers are installed to protect the relevant components of the KING KFC/KAP 150 autopilot system:

Name	
A/P	supplies power to the computer KC 191/192, the roll and pitch servo motors and the elevator trim circuit breaker.
ALERTER	supplies power to the acoustic autopilot warning.
PITCH /TRIM	supplies power to the electrical elevator trim through the AP circuit breaker.
GYRO	supplies power to the KCS 55A compass system (if installed).

LIMITATIONS

All limitations listed in Chapter II of the airplane flight manual are valid with the autopilot engaged. In addition, the following limitations are valid when the autopilot is in operation:

Maximum altitude	16000 ft	Maximum permissible altitude with autopilot in operation.
Minimum height	500 ft*	Minimum permissible altitude above ground below which the autopilot may not be engaged. The autopilot must be switched off during takeoff and landing.
approach	200 ft*	
Maximum airspeed	180 KIAS	Maximum permissible speed with autopilot in operation.
approach	140 KIAS	
Minimum airspeed	90 KIAS	Minimum airspeed below which the autopilot may not be engaged.
Maximum fuel unballance	50 Liter	Greatest permissible difference between amount of fuel in the right and left wing tanks.

*..altitude above ground

EMERGENCY PROCEDURES

AUTOPILOT MALFUNCTION

In the case of an autopilot malfunction, steps 1 and 2 should be carried out simultaneously:

1. Control stick - Hold firmly and take over control of the aircraft.
2. A/P DISC button on the control stick - Press to switch off the autopilot.

WARNING

During an autopilot malfunction the following bank or pitch angles and losses of altitude may be experienced:

	Change in pitch angle		Loss of altitude
	after 4 secs.	after 2 secs.	
Climb	20 °	-	200 ft
Cruise	20°	-	400 ft
Descent	20°	-	400 ft
Turn	-	10°	120 ft
Approach	-	8°	70 ft

	Change in bank angle		Loss of altitude
	after 4 secs.	after 2 secs.	
Climb	60°	-	200 ft
Cruise	60°	-	200 ft
Descent	60°	-	200 ft
Turn	-	45°	150 ft
Approach	-	45°	150 ft

WARNING

After a malfunction of the automatic trim system hand forces of up to 11 lbs (5 daN) can be experienced during autopilot disengagement.

ELECTRICAL TRIM MALFUNCTION

1. Control stick - hold firmly and take over control of the aircraft.
2. A/P DISC button - press and hold.
3. TRIM circuit breaker - pull.
4. A/P DISC button - release.
5. Aircraft - trim manually.

WARNING

4 seconds after a malfunction of the electrical trim system hand forces of up to 22 lbs (10 daN) can be experienced.

NORMAL PROCEDURES

PREFLIGHT CHECK

After starting the engine:

1. AVIONICS master switch - ON.

After the gyros are stable (approx. 3 - 4 minutes):

2. AUTOPILOT test button - Press.

3. Proper test function sequence - Check:

   a. All displays illuminate, the trim warning light flashes.
   b. After approx. 5 seconds all displays extinguish excepting the AP control lamp which flashes about 12 times before going out. An acoustic warning sounds for about 2 seconds while the lamp flashes.

Note

If the AP control lamp does not flash the preflight test has not been completed successfully. The autopilot cannot be engaged. In this case, an appropriate maintenance shop should be consulted.

If the TRIM warning display does not extinguish the preflight test of the electrical trim has not been completed successfully. The autopilot AP circuit breaker must be pulled. Autopilot and manual, electrical trim are inoperable.

4. Manual electrical trim - Check:

   a. Switch the left half of the split TRIM switch back and forward. The trim wheel in the center console should not move. Hold the left half of the switch pressed - either to the back or the front (trim servo motor clutch engaged). Manually turn the trim wheel against the engaged clutch to check that the servo motor can be overridden.

   b. Switch the right half of the split switch back and forward. The trim wheel should not move. The wheel must be easy to move by hand (clutch not engaged).

   c. Press the A/P DISC button on the control stick and hold. Switch on the electrical trim. The trim should neither run "nose down" nor "nose up".

5. Flight director mode FD (KFC 150 only) - To switch on press either the FD or the CWS button

6. AP ENG button - Press to switch on the autopilot.

7. Control stick - Move back and forward and to the left and right to ensure that the autopilot can be overridden.

8. A/P DISC button - Press and check that the autopilot can be switched off and that all modes are deleted.

9. Trim - Set for takeoff.

AUTOPILOT OPERATION

BEFORE TAKEOFF

1. A/P DISC - Press to ensure that the autopilot is switched off during takeoff.

IN FLIGHT

ENGAGE (BASIC MODE)

1. Flight director mode FD (KFC 150 only) - Select.

2. A/P ENG button - Press.

2. AP display - Check that it illuminates. If no other mode is selected the autopilot will operate in the basic mode, i.e. wings level and the pitch angle as at the time of engagement.

WARNING

Do not "help" the autopilot by piloting manually as the automatic elevator trim works against this.

Manual heading change with autopilot engaged:

4. CWS button - Press and hold.

5. Aircraft - Manually pilot the aircraft to the desired heading.

6. CWS button - Release. The autopilot will hold the wings level.

Manual pitch change with autopilot engaged:

7. CWS button - Press and hold.

8. Aircraft - Manually pilot aircraft to the desired pitch angle.

9. CWS button - Release. The autopilot will automatically hold the new attitude.

Note

The vertical trim switch of the autopilot computer can be used to undertake very slight changes in pitch.

ALT MODE (Holding altitude)

1. ALT button - Press.

2. ALT display - Check. The autopilot automatically holds the pressure altitude at the time of selection.

Manual altitude changes in the ALT mode:

3. CWS button - Press and hold.

4. Aircraft - Manually pilot aircraft to new desired pressure altitude.

5. CWS button - Release. The autopilot automatically holds the new pressure altitude.

Note

The vertical trim switch of the autopilot computer can be used to undertake very slight changes in altitude (less than 100 ft).

HDG MODE (Holding the heading)

1. Heading bug (41) - Set desired heading with the heading select button (36).

2. HDG button - Press.

3. HDG display - Check. The autopilot automatically pilots the aircraft on the selected heading.

Heading changes in HDG mode:

4. Heading bug (41) - Set desired heading with the heading select button (36). The autopilot immediately turns to the new heading.

NAV MODE

A. PNI(HSI) KING KCS 55A installed:

1. Course bearing pointer (32) - Set to desired radial or LOC approach course.

Note

If the system is equipped with a NAV1/NAV2 switch and NAV2 is in use, the desired radial must be set in NAV2.

2. Heading bug (41) - Set intercept heading with the heading select button (36) (HDG mode).

3. NAV button - Press.
If the VOR/LOC deviation bar (32) is more than 2 or 3 dots away from the center, the autopilot will continue to operate in the HDG mode. The NAV display will flash until coupling has been completed. The HDG display will extinguish and the NAV display illuminate continously. The autopilot intercepts and proceeds along the selected radial.
If the VOR/LOC deviation bar is less than 2 or 3 dots away from the center, the coupling procedure will be initiated immediately after the NAV mode is engaged. The HDG display will extinguish immediately and the NAV display illuminates continously.

B. Standard directional gyro KING KG 107 installed:

1. Course index (45) - Set desired radial or LOC approach course on the VOR/LOC/glideslope indicator (44) with the omni bearing selector (43).

2. NAV button - Press.

3. Heading bug (41) - Using the heading select button (36) set heading bug on standard directional gyro KG 107 to the same value as the selected radial or VOR/LOC approach course.

Note

After selecting the NAV mode, the autopilot will switch for approx. 5 seconds from the HDG mode to the basic mode (wings level). An intercept angle of 45° with respect to the heading bug (41) setting will then automatically be followed.

If the VOR/LOC course deviation needle (51) is more than 2 or 3 dots away from the center, the autopilot will continue to operate in the HDG mode. The NAV display will flash until the coupling procedure has been completed. The HDG display will then extinguish and the NAV display illuminate continously. The autopilot intercepts and follows the selected radial.
If the VOR/LOC course deviation needle (51) is less than 2 or 3 dots away from the center, the coupling procedure will be initiated immediately after the NAV mode is engaged. The HDG display will extinguish immediately and the NAV display will illuminate continously.

APR MODE (Approach)

A. PNI(HSI) KING KCS 55A installed:

1. Course bearing pointer (32) - Set to desired radial or LOC approach course.

Note

If the system is equipped with a NAV1/NAV2 switch and NAV2 is in use, the desired radial must be set in NAV2.

2. Heading bug (41) - Set intercept heading with the heading select button (36) (HDG mode).

3. APR button - Press.
If the VOR/LOC deviation bar (39) is more than 2 or 3 dots away from the center, the autopilot will continue to operate in the HDG mode. The NAV display will flash until coupling has been completed. The HDG display will extinguish and the NAV display illuminate continously. The autopilot intercepts and proceeds along the selected radial.
If the VOR/LOC deviation bar (39) is less than 2 or 3 dots away from the center, the coupling procedure will be initiated immediately after the NAV mode is engaged. The HDG display will extinguish immediately and the NAV display illuminates continu-ally.

B. Standard directional gyro KING KG 107 installed:

1. Course index (45) - Set desired radial or LOC approach course on the VOR/LOC/glideslope indicator (44) with the omni bearing selector (50).

2. APR button - Press.

3. Heading bug (41) - Using the heading select button (29) set heading bug on standard directional gyro KG 107 to the same value as the selected radial or VOR/LOC approach course.

Note

After selecting the APR mode, the autopilot will switch for approx. 5 seconds from the HDG mode to the basic mode (wings level). An intercept angle of 45° with respect to the heading bug setting will then automatically be followed.

If the VOR/LOC course deviation needle (51) is more than 2 or 3 dots away from the center, the autopilot will continue to operate in the HDG mode. The APR display will flash until the coupling procedure has been completed. The HDG display will then extinguish and the APR display illuminate continously. The autopilot intercepts and follows the selected radial.
If the VOR/LOC course deviation needle (51) is less than 2 or 3 dots away from the center, the coupling procedure will be initiated immediately after the APR mode is engaged. The HDG display will extinguish immediately and the APR display will illuminate continously.

BC MODE (Back course approach)

A. PNI(HSI) KING KCS 55A installed:

1. Course bearing pointer (32) - Set to ILS front course (normal approach course).

Note

If the system is equipped with a NAV1/NAV2 switch and NAV2 is in use, the ILS front course must be set in NAV2.

2. Heading bug (41) - Set intercept heading (HDG mode) with the heading select button (36).

3, BC button - Press.

If the VOR/LOC deviation bar (39) is more than 2 or 3 dots away from the center, the autopilot will continue to operate in the HDG mode. The HDG and BC displays will illuminate continously and the APR display will flash until coupling has been completed. The HDG display will extinguish and the APR and BC displays will illuminate continously. The autopilot will follow and hold the localizer back course.
If the VOR/LOC deviation bar (39) is less than 2 or 3 dots away from the center, the coupling procedure will be initiated immediately after the BC mode is engaged. The HDG display will extinguish and the APR and BC displays will illuminate continously. The autopilot will follow and hold the localizer back course.

B. Standard directional gyro KING KG 107 installed:

1. Course index (45) - Set ILS front course with the omni bearing selector (50) on the VOR/LOC/glideslope indicator (44).

2. BC button - Press.

3. Heading bug (41) - Using the heading select button (36) set heading bug on standard directional gyro KG 107 to the same value as the selected radial or ILS front course.

Note

After selecting the BC mode, the autopilot will switch for approx. 5 seconds from the HDG mode to the basic mode (wings level). An intercept angle of 45° with respect to the heading bug setting will then automatically be followed.

If the VOR/LOC course deviation needle (51) is more than 2 or 3 dots away from the center, the autopilot will continue to operate in the HDG mode. The HDG and BC displays will illuminate continously and the APR display will flash until the coupling procedure has been completed. The HDG display will then extinguish and the APR and BC displays will illuminate continously. The autopilot follows and holds the localizer back course.
If the VOR/LOC course deviation needle (51) is less than 2 or 3 dots away from the center, the coupling procedure will be initiated immediately after the BC mode is engaged. The HDG display will extinguish immediately and the APR and BC displays will illuminate continously. The autopilot follows and holds the localizer back course.

GLIDESLOPE COUPLING

CAUTION

Glideslope coupling is carried out automatically in the approach mode APR. It is *not* operative in the NAV and BC modes.

1. APR mode - Selected and engaged.

2. Center of glideslope - Fly through.

3. GS indicator - Check. If the glideslope is coupled, the GS display will stop flashing and illuminate continously.

CAUTION

In the pitch hold (basic mode) or altitude hold (ALT) modes the autopilot can couple with the glideslope after flying through the center of the glideslope. In horizontal flight this is only possible if the glideslope is intercepted from below. If the coupling manoeuvre is started from a position above the glideslope, an appropriately high rate of descent should first be selected by means of the CWS switch or the vertical trim switch in order to achieve a flight angle that is steeper than that of the glideslope.

MISSED APPROACH

1. A/P DISC - Press to disengage autopilot.
2. Missed approach - Carry out manually.
3. AP ENG button - Press if the autopilot is to be reengaged.
4. AP display - Check.

BEFORE LANDING

1. A/P DISC button - Press to disengage autopilot.

WARNING

The preflight test button must not be pressed if the autopilot is switched on as the autopilot will then switch itself off automatically.

POSSIBLE MODE COMBINATIONS

The following matrix lists all possible vertical and horizontal mode combinations:

	Vertical mode		
Horizontal mode	Pitch angle hold (Basic mode)	Altitude hold ALT	Glideslope coupl. GS
wings level (basic mode)	X	X	
heading hold HDG	X	X	
navigation NAV	X	X	
approach APR	X*	X*	X
back course appr. BC	X	X	

* In the approach mode APR the glideslope mode GS is switched on automatically after flying throug the center of the glideslope whereas the pitch and altitude hold modes are automatically switched off.

Note

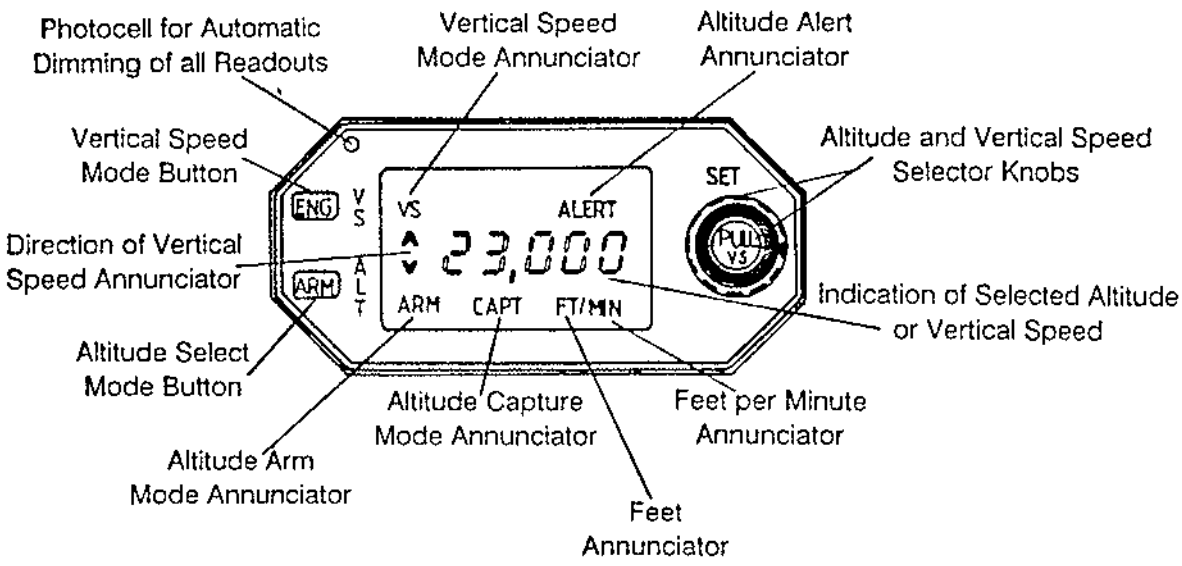
In the case of the KFC 150 the combinations listed above are also available in the flight director mode FD with the autopilot disengaged.

PERFORMANCE

Not affected.

Operating Instructions

ALTITUDE AND VERTICAL SPEED SELECTOR KING KAS 297B



The altitude and vertical speed selector KING KAS 297B augments the functions of the autopilot systems KING KFC/KAP 150 through the preselection of an altitude to be reached and then held and the preselection of the relevant vertical speed.

CAUTION

The KAS 297B receives information concerning altitude from the encoding altimeter KING KEA 130A related to the QNH set on this altimeter.

Altitude preselect

FT must be displayed on the KAS 297B if a new altitude is to be selected. If FT/MIN is displayed, it can be altered by pressing the right inner adjustment knob.
If the outer concentric adjustment knob is turned, altitude can be set in 1000 ft intervals up to 35,000 ft. By turning the inner knob, altitude can be altered in 100 ft intervals.
Once the desired altitude has been programmed, the altitude mode is activated by pressing the ARM button. The ARM mode display will illuminate and the altitude hold mode ALT of the autopilot computer will be disengaged, should it be switched on at this time. In order to reach the programmed altitude, a vertical speed (cf. Chapter vertical speed mode) or an appropriate pitch attitude must be selected (cf. autopilot system KFC/KAP 150).

CAUTION

The preselected vertical speed must co-incide with the preselected altitude change with respect to direction, e.g. a rate of climb must be preselected if the preselected altitude is above the current altitude. If a rate of descent is programmed, the autopilot will obey this command without giving any warning to the pilot. The vertical speed is held until the pilot carries out a correction.

On approaching the preselected altitude the KAS 297B will calculate a smooth transition to horizontal flight based on the vertical speed being flown. Once this transitional phase begins the mode annunciator will switch from altitude mode ARM to attained altitude mode CAPT and vertical speed mode VS will be disengaged if it was in operation. On attaining the preselected altitude, the altitude hold mode ALT of the autopilot computer KC 191/192 will be automatically activated and the mode display CAPT will extinguish.

Note

It is recommended that the altitude preselect mode only will be activated (ARM button) if the annunciator is in the altitude display mode (FT) to allow the pilot to check whether the programmed altitude is correct or not.

Altitude warning

The KAS 297B will send out a warning once the preselected altitude has been reached or if the aircraft deviates from altitude attained. This warning is given irrespective of autopilot operational status.

Once the aircraft has reached an altitude within 1000 ft of the preselected altitude, ALERT will appear in the KAS 297B display and an acoustic warning will be given for 2 seconds. Once the aircraft has reached the preselected altitude, the pilot will once again be warned by the ALERT display and the signal (both of which last for 2 seconds).

If the aircraft deviates more than 300 ft from the preselected altitude warning (ALERT display and acoustic signal) will be given again until a new altitude is programmed.

Vertical speed mode

The vertical speed mode is activated by pressing the ENG button.

Note

On activating the vertical speed mode VS the altitude hold mode ALT of the autopilot computer will be disengaged if it is active.

Vertical speed can be programmed in two ways:

1. Either by preselecting a vertical speed for the KAS 297B (cf. Chapter "Vertical speed preselect") and activating with the ENG button, or

2. by flying the desired vertical speed and then pressing the ENG button. The altitude display (FT) of the KAS 297B must be active. The autopilot will hold the vertical speed at the time of activating the VS mode and this value will appear in the display for 2 seconds.

With the vertical speed mode active, the selected vertical speed can be altered by means of the vertical trim switch in the autopilot computer, the CWS button or the KAS 297B adjustment knob (cf. Chapter "Vertical speed preselect").

WARNING

If a rate of descent has been programmed in the vertical speed mode and altitude preselection is not active (or an altitude above the current altitude has been selected), the autopilot will descend until impact with the ground.

Note

The error in a mechanical vertical speed indicator can vary between 5 and 15 % depending on altitude and vertical speed. If the aircraft is being piloted by the autopilot the vertical speed will be held exactly even if the speed differs from that shown on the vertical speed indicator.

The vertical speed indicator is prone to lag, comparison is, therefore, only possible in stable flight conditions.

Vertical speed preselect

The inner concentric adjustment knob must be pulled out to preselect vertical speed. On completion the last selected vertical speed will appear in the display along with the appropriate arrow showing climb or descent and the FT/MIN value.

The small, inner adjustment knob is used to set the vertical speed in 100 ft intervals whereas the large, outer knob adjusts the speed in 1000 ft intervals. If the knob is turned beyond zero during setting, the arrow will change from climb to descent or vice versa. The vertical speed mode is activated by the ENG button and the autopilot flies at the selected vertical speed.

Note

If a vertical speed which has been preselected with the KAS 297B is to be flown, the vertical speed display (FT/MIN) must be active when the ENG button is pressed. If the altitude display (FT) is active at the time of pressing the ENG button, the vertical speed being flown at that time will be retained (cf. Chapter "Vertical speed mode").

A preselected vertical speed can be altered in different ways with the vertical speed mode active:

1. By means of the vertical trim switch in the autopilot computer KC 191/192. For every second that the trim switch is pressed, the vertical speed will change by 100 ft/min. The alteration appears in the KAS 297B display.

2. By means of the CWS switch. On pressing the CWS switch the vertical speed will appear in the KAS 297B display even if altitude has been prèviously shown. The pitch attitude of the aircraft can be manually altered to the desired vertical speed as long as the CWS switch is depressed. The autopilot will hold the vertical speed shown when the CWS switch is released.

3. The vertical speed can be altered in 100ft intervals by turning the small, inner adjustment knob on the KAS 297B.

CAUTION

The preselected rate of climb or descent must correspond to the aircraft performance data. If a rate of climb is selected which is too high, the aircraft can stall. If a rate of descent is selected which is too high, V_{NE} can be exceeded.

Test function

While the preflight test is being carried out on the autopilot, the KAS 297B display will also illuminate to allow the pilot to check that the display is operational.

Operating Instructions

ELECTRONIC TACHOMETER HORIZON P-1000

GENERAL

The tachometer is a full electronic design and utilizes the engine speed information which is available at the ignition switch cables of the magnetos (primary side). This signal is electronically evaluated for the righthand and lefthand magneto seperately.

Speed indication is by a large digital illuminated LC Display. Operating limitations are indicated by large colored light emitting diodes (LED's) in the limitations panel. The green LED is illuminated if the speed is within the normal operating range and the red LED illuminates if the maximum permissible speed is exceeded (For operating limitations refer to Section II).

In addition, the tachometer P-1000 shows supplementary features which are described by the following.

System Description

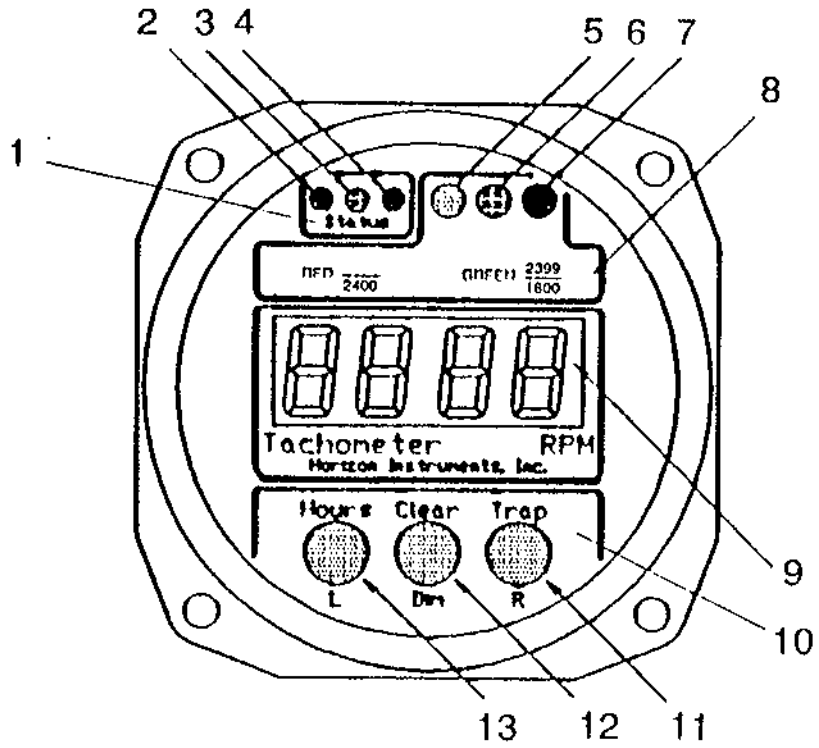


Figure 1: Tachometer P-1000

1. LED Status Panel

The LED's located in this panel indicate the status of the ignition system.

2. Left Magneto Warning Light

This red LED illuminates if the left magneto does not deliver ignition signals (e.g. ground short circuit or ignition switch set to "R"). It is flashing if the speed evaluation of the left magneto has been switched off (see 13.).

3. Speed Mismatch Annunciator Light

This amber LED illuminates if the speed signal difference from left and right magneto exceeds 80 RPM. This light may flicker momentarily at larger speed changes.

4. Right Magneto Warning Light

This red LED illuminates if the right magneto does not deliver ignition signals (e.g. ground short circuit or ignition switch set to "L"). It is flashing if the speed evaluation of the right magneto has been switched off (see 11.).

5. Anninciator Light for Normal Operating Range

This green LED illuminates if engine speed is within the normal aperating range (refer to Section II "Limitations").

6. Anninciator Light for Caution Speed Operating Range

CAUTION

The P-1000 tachometer contains an amber annunciator light in its operating limitations panel to indicate a caution range. The aircraft R 90-230 RG however does not have a speed caution range (refer to Section II "Limitations"). If this LED illuminates a tachometer malfunction is to be assumed.

7. Warning Light for Maximum Permissible Speed

This red warning light is illuminated when reaching or exceeding the max. permissible RPM (refer to Section II "Limitations").

8. Operating Limitations Panel

The LED's contained in this panel provide for the indication of the speed operating limitations. In addition, these limits are noted on a placard.

9. 4-digit Display

This illuminated LC Display indicates engine speed. During engine runup, the display indicates a speed decrease marked by a preceding minus sign.

10. Pushbutton Panel

This panel contains the pushbuttons provided for the operation of the tachometer. The buttons are spring loaded and return to their initial position after release. Any button has a dual function which is activated depending on the actuation of the button. The possible kinds of actuation are:

a. Push and Hold (P&H) ➪ The P&H function is activated by pressing the respective button and holding it down for more than 2/3 of a second.

b. Press and Release (P&R) ➪ The P&R function is activated by pressing the respective button releasing it within less than 2/3 of a second.

The corresponding P&H function is indicated on the pushbutton panel on top of the button and the corresponding P&R function below the button respectively.

11. Right Pushbutton

P&H function ➪ the tachometer indicates the engine speed peak value since last power on or reset respectively (see 12.).
P&R function ➪ switches the speed evaluation of the right magneto ON and OFF respectively. A single push deactivates speed evaluation, a second push activates it again.

12. Center Pushbutton

P&H function ➪ The engine speed peak value is reset to zero.
P&R funktion ➪ dimming of LED's. Pushing again deactivates dimming. The red warning light in the operating limitations panel cannot be dimmed.

13. Left Pushbutton

P&H function ⇨ the tachometer indicates total engine operating time in full hours. When the button is released, the display indicates the decimals of the operating hours (in tenth and hundreds of an hour, *not* in minutes).

P&R function ⇨ switches the speed evaluation of the left magneto ON and OFF respectively. A single push deactivates speed evaluation, a second push activates it again.

Power Supply

The power for the electronic tachometer is supplied via the systems bus. The respective circuit breaker is marked TACHOMETER.

OPERATION

Before Flight

After switching on the master switch, the tachometer performs an automatic self test. Thereafter the tachometer is in the "speed indication" mode. As long as the engine is not running and the magnetos do not deliver speed signals, the two red status LED's for the right and left magneto are illuminated and the LC Display shows four dashes.

When the engine is running, the tachometer indicates actual engine speed. If the ignition switch is set to the right magneto during engine runup, the red status LED for the left magneto illuminates and the LC Display shows the speed decrease, i.e. the difference between actual value (one magneto) and value before switching (two magnetos). If a speed decrease is indicated, the value is preceded by a minus sign. The same applies for the magneto check of the left magneto.

In Flight

In flight no actuation of the tachometer is required. The actual engine speed is displayed by the LC Display and the operating limitations are indicated by the colored LED's. During large speed changes, a short time exceedance of the max. speed is possible due to sluggishness of the propeller governor. Such short time occurence is of no importance.

For the operation of the dimming function and the indication of the operating hours refer to the system description.

EMERGENCY LOCATOR TRANSMITTER

POINTER 3000

CONTENTS: ..... Page

This is a compulsary supplement to the instructions for the safe operation of the aircraft. It is an integral part of the airplane flight manual and must be carried on board at all times, if an ELT POINTER 3000 is installed.

GENERAL

This airplane is equipped with an Emergency Locator Transmitter (ELT) of type Pointer 3000.

The unit is installed in the rear end of the fuselage behind the baggage compartment bulkhead. This location is marked by a placard at the outer surface of the fuselage.

The ELT is operated by means of a switch at the front face of the unit. In addition, a remote control switch is located in the instrument panel to provide for operation from the pilot's seat.

The ELT is a radio transmitter which upon activation transmits a non-directional signal on the international emergency frequencies 121.5 and 234.0 MHz. In case of a crash landing, the unit is activated automatically by a deceleration switch and transmits a non-directional signal (up- and deswelling sound) for a period of 48 hours which can be received at a range of 100 NM at 10000 ft and makes the location of the aircraft in emergency possible.

LIMITATIONS

PLACARDS

The following placard must be fixed close to the mounting location at the outer surface of the fuselage:

ELT LOCATED HERE

A placard describing the switch positions has to be fixed to the unit and to the remote control switch:

In the OFF position, the unit is switched off. In the AUTO position, the unit is activated automatically at decelerations exceeding -5g. In the ON position, the unit is switched on and transmits.

EMERGENCY PROCEDURES

Immediately after an emergency landing if help is needed the ELT should be operated as follows:

1. Check ELT activation:
   Switch on a communication receiver and select frequency 121.5 MHz. If the ELT transmission is audible the ELT has already been activated by the deceleration switch and is functioning properly. If no ELT transmission is audible set ELT operating switch to ON and check for proper operation by listening to the communication receiver.

2. Before search aircraft is in sight:
   Switch off communication receiver in order to avoid unnecessary battery discharge.

3. If search aircraft is in sight:
   Set ELT switch to OFF in order to avoid interference with communication transmissions. Try to establish radio contact with search aircraft on frequency 121.5 MHz by using the communication receiver. If no contact is possible immediately set back the ELT switch to ON.

4. After successful identification by the search aircraft:
   Set ELT switch back to OFF in order to avoid unnecessary transmission.

5. Other emergency transmissions:
   Refer to original ELT operating instructions.

NORMAL PROCEDURES

BEFORE TAKEOFF

1. ELT Switch - AUTO
2. Communication receiver - 121.5 MHz
3. ELT transmission - NONE

AFTER LANDING

1. ELT switch - AUTO
2. Communication receiver - 121.5 MHz
3. ELT transmission - NONE

OTHER PROCEDURES

Refer to original ELT operating instructions.

SATELLITE BASED NAVIGATION SYSTEM (GPS)

KING KLN 90

CONTENTS: ..... Page

This is a compulsary supplement to the instructions for the safe operation of the aircraft. It is an integral part of the airplane flight manual and must be carried on board at all times together with the original operating instructions of the GPS system, if the concernig GPS system is installed.

GENERAL

This airplane flight manual supplement is valid only in conjunction with the original operating instructions "STAR 5000 Pilot's Guide", ARNAV P/N 572-0043, issue 3/92 or later.

LIMITATIONS

APPROVED KIND OF OPERATION

The usage of the GPS system is limited to a supplemental navigation aid for flight under Visual Flight Rules (VFR).

PLACARDS

The following placard is mounted to the instrument panel and visible to the pilot:

GPS limited for VFR use only

EMERGENCY PROCEDURES

No change.

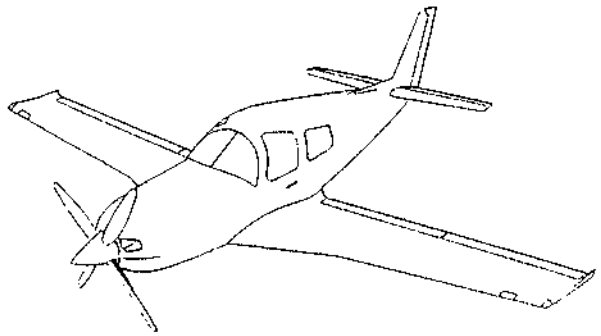
NORMAL PROCEDURES

Normal procedures are described in the original operating instructions of the ARNAV STAR 5000 GPS system.

CHECK LISTS

Ruschmeyer

R 90-230 RG



ATTENTION

These check lists represent an abridgement of the sections

III Emergency Procedures and
IV Normal Procedures

of the valid airplane flight manual. Studying these sections is the prerequisite of meaningful application of these check lists, being abridged to the essentials.

PREFLIGHT CHECK

INSIDE THE AIRCRAFT

Airplane Flight Manual and Documents ..... Check for availability and currency status
Control Lock Device .....Remove
Ignition Switch.....OFF
All Switch- and Circuit-Breakers.....Engaged
Landing Gear Switch.....DOWN
All Switches.....OFF or normal position
Master Switch .....ON
Landing Gear Position Indicator Lights....Check for safe indicaton
Fuel Gauges.....Check
Fuel Selector Valve .....Fullest tank
Elevator Trim .....Take-off range (START)
Pitot Heat.....Check
(Switch on, observe ammeter and annunciator light)
Static Source Selector.....NORMAL
Master Switch .....OFF
Both Fuel Tank Filler Cap Locks.....Unlock
Cowl Flap .....OPEN

LEFT SIDE OF FUSELAGE

Windows.....Check condition
Baggage Compartment .....Check and close door
Fuselage Side Wall .....Check condition
Antennas .....Check condition
Static Port.....Clear
Aft Fresh Air Inlet .....Clear

EMPENNAGE

Horizontal Stabilizer and Elevator.....Check
Elevator .....Check for free movement
Elevator Trim Tabs.....Check
Vertical Tail, Rudder and Discharger .....Check
Position Light.....Check
Anti-Collision Light .....Check condition
Tail Skid Tie Down.....Release

RIGHT SIDE OF FUSELAGE

Fuselage Side Wall .....Check condition
Static Port.....Clear
Windows.....Check condition

REAR PART OF RIGHT WING

Wing Flap ..... Check
Aileron ..... Check
Wing Tip and Dischargers ..... Check
Position Light and
Anti-Collision Light ..... Check

RIGHT WING LEADING EDGE

Fuel Tank Vent ..... Check for clogging
Landing/Taxi Light ..... Check glazing and condition
Wing Leading Edge ..... Check condition
Stall Warning Sensor ..... Check for free movement
Fuel Quantity ..... Check
Filler Cap ..... Check for tight fit, close cover
Wing Tie Down ..... Release and remove hook
Right Main Landing Gear
and Wheel Well ..... Check
Main Wheel Tire ..... Check condition
Brake Disk, Caliper,
and Brake Hose ..... Check
Fuel Tank Sump ..... Drain

POWERPLANT

Fuel Filter ..... Drain fuel sample
Engine Cowling ..... Check closed and secured

Cowl Flaps ..... Check condition and safe attachement
Towing Bar ..... Remove
Nose Landing Gear
and Strut ..... Check condition
Nose Wheel Tire ..... Check condition
Engine Air Inlets ..... Remove protective cover
Propeller and Spinner ..... Check condition
Oil Filling Level ..... Check
(minimum 8,5 l = 9 qts before flight)
Front Window ..... Check condition

LEFT WING LEADING EDGE

Fuel Tank Sump ..... Drain fuel sample
Left Main Landing Gear
and Wheel Well ..... Check
Main Wheel Tire ..... Check condition
Brake Disk, Caliper,
and Brake Hose ..... Check
Wing Tie Down ..... Release and remove hook
Fuel Quantity ..... Check
Fuel Tank Filler Cap ..... Check for tight fit, close cover
Wing Leading Edge ..... Check condition
Pitot Tube ..... Remove pitot cover and check for clogging

Landing-/Taxi Light ..... Check glazing and condition
Fuel Tank Vent ..... Check for clogging
Position Light and-
Anti-Collision Light ..... Check
Wing Tip and
Discharger ..... Check

AFT PART OF LEFT WING

Aileron ..... Check
Wing Flap ..... Check

BEFORE ENGINE STARTING

Exterior Check ..... Completed
Seats and
Seat Belts ..... Check secured
Avionics Master Switch ..... OFF
Cowl Flap ..... Closed
Landing Gear Switch ..... DOWN
Parking Brake ..... Pull
Doors ..... Closed and locked

ENGINE STARTING (COLD)

Mixture ..... Pull back (closed)
Propeller ..... HIGH RPM
Throttle ..... Open 0.5 in (1 cm)
Master Switch ..... ON
Anti-Collision Light ..... ON
Voltmeter ..... Check
Mixture ..... FULL RICH
Auxillary Fuel Pump Switch ..... ON 4-5 secs, then OFF
Propeller Area ..... CLEAR
Mixture ..... Pull back (closed)
Ignition Switch ..... START, then BOTH when engine is running
Mixture ..... FULL RICH when engine starts firing
Throttle ..... 800 to 1000 RPM
Oil Pressure ..... Check (green range)
Ammeter ..... Check charging current

BEFORE TAXIING

Avionics Master Switch	ON
Lighting	As required
Directional Gyro	Set
Instruments	Check
Avionics	Check, select frequencies
Altimeter	Set
Fuel Selector	Check both tanks
Autopilot	Check

TAXIING

Parking Brake	Release
Brakes	Check during taxiing
Nose Wheel Steering	Check
Directional Gyro	Check during turns
Turn and Bank Indicator	Check during turns
Artificial Horizon	Stabilized

BEFORE TAKE-OFF

Parking Brake	Set
All Flight Controls	Check for free and correct movement
Elevator Trim	Take-Off range (START)
Fuel Selector	Fullest tank
Cowl Flaps	As required
Mixture	RICH
Throttle	1900 RPM
Ignition	Check (Max. Speed Drop 175 RPM, Diff. max. 50 RPM)
Propeller Control Lever	~ 1600-1700 RPM
and back to	1900 RPM
Vacuum System	Check (green range)
Throttle	Idle
Wing Flaps	Take-Off (15°)
Radios and Avionics	Set
Flight Instruments	Check
Fuel Selector	Fullest Tank
Safety Belts and Doors	Locked
Parking Brake	Released

TAKE-OFF

Auxillary Fuel Pump Switch	ON
Wing Flaps	15°
Throttle	FULL THROTTLE
Elevator Control	Pull slightly
Lift Off	~ 62 KIAS
Climb Speed	76 KIAS
Landing Gear	Retract
Wing Flaps	Retract
Climb Speed	98 KIAS

CLIMB

Airspeed	92 to 98 KIAS
Manifold Pressure	Full throttle
Engine Speed	2400 RPM
Mixture	As required
Auxillary Fuel Pump	OFF
Cowl Flaps	As required

CRUISE

Power	As required
Cowl Flaps	As required
Engine Speed	1800 to 2400 RPM
Manifold Pressure	Green or yellow arc
Mixture	For best power or economy
Fuel Selector Valve	for balanced emptying

DESCENT

Mixture	Full Rich
Throttle	As required
Engine Speed	As required
Cowl Flaps	Closed

BEFORE LANDING

Seats and Seatbelts	Secured
Fuel Selector Valve	Fullest tank
Aux. Fuel Pump	ON
Landing Gear (below 140 KIAS)	DOWN
Wing Flaps (below 102 KIAS)	15°
Mixture	FULL RICH

LANDING

Power	As required
Mixture	Full rich
Approach Speed	80 KIAS
Propeller	High RPM
Wing Flaps	30° below 102 KIAS
Airspeed at 50 ft	75 - 80 KIAS
Airspeed at Touchdown	60 - 65 KIAS
Touchdown	Main wheels first
Brakes	As required

AFTER LANDING

Wing Flaps	Retracted
Cowl Flaps	Open
Auxillary Fuel Pump	OFF
Pitot Heat	OFF

BEFORE LEAVING THE AIRCRAFT

Parking Brake	As required
Avionics Master Switch	OFF
Electrical Equipment	OFF
Mixture	IDLE CUT-OFF
Throttle	IDLE
Anti-Collision Light	OFF
Ignition Switch	OFF
Master Switch	OFF

PARKING

Control Stick	Attach control lock
Pitot Tube	Attach cover
Engine Air Intake	Attach cover
Mooring	Apply
Baggage Compartment Light	OFF
Doors	Locked

NORMAL AIRSPEEDS

If not stated otherwise, the following airspeeds are based on a maximum weight of 2977 lbs (1350 kg) and can be applied for lower weights. To reach the performance data, given in Section V, the airspeeds related to the corresponding weight must be kept.

TAKE-OFF (Gear DOWN, Flaps 15°,FULL THROTTLE)	
Lift-Off	62* KIAS
Above 50" Obstacle	74 KIAS
CLIMB (Gear UP, Flaps 0°, FULL THROTTLE)	
Best Rate of Climb, at Sea Level	98 KIAS
Best Rate of Climb, at 5000 ft	96 KIAS
Best Rate of Climb, at 10000 ft	94 KIAS
Best Angle of Climb, at Sea Level	76 KIAS
Best Angle of Climb, at 5000 ft	81 KIAS
Best Angle of Climb, at 10000 ft	85 KIAS
LANDING (Gear DOWN, Flaps 30°)	
Approach above 50" Obstacle	80* KIAS
Touchdown	65* KIAS
GO-AROUND (Gear DOWN, Flaps 30°)	
at Sea Level	72 KIAS
Rate of Climb at Sea Level	620 ft/min

* At no wind only; in turbulence, increase by 10 - 15 kts

AIRSPEED LIMITATIONS

Max. Permissible Airspeed from	
Sea Level to 12.000 ft	193* KIAS
at 16.000 ft	181* KIAS
at 20.000 ft	171* KIAS
Max. Structural Cruising Speed	157 KIAS
Maneuvering Speed at	
2977 lbs (1350 kg)	128* KIAS
2803 lbs (1271 kg)	124* KIAS
2119 lbs (961 kg)	107* KIAS
Max. Landing Gear Operating Speed	140 KIAS
Max. Landing Gear Extended Speed	140 KIAS
Max. Flap Extended Speed	102 KIAS
Max. Airspeed, Cowl Flaps Open	193 KIAS
Max. Demonstrated Crosswind Velocity for Take-Off and Landing	16 knots

* Linear Interpolation between given values.

EMERGENCY PROCEDURES

CHECK LISTS

ENGINE FAILURE DURING FLIGHT

Airspeed ..... 100 KIAS
Aux. Fuel Pump ..... ON
Mixture ..... FULL RICH
Fuel Selector ..... Fullest Tank
If engine does not windmill:
Ignition Switch ..... START
If engine does not fire again:

EMERGENCY LANDING WITHOUT ENGINE POWER

Glide Distance in Cruise Configuration:

1.65 NM per 1000 ft of altitude above ground

EMERGENCY LANDING WITHOUT ENGINE POWER

Airspeed ..... 90 KIAS
Mixture ..... IDLE CUT-OFF
Ignition Switch ..... OFF
Fuel Selector ..... CLOSE
Wing Flaps ..... Retracted
Landing Gear ..... Retracted
Cowl Flaps ..... Closed
ELT ..... ON
Transponder ..... CODE 7700
Seats and Seat Belts ..... CHECK secured
Loose Items ..... Secure
Appropr. Landg. Site .... Select
On final approach:
Landing Gear ..... DOWN or UP acc. to surface condition
Wing Flaps ..... 30°
Min. Airspeed. ..... 70 KIAS
Shortly before touchdown:
Master Switch ..... OFF

EMERGENCY LANDING WITH ENGINE POWER

Seat and Seat Belts ..... CHECK secured
Loose Items ..... Secure
ELT ..... ON
Mixture ..... FULL RICH
Propeller ..... HIGH RPM
Landing Gear ..... DOWN or UP acc. to surface cond.
On Final Approach:
Wing Flaps ..... 30°
Min. Airspeed ..... 70 KIAS
After touchdown:
Mixture ..... IDLE CUT-OFF
Fuel Selector ..... CLOSE
Master Switch ..... OFF
Ignition ..... OFF

EMERGENCY DESCENT FOR MINIMUM DESCENT TIME

Landing Gear ..... DOWN below 140 KIAS
Wing Flaps..... Retracted
Cowl Flaps..... CLOSED
Throttle..... IDLE
Propeller..... HIGH RPM
Bank Attitude ..... Depending on visibility up to 45°
Airspeed..... 140 KIAS

EMERGENCY GEAR-DOWN

Circ.-Breaker GEAR ACT ..... PULL
Landing Gear Switch..... DOWN
Throttle ..... IDLE
Airspeed..... 80 KIAS
Control Lever of Emergency Release Valve ..... PULL up
Indication of the 3 green lights..... CHECK

NOTE

If the landing gear does not extend it might be necessary to push the rudder pedals repeatedly and to reduce engine power and/or airspeed.

LANDING WITH LANDING GEAR RETRACTED

Seats and Seat Belts..... CHECK secured
Loose Items..... Secure
Mixture..... FULL RICH
Propeller..... HIGH RPM
Landing Gear..... Retracted

Select a smooth grass runway or a carpet of foam, if possible. Perform a headwind landing.

Engine Power..... As required
On Final Approach:
Wing Flaps..... 30°
Min. Airspeed. ..... 70 KIAS
Touchdown and skidding:
Elevator ..... PULL
Direction..... Maintain, using rudder
Mixture..... IDLE CUT-OFF
Fuel Selector ..... CLOSE
Master Switch..... OFF
Ignition..... OFF

INFLIGHT ELECTRICAL FIRE

WARNING

In any emergency situation, first priority for the pilot is to maintain control of safe flight attitude, altitude, and airspeed of the airplane. Countermeasures for the emergency situation are of secondary priority.

Master Switch..... OFF
Electrical Switches and Circuit-Breakers..... OFF
Cabin Heating..... OFF
If smoke and fire stop:
Master Switch..... ON
Switches and Circuit-Breakers ..... Reset stepwise until defective load has been found
Defective Load..... DISENGAGE
If smoke and fire continue:
Fire Extinguisher ..... Use
Emergency Descent ..... Perform

INFLIGHT ENGINE FIRE

WARNING

In any emergency situation, first priority for the pilot is to maintain control of safe flight attitude, altitude, and airspeed of the airplane. Countermeasures for the emergency situation are of secondary priority.

Mixture.....IDLE CUT-OFF
Fuel Selector .....CLOSE
Master Switch.....As required, OFF, if possible
Ignition.....OFF
Cabin Heating.....CLOSE
Front Fresh Air Outlets.....CLOSE
Emergency Descent .....Perform
Emergency Landing.....Perform

INFLIGHT CABIN FIRE

WARNING

In any emergency situation, first priority for the pilot is to maintain control of safe flight attitude, altitude, and airspeed of the airplane. Countermeasures for the emergency situation are of secondary priority.

Heating.....CLOSE
Ventilation.....As required
Fire Extinguisher .....Use
If fire continues:
Emergency Descent .....Perform
Emergency Landing .....Perfom

NO OIL PRESSURE INDICATION

Engine Power..... Reduce
Engine RPM ..... Reduce
Oil Temperature..... CHECK

- If oil temperature remains constant land at the next appropriate airfield within reach.
- If oil temperature increases prepare for an emergency landing.

HIGH OIL OR CYLINDER-HEAD TEMPERATURE

Cowl Flaps..... OPEN
Airspeed..... Increase (Descent)
Mixture..... FULL RICH
Engine Power..... Reduce

FUEL SYSTEM FAILURE

Aux. Fuel Pump ..... ON
Mixture..... FULL RICH
Fuel Gauges..... CHECK
Fuel Selector ..... Fullest Tank
Fuel Flow Indication ..... CHECK

UNINTENTIONAL SPIN

Rudder ..... Apply **full opposite** to spinning direction and hold

Elevator ..... Neutral to slightly nose down

Aileron ..... Neutral

Throttle ..... Idle

If spinning stops:

Wing Flaps ..... UP

Rudder ..... Neutral

Elevator ..... Level off softly

Intentionally left blank