MOONEY AIRCRAFT CORPORATION
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FAA APPROVED

AIRPLANE FLIGHT MANUAL SUPPLEMENT

FOR

MOONEY M20J, M20K, M20L, M20M, M20R

with
KNS 81 RNAV SYSTEM

Aircraft Serial No._____

Aircraft Reg. No._____

This supplement must be attached to the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual applicable when the KNS 81 Digital Area Navigation System is installed by Mooney Aircraft Corporation.

The information contained herein supplements or supersedes the basic Airplane Flight Manual only in those areas listed herein. For limitations, procedures, and performance information not contained in this document, consult the basic Airplane Flight Manual.

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LOG OF REVISIONS

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C	ALL PAGES	Added M20R to heading of all pages..	*Brian Hancock*	7/20/94

The revised portions of affected pages are indicated by vertical black lines in the margin.

SECTION I - GENERAL

This manual is to acquaint the pilot with the operation of the KNS 81 Navigation System. The airplane must be operated within the limitations herein specified.

1. SYSTEM DESCRIPTION

The King KNS 81 is a navigation system combining a 200 channel VOR/Localizer receiver, a 40 channel glideslope receiver and a digital RNAV computer with a capability of preselection and storage of 9 VOR/LOC frequencies and 9 sets of RNAV waypoint parameters. A DME System must be used in conjunction with the KNS 81.

The KNS 81 can be operated in any one of three basic modes: VOR, RNAV, or ILS. To change from one mode to another the rotary MODE selector knob on the left side of panel is rotated, except that the ILS Mode is entered automatically whenever an ILS frequency is channeled as the ACTIVE frequency. The display will annunciate the mode by lighting a message beside the WPT display, except in the ILS mode in which case the RAD & DST displays are blanked to denote the ILS mode. In addition to the standard VOR & RNAV enroute (RNV) modes, the KNS 81 has a constant course width or parallel VOR mode (VOR-PAR) and an RNAV approach mode (RNV APR). The same rotary MODE selector knob is used to place the unit in either of these secondary modes.

All waypoint information, station frequency, waypoint distance and waypoint radial are entered with the increment/decrement rotary switch on the right side of the panel and displayed in their respective displays. The small knob affects the least significant digits while the large knob changes the most significant digits. The tenth's position of waypoint radial and distance can be changed by pulling the small knob to the out position. The type of data being selected is indicated by the illuminated carets (> <) located by either FRQ, RAD or DST. Frequency, radial or distance information for a waypoint can be selected sequentially by pressing the "DATA" push button. The increment/decrement switch changes only the information being displayed with the carets.

The KNS 81 can store frequency, radial and distance information for up to nine waypoints. The waypoint number of the data being displayed is located above the message WPT. The waypoint number is changed by rotating the WPT selector knob (small center knob) on the left side of the panel. If the waypoint in use is different from the displayed waypoint (WPT blinking), pressing the USE button will cause the displayed WPT to become the waypoint in use.

2. DISPLAYS

A. FRQ, RAD, DST Display

1) FRQ Display

Displays frequency from 108.00 to 117.95 MHz in increments of .05 MHz. Least significant digit displays only zero or five.

2) RAD Display

Displays ground station radial on which waypoint is located from 0.0 to 359.9 degrees.

3) DST Display

Displays the offset distance of the waypoint from the ground station over a range of 0.0 to 199.9 NM.

B. VOR, PAR, RNV, APR Displays

System mode lights

C. WPT Display

Displays waypoint number (1 to 9) of data being displayed.

D. Carets (> <) Display

Indicates which waypoint data (FRQ, RAD or DST) the increment/decrement rotary switch will change.

E. DME Indicator (Remote)

Displays NM to/from the waypoint/station, KT ground speed & MIN time to the waypoint/station. Also, the waypoint radial is displayed whenever the KNS 81 RAD Button is pressed. Consult the DME Supplement or additional information. F.RMI Display (Optional)

Displays the bearing to the waypoint/station.

3. CONTROLS

A. WPT/Mode Control

Dual concentric knobs.

1) The outer knob selects the MODE of unit operation. Turning the knob clockwise causes the mode to sequence thru VOR, VOR PAR, RNV, RNV APR and then back to the VOR mode.

2) The center knob selects the WPT to be displayed. Turning the knob causes the displayed waypoint to increment by one thru the waypoint sequence of 1,2,....8,9,1.

B. USE Button

Momentary pushbutton which, when pressed, causes the active waypoint to take on the same value as the displayed waypoint.

C. RTN Button

Momentary pushbutton which, when pressed, causes the active waypoint to return to the display.

D. RAD Button

Push on, push off button which, when pushed on, causes the radial from the waypoint and "F" to be displayed on the remote DME display.

E. CHK Button

Momentary pushbutton which, when pressed, causes the raw radio data from the NAV Receiver and DME to be displayed. The radial from the VOR ground Station will be displayed on the RAD display and the distance from the station will be displayed on the DST display. There is no effect on any other data output.

F. DATA Button

Momentary pushbutton which, when pressed, causes the caret (> <) display to change from FRQ to RAD to DST and back to FRQ.

G. OFF/PULL ID Control

Rotary switch/potentiometer which, when turned clockwise, applies power to the KNS 81 and increases NAV audio level. The switch may be pulled out to hear VOR ident.

H. DATA INPUT Control

Dual concentric knobs with the center knob having an "in" and "out" position.

1) Frequency Data

The outer knob varies the 1 MHz and 10 MHz digits and the center knob varies the frequency in .05 MHz increments with carry to/from the .1 MHz digit regardless of whether the switch is in its "in" or "out" position.

2) Radial Data

The outer knob varies the 10 degree digit with a carryover occurring from the tens to hundreds position. The center knob in the "in" position varies the 1 degree digit and the "out" position varies the 0.1 degree digit.

3) Distance Data

The outer knob varies the 10 NM digit with a carryover occurring from the tens to hundreds place. The center knob in the "in" position varies the 1 NM digit and in the "out" position varies the 0.1 NM digit.

SECTION II - LIMITATIONS

1. The Area Navigation mode may be used as the primary navigation system under IFR conditions on approved approach procedures, approved airways, and random area navigation routes only when approved by Air Traffic Control.

2. The Area Navigation or VOR PAR mode can only be used with colocated facilities (VOR & DME signals originate from the same geographical location).

SECTION III - EMERGENCY PROCEDURES

CAUTION
DME MAY UNLOCK DUE TO LOSS OF SIGNAL WITH CERTAIN COMBINATIONS OF DISTANCE FROM STATION, ALTITUDE AND ANGLE OF BANK.

1. If NAV flag appears while in the Area Navigation mode, use CHK Button to check for validity of Raw DME and VOR Data.

2. IF VOR or DME information is intermittent or lost, utilize remaining operational navigation equipment as required.

3. If NAV flag appears and/or DME information is lost during an approach, execute published missed approach and utilize another approved facility.

SECTION IV - NORMAL PROCEDURES

1. PREFLIGHT

AREA NAVIGATION FUNCTIONAL TEST

The following procedure applies only to airports equipped with, or in range of, a co-located VOR/DME station.

1) Place the KNS 81 in VOR mode.

2) Find and record the angle from the VOR station by centering the course deviation needle with the TO/From flag giving a "FROM" indication.

3) Program a waypoint radial angle equal to the OBS value determined in Step 2.

4) Program a waypoint distance equal to the indicated DME value.

5) Place the KNS 81 in RNV.

The KNS 81 is operating properly if the distance waypoint is 0 + 1.0 NM and the course deviation needle is within a dot of being centered.

2. PROGRAMMING

Pertinent information (waypoint number, station frequency, waypoint radial, and waypoint distance) for up to nine waypoints is entered into the memory. Programming may be completed prior to takeoff or during the flight. Any combination of navigational facilities (RNAV waypoint, VOR/DME, ILS) may be loaded into the computer; however, it is desirable that each facility be numbered and loaded in the sequence it is to be used.

A. RNAV WAYPOINTS

1) Turn the system on by rotating the ON/OFF switch clockwise.

2) Put the waypoint 1 in the WPT window by turning the WPT knob. Turn the knob in either direction to get "1".

3) Select the waypoint 1 frequency using the data input controls which are the two concentric knobs on the right.

4) Select the waypoint 1 radial by depressing the DATA button. This will move the caret (> <) from FRQ to RAD. Select the new radial with the data input controls.

5) Select the waypoint 1 distance by again depressing the DATA button. This will move the (> <) from RAD to DST. Select the new distance with the data input controls.

6) This completes the programming for the first waypoint. Follow these procedures for all selected waypoints up to a maximum of nine.

B. CONVENTIONAL VOR

1) The programming technique for conventional navigation directly toward or away from a VOR facility without a colocated DME is similar to that for RNAV waypoints. Inputting the waypoint number and frequency into the memory is accomplished in the same manner. The RAD and DST displays will display dashes during VOR and VOR PAR operation.

C. ILS APPROACH (Front course and Back course)

1) Programming an ILS approach is accomplished in the same manner as programming conventional VOR.

D. MISSED APPROACH

1) If the published missed approach utilizes an RNAV waypoint or VOR facility, it may be entered into the memory any time prior to the approach. This is accomplished in the same manner set forth in CONVENTIONAL VOR and RNAV WAYPOINTS in this section.

E. INFLIGHT

1) Preset waypoints may be recalled from memory and put into active use as required.

Turn the WPT knob as required to select the desired waypoint. The preset waypoint number, frequency, radial and distance will appear in their respective displays. The WPT display will blink to indicate that the waypoint displayed is other than the active waypoint.

2) Verify that the data if correct.

NOTE
REVISIONS TO THE WAYPOINT DATA CAN BE PROGRAMED AT THIS TIME BY ENTERING THE NEW WAYPOINT PARAMETERS.

3) When return to the active waypoint is desired press the RTN button. The active waypoint along with its data will be displayed.

4) When navigation to the displayed (blinking WPT) waypoint is desired, press the USE button. The WPT display will cease blinking and the displayed waypoint becomes the active waypoint.

5) The raw VOR and DME data can be checked at any time by pressing the CHK button. The radial from the VOR will be displayed above RAD and the DME distance will be displayed above DST.

3. RNAV OPERATION

If the system is receiving valid signals from a colocated VOR-DME facility, it will supply linear deviation information to the Horizontal Situation Indicator (or Course Deviation Indicator). Enroute (RNV) sensitivity, available by turning the MODE selector knob until RNV is displayed, provides a constant course width of +/- 5 NM full scale.

Approach (RNV APR) sensitivity, available by turning the MODE selector knob until RNV APR is displayed, provides a constant course width of +/- 1 1/4 NM full scale. Approach sensitivity should be selected just prior to final approach course interception. Time and distance to the waypoint, and computed groundspeed are displayed on the DME display.

4. CONVENTIONAL VOR OPERATION

VOR or VOR-PAR modes are selected by turning the MODE selector knob until VOR or VOR PAR is displayed. In VOR mode the remote DME is automatically tuned when the KNS 81 is selected as the tuning source. Upon lock-on, distance, groundspeed and time to the VORTAC station will be displayed on the DME display. The HSI (CDI) will display conventional angular crosstrack deviation from the selected course (+/- 10 full scale). In VOR-PAR mode, operation is identical to VOR except the HSI (CDI) will display crosstrack deviation of +/- 5 NM full scale from the selected course. Course width will be constant irrespective of distance from the VORTAC.

Anytime the RAD button is engaged, the radial from the waypoint/station will be displayed on the DME knots display along with an "F" on the DME time to station display.

NOTE
**THE" RAD" SWITCH IS NOT THE MOMENTARY TYPE, THEREFORE, THE
SWITCH MUST BE PRESSED AGAIN FOR THE NORMAL DME INFORMATION
TO BE DISPLAYED.**

5. ILS OPERATION

Whenever an ILS Frequency is put "IN USE" the mode display will remain the same (either VOR, VOR-PAR, RNAV, RNAV APR displayed) but the RAD & DST displays will be blanked. Absence of the LOC/GS functions is annunciated by the NAV and GS flags in the HSI (CDI). Only angular deviation is provided in the ILS mode.

6. RNAV APPROACH

The RNAV Approach (RNV-APR) mode may be used for runway location (by placing a waypoint at the approach end of the runway) during an approach to an airport. Turn the MODE selector knob to select RNV-APR the deviation needle on the HSI (CDI will display crosstrack deviation of +/- 1 1/4 NM full scale). All other aspects of the RNV-APR mode are identical to the RNV mode.

SECTION V thru X

No change.