CENTURY
FLIGHT SYSTEMS, INC.

CENTURY

NSD360A
NSD-360A (SLAVED)
NSD-1000 (SLAVED)
COMPASS SYSTEMS

PILOT'S OPERATING HANDBOOK

10-01-99
68S85

FOREWORD

The NSD-360A and NSD-1000 families of instruments represent a significant break through in low-cost compass and display systems. For maximum enjoyment, may we suggest that you do two things:

1. Read this handbook.
2. Spend some VFR flight time with the equipment to learn how to work with your autopilot and instrumentation so that you may enjoy the convenience and benefits to the fullest.

This handbook has been designed to provide operating techniques for the NSD-1000 and NSD-360A when used with an autopilot such as the Century Flight Systems, Inc. Century IIB, III or Altimatic III series using the 1C388-2 radio coupler.

These techniques apply equally to the NSD-360A and the NSD-1000 when used without autopilot tie-in to provide more enjoyable and convenient manual flight. Of course references to the radio coupler function should be disregarded.

NOTE

This handbook may also be used with ARINC compass systems such as the PN-101, KCS-55A, etc., for operating techniques using the 1C388-3 ARINC radio coupler, provided the operating differences and control location differences are properly noted.

CONTENTS

INTRODUCTION

All versions have in common a servo'd heading card system to eliminate gyro drag and friction. This provides low drift performance in unslaved versions.

The standard NSD-360A is the unslaved pneumatic version with a square front bezel for a standard 3 ATI instrument hole. Standard features include:

1. VOR/Localizer left-right needle with Omni Course Resolver.
2. Glideslope needle and flag.
3. Internal lighting.

Available NSD-360A options include:

1. Slaving.
2. RMI Bootstrap.

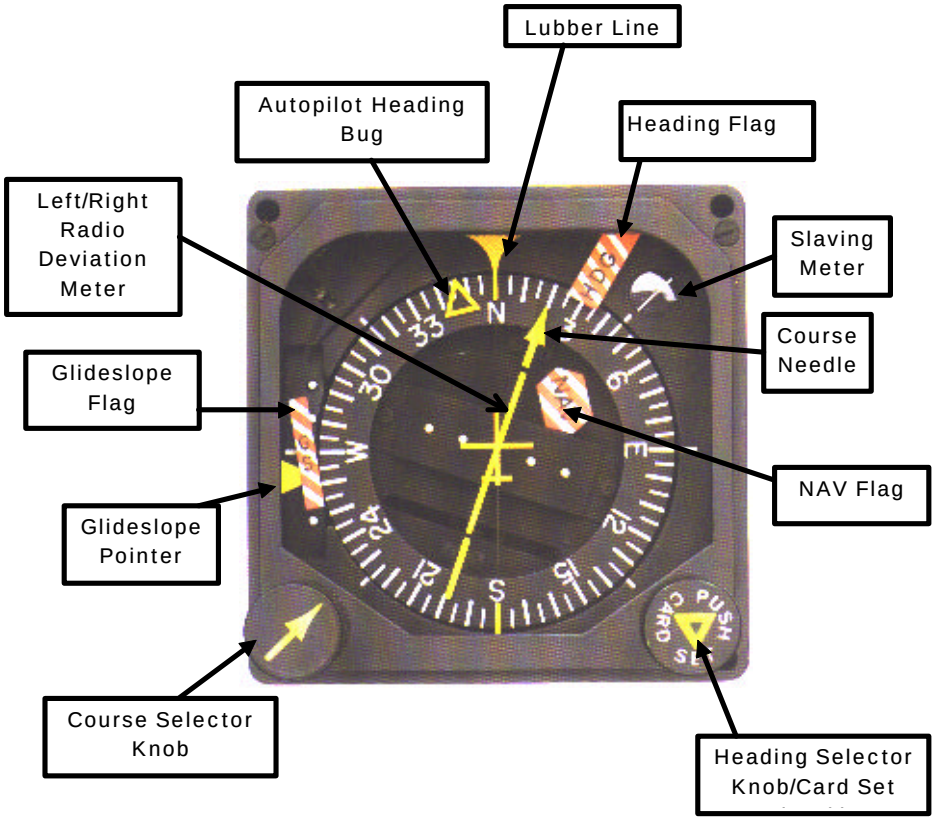
The NSD-1000 (DC electric version) also features the ARINC square bezel (3 ATI) with the following standard features:

1. VOR/Localizer left-right needle with Omni Course Resolver.
2. Glideslope needle and flag.
3. Internal lighting.
4. Slaving.

Available NSD-1000 options include:

1. RMI Bootstrap.

The NSD-360A/1000 is designed to operate with external VOR/Localizer converters and RNAV equipment meeting and requiring ARINC needle and resolver characteristics.


Lubber Line
Autopilot Heading Bug
Heading Flag
Left/Right Radio Deviation Meter
Slaving Meter
Course Needle
Glideslope Flag
NAV Flag
Glideslope Pointer
Course Selector Knob
Heading Selector Knob/Card Set

NSD-360A

NSD-360A

The NSD-360A (Navigation Situation Display) is an integrated HSI instrument combining an air driven gyro and an electrically servo'd heading card with VOR/Localizer and glideslope information.

NOTE: Do not set heading card when turning as the magnetic compass and magnetic flux detectors in slaved systems are not reliable references when the aircraft is banked.

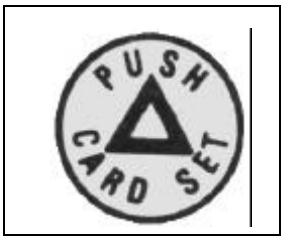
The NSD-360A has an optional slaving feature that requires initial heading setting on start-up. Subsequent resetting of the heading card, required manually on non-slaved versions, is automatically accomplished.

The NSD-360A has incorporated a heading warning flag to warn of loss of either air or electric power. Appearance of the flag during flight should be sufficient grounds to question the validity of displayed heading. In slaved versions, the slaving meter should oscillate about a 45° point to show that the slaving circuits are accomplishing their function. Should the needle remain motionless, vertical, or horizontal for an extended period (two minutes) in level flight, the heading should be manually set so that the slaving meter is at the 45° point and then observe the performance of the heading card. If slaving difficulties are encountered, set the slaving mode switch to SL#2 or free gyro. In free gyro mode, the instrument must be periodically reset to manually counteract the effects of gyro precession.

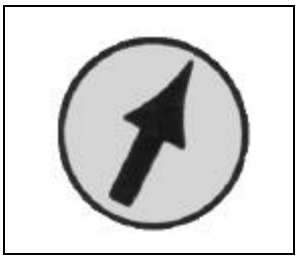
NSD-1000

The NSD-1000 offers the same functions as the NSD-360A. The NSD-1000 incorporates an electrically driven gyro. Appearance of the heading flag is to warn of loss of gyro speed or total electrical power loss to the instrument.

NSD-360A and NSD-1000 CONTROLS

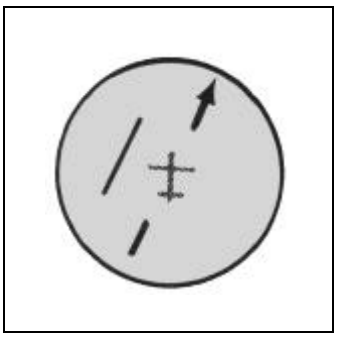


The heading selector/card set is used to move the heading bug relative to the heading card. It is also used to set the heading card to the aircraft heading by pushing in and rotating card. When setting has been accomplished the knob is released. The heading selector should not be pushed in when setting the heading bug.



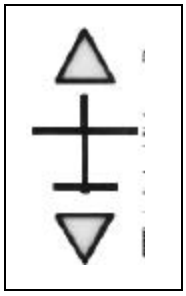
The course selector knob is used to adjust the autopilot course selector arrow to the desired course. Selection of the autopilot course automatically sets the internal VOR resolver to the identical VOR radial. Readout of VOR left-right information is made by observing the center segment of the course arrow

DISPLAYS



VOR/Localizer left-right deviation is display by the center segment of the autopilot course radio arrow. Note that the airplane in the center of the instrument display gives a pictorial representation of the navigation situation. In the illustration, the aircraft is approaching the desired radial at an approximate 20° intercept. When operating in the VOR mode, the display always gives the correct display if the heading card is matched to the magnetic heading. When operating in the localizer mode, the course arrow should be placed on the INBOUND front course heading. The display will then be correct for either front course or back course.

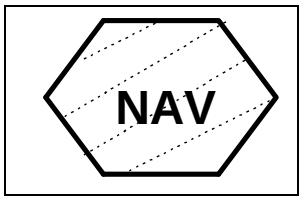
During back course approaches, the display will be inverted and the tail of the course arrow will indicate the back course heading. The left-right needle sensing will require turns <u>toward</u> the needle for course centerline.



“TO” FLAG “FROM” FLAG

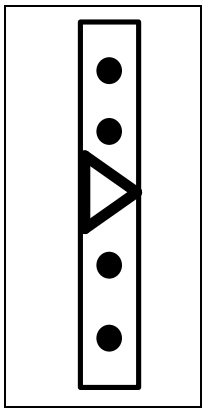
The TO and FROM flags point in the direction of the VOR station. TO Or FROM is pictorially represented. In the localizer mode, neither a “TO” or a “FROM” flag will appear. The same is true for either front or back course.

NAV WARNING FLAG



The red and white striped NAV warning flag will appear if the signal being received is not suitable for NAVigation.

GLIDESLOPE POINTER



The GLIDESLOPE meter on the left side of the instrument displays conventional glideslope information - location of glideslope centerline is pictorially represented.

The red and white striped **GLIDESLOPE FLAG** is on the left side of the instrument. It is arranged so that it will obstruct view of the glideslope meter if a glideslope signal is not available or is unsuitable for guidance..

IMPORTANT NOTICE

If the NSD360A/1000 is to be used in a shared display role (i.e. indicating VHF NAV and RNAV or LORAN), the incorporation of the Century Nav Data Selector is recommended.

NSD-360A and NSD-1000
OPERATING TECHNIQUES

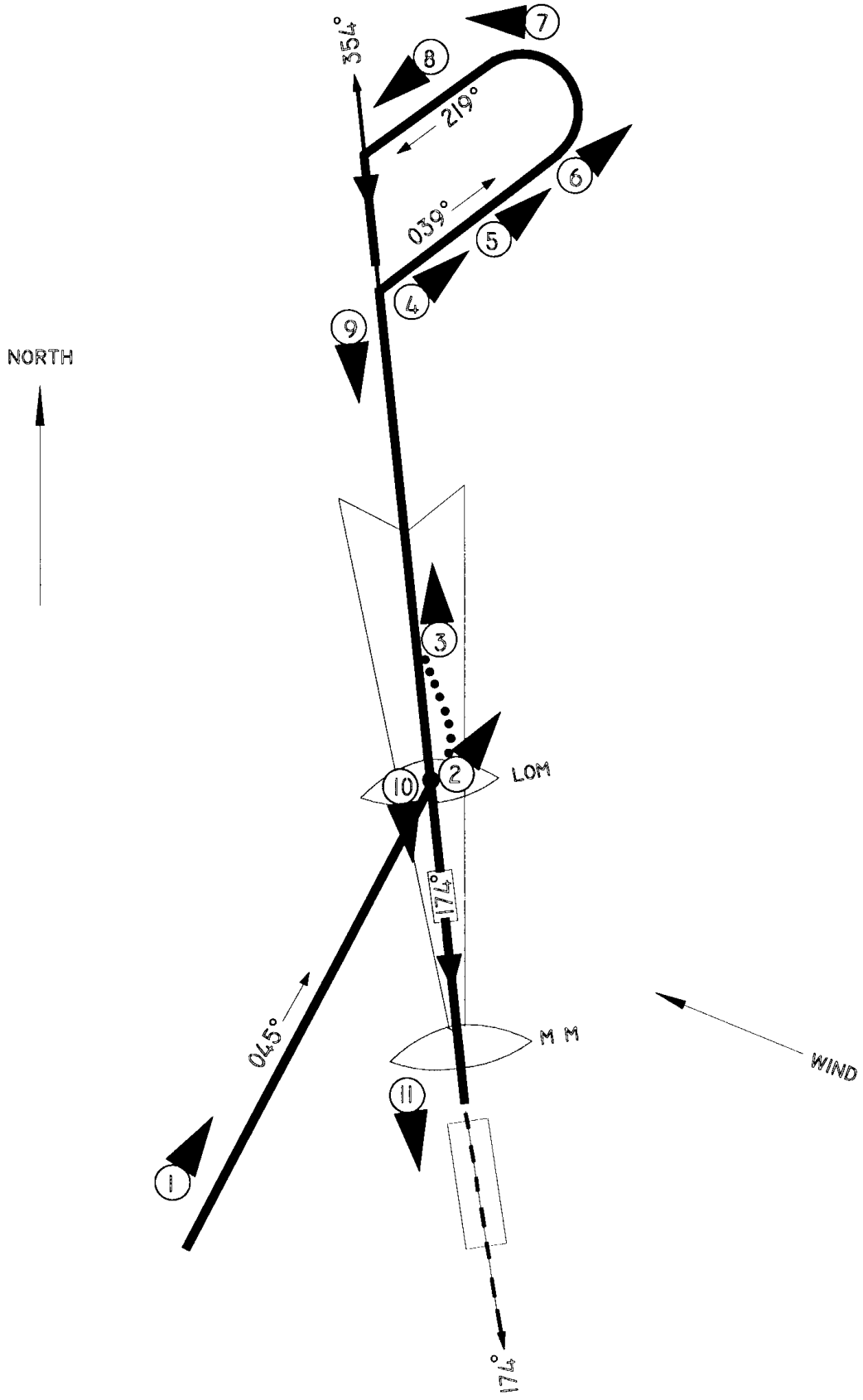
In the pages that follow we have included techniques for:

Localizer Approaches
Back Course Approaches
VOR Approaches
VOR Navigation

NOTE

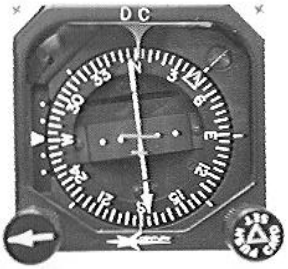
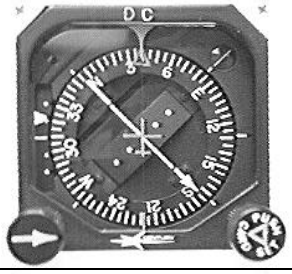
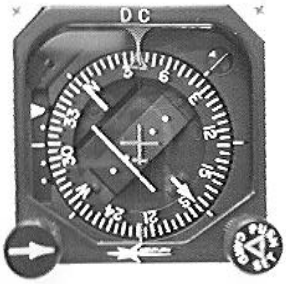
These techniques are APPLICABLE to other compass systems such as the PN101, KCS-55A, etc., if the 1C388-3 radio coupler is used.

LOCALIZER APPROACH



LOCALIZER (LOC) APPROACH

See also Autopilot Manual for Glideslope Coupler Techniques

PSN	NSD-360A NSD-1000	RADIO COUPLER	REMARKS
1		HDG	The localizer or ILS approach begins with a transition from the enroute structure to the outer compass locator (LOM). The radio coupler is in the HDG position so the pilot may control intercept location. The **Inbound Front Course** direction is selected with the course arrow. Note: If a 45° intercept is desired, the **LOC REV** position may be selected after radio course arrow is positioned.
2		**LOC REV**	As the LOM is reached, select **LOC REV** on the radio coupler. Coupler will intercept and track **outbound.**.
3		**LOC REV**	Altitude for this phase of the approach is controlled using the Altitude or Pitch Command Mode. The outbound procedure turn heading may be preselected with the heading bug.
4		**HDG**	Select the HDG position on the radio coupler to begin procedure turn.
5		**HDG**	Proceed outbound in procedure turn for sufficient time to assure proper re-interception .

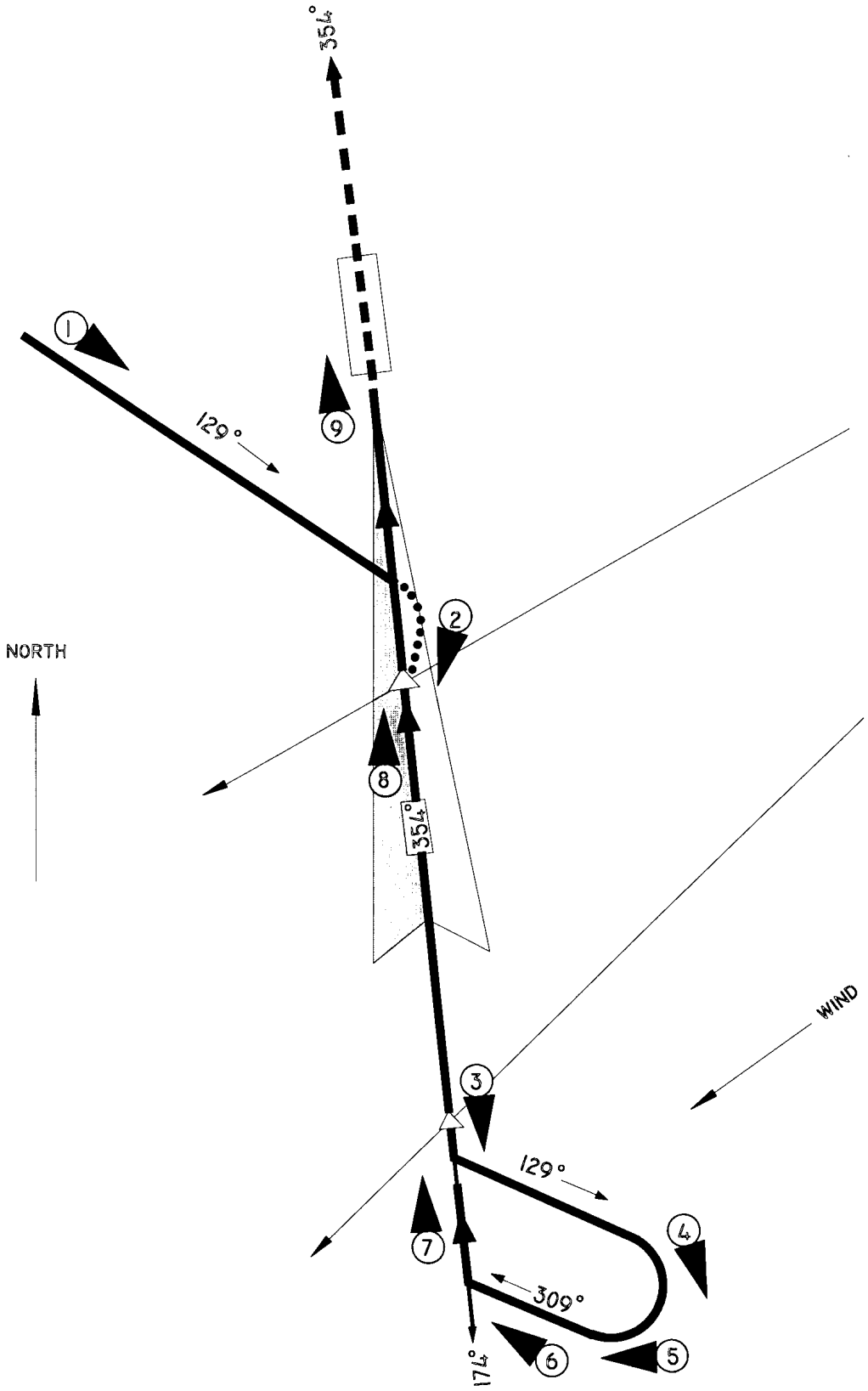
LOCALIZER (LOC) APPROACH Con't

PSN	NSD-360A NSD-1000	RADIO COUPLER	REMARKS
6		**HDG**	Lead aircraft through procedure turn by moving the heading bug initially about three-fourths of the way around the card in the desired direction of turn.
7		**HDG**	As the aircraft turns, move the heading bug to the 45° intercept heading. If intercept other than 45° is desired (radar vectored) select intercept with HDG bug and delay selection of LOC NORM. CAUTION: Glideslope coupler arming does not start until LOC NORM is selected. Approximately 20-30 seconds must elapse with GS needle up for arming to occur.
8		**LOC NORM**	Select LOC NORM—coupler will execute 45° intercept. Note: Some bracketing upon intercept is normal as coupler determines crosswind; bracketing may be minimized by avoiding excess intercept speed.
9		**LOC NORM**	After intercept, coupler will compensate for up to 15° crosswind correction. Slight additional crosswind correction for localizer approaches may be achieved by moving course arrow to lubber line after initial crosswind correction has occurred.
10		**LOC NORM**	If typical ILS glideslope coupling will occur as the outer marker is reached. Extend gear and adjust power to maintain glideslope. Missed approach may be pre-selected with heading bug.

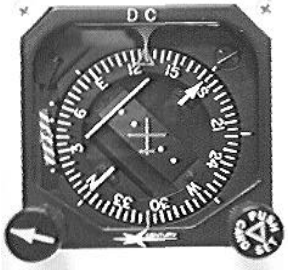
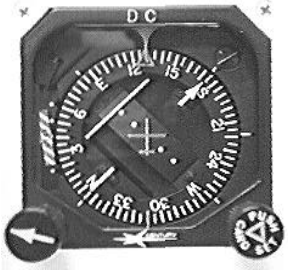
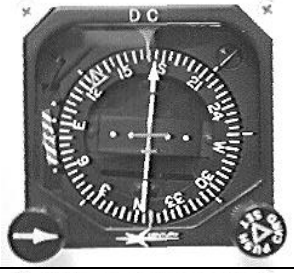
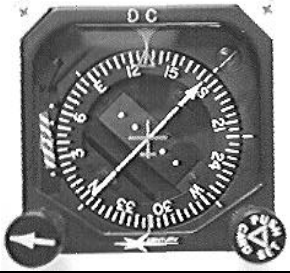
LOCALIZER (LOC) APPROACH Con't

PSN	NSD-360A NSD-1000	RADIO COUPLER	REMARKS
11		**HDG**	If missed approach is required, see AFM Supplement for correct procedures in your model aircraft.

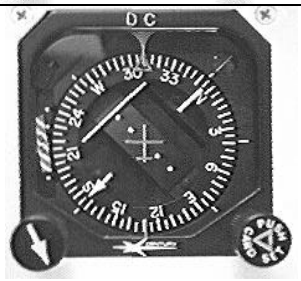
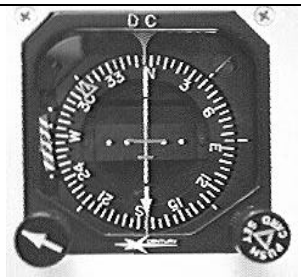
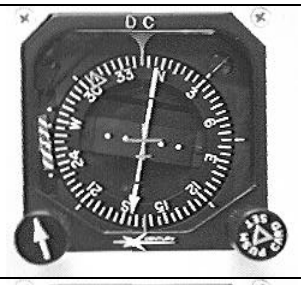
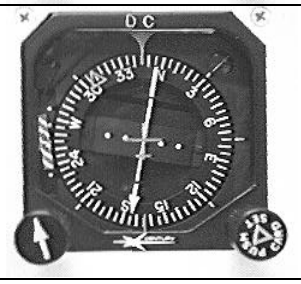
Localizer Back Course



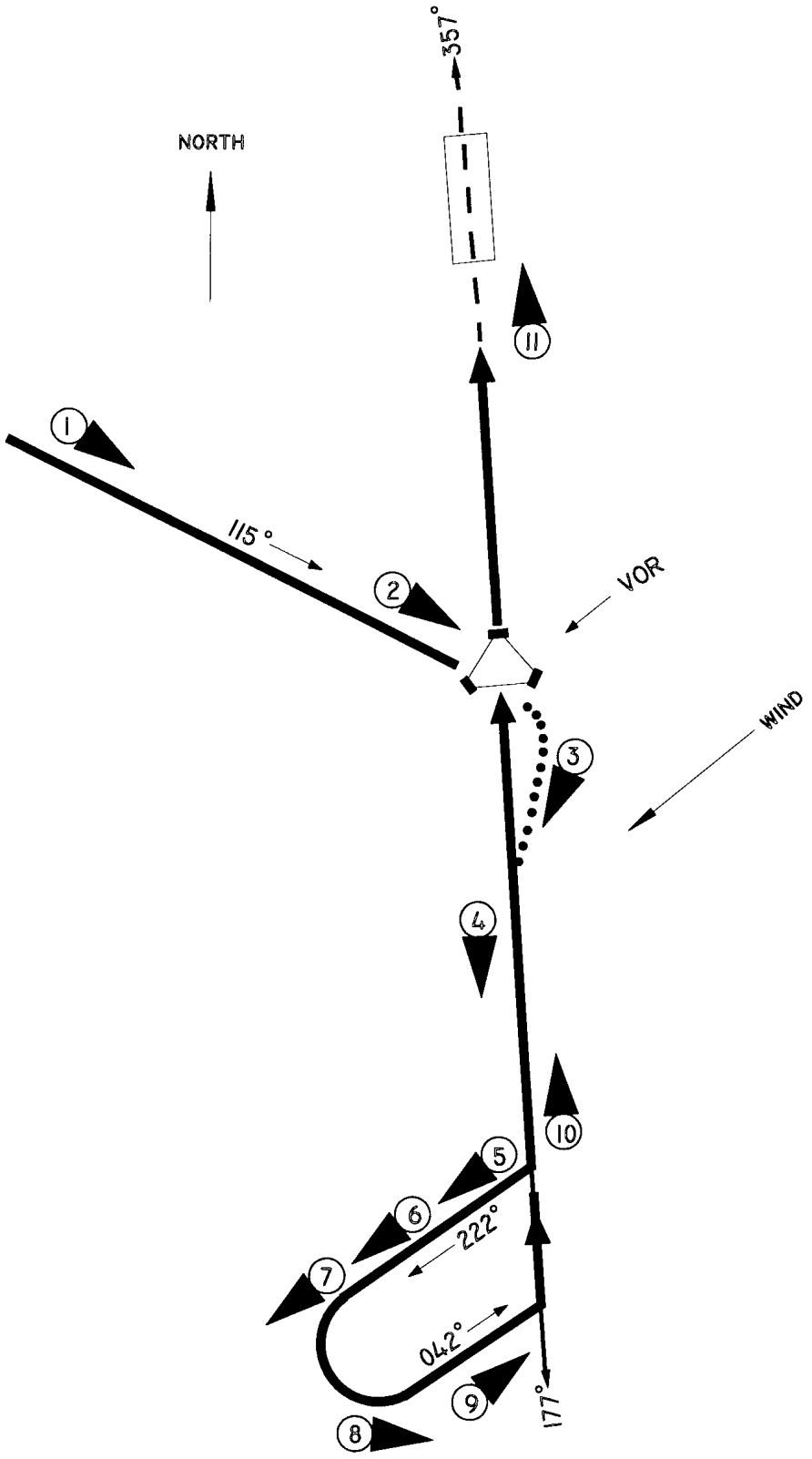
LOCALIZER BACK COURSE (LOC BC)

PSN	NSD-360A NSD-1000	RADIO COUPLER	REMARKS
1		**LOC NORM**	The Localizer Back Course approach begins with a transition from the enroute structure to an intercept with the back course **outbound.** The **Inbound Front Course** is set on the course arrow and a 45° intercept is achieved by selecting LOC Normal on the Radio Coupler.
1A		**HDG**	Alternate - If desired, the intercept may be accomplished semi-automatically with the HDG bug selecting the HDG mode on the Radio Coupler. When automatic tracking is desired, select LOC NORM on the Radio Coupler.
2		**LOC NORM**	As outbound tracking begins, select outbound procedure turn heading with heading bug.
3		**HDG**	When outbound procedure turn heading is desired, select HDG mode on Radio Coupler. Fly outbound for sufficient time to permit proper re-interception.
4		**HDG**	Lead aircraft through procedure turn initially by turning the heading bug approximately three-fourths distance around the card in the desired direction of turn.

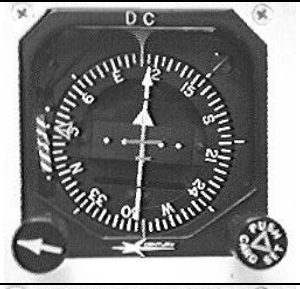
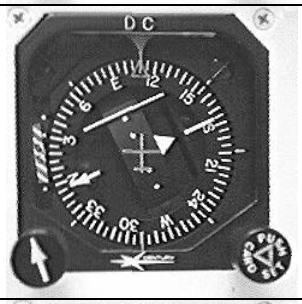
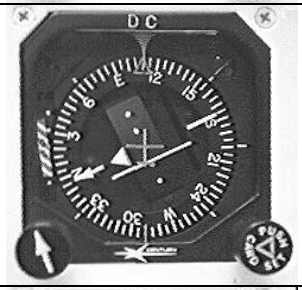
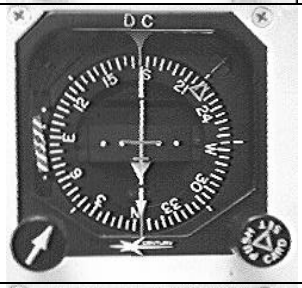
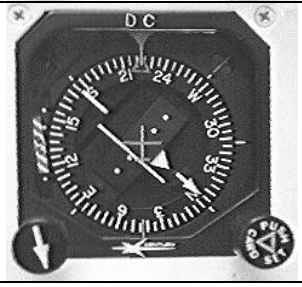
LOCALIZER BACK COURSE (LOC BC) Con't

PSN	NSD-360A NSD-1000	RADIO COUPLER	REMARKS
5		**HDG**	As the aircraft turns, set heading bug to inbound procedure turn heading.
6		**LOC REV**	For 45° intercept to back course inbound select **LOC REV** on Radio Coupler. Note: **Inbound Front Course** direction must be under course arrow or incorrect operation will result.
7		**LOC REV**	After intercept, Radio Coupler will correct for up to 15° crosswind. If additional crosswind correction is needed move **"Tail"** of course arrow nearer lubber line after initial crosswind correction is accomplished.
8		**LOC REV**	During the LOC BC approach, altitude is controlled using the pitch command in autopilots so equipped.
9		**LOC REV** OR **HDG**	For missed approach, either remain on localizer or set heading bug and select HDG on Radio Coupler as appropriate for procedure.

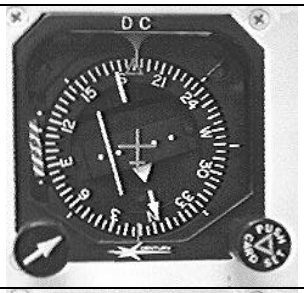
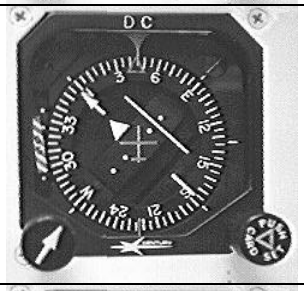
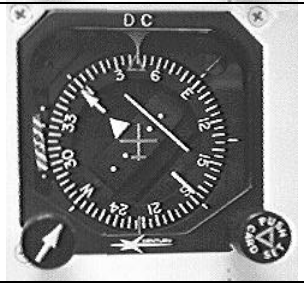
VOR APPROACH



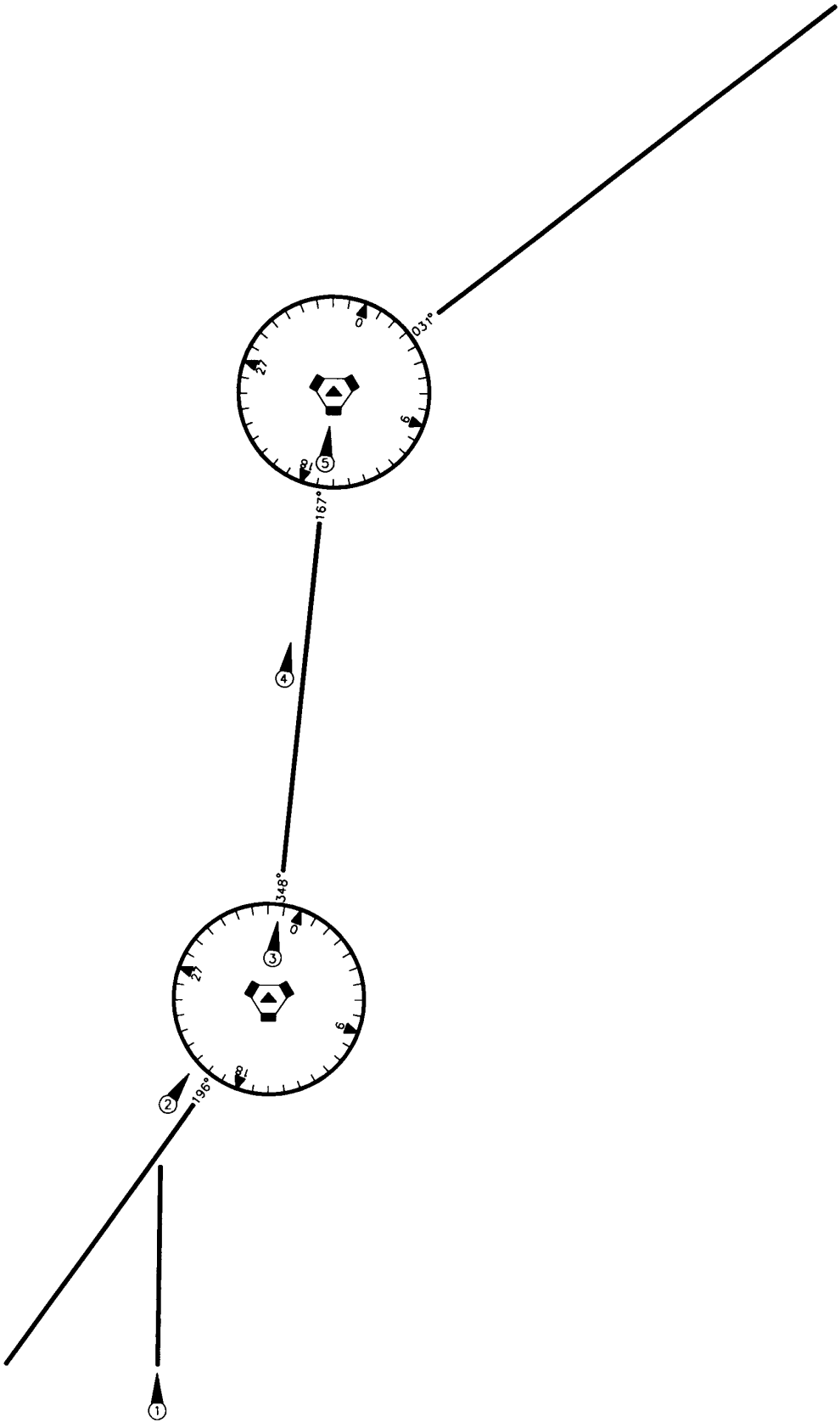
VOR APPROACH

PSN	NSD-360A NSD-1000	RADIO COUPLER	REMARKS
1		**NAV**	The VOR approach usually begins from an enroute situation.
2		**HDG**	As the VOR is neared, match the heading bug to the lubber line and select HDG on the Radio Coupler. The course arrow should now be set for the **Inbound** VOR radial (in the Illustration357°)
3		**LOC REV**	As the VOR is crossed, select **LOC REV** ON THE Radio Coupler to intercept and track the **outbound** VOR radial (177°).
4		**LOC REV**	While the coupler is intercepting and tracking outbound, the outbound procedure turn heading may be pre-select with the heading bug.
5		**HDG**	To begin the procedure turn, select HDG on the Radio Coupler.
6		**HDG**	Proceed outbound until sufficient time has elapsed to assure proper re-interception. This would be an excellent time to recheck the course arrow/OBS for the inbound course (in illustration 357°).

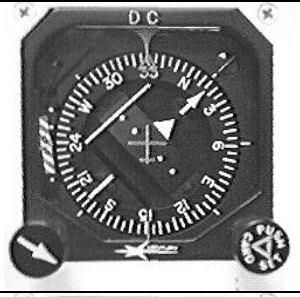
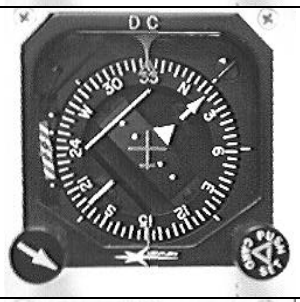
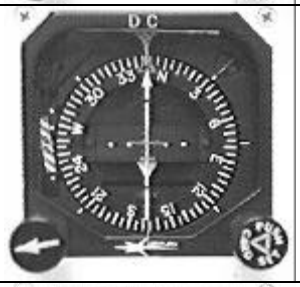
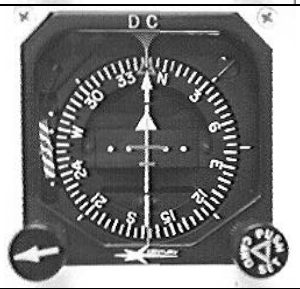
VOR APPROACH Con't

PSN	NSD-360A NSD-1000	RADIO COUPLER	REMARKS
7		**HDG**	Lead aircraft through procedure turn by moving the heading bug initial about three-quarters of the way around the card in the desired direction of turn.
8		**HDG**	As the aircraft turns, move the heading bug to the desired intercept heading.
9		**OMNI**	Select **OMNI** on the Radio Coupler for a 45° intercept to the VOR course.
10		**OMNI**	After intercept, the radio coupler will correct for up to 15° crosswind; do not compensate for excessive crosswind by moving course selector . If a course change is required at the VOR for the final approach segment, simply move the course selector to the new course as the VOR is crossed. NOTE: Heading excursions at the VOR may be minimized by matching the heading bug to the lubber line and momentarily switching to HDG for station passage them returning to OMNI.
11		**HDG**	For missed approach, set heading bug and select HDG or OMNI as appropriate for the approach procedure.

VOR Navigation



VOR NAVIGATION

PSN	NSD-360A NSD-1000	RADIO COUPLER	REMARKS
1		**NAV**	45° intercept to a selected radial is automatically accomplished by setting the course arrow/OBS to the desired course and selecting **NAV** on the Radio Coupler.
1A		**HDG**	Alternate If desired ,a semi-automatic intercept is accomplished by setting the heading and selecting HDG on the radio coupler until the desired course is neared and then selecting “NAV”. .
2		**NAV**	The Radio Coupler will compensate for up to 15° crosswind in the NAV mode. Note: Heading excursions over VOR may be minimized by matching the heading bug to the lubber line and momentarily switching to HDG as the station is crossed.
3		**NAV**	If course changes are required at a VOR, simply reposition the course arrow/OBS to the new course.
4		**NAV**	Station switching is accomplished by re-channeling the NAV Receiver to the station ahead and repositioning the course arrow/OBS as required.

If more positive course tracking is desired, OMNI may be used for VOR navigation if desired.

NOTE: On extremely noisy VOR stations (those with nervous needles), it may not be possible to achieve comfortable tracking in NAV. The Radio Coupler cannot distinguish between needle motion caused by noise and needle motion caused by valid course error information; it tries to follow both. Under extremely noisy conditions, it may be desirable to revert to HDG and navigate cross-country with the heading bug.

EMERGENCY OPERATION

Appearance of HDG Flag:

1. Check air supply gauge (vac or pressure) for adequate air supply (4 in. Hg min.)
2. Check NSD-360A/NSD-1000 circuit breaker.
3. Observe display for proper operation.

To disable heading card – pull circuit breaker and use magnetic compass for directional data.
Note: If heading card is not operational, autopilot should not be used.

NSD-360A/NSD1000

With card disabled -- VOR Localizer, and Glideslope displays are still functional; use card set to rotate card to aircraft heading for correct picture.

Slaving Failure - (i.e. failure to self correct for gyro drift):

1. Check slave switch (if installed) for SL-1# PSN.
2. Check for HDG Flag.
3. Check NSD circuit breaker.
4. Reset heading card while observing slaving meter.
5. Select slaving amplifier #2 (SL-#2) if available.
6. Reset heading card while checking slaving meter.
7. Switch to free gyro and periodically set card as unslaved gyro.

Maintenance

The NSD family of instruments have been designed and manufactured to render reliable service. If service is required, it is important that agencies selected for service are properly qualified and equipped.

Gyro Filter - The gyros used in the NSD-360A family are precise devices whose performance and service life are in part dependent upon the quality of the air supply. Poor air quality can significantly reduce gyro life by contaminating bearings. Regular filter maintenance is a good investment.

Effective: July 4, 1975

LIMITED WARRANTY CENTURY FLIGHT SYSTEMS AUTOPILOT

Each new Century Flight Systems Inc. Autopilot is warranted by the manufacturer to be free from defects in material and workmanship under normal use, subject to the following conditions:

1. Century Flight Systems Inc. will through its designated service facilities at its option either repair or replace new components which, shall within (12 months after date of installation, be found, to Century Flight Systems Inc. satisfaction, to have been defective in material or workmanship under normal use.
2. The warranty registration must be signed and returned to Century Flight Systems Inc. within ten days of equipment installation date. In the event that the registration card is not returned within this time, the date of shipment from the factory will be deemed to be the installation date.
3. This warranty will not apply to any product which has been installed, repaired or altered in any way whatsoever in Century Flight Systems Inc. opinion to adversely affect its performance or reliability, or which has been subject to misuse, contamination, negligence, or accident.
4. Cost of transportation, removal or reinstallation are at the option of Century Flight Systems Inc..
5. This is Century Flight Systems Inc. sole express warranty with respect to the goods supplied herein. CENTURY FLIGHT SYSTEMS INC. MAKES NO OTHER EXPRESS WARRANTY OF ANY KIND WHATSOEVER. CENTURY FLIGHT SYSTEMS INC.EMPLOYEES MAY HAVE MADE ORAL STATEMENTS ABOUT THE PRODUCTS DESCRIBED IN THIS CONTRACT. SUCH STATEMENTS DO NOT CONSTITUTE WARRANTIES, SHALL NOT BE RELIED UPON BY THE CUSTOMER, AND ARE NOT PART OF THE SALE CONTRACT.
6. THE DURATION OF ANY IMPLIED WARRANTY, AND OF ALL WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, SHALL BE LIMITED TO (12) MONTHS COMMENCING AT DATE OF INSTALLATION TO THE FULL EXTENT PERMITTED BY APPLICABLE LAW, CONSEQUENTIAL DAMAGE OR BREECH OF ANY WARRANTY ARE HEREBY DISCLAIMED AND EXCLUDED BY CENTURY FLIGHT SYSTEMS.INC. .

CENTURY FLIGHT SYSTEMS, INC.
P. O. Box 610
Mineral Wells, Texas
76068
January 1982