MIL-STD-1293
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MILITARY STANDARD

ELECTRO-MECHANICAL COMMAND INSTRUMENT SYSTEM

FOR ROTARY WING AIRCRAFT

FSC 6610

DEPARTMENT OF DEFENSE
WASHINGTON, DC 20301

Electro-Mechanical Command Instrument System for Rotary Wing Aircraft.

MIL-STD-1293

1. This Military Standard is approved for use by all Agencies of the Department of Defense.

2. Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to Commander, US Army Aviation Research and Development Command, ATTN: DRDAV-EKS, St. Louis, MO 63166, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

FOREWORD

The information contained herein presents operational and functional requirements for Electro-Mechanical Command Instrument Systems for Rotary Wing Aircraft. In-flight research and testing to date indicates that use of a command instrument system designed in accordance with these requirements will reduce aircrew workload, enable close tolerance precision instrument flying, and enable safe and precision instrument approaches in helicopters.

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FIGURES

1. PURPOSE, SCOPE, AND APPLICATION

1.1 Purpose. The purpose of this standard is to establish design requirements for Electro-Mechanical Command Instrument Systems (Flight Directors) for Rotary Wing aircraft.

1.2 Scope. This standard describes the primary control/display requirements for helicopter Command Instrument System (CIS) although it does not preclude unique or novel presentations over and above the basic instrument requirements.

1.3 Application. This standard applies to the primary headdown attitude director indicator, horizontal situation indicator, controller, and computer for the CIS. Auxiliary displays and controls required to complete the system are not described herein and shall be selected by the procuring agency as required.

2. REFERENCED DOCUMENTS

2.1 Issues of documents. The following documents, of the issue in effect on date of invitation for bids, form a part of this standard to the extent specified herein.

SPECIFICATIONS

MILITARY

MIL-C-14806	-	Coating, Reflection Reducing, for Instrument Cover Glasses and Lighting Wedges.
MIL-M-18012	-	Markings for Aircrew Station Displays, Design and Configuration of
MIL-L-25467	-	Lighting, Integral, Red, Aircraft ~~Instrument, General Specification for~~
MIL-L-27160	-	Lighting, Instrument, Integral, White, General Specification for
MIL-C-25050	-	Color, Aeronautical Lights and Lighting Equipment, General Requirements for

STANDARDS

FEDERAL

FED-STD-595	-	Colors

MILITARY

MIL-STD-1553 - Aircraft Internal Time Division Command/ Response Multiplex Data Bus

MS33558 - Numerical and Letter, Aircraft Instrument Dial, Standard Form of

3. DEFINITIONS

3.1 Acronym definitions. For convenience, reference herein to navigation systems/aids is by acronym. Interpretations of acronyms used in the various referenced navigation systems/aids are as follows:

a.	ADF	automatic direction finder
b.	FM	frequency modulation
c.	ILS	instrument landing system
d.	LORAN	long range navigation
e.	MLS	microwave landing system
f.	TACAN	tactical air navigation
g.	TLS	tactical landing system
h.	VLF	very low frequency
i.	VOR	very low frequency, omnidirectional range

3.2 CIS command. A CIS command is a visual indication provided to the pilot which, if properly interpreted, will direct pilot activity to place the aircraft on the desired flight path and/or speed. This indication, which may be by means of a bar, pointer, or symbol, informs the pilot of the resultant direction, magnitude, and effectiveness of pilot control inputs relative to the desired flight path.

3.3 System components.

3.3.1 Attitude director indicator (ADI). A panel mounted indicator that receives signals from a primary vertical gyro reference, flight director computer, and rate transmitting gyros. It displays pitch and roll attitude, slip, rate of turn, collective command, bank cyclic command, pitch cyclic command, and raw localizer/glide slope. It may contain yaw command.

3.3.2 Horizontal situation indicator (HSI). A panel mounted indicator that receives signals from the navigational radio receivers (VOR, TACAN, etc.) and compass system to display bearing, heading, to-from course, course deviation, glide slope, etc. It also displays distance to the selected waypoint or radio beacon. It provides course selection, heading, course error, and heading error signals to the Flight Director Computer.

3.3.3 Controller. The controller is a self contained unit which enables the pilot to select the various modes of the CIS.

3.3.4 Computer. The computer computes command information required, per mode selected on the controller, from raw data supplied by navigation systems, air data systems, and other sensors. The heading to intercept a radial, the drift correction, the required angle of bank, vertical velocity on an ILS approach are examples of this computed information.

3.4 System commands.

3.4.1 Roll cyclic command. The roll cyclic command is the computed bank angle which provides the control commands for satisfying a selected course. It is presented on the vertical bar of the ADI. The bar deflects in the direction of the roll input required to establish the selected bank angle and returns to neutral when the selected bank angle is established.

3.4.2 Pitch cyclic command. The pitch cyclic command is the computed pitch angle which provides the control commands for satisfying a selected pitch attitude (airspeed). It is presented on the horizontal bar of the ADI. The bar deflects in the direction of the pitch input required to satisfy the computed attitude and returns to neutral when the computed attitude is established. Both pitch and airspeed are integrated for the command display.

3.4.3 Collective command. The collective command is the computed collective position presented on a vertically moving pointer to the left of the attitude display that provides the command for increasing or decreasing the collective stick position.

3.4.4 Yaw command. The yaw or pedal command is the computed yaw angle presented on a horizontally moving pointer on the attitude director indicator that provides the commands for pedal control actions to satisfy a selected course at the lower operating airspeeds.

4. GENERAL REQUIREMENTS

4.1 System compatibility. The system shall be fully compatible with the provisions of MIL-STD-1553.

5. DETAILED REQUIREMENTS

5.1 System operation/performance.

5.1.1 Vertical/Speed modes of operation/performance. The CIS shall provide the following modes as specified by the procuring activity. Command bars and pointers shall be biased out of view when not engaged to the CIS.

5.1.1.1 Takeoff. The takeoff mode shall command a safe ascent from liftoff by providing the appropriate commands to enable the aircraft to

establish the best airspeed, attitude and rate of climb within the torque and height velocity performance limits of the aircraft. The takeoff mode may be engaged with any horizontal mode.

5.1.1.2 Go-around. The go-around mode shall command a preset 500 to 750 feet per minute rate of climb (within the height-velocity and torque limits of the aircraft) via the cyclic and collective command bars. The mode may be automatically engaged 10 seconds after reaching minimum decision altitude (MDA) or manually engaged when necessary. The pilot shall have the capability to disengage this automatic feature.

5.1.1.3 Vertical speed select. For conditions other than the go-around mode, a climb descent rate shall be selectable from 0 (zero) feet per minute climb/descent up to the maximum climb/descent rate of the aircraft. Satisfying the collective command will cause the aircraft to maintain a constant rate of climb/descent until another vertical mode (such as altitude hold) is engaged. The vertical speed select mode may be engaged with any horizontal or speed mode.

5.1.1.4 Altitude hold. The altitude hold mode shall command level flight at a constant barometric altitude when engaged. Satisfying the collective command will maintain the aircraft within $\pm$ 25 feet of barometric altitude. The altitude select mode may be engaged with any horizontal or speed mode.

5.1.1.5 Airspeed select. The airspeed select mode shall command a constant airspeed when engaged. Satisfying the cyclic pitch command will maintain the aircraft within $\pm$ 2 knots of indicated airspeed at speeds above 45 knots. The airspeed select mode may be engaged with any horizontal or vertical mode.

5.1.1.6 Approach. The approach mode shall command the appropriate approach angle as computed from the ground signal (ILS or MLS) presented via the collective command. Approach angles shall be selected from the standard 3 degree ILS glideslope angle up to 12 degrees for a TLS. The approach mode may be selected with MLS or ILS modes and with airspeed and speed deceleration modes.

5.1.1.7 Speed deceleration. The speed deceleration mode shall command a smooth deceleration in airspeed via the collective and cyclic command bars when activiated. The speed deceleration mode may be engaged with a manual switch, the TLS, or similar system and the deceleration shall lead to a smooth coupling to initiate the appropriate approach angle (paragraph 5.1.1.6) as required for the intercept with selected approach beam. When initiated in the absence of an external ground signal, the commands shall command a smooth deceleration to minimum safe airspeed within the height-velocity envelope of the aircraft. The manual deceleration mode may be

coupled with any horizontal or speed mode. A switch shall be provided to enable the pilot to disengage the speed deceleration mode in flight.

5.1.1.8 Vertical deceleration. The vertical deceleration mode shall command a smooth decrease in vertical velocity via the cyclic and collective command bars. The commands for the guided deceleration shall be based upon the ground navigation aids and altitude to achieve zero vertical velocity at the MDA within the height-velocity limits of the aircraft. When initiated in the absence of an external ground signal, the commands shall command a descent and deceleration to the MDA selected. The manual descent mode may be engaged with any horizontal or speed mode. A switch shall be provided to enable the pilot to disengage the vertical deceleration mode in flight.

5.1.1.9 Hover. The hover command mode shall command a hover via the cyclic, collective, and yaw commands. The hover mode may be engaged with any horizontal mode. The go-around mode may be employed in lieu of the hover mode during ILS approach if no low airspeed sensor, doppler, or landing system guidance is available.

5.1.2 Horizontal modes of operation/performance.

5.1.2.1 Heading. The heading mode shall command the cyclic bank control actions to produce a banked turn to a selected heading and the appropriate cyclic bank control action required to hold the prescribed heading within $\pm$ 1°. The heading shall be established through the appropriate heading select control on the HSI. The heading mode may be used with any complimentary vertical or speed mode.

5.1.2.2 Navigation. The CIS computer shall be capable of accepting standard output signals from any navigation system listed in 5.1.2.2.1 for computing and displaying appropriate bank cyclic commands on the ADI. The navigation mode shall command the cyclic bank control action to produce limited bank to a selected track and the appropriate cyclic bank control actions required to maintain the track to within $\pm$ 1°. The navigation mode may be engaged with any complimentary vertical or speed mode.

5.1.2.2.1 Navigation systems/aids. The CIS shall be compatible with all the below listed navigation systems/aids. Particular navigation system/aid requirements will be as prescribed in the detail specification.

a. VOR/ILS
b. TACAN
c. ADF
d. LORAN
e. Doppler
f. FM Homing
g. TLS
h. MLS
i. VLF
j. The aircraft's heading reference system

5.1.2.3 Level attitude. The level attitude mode shall command a level attitude when no navigation or heading mode has been selected during engagement of the go-around mode.

5.2 Attitude director indicator requirements.

5.2.1 General. The ADI shall display data and cues required by the pilot to satisfy cyclic, collective, and pedal commands per the selected CIS modes. The ADI shall also display course deviation situation cues (e.g., glideslope and localizer deviation) and a rising runway (height above touchdown) cue. Cues may be flown manually by the pilot or reflect the response of the automatic flight control system. Configuration of the indicator elements shall be in general accordance with Figure 1 and shall conform with the following display and physical requirements.

5.2.1.1 Attitude display. The attitude display shall comprise the central background of the ADI and shall be in general accordance with Figure 2. It shall be free to rotate about mutually perpedicular axes to present aircraft pitch and roll data.

5.2.1.1.1 Pitch. The display shall be driven in pitch so that the horizon line moves up in relation to the fixed aircraft symbol during nose down (dive) attitudes and down with respect to the fixed aircraft symbol during nose up (climb) attitudes.

5.2.1.1.2 Roll. The display shall rotate clockwise in left bank maneuvers and counter-clockwise in right bank maneuvers.

5.2.1.2 Fixed aircraft reference symbol. The fixed aircraft reference symbol shall be positioned at the geometric center of the exposed attitude display, oriented in conformance with the aircraft horizontal plane, and viewed from an imaginary position directly behind the aircraft.

5.2.1.3 Collective command. The collective pitch scale and collective pitch command pointer shall be located on the left side of the indicator unit outboard of the display. The pointer shall be driven up or down from its null point to indicate the collective control required for satisfying the requirements of the vertical mode selected. For a high pointer position, lower the collective stick; for a low pointer position, raise the collective stick; for the pointer at center (null) position, the collective control is in the correct position to satisfy the command.

5.2.1.4 Pitch cyclic command. The pitch cyclic command shall be displayed on a horizontal bar which, as a function of its vertical movement, indicates the direction and amount of change in the cyclic stick in the fore-aft direction for pitch control to satisfy the command. The pitch cyclic command is a "fly-to" command. In its null position, the bar shall be centered on the fixed aircraft symbol.

5.2.1.5 Yaw (pedal) command. The yaw command is an optional command on the attitude director indicator. When this command is incorporated it may be displayed on a "V" bar which, as a function of its lateral movement, indicates the direction and amount of change in pedal position required to stabilize the aircraft on a required heading during low speed (below 45 kts) maneuvers. Left/right deflection of the yaw command indicator indicates the need for increased left/right rudder, respectively. At speeds above 45 knots $\pm$ 5 knots, the pointer shall be biased out of view. Its null position shall be centered over the fixed aircraft symbol.

5.2.1.6 Roll cyclic command. The roll cyclic command shall be displayed by a vertical bar which, as a function of its horizontal displacement, indicates the direction and amount of change to be made with the cyclic stick in the lateral (left-right) direction to roll (or bank) the aircraft. The roll cyclic command is a "fly-to" command. In its null position, the bar shall be centered on the fixed aircraft symbol.

5.2.1.7 Roll indicia and pointer. Roll indicia shall be marked at the top face of the ADI at its border with the attitude display and read against the roll attitude pointer to indicate bank attitude of the helicopter with respect to the earth's vertical plane through the aircraft longitudinal center line. The roll index shall move in the direction of the bank.

5.2.1.8 Attitude trim. A knob, located at the lower right hand side of the bezel face, shall be provided for control of attitude pitch trim. When the knob is rotated in the clockwise direction, the attitude display shall rotate to deflect the horizon line upward to indicate a dive. When the knob is rotated in the counterclockwise direction, the attitude display shall rotate to deflect the horizon line downward to indicate a climb. Stops shall be provided to terminate knob actuation at a maximum within the climb/dive limits of the vertical gyro indicator. Roll trim, if required, shall be as specified by the procuring activity.

5.2.1.9 Rate of turn. The rate of turn pointer and scale shall be located near the bottom of the instrument face. The pointer and scale divisions shall be of equal width, and the actuation control shall be such that one division width indicates three degrees per second turn rate.

5.2.1.10 Inclinometer. An inclinometer may be incorporated at the center bottom of the instrument bezel, as shown in Figure 1. Alternatively, it may be mounted within the envelope of the case if the design determines that this location provides enhanced visibility under night lighting conditions. The ball shall be gravity actuated to indicate whether the helicopter is in directional balance, either in turn or in straight and level flight. The damping liquid used shall be sufficiently devoid of color to preclude interference with the visibility of the ball under daylight and

night lighting conditions and under expected ranges of temperature. A required property of the damping fluid shall be that it prevent ball sticking caused by vibration induced electro-static charges.

5.2.1.11 Radar altitude indication. The requirements for a radar altitude indication shall be as specified by the procuring activity.

5.2.1.11.1 Indicator operation. The indicator (rising runway) referencing the radar altimeter, provides qualitative information of the aircraft's height above touchdown during the final leg of the instrument approach. The bar rises from behind the mask at the bottom of the display opening at 200 feet above terrain, and continues to rise, as altitude decreases, to the point where the bar touches the bottom of the fixed aircraft reference at zero feet altitude.

5.2.1.12 Glide slope deviation. A glide slope deviation scale and pointer shall be incorporated along the mid right side of the instrument bezel. It shall indicate deviation, in raw data, from a selected glide slope during landing approaches. The deviation pointer shall be biased from view except when a glide slope frequency is selected.

5.2.1.13 Localizer. A localizer pointer and scale shall be incorporated in the lower portion of the indicator to show, in raw data, the extent of lateral deviation for a navigation mode.

5.2.1.14 Warning flags. The following warning flags shall be provided:

a. Attitude

b. Glide slope

c. Flight director

5.2.1.14.1 When the flight attitude or glide slope or the flight director system has suffered a failure or has been supplied an unreliable signal, the appropriate warning flag(s) shall come into view on the instrument.

5.2.1.14.2 When in view, the warning flags shall be located as follows:

a. Attitude. The attitude warning flag shall be in front of and cover a portion of the attitude display.

b. Glide slope. The glide slope warning flag shall be in front of and cover a portion of the glide slope scale.

c. Flight director. The flight director warning flag shall be in front of and cover a portion of the attitude display.

5.2.1.15 Indicator lights. A decision height, a deceleration, and a go-around light shall be provided. They shall indicate, respectively, when decision height is reached, when deceleration has been initiated, or when go-around has been initiated. The color of the lights shall be aviation yellow in accordance with MIL-C-25050. The lights shall be located as follows:

a. Go-around: On upper left corner of the bezel.

b. Decision height: Second from left on upper bezel.

c. Spare: For use as needed, e.g., marker beacon, future development technical beacon, or MLS. Second from right on upper bezel.

d. Deceleration: Upper right corner of bezel.

5.2.1.16 Built-in test. The ADI shall incorporate a built-in continuous test for all critical functions.

5.2.1.17 Numerals and letters. Unless otherwise specified, all numerals and letters on the indicator, other than the nameplate, shall be the style (font) as specified in MS 33558. Size and spacing of characters shall be as specified in MIL-M-18012. Letters shall be no less than .2 inches in height.

5.2.1.18 Markings. Line width shall be .012 -0 + .005 inches and may be heavier for limiting values and for separate scales where distinction of scale identity would be facilitated by this variation. Pitch attitude scale lines may be of varying length, with increasing length for increasing angles of pitch. Constant length for these lines is an approved alternate. Pitch attitude scale dots shall be .025 inch diameter solid circles. Other scale dots, for the separate scales, may be of larger diameter to a maximum of .060 inch diameter. If pilot night vision devices are to be used, these markings must be sufficiently reflective in the range of illumination required for these devices.

5.2.1.19 Parallax, masking. The dial face, markings, bezel, pointers, and bars shall be designed to minimize parallax errors and masking of the dial face.

5.2.1.20 Cover glass and lighting wedge. The cover glass and lighting wedge shall be free from discoloration, scratches, and striae that might interfere with reading of the indicator. All reflecting surfaces shall be coated with a reflection-reducing coating that meets the requirements of MIL-C-14806.

5.2.1.21 Illumination. The display case shall have integral lighting and shall meet the requirements of MIL-L-27160 for 5V white lighting and MIL-L-25467 for 5V red lighting. All markings, legends, and indicia shall appear uniform and the display shall be readable at 1.60 volts. If pilot night vision goggles are to be used, the display shall be capable of being dimmed by the aircraft's dimming circuits to 1 x 10^{-5} foot lamberts illumination and the indicator lights shall be capable of being dimmed to 1 x 10^{-4} foot-lamberts.

5.2.1.22 Indicator case. The indicator case shall be dust proof and water tight. The case shall provide a nominal 5 inch by 5¼ inch frontal area.

5.3 Horizontal situation indicator requirements.

5.3.1 General. The horizontal situation indicator shall provide display information and indications to enable the pilot to select a course, both automatically (through reference to a servo system) and manually, and to keep the pilot informed regarding flight and reference bearings, flight course deviation, range information, and aircraft current position. Configuration of the indicator elements shall be in general accordance with Figure 3 and shall conform with the following display and physical requirements.

5.3.1.1 Course arrow. The course arrow shall be installed so that it can be rotated about the inner ring of the compass card to the selected course referencing the compass card scale. It is driven by a servo system or manually turned by the course selection knob. It shall rotate in synchronism with the compass card after it is set.

5.3.1.2 Course selection knob. The course-selection knob shall be located on the lower right portion of the bezel. Clockwise rotation of the course-selection knob shall produce clockwise rotation of the course arrow. Tuning of the course-selection knob shall have no lasting effect on the course arrow when the servo is being driven by a remote device.

5.3.1.3 Digital counter. A digital counter shall present the selected course in a window on the upper right side of the indicator.

5.3.1.4 Compass card. The rotating compass card provides aircraft heading at a fixed index at the top center of the indicator. The reciprocal aircraft heading is read against a fixed index at the bottom of the indicator. The compass card shall be earth stabilized and shall rotate counterclockwise with respect to the instrument case for increasing heading angle indication.

5.3.1.5 Aircraft symbol. A fixed aircraft symbol shall be located at the geometric center of the compass card. It provides a reference for heading and, at its center point, for course deviation.

5.3.1.6 Course/Track deviation. An indication of the displacement of the aircraft to the right or left of the selected course shall be provided by means of a course bar (parallel with the course arrow) and a deviation scale (dots) along a line through the mid point of the display and perpendicular to the course arrow.

5.3.1.7 Glide slope deviation. A glide slope deviation scale and pointer shall be incorporated along the mid right side of the instrument bezel. It shall indicate deviation, in raw data, from a selected glide slope during landing approaches. The deviation pointer shall be biased from view except when a glide slope frequency is selected.

5.3.1.8 To-from indicator. Arrows or pointers shall be incorporated within the display to indicate the aircraft position with respect to a selected navigational facility. The indicator shall be hidden from view when no signal is present.

5.3.1.9 Distance indicator. A digital read-out of distance from or to a reference point shall be provided in the upper left hand corner. The distance display shall be obscured when the system is inoperative.

5.3.1.10 Heading marker. A heading marker shall be provided which can be automatically or manually set and which can rotate around the compass card. The heading marker shall rotate in synchronism with the compass card after it is set.

5.3.1.11 Heading selection knob. The heading selection knob shall be positioned at the lower left hand corner. Clockwise rotation of the knob shall produce clockwise rotation of the marker.

5.3.1.12 Bearing pointer. Two bearing pointers shall be provided for indicating radio signal source direction. They should be suitably identified or shaped so that they can be easily distinguished from each other. Design shall provide for continuous indication of radio signal source direction throughout the full range of aircraft flight bearings.

5.3.1.13 Warning flags/indicators. The following warning flags/indicators shall be provided:

a. Navigation

b. Heading

c. Glide slope

d. Distance measuring equipment (DME)

5.3.1.13.1 When the navigation, heading, glide slope, or distance measuring system has suffered a failure or has been supplied an unreliable signal, the appropriate warning flag/indicator shall come into view on the instrument.

5.3.1.13.2 When in view, the warning flags/indicators shall be located as follows:

a. Navigation. The navigation (deviation validity) warning flag shall be in front of and cover a portion of the compass card along the left side of the bezel.

b. Heading. The heading warning flag shall be in front of and cover a portion of the comapss card along the top side of the bezel.

c. Glide slope. The glide slope warning flag shall be in front of and cover a portion of the glide slope scale.

d. DME shield. The DME shield shall cover the full numeral display of the distance indicator.

5.3.1.14 Built-in test. The HSI shall incorporate a built-in continuous test for all critical functions.

5.3.1.15 Numerals and letters. Unless otherwise specified, all numerals and letters on the indicator, other than the nameplate, shall be the style (font) as specified in MS 33558. Size and spacing of characters shall be as specified in MIL-M-18012. Course and range numerals and compass card letters shall be no less than .2 inches in height.

5.3.1.16 Markings. Line width for the course deviation bar, the course arrow, and the to-from indicator shall be .015 -.0 + .005 inches. Compass point markers shall be .012 -.0 + .005 inches in width. The fixed indices, heading markers, and reciprocal bearing pointer shall be .050 $\pm$ .010 inches in width. Course deviation scale dots shall be .025 inch diameter solid circles. If pilot night vision devices are to be used, these markings must be sufficiently reflective in the range of illumination required for these devices.

5.3.1.17 Parallax, masking. The dial face, markings, bezel, pointers, and bars shall be designed to minimize parallax errors and masking of the dial face.

5.3.1.18 Cover glass and lighting wedge. The cover glass and lighting wedge shall be free from discolorations, scratches, and striae that might

interfere with reading of the indicator. All reflecting surfaces shall be coated with a reflection-reducing coating that meets the requirements of MIL-C-14806.

5.3.1.19 Illumination. The display case shall have integral lighting and shall meet the requirements of MIL-L-27160 for 5V white lighting and MIL-L-25467 for 5V red lighting. All markings, legends, and indicia shall appear uniform and the display shall be readable at 1.60 volts. If pilot night vision goggles are to be used, the display shall be capable of being dimmed by the aircraft's dimming circuits to 1 x 10^{-5} foot-lamberts illumination.

5.3.1.20 Indicator case. The indicator case shall be dust-proof and water-tight. Case size shall be as prescribed by the procuring activity.

5.4 Controller requirements.

NOTE: Controller requirements will vary extensively based on system mechanization, therefore, detailed requirements shall be as specified by the procuring activity.

5.5 Computer requirements.

NOTE: Computer requirements shall be as specified by the procuring activity.

5.6 International interest. Certain provisions of this standard are the subject of international standardization agreements (ASCC 10/54 - STANAG 3640; ASCC 10/45 - STANAG 3741). When revision or cancellation of this standard is proposed, the departmental custodians will inform their respective Departmental Standardization Offices so that appropriate action may be taken respecting the international agreements concerned.

Custodians:

Army - AV
Air Force - 99

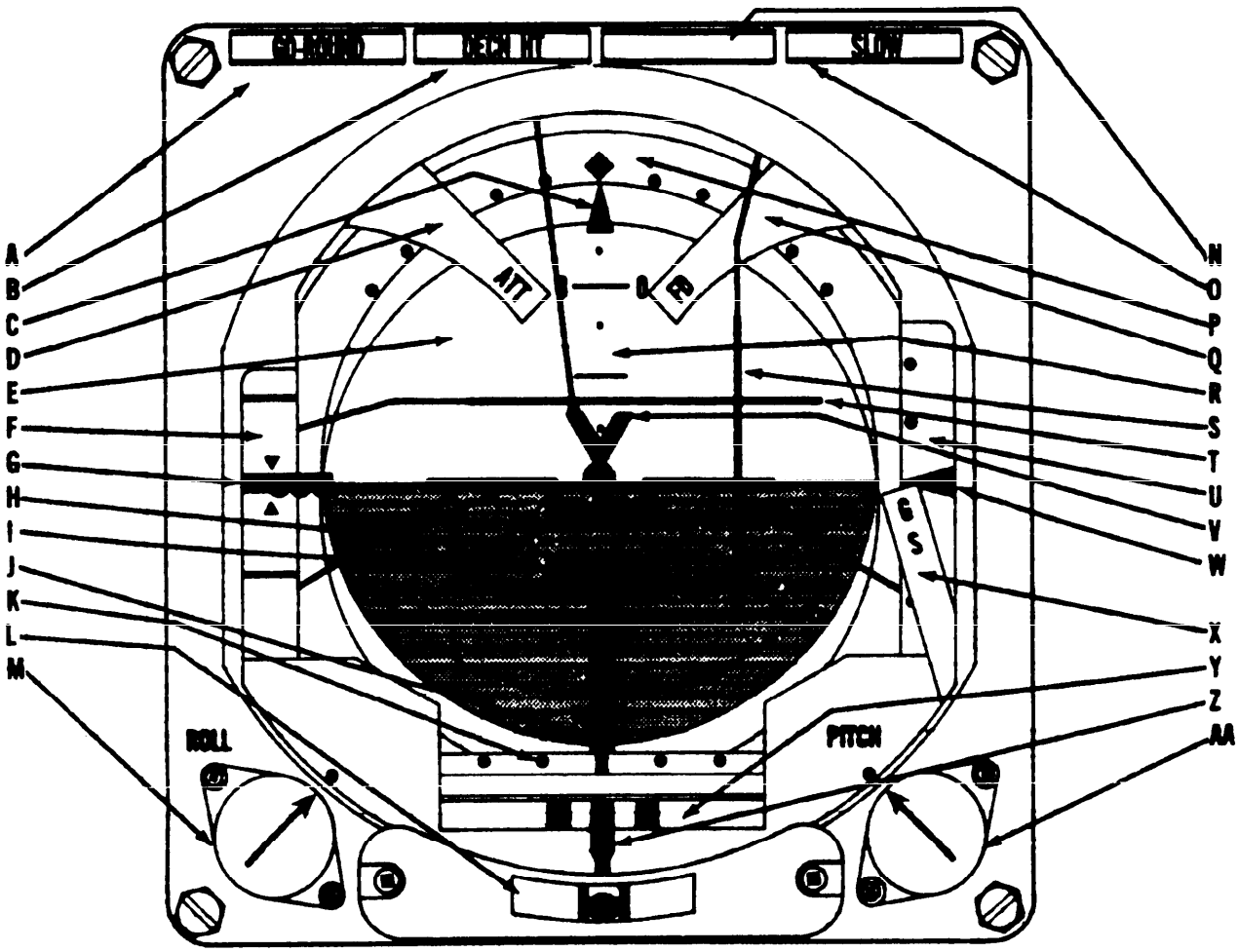
Review activities:

Army - TE
Air Force - 11

Preparing activity:

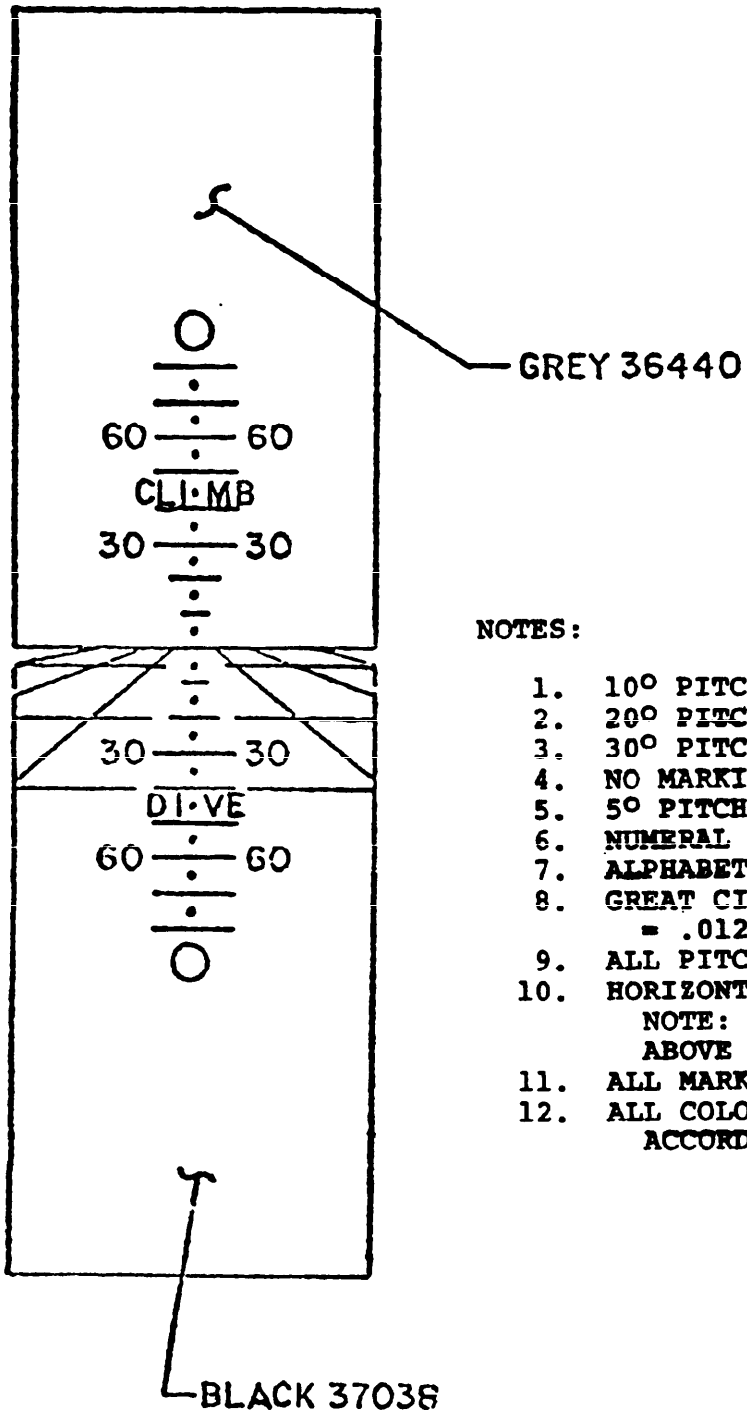
Army - AV

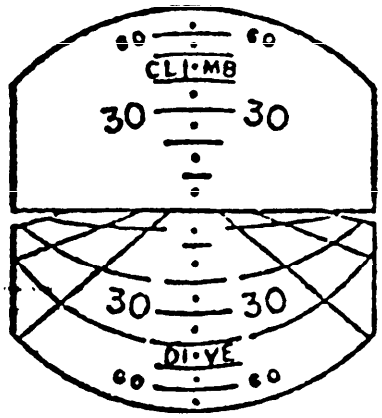
Project No. 6610-0405



A. GO-AROUND INDICATOR LIGHT
B. DECISION HEIGHT INDICATOR LIGHT
C. ROLL ATTITUDE POINTER
D. ATTITUDE WARNING FLAG
E. MOVABLE DISPLAY
F. COLLECTIVE PITCH SCALE
G. COLLECTIVE PITCH COMMAND POINTER
H. MINIATURE AIRPLANE SYMBOL
I. HEIGHT ABOVE TOUCHDOWN INDICATOR
J. LOCALIZER POINTER
K. LOCALIZER SCALE
L. INCLINOMETER
M. ROLL TRIM KNOB
N. SPARE
O. DECELERATION INDICATOR LIGHT
P. ROLL ATTITUDE SCALE
Q. FLIGHT DIRECTOR WARNING FLAG
R. PITCH ATTITUDE SCALE
S. ROLL COMMAND FLIGHT DIRECTOR BAR
T. PITCH COMMAND FLIGHT DIRECTOR BAR
U. GLIDE SLOPE SCALE
V. YAW (PEDAL) COMMAND
W. GLIDE SLOPE DEVIATION POINTER
X. GLIDE SLOPE WARNING FLAG
Y. RATE OF TURN SCALE
Z. RATE OF TURN POINTER
AA. PITCH TRIM KNOB

FIGURE 1
ADI CONFIGURATION



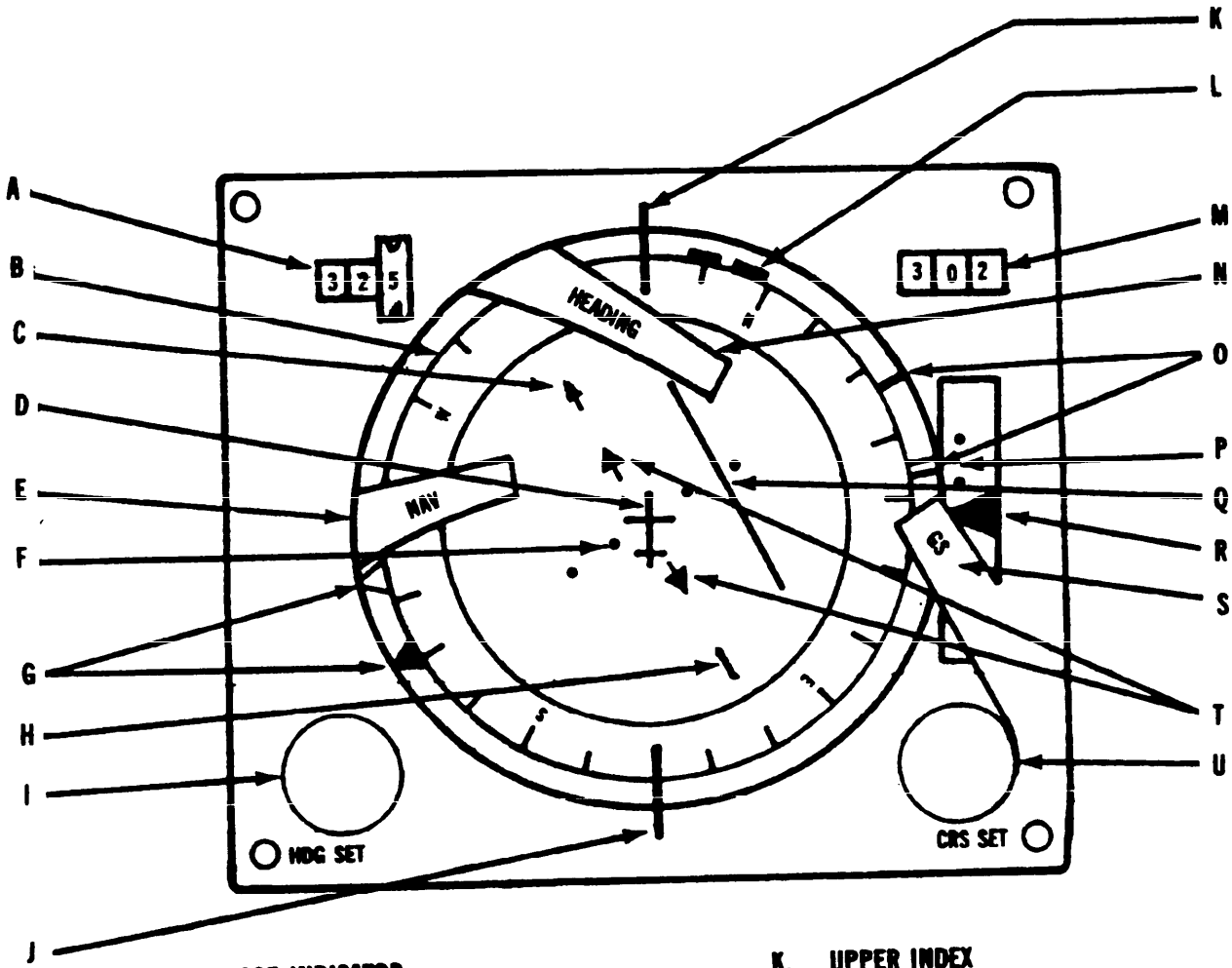


NOTES:

1. 10° PITCH MARKS .45 INCH LONG.
2. 20° PITCH MARKS .65 INCH LONG.
3. 30° PITCH MARKS .85 INCH LONG.
4. NO MARKINGS BEYOND + 90° PITCH.
5. 5° PITCH MARKS .05 DIAMETER.
6. NUMERAL HEIGHTS = .20.
7. ALPHABET (CLIMB/DIVE) = .20.
8. GREAT CIRCLE PERSPECTIVE LINES = .012 THICKNESS.
9. ALL PITCH LINES = .015 THICKNESS.
10. HORIZONTAL LINE - WHITE .040 THICK-
    NOTE: ADD A .015 THICK BLACK LINE ABOVE THE WHITE HORIZONTAL LINE.
11. ALL MARKINGS SHALL BE WHITE 37875.
12. ALL COLORS SPECIFIED SHALL BE IN ACCORDANCE WITH FED-STD-595.

FIGURE 2

ATTITUDE DISPLAY



A. (1) RAGE INDICATOR
(2) DISTANCE INDICATOR (AND DME SHIELD)
B. COMPASS CARD
C. (1) COURSE ARROW
(2) TRACK ARROW
D. AIRCRAFT SYMBOL
E. NAVIGATION WARNING FLAG
F. (1) COURSE DEVIATION SCALE
(2) TRACK DEVIATION SCALE
G. BEARING POINTERS
H. (1) COURSE ARROW (TAIL)
(2) RECIPROCAL TRACK INDEX
I. HEADING SET KNOB
J. LOWER INDEX
K. UPPER INDEX
L. HEADING MARKER
M. (1) COURSE SELECTOR WINDOW
(2) TRACK SELECTOR WINDOW
N. HEADING WARNING FLAG
O. RECIPROCAL BEARING POINTERS
P. GLIDE SLOPE SCALE
Q. (1) COURSE DEVIATION BAR
(2) COURSE BAR
(3) TRACK DEVIATION BAR
R. GLIDE SLOPE DEVIATION POINTER
S. GLIDE SLOPE WARNING FLAG
T. TO-FROM INDICATOR
U. (1) COURSE SET KNOB
(2) TRACK SET KNOB

FIGURE 3
HSI CONFIGURATION

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