NATO STANDARD

MPP-02.3.1

GLIDE SLOPE INDICATORS FOR HELICOPTER OPERATIONS FROM SHIPS

Edition (A) Version (2)

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NORTH ATLANTIC TREATY ORGANIZATION

MULTINATIONAL PROCEDURAL PUBLICATION

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NATO LETTER OF PROMULGATION

10 June 2016

1. The enclosed Multinational Procedural Publication MPP-02.3.1, Edition A Version 2 – GLIDE SLOPE INDICATORS FOR HELICOPTER OPERATIONS FROM SHIPS, which has been approved by the nations in the Military Committee Maritime Standardization Board, is promulgated herewith. The agreement of nations to use this publication is recorded in STANAG 1236.

2. MPP-02.3.1, Edition A Version 2, is effective upon receipt and supersedes MPP-02.3.1, Edition A, Version 1, which shall be destroyed in accordance with the local procedure for the destruction of documents.

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4. This publication shall be handled in accordance with C-M(2002)60.

Edvardas MAŽEIKIS
Major General, LTUAF
Director, NATO Standardization Office

NATO Nations, NATO Partner or Participating
Nation's Letter of Promulgation

RECORD OF RESERVATIONS

CHAPTER	RECORD OF RESERVATIONS BY NATION
General	**FRA**
General	**PRT**

NOTE

THE RESERVATIONS LISTED ON THIS PAGE INCLUDE ONLY THOSE THAT WERE RECORDED AT TIME OF PROMULGATION AND MAY NOT BE COMPLETE. REFER TO THE NATO STANDARDIZATION DOCUMENT DATABASE FOR THE COMPLETE LIST OF EXISTING RESERVATIONS.

RECORD OF RESERVATIONS

RECORD OF RESERVATIONS BY NATION
FRA - French Navy ships are equipped with type FYGFR glide slope indicators (GSI) that are compatible with night vision goggles (NVG). Foreign pilots who have to land on a French ship must learn about the French specific characteristics of GSI colors and flashing rates. These specific characteristics will be highlighted in APP-02, Volume II, covered by STANAG 1288. French pilots will use this STANAG when landing on ships of NATO nations that have ratified this STANAG.
PRT - Portuguese Navy does not currently have equipment that cover the STANAG needs, will be considered at a future acquisition.

NOTE

THE RESERVATIONS LISTED ON THIS PAGE INCLUDE ONLY THOSE THAT WERE RECORDED AT TIME OF PROMULGATION AND MAY NOT BE COMPLETE. REFER TO THE NATO STANDARDIZATION DOCUMENT DATABASE FOR THE COMPLETE LIST OF EXISTING RESERVATIONS.

RECORD OF OBSERVATIONS

RECORD OF OBSERVATIONS BY NON-NATO NATIONS

NATIONAL COMMENTS

NATO NATIONAL COMMENTS
CZE - The Armed Forces of the Czech Republic do not have Navy. This CZE replay is also valid for any RD of higher editions of this STANAG.
DNK - SGSIs within the Royal Danish Navy are NVG compatible and indicate FG (High), G (on Glide Slope) and FR (amber) (Low).
EST - Estonian Navy does not operate relevant capability.
FRA - GSI used in the French Navy comply with the minimun standard requirements for the nomenclature, vertical and horizontal beam spreads, intensity, stabilization and installation. However, light characteristics are different from those described in the STANAG : French Navy ships are equipped with type FYGFR GSI that are compatible with NVG. The upper orange sector flashes at a rate of 40 flashes per minute ; the lower red sector flashes at 85 flashes per minute. Discussions are ongoing with the custodian of STANAG 1236 in order to standardize the colors of the GSI used by all NATO nations. It will be possible to reflect this standardized approach in a technical publication such as an ANEP.
GRC - Operations with the use of NVDs are not conducted by Hellenic Navy Helicopters. The Hellenic Navy helicopter carrier ships do not have NVD compatible GSI systems.
HRV - The Croatian Navy currently doesn't have either organic shipborne helicopters nor ships with landing zones.
SVK - There are no Naval Forces in the structure of the Armed Forces of the Slovak Republic, no organizational branch, nor subject matter expert dealing with the issue listed in this STANAG. This reply is also valid for any RD of higher editions of this STANAG.

NATIONAL COMMENTS

NATO NATIONAL COMMENTS
SVN - SVN does not have means covered by this agreement.

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ANNEX C—GLIDE SLOPE BEAM CHARACTERICS FOR TYPE FGR (FLASHING GREEN/RED) SYSTEM

LIST OF REFERENCES

1. MPP-02 - *Helicopter Operations from Ships Other Than Aircraft Carriers (HOSTAC) (Maritime VSTOL Data Included)*

2. MIL-STD-3009 - *Lighting, Aircraft, Night Vision Imaging System (NVIS) Compatible*

CONVENTIONS USED IN THIS PUBLICATION

RESERVATIONS AND OBSERVATIONS

NATO Reservations and Partner/Global HOSTAC Participating Nations' Observations will be delineated by their respective 3-letter national country code within the margin. Refer to the Record of Reservations and Record of Observations for details.

CHANGE SYMBOLS

Revised text from new versions are indicated by a black vertical line in the margin of the page, like the one printed next to this paragraph. The change symbol indicates added or restated information. A change symbol in the margin adjacent to an annex number and title indicates a new or completely revised annex.

WARNINGS, CAUTIONS, AND NOTES

The following symbols and definitions apply to warnings, cautions, and notes used in this publication:

WARNING

AN OPERATING PROCEDURE, PRACTICE, OR CONDITION THAT MAY RESULT IN INJURY OR DEATH IF NOT CAREFULLY OBSERVED OR FOLLOWED.

CAUTION

AN OPERATING PROCEDURE, PRACTICE, OR CONDITION THAT MAY RESULT IN DAMAGE TO EQUIPMENT IF NOT CAREFULLY OBSERVED OR FOLLOWED.

NOTE

AN OPERATING PROCEDURE, PRACTICE, OR CONDITION THAT REQUIRES EMPHASIS.

WORDING

Word usage and intended meaning throughout this publication is as follows:

“Shall” indicates the application of a procedure is mandatory.

“Should” indicates the application of a procedure is recommended.

“May” and “need not” indicates the application of a procedure is optional.

“Will” indicates future time. It never indicates any degree of requirement for application of a procedure.

CHAPTER 1 — STANDARDS FOR GLIDE SLOPE INDICATORS

0101 Purpose

To establish minimum standard requirements for the nomenclature, light characteristics, vertical beam spread, beam elevation, horizontal beam spread, intensity, intensity balance, intensity control, stabilization and installation of all types of glide slope indicators used in helicopter operations between ships of NATO and Partner nations.

0102 Agreement

Participation nations agree to accept the definitions and to adopt the characteristics of glide slope indicators specified herein. Participating nations also agree to specify in MPP-02 SRD the type of glide slope indicator used in fleet operations. **FRA PRT**

0103 Equipment and Lighting

The following includes the types of equipment and lighting used for this standard.

1. **Glide Slope Indicator (GSI):** A light emitting landing aid designed to indicate the desired angle of descent.

2. **Stabilized Glide Slope Indicator (SGSI):** A GSI which maintains a fixed orientation with respect to the earth, independent of the pitch and roll of the ship.

3. **Type YGR Glide Slope Indicator:** A GSI which indicates the position of an aircraft with respect to the glide slope by means of a Y (yellow) HIGH signal, a G (green) ON GLIDE SLOPE signal, and an R (red) LOW signal.

4. **Type GYR Glide Slope Indicator:** A GSI which indicates the position of an aircraft with respect to the glide slope by means of a G (green) HIGH signal, a Y (yellow) ON GLIDE SLOPE signal, and an R (red) LOW signal.

5. **Type FGYR Glide Slope Indicator:** A GSI which indicates the position of an aircraft with respect to the glide slope by means of a FG (flashing green) HIGH signal, a Y (yellow) ON GLIDE SLOPE signal, and an FR (Flashing red) LOW signal.

6. **Type FYGR Glide Slope Indicator:** A GSI which indicates the position of an aircraft with respect to the glide slope by means of a FY (flashing yellow) HIGH signal, a G (green) ONGLIDE SLOPE signal, and an FR (Flashing red) LOW signal.

7. **Type FGR Glide Slope Indicator:** A GSI which indicates the position of an aircraft with respect to the glide slope by means of an FG (flashing green) HIGH signal, a G (green) ON SLIDE SLOPE signal, and R (red) LOW signal, and an FR (flashing red) VERY LOW signal.

8. **Type NVD Glide Slope Indicator:** A GSI that meets one of the above display types but who's display is compatible with Night Vision Devices (NVD) for use in aided operations. The NVD GSI indicates the position of an aircraft with respect to the glide slope by means of a flashing HIGH signal, a steady ON GLIDE SLOPE signal, and a Flashing LOW signal.

9. **Centre Portion (Command Path):** The center sector of a glide slope indicator. The Command Path is centered about the desired angle of descent.

10. **Upper Sector:** The color sector above the command in a tri-color GSI.

11. **Lower Sector:** The color sector below the command in a tri-color GSI.

12. **Edge of a Coloured Sector:** The direction in the vertical (or horizontal) plane at which the intensity (candlepower) of a tri-color GSI is 50 percent of the maximum intensity in the sector.

13. **Beam Spread of a Colored Sector:** The angle, in the vertical or horizontal plane of a tri-color GSI between the edges in that plane.

14. **Flashing Rates:** If flash coding is used, the slower flash rate shall be used to indicate high and the higher flash rate shall be used to indicate low with respect to glide slope position. The ratio between these two flash rates shall be a minimum of 1.9:1. The flashing zones may be pulse width modulated (PWM) to increase the information content.

15. **Duty Cycle:** The ratio between the on and off times in a flashing display.

16. **PWM:** Pulse Width Modulated. The duty cycle varies continuously as glide slope is changed. If the flashing zones are PWM then the signal with the longer on time shall be closest to the center command path.

17. **NRIa:** Night Radiant Intensity Type 1 Class A as defined in SAE ARP 4392 (Lighting, Aircraft Exterior, Night Vision Imaging System (NVIS) Compatible) and MIL-STD-3009 (Lighting, Aircraft, Night Vision Imaging System (NVIS) Compatible)

0104 Nomenclature

The GSI shall be designated as type YGR, type GYR, type FGYR, type FGR or type NVD. The type NVD may also encompass one of the other types when used in unaided operations. To differentiate the type may follow the type NVD, for example type NVD-GYR.

0105 Light Characteristics

1. The GSI shall provide color configuration of type YGR, type GYR or type FGR. The yellow, green and red colors shall fall within the boundaries indicated in Annex A.

2. For tri-color GSI, the center portion (Command Path) and upper sector of the GSI shall be steady burning. Part or all of the lower sector may be flashing at a rate of approximately 90 flashes per minute.

a. In an FGR system the upper sector and lower half of the lower sector shall flash at 90-120 flashes per minute.

b. For systems that use flash rates to indicate high and low the higher flash rate shall be at least two times the lower flash rate with 2.5 times preferred. Flash rates of 90 fl/min for slow and 225 fl/min are preferred.

c. When flash coding is used the duty cycle shall be a minimum of a 1:1 on/off ratio and no more than a 1:2 on/off ratio (preferred).

0106 Vertical Beam Spreads

The vertical beam spread of the upper sector of the GSI shall be at least 1.5 degrees. The vertical beam spread of the center portion shall be between 1 degree and 4 degrees. The vertical beam spread of the lower sector shall be sufficient to place the lower edge of that sector below the horizontal (See Annex B Figure 1), although for operational reasons, the beam may be limited to an angle close to but above the horizontal.

0107 Beam Elevation

The lower edge of the center portion (Command Path) of the GSI shall be not less that 2 degrees above the horizontal (See Annex B Figure 1).

0108 Horizontal Beam Spread

The horizontal beam spread of the GSI shall not be less than 25 degrees. The vertical plane through the center of the beam shall be directed to the desired approach (See Annex B Figure 2).

0109 Intensity

1. The peak intensity in each sector of the tri-color GSI shall be at least 80 (100 preferred) candelas. This will provide a visual detection range of 5-6 nm.

   a. The FGR system shall meet the intensity requirements shown at Annex C.

b. The type NVD display shall have a maximum intensity of between 5 to 7 x10-3 NRIa "(This will provide a NVG detection range of 5-6 nm)" and be dimmable down to 5 x 10-6 NRIa "(This will allow for the SGSI to remain friendly inside 0.25 nm)" prior to extinction.

0110 Intensity Balance

The peak intensity of the yellow sector of the tri-color GSI shall be not more than three (two preferred) times the peak intensity of either of the other two sectors. In the FGR system the filter transmissions shall have a ratio of not greater than 1.5 to 1.

0111 Intensity Control

The GSI shall be capable of being dimmed to an intensity suitable for use on a clear dark night.

0112 Stabilization

The tri-color GSI shall be stabilized to maintain the design alignment within 0.5 degrees for a ± 10 degrees roll (8 second period) or ± 6 degree pitch (4 second period) of the ship. The FGR system shall be stabilized within 5 minutes of minimum arc for the same angles of roll and pitch.

CHAPTER 2 — INSTALLATION

0113 Installation (Including Separation from Other Lights)

The GSI shall be installed on the extended axis of the preferred approach at a height sufficient to provide at least 3m (10 feet) wheel-to-deck clearance for an aircraft approaching in the center of the command path (See Annex B Figure 3). GSI should be at least 4.5m (15 feet) from Deck Status Light/Rotary Beacon (Foul Deck Indicator). Wave-Off lights are normally 1.5m (5 feet) apart with SGSI in between.

ANNEX A

COLORS OF GLIDE INDICATOR LIGHT SIGNALS

A.1 The following specifications define the chromaticity limits of the colors of the light signals used in glide slope indicators.

A.2 The chromaticities are expressed in terms of the standard observer and coordinate system adopted by the International Commission on Illumination (CIE) in 1931.

A.3 It is preferred that the chromaticities of the light signals meet the requirements of Aerospace Standard AS25050 for aviation colors; however, chromaticities shall not exceed the areas bounded by the spectrum locus and the following boundaries (non-dimensional units):

Red	Purple boundary y = 0.980-X
	Yellow boundary y = 0.335
Yellow	Red boundary y = 0.382
	White boundary y = 0.790 - 0.667X
	Green boundary y = X - 0.120
Green	Yellow boundary x = 0.360 - 0.080y
	White boundary x = 0.650y
	Blue boundary y = 0.390 - 0.171x

A.4 To ensure the lights are compatible with NVD, the colour coordinates should used the CIE 1976 NVIS colours defined in MIL-STD-3009. NVIS Green B, NVIS Yellow and NVIS Red should be specified.

ANNEX B

COLORS OF GLIDE INDICATOR BEAM CROSS SECTIONS AND INSTALLATIONS

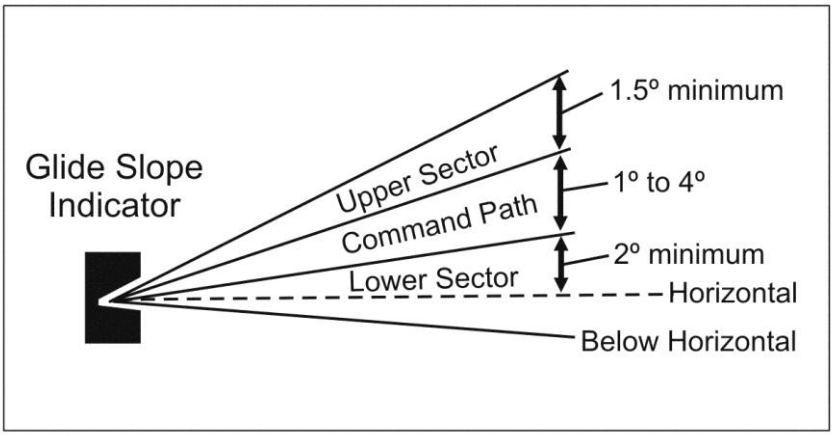


Figure 1 Vertical Beam Cross Section

Figure 2 Horizontal Beam Cross Section

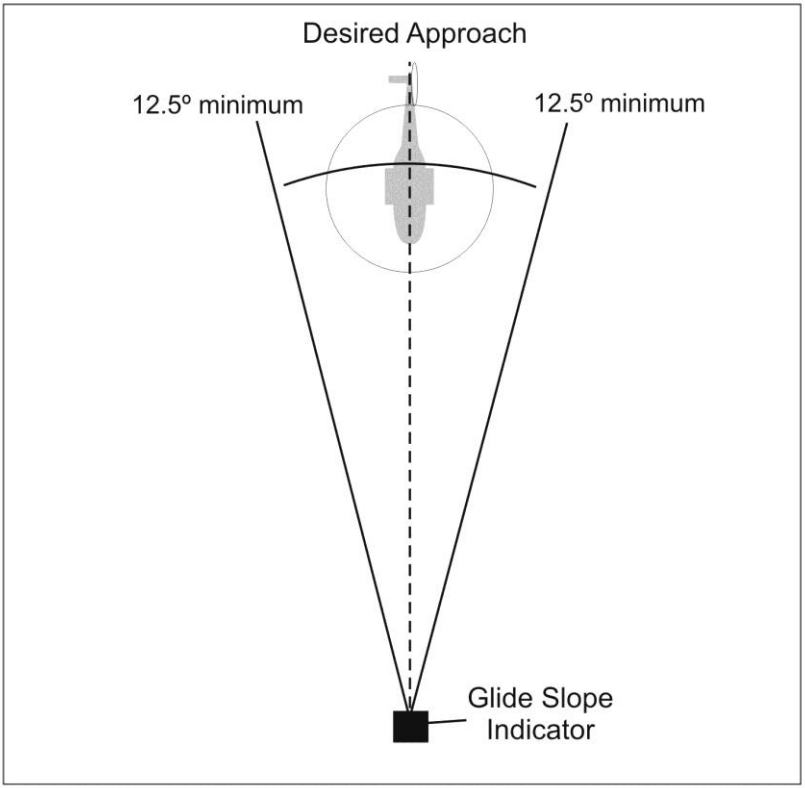
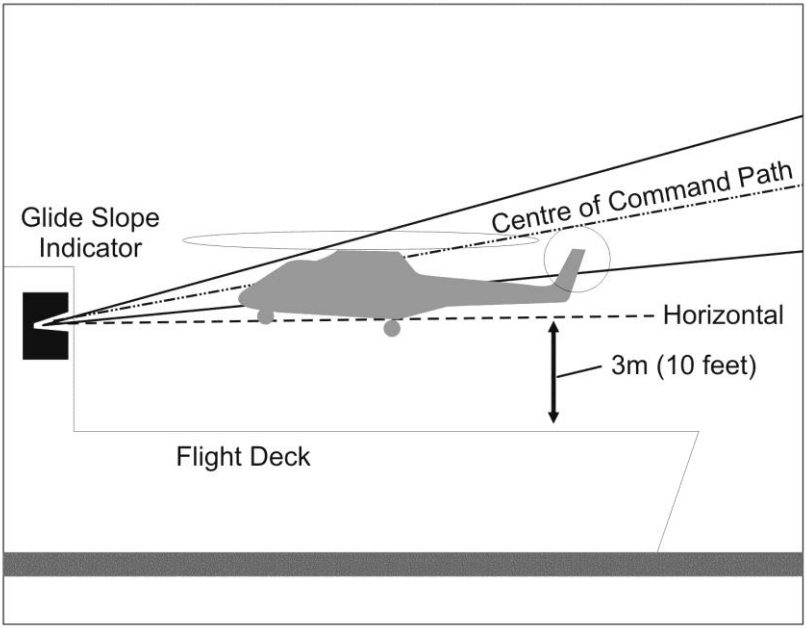


Figure 3 Installation - Wheel to Deck Clearance



ANNEX C

GLIDE SLOPE BEAM CHARACTERISTICS FOR TYPE FGR (FLASHING GREEN/RED) SYSTEM

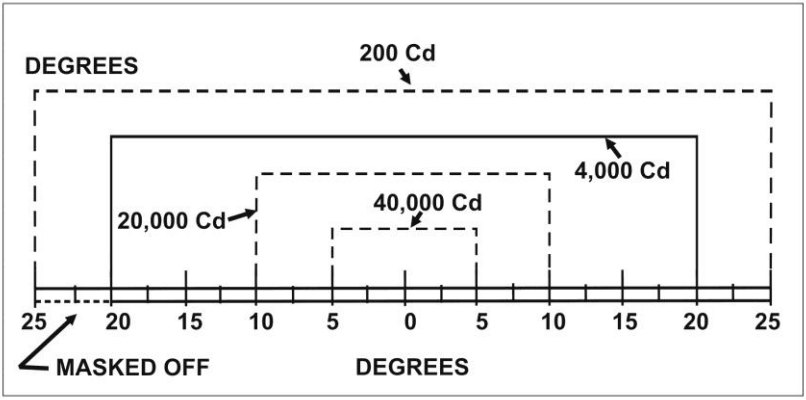


Figure 4 Isocandela Diagram (White Light)

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