technical note techn

# Heliport Identification Beacon

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16. Abstract

The International Civil Aviation Organization (ICAO) has proposed the adoption of a standard international heliport beacon. This beacon consists of a white strobe light coded to display a sequence of four flashes that signify the Morse code letter "H". For evaluation purposes, the proposed strobe beacon was compared to the United States standard three-color rotating beacon. Pilots completed post-flight questionnaires after viewing both beacons. Without any clear-cut choice as to which beacon was the best, pilot responses indicated that both beacons provide adequate guidance in locating a heliport. From these results, we conclude that there does not appear to be reasonable cause for opposing adoption of the proposed strobe beacon as an ICAO standard. Furthermore, there does not appear to be any compelling reason to change the present United States standard for heliport identification beacons at this time.

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# EXECUTIVE SUMMARY

The purpose of this evaluation was to determine the suitability and effectiveness of a coded stroboscopic heliport identification beacon for international standardization.

The International Civil Aviation Organization (ICAO) has proposed the adoption of a standard international heliport beacon. This beacon consists of a white strobe light coded to display a sequence of four flashes that signify the Morse code letter "H". A prototype beacon was obtained from a United States manufacturer using the ICAO specifications. For evaluation purposes, the proposed strobe beacon was compared to the United States standard three-color rotating beacon. Testing was conducted at the Linden Municipal Airport, Linden, New Jersey, and at the Tipton Army Airfield, Fort George G. Meade, Maryland. After having sufficient time to observe both beacons, pilots were asked to complete a post-flight questionnaire.

Without any clear-cut choice as to which type beacon was the best, pilot responses indicated that both beacons provide adequate guidance in locating a heliport. From these results, we conclude that there does not appear to be reasonable cause for opposing adoption of the proposed strobe beacon as an ICAO standard. Furthermore, there does not appear to be any compelling reason to change the present United States standards for heliport identification beacons at this time.

# INTRODUCTION

## PURPOSE.

The purpose of this evaluation was to determine the suitability and effectiveness of a coded stroboscopic heliport identification beacon for international standardization. The work was performed in response to a request from the Office of Airport Standards, AAS-1, and accomplished under the Technical Center Project T19-03N, "Airport and Heliport Lighting and Marking."

## BACKGROUND.

The report of the eleventh meeting of the Visual Aids Panel of the International Civil Aviation Organization (ICAO), dated October 18, 1987, proposed the adoption of a standard international heliport beacon consisting of a white flashing (strobe) light coded to display the four "dots" or flashes that signify the letter "H" in Morse code. The present standard United States heliport beacon consists of a rotating white, green, and yellow flashing light, the yellow segment having been added to the standard white/green airport beacon to provide the distinctive heliport identification signal. The United States standard for heliport beacons has been in use for a considerable time and significant numbers of these beacons are installed and in use throughout the country.

## TECHNICAL APPROACH.

Photometric details of the proposed ICAO heliport strobe beacon, provided as appendix A to this report, were obtained; and a prototype example of the beacon was procured from a United States aviation lighting manufacturer for testing (figure 1). A typical United States standard heliport identification beacon (figure 2) was also procured to permit a comparative evaluation effort. Both beacons were initially installed for preliminary testing at the Technical Center. It was immediately evident, however, that the Technical Center was unsuitable as an evaluation site since there was a minimum of ambient light in the surrounding area. Since most heliport facilities will probably be located in urban areas, with a significant amount of ambient light competing for the pilot's attention, it was decided that the beacons would have to be relocated to a nearby city airport/heliport environment for evaluation.

The Linden Municipal Airport, Linden, New Jersey, was chosen as the primary evaluation site since a number of commercial helicopter operators are based there and the surrounding city environment provided a high density of ambient lighting. Both beacons were installed on a centrally located hangar roof and energized individually on alternating nights, during the hours of darkness, for evaluation by helicopter pilots operating into and out of the airport. Pilots were briefed on the purpose of the evaluation and were provided with evaluation questionnaires to be completed after they had the opportunity of observing each of the beacons over a period of approximately 1 month. A total of ten commercial helicopter pilots with considerable civilian helicopter experience participated in this phase of the evaluation and provided pilot opinion through questionnaire responses.

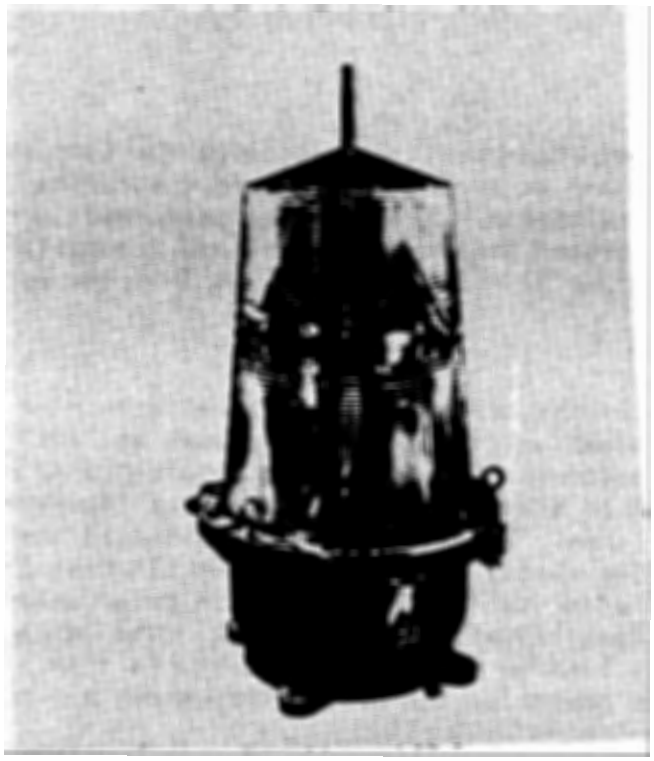


FIGURE 1. PROTOTYPE OF PROPOSED ICAO HELIPORT STROBE BEACON

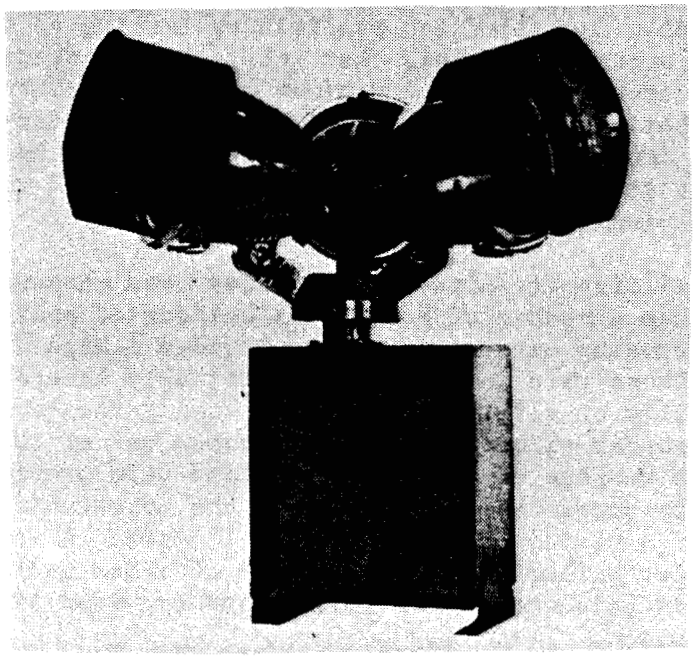


FIGURE 2. TYPICAL UNITED STATES STANDARD HELIPORT IDENTIFICATION BEACON

Upon completion of the testing at Linden Airport, the beacons were relocated to Tipton Army Airfield, Fort George G. Meade, Maryland, for further comparative evaluation by U.S. Army Reserve component pilots performing nighttime reserve training there. Project personnel were present during training sessions to operate the beacons individually, upon request, for observation and evaluation by helicopter pilots leaving and returning to the Tipton Airfield heliport area. The beacons were installed on the roof of the Army Reserve Unit hangar, in an area having relatively high ambient lighting, and pilots were afforded the opportunity of observing both beacons with and without a background of high intensity hangar floodlighting. Pilots were briefed before each flight session concerning the purpose of the evaluation and required to complete post-flight evaluation questionnaires identical to those provided to the civilian subject pilots previously at Linden Airport.

The evaluation questionnaire (figure 3) was designed to elicit pilot comment and opinion, not only as to the comparative effectiveness of the two beacons, but also to reveal significant strong and weak features of each individual device. A section for spontaneous pilot comments was also provided, and a considerable number of the subjects expanded upon their opinions and preferences for one or the other beacon in the space available.

Helicopters flown by subject pilots during the conduct of this evaluation were representative of military and civilian types commonly encountered.

## RESULTS

A total of 43 pilot-completed questionnaires were collected during the evaluations at Linden, New Jersey, and Fort Meade, Maryland. Pilot responses were very similar for both locations. A summary of questionnaire responses is provided as figure 4.

Subject pilots were about equally divided when asked for their opinion as to which type of beacon would provide the best guidance for locating a heliport. When asked if the beacons provided adequate guidance in locating a heliport, 88 percent of the pilots answered "yes" for the rotating beacon, while 77 percent replied "yes" for the strobe coded beacon. Responses showed that 74 percent (strobe) and 72 percent (rotating) thought that the beacons were distinctive enough not to be confused with other area lighting. While they had been previously briefed, only 53 percent of the pilots could determine the flashing strobe beacon's code as the Morse code letter "H". When the pilots were asked which type of beacon they thought would be the best for identifying a heliport, 58 percent chose the strobe beacon, while 42 percent favored the rotating beacon.

Pilot subjective comments also showed the same mixed opinion as to which was the best type beacon (table 1). While more pilots commented that the strobe beacon was more distinguishable, the same strobe beacon was the subject of the greater number of complaints. Pilots commented that the strobe beacon could be confused with strobe-lighted towers and helicopters with strobe anti-collision lighting in urban areas. Four pilots also complained that the strobe became distracting during the final portion of the approach. Four of the five complaints concerning the colors of the rotating beacon involved the lack of difference between the yellow and white colors. The other complaint was that the green color appeared weak in comparison to the other colors.

## HELIPORT BEACON EVALUATION

The Visual Aids Panel of the International Civil Aviation Organization (ICAO) has proposed a heliport beacon consisting of a white strobe light flashing the Morse code letter "H" for the new international standard. The current United States standard heliport beacon consists of rotating white, green, and yellow lights. This is similar to our standard airport beacon which consists of white and green lights. This evaluation is being conducted to determine which beacon would be more effective in locating a heliport. After you have had sufficient time to observe both beacon formats please complete the questions below.

Name: _____ A/C Type: _____ Date: _____

Weather Conditions: _____

CIRCLE YOUR ANSWER PLEASE.

1. Does the flashing strobe coded beacon provide adequate guidance to be useful in locating a heliport?

   Yes  No

2. Is the flashing strobe coded beacon distinctive enough to distinguish it from other flashing lights (signs, towers, etc.)?

   Yes  No

3. Can you determine the flashing strobe code as a letter "H"?

   Yes  No

4. Does the rotating (white, green, yellow) beacon provide adequate guidance to be useful in locating a heliport?

   Yes  No

5. Is the rotating (white, green, yellow) beacon distinctive enough to distinguish it from other flashing lights (signs, towers, etc.)?

   Yes  No

6. Which type beacon do you prefer as being the best for identifying a heliport?

   Flashing Strobe Coded  Rotating White-Green-Yellow

COMMENTS:

_____

_____

FIGURE 3. EVALUATION QUESTIONNAIRE

## HELIPORT BEACON EVALUATION

The Visual Aids Panel of the International Civil Aviation Organization (ICAO) has proposed a heliport beacon consisting of a white strobe light flashing the Morse code letter "H" for the new international standard. The current United States standard heliport beacon consists of rotating white, green, and yellow lights. This is similar to our standard airport beacon which consists of white and green lights. This evaluation is being conducted to determine which beacon would be more effective in locating a heliport. After you have had sufficient time to observe both beacon formats please complete the questions below.

Name: 43 Pilots A/C Type: _____ Date: _____

Weather Conditions: _____

CIRCLE YOUR ANSWER PLEASE.

1. Does the flashing strobe coded beacon provide adequate guidance to be useful in locating a heliport?

   Yes - 33 (77%) No - 10 (23%)

2. Is the flashing strobe coded beacon distinctive enough to distinguish it from other flashing lights (signs, towers, etc.)?

   Yes - 32 (74%) No - 11 (26%)

3. Can you determine the flashing strobe code as a letter "H"?

   Yes - 23 (53%) No - 18 (42%)

   Non responses - 2 (5%)

4. Does the rotating (white, green, yellow) beacon provide adequate guidance to be useful in locating a heliport?

   Yes - 38 (88%) No - 5 (12%)

5. Is the rotating (white, green, yellow) beacon distinctive enough to distinguish it from other flashing lights (signs, towers, etc.)?

   Yes - 31 (72%) No - 12 (28%)

6. Which type beacon do you prefer as being the best for identifying a heliport?

   Flashing Strobe Coded 25 (58%) Rotating White-Green-Yellow 18 (42%)

COMMENTS:

_____

_____

FIGURE 4. QUESTIONNAIRE SUMMARY SHEET

TABLE 1. SUMMARY OF PILOT COMMENTS

| COMMENT | NUMBER OF RESPONSES |
|---|---|
| Strobe beacon was more distinguishable | 12 |
| Rotating beacon was more distinguishable from other lights | 7 |
| Flashing strobe beacon confused with other lights (towers, aircraft) | 5 |
| Both beacons good | 5 |
| Weak colors of rotating beacon | 5 |
| Strobe beacon distracting on final approach | 4 |

## CONCLUSIONS

From the results of this comparative evaluation, we can conclude that:

1. Both type beacons are adequate in providing distinct and unique identification of the heliport location.

2. Neither beacon configuration has demonstrated markedly superior performance characteristics that would make it significantly preferable to the other.

3. While pilots noted minor deficiencies for each beacon type, they are not of sufficient importance to warrant design or construction changes to the existing concepts.

4. There does not appear to be reasonable cause for opposing adoption of the proposed white flashing (strobe) beacon as an International Civil Aviation Organization standard.

5. There does not appear to be any compelling reason to change the present United States standard for heliport identification beacons (three-color flashing beacon) at this time.

# APPENDIX A

## PROPOSED ICAO HELIPORT STROBE BEACON

X.3.2 Heliport beacon

Application

X.3.2.1 Recommendation.- A heliport beacon should be provided at a heliport where long range visual guidance is considered necessary and is not provided by other visual means.

Location

X.3.2.2 The heliport beacon shall be located on or adjacent to the heliport preferably at an elevated position and so that it does not dazzle a pilot at short range.

Note.- Where a heliport beacon is likely to dazzle pilots at short range it may be switched off during the final stages of the approach and landing.

Characteristics

X.3.2.3 The heliport beacon shall emit repeated series of equi-spaced short duration white flashes in the format in Figure X-7.

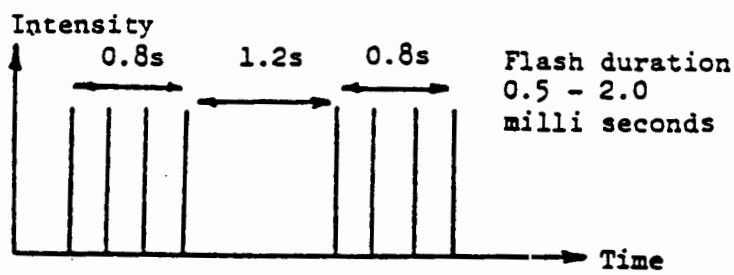
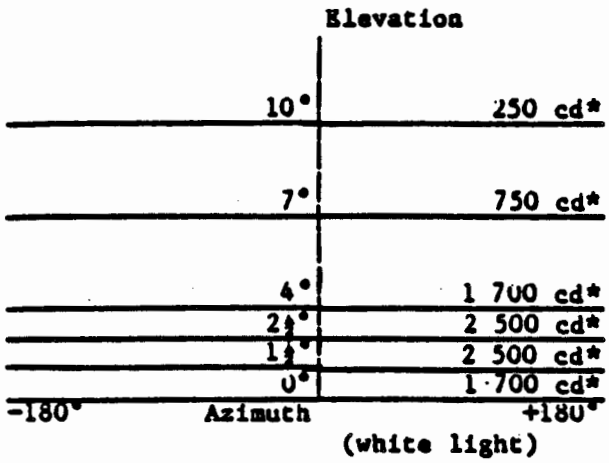


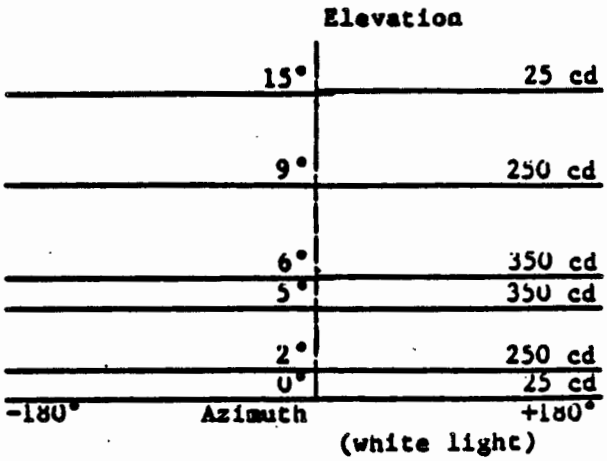

Figure X-7. Heliport beacon flash characteristics

X.3.2.4 The light from the beacon shall show at all angles of azimuth.

X.3.2.5 Recommendation.- The effective light intensity distribution of each flash should be not less than the values shown in Figure X-8, Illustration 1.

Note.- Where brillancy control is desired, settings of 10 per cent and 3 per cent have been found to be satisfactory. In addition, shielding may be necessary to ensure that pilots are not dazzled during the final stages of the approach and landing.

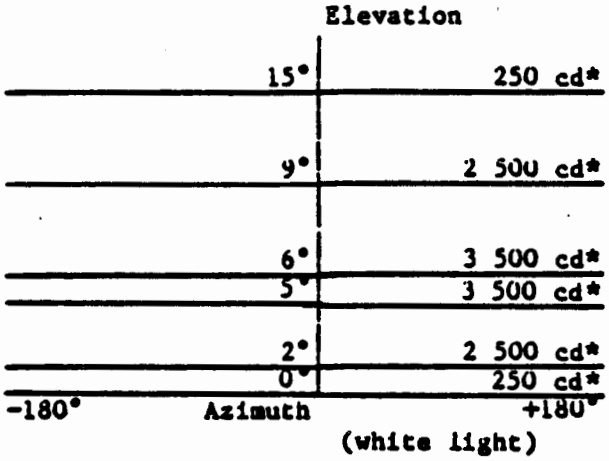



* Effective intensity

Illustration 1 - Heliport beacon

Illustration 2 - Approach light steady burning




* Effective intensity

Illustration 3 - Approach light flashing

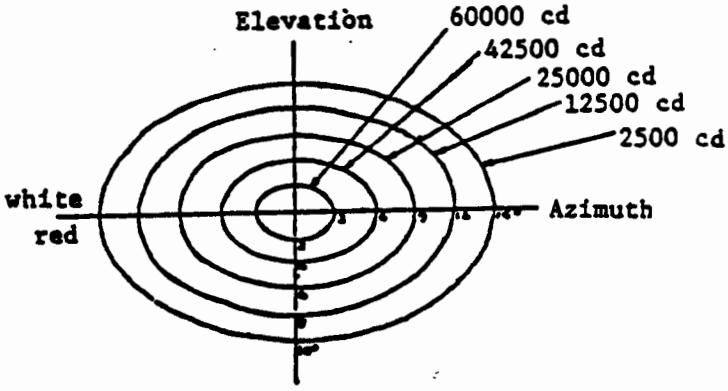



Illustration 4 - HAPI system (unfiltered beam)

Figure X-8. Isocandela diagrams of lights meant for helicopter operations in VMC