



APPLICATION & PROCESS:
HEADS-UP DISPLAY SYSTEMS

Purpose— The purpose of this advisory circular (AC) is to provide guidance to aircraft operators regarding the application and approval for the use of Heads-Up Display systems by Rwanda operators.

- This advisory circular is intended to announce the RCAA intent to exercise approval authority for the use of HUD systems.
- It is expected that this circular will be amended as the international standards for use of HUD are expanded.

Table of Contents

Section 1 Policy & General Information 2

 1.1 Status of this AC 2

 1.2 Background 2

 1.3 Applicability 2

 1.4 Related Regulations 2

 1.5 Related Publications 2

 1.6 Definitions & Acronyms 3

Section 2 Operational Approval Process 3

 2.1 General International Requirements 3

 2.2 General Rwanda Requirements 4

Section 3 Contents of Formal Application Package 5

 3.1 General Requirements 5

 3.2 For Aircraft Type 5

 3.3 For HUD Equipment 5

 3.4 Available for Consultation 5

Section 4 HUD Systems Characteristics 6

 4.1 HUD Characteristics 6

 4.2 HUD Operational Applications 6

 4.3 Hud Applications 6

Section 5 HUD Training 7

- Advisory Circulars are intended to provide advice and guidance to illustrate a means, but not necessarily the only means, of complying with the Regulations, or to explain certain regulatory requirements by providing informative, interpretative and explanatory material.
- Where an AC is referred to in a 'Note' below the regulation, the AC remains as guidance material,
- ACs should always be read in conjunction with the referenced regulations.

SECTION 1 POLICY & GENERAL INFORMATION

1.1 STATUS OF THIS AC

This AC is an original issuance.

1.2 BACKGROUND

A. The information in this advisory circular provides guidance for HUD intended for installation and operational use in aircraft engaged in international air navigation.

B. HUD may be installed and operated to enhance situational awareness or to obtain an operational credit such as lower minima for approach and landing operations.

A HUD and EVS system may be installed separately or together as part of a hybrid system

C. Any use of these systems and any operational credit gained from their use requires approval from the RCAA.

Operational credit can only be granted within the limits of the design approval

1.3 APPLICABILITY

The requirement for RCAA approval for the use of Heads-Up Displays before use in all-weather operations (Category II or III approaches and low visibility takeoff operations) to operators of Rwanda-registered aircraft involved in general aviation, aerial work and commercial air transport.

1.4 RELATED REGULATIONS

- RCAR Part 6 includes standards for approval of Heads-Up Display systems before use in all-weather operations
- RCAR Part 10 includes the requirements for all-weather operations..
- RCAR Part 12 includes the requirements for RCAA approval of all-weather operations for AOC holders.

1.5 RELATED PUBLICATIONS

The following publications provide information that is used in this advisory circular—

1) Rwanda Civil Aviation Authority (RCAA)

- ◆ AC 00-004, Generic RCAA Certification Process.
- ◆ AC 10-020; Application & Process: Enhanced Vision Systems

Copies may be obtained from RCAA-FSS.

2) International Civil Aviation Organization (ICAO)

- ◆ Annex 6, Part 1, International Commercial Air Transport – Aeroplanes
- ◆ Annex 6, Part 3, International Operations – Helicopters

Copies may be obtained from Document Sales Unit, ICAO, 999 University Street, Montreal, Quebec, Canada H3C 5H7.

1.6 DEFINITIONS & ACRONYMS

1.6.1 DEFINITIONS

[Reserved]

1.6.2 ACRONYMS & ABBREVIATIONS

The following acronyms apply to this advisory circular—

- 1) **AC** = Advisory Circular
- 2) **AOC** = Air Operator Certificate
- 3) **EASA** = European Aviation Safety Agency
- 4) **ECAC** = European Civil Aviation Conference
- 5) **EVS** = Enhanced Vision System
- 6) **EUROCAE** = European Organization for Civil Aviation Equipment
- 7) **EUROCONTROL** = European Organisation for the Safety of Air Navigation
- 8) **FAA** = Federal Aviation Administration
- 9) **HUD** = Heads-Up Display
- 10) **MEL** = Minimum Equipment List
- 11) **NAT-HLA** = North Atlantic High Level Airspace
- 12) **NSE** – Navigation System Error
- 13) **OEM** – Original Equipment Manufacturer
- 14) **RCAR** – Rwanda Civil Aviation Regulation

SECTION 2 OPERATIONAL APPROVAL PROCESS

2.1 GENERAL INTERNATIONAL REQUIREMENTS

2.1.1 COMPLETE CERTIFICATION REQUIREMENTS

Prior to operating a civil aircraft of Rwanda registry in airspace for which HUD will be used must first—

- 1) Satisfactorily complete the process for granting of the proper authorizations;
- 2) Obtain RCAA-approval document for the specific aircraft or fleet.

2.1.2 CERTIFICATION EVALUATION REQUIRED

In making this certification evaluation, RCAA shall take into account the—

- 1) Type(s) of operations proposed;
- 2) Suitability of the aircraft, instruments and equipment for those operations;
- 3) Procedures for conformance with international standards; and
- 4) Qualification of operator personnel for such operations

2.1.3 CRITERIA FOR GRANTING THE APPROVAL DOCUMENT

RCAA shall be satisfied that the—

- 1) The aircraft, instruments and equipment were designed and airworthiness-tested for the HUD operations proposed by the operator;
- 2) Operator has instituted appropriate procedures and training in respect to maintenance programmes and practices necessary to ensure the continued airworthiness of the aircraft, instruments and equipment involved in the proposed HUD operations.
- 3) Operator has instituted adequate and appropriate operational procedures to ensure the safe accomplishment of the HUD operations;
- 4) Operator has ensured that all flight crew and flight dispatcher participants in the proposed HUD operations are trained and qualified; and
- 5) The operator has demonstrated that its personnel can conduct the HUD operations consistently and safely

- The criteria specified in this paragraph will be applied after certification to all inspections involving HUD operations.
- Consistent satisfactory performance is absolutely necessary for continued HUD approval.

2.2 GENERAL RWANDA REQUIREMENTS

2.2.1 CERTIFICATION PROCESS

- A. While all certification proceeds through the same 5-phase process, whether is a single document or a completely new airline, the lines between the phases blur in a simple certification.
- B. Granting of HUD approval is a simple process. The applicant will provide the required formal application as prescribed by RCAA.
- C. The certification team will then accomplish the document conformance.
- D. Document conformance is considered complete when all submitted documents have been—
 - 1) Evaluated;
 - 2) Found to be acceptable for use in aviation; and
 - 3) Issued a formal instrument of approval or acceptance.

2.2.2 INSPECTION & DEMONSTRATION

- A. The specific aircraft to be used will be inspected for HUD equipment capability and reliability.
- B. If there is any doubt that the operator's personnel and equipment may not be capable of meeting the required international standards, the applicant will be issued an LOA to conduct HUD operations under the close supervision of RCAA inspector personnel.
- C. The demonstrated operational performance will be considered before granting the HUD approval(s).

- Past performance of the operator's personnel with the HUD will be a key factor in the type of demonstration required.

2.2.3 FINAL CERTIFICATION ACTIONS

- A. This is the period of time that RCAA completes the necessary documentation to formalize the approval of the applicant for HUD approvals for specific operations and, if necessary, for aircraft type(s).
- B. That approval will be in the form of—

- 1) For general aviation operators; an LOA valid for a period of 12 months; and
- 2) For AOC holders, a revision to the—
 - (a) Master (formal) operations specifications; and
 - (b) Aircraft Display operations specification (for each type of aircraft).

SECTION 3 CONTENTS OF FORMAL APPLICATION PACKAGE

3.1 GENERAL REQUIREMENTS

The following documents will be considered individually—

- 1) A letter of intent detailing the type of operation, equipment and relevant certification documents;
- 2) Operations Manual (or revisions) that include HUD policies and procedures appropriate to the desired operational applications;
- 3) Operations Manual-D (or revisions) that include training programs appropriate to the use of the HUD;
- 4) Maintenance Control Manual (or revisions) that include general maintenance procedures related to HUD airworthiness and current status;
- 5) Summary of relevant operator or personnel past operating history (where available);

3.2 FOR AIRCRAFT TYPE

The following documents must be submitted for each aircraft type—

- 1) Description of aircraft or equipment airworthiness data;
- 2) Operations Manual-B (or revisions) that include HUD procedures and limitations appropriate;
- 3) Proposed Minimum Equipment List (MEL) revisions for HUD, if applicable; and
- 4) Current Master Minimum Equipment List (MMEL);

3.3 FOR HUD EQUIPMENT

The following documents related to the specific HUD equipment required should be submitted with the application—

- 1) Manufacturer's certification documentation; and
- 2) Proposed maintenance program revisions;

3.4 AVAILABLE FOR CONSULTATION

The following documents (for each type of aircraft and equipment necessary for the HUD operations) must be available at the applicant's facilities for consultation—

- 1) Maintenance manuals;
- 2) Standard practices manuals; and
- 3) Illustrated parts catalogues.

- RCAA inspectors shall have unobstructed ability to refer to these documents.
- If this criteria is not met, copies of these manuals will be required to be submitted to the RCAA offices as a part of the application.

SECTION 4 HUD SYSTEMS CHARACTERISTICS

4.1 HUD CHARACTERISTICS

- A. HUD presents flight information into the pilot's forward external field of view without significantly restricting that external view.
- B. A HUD may include, but is not limited to, the following—
- 1) Airspeed;
 - 2) Altitude;
 - 3) Heading;
 - 4) Vertical speed;
 - 5) Angle of attack;
 - 6) Flight path or velocity vector;
 - 7) Attitude with bank and/or pitch references;
 - 8) Course and glidepath with deviation indications;
 - 9) Status indications (navigation sensor, autopilot, flight director, etc.); and
 - 10) Alerts and warning displays (ACAS, wind shear, ground proximity warning, etc)

A variety of flight information may be presented on a HUD depending on the intended flight operation, flight conditions, systems capabilities and operational approval.

4.2 HUD OPERATIONAL APPLICATIONS

- A. Flight operations with HUD can improve situational awareness by combining flight information located on head-down displays with the external view to provide pilots with more immediate awareness of relevant flight parameters and situation information while they continuously view the external scene.
- B. This improved situational awareness can also reduce errors in flight operations and improve the pilot's ability to transition between visual and instrument references as meteorological conditions change.
- C. Flight operations applications may include the following—
- 1) Enhanced situational awareness during all flight operations, but especially during taxi, take-off, approach and landing;
 - 2) Reduced flight technical error during take-off, approach and landing especially in all-weather operations; and
 - 3) Improvements in performance due to precise prediction of touchdown area, tail strike awareness/warning and rapid recognition and recovery from unusual attitudes.

4.3 HUD APPLICATIONS

- A. HUD may be used for the following purposes—
- 1) To supplement conventional flight deck instrumentation in the performance of a particular task or operation; and
 - 2) As a primary flight display;

The primary cockpit instruments remain the primary means for manually controlling or manoeuvring the aircraft

- B. Information presented by the HUD may be used by the pilot in lieu of scanning head-down displays.
- C. Information presented by the HUD may be used as a means to achieve additional navigation or control performance. The required information is displayed on the HUD.
- D. Operational credit, in the form of lower minima, for HUD used for this purpose may be approved for a particular aircraft or automatic flight control system.

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SECTION 5 HUD TRAINING

- A. Training requirements will be monitored and approved by the RCAA.
- These training requirements should include requirements for recent experience if the RCAA determines those requirements are significantly different than current requirements for the use of conventional head-down instrumentation.
- B. HUD training should address all flight operations for which the HUD is designed and operationally approved.
- Training should include contingency procedures required in the event of head-up display degradation or failure.
- C. HUD training should include the following elements as applicable to the intended use—
- 1) An understanding of the HUD, its flight path and energy management concepts, and symbology.
 - ◆ This should include operations during critical flight events (ACAS TA/RA, upset and wind shear recovery, engine or system failure, etc.);
 - 2) HUD limitations and normal procedures, including maintenance and operational checks performed to ensure normal system function prior to use.
 - ◆ These checks include pilot seat adjustment to attain and maintain appropriate viewing angles and verification of HUD operating modes;
 - 3) HUD use during low visibility operations, including taxi, take-off, instrument approach and landing in both day and night conditions.
 - ◆ This training should include the transition from head-down to head-up and head-up to head-down operations;
 - 4) Failure modes of the HUD and the impact of the failure modes or limitations upon crew performance;
 - 5) Crew coordination, monitoring and verbal call out procedures for single HUD installations with head-down monitoring for pilot-not-equipped with HUD and head-up monitoring for pilot-equipped with HUD;
 - 6) Crew coordination, monitoring and verbal call-out procedures for dual HUD installations with use of HUD by the pilot flying the aircraft and either head-up or head-down monitoring by the other pilot;
 - 7) Consideration of the potential for loss of situational awareness due to "tunnel vision" (also known as cognitive tunnelling or attention tunnelling);
 - 8) Any effects that weather, such as low ceilings and visibilities, may have on the performance of a HUD; and

Some training elements may require adjustments based on whether the aeroplane has a single or dual HUD installation.

- 9) HUD airworthiness requirements.

End of Advisory Circular
