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NATIONAL TRANSPORTATION SAFETY BOARD

Washington, D.C.

FAA Avionics Systems Branch (AIR-130)

Synthetic Vision Position Paper

(2 Pages)



FAA
Avionics Systems Branch, AIR-130

Synthetic Vision

Background

Synthetic vision is a computer-generated image of the external scene topography from the perspective of the flight deck that is derived from aircraft attitude, high-precision navigation solution, and database of terrain, obstacles and relevant cultural features. Consequently, a synthetic vision system is an electronic means to display a synthetic vision image of the external scene topography to the flight crew. While these definitions describe the external, computer-generated image, most installations incorporate primary flight display instruments and usually pathway guidance.

Existing Guidance

- Advisory Circular 23-26, *Synthetic Vision and Pathway Depictions on the Primary Flight Display*
- RTCA/DO-315 *Minimum Aviation System Performance Standards (MASPS) for Enhanced Vision Systems (EVS), Synthetic Vision Systems (SVS), Combined Vision Systems (CVS), and Enhanced Flight Vision Systems (EFVS)*

Current Status

Synthetic vision provides increased situation awareness. FAA list of approved synthetic vision installations may be found at the FAA website, <http://rql.faa.gov> , under the category of Special Conditions & Supplemental Type Certificates. These installation approvals exist for both fixed wing and helicopter aircraft. However, current installations of synthetic vision appliances do not allow the operator any additional operational benefit (for example, lower takeoff or landing minima). There are no current rulemaking efforts to provide operational credit for synthetic vision installations.

Performance Considerations

The FAA Aircraft Certification Service evaluates synthetic vision systems primarily around the applicant's stated intended function (i.e., its functionality). Applicants state how synthetic vision will be used when a certification project begins. While synthetic vision provides the pilot with increased situation awareness, the most challenging performance consideration factor is integrity - guaranteeing what is being displayed is what actually exists out the cockpit window. Other performance considerations which must be addressed are listed below:

- Terrain alerting – function compatible with existing terrain warning systems?
- Three-dimensional position accuracy and heading integrity – based on the intended function, what pilot decisions are based on the computer image?
- Terrain color and depiction – are the most effective techniques used to convey terrain information to pilots?
- Cultural features – do features increase situation awareness and reduce mental workload? Since cultural features (e.g., small lakes, rivers, and vegetation) may change, only those features with sufficient duration and importance, or posing a significant hazard to aircraft, should be considered. While these depictions are not currently mandatory, they should be evaluated for accuracy, with emphasis on the database.
- Terrain, obstacle, and navigation database, and database integrity – is the level of database integrity commensurate with the intended function, and is it current? What was the accuracy of the originating survey data?
- Display update rates and image latency – is the synthetic vision image updated at an equivalent rate with the rest of the primary flight display?
- Pathway displays – besides understanding the pathway boundary, hazardously misleading information must be prevented (e.g., a compelling flight display through terrain).
- Field of view – has the image been minified to accommodate more information but with less detail?
- Range – does the image range match what the pilot sees out-the-window?

The FAA is actively working with industry to develop safe, affordable standards to enable the use of this technology to increase safety in fixed and rotary wing aircraft.