

## ICAO Action

The safety recommendation has been processed by ICAO and the following actions have been taken with regard to the above mentioned safety recommendation:

1. The conclusions of section 3.2. of the Final Report with regard to the causal factors of the incident have been examined and deemed fully justified in light of the information provided in the body of the report. It seems that such factors include, *inter alia*, the incorrect bearing information provided by the VOR on which the published approach procedure was based, and the failure of the quality controls associated with the maintenance and monitoring of the facility.
2. A preliminary review of the relevant ICAO provisions on radio navigation aid ground station monitors has been conducted. In the specific case of the VOR, monitoring provisions are specified in Annex 10, Volume I, Chapter 3, 3.3.7 (similar provisions exist for other radio navigation aids):

### 3.3.7 Monitoring

*3.3.7.1 Suitable equipment located in the radiation field shall provide signals for the operation of an automatic monitor. The monitor shall transmit a warning to a control point, and either remove the identification and navigation components from the carrier or cause radiation to cease if any one or a combination of the following deviations from established conditions arises:*

- a) a change in excess of 1 degree at the monitor site of the bearing information transmitted by the VOR;*
- b) a reduction of 15 per cent in the modulation components of the radio frequency signals voltage level at the monitor of either the subcarrier, or 30 Hz amplitude modulation signals, or both.*

*3.3.7.2 Failure of the monitor itself shall transmit a warning to a control point and either:*

- a) remove the identification and navigation components from the carrier; or*
- b) cause radiation to cease.*

3. It should be noted that, on the occasion of the incident, as stated in the report, variable VOR bearing errors of up to 30 degrees were observed. Accordingly, condition 3.3.7.1 a) (bearing changes in excess of 1 degree) had arisen, and the monitor should have been triggered to perform the required action, namely “*either remove the identification and navigation components from the carrier or cause radiation to cease* “. However, as the report itself confirms, the monitor failed to activate, either because the error condition had not been detected or because the detection did not lead to the required action being performed. This could be attributable either to a permanent condition associated with the use of unsuitable monitoring equipment, or to a temporary failure of the monitoring equipment itself. The former reason would point to non-compliance with the main provisions of 3.3.7.1; the latter would point to non-compliance with the provisions of 3.3.7.2. In either case, it is apparent that the relevant ICAO Standards were not being met by the monitoring equipment. Had they been met, the incident could have been prevented.

4. In light of the above considerations, the following conclusions are submitted:
  - a) one or both of the relevant ICAO Standards for VOR monitoring (3.3.7.1 and 3.3.7.2) were not being met by the monitoring equipment;
  - b) the existing ICAO provisions are sufficient to assure the effectiveness of VOR monitoring, provided that such provisions are met by States.
5. The incident report will also be submitted to the consideration of the next meeting of the Navigation Systems Panel (NSP), to be held on 22–31 October 2008.