International Civil Aviation Organization

WORKING PAPER

A38-WP/123
TE/41
22/8/13
(Information paper)
English and Russian only[1]

ASSEMBLY — 38TH SESSION

TECHNICAL COMMISSION

Agenda Item 31: Aviation Safety — Emerging Issues

METHOD OF EXAMINATION OF THE PORTABLE GNSS RECEIVERS' DATA DURING THE AIRCRAFT ACCIDENT INVESTIGATION

(Presented by the Interstate Aviation Committee)

EXECUTIVE SUMMARY

Due to the wide use of the satellite navigation technologies in civil aviation the capabilities of portable GNSS receivers' data investigation expand when these receivers are discovered and removed from the aircraft accident site.

The Interstate Aviation Committee (IAC) along with the leading aircraft accident investigation organizations (BEA, NTSB etc.) has developed methods of data recovery from the damaged portable GNSS receivers during the aircraft accident investigation.

IAC's experience in using such method substantiates its efficiency as a supplemental means for aircraft accident investigation, as well as the possibility to consider the introduction of this method into ICAO guidance material on the aircraft accident investigation.

Action: The Assembly is invited to note this information.

Strategic Objectives:	This working paper relates to the Safety Strategic Objective.
Financial implications:	No financial implications.
References:	Annex 13 — *Aircraft Accident and Incident Investigation* Doc 9756, *Manual of Aircraft Accident and Incident Investigation* Doc 9962, *Manual on Accident and Incident Investigation Policies and Procedures*

[1] Versions in Russian and English are presented by the Interstate Aviation Committee (IAC).

(3 pages)

1. INTRODUCTION

1.1 The ICAO *Manual on Accident and Incident Investigation Policies and Procedures* (Doc 9962) in Section 9.1, LABORATORY TESTING OF AIRCRAFT SYSTEMS AND COMPONENTS indicates that in cases when special examinations or testing of specific components are required "specialist examinations may also be needed to conduct the read-out and decoding of information from other electronic devices, such as satellite navigation equipment (e.g. GPS, GLONASS, GPWS, TAWS, FMS)".

1.2 During the past years due to the widely use of the satellite navigation technologies in civil aviation the amount of work on the examination of data from the portable GNSS receivers increases provided that these receivers are discovered and removed from the aircraft accident site.

1.3 As the portable GNSS receivers are not recognized as standard aviation equipment there are no requirements for the manufacturers of such receivers to describe the algorithms of the track data recording on the internal data storage device, which later on could have been used during the aircraft accident investigation. This fact leads to the significant increase of the workload related to the data recovery if the portable GNSS receiver has been damaged during the aircraft accident.

1.4 The specificity of the portable GNSS receivers operation can impose some limitations on the use of the recorded data during the aircraft accident investigation. When it is impossible to determine the accurate position (e.g. due to antenna blockage) these devices can switch to the position prediction mode. At that time the recording of the “false” data will continue, which usually complicates the analysis of this data at a later stage.

2. DISCUSSION

2.1 Presently most of the receivers’ models can be considered as a device, which is equipped with a module for its position determination using the GPS/GLONASS technology and which provides the following features to the user:

a) indication of its position on the terrain map;

b) work with the database of the user’s navigation points;

c) tracks definition along with their indication on the terrain map;

d) capture of the track covered (Track log function); and

e) data synchronization and exchange with the personal computer (PC).

However in most accidents it is impossible to recover data using the standard means, so the issue of creating a complex methodology incorporating methods and algorithms of data recovery from the damaged portable GNSS receivers during the aircraft accident investigation has gained a specific value.

2.2 The following types of damages make the data recovery from the significantly damaged devices the most labor-consuming:

a) burn-off of the internal elements due to the high temperature;

b) deformation of the multilayer standard board; and

c) destruction of some microchips due to the mechanical shock.

2.3 In order to solve the problem of the recorded data recovery from the damaged portable GNSS receivers IAC along with the other leading aircraft accident investigation organizations (BEA, NTSB etc) has developed methods, which allow the track data readout from the FLASH-memory microchips removed from the damaged portable GNSS receivers.

The developed methods have been practically approbated and have been positively evaluated by the international aircraft accidents' investigation community during the working meetings of IRIG (International Recorder Investigator Group) in 2008 in Taipei and in 2011 in Moscow.

2.4 Throughout the years the implementation of the developed methods during the aircraft accident investigation in IAC has assisted in more than fifty aircraft accident investigations (mostly of general aviation (GA) aircraft), during which the portable GNSS receivers' data had been analyzed due to the absence or loss of the standard data recorders. Use of this supplementary data has accelerated the investigation, as well as has allowed for the improved accuracy of the aircraft flight track restoration.

2.5 At the same time the major difficulty experienced when using this method is that the track data readout is a highly labor-consuming process, which can be explained by the limited amount of the service data recorded on the portable GNSS receiver and by the absence of the description of the algorithms used in the track data recording.

2.6 IAC's positive experience in using such method of the recorded data recovery from the portable GNSS receivers proves its efficiency as a supplementary source during the aircraft accident investigation. It seems to be reasonable to consider introduction of the appropriate material into the ICAO Manual of Aircraft Accident and Incident Investigation within the framework of ICAO continuing activities in the field of aircraft accident investigation. This material could include some guidance on tools and methods to recover data from memory chips installed on GNSS portable devices (including tablets and light PCs) that are increasingly being used, particularly in GA. Potentially, suggestions to manufacturers of such devices could be included with regard to recording and storing data that could benefit aviation (and other means of transportation) safety investigation authorities.

— END —