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NATIONAL TRANSPORTATION SAFETY BOARD
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Addendum to Group Chairman's Factual Report
Flight Data Recorder

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(4 pages)

NATIONAL TRANSPORTATION SAFETY BOARD
Office of Research and Engineering
Washington, D.C.

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Addendum to Group Chairman's Factual Report - Flight Data Recorder

A. ACCIDENT DCA-97-MA-058

Location	:	Agana International Airport, Guam
Date	:	August 5, 1997
Time	:	0142 Local Time (1542 Coordinated Universal Time)
Aircraft	:	Korean Air Lines Flight 801, a Boeing B-747-300, HL-7468

B. GROUP IDENTIFICATION

The group met at NTSB headquarters Washington, D.C. from August 11 to August 15, 1997, for the initial readout of the FDR. The group members were:

Chairman	: Thomas R. Jacky, NTSB
Member	: Sumio Thomas Sakata, Boeing Commercial Airplane Group
Member	: George Kaseote, Federal Aviation Administration (FAA)
Member	: Heung Ok Choi, Korean Ministry of Construction & Transportation
Member	: Kim Yung Yook, Korean Air
Member	: Joseph Poirier, Pratt & Whitney

However, the group did not participate in the readout activities described in this addendum.

C. SUMMARY

Subsequent to the readout of the HG-7468's FDR, the airline provided documentation that eleven additional parameters were recorded on the FDR. The additional parameters were retrofitted after the airline took delivery of the airplane. Documentation provided by the airline and airplane manufacturer at the time of the initial readout did not reflect the retrofitted parameters.

The documentation of the additional parameters did not include the necessary equations to convert the recorded decimal information into engineering units. The Safety

Board was unable to acquire verified equations for the parameters, therefore, equations used previously for similar B-747 FDR readouts were utilized for this effort. However, since the validity of the conversion equations could not be verified, the reader is cautioned that the resultant data may be erroneous; some of the resultant data is clearly erroneous.

The composite transcription file used for the initial FDR readout was used to develop tabular and plotted data corresponding to the additional parameters. The data listing and plots were included in this addendum.

Within the Group Chairman's Factual Report - Flight Data Recorder, Section C (Summary), the paragraph denoted 9) of the observed points should be changed to read as follows:

9) The horizontal stabilizer (pitch trim) position was approximately 6 units five minutes prior to the data transition. At time 17,142 seconds, the horizontal stabilizer position values increased to 6.6 units, and at time 17,284 seconds, the values increased to 7.88 units. The final, valid recorded value, 8.01 units, was recorded at 17,340 seconds.

Finally, further observation of the tabular data revealed additional, erroneous data. Within the Group Chairman's Factual Report - Flight Data Recorder, Attachment 3, "Tabular Listings of Korean Air Flight 801 FDR Data, tabular file 1, within data listed at time 17,338 seconds, the final values for Normal Acceleration, Lateral Acceleration, and Longitudinal Acceleration, -3.370 G's, -1.083 G's, and -1.083 G's, respectively, are erroneous and should be ignored. In addition, within tabular file 3, the stabilizer position values at times 17,134 through 17,138 seconds are considered erroneous and should be ignored.

D. DETAILS OF INVESTIGATION

During all-party meetings regarding the investigation, held in Guam during January, 1998, the Safety Board received information from Korean investigative officials that eleven parameters, in addition to the parameters developed during the initial readout, had been recorded on the accident airplane's FDR. The documentation indicated that Korean Air Lines installed, or had installed, the additional parameters after taking delivery of the airplane. Therefore, the parameters were not reflected in the FDR documentation provided by the manufacturer at the time of the initial FDR readout. In addition, the parameters were not reflected in the documentation provided by the airline and Korean investigative authorities at the time of the initial accident readout. The additional parameters were: exhaust gas temperature (EGT) and oil quantity for each of the airplane's four engines, static air temperature, left number 4 spoiler position, and right number 12 spoiler position.

The new documentation included word slot and bit location descriptions for the additional, retrofitted parameters, but did not provide the equations necessary to convert the recorded decimal counts into engineering units. The airline, the airplane manufacturer, and a contractor to the airplane manufacturer did not have definitive documentation for the necessary equations. Therefore, equations used by the Safety Board in previous readouts of FDRs from similar B-747s were utilized for the purposes of this exercise. However, the validity of the conversion equations has not been verified, therefore, the reader is cautioned that the resultant data may be erroneous; some of the resultant data is clearly erroneous. Additional efforts will be made to ensure the equations are correct or change if necessary.

The equations used to convert the data were:

1) EGT (in degrees Celsius) - All Four Engines:

EGT = (recorded decimal value) x (0.24414063)

2) Oil Quantity (in gallons) - All Four Engines:

Oil Quantity = (recorded decimal value) x (0.001709401)

3) Static Air Temperature (in degrees Celsius):

Temperature = (recorded decimal value) x (0.028816) - 59.0

4) Spoiler Position Left Number 4 and Right Number 12 (in degrees):

For recorded decimal values between 0 and 2048:

Position = (recorded decimal value) x (0.08789)

For recorded decimal values between 2049 and 4095:

Position = (recorded decimal value - 4095) x (0.08789)

The previously-developed computer file of transcribed data were reduced from the recorded binary decimal values (0 to 4095) to engineering units by the above conversion equations. The actual conversion was accomplished by an automated process that incorporates the laboratory's computer and associated software. Elapsed time, or FDR Subframe Reference Number, from the beginning of the data transcription was used as the time base for data output.

Observation of the resultant data revealed that either some of the conversion equations are incorrect, or that the recorded data are erroneous for specific parameters. For example, over the final five minutes of recorded data, the static air temperature values exceed the known ambient temperature at the airport for the time of the accident. Therefore, extreme caution should be taken while using the data for these parameters.

Tabular printouts of selected parameters for the final, approximate 5 minutes of recorded data, from 17,048 to 17,352 FDR Subframe Reference Number (Elapsed Time), are included in Attachment 3. Data determined to be erroneous, out-of-sync, or suspect have been crossed out and should be ignored.

Two plots of the additional parameters during the accident sequence are included in Attachment 4. Plots 4-1 covers the final 5 minutes of recorded data, from 17,050 (4:44:10) to 17,350 (4:49:10) Elapsed Time (FDR Subframe Reference Number). Plot 4-2 covers the final 30 seconds of recorded data, from 17,312 (4:48:32) to 17,342 (4:49:02) Elapsed Time. Care should be used while reading the plot, as erroneous and/or out-of-sync data were not plotted.

Since, for the portion of flight presented in the tabular data files and plots, the pressure altitude of the airplane was less than 5,000 feet, pressure altitude and altitude fine may be used interchangeably as the airplane's altitude.

Tom Jacky
Aerospace Engineer

Attachments

1. HG-7468 FDR Parameter Retrofit Documentation **(Exhibit 10D)**
2. Revised HG-7468 Parameter List **(Exhibit 10C)**
3. Tabular Listing of Korean Air Flight 801 FDR Data
4. Plots of Korean Air Flight 801 FDR Data **(Exhibit 10E)**