


**SECTION VI ATTACHMENTS**

**EMB-120 Flight Simulation Data**

		<b>TRANSMISSÃO EM FAC-SIMILE</b>		No. <b>EAD-077/95</b>	
<b>DESTINATÁRIO (ADDRESSEE)</b>				<b>DATA (DATE)</b>	
EMPRESA (COMPANY) <b>NTSB - Performance Group</b>		FAC-SIMILE No <b>(202)382-1033</b>		<b>26/09/95</b>	
AT. Sr(a) . (ATT. Mr(s).) <b>JIM RITTER</b>		SETOR (LOCATION) <b>Performance</b>		<b>PAG. (PAGE)</b> <b>1 DE (OF) 2</b>	
<b>REMETENTE (SENDER)</b>					
NOME (NAME) <b>DECIO PULLIN</b>		SETOR (LOCATION) <b>DTE/TEE/EAD</b>		FAX No. <b>55 123 411675</b>	
<b>ASSUNTO (SUBJECT)</b>				<b>TELEFONE (PHONE)</b>	
<b>EMB-120 N256AS ACCIDENT - AERODYNAMIC STUDY</b>				<b>55 123 251457</b>	

**COMUNICAÇÃO (COMMUNICATION)**

IN RESPONSE TO YOUR PHONE REQUEST ABOUT THE AERODYNAMIC EFFECT OF THE ENGINE LEFT NACELLE BENDING OF THE ASA N256AS EMB-120 ACCIDENT, FOLLOWS THE RESULTS OF OUR ANALYSIS:

**ASA N256AS EMB-120 ACCIDENT SIMULATOR ANALYSIS**

In order to try to obtain the value of the aerodynamic effect of the bending of the engine nacelle and propeller to the left due to sudden blade in flight separation, a simulator flight was performed with the aerodynamic module modified to simulate the lift (Cl), drag (Cd), rolling moment (Cr) and yawing moment (Cn) coefficient changes due to the engine nacelle and propeller bending. Some theoretical calculations were performed assuming that the nacelle had twisted to the left in such way that the wing area behind the twisted nacelle would not produce any lift and a corresponding rolling moment to the left would be produced. The drag of a flat plate of the same area as the side view of the twisted nacelle was assumed as well as the corresponding yawing moment (The arm for the moment was assumed as 0.26 spans). The final theoretical values were:

$\Delta C_l = -0.08$

$\Delta C_d = + 0.0500$

$\Delta C_r = - 0.08 \cdot 0.26 = - 0.024$

$\Delta C_n = - 0.05 \cdot 0.26 = - 0.013$

14150

Reading the FDR, the time of 14500 sec. was chosen as a reference for comparison with the simulator due to the fact that the airplane was stable and with roll angle and pitch angle close to zero. The obtained flight condition was:

CASO NÃO RECEBA TODAS AS PÁGINAS, FAVOR TELEFONAR O MAIS RÁPIDO POSSÍVEL  
 (IF YOU DO NOT RECEIVE ALL THE PAGES, PLEASE CALL BACK AS SOON AS POSSIBLE)

**EMBRAER - EMPRESA BRASILEIRA DE AERONÁUTICA**  
 CAIXA POSTAL 343/CEP 12227-901 SÃO JOSÉ DOS CAMPOS / SÃO PAULO / BRASIL  
 (FAX COMPATIBLE WITH GROUPS I/II/III AND C.C.I.T.T STANDARDS)

VI-1


**TRANSMISSÃO EM FAC-SÍMILE**

PÁG. (PAGE)

2 DE (OF) 2

**CONTINUAÇÃO DA COMUNICAÇÃO (COMMUNICATION CONTINUATION)**

Pitch angle = + 1 deg  
 Airspeed = 165 Kias  
 Rate of descent = 1400 fpm  
 Wheel position = 28 deg RH  
 Weight = 24000 lb (assumed)

Roll angle = 0 deg  
 Altitude = 7000 ft  
 Torque right = 92 %  
 Prop RPM = 100 %  
 C.G. = 25 % (assumed)

Using the theoretical values described above and the airplane flight conditions from the FDR, the simulator was flown adjusting the Airspeed, Altitude, Roll angle, Torque, NP, Weight and C.G. position. The obtained values in that condition were:

Pitch angle = -1 deg  
 Wheel position = 20 deg

Rate of descent = 1200 fpm

The theoretical values of the aerodynamic coefficients were progressively adjusted until the obtained values of the Pitch Angle, Rate of Descent and Wheel Position became very close to the FDR readings. The final values of the aerodynamic coefficients were:

Delta Cl = -0.11

Delta Cd = + 0.0550

Delta Cr = - 0.029

Delta Cn = - 0.013

The obtained rudder deflection on that condition in the simulator was -11 deg. This is the force limited stop of the rudder at that airspeed.

The values above represent the change in the aerodynamic characteristics of the EMB-120 to reproduce the time frame <sup>14150</sup>14500 sec of the FDR reading of ASA N256AS.

Regards,

Decio Pullin



**TRANSMISSÃO EM FAC-SIMILE**

No.  
EAD-080193

DESTINATÁRIO (ADDRESSEE)	
EMPRESA (COMPANY) NTSB - Performance Group	FAC-SIMILE No (202)382-1033
AT. Sr(a) . (ATT. Mr(s).) JIM RITTER	SETOR (LOCATION) Performance

DATA (DATE)  
29/09/95

PÁG. (PAGE)  
1 DE (OF) 1

REMETENTE (SENDER)	
NOME (NAME) DECIO PULLIN	SETOR (LOCATION) DTE/TEE/EAD

FAX No.  
55 123 411675

ASSUNTO (SUBJECT)  
EMB-120 N256AS ACCIDENT - FAX INFORMATION CORRECTION

TELEFONE (PHONE)  
55 123 251457

COMUNICAÇÃO (COMMUNICATION)

Dear Jim:

In the last fax I sent you (EAD-077/95 dated 26/Sep/95), I wrote the wrong Time Slice value from the FDR that was used for simulator comparison. The right value is 14150 sec instead of 14500 sec. Please correct this information on the above mentioned fax.

Regards,

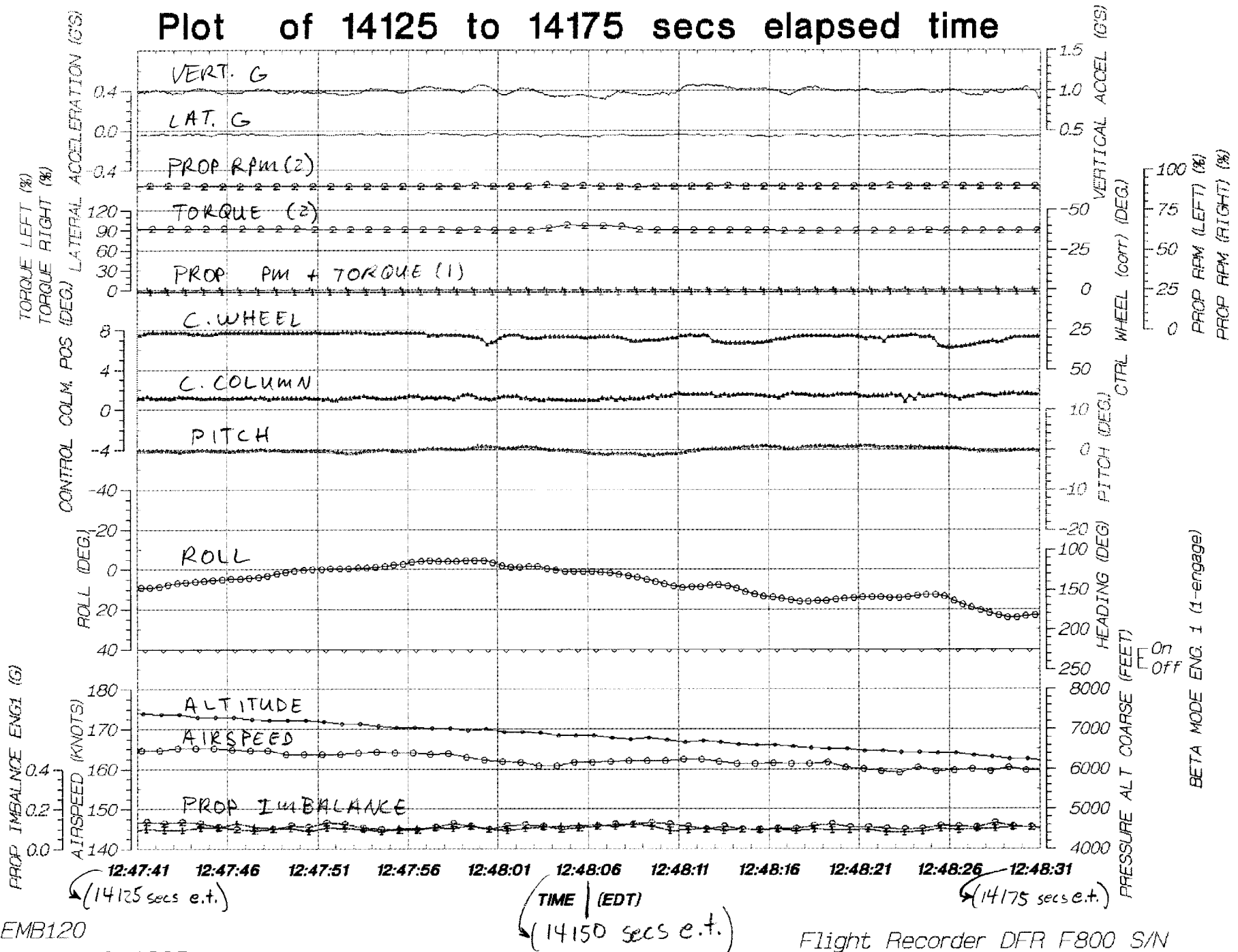
Decio Pullin

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VI-3

# Plot of 14125 to 14175 secs elapsed time



EMB-120

EMB120  
 August 21, 1995  
 Revised: December 4, 1995

Flight Recorder DFR F800 S/N  
 DCA-95-M-A-054