

**APPENDIX K**

**Briefing Presentation Materials**

*EgyptAir Flight 990 Investigation*  
*Elevator Failure Conditions Ground Tests August 27-31, 2001*

**Monday August 27, 2001 Agenda:**

- 1. Introductions**
- 2. Test Objectives**
- 3. Test Airplane Configuration and Baseline Test Data Review**
- 4. Failure Modes Discussion**
- 5. Test Plan for Cable Failure Conditions**
- 6. Testing Protocol Discussion**
- 7. Test Condition Review**
- 8. Aft Cable Failure Ground Test – Meet at airplane for test briefing**

*EgyptAir Flight 990 Investigation*  
*Elevator Failure Conditions Ground Tests August 27-31, 2001*

**Test Objectives:**

- 1. To measure the response of the 767 elevator control system to two failure combinations:**
  - Control Cable failure and jam of one free end**
  - Elevator Power Control Actuator (PCA) control valve jam and a high break-out input pogo**
- 2. To measure the elevator control available from the left and right control columns after insertion of these failure conditions**
- 3. To produce factual documentation of the testing that all parties agree with by the end of the week**

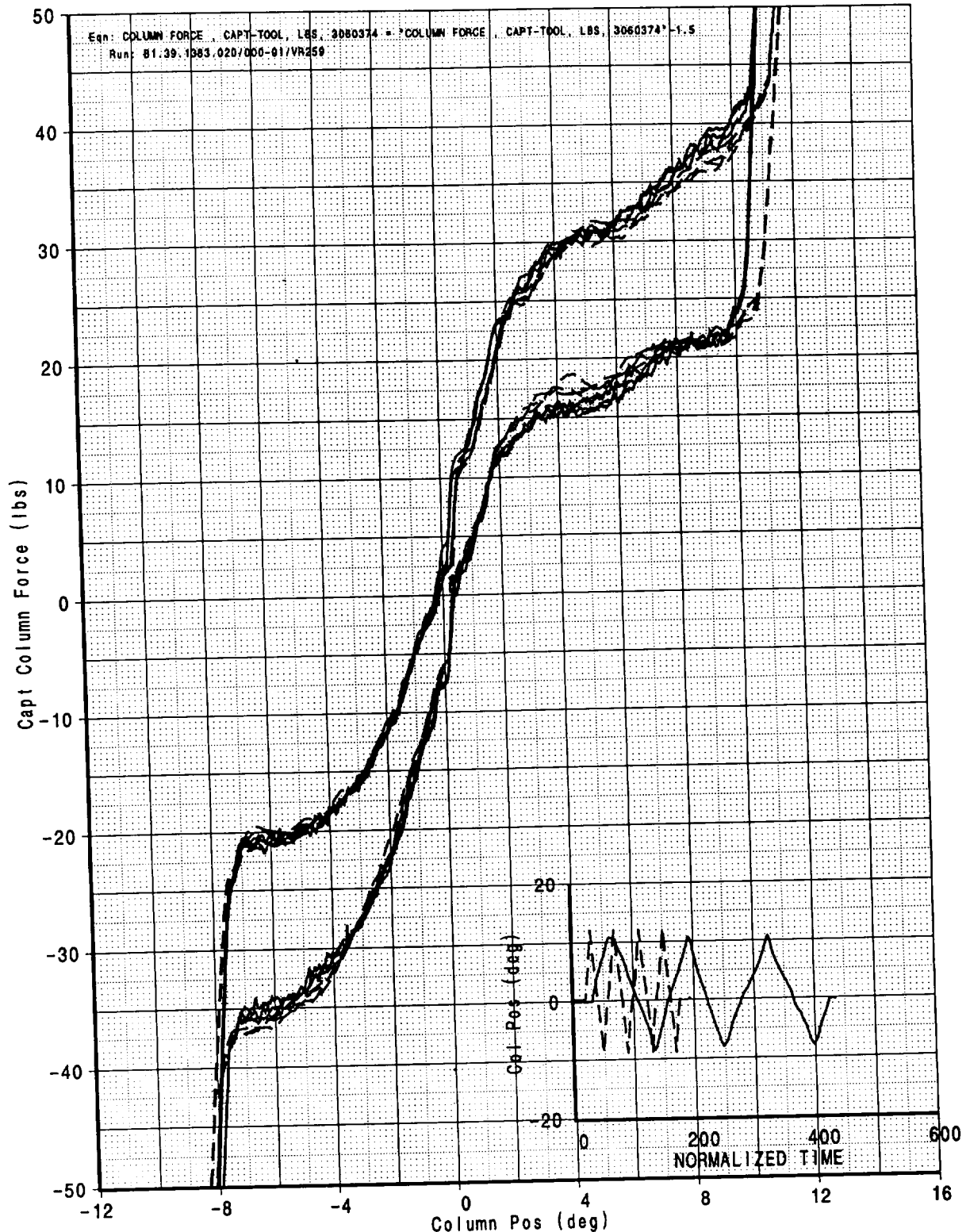
*EgyptAir Flight 990 Investigation*  
*Elevator Failure Conditions Ground Tests August 27-31, 2001*

**Test Airplane Configuration and Baseline Test Data Review:**


- **The test airplane is a 767-Freighter, Boeing variable number VR259, line number 848**
  
- **Elevator System Configuration Differences 767-300 vs 767-Freighter**
  1. **Airplane plan forms are identical**
  2. **All elevator system components are the same**
  3. **The only difference is a slight modification to the elevator cable routing to accommodate internal configuration unique to the Freighter**
  4. **The magnitude of the cable routing difference is very small and produces no system response differences relevant to the testing planned this week**
  
- **Baseline Test Data Review**

**Comparison of elevator control sweeps from previous Ground Test (VQ001) with data from VR259 in a production configuration (prior to test modifications being incorporated)**

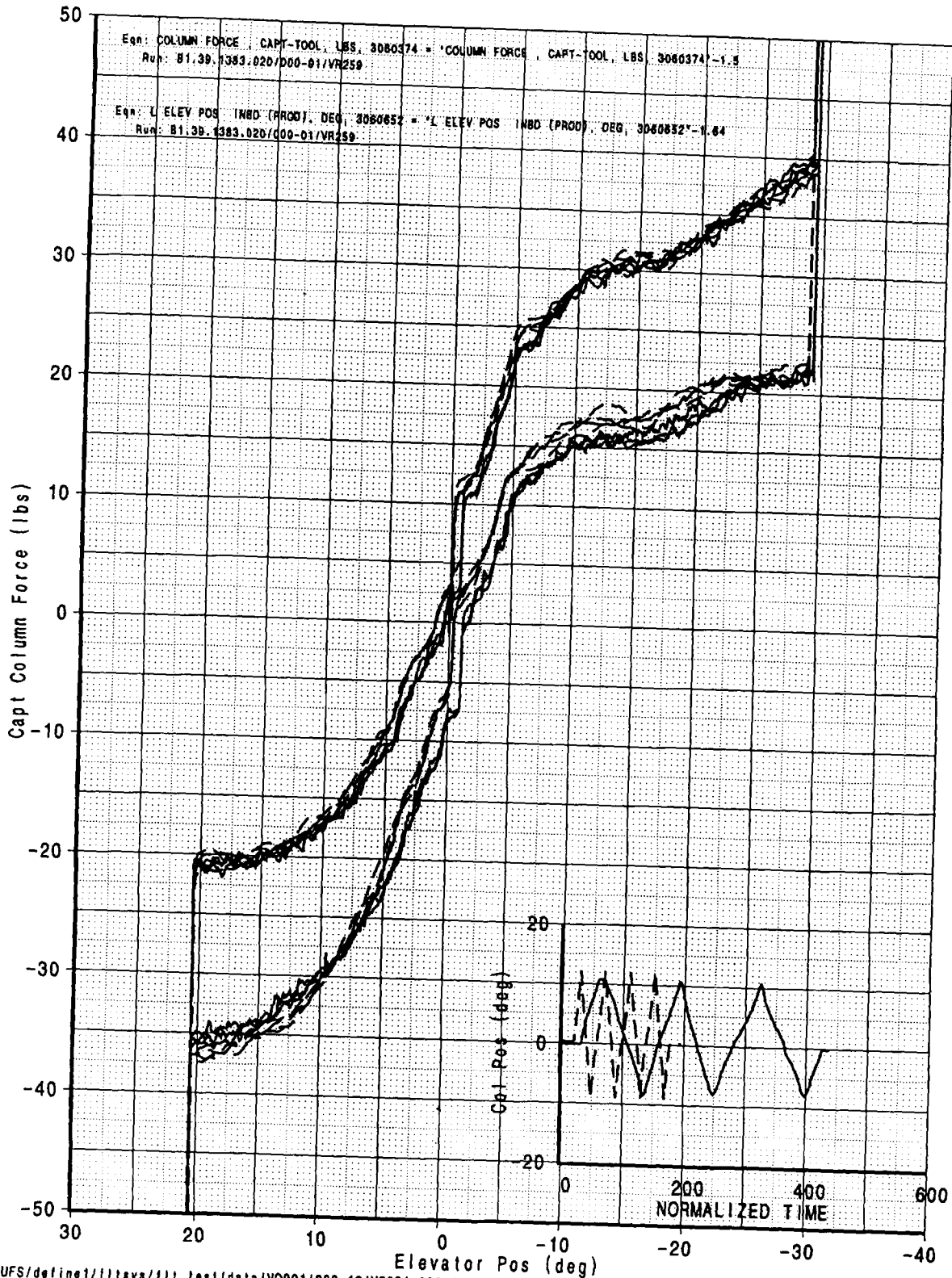
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 - - - - - VQ001



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CALC	B.RICHARDSON	27Aug01	REVISED	DATE	VR259 COLUMN FORCE VS. COLUMN POSITION VQ001 COLUMN FORCE VS. COLUMN POSITION CAPT SLOW RATE COLUMN SWEEP - BASE FEEL 	VR259 767-300F
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\_\_\_\_\_ VR259  
 - - - - - VQ001



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CALC	B. RICHARDSON	27Aug01	REVISED	DATE	VR259 COLUMN FORCE VS. ELEVATOR POSITION VQ001 COLUMN FORCE VS. ELEVATOR POSITION SLOW SWEEP - BASE FEEL	VR259 767-300F
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*EgyptAir Flight 990 Investigation  
Elevator Failure Conditions Ground Tests August 27-31, 2001*

**Failure Modes Discussion:**

**Control Cable Failure and Jam of one free end**

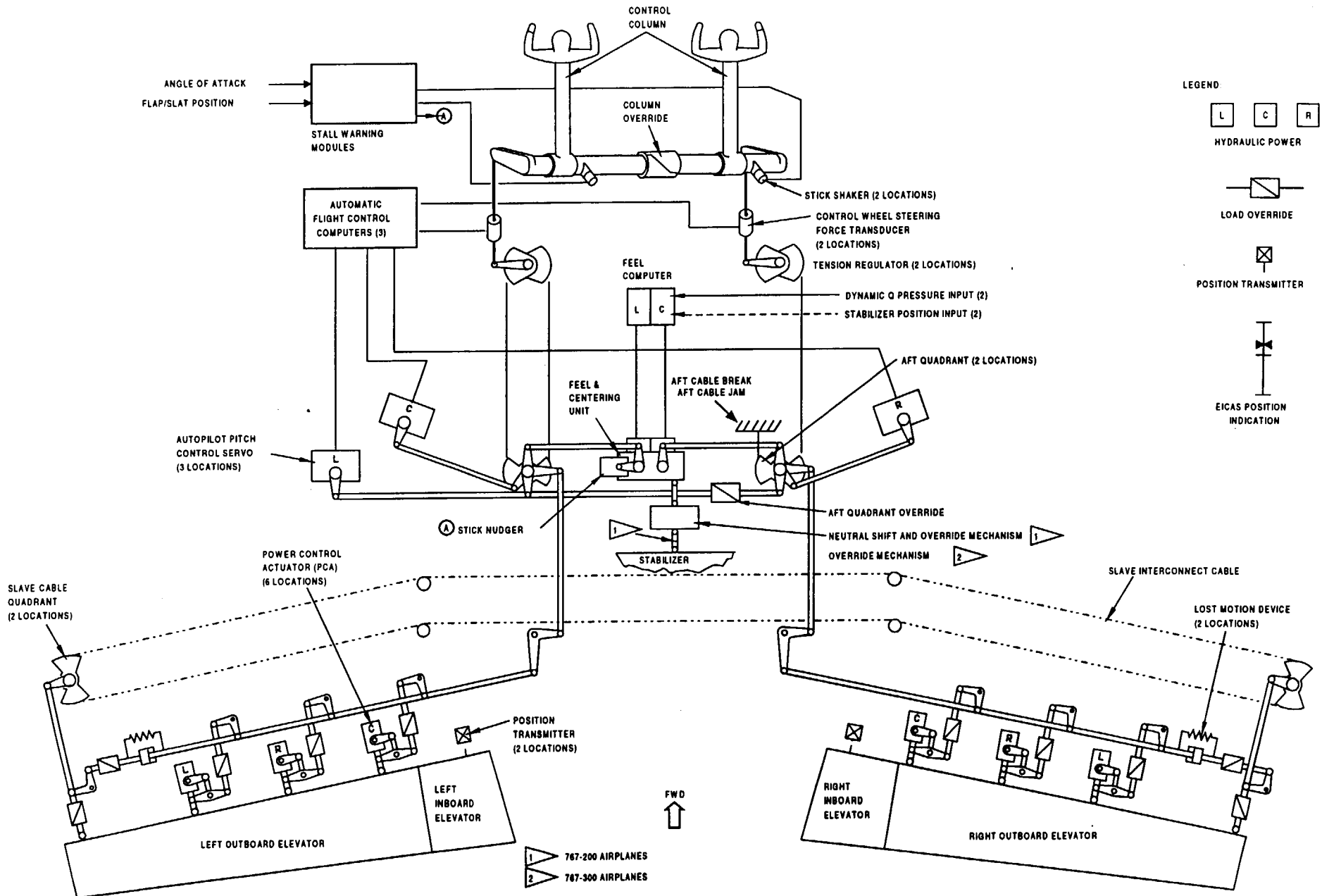
- **Aft Cable Failure Conditions – Monday August 27<sup>th</sup>**
  1. **Aft portion free, forward portion jammed (see schematic)**
  2. **Forward portion free, aft portion jammed (see schematic)**
  
- **Forward Cable Failure Conditions – Tuesday August 28<sup>th</sup>**
  1. **Aft portion free, forward portion jammed (see schematic)**
  2. **Forward portion free, aft portion jammed (see schematic)**

**Elevator PCA Control Valve Jam and High Break-out Input Pogo**

- **Modified PCA with jammed control valve and high break-out input pogo will be installed in the outboard location – Thursday August 30<sup>th</sup>**

*This condition will be discussed in more detail on Wednesday August 29<sup>th</sup>*

# AFT CABLE BREAK/AFT CABLE JAM





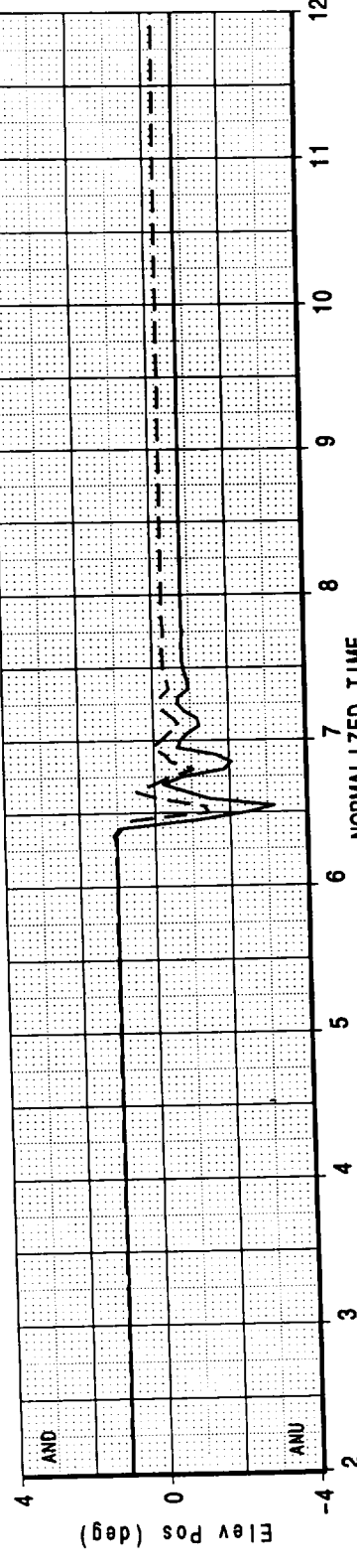
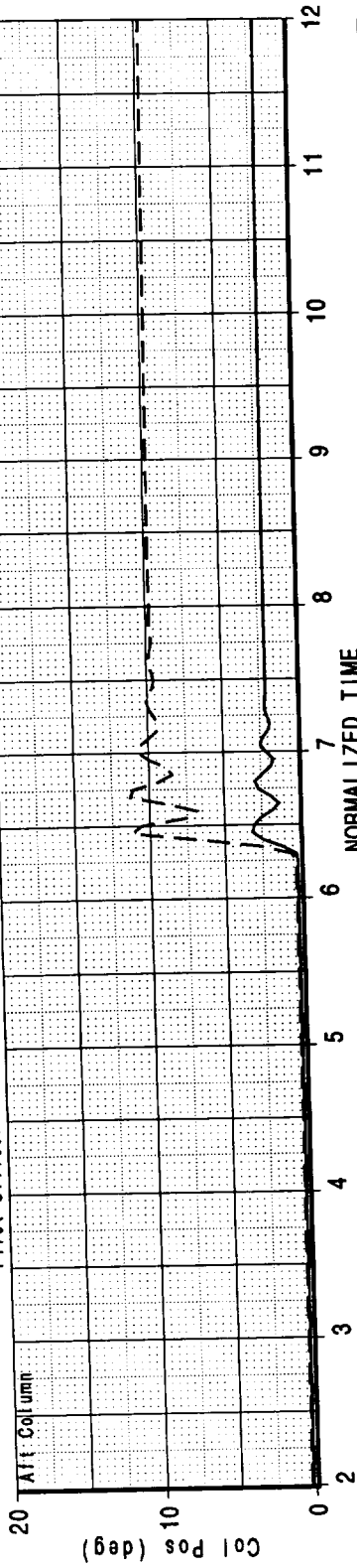
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PRELIMINARY

Differential Elevator Feel Pressure = 620 psi

Calibrated Airspeed = 220 kts

— Captain  
 - - - First Officer



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EGYPT AIR INVESTIGATION  
 AFT CABLE BREAK/AFT CABLE JAM  
 TRANSIENT RESPONSE - COND .050



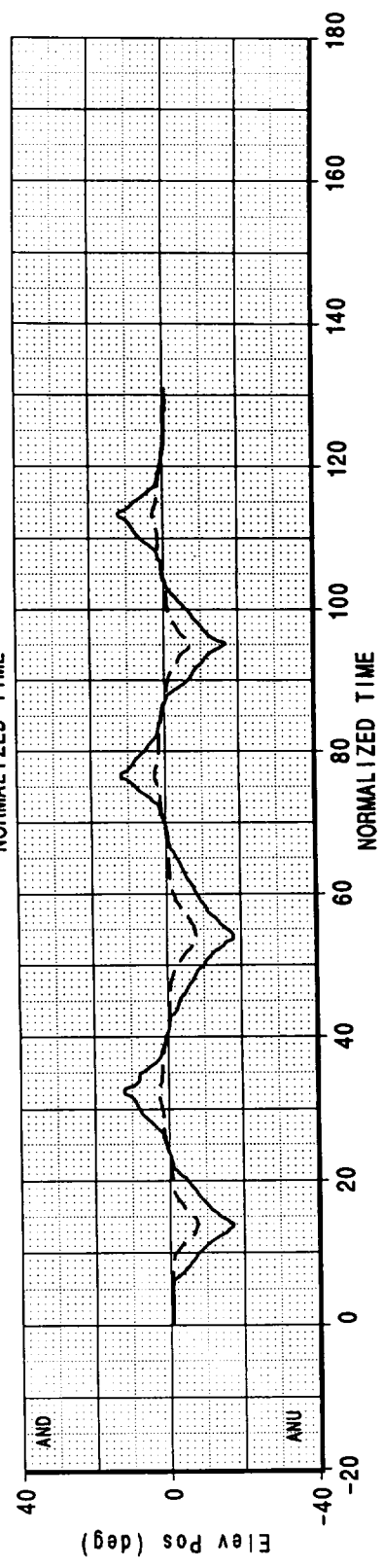
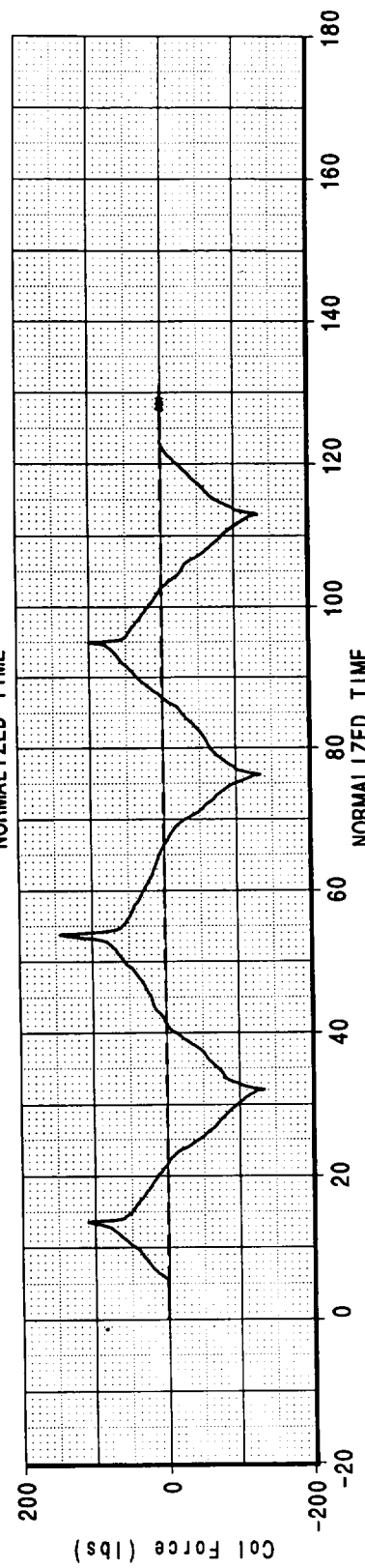
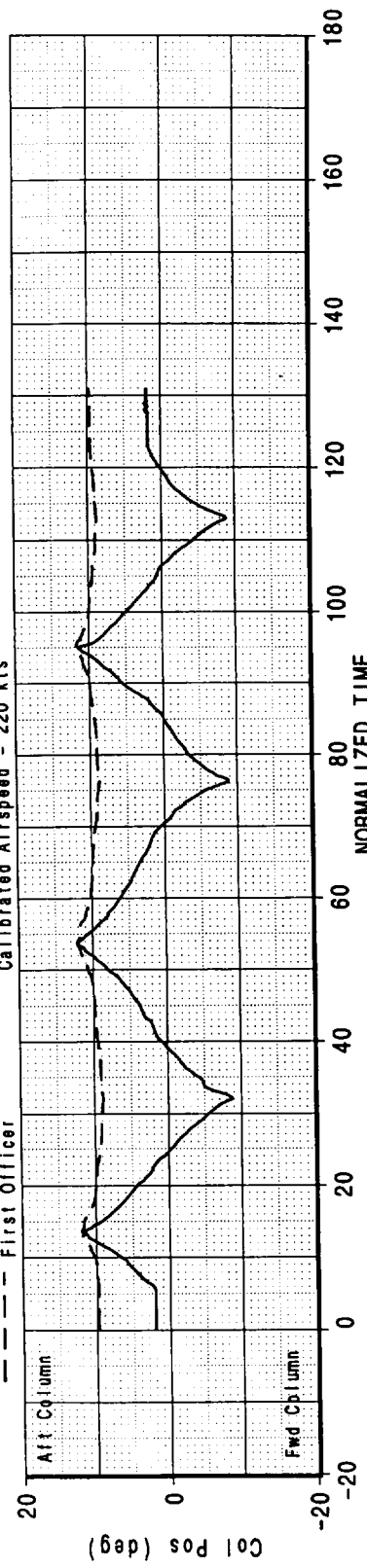
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PRELIMINARY

Differential Elevator Feel Pressure = 620 psi  
 Calibrated Airspeed = 220 kts

— Captain  
 - - - First Officer



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EGYPT AIR INVESTIGATION  
 AFT CABLE BREAK/AFT CABLE JAM  
 CAPT SLOW RATE COLUMN SWEEP - COND .053

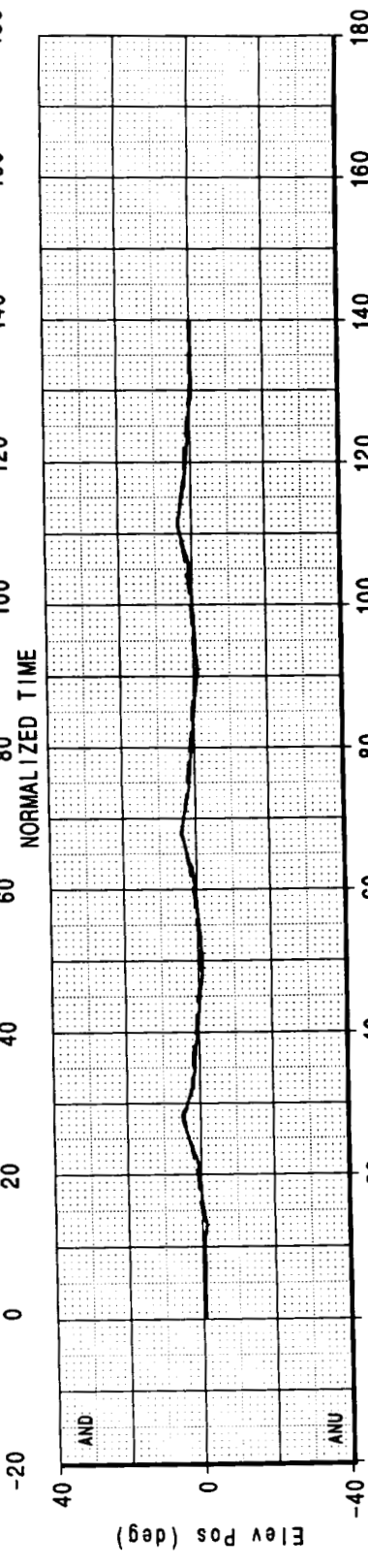
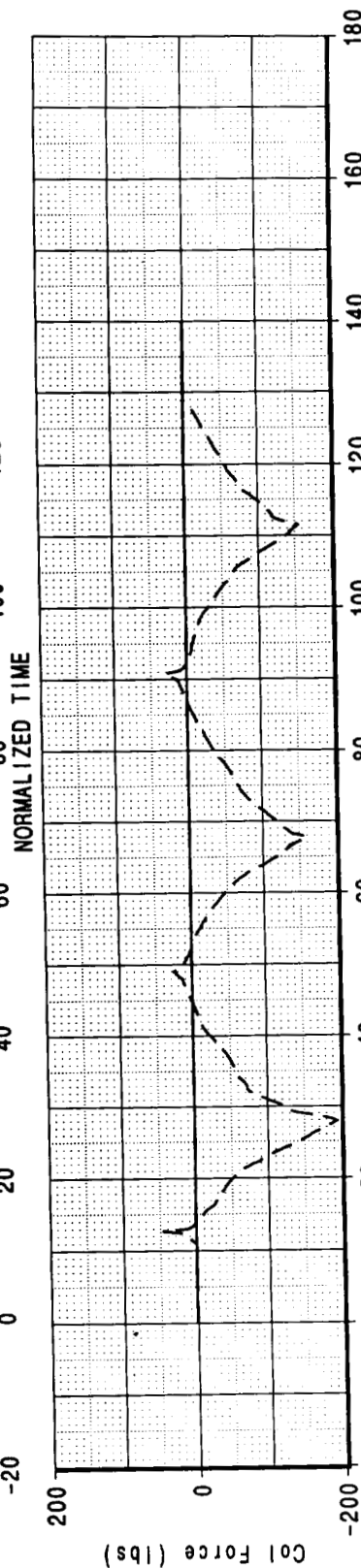
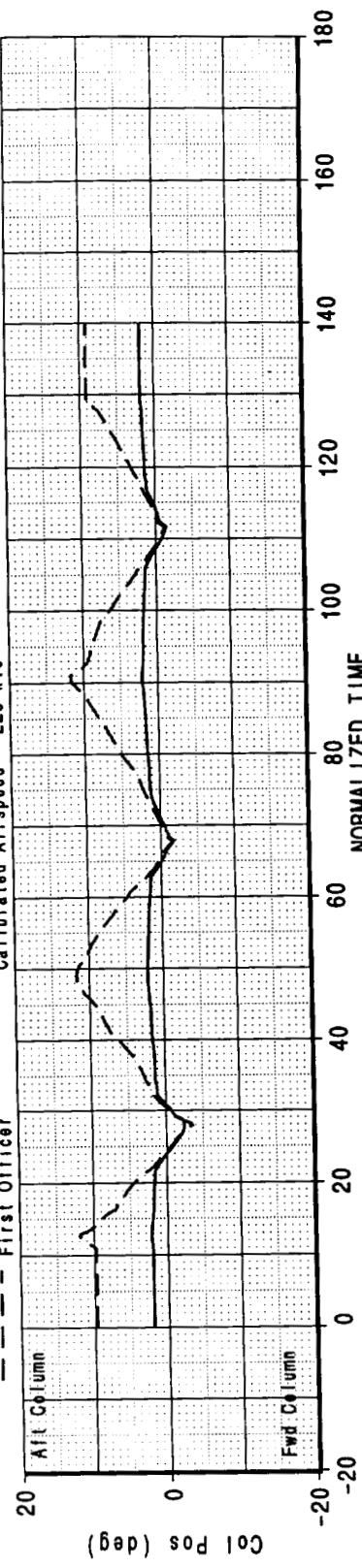
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PRELIMINARY  
 Differential Elevator Feel Pressure = 620 psi  
 Calibrated Airspeed = 220 kts

— Captain  
 - - - First Officer



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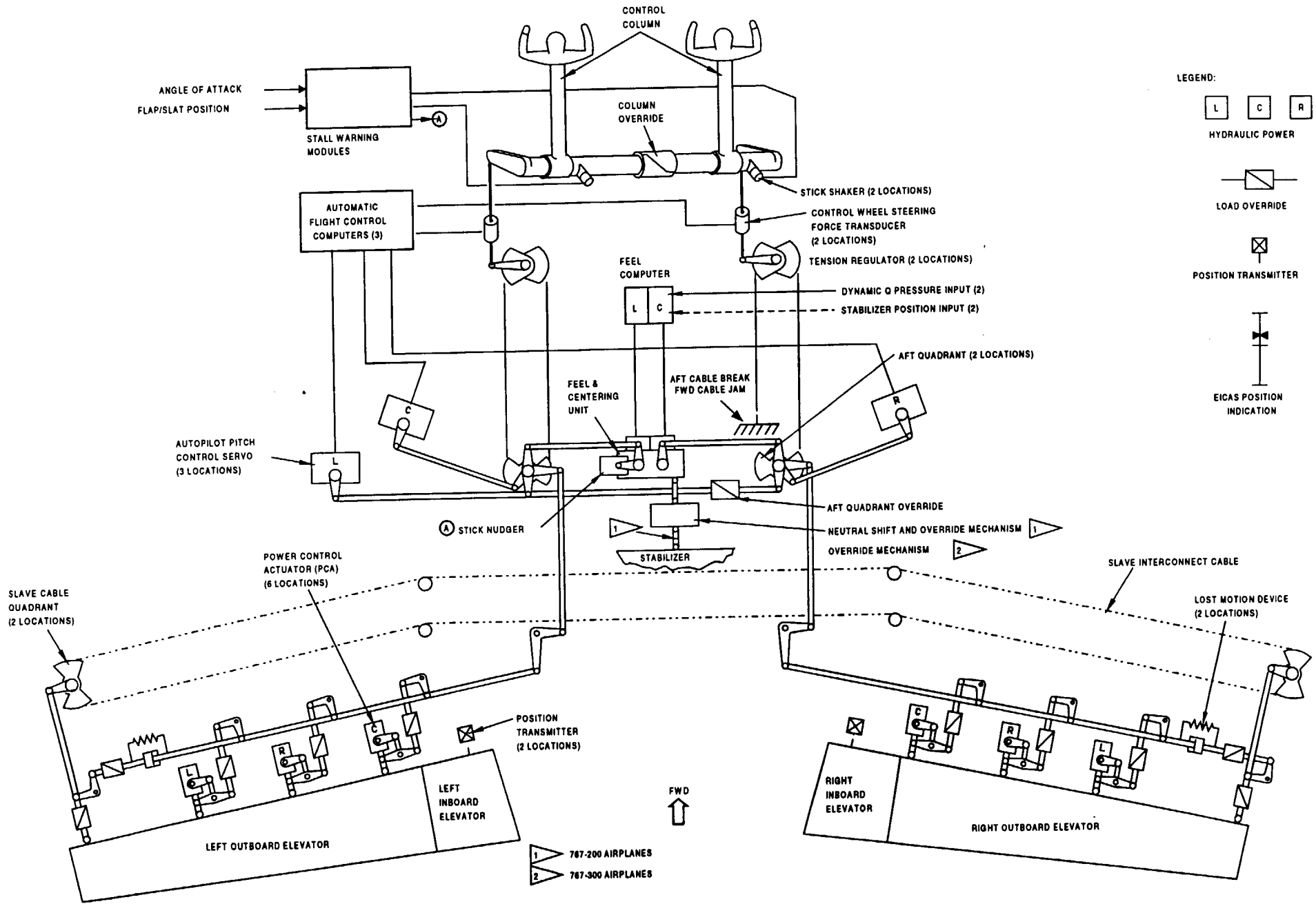
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EGYPT AIR INVESTIGATION  
 AFT CABLE BREAK/AFT CABLE JAM  
 F/O SLOW RATE COLUMN SWEEP - COND .056

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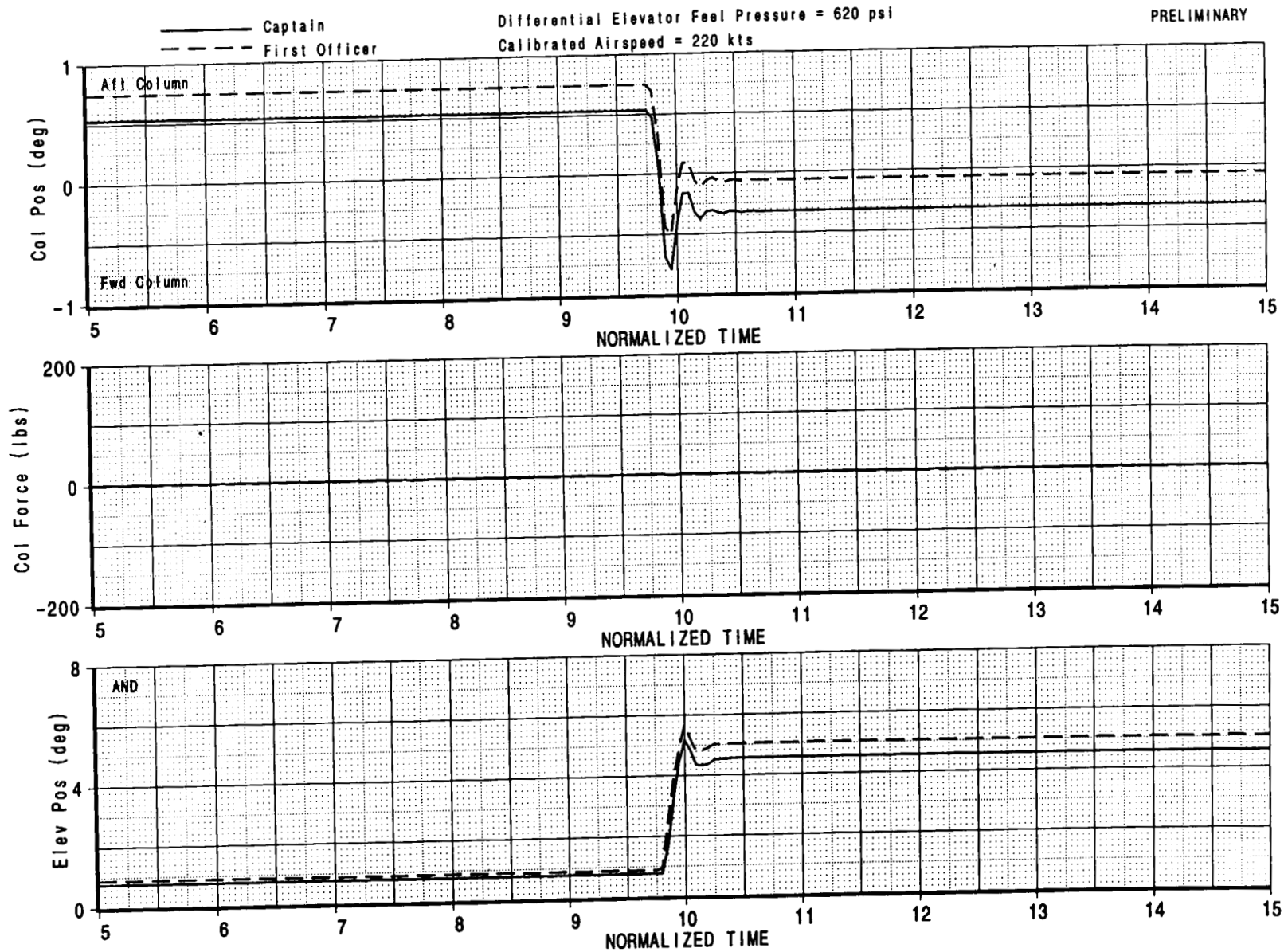
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# AFT CABLE BREAK/FORWARD CABLE JAM



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PRELIMINARY



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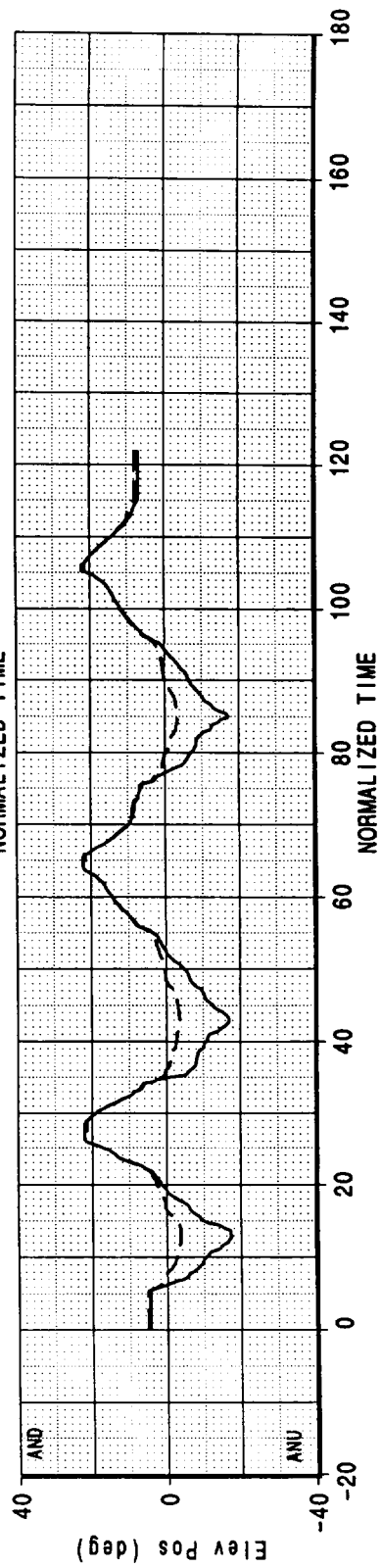
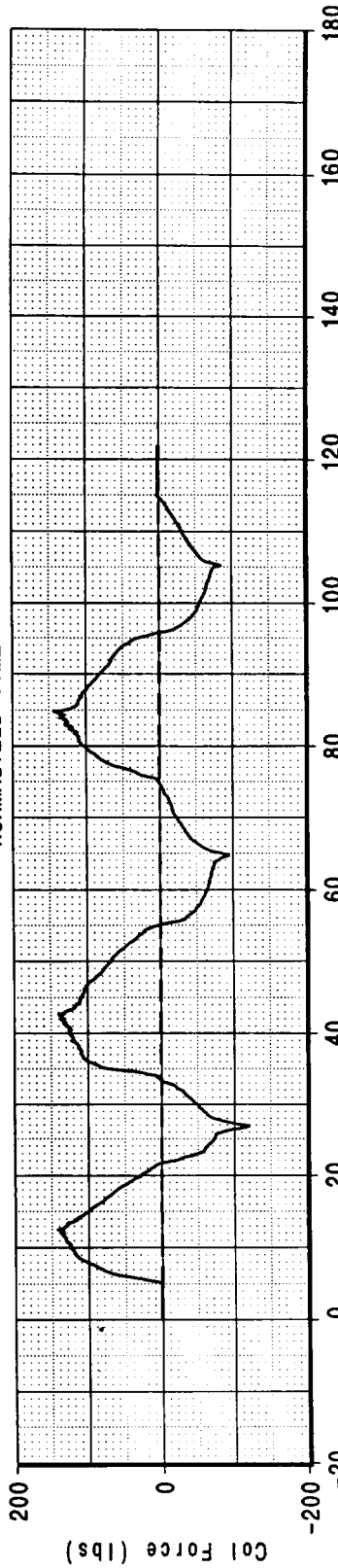
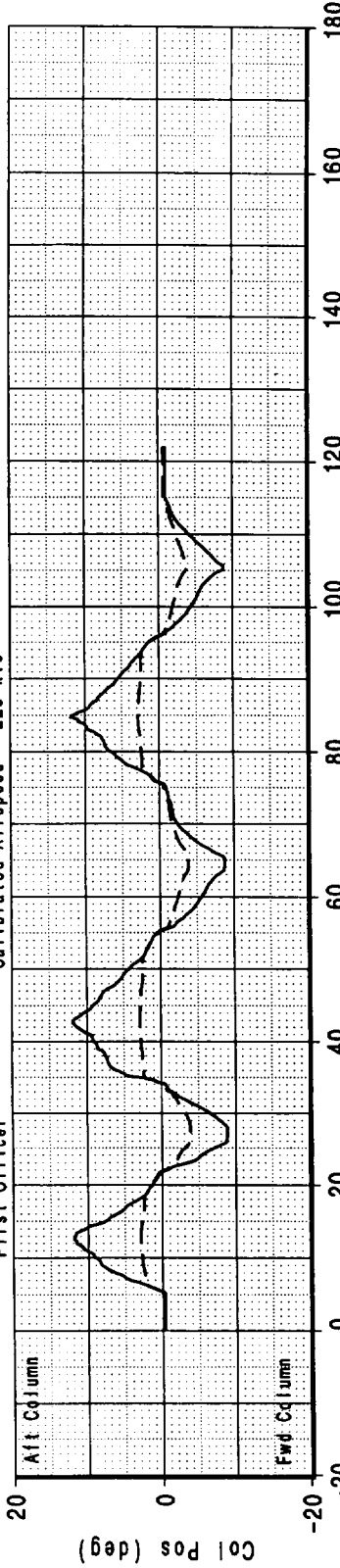
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08/24/01 14:26:25.0000-14:28:27.0000 VR259 000-05 767-300 BUCKLEY, KIMBERL

PRELIMINARY  
 Differential Elevator Feel Pressure = 620 psi  
 Calibrated Airspeed = 220 kts

— Captain  
 - - - First Officer



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EGYPT AIR INVESTIGATION  
 AFT CABLE BREAK/FWD CABLE JAM  
 CAPT SLOW RATE COLUMN SWEEP - COND .073

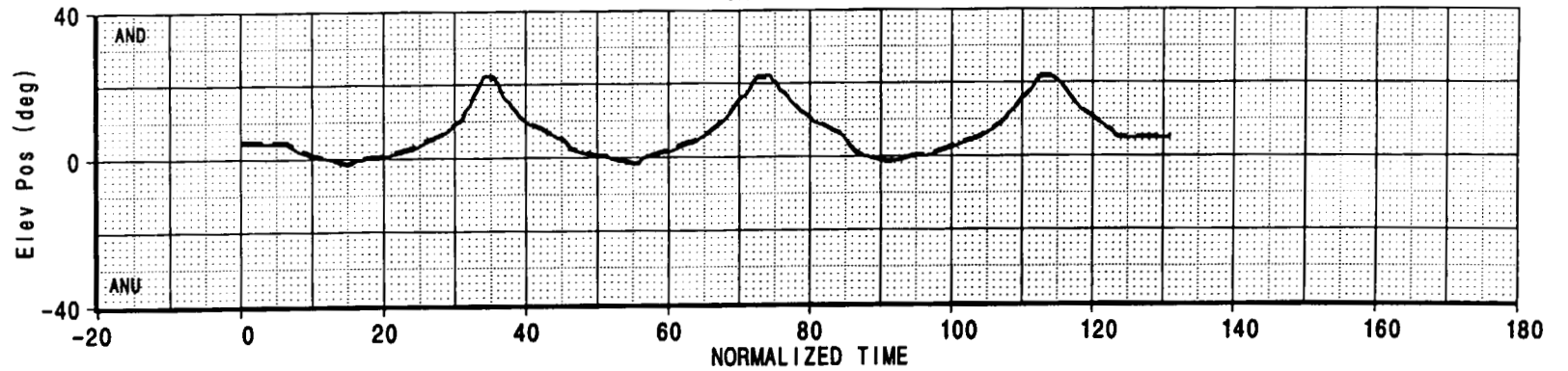
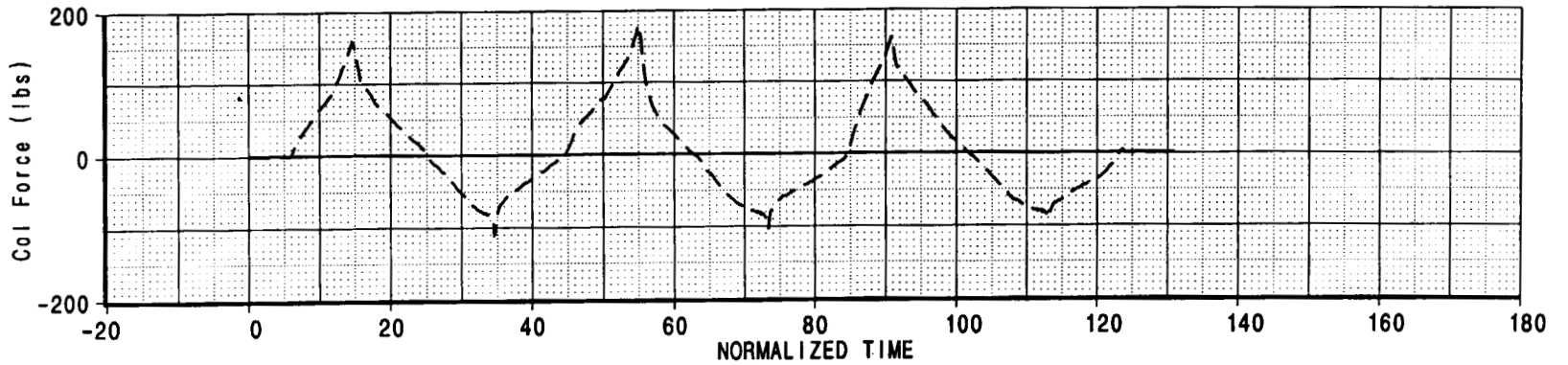
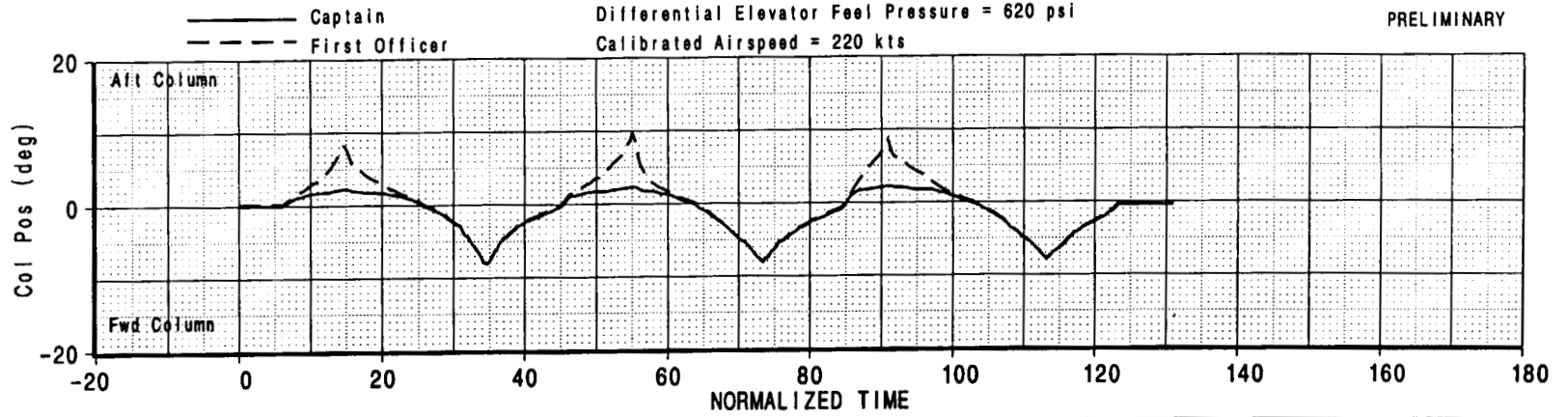
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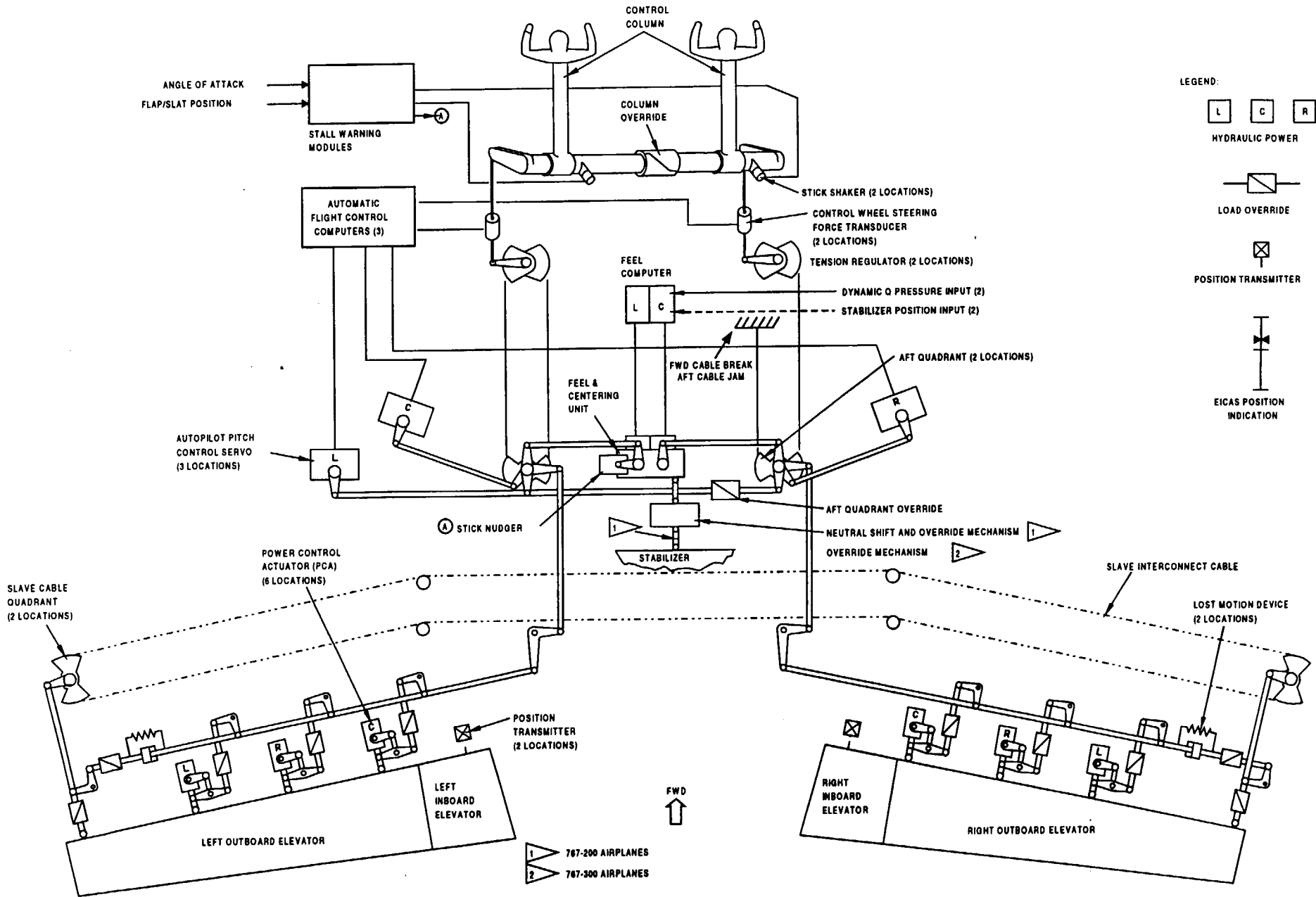
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EGYPT AIR INVESTIGATION AFT CABLE BREAK/FWD CABLE JAM F/O SLOW RATE COLUMN SWEEP - COND .076				
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# FORWARD CABLE BREAK/AFT CABLE JAM





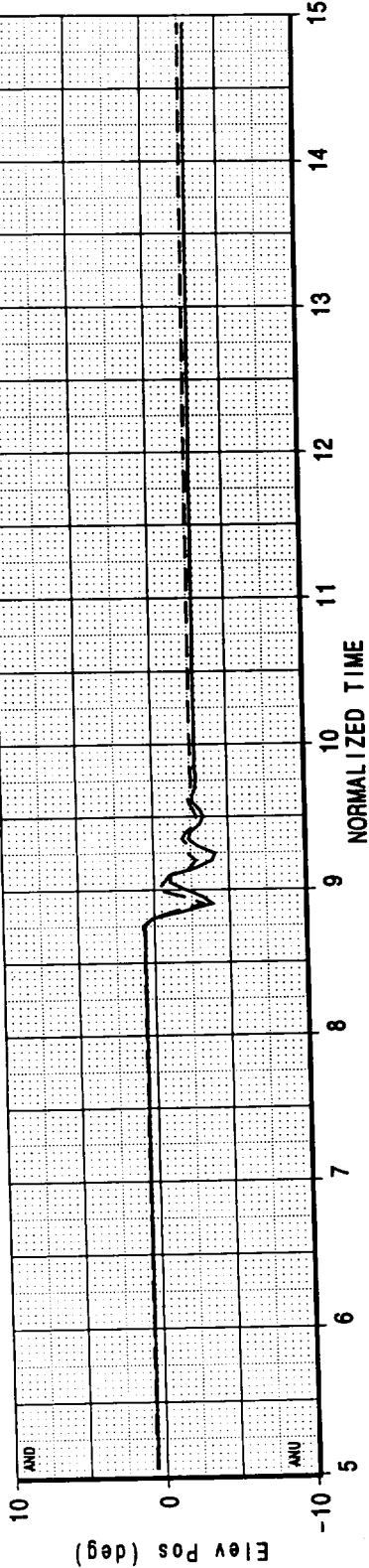
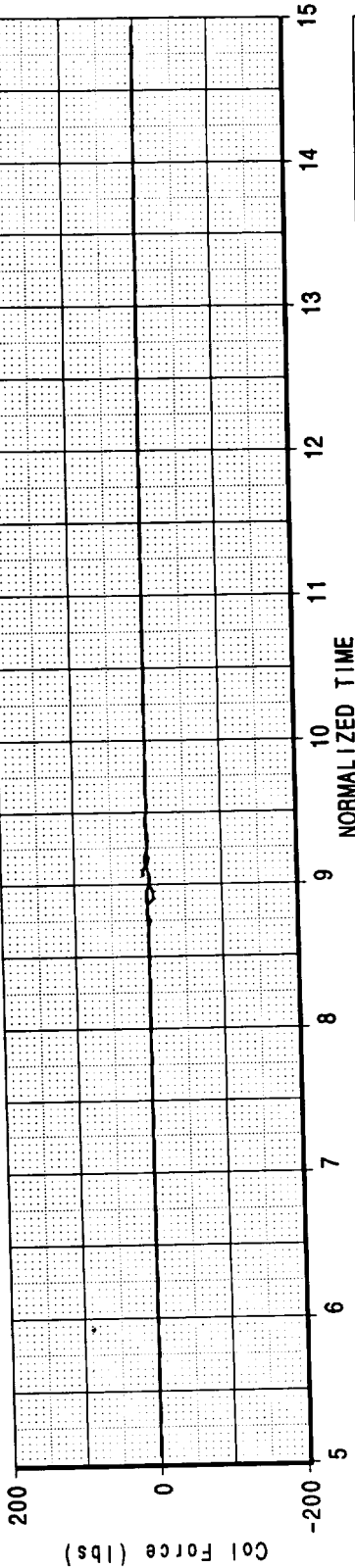
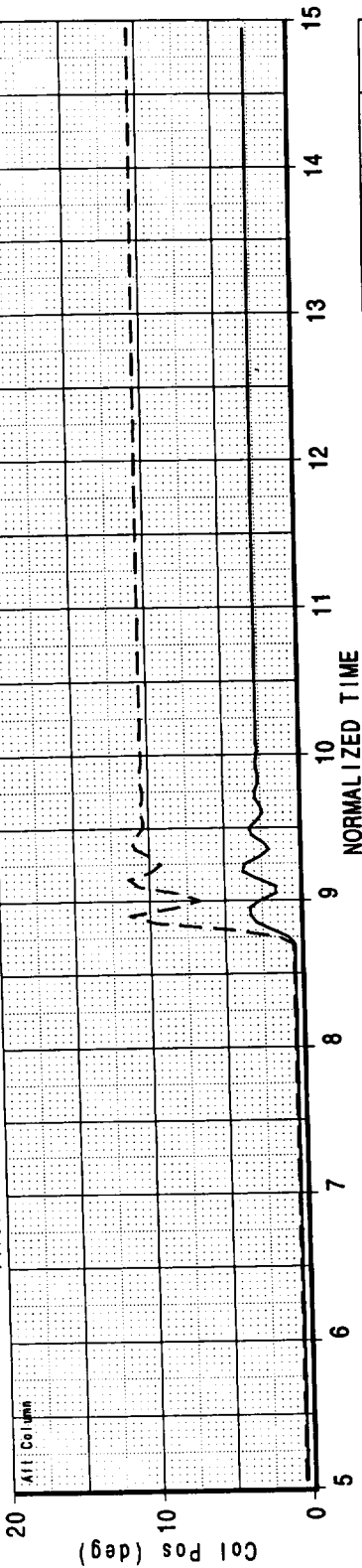
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PRELIMINARY

Differential Elevator Feel Pressure = 620 psi

Calibrated Airspeed = 220 kts

— Captain  
 - - - First Officer



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EGYPT AIR INVESTIGATION  
 FORWARD CABLE BREAK/AFT CABLE JAM  
 TRANSIENT RESPONSE - COND .110

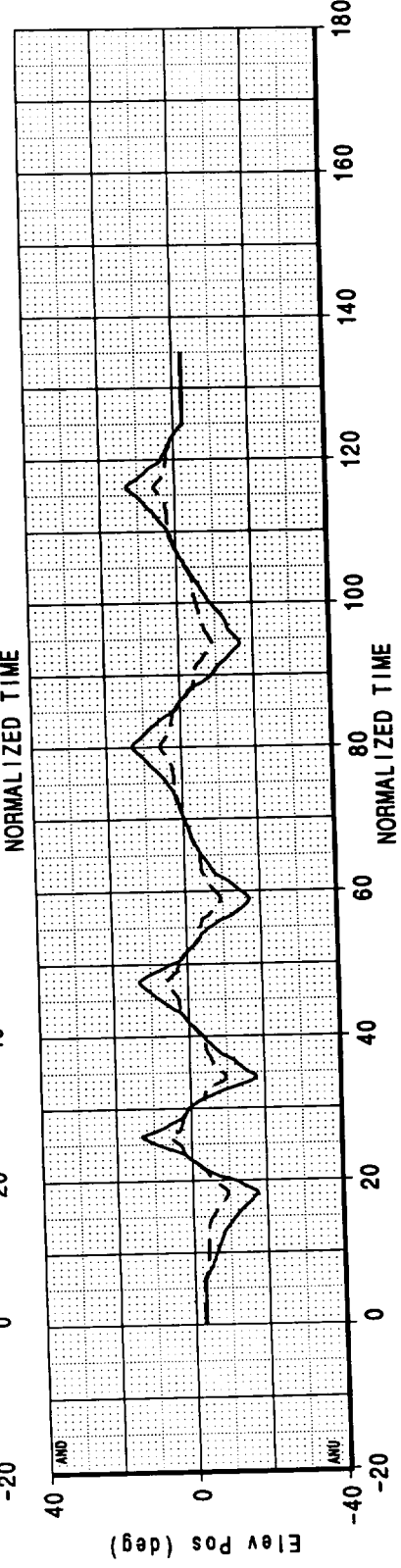
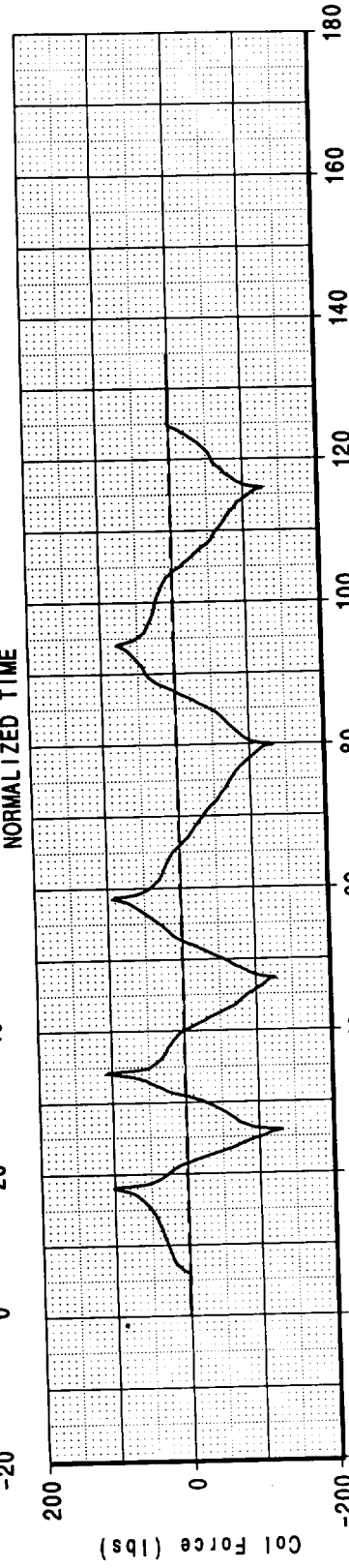
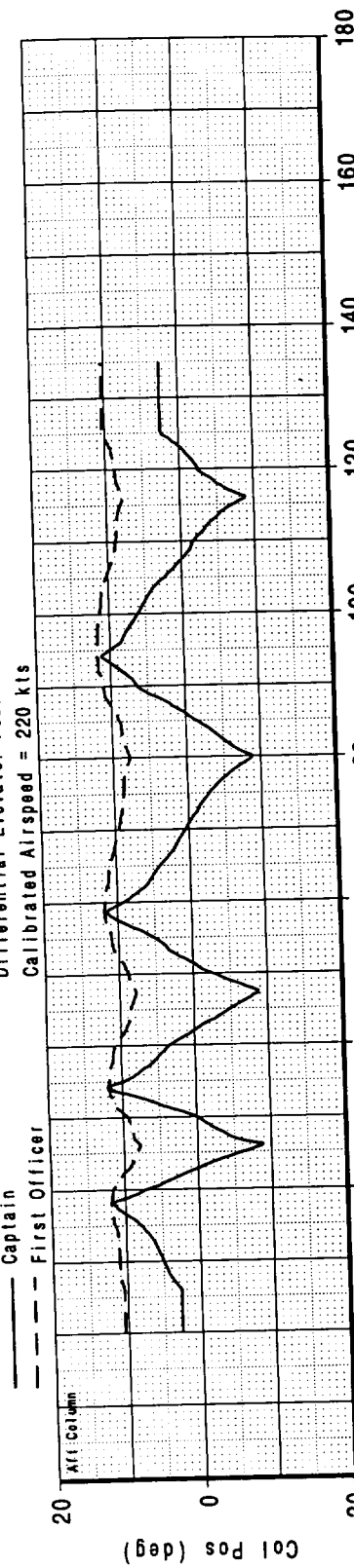


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PRELIMINARY

Differential Elevator Feel Pressure = 620 psi  
Calibrated Airspeed = 220 kts



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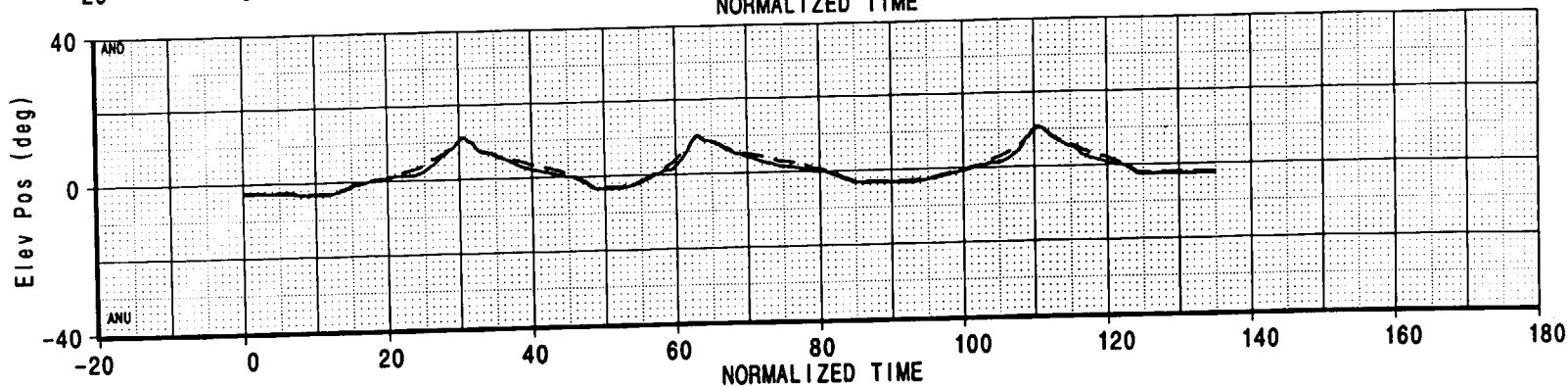
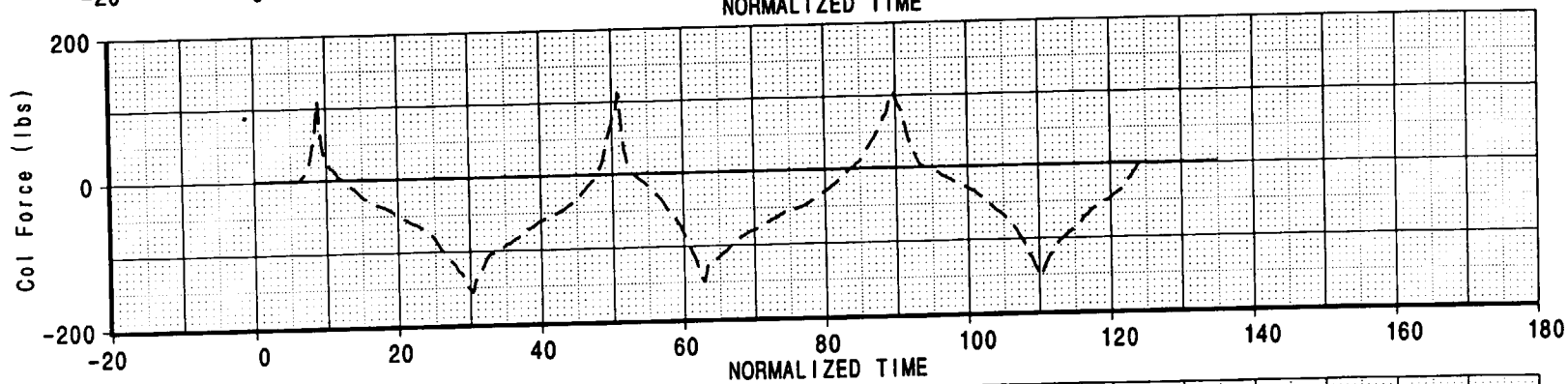
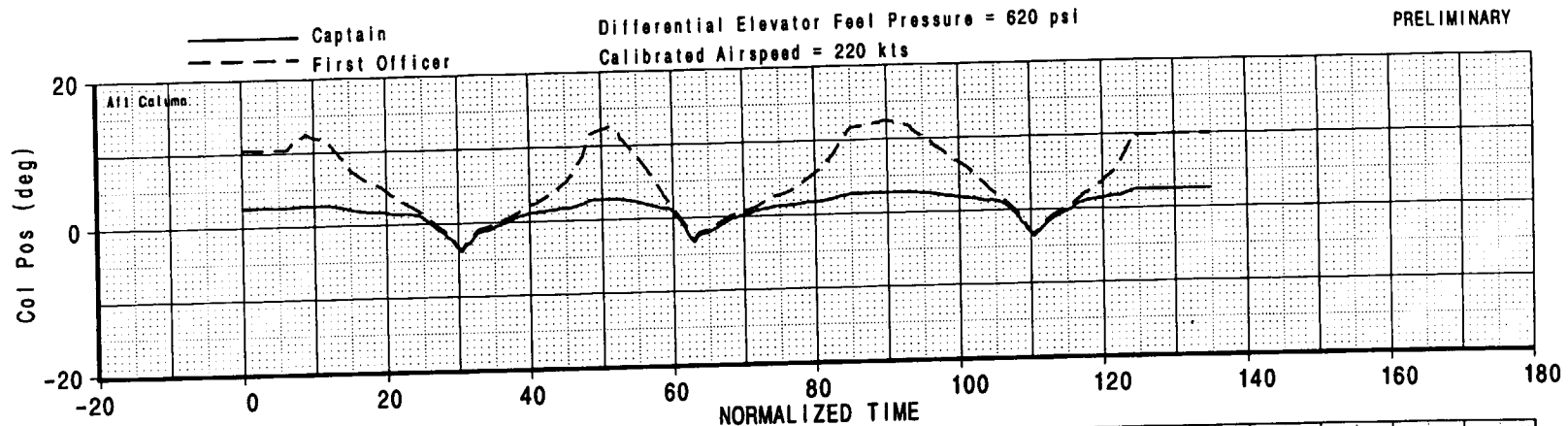
EGYPT AIR INVESTIGATION  
FORWARD CABLE BREAK/AFT CABLE JAM  
CAPT SLOW RATE COLUMN SWEEP - COND .113



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PRELIMINARY



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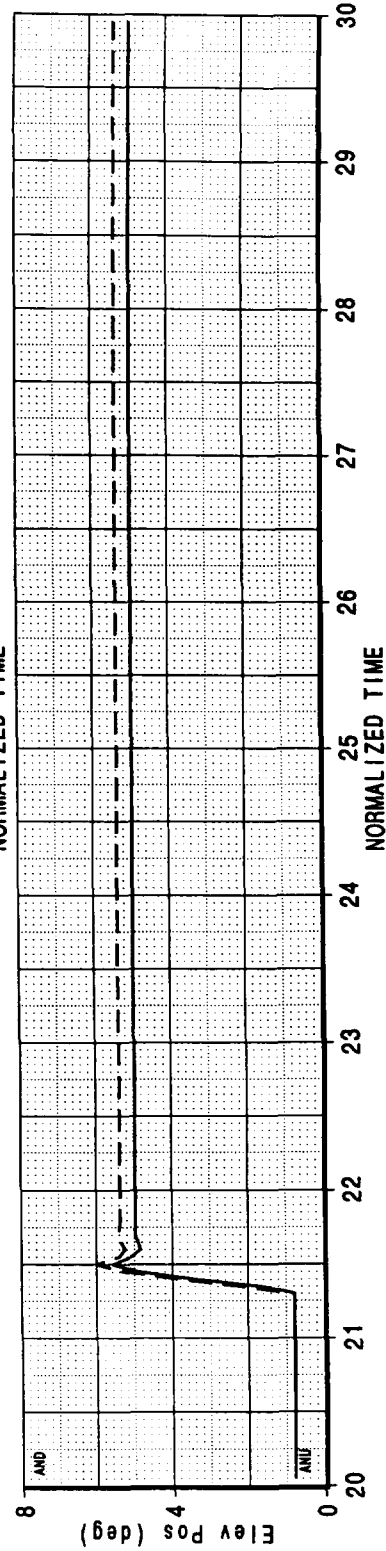
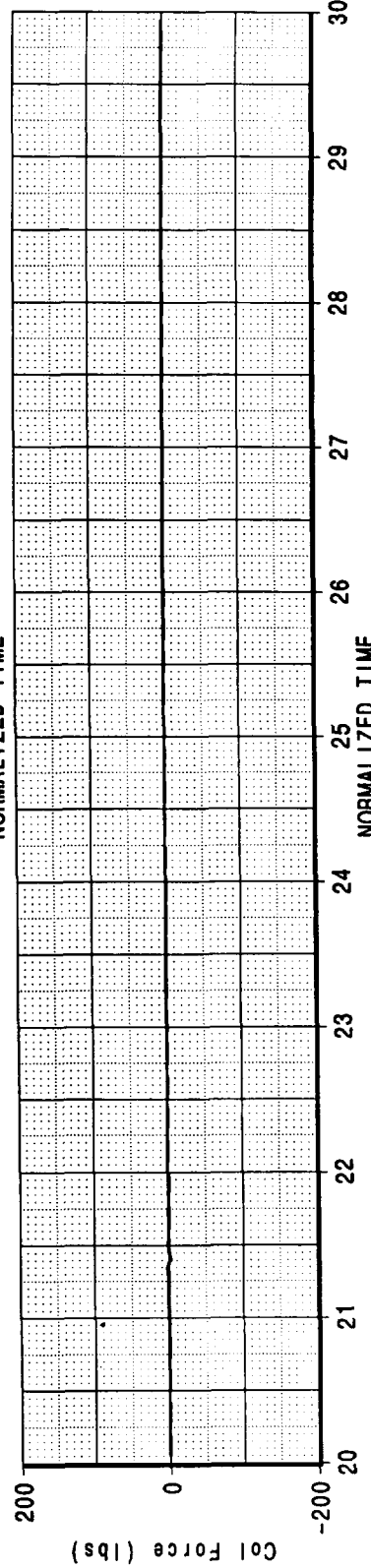
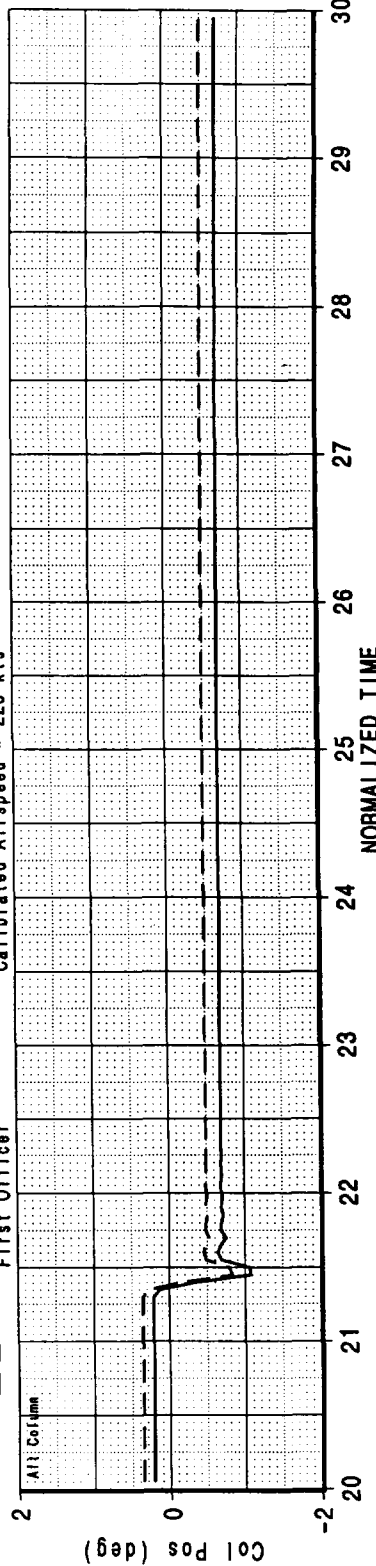
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EGYPT AIR INVESTIGATION FORWARD CABLE BREAK/AFT CABLE JAM F/O SLOW RATE COLUMN SWEEP - COND .116				
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PRELIMINARY  
 Differential Elevator Feel Pressure = 620 psi  
 Calibrated Airspeed = 220 kts

--- Captain  
 --- First Officer



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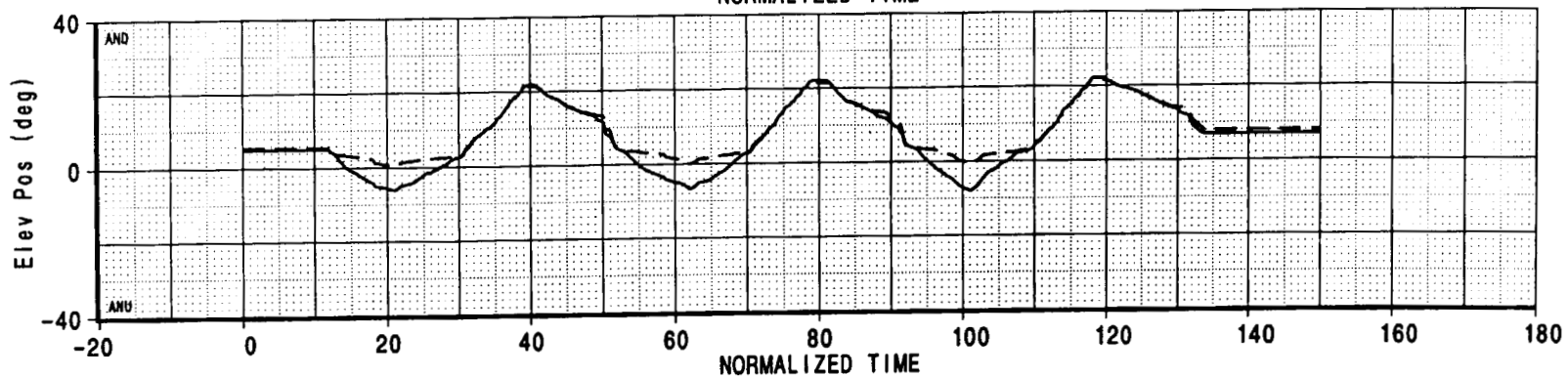
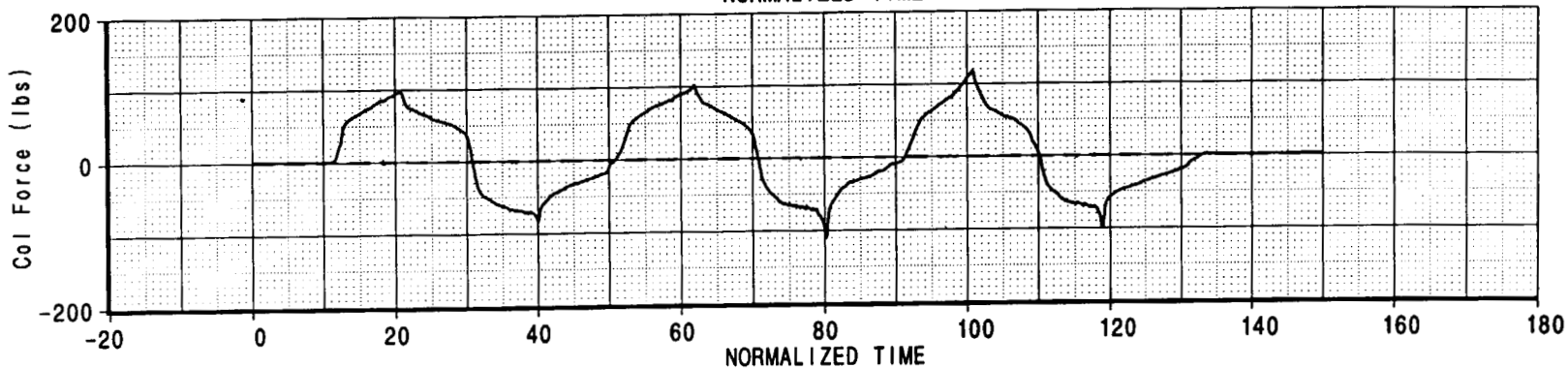
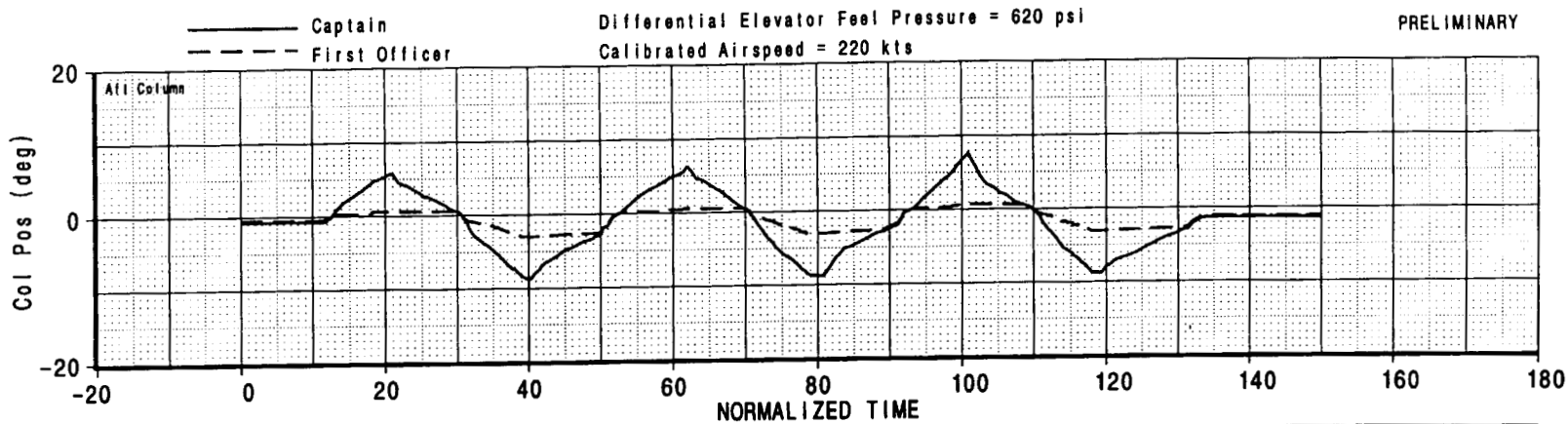
EGYPT AIR INVESTIGATION  
 FORWARD CABLE BREAK/FORWARD CABLE JAM  
 TRANSIENT RESPONSE - COND .130

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EGYPT AIR INVESTIGATION  
 FORWARD CABLE BREAK/FORWARD CABLE JAM  
 CAPT SLOW RATE COLUMN SWEEP - COND. 133



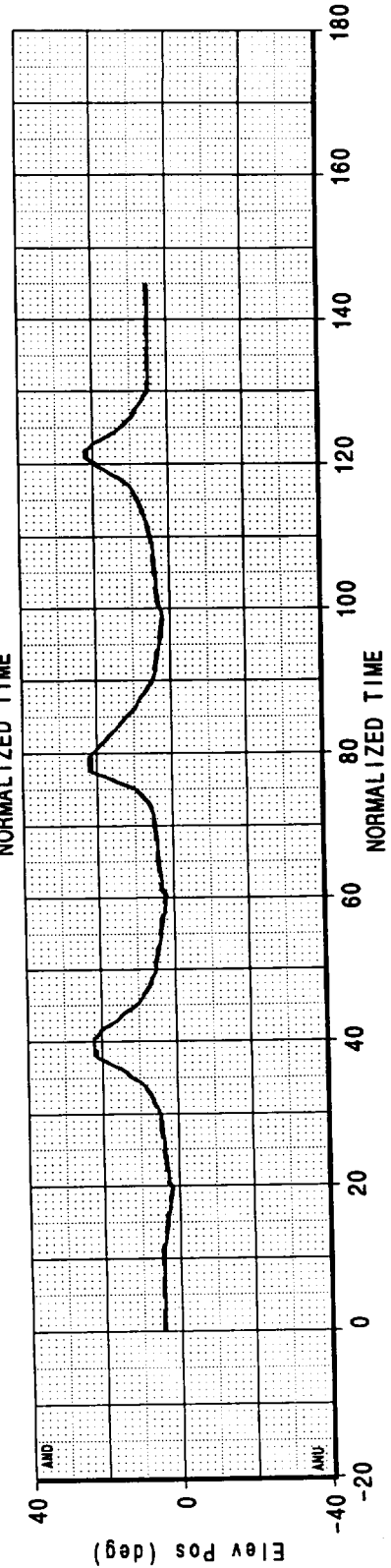
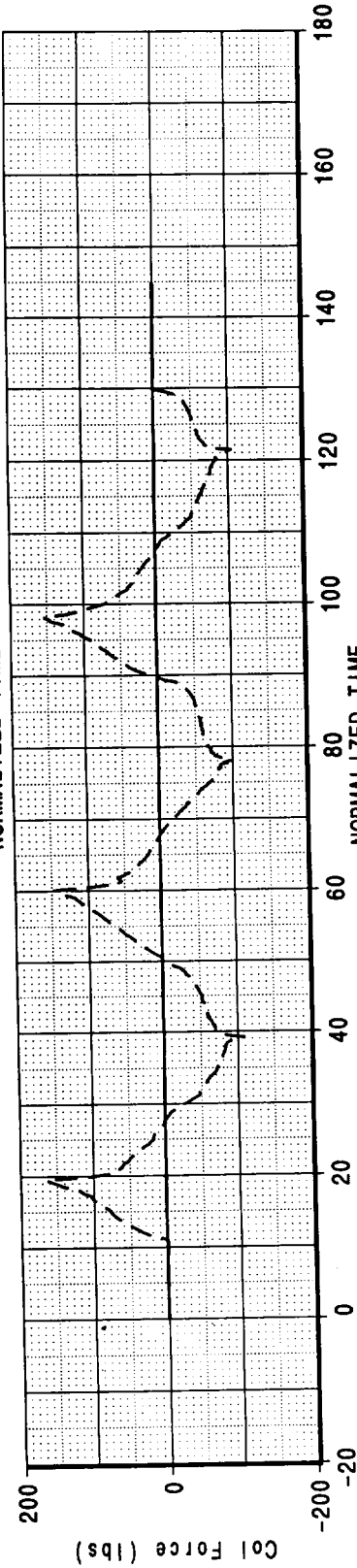
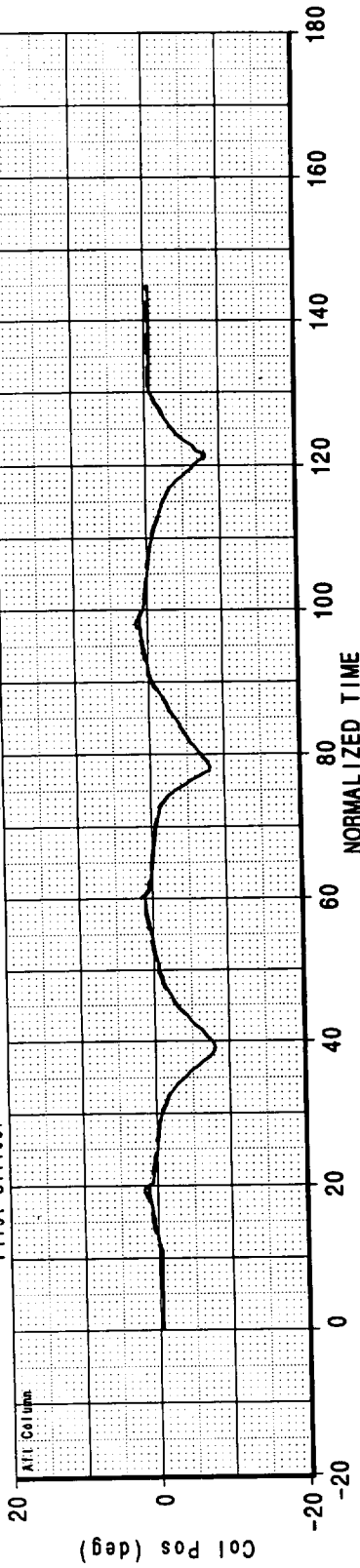
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PRELIMINARY

Differential Elevator Feel Pressure = 620 psi  
 Calibrated Airspeed = 220 kts

— Captain  
 - - - First Officer



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EGYPT AIR INVESTIGATION  
 FORWARD CABLE BREAK/FORWARD CABLE JAM  
 F/O SLOW RATE COLUMN SWEEP - COND .136

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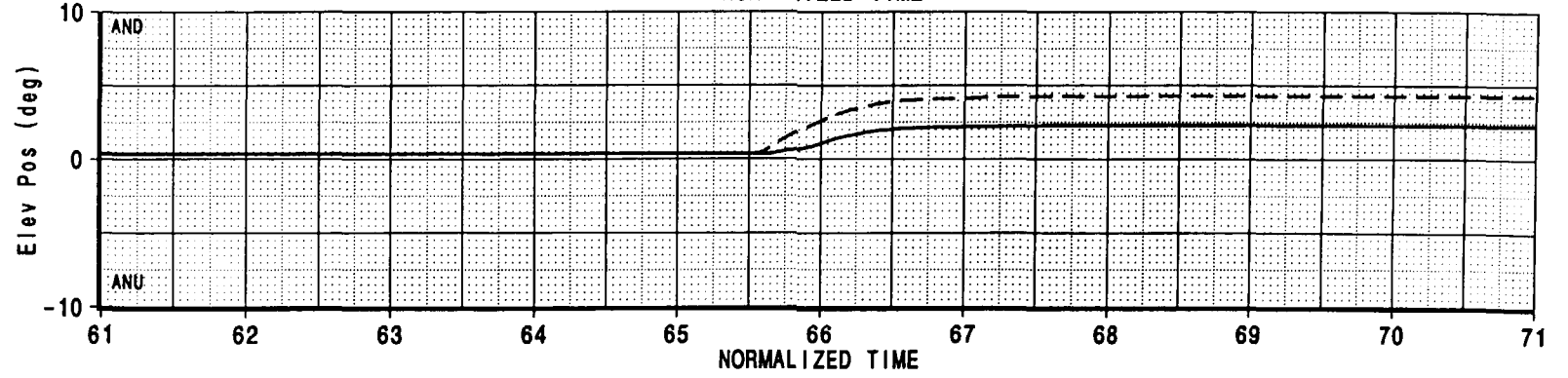
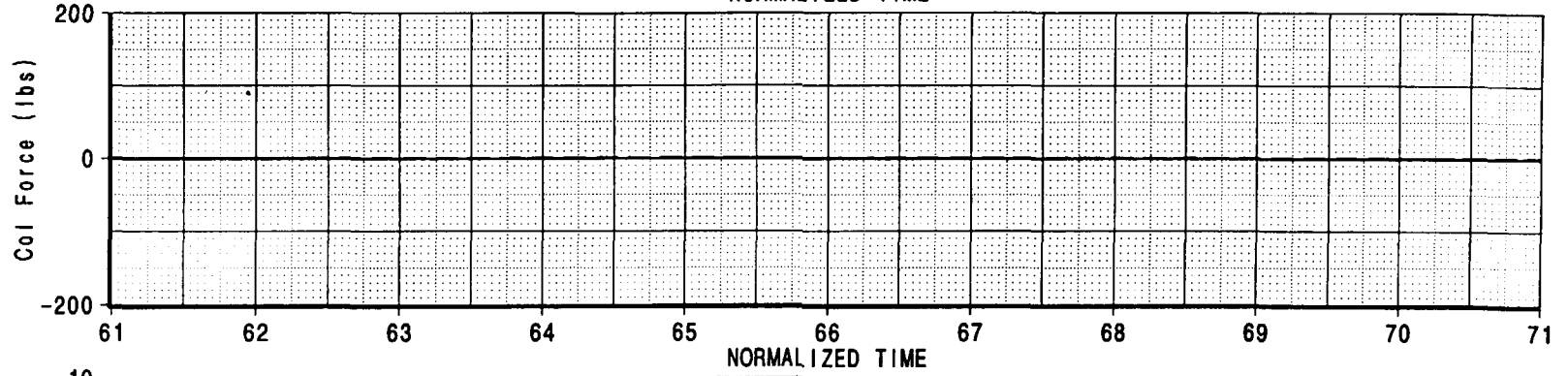
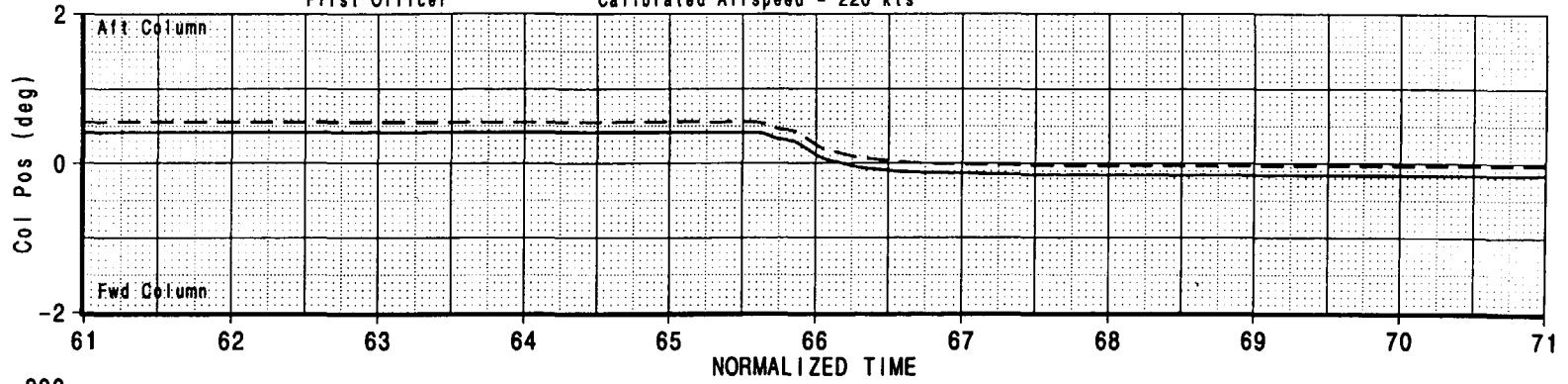


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— Captain  
 - - - First Officer

Differential Elevator Feel Pressure = 620 psi  
 Calibrated Airspeed = 220 kts

PRELIMINARY



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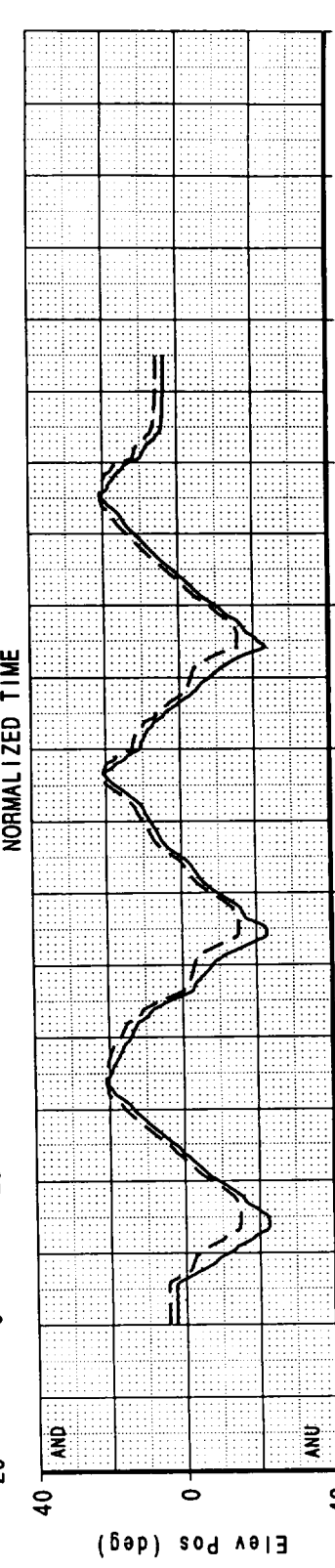
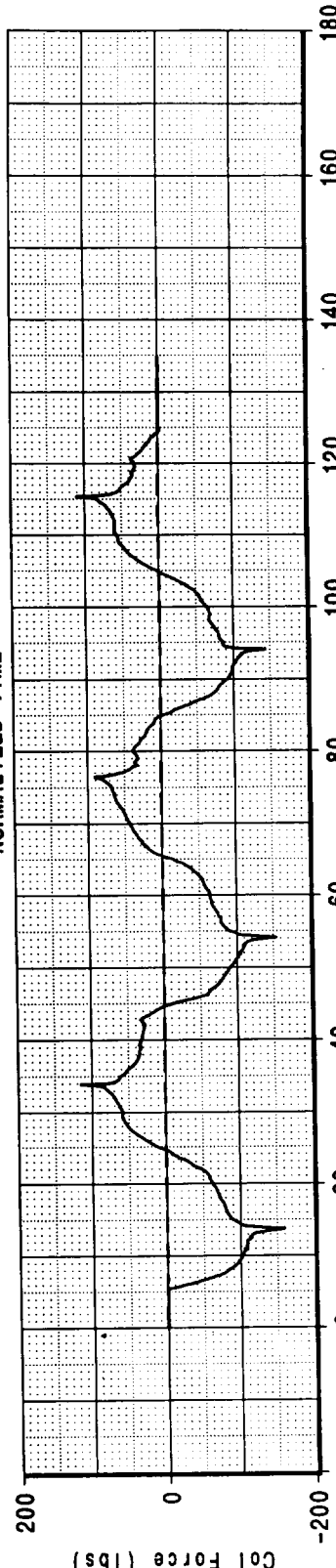
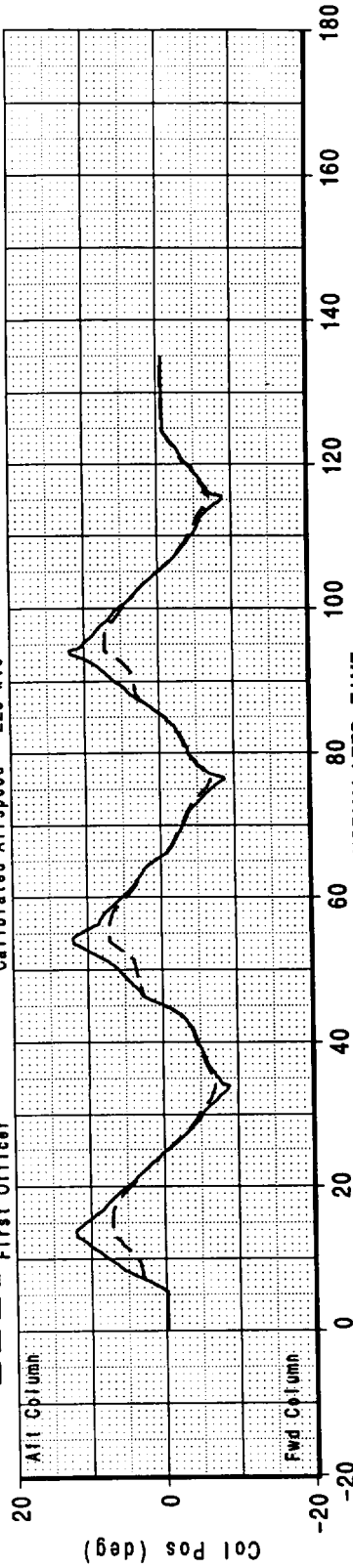
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EGYPT AIR INVESTIGATION RT INBD PCA CTRL VALVE JAM/MOD INPUT POGO JAM INSERTION - COND .237				
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08/21/01 16:12:15.0000-16:14:30.0000 VR259 000-03 767-300 BUCKLEY, KIMBERL

PRELIMINARY

Differential Elevator Feel Pressure = 620 psi  
 Calibrated Airspeed = 220 kts

— Captain  
 - - - First Officer



[A]: /project/11ays/control\_ays/ays\_int/787/ustain/multisys/egypt\_etr/vr259\_gl\_000\_03/vr259\_000\_03\_4638.oob  
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CALC	B.RICHARDSON	27Aug01	REVISED	DATE
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EGYPT AIR INVESTIGATION  
 RT INBD PCA CTRL VALVE JAM/MOD INPUT POGO  
 CAPT SLOW RATE COLUMN SWEEP - COND .230



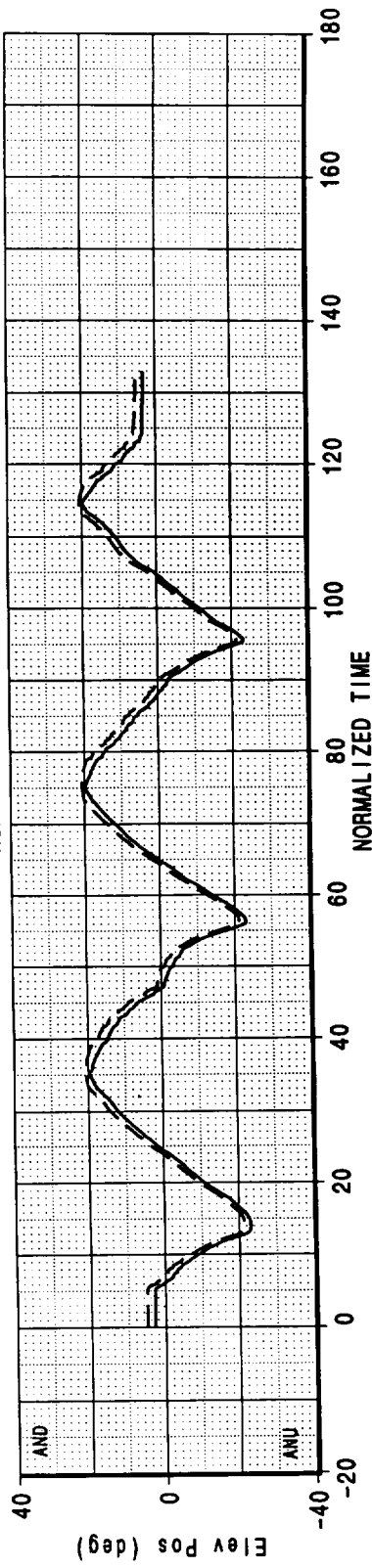
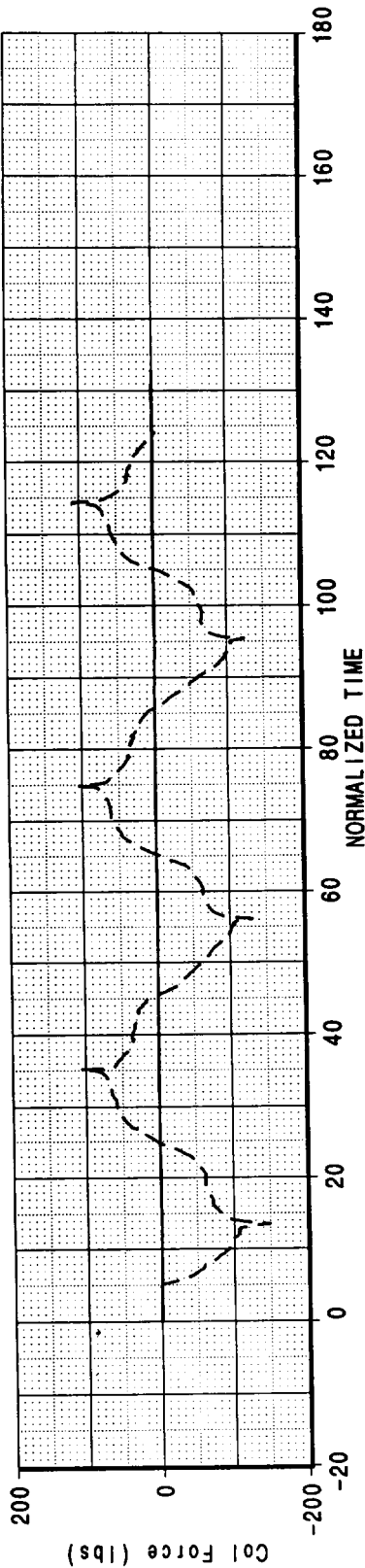
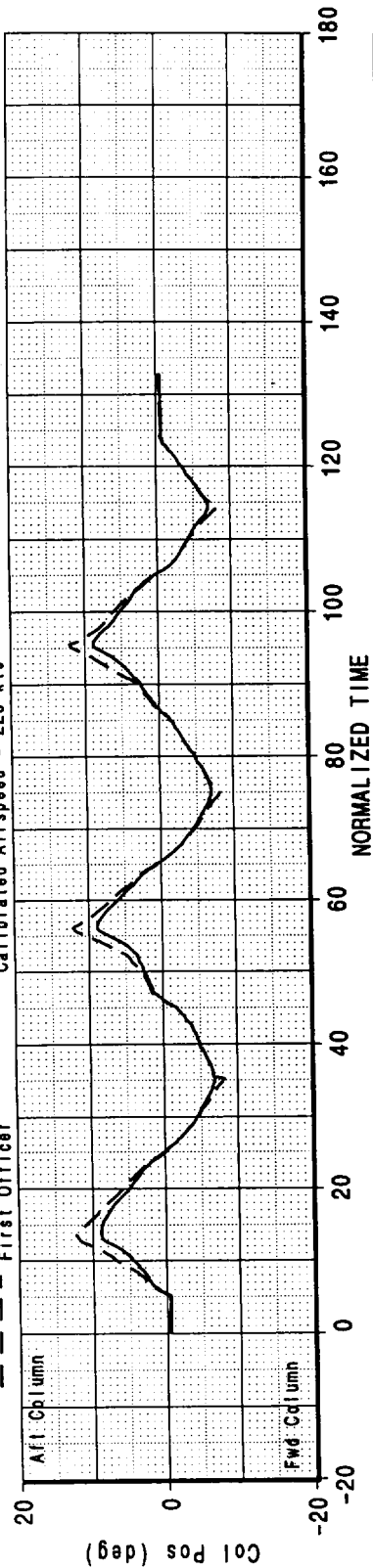
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PRELIMINARY

Differential Elevator Feel Pressure = 620 psi  
 Calibrated Airspeed = 220 kts

— Captain  
 - - - First Officer



[A]: /project/illays/control\_eyesys\_int/787/sustain/multisys/egypt\_air/vr259\_01\_000\_03/vr259\_000\_03\_4636.asb  
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CALC	B. RICHARDSON	27Aug01	REVISED	DATE	EGYPT AIR INVESTIGATION RT INBD PCA CTRL VALVE JAM/MOD INPUT POGO F/O SLOW RATE COLUMN SWEEP - COND .233 	767-300 VR259
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*EgyptAir Flight 990 Investigation*  
*Elevator Failure Conditions Ground Tests August 27-31, 2001*

**Test Plan for Cable Failure Conditions – Monday August 27<sup>th</sup>:**

**1. Instrumentation Check**

- **Control column and elevator neutral check – run concurrent with pogo test only on August 30<sup>th</sup>**
- **Control column and elevator travel check – run concurrent with pogo test only on August 30<sup>th</sup>**
- **Control column force check – run before each day of testing**

**2. Aft cable failure with forward end free and aft end jammed**

- **Control column sweeps from left side**
- **Control column sweeps from right side**

**\*This failure condition will be demonstrated twice: 1) at zero airspeed and 2) at the Flight 990 initial conditions**

**3. Aft cable failure with aft end free and forward end jammed**

- **Control column sweeps from left side**
- **Control column sweeps from right side**

**\*This failure condition will be demonstrated twice: 1) at zero airspeed and 2) at the Flight 990 initial conditions**

*EgyptAir Flight 990 Investigation*  
*Elevator Failure Conditions Ground Tests August 27-31, 2001*

**Test Plan for Cable Failure Conditions – Tuesday August 28<sup>th</sup>:**

**1. Instrumentation Check**

- **Control column and elevator neutral check – run concurrent with pogo test only on August 30<sup>th</sup>**
- **Control column and elevator travel check – run concurrent with pogo test only on August 30<sup>th</sup>**
- **Control column force check – run before each day of testing**

**2. Forward cable failure with forward end free and aft end jammed**

- **Control column sweeps from left side**
- **Control column sweeps from right side**

**\*This failure condition will be demonstrated twice: 1)at zero airspeed and 2) at the Flight 990 initial conditions**

**3. Forward cable failure with aft end free and forward end jammed**

- **Control column sweeps from left side**
- **Control column sweeps from right side**

**\*This failure condition will be demonstrated twice: 1)at zero airspeed and 2) at the Flight 990 initial conditions**

*EgyptAir Flight 990 Investigation*  
*Elevator Failure Conditions Ground Tests August 27-31, 2001*

**Testing Protocol Discussion:**

- Personnel safety is of paramount importance
- Boeing test director is in charge of the test and will control all test conditions and conduct
- There will be access to most of the elevator control system components so that test participants can visually monitor how the system performs during the test conditions
- Personnel movement in and around the test airplane must be coordinated with the test director
- System performance can also be monitored at the instrumentation station on the floor and on the flight deck (limited to six people)
- Safety glasses will be issued and must be worn by all test participants (subject to change by the test director once testing begins)
- Photography is limited to Boeing personnel
- No talking on the flight deck or on headsets during the conditions when the CVR is turned on