Taking the 737 to the MAX!

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Content Warning

This talk contains stories of two plane crashes.

If you are a nervous flyer, this talk might not be for you.

BAe Avro RJ-85 EI-RJD

D-AIDV
LUFTHANSA

Boeing 737 MAX 8

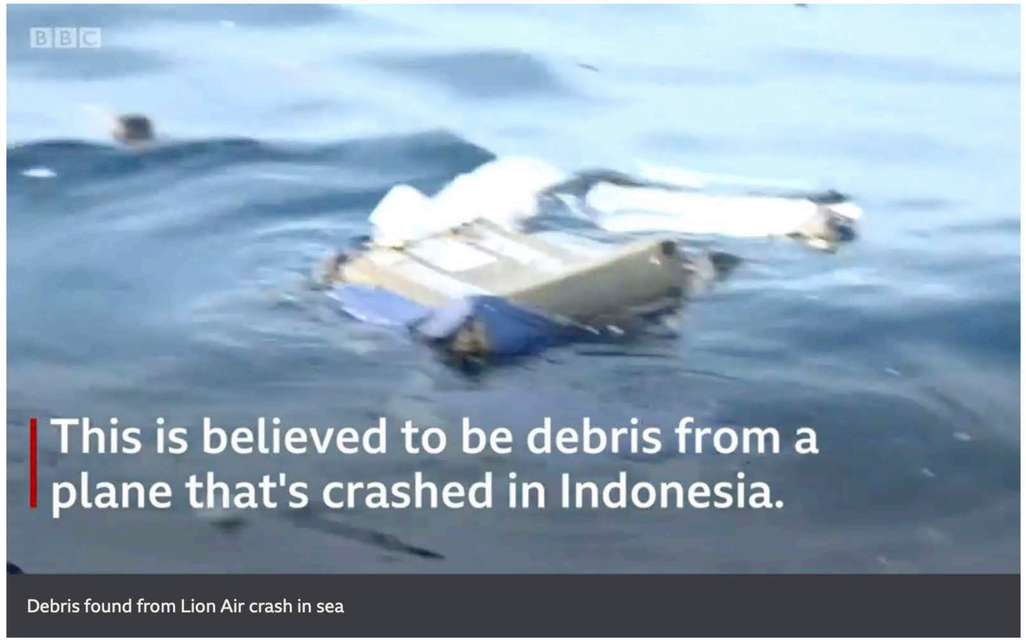
Boeing 737 MAX 8

Boeing 737-100 Prototype

Lion Air crash: Boeing 737 plane crashes in sea off Jakarta

29 October 2018

Lion Air plane crash



Debris found from Lion Air crash in sea

Top Stories

Colombia's most wanted drug lord captured

The US had placed a $5m bounty on the head of Dairo Antonio Úsuga, better known as Otoniel.

1 hour ago

Injured filmmaker 'gutted' at movie set death

8 hours ago

Turkey moves to throw out US envoy and nine others

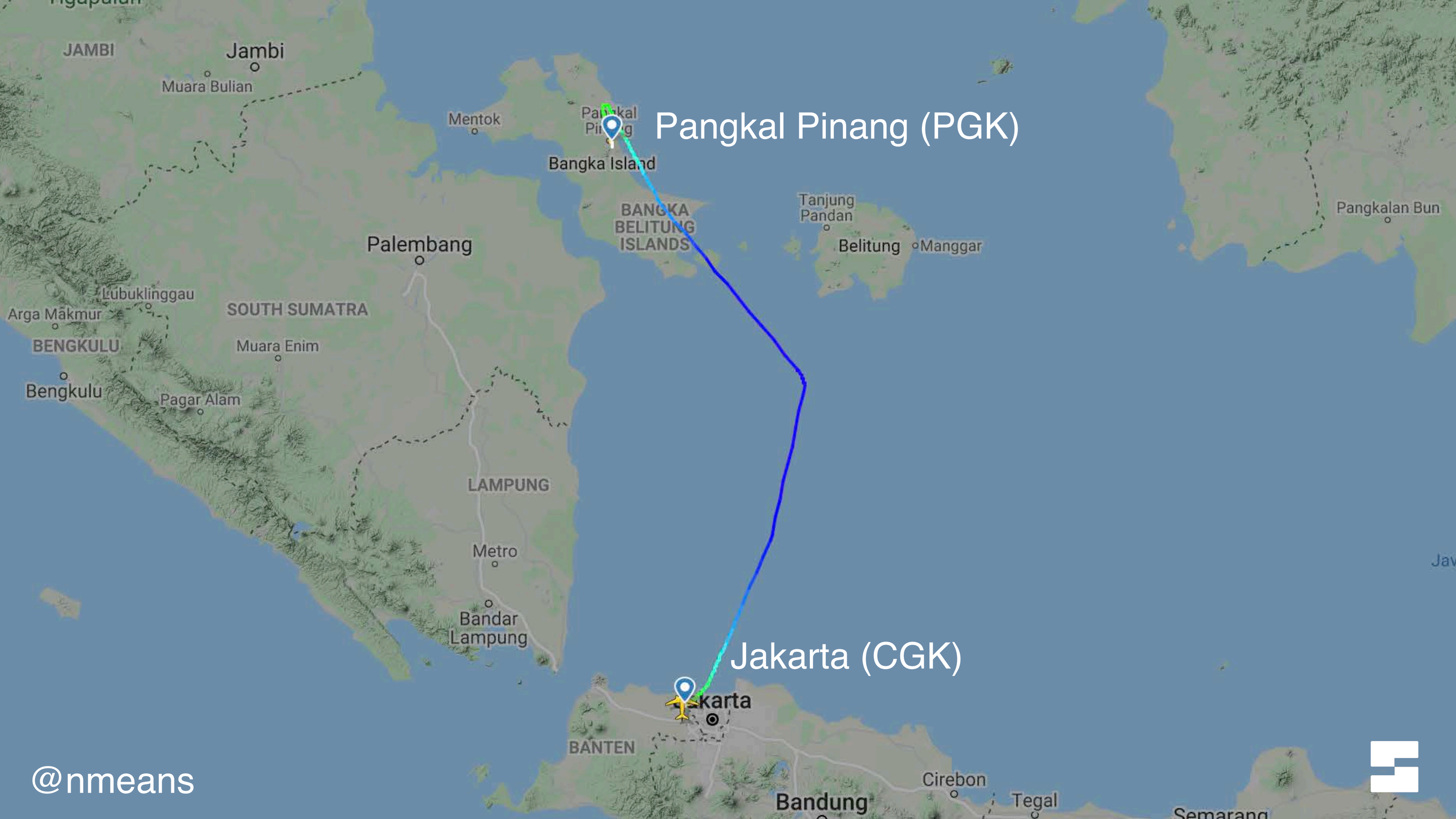
7 hours ago

Features

What's next after the release

Boeing 737-MAX 8 PK-LQP

Captain Bhavye Suneja


Pangkal Pinang (PGK)
Jakarta (CGK)
JAMBI
Jambi
Muara Bulian
Mentok
Bangka Island
BANGKA BELITUNG ISLANDS
Tanjung Pandan
Belitung
Manggar
Pangkalan Bun
Palembang
Lubuklinggau
Arga Makmur
SOUTH SUMATRA
BENGKULU
Muara Enim
Bengkulu
Pagar Alam
LAMPUNG
Metro
Bandar Lampung
BANTEN
Cirebon
Bandung
Tegal
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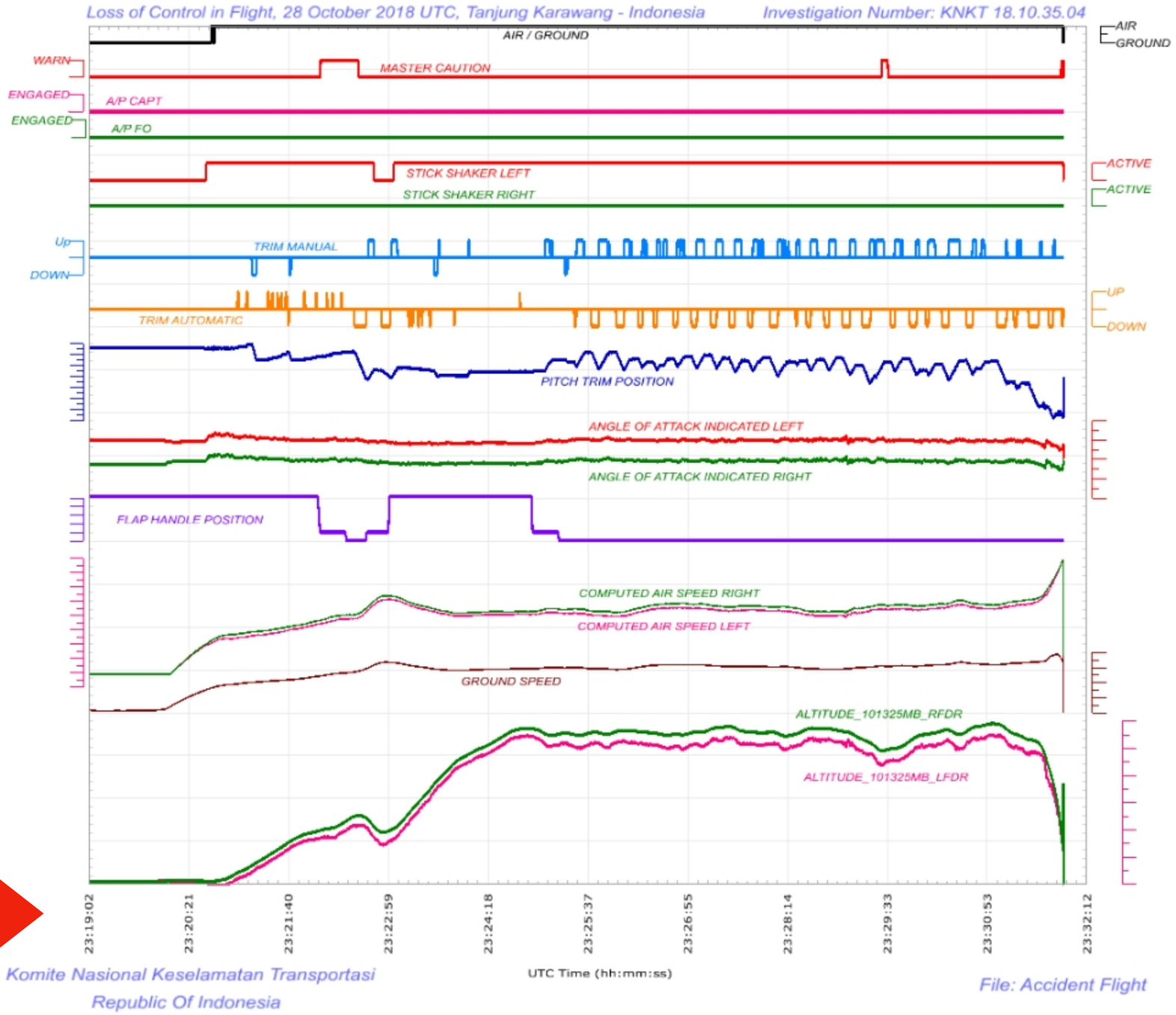
PK-LQP Boeing 737-MAX8



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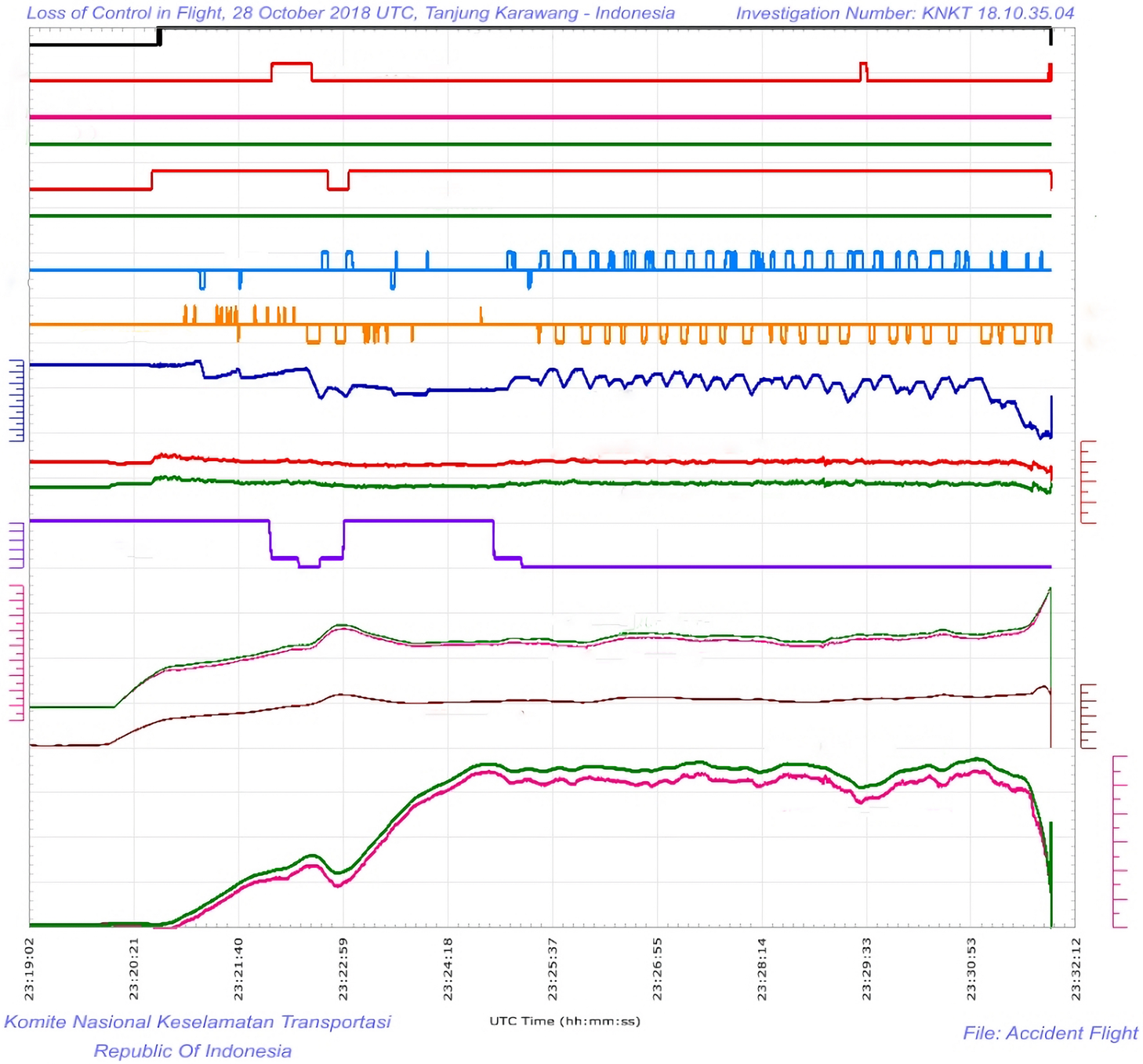

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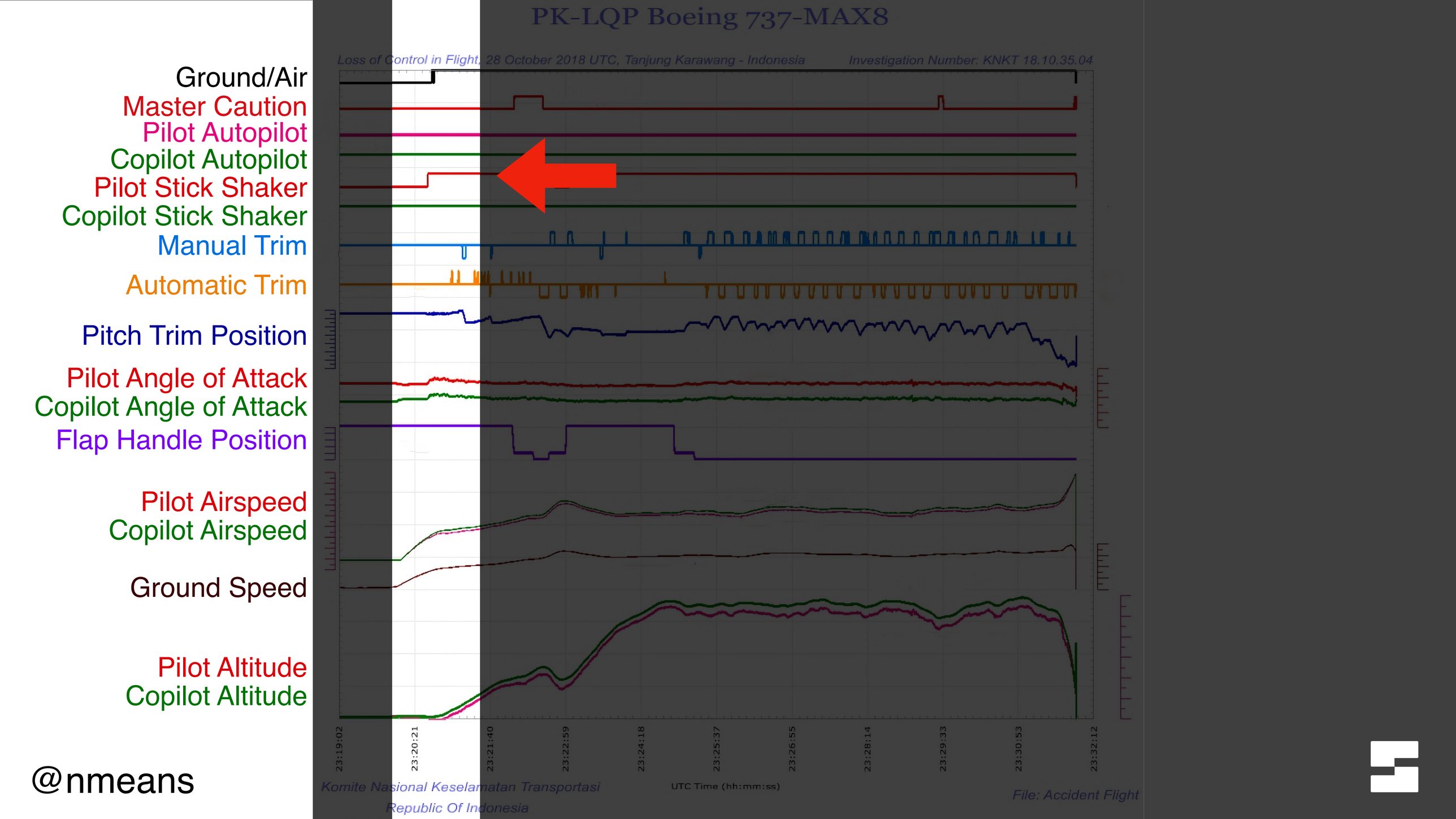
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UTC Time (hh:mm:ss)
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File: Accident Flight

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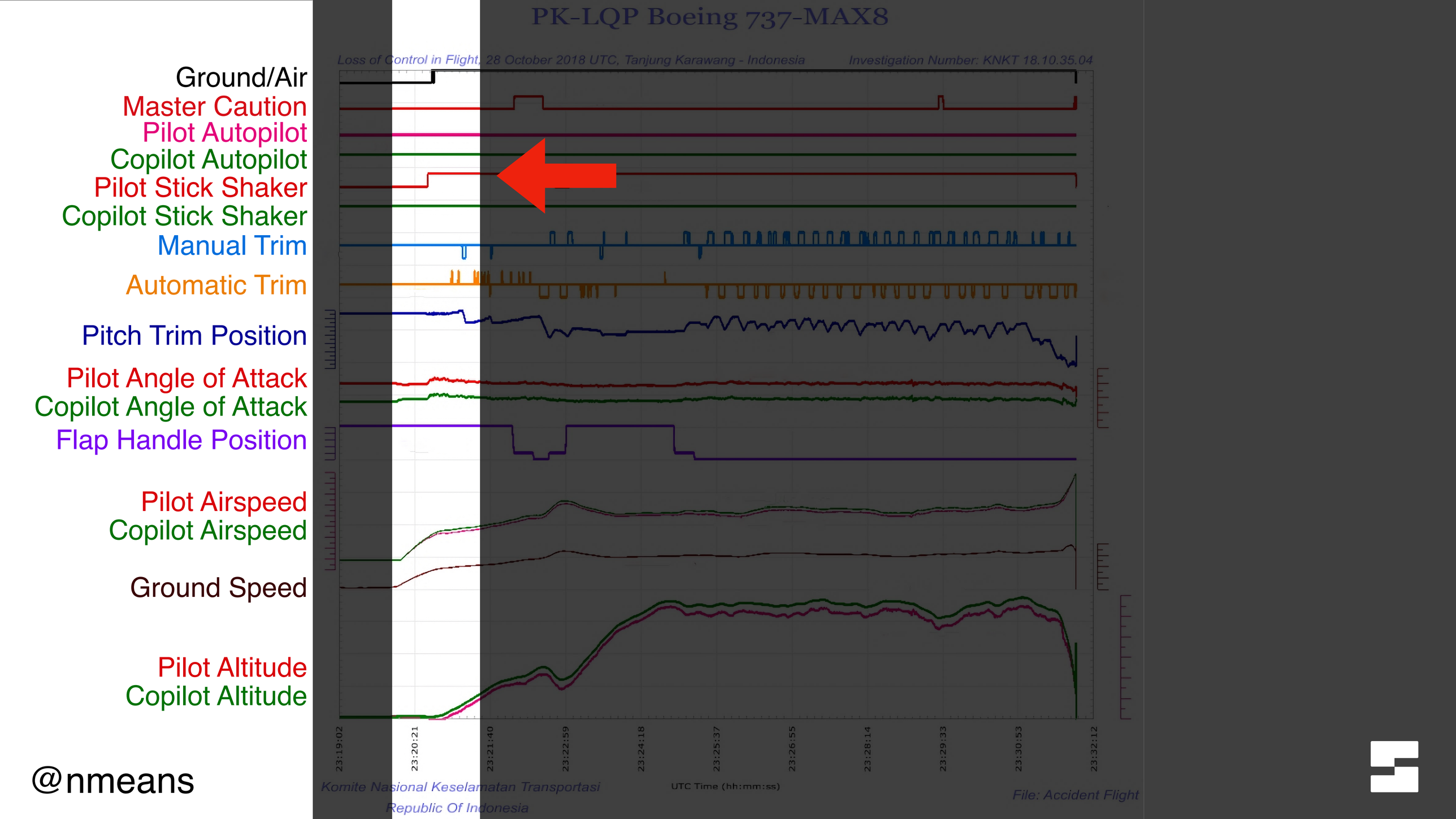
Aerodynamic Stall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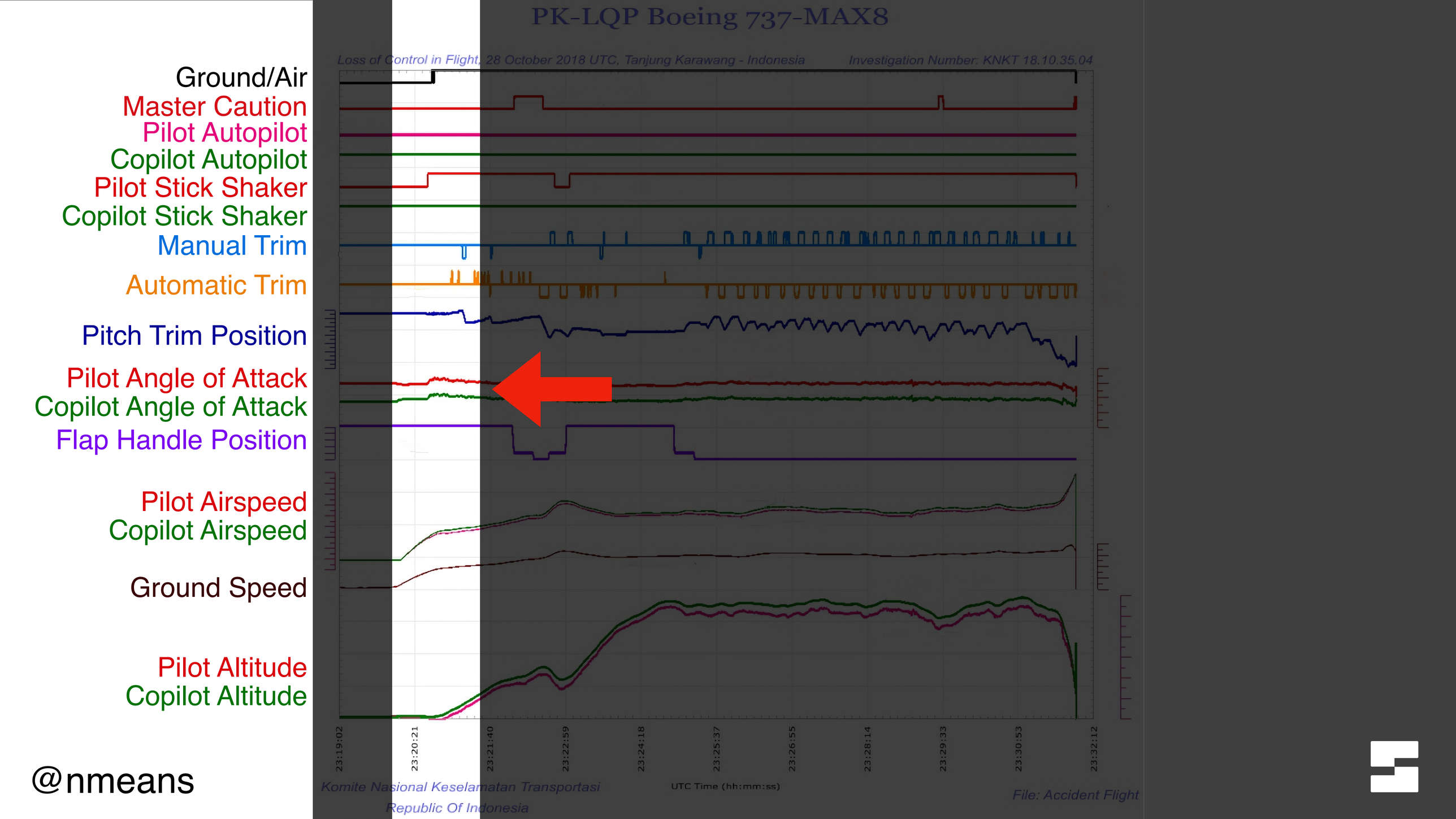
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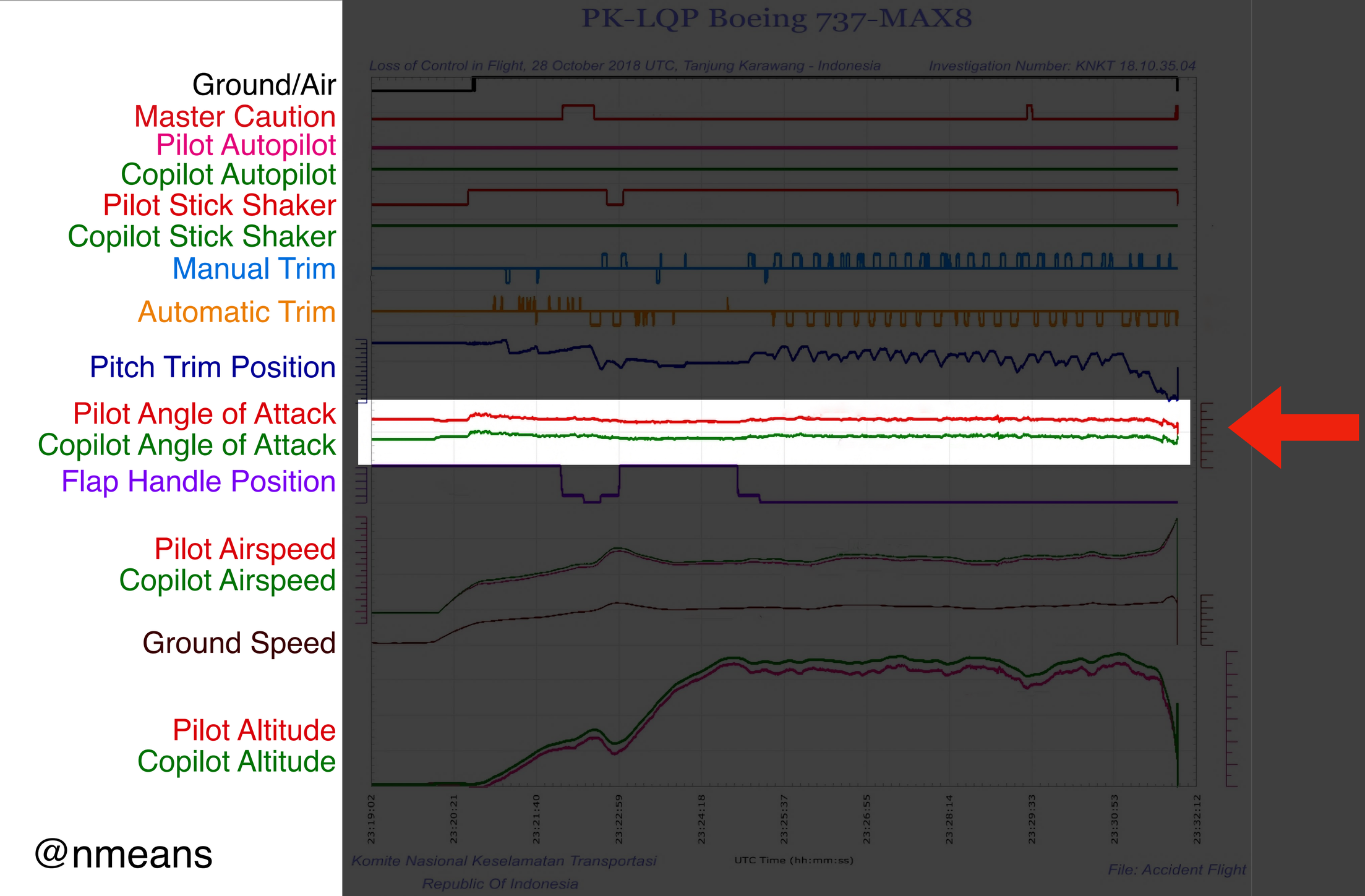
Angle of Attack Vane, Boeing 737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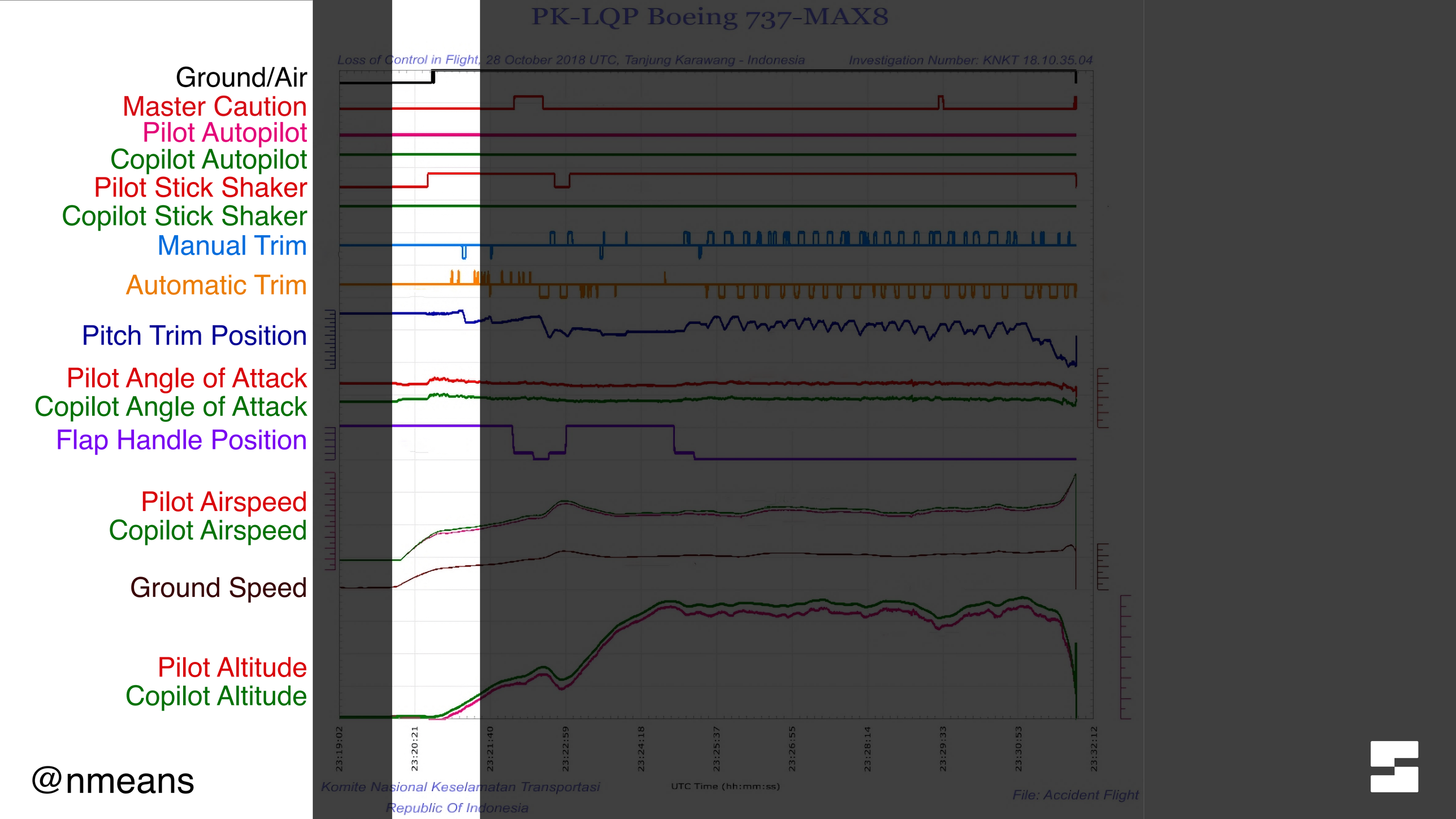
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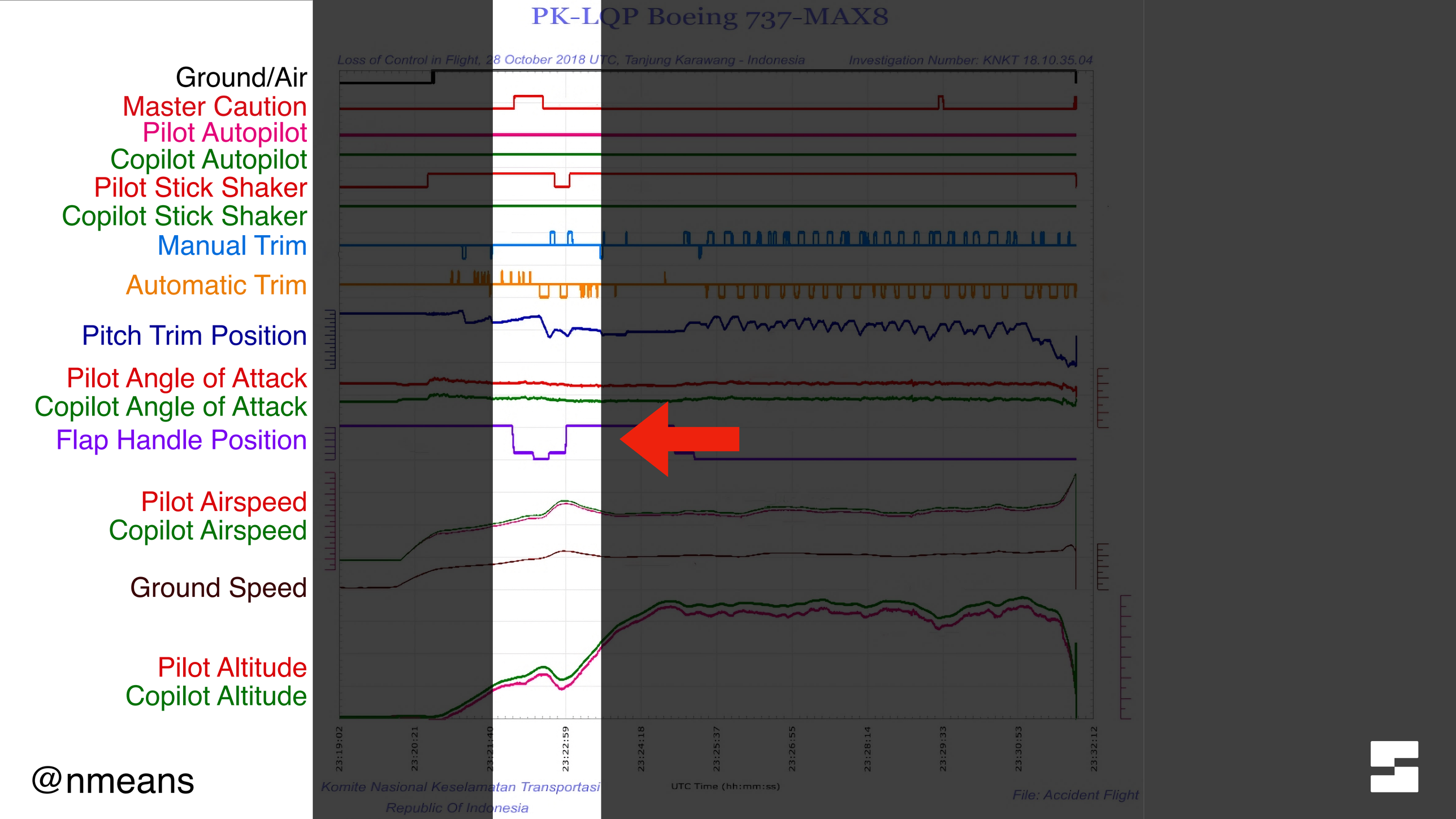
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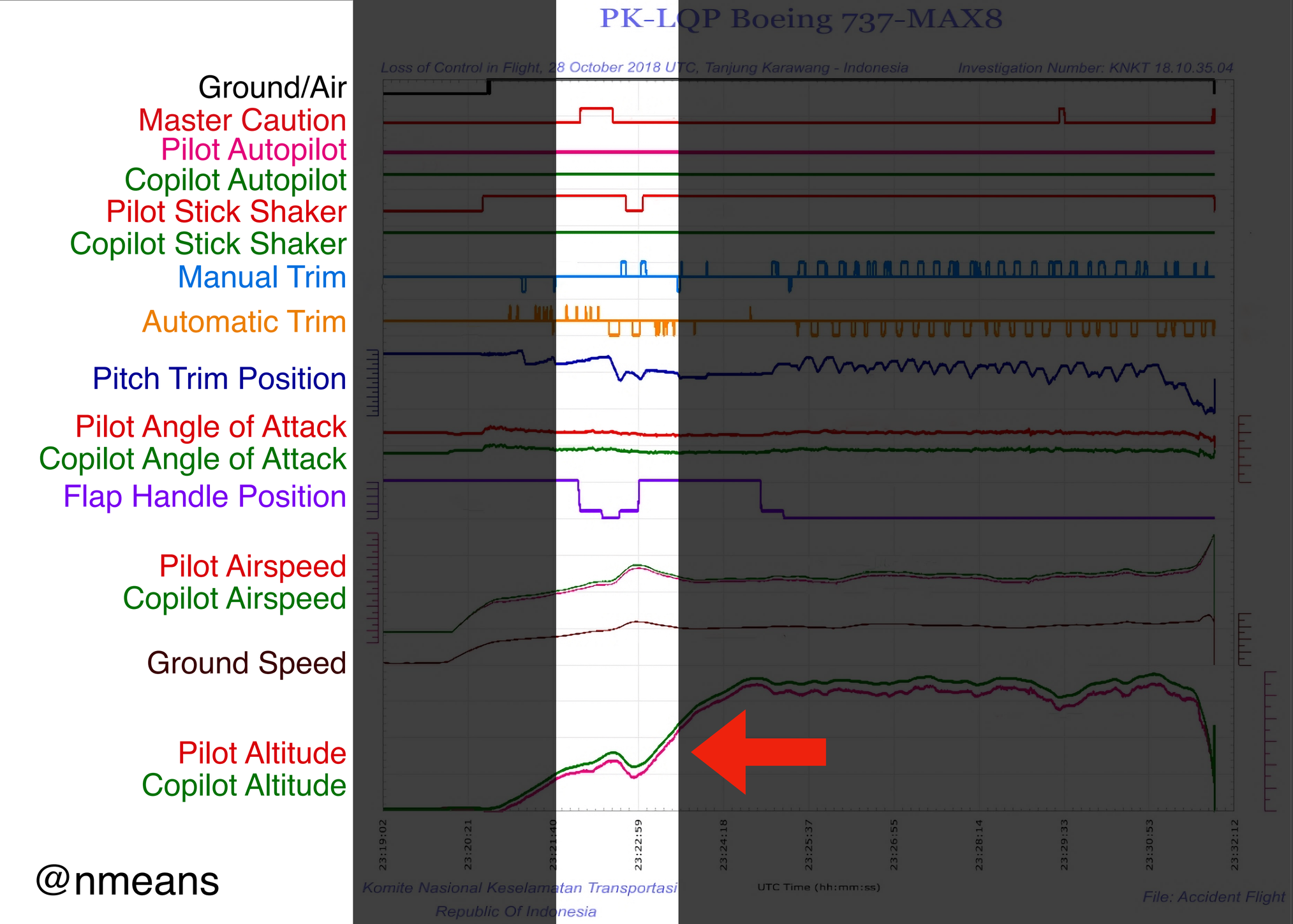
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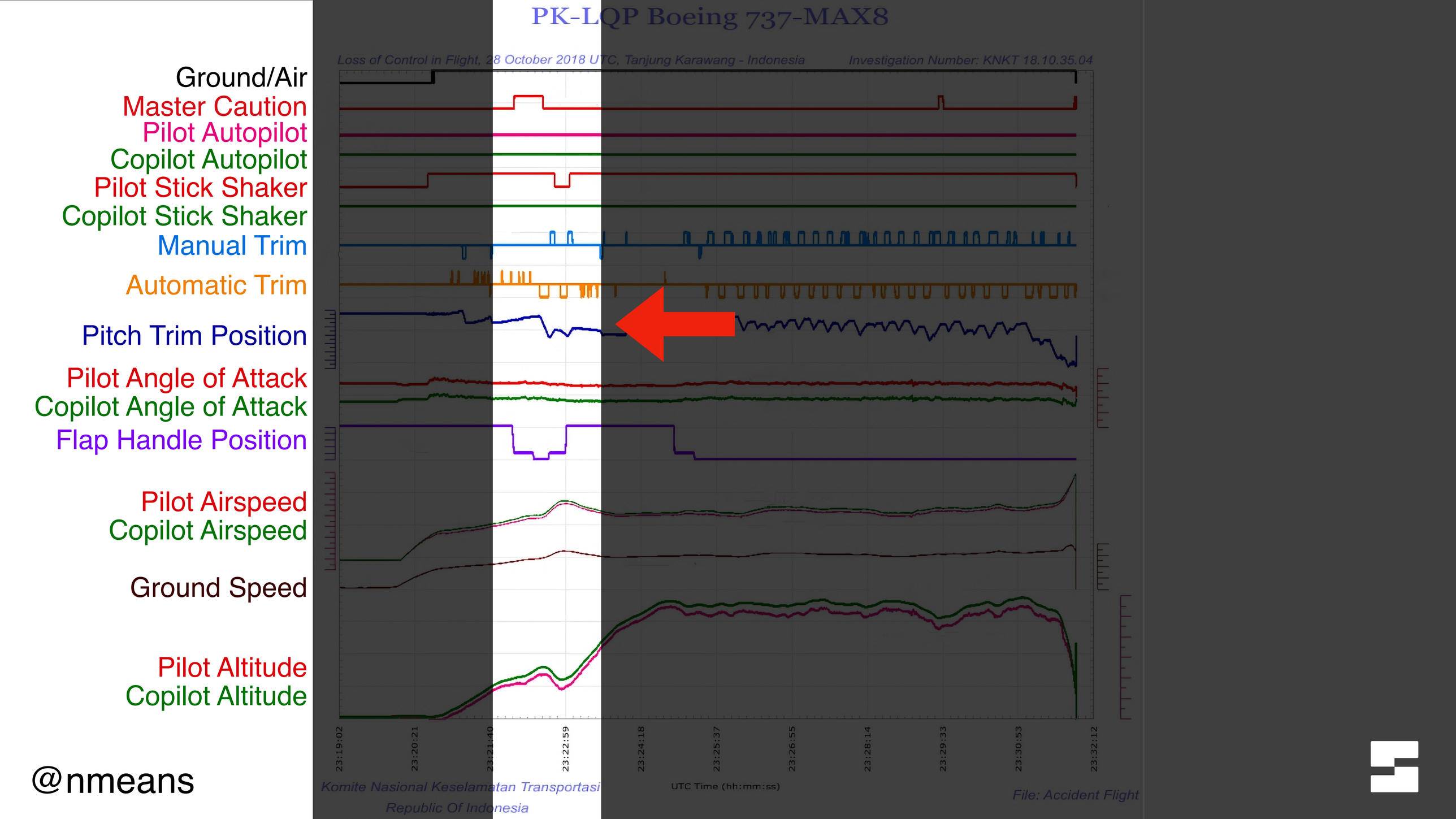
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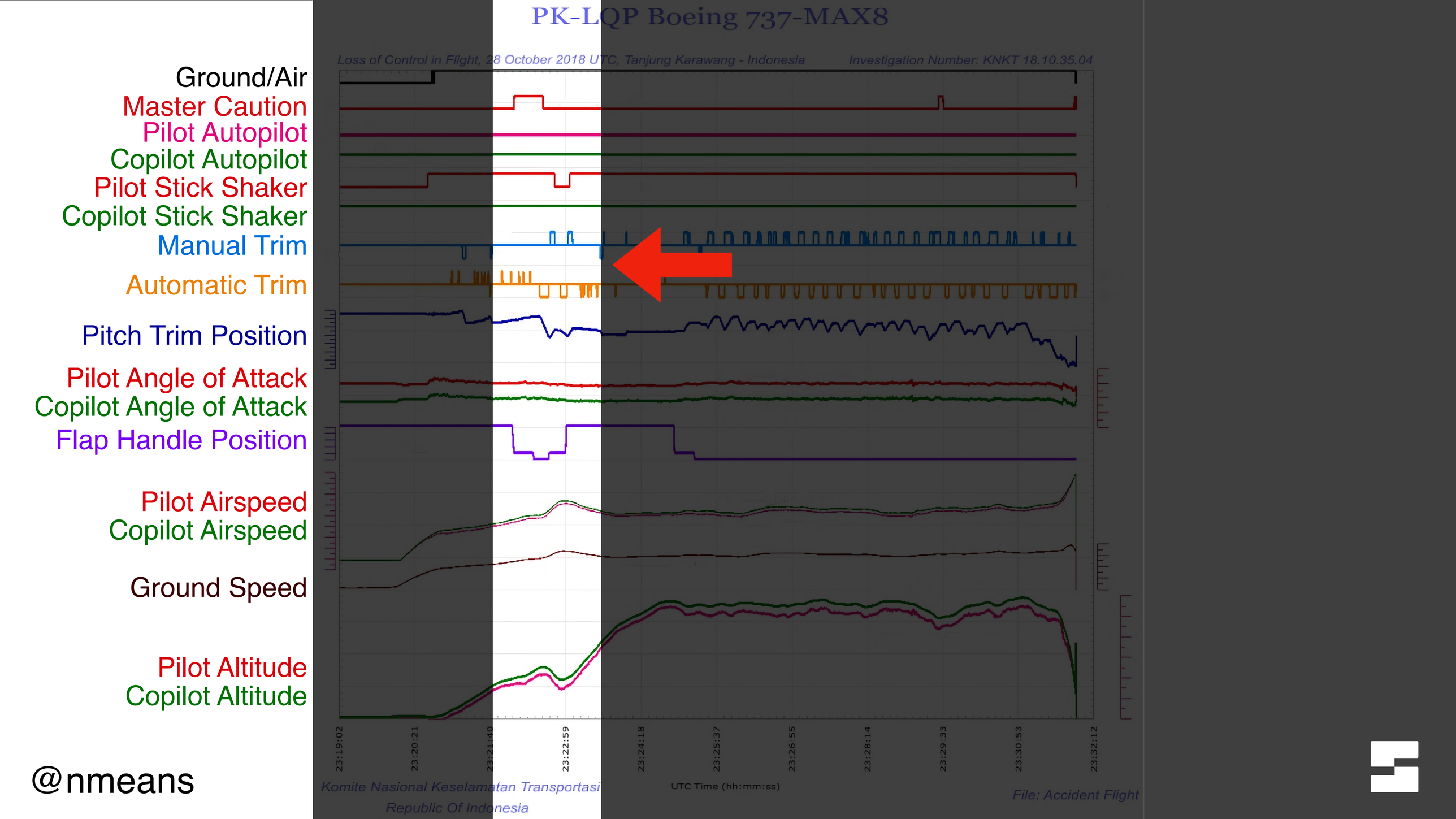
Boeing 737-700 Horizontal Stabilizer

Boeing 737-700 Horizontal Stabilizer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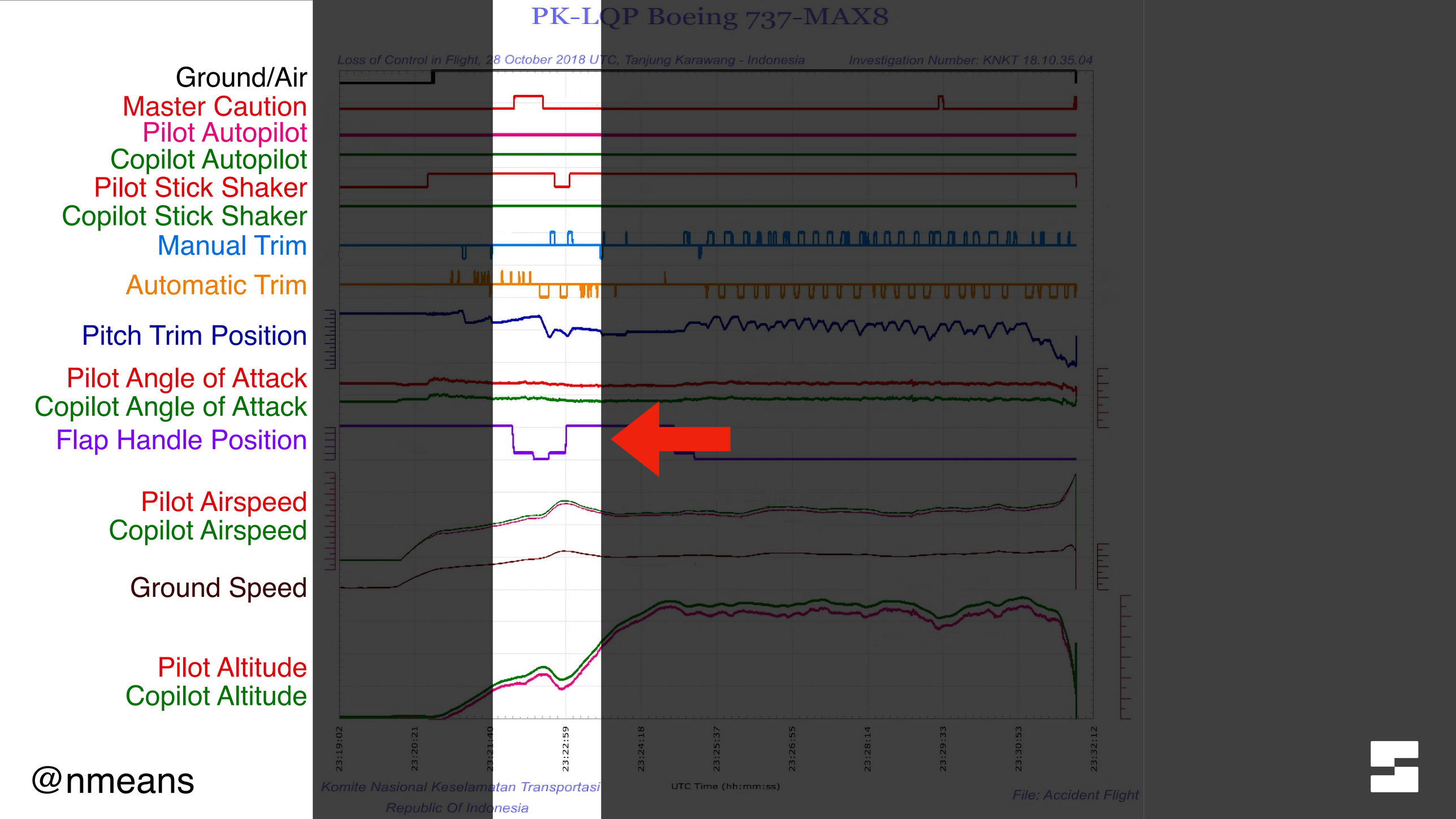
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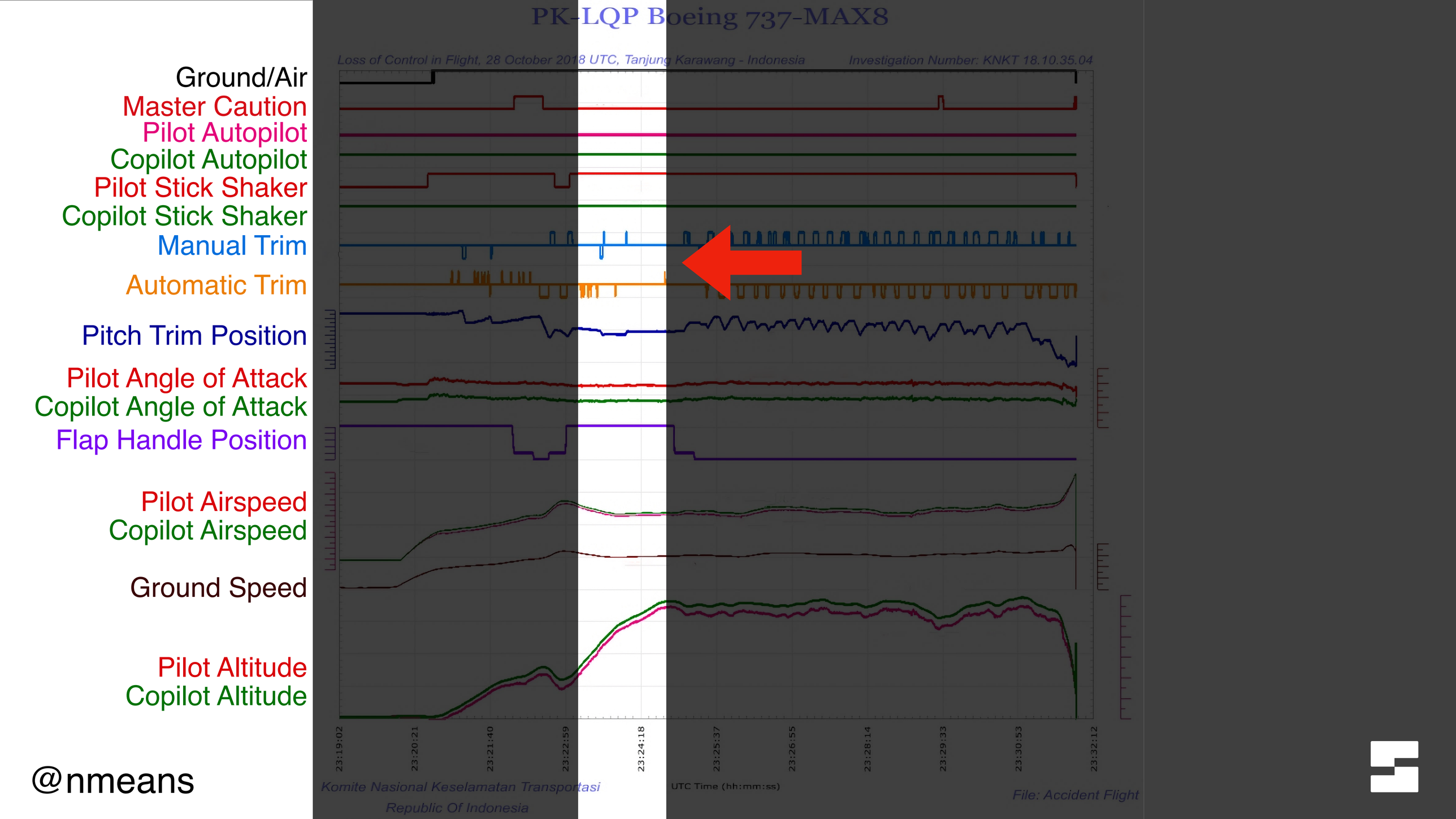
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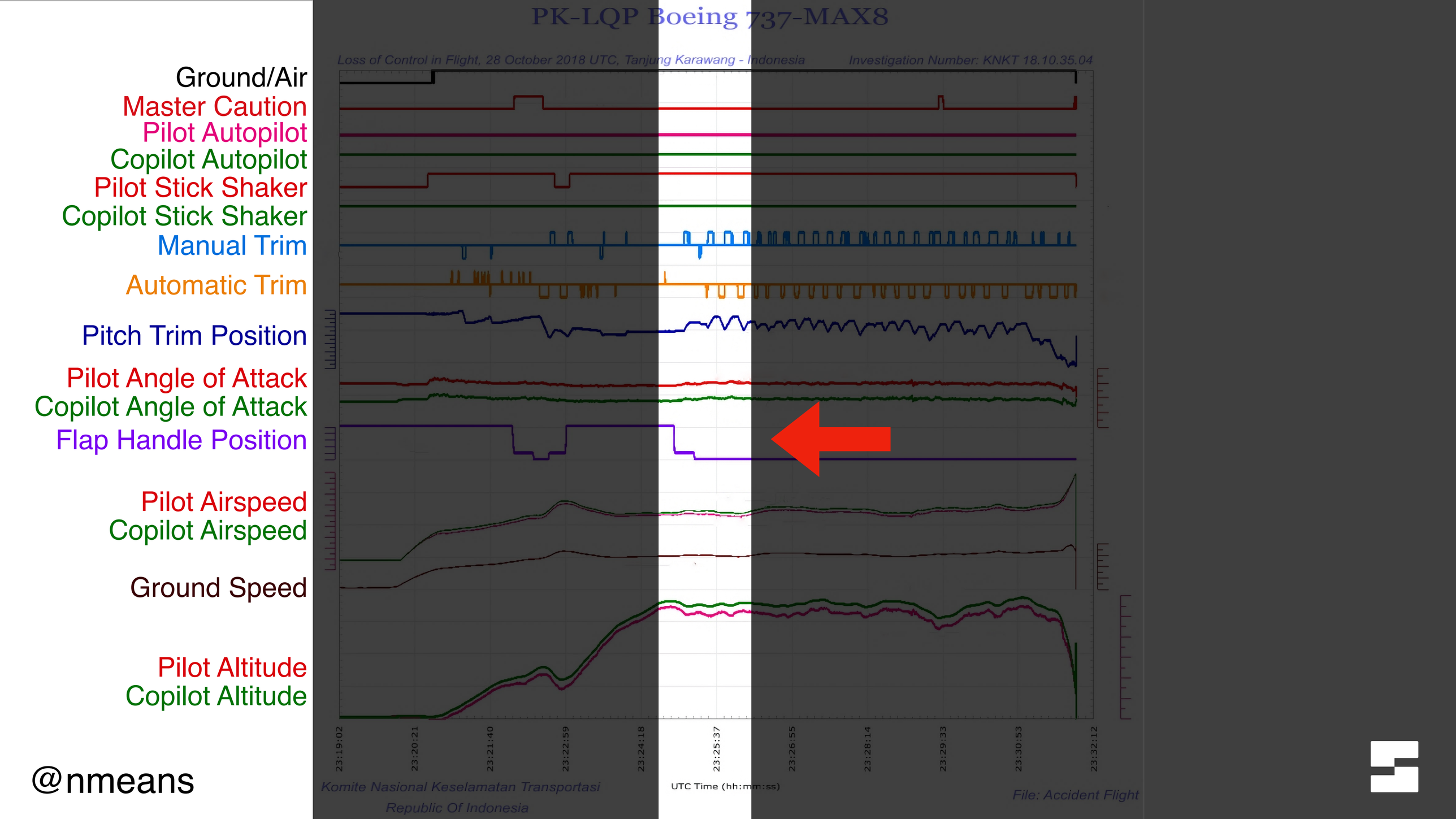
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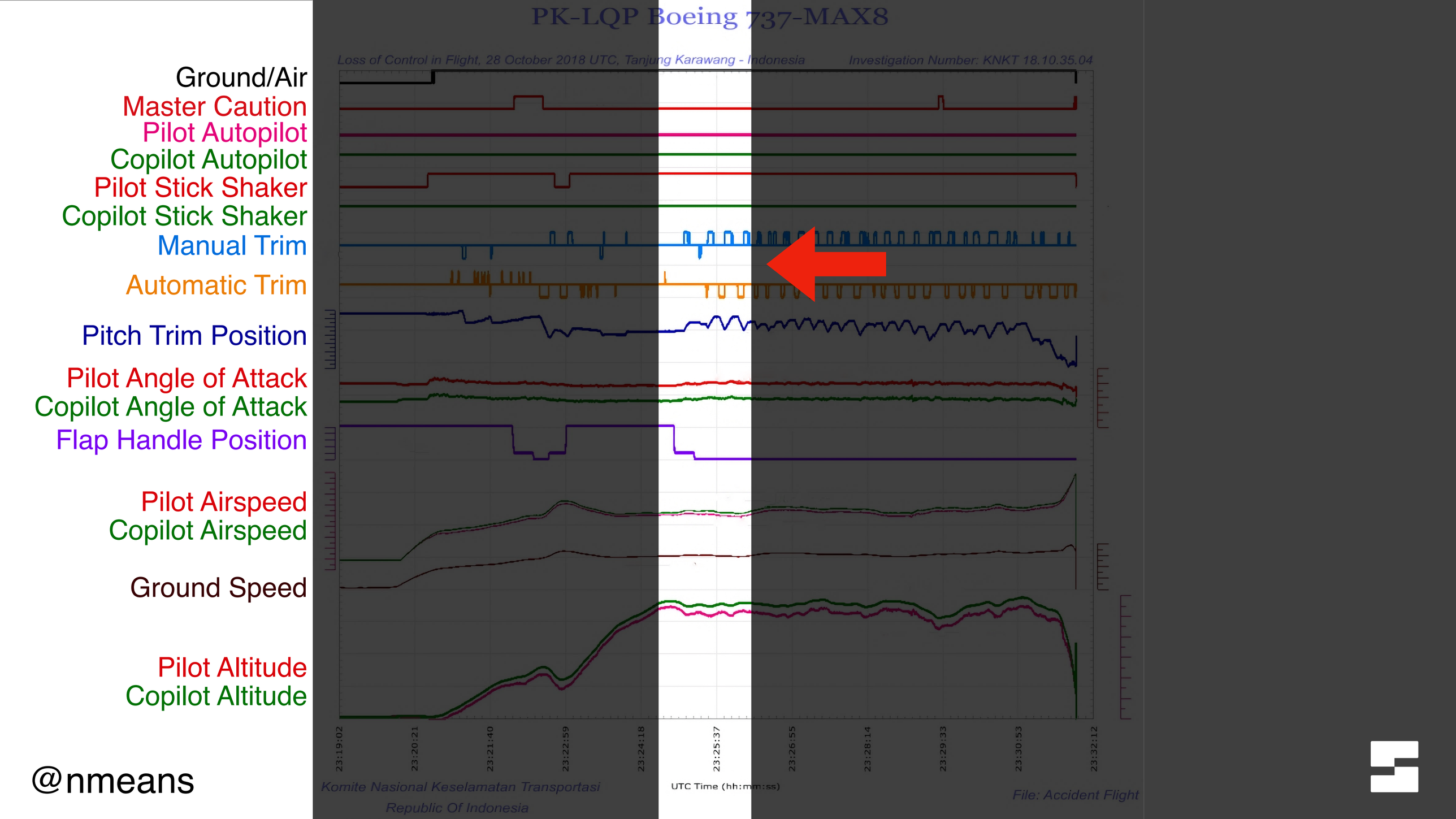
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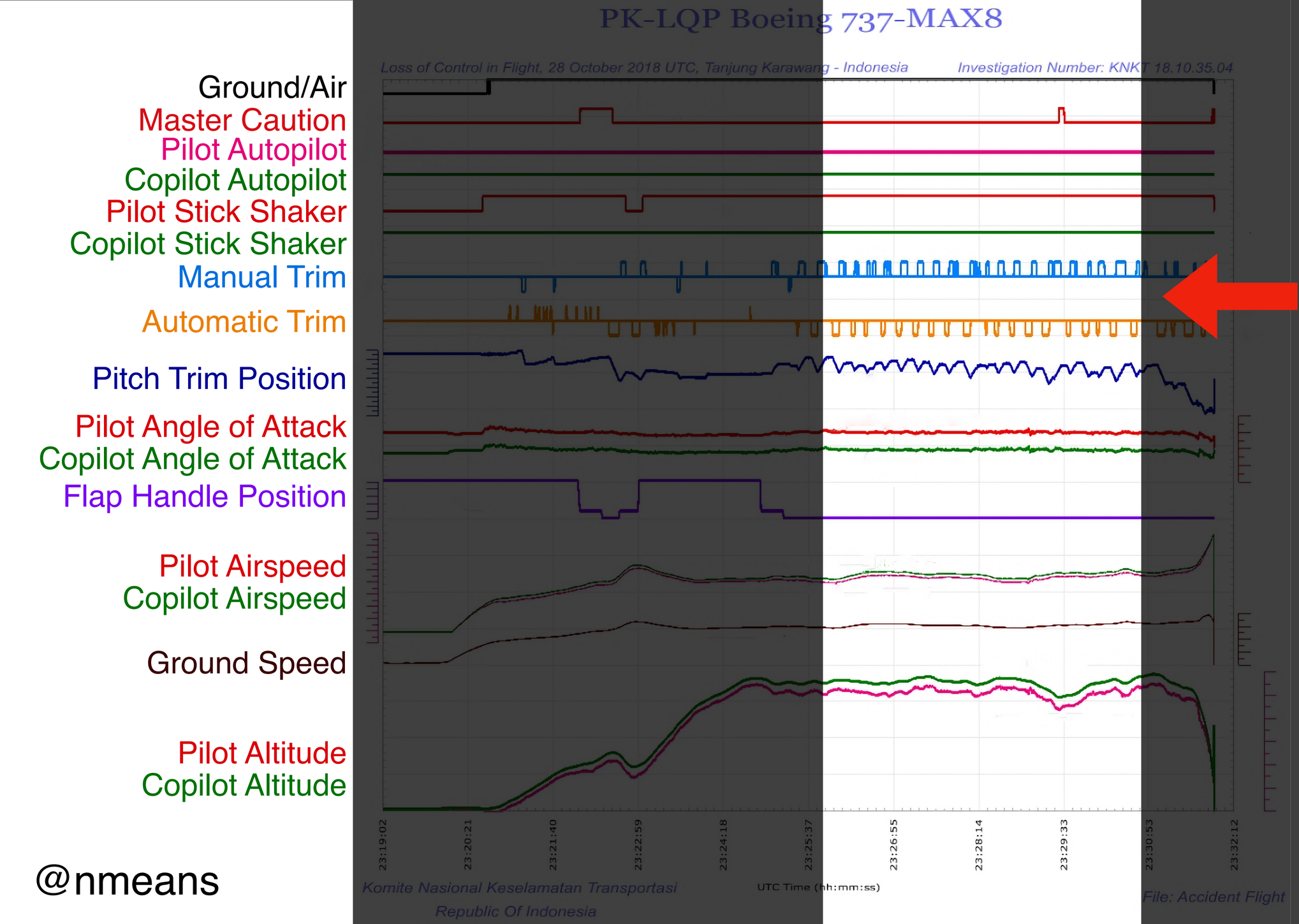
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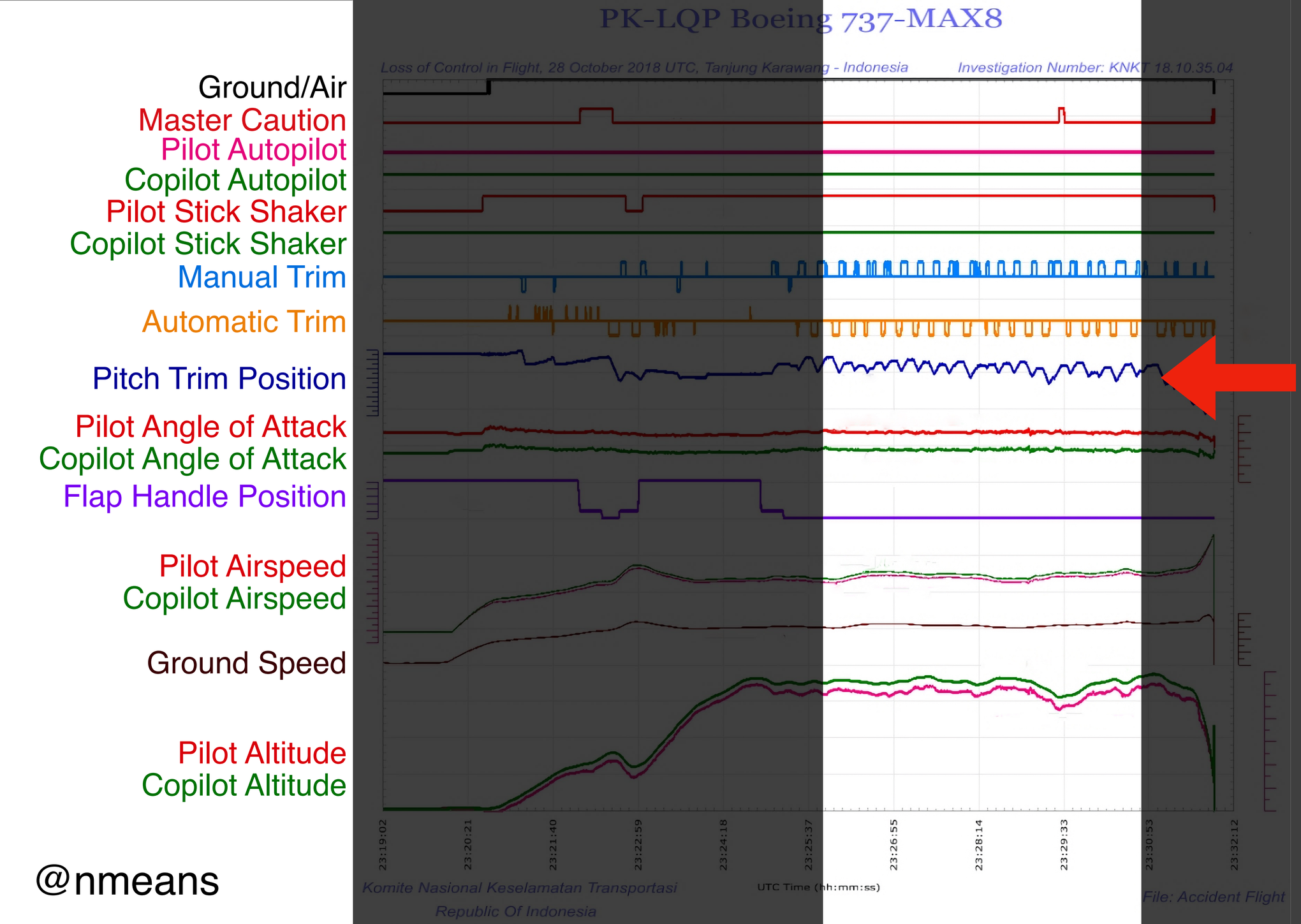
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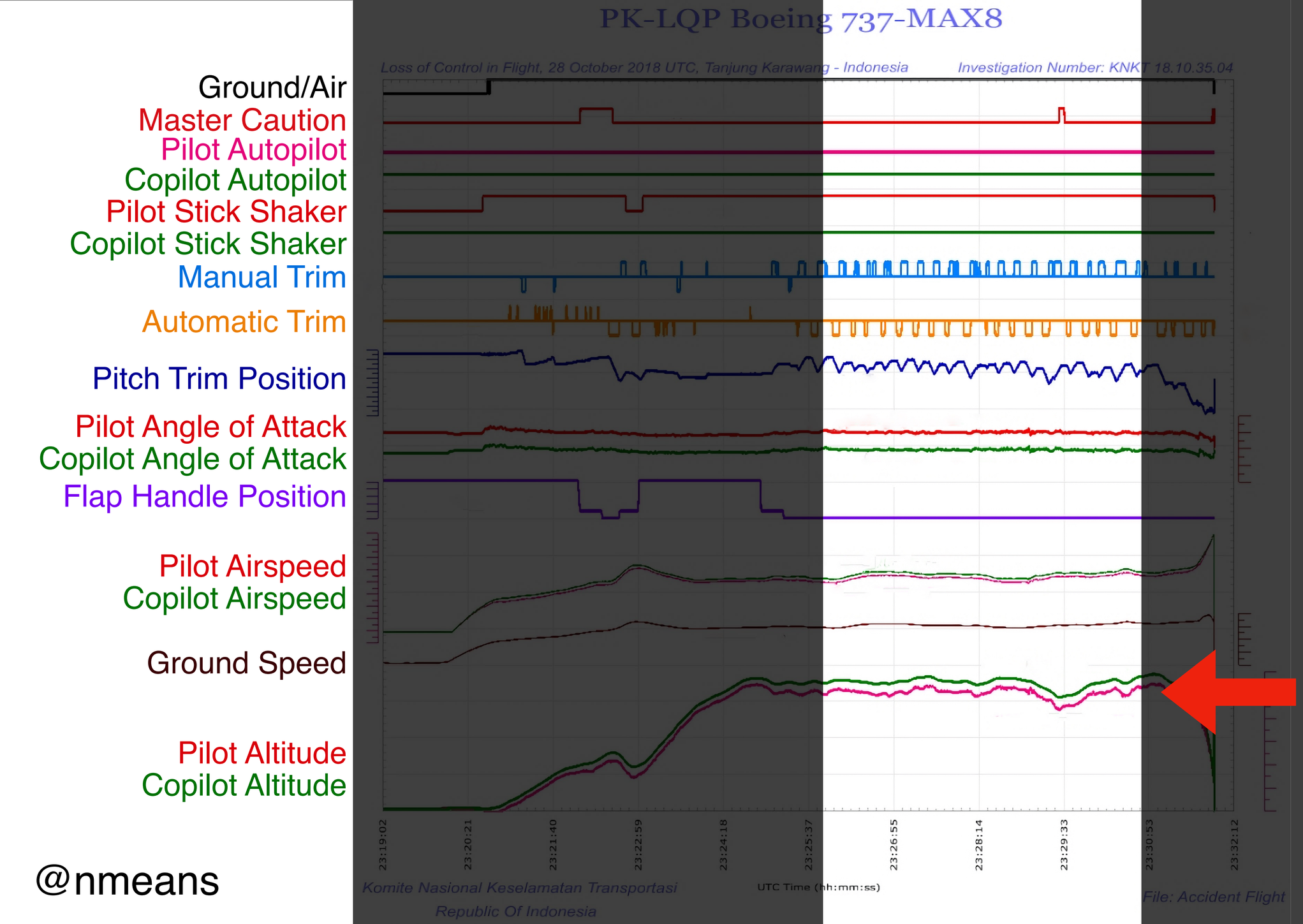
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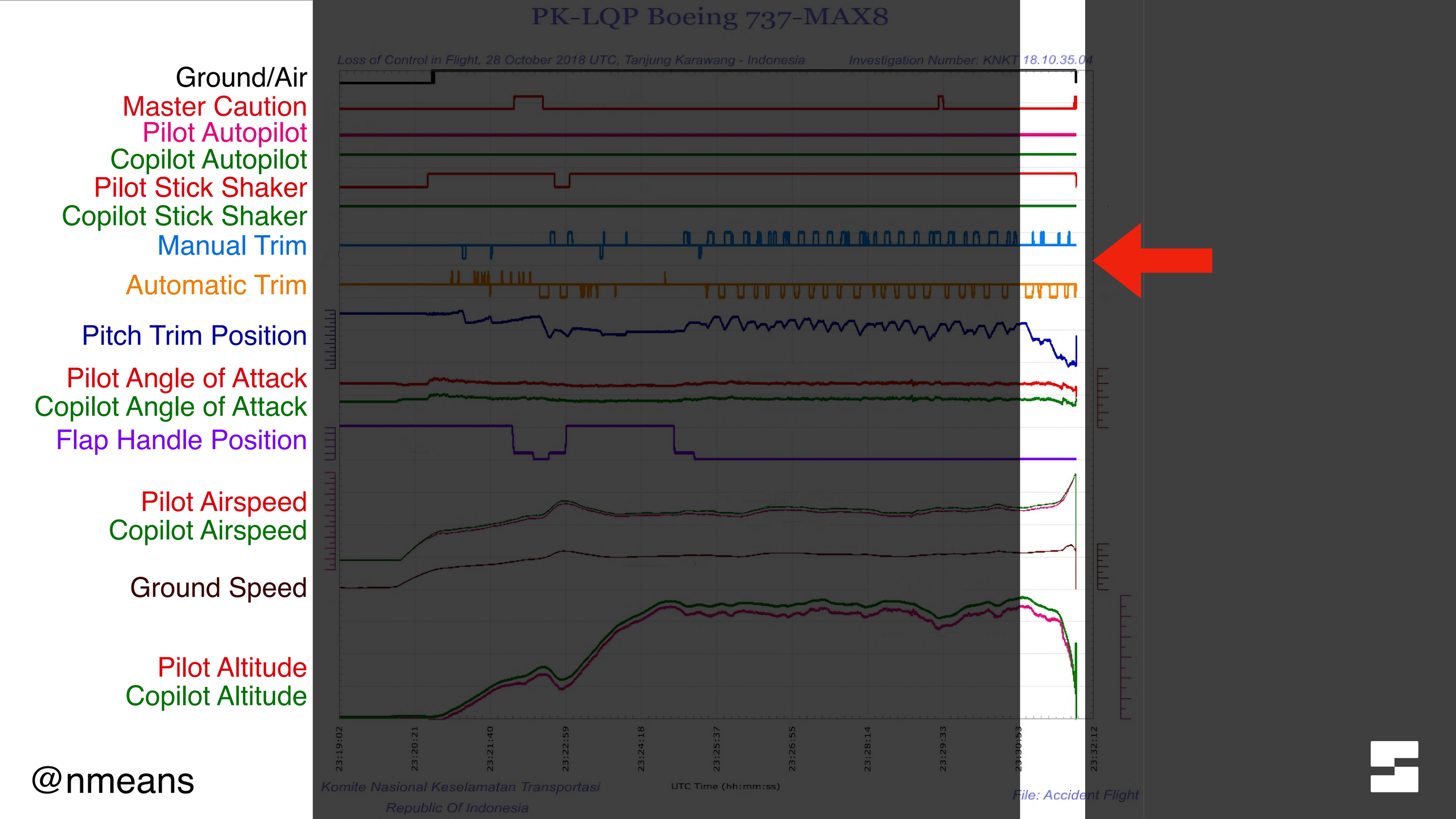
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Komite Nasional Keselamatan Transportasi
Republic Of Indonesia
File: Accident Flight
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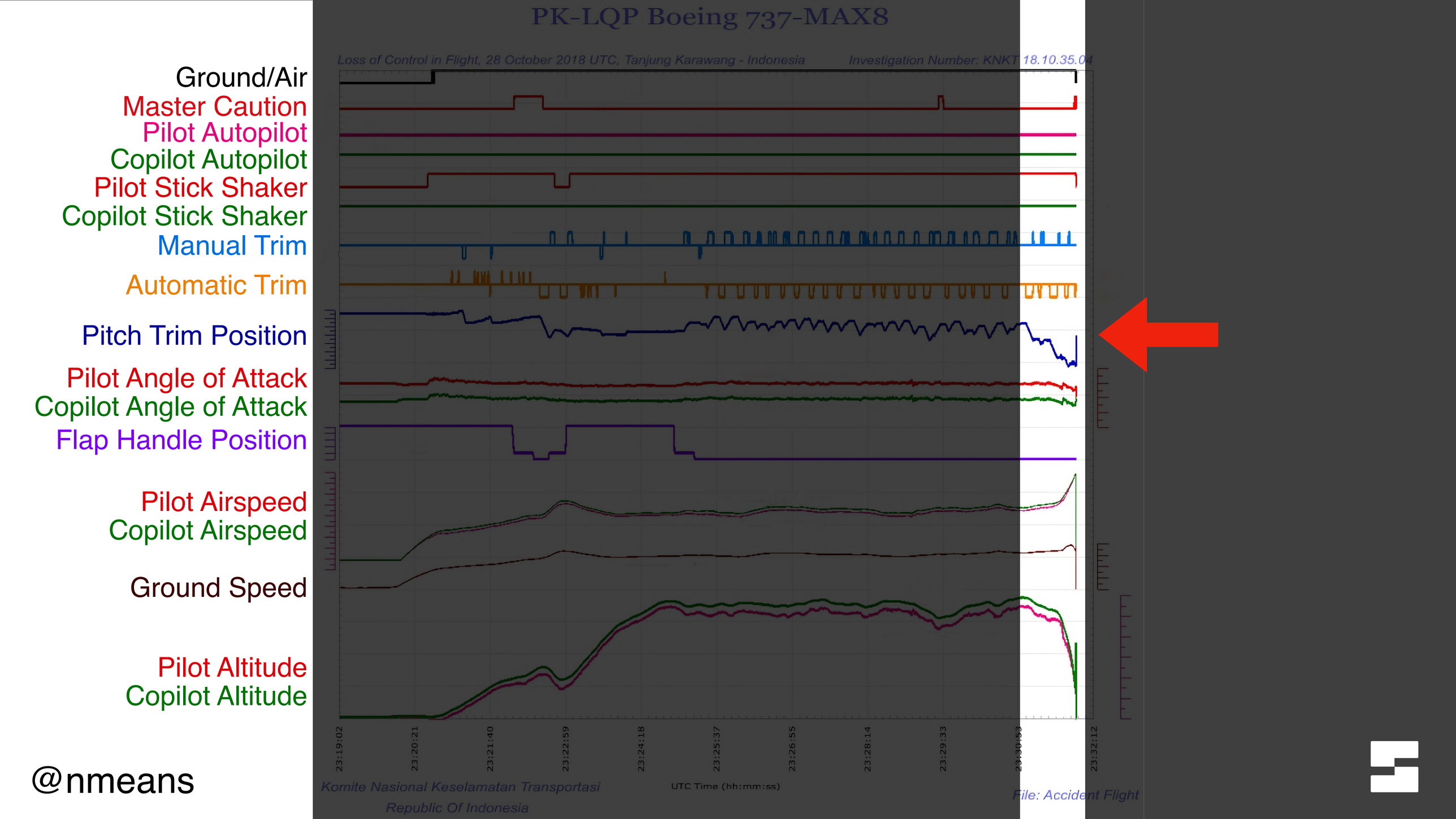
PK-LQP Boeing 737-MAX8
Loss of Control in Flight, 28 October 2018 UTC, Tanjung Karawang - Indonesia
Investigation Number: KNKT.18.10.35.04
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Copilot Autopilot
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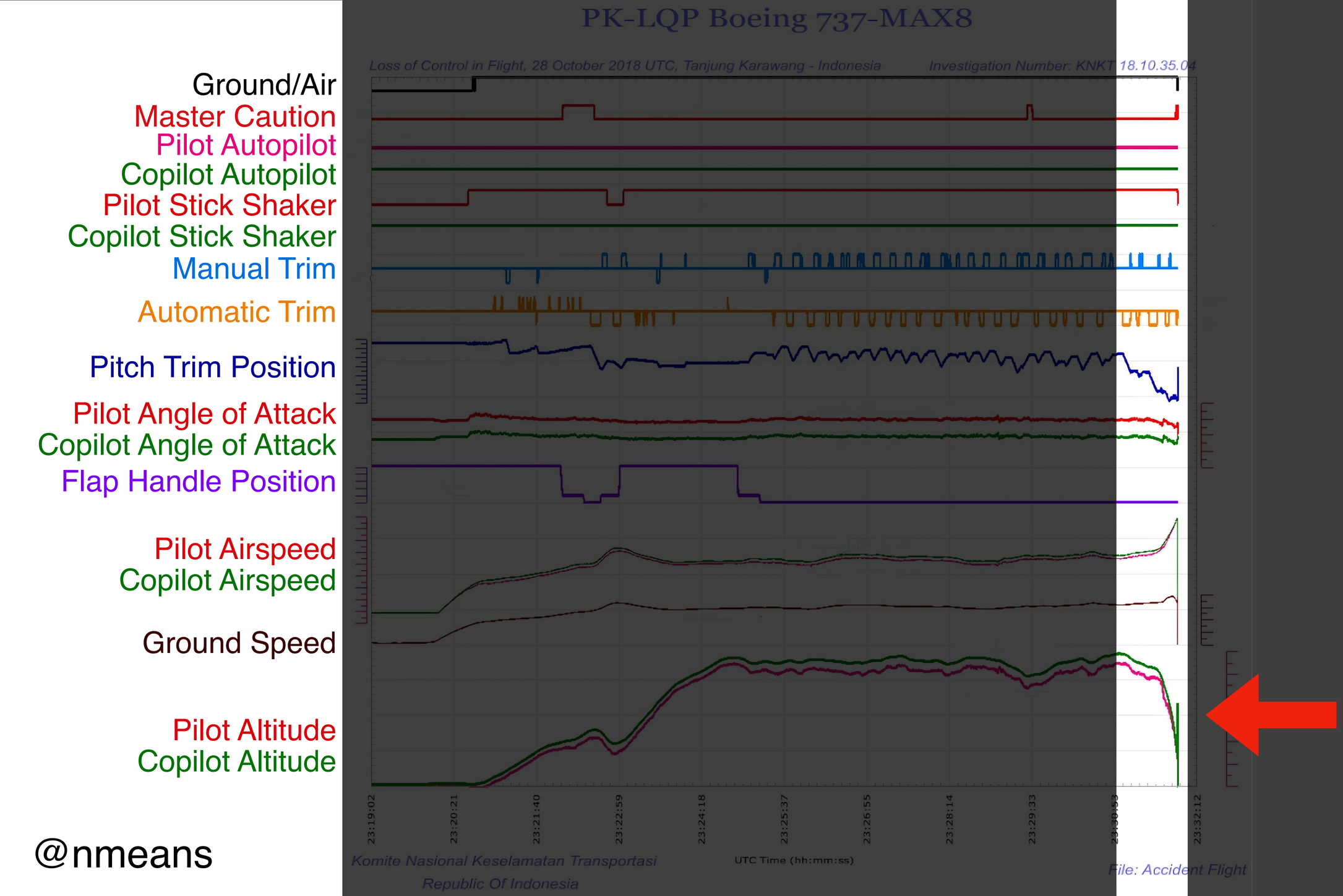
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BOEING

Flight Crew Operations Manual Bulletin for The Boeing Company

The Boeing Company
Seattle, Washington 98124-2207

737

Number: TBC-19

IssueDate: November 6, 2018

Airplane Effectivity: 737-8 / -9

Subject: Uncommanded Nose Down Stabilizer Trim Due to Erroneous Angle of Attack (AOA) During Manual Flight Only

Reason: To Emphasize the Procedures Provided in the Runaway Stabilizer Non-Normal Checklist (NNC).

Information in this bulletin is recommended by The Boeing Company, but may not be FAA approved at the time of writing. In the event of conflict with the FAA approved Airplane Flight Manual (AFM), the AFM shall supersede. The Boeing Company regards the information or procedures described herein as having a direct or indirect bearing on the safe operation of this model airplane.

THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT

Background Information

The Indonesian National Transportation Safety Committee has indicated that Lion Air flight 610 experienced erroneous AOA data. Boeing would like to call attention to an AOA failure condition that can occur **during manual flight only**

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FROM: THE BOEING COMPANY
TO: Boeing Correspondence (MOM)
[MESSAGE NUMBER:MOM-MOM-18-0664-01B] Multi Operator Message
MESSAGE DATE: 10 Nov 2018 1810 US PACIFIC TIME / 11 Nov 2018 0210 GMT

This message is sent to all 737NG/MAX Customers, Regional Directors, Regional Managers and Boeing Field Service Bases.

CATEGORY: Maintenance, Engineering, Flight Operations, Management, Safety

SERVICE REQUEST ID: 4-4298138108
ACCOUNT: Boeing Correspondence (MOM)
DUE DATE: No Action Required
PRODUCT TYPE: Airplane
PRODUCT LINE: 737
PRODUCT: SEVERAL
ATA: 0000-57

SUBJECT: Information - Multi-Model Stall Warning and Pitch Augmentation Operation

REFERENCES:
/A/ MOM-MOM-18-0655-01B

- -

SUMMARY:
Boeing has received many requests for the same information from 737 fleet operators in response to the reference /A/ message. This message provides technical information and operational details.

- -

DESCRIPTION:
A pitch augmentation system function called "Maneuvering Characteristics Augmentation System" (MCAS) is implemented on the 737-8, -9 (MAX) to enhance pitch characteristics with flaps UP and at elevated angles of attack. The MCAS function commands nose down stabilizer to enhance pitch characteristics during steep turns with elevated load factors and during flaps up flight at airspeeds approaching stall. MCAS is activated without pilot input and only operates in manual, flaps up flight. The system is designed to allow the flight crew to use column trim switch or stabilizer aisle stand cutout switches to override MCAS input. The function is commanded by the Flight Control computer using input data from sensors and other airplane systems.

Boeing 737-200

Boeing 737-300 Engine Inlet

Boeing 737-700 “NextGen”

Airbus A320neo

James McNerney
CEO, Boeing

Gerard Arpey
CEO, American Airlines

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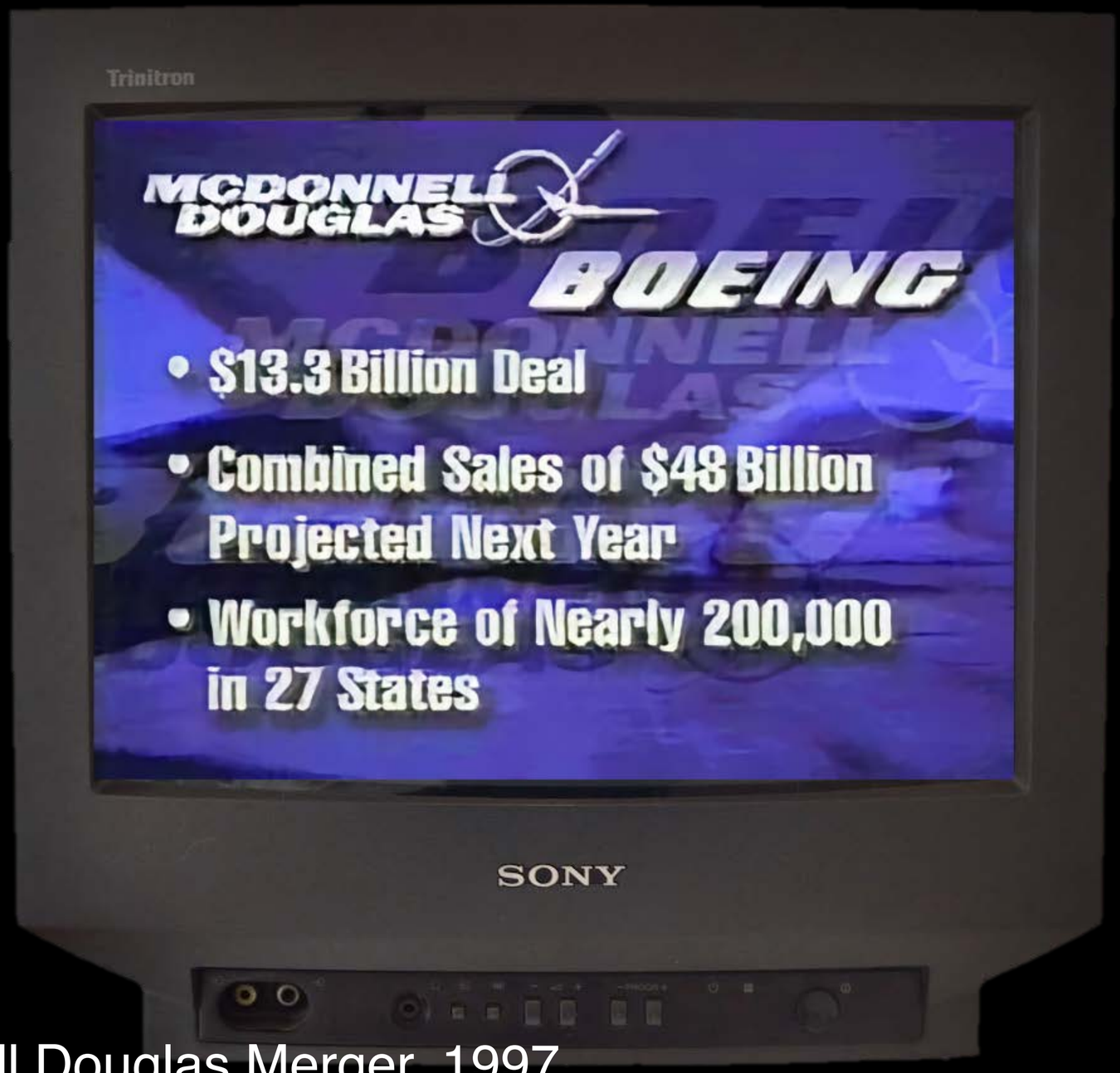
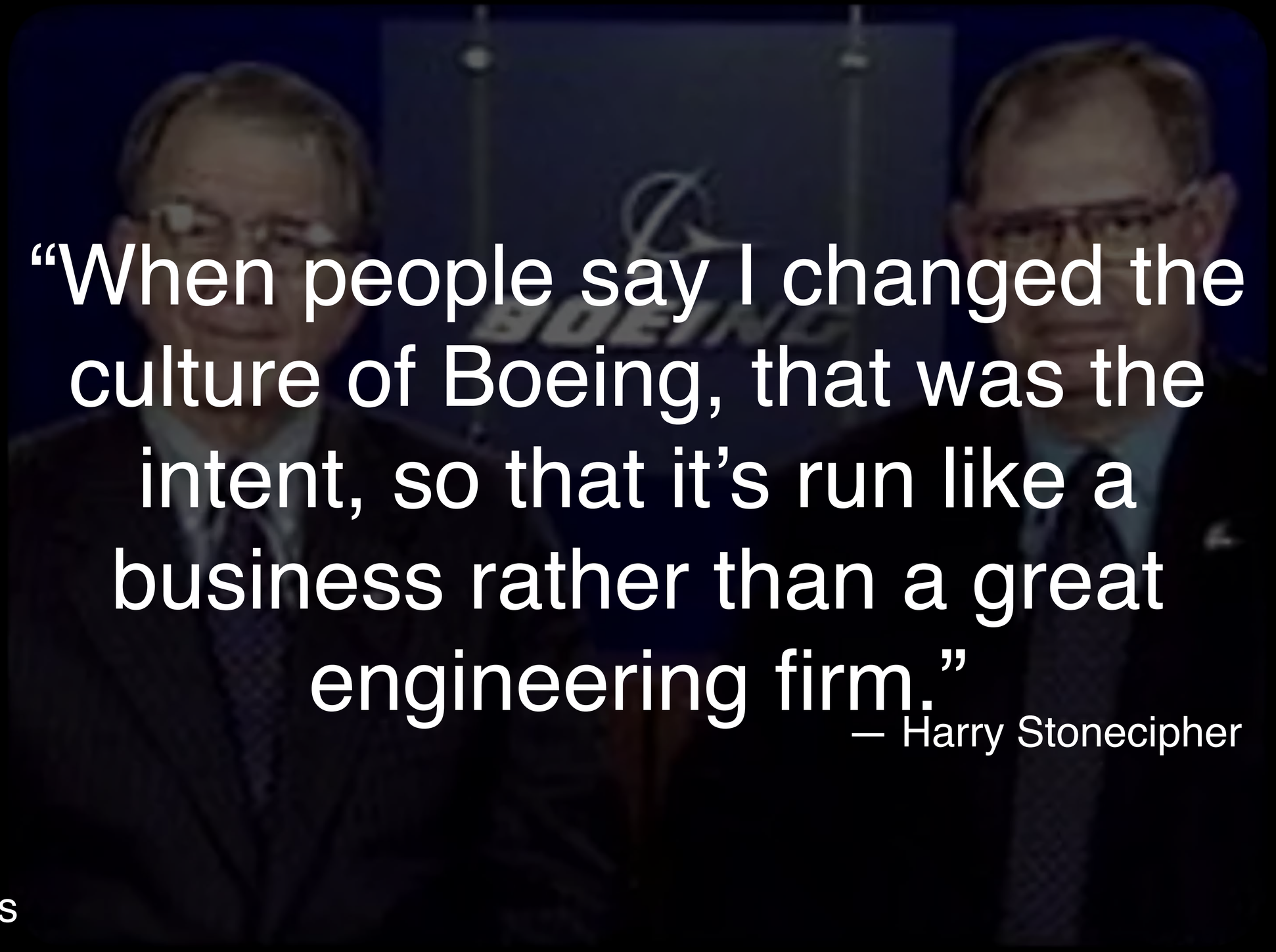


Boeing / McDonnell Douglas Merger, 1997

Harry Stonecipher
Boeing President & COO

Phil Condit
Boeing CEO

@nmeans



“When people say I changed the culture of Boeing, that was the intent, so that it’s run like a business rather than a great engineering firm.”

— Harry Stonecipher

James McNerney
CEO, Boeing

Gerard Arpey
CEO, American Airlines

@nmeans

Boeing 737-MAX 8

Airbus A320
Boeing 737
A

Boeing 737 MAX Engine Nacelle

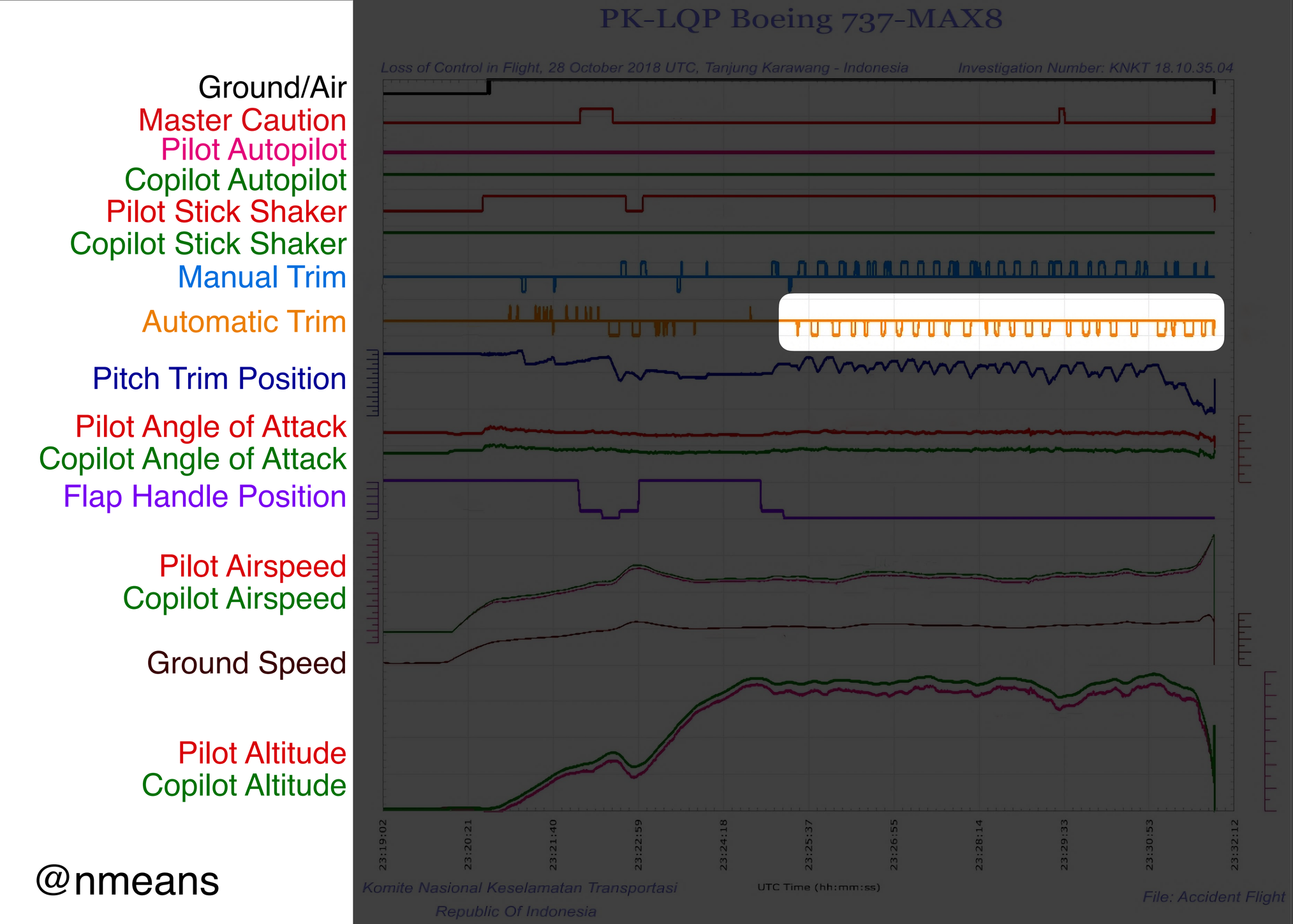
Boeing 737 MAX Wind Tunnel Testing

Boeing KC-46 Pegasus

FAA Administrator Steve Dickson

737 MAX Test Flight

737 MAX Test Flight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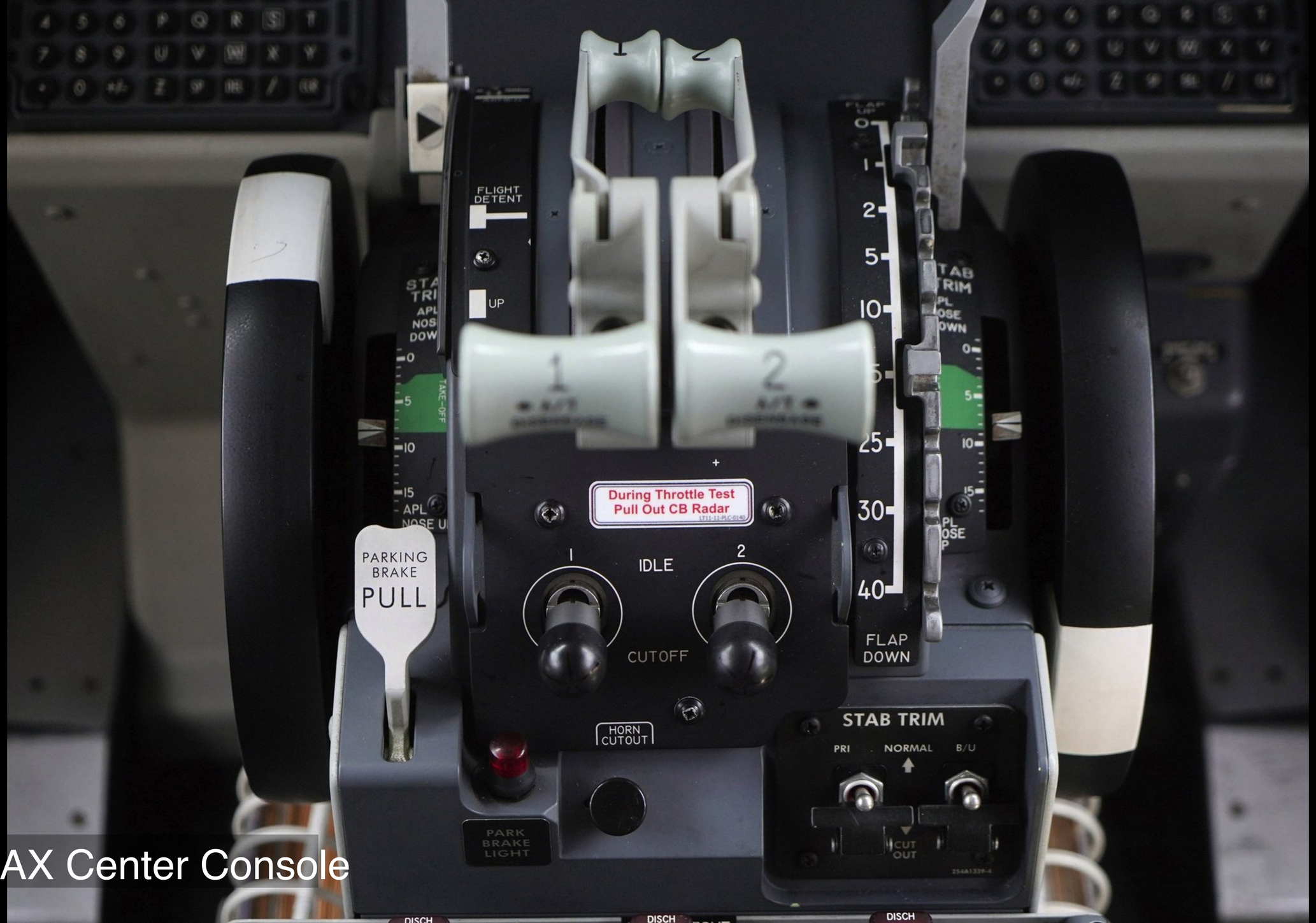
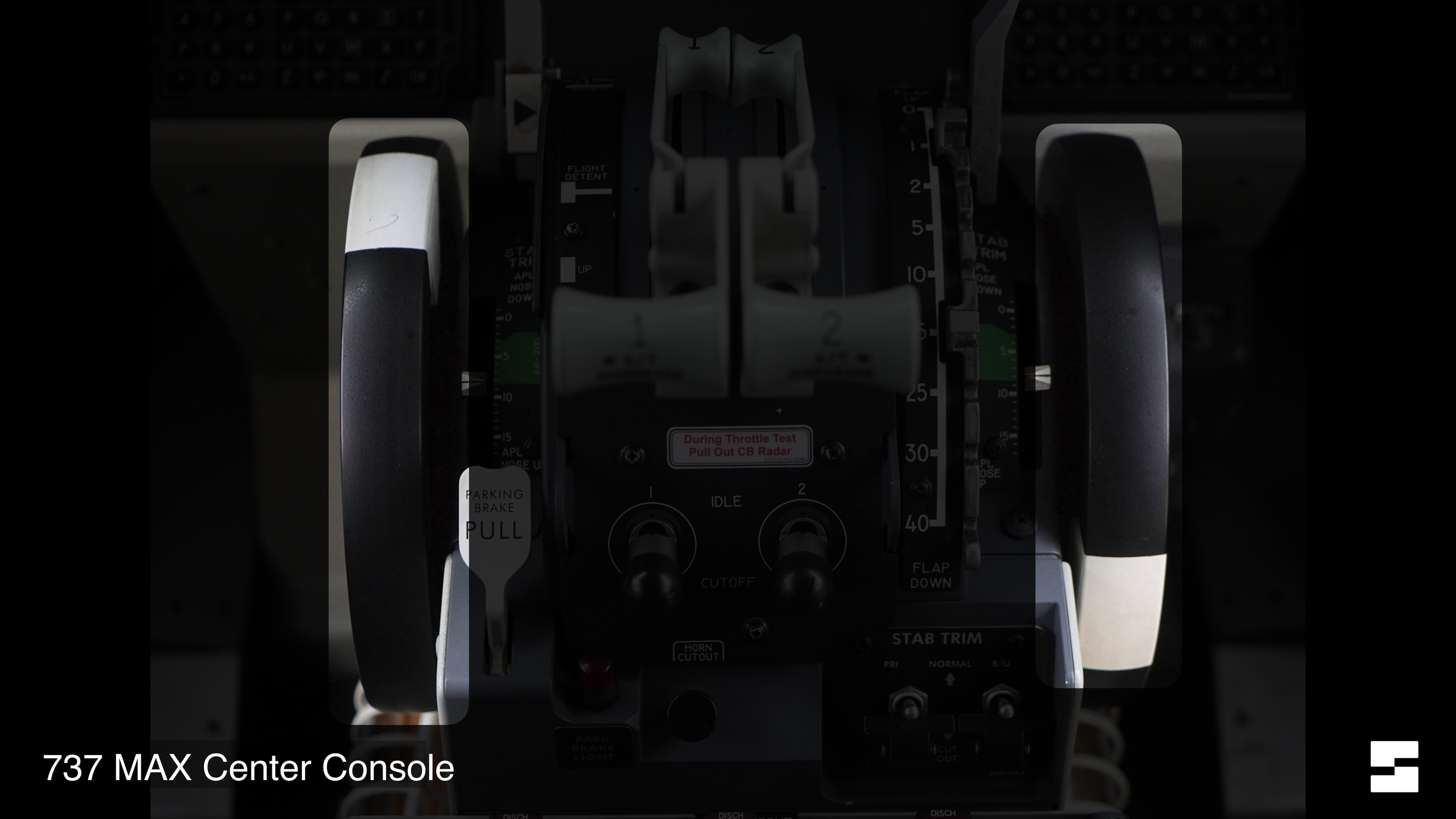


737 MAX Center Console



737 MAX Center Console

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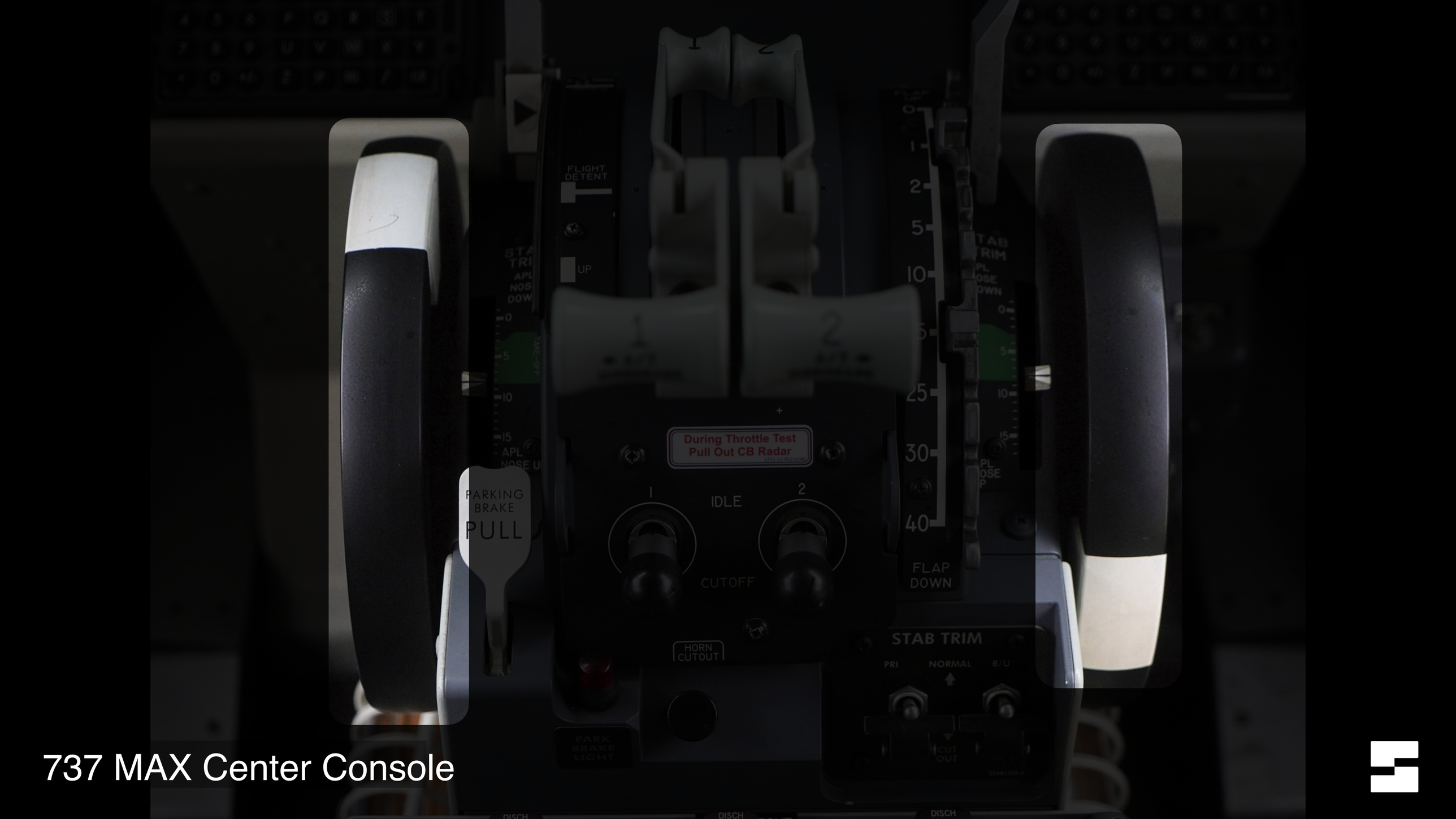

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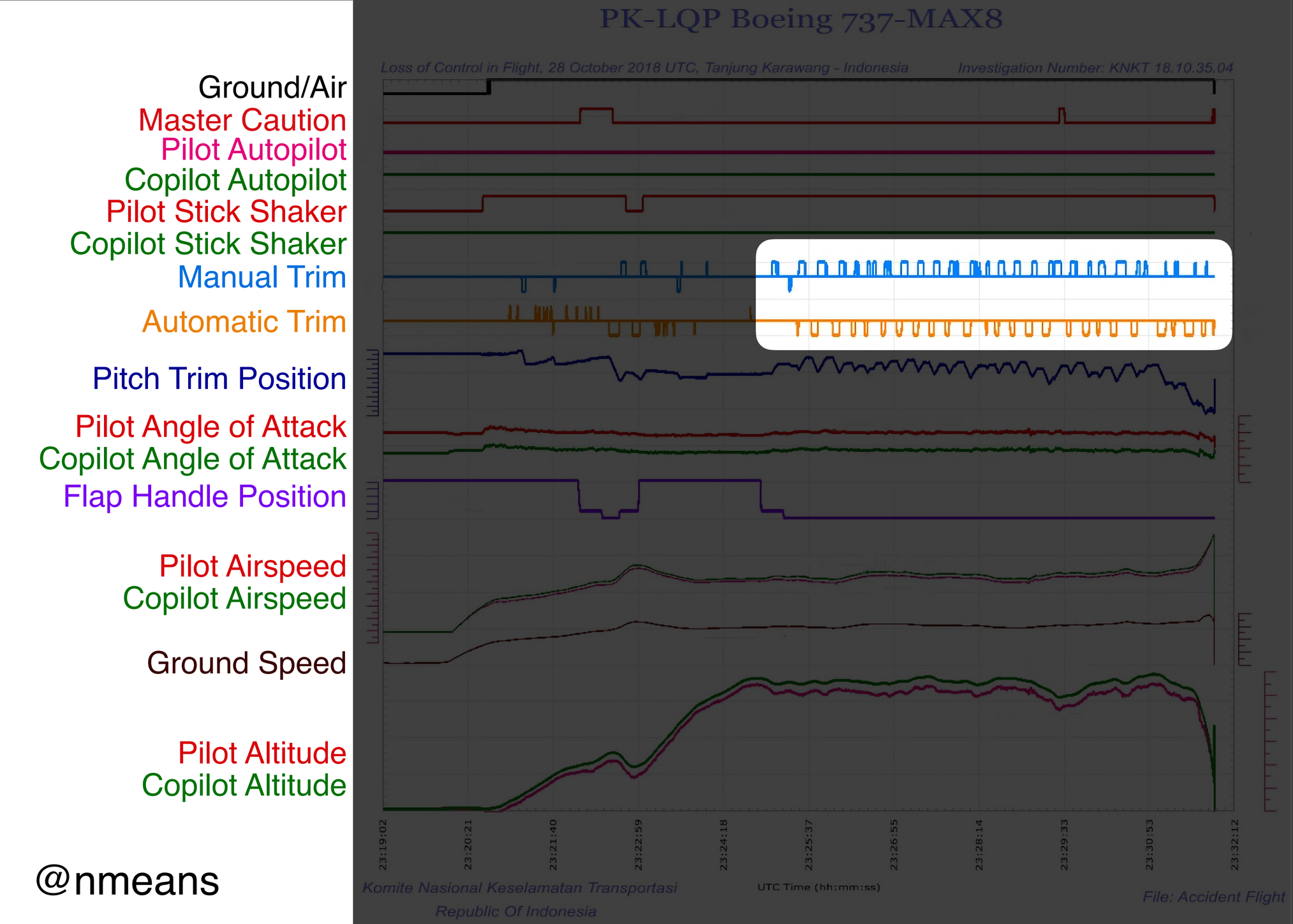
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The New York Times Magazine

Account

FEATURE

What Really Brought Down the Boeing 737 Max?

Malfunctions caused two deadly crashes. But an industry that puts unprepared pilots in the cockpit is just as guilty.

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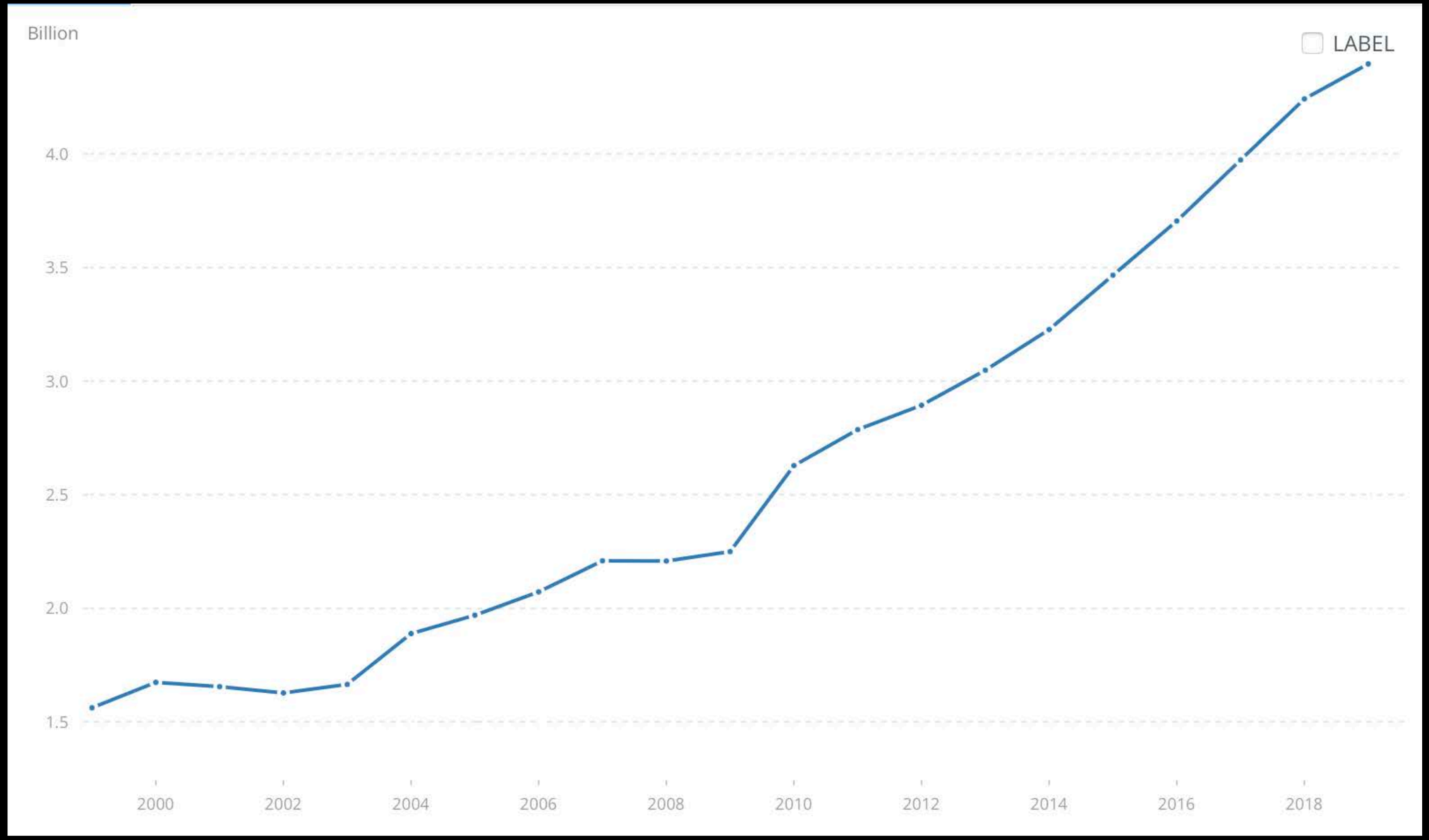
William Langewische



Passengers Carried Globally per Year, 1999-2019

Source: World Bank

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The New York Times Magazine

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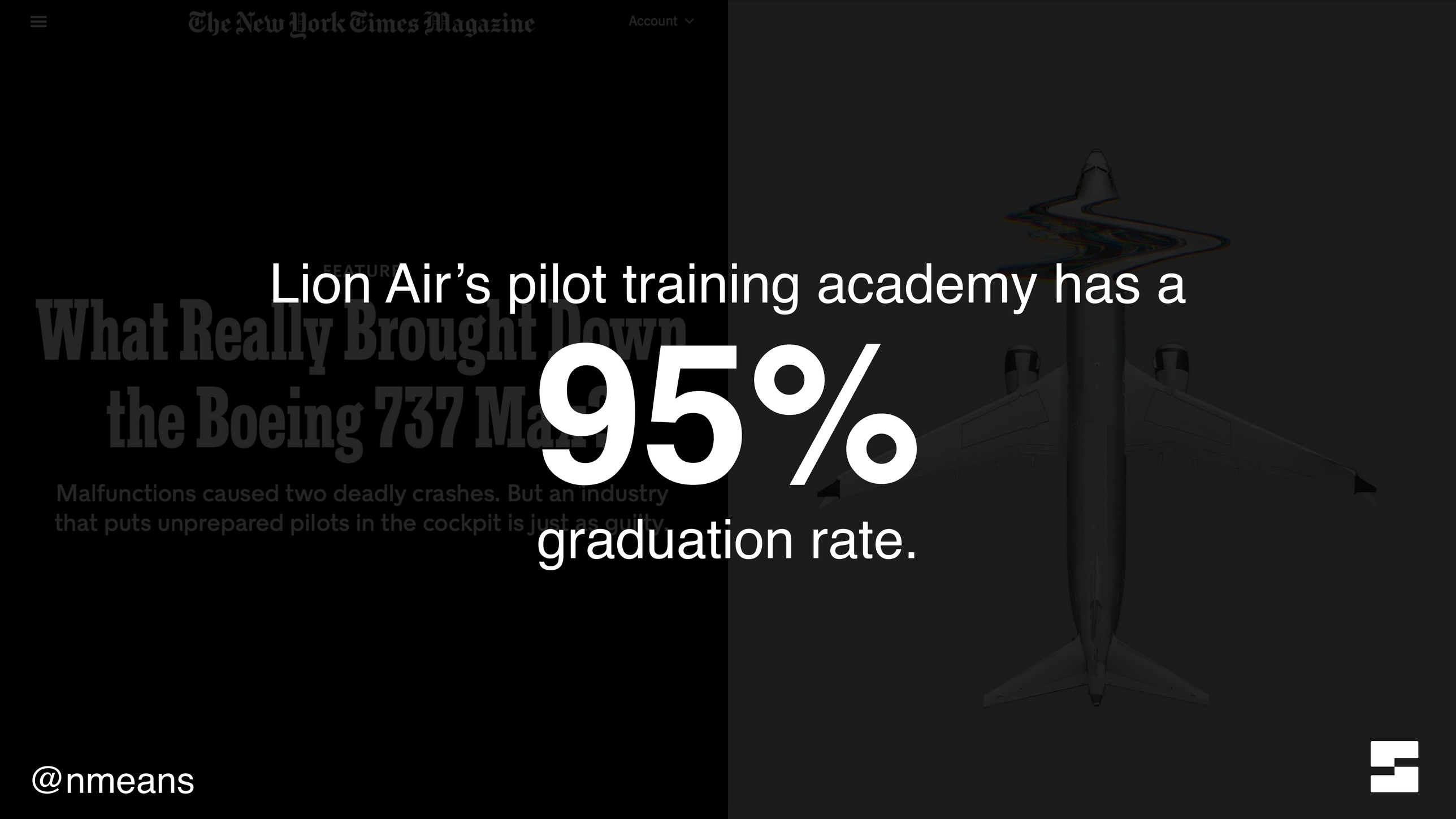

Lion Air’s pilot training academy has a

95%

graduation rate.

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Indonesia’s aviation sector has a fatality rate

15x

the global average.

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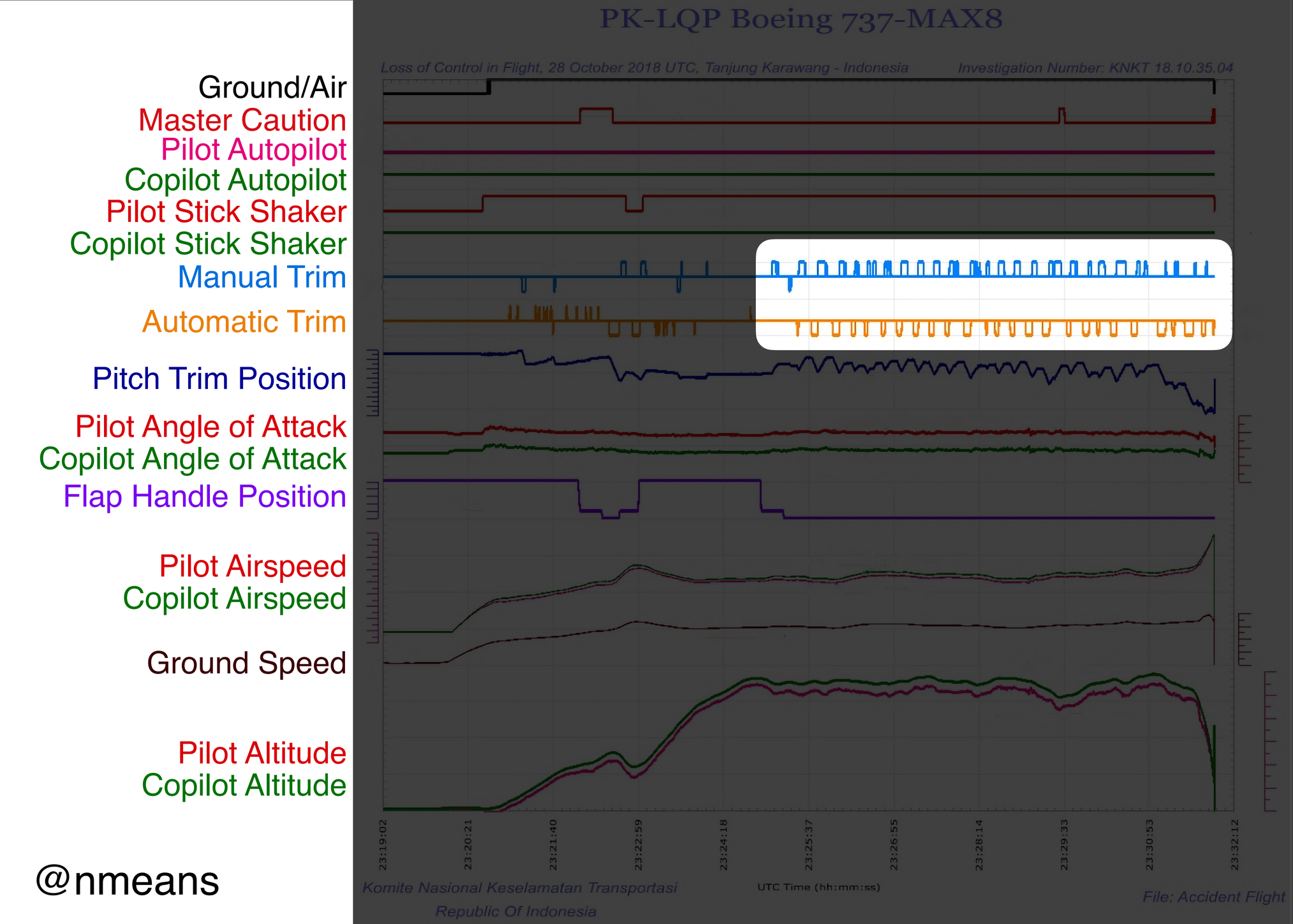
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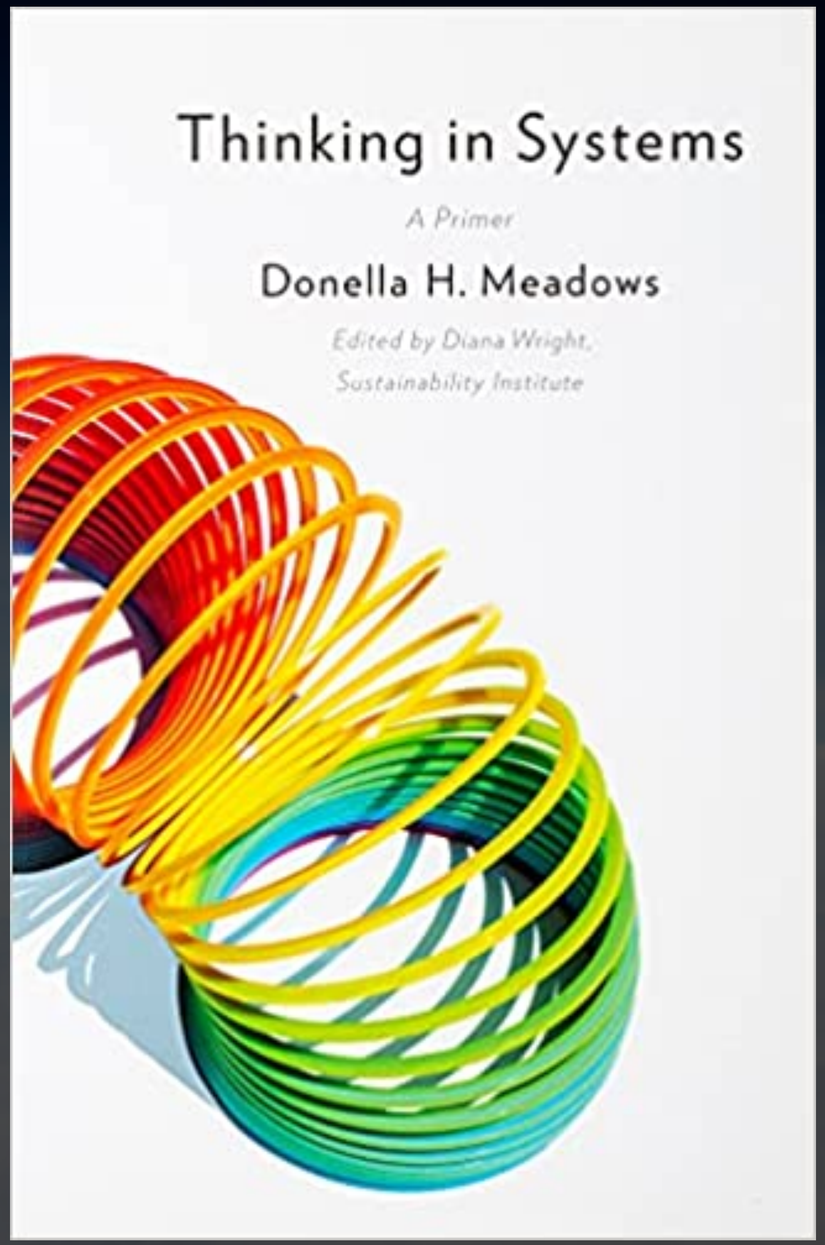
Ethiopian Airlines 737 MAX 8

737 MAXes Parked in Renton, WA

Why did this happen?


Thinking in Systems
A Primer
Donella H. Meadows
Edited by Diana Wright,
Sustainability Institute

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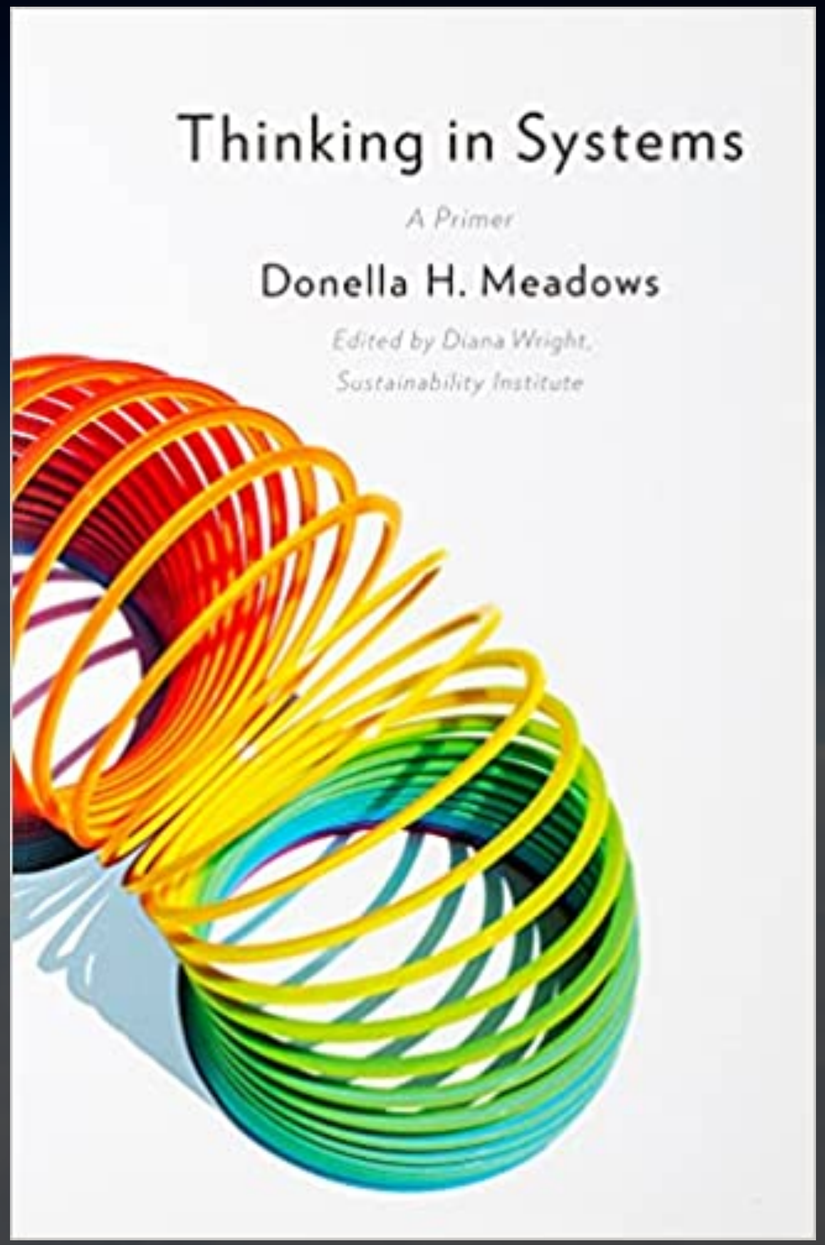
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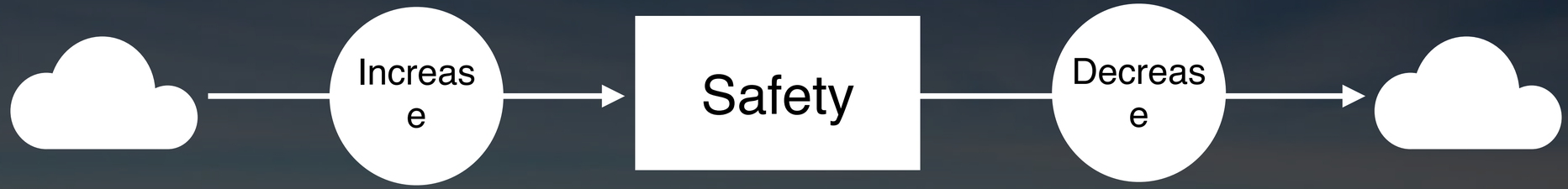

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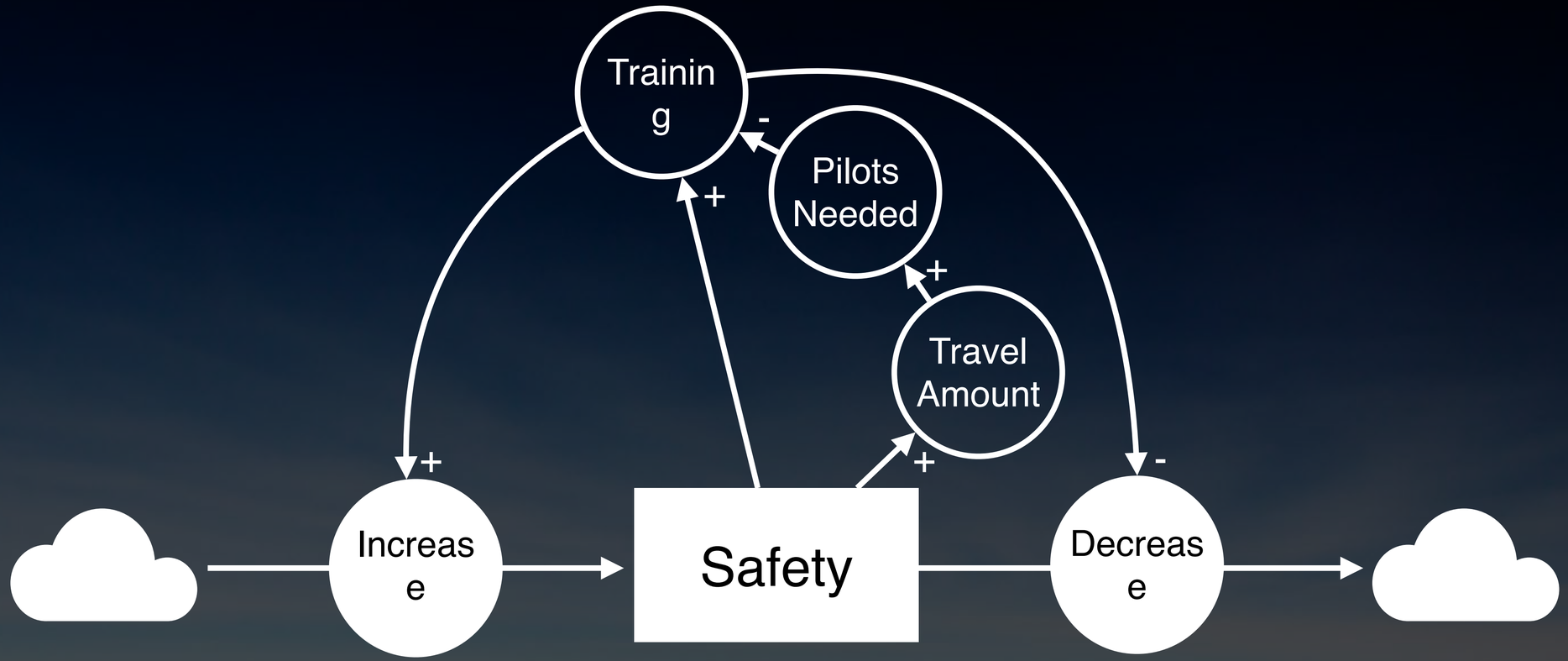
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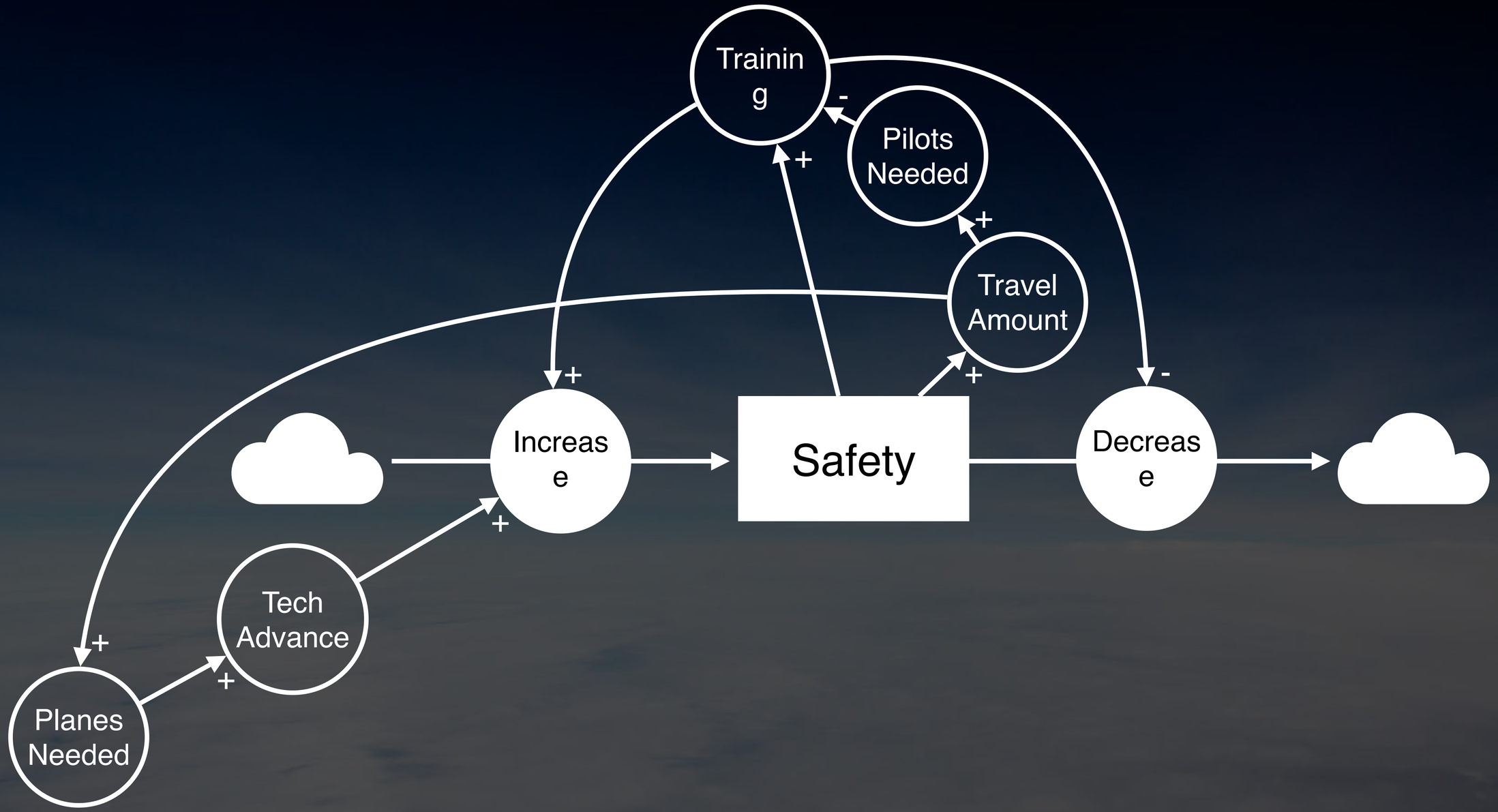
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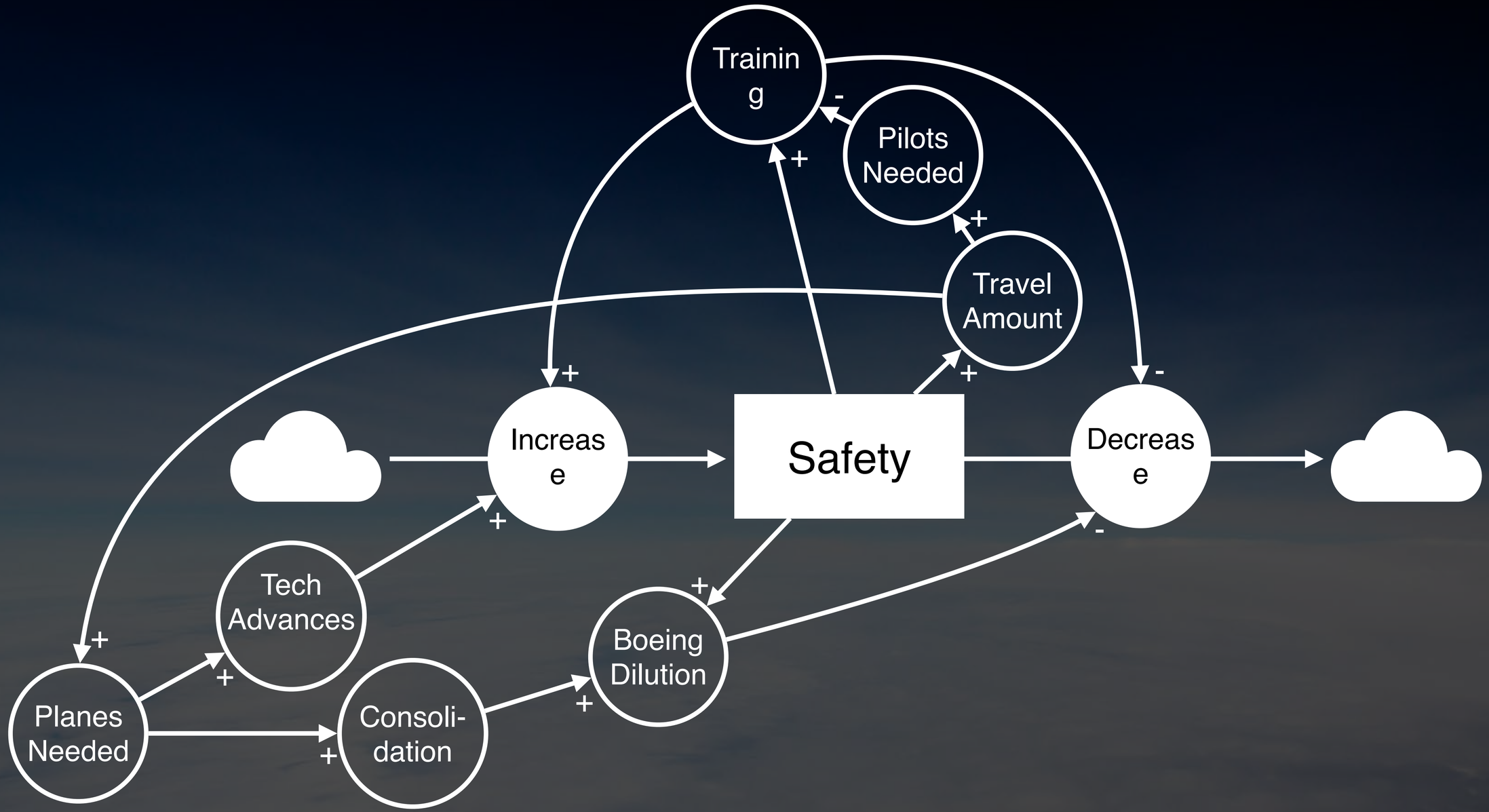
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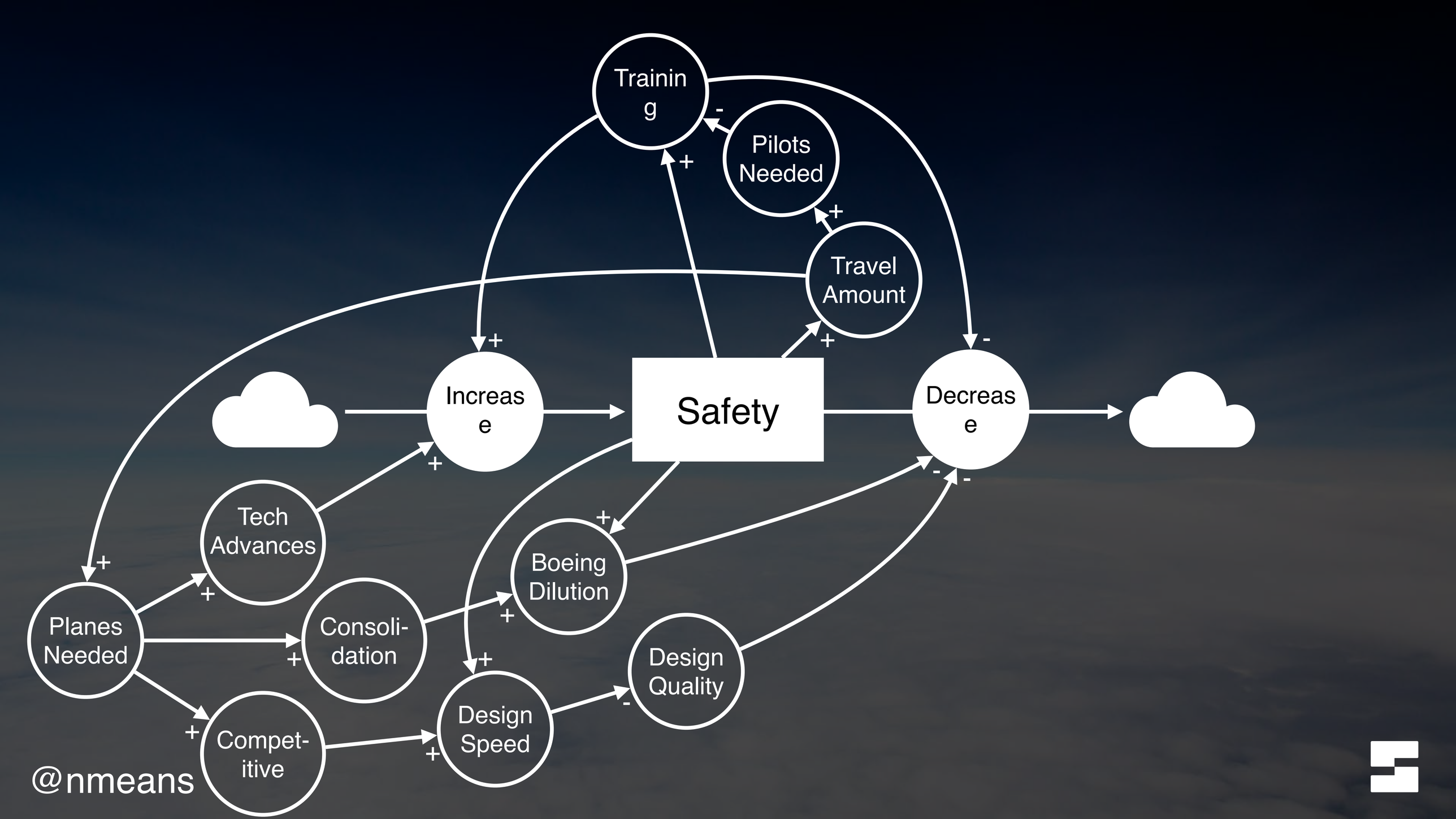
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“Everyone or everything in a system can act dutifully and rationally, yet all these well-meaning actions too often add up to a perfectly terrible result.”

— Donella H. Meadows, Thinking in Systems

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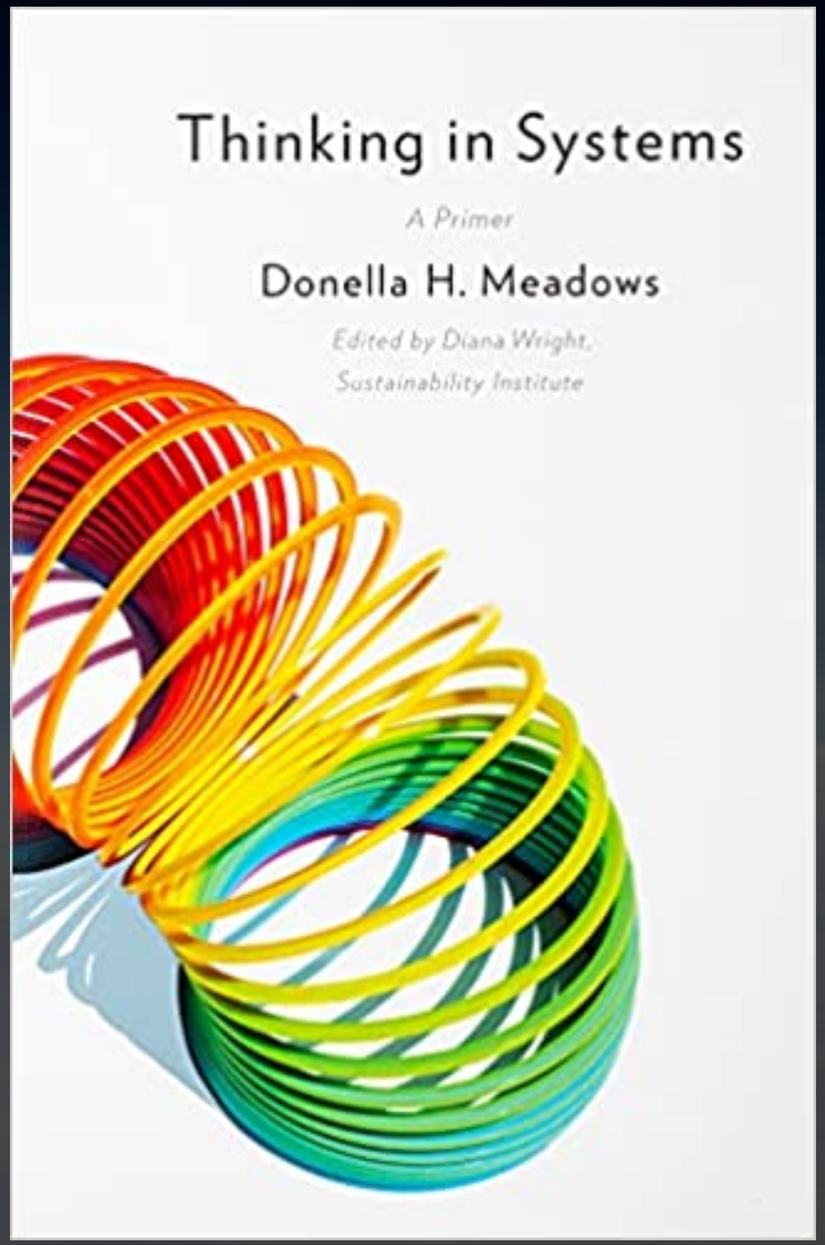
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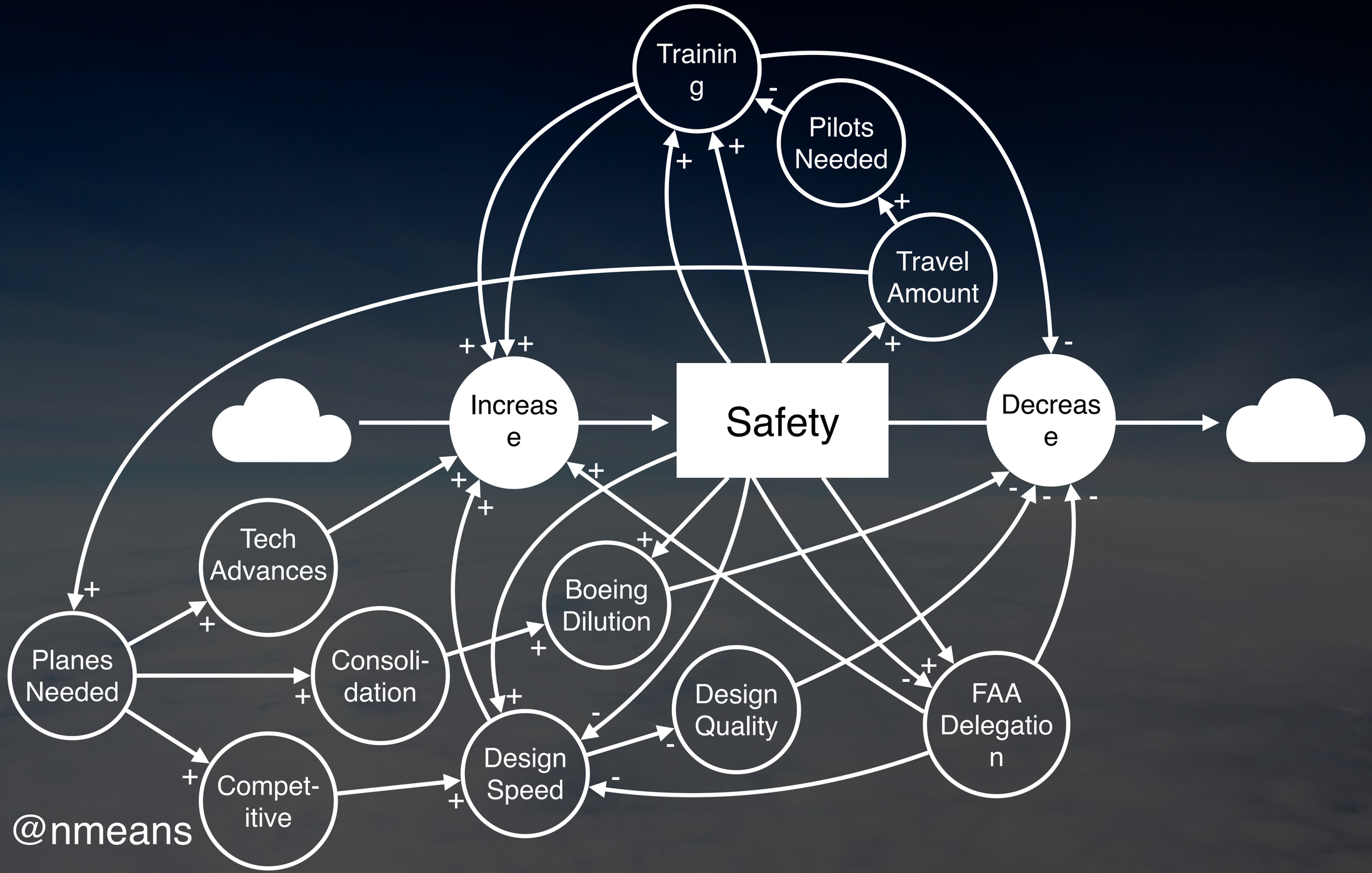
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THANK YOU!

Nickolas Means
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SYM