United Arab Emirates

GCAA

UAE General Civil Aviation Authority

MENASASI

Major Accident Investigation Review

- Boeing 747-4AF Freighter Accident
Dubai, 2010

MENASASI,
Abu Dhabi
27 May 2013

Accident Summary

- On September 03 2010 a UPS Boeing 747-4AF Freighter departed Dubai bound for Cologne.
- 30 minutes into the flight, at FL310, having just crossed into the Bahrain East FIR, the crew reported a main deck fire, declared an emergency, requesting to 'land ASAP', BAH-C advised that Doha was 100 track miles to the West. The crew elected to return to Dubai.
- The fire rapidly compromised the cargo liner, exposing the area above Fire Zone 3 to intense thermal loading, leading to a series of cascading systems failures, including damaging the flight control cables, ECS ducting and other critical systems, including the crew supplementary oxygen.
- As the fire spread and the cargo liner continued to fail, the flight deck filled with thick, toxic smoke.
- The Captain's oxygen system failed, leading to the Captain's incapacitation eight minutes into the emergency
- The inability of the PF to retune any of the VHF radios required all communication to be routed through the BAH-C frequency. Relay aircraft were used for the majority of the flight.
- The aircraft lost control in flight leading to an uncontrolled descent into terrain 9nm miles south of Dubai . The accident occurred on Nad Al Sheba military base at 19:41 GST

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Accident Site

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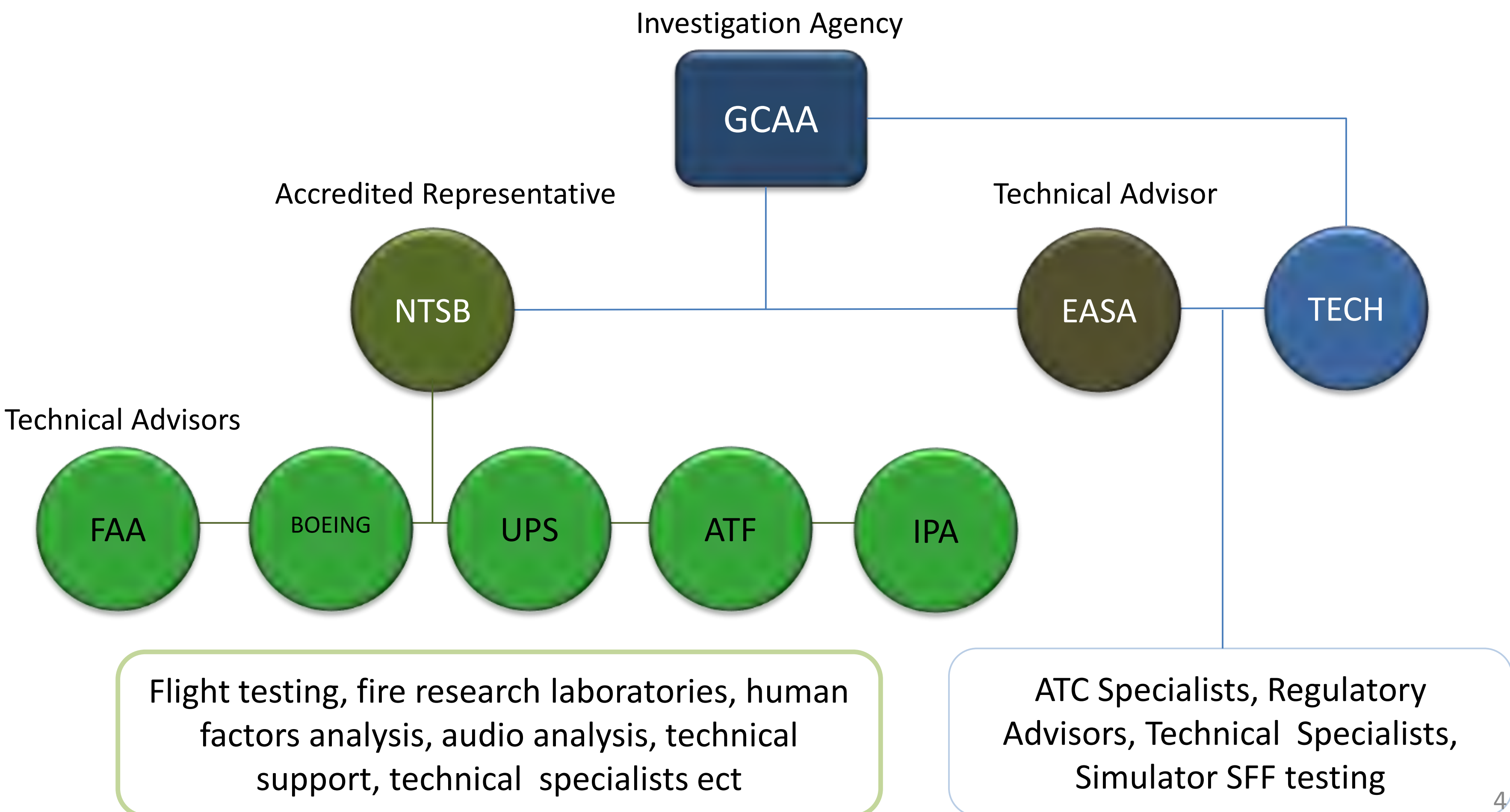
Accident Investigation Organization



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ICAO Annex 13 and EASA Participation

<u>Participation in the investigation:</u>

Participation of the State of Registry, the State of the Operator, the State of Design and the State of Manufacture

Anx13/5.23: *Any State which on request provides information, facilities or experts to the State conducting the investigation shall be entitled to appoint an accredited representative to participate in the investigation.*

EASA Statement on accident investigation participation

Furthermore, ICAO Annex 13 provides that the State of Registry, the State of Design and the State of Manufacture shall each be entitled to appoint an accredited representative because of the function that have been attributed to each of those States with respect to the airworthiness of aircraft under ICAO Annex 8.

Therefore, as the EASA is now carrying out on behalf of the Member States the functions and tasks of the State of Design, Manufacture and Registry whenever it related to Design approval, Regulation (EU) No 996/2010 entitles EASA to participate to investigations.

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Event Timeline – DFDR Track and Time Stamps

Event duration: 27min 45 sec

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Initiating Action - Sequence of Events

- **Two minutes after passing into the Bahrain FIR, Twenty one minutes after take-off there is a fire alert at 15:12 UTC indicating a: FIRE MAIN DK FWD.**

- **The time interval between fire detection and the onset of aircraft system failures was two minutes and thirty seconds at the point of detection - in all probability the fire had damaged the control cables prior to autopilot disconnection.**

- **The cargo compartment liner failed as a fire and smoke barrier under combined thermal and mechanical loads.**

Phase One - Key Events

Three events occurred rapidly and in quick succession approximately three minutes from the start of the inflight turn back:

- SMOKE/FUMES

  The cockpit filled with smoke. The smoke was present at the start of the sequence, however it rapidly became noticeable in the CVR statements that the volume and the density of the smoke had increased significantly. Within two minutes neither crew member could view the panels or out of the cockpit.

- CONTROL/STABILITY

  At about the same time, the pitch control problem became apparent which diverted the F.O's attention as the Captain asked the F.O to 'figure out what was going on'. The F.O was already managing a number of other problems, including the FMC input and the SFF checklist.

- CREW INCAPACITATION

  The Captain's oxygen supply stopped, the Captain asked for oxygen [the portable oxygen bottle was behind the Captains seat next to the left hand observer seat]. The First Officer did not know where to get the oxygen. The Captain, one minute after the oxygen supply stopped, got out of the LH seat and went back into the aft cockpit area. The Captain was heard to say 'I cannot see', and that was the last CVR recording of the Captain.

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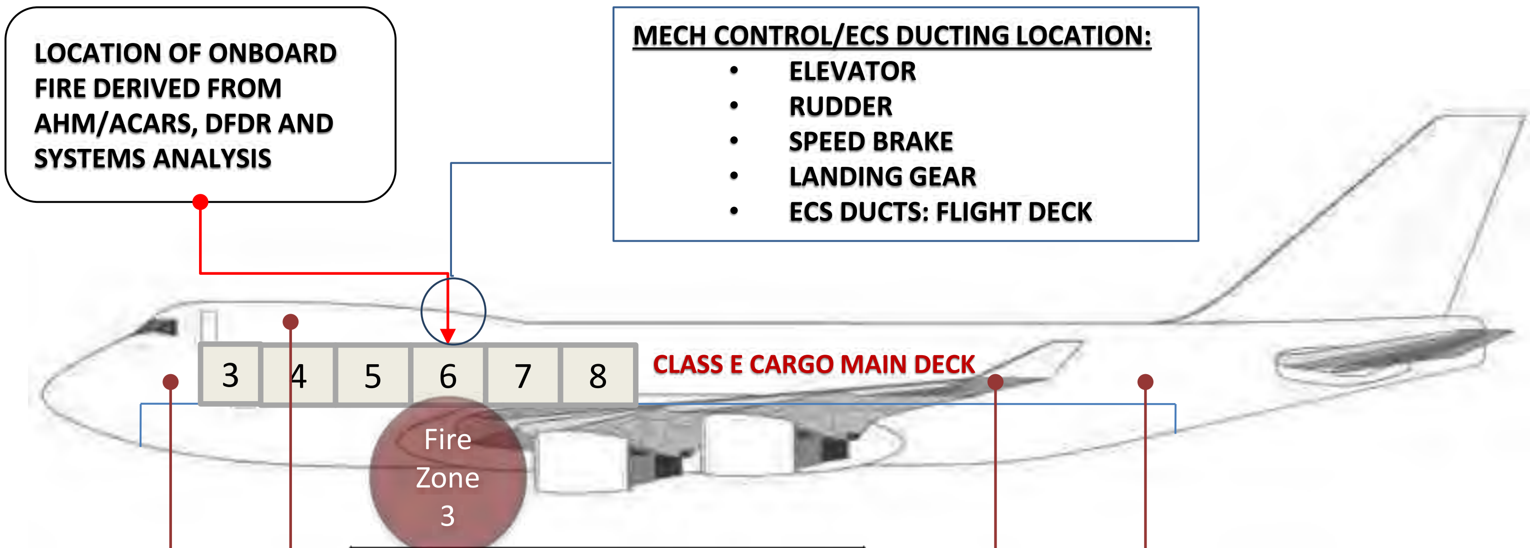
Fire Origin/Point of Initiation



MAIN CARGO DECK SMOKE DETECTION	
TIME (UTC)	DFDR EVENT
15:12:54	FIRE MAIN DECK FWD
15:13:46	FIRE MAIN DECK
15:14:40	MAIN CARGO ZONE 12
15:15:15	CREW REST SMOKE
15:15:28	FIRE MAIN DECK AFT

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ACARS/AHM – Fire Initiating Point Detection

Determining the fire location using the Aircraft Communications Addressing and Reporting System [ACARS] and the Aircraft Health Monitoring [AHM] Data

ACARS Sensor and Wiring Failures

15:15	21015	FLIGHT DECK TRIM AIR MODULATION VALVE/WIRING FAIL	V450
15:15	21016	UPPER DECK TRIM AIR MODULATION VALVE/WIRING FAIL	V451
15:15	21071	FORWARD MAIN DECK TEMP SENSOR 2 (AFT)/WIRING FAIL	T1925
15:15	21072	AFT MAIN DECK TEMP SENSOR 1 (FWD)/WIRING FAIL	T1930
15:15	21073	AFT MAIN DECK TEMP SENSOR 2 (AFT)/WIRING FAIL	T1931
15:15	21078	CREW REST TRIM AIR MODULATION VALVE/WIRING FAIL	V554
15:15	21082	CREW REST DUCT TEMP SENSOR/WIRING FAIL	T1937
15:15	21083	FORWARD MAIN DECK DUCT TEMP SENSOR/WIRING FAIL	T1929
15:15	21084	AFT MAIN DECK DUCT TEMP SENSOR/WIRING FAIL	T1934
15:17	21028	UPPER DECK DUCT TEMP SENSOR/WIRING FAIL	T1648
15:18	21027	FLIGHT DECK DUCT TEMP SENSOR/WIRING FAIL	T1647

Conclusion:

Based on the ACAR/AHM analysis the cargo fire originated in Zone 3 at 15:13 UTC


15:15:37.0
Computed Airspeed: 316 (knots)
Pressure Altitude Capt: 28374.2 (FT)
Pitch Angle: -0.351563 (degrees)
FIRE Main Deck: .
Control Wheel Left Position: -0.933831 (degrees)
Elevator LIB Position: -1.3623 (degrees)
Elevator LOB Position: 0.483395 (degrees)
Vertical Speed: -2954.75 (FT/MIN)
Flight Path Angle: -3.46518 (degrees)
45.0
45.2
45.1
45.4
287
296
287
292
TOTAL FUEL 171.3
17.2 mi
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Google earth

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ATFE Testing Findings

Bureau of Alcohol, Tobacco, Firearms and Explosives United States Department of Justice

To date, the hazard posed by lithium and lithium-ion batteries has not been fully understood and quantified by the fire protection community to determine the:

- Fire load contribution of lithium and lithium-ion batteries
- Burning characteristics of aircraft cargo container fires

Figure 10. Box of lithium-ion batteries burning over propane burner exhibiting battery venting and electrolyte combustion

Box of 100 lithium-ion batteries suspended over 30kW burner

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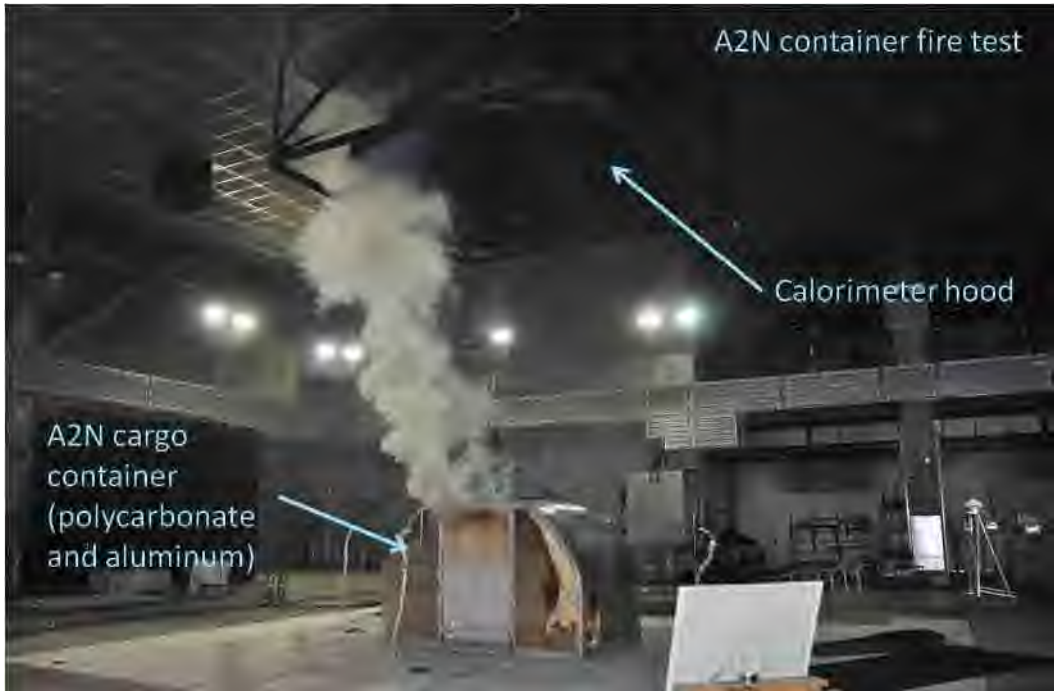
Fire Testing- ATFE Lab, USA



Rigid A2N container tests

Two tests were performed using the A2N type of rigid cargo container (figure 16). This container type is constructed from aluminum and polycarbonate and has a fabric roll-up door.

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Fire Testing- ATFE Lab, USA

Collapsible DMZ container tests

Two tests were performed using the DMZ type of collapsible cargo container. This container type is constructed from corrugated polypropylene and while in use is covered with a lightweight impermeable cover. This container type was chosen because it was likely to exhibit the greatest delay in becoming a detectable fire and because the material of construction provide the most contribution to the fire load.

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Large Container Fire Test

Small Scale Battery Tests

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ATFE Testing Findings – Lithium Batteries

Bureau of Alcohol, Tobacco, Firearms and Explosives United States Department of Justice

From the tests involving batteries, the following conclusions were made:

- At the single-cell level, the energy release rate of lithium and lithium-ion type batteries is relatively small when compared to other ordinary materials.
- In addition to the energy release from batteries resulting in combustion, there is an associated mechanical energy release. This mechanical energy release is capable of compromising the integrity of packaging and creating incendiary projectiles.
- Lithium (primary) batteries tend to exhibit more energetic failures than lithium-ion (secondary) batteries.
- The total energy release of a box of 100 lithium-ion batteries can be fairly accurately predicted based on single battery cell calorimetry data.
- The thermal runaway of lithium-ion batteries is capable of spreading from cell to cell within a package of batteries.
- The thermal runaway of lithium-ion batteries is capable of causing adjacent combustibles to ignite.

ATFE Testing Findings - Containers

Bureau of Alcohol, Tobacco, Firearms and Explosives United States Department of Justice

From the tests involving cargo containers, the following conclusions were made:

- Differences in container design and materials have a significant effect on fires originating within them.
- Container design has a significant effect on the time it takes for a fire to become detectable to an outside smoke detector.
- Container construction materials have a significant effect on the total fire load and energy release rate of a cargo fire.
- The time it takes to detect a fire originating within a cargo container exceeds the time specified in 14 CFR.
- The growth rate of container fires after they become detectable can be extremely fast, precluding any mitigating action.

Pallet/Container Fire Test Report Findings

- **The growth rate of container and pallet fires after they become detectable by the aircraft's smoke detection system can be extremely fast, precluding any mitigating action and resulting in an overwhelming fire that cannot be contained.**
- **The fire detection methodology of detecting smoke sampling as an indicator of a fire is inadequate as pallet smoke masking can delay the time it takes for a smoke detection system to detect a fire originating within a cargo container or a pallet with a rain cover.**

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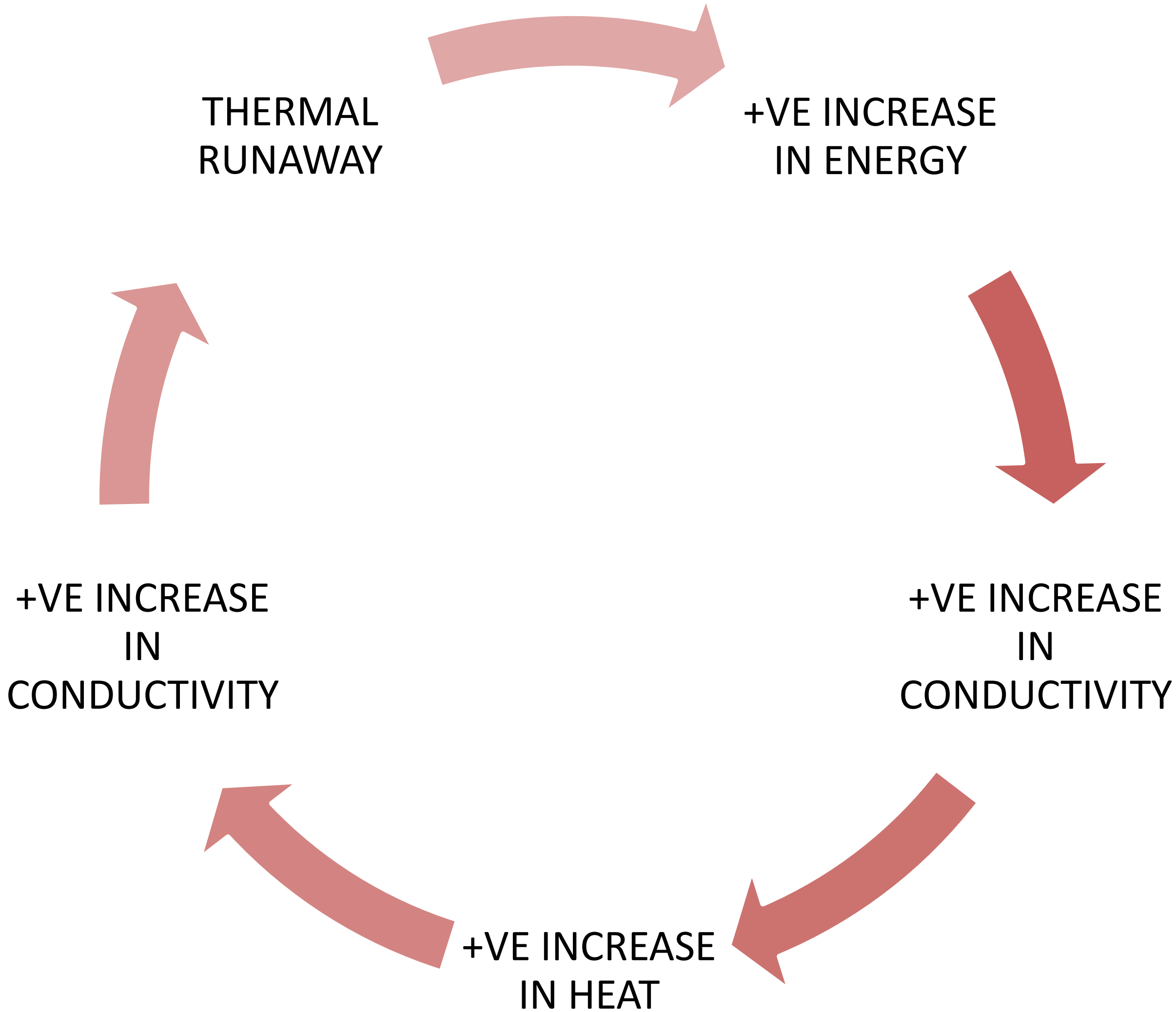

Lithium Ion Battery Thermal Runaway

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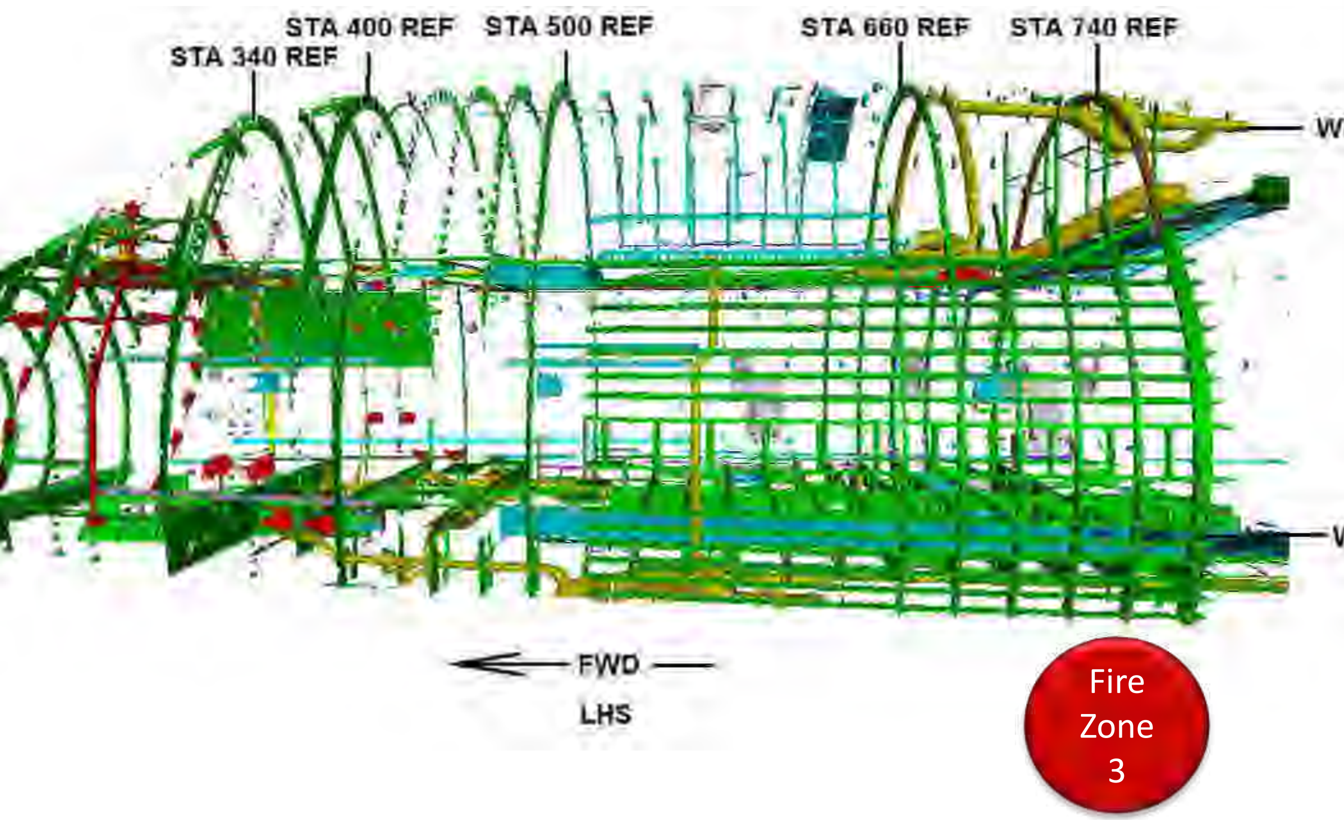
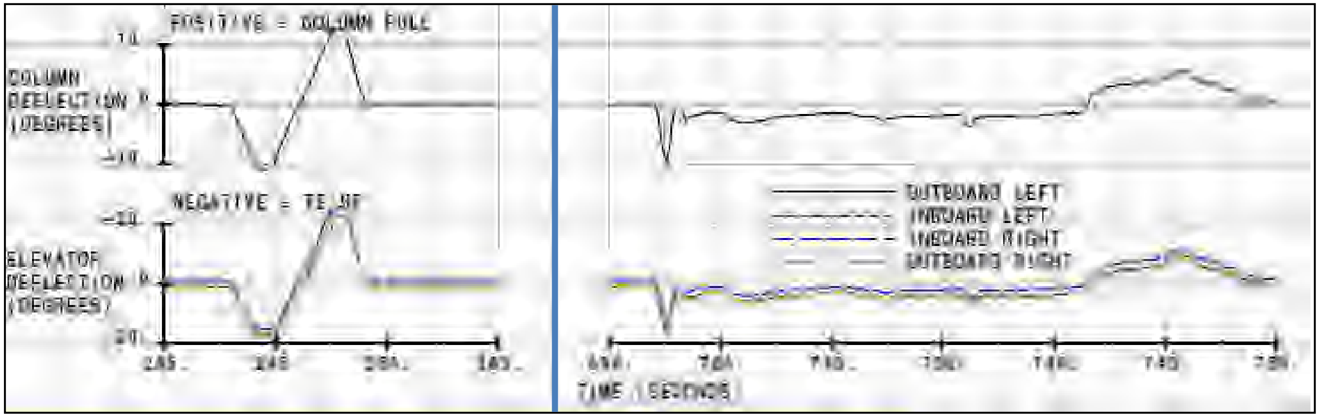
Single Point of Failure – Critical Systems



Control Cable Trusses

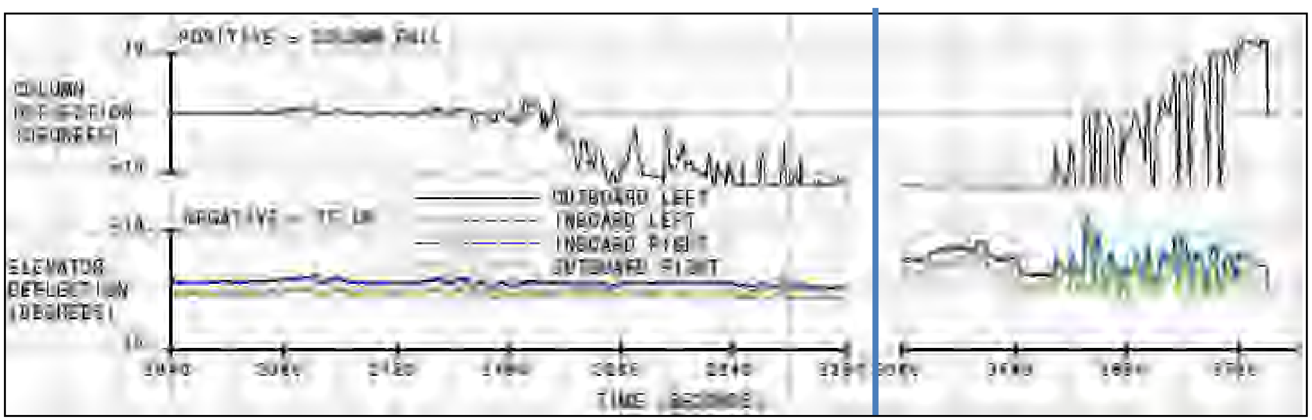
Control Column/Elevator Desynchronization

Normal



Column sweep and take-off rotation display the normal relationship between column and elevator. If the tension is below the allowable tolerance, the column and elevator will no longer be consistent.

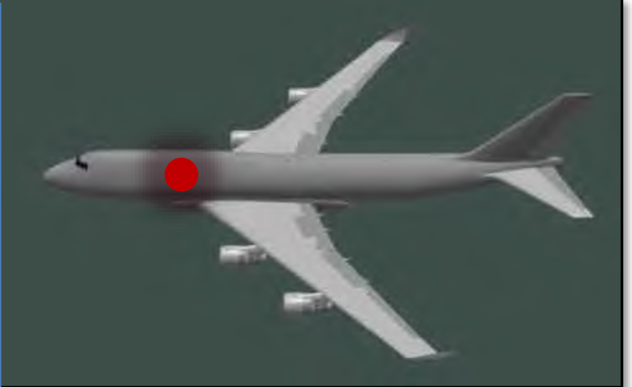
Abnormal



Following the initial fire warnings the column moved nose-down with no corresponding change in elevator deflection (left plot). Near the end of the data, the FDR data shows nose-up column inputs

The elevator was deflecting with the column inputs but not with the relative magnitude seen in the figure above [Normal].

This indicates that there was some column cable tension but not enough to maintain normal column to elevator gearing.



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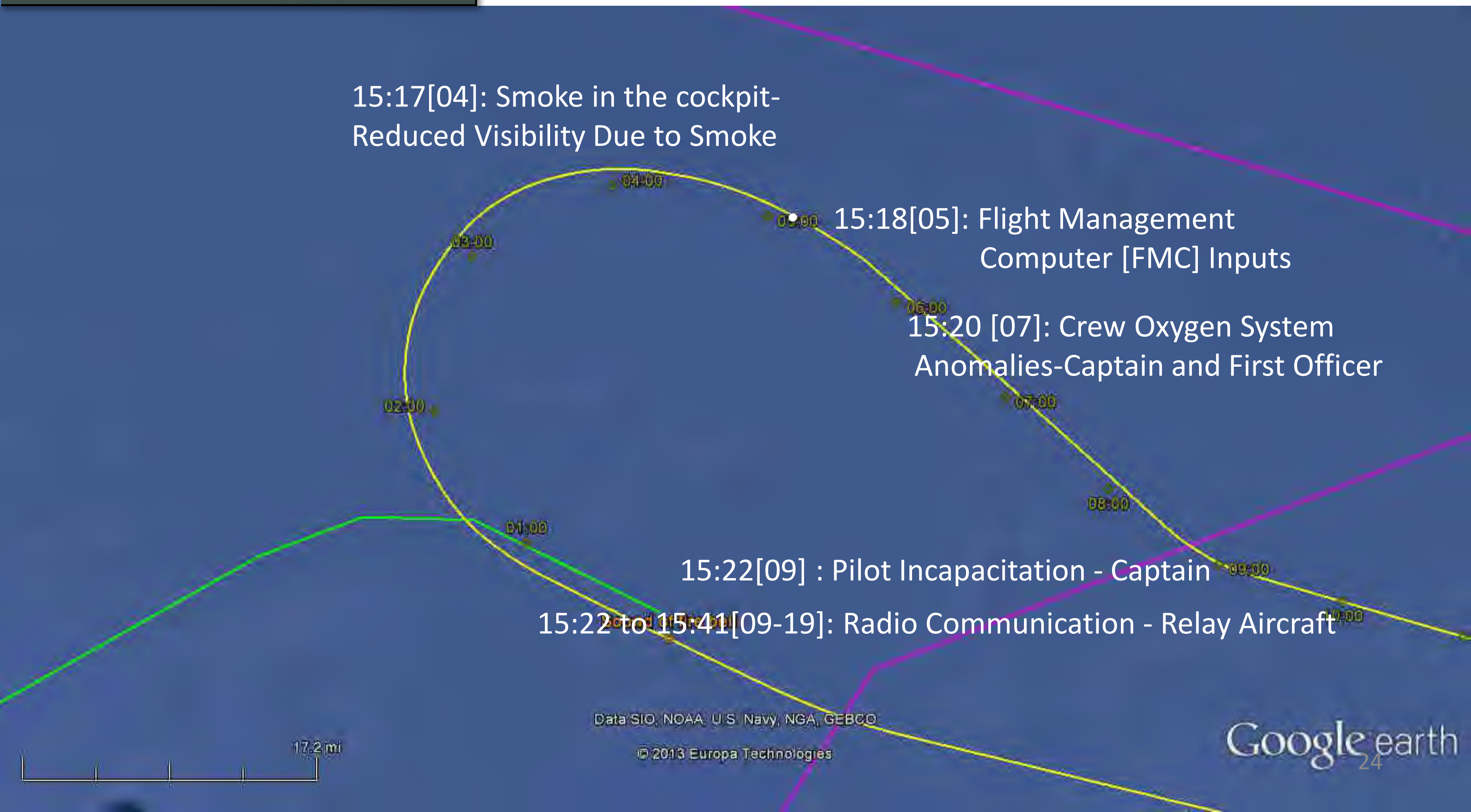
15:17[04]: Smoke in the cockpit-
Reduced Visibility Due to Smoke

15:18[05]: Flight Management
Computer [FMC] Inputs

15:20 [07]: Crew Oxygen System
Anomalies-Captain and First Officer

15:22[09] : Pilot Incapacitation - Captain

15:22 to 15:41[09-19]: Radio Communication - Relay Aircraft



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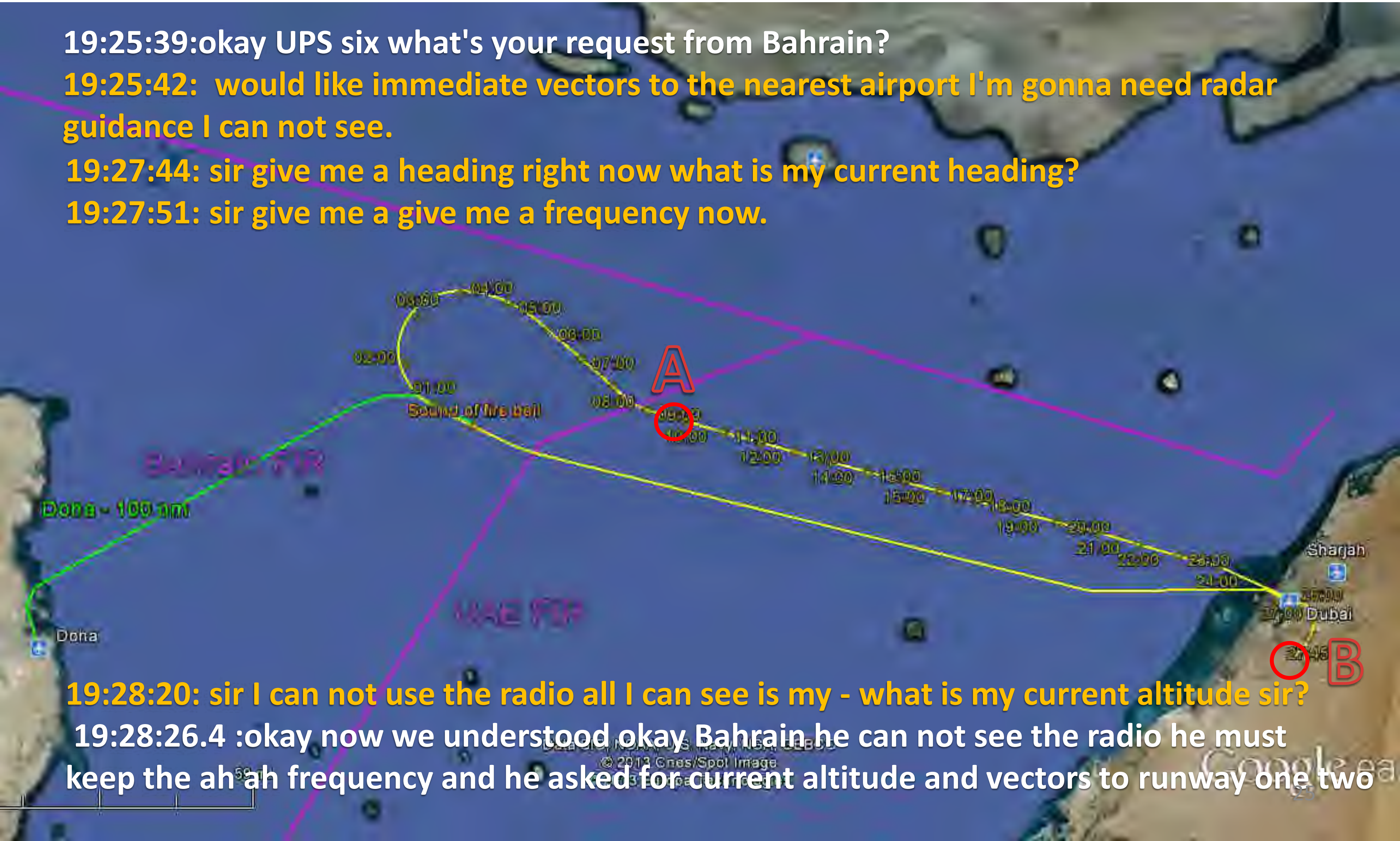
19:25:39:okay UPS six what's your request from Bahrain?

19:25:42: would like immediate vectors to the nearest airport I'm gonna need radar guidance I can not see.

19:27:44: sir give me a heading right now what is my current heading?

19:27:51: sir give me a give me a frequency now.



19:28:20: sir I can not use the radio all I can see is my - what is my current altitude sir?

19:28:26.4 :okay now we understood okay Bahrain he can not see the radio he must keep the ah ah frequency and he asked for current altitude and vectors to runway one two

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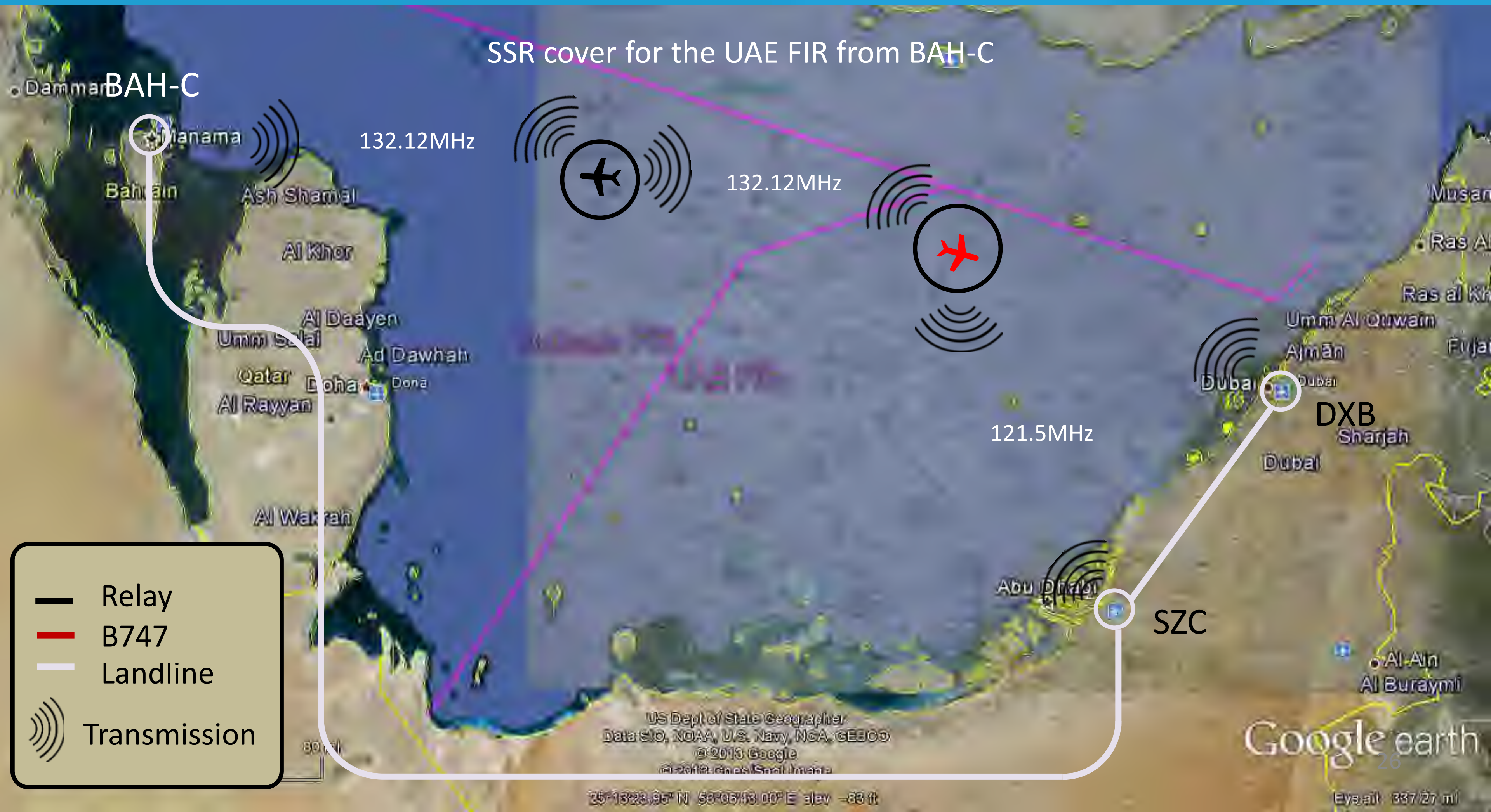
ANS/ATC – BAH East, SZC, DXB



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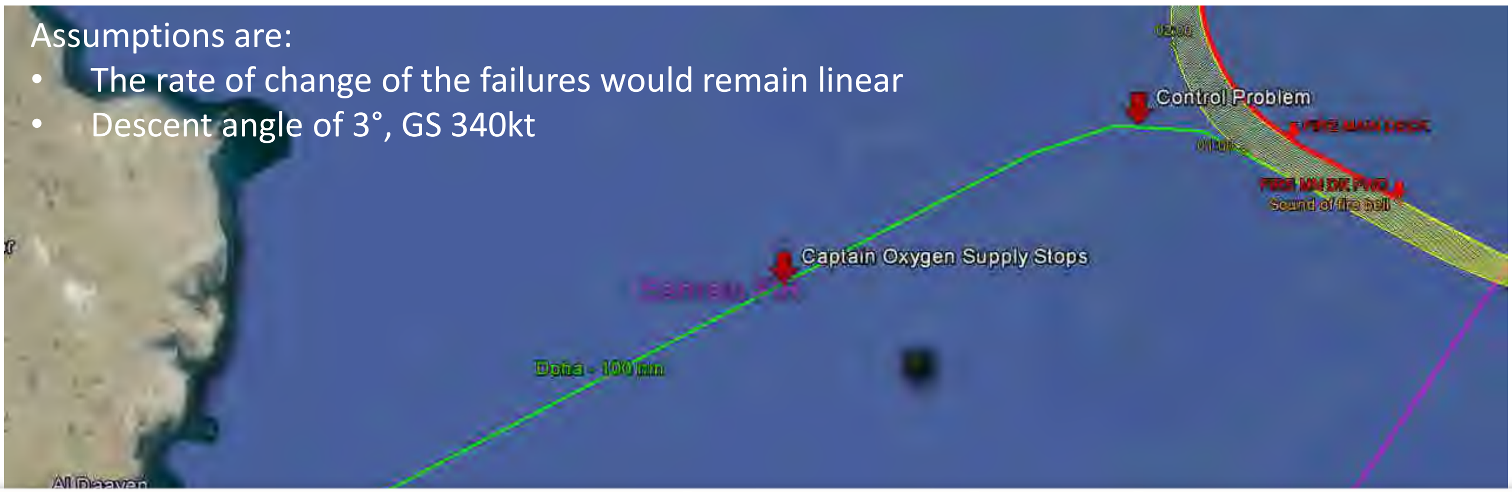
Doha – Nearest Available/Suitable Airport

Assumptions are:

- The rate of change of the failures would remain linear
- Descent angle of 3°, GS 340kt



The advantage of diverting to DOH would have been the following:

- **No Radio Frequency change would have been required as the crew could have talked directly to BAE-C until out of line of sight, then DOH Approach Control if possible.**
- **Direct landline communication between BAE-C and Doha approach control would have simplified the radio communication.**
- **Coordination between the adjacent control zones would have been simplified.**
- **The SSR data would have been available to the ATCO.**
- **The airbourne time would have been reduced by a significant factor [approx. 20%]**
- **There would have been more available ambient light due to the longitude of DOH.**

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• What failed – the oxygen mask or the oxygen delivery system?

- ***What mask settings where the crew using: Normal, 100% or Emergency?***
- ***What failed – the oxygen mask or the oxygen delivery system?***

Initially the investigation suspected that the mask had failed as the F.O's mask was delivering oxygen and a systems investigation indicated a common supply, so how can one side fail and not the other?

Testing of an exemplar oxygen mask in the laboratory revealed that the acoustic signature of the inspiration and exhalation sound generated by the air moving through the mask was distinctly different when the mask selector was set in different modes.

A flight test was conducted using a UPS B747. The objective was to determine a baseline CVR signature for all mask operating modes, and from this reference:

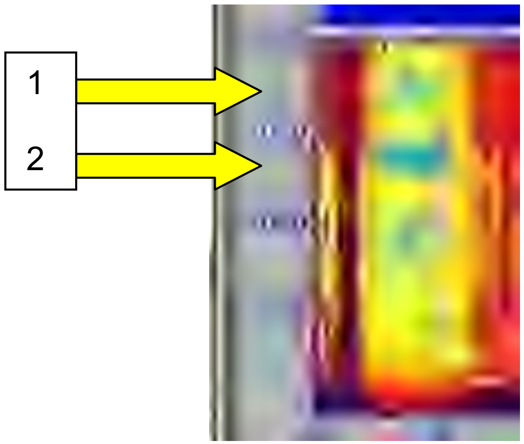
- Cross reference the CVR from the accident with the baseline CVR and establish where the mask setting frequency ranges are coincident.
- Determine what mask setting the crew were had selected.
- Establish if oxygen was available at the delivery point of the mask

The exemplar mask was the same make and model as the masks installed on the accident airplane (Intertechnique model MC-10-25-104).

CVR Sound Spectrum Analysis

Oxygen Mask Microphone Audio

The auditory review of the mask microphone audio revealed that the breath noises did not sound significantly different between the two mask modes. However, the sound spectrum analysis found a unique characteristic in the audio that differentiates one mask mode from the other. Figure 1 shows a spectrogram of the inspiratory noise from a single breath, as recorded from the oxygen mask microphone.



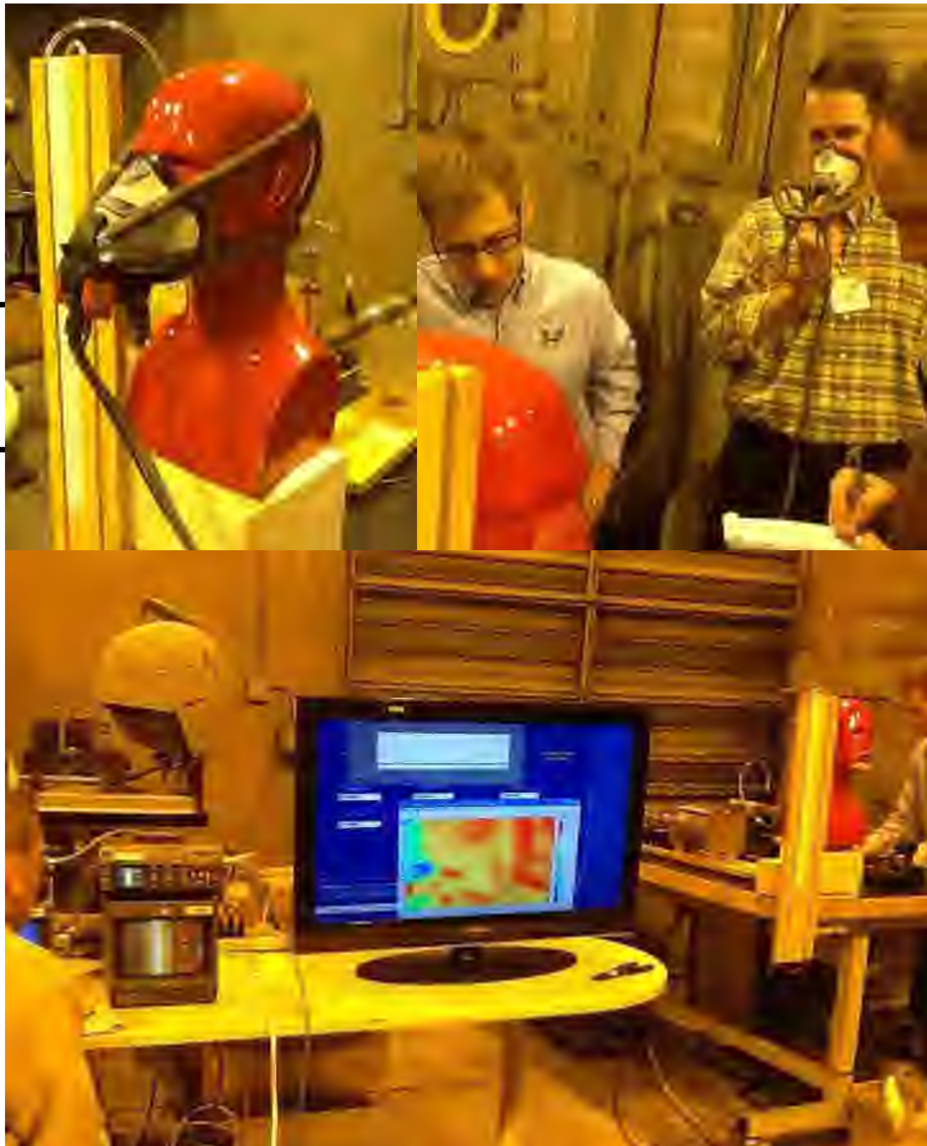
Captain’s selector: 100%

F/O selector: Normal

Figure 1 – Spectrogram of Inspiratory Noise from Mask Microphone Audio

The audio from the mask microphones exhibits characteristic “bands” of energy during inspiratory breaths (light blue regions labeled 1 and 2 in Figure 1

FAA William J. Hughes Technical Center, Atlantic City, USA



- A Simulated Breathing Device [SBD] was designed and assembled to replicate the rate, exhalation/inhalation pressure and volume of air exchange of a typical human breathing pattern.
- The oxygen supply was routed through a variable temperature furnace capable of replicating the temperatures of a cargo fire of between 1000-1400°F/538-760°C.
- Compressed air was introduced into the system; the air was heated to representative thermal load in the furnace and then delivered through a CRES tube connected by the design standard metallic connector used on the B744F.
- Downstream of the connector the oxygen was routed through the MXP147 mask stowage box, and then through the DTS4032 oxygen hose to the mask.

Elevated Oxygen System Temperature Testing

Observations/Results:

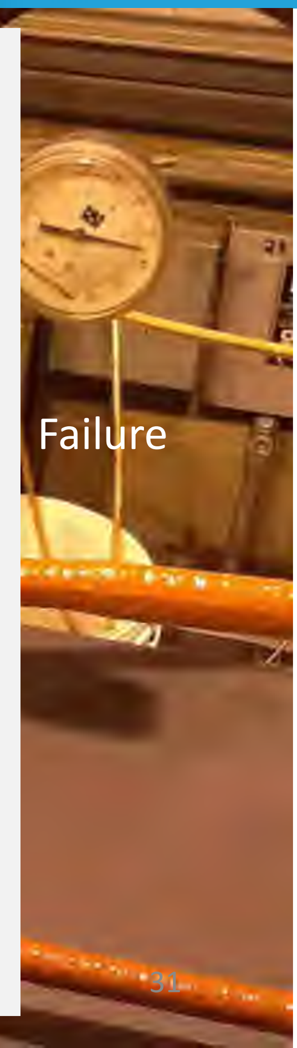
- i SBD on at: 12:14:50 [Local]
- ii Initially the mask operated as expected.
- iii As the IR camera indicated the progression of the heated air and the heating of the tubing, a fissure in the 60B50059 hose was detected at the T3 junction of the 3/8" CRES/60B50059 oxygen hose connector coupling joint, followed by an detectable increase in the size of the fissure downstream from the CRES/60B50059 hose connector as the heated air flow increased.
- iv Flex hose 60B50059 failed at 12:21:20 [Local]
- v The manometer reading went above the 4 inches of water limit cut off and the test was discontinued.

Failure Summary:

- Elapsed time between starting and the hose failure was: **7min 30 sec**
- Failure of the 60B50059 hose fitting between the CRES connector and the Mask Stowage Box.
- White smoke was observed to be emanating the mask. The mask was removed and secured for further detailed examination with the mask manufacturer.

Thermocouple temperature values at the termination of Test 1

Mask Delivery Temps	T1	T2	T3	T4
	67.41F	1042.7F	720.4F	72.56F
	18C	561.5C	382.2C	21.81C



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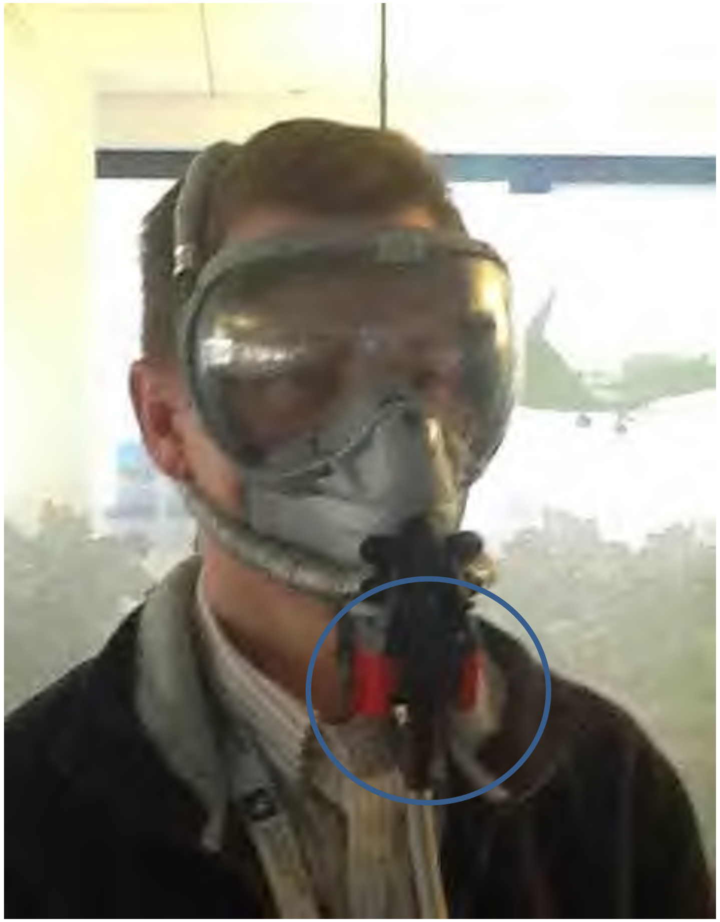
New Design Full Face Oxygen Mask



<u>Redesigned oxygen selector:</u>

Simplified rotating selector for selecting <u>Normal, 100% or Emergency.</u>

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Asiana Flight 991, Boeing 744F Cargo Fire/LOC-I

[Figure 23] Exterior and Interior Side of the L5 Door

Asiana Flight 991 departed Incheon International Airport at 01:47[L] on 27 July 2011, bound for Shanghai Pudong International Airport. At 04:03[L], the crew reported a fire and diverted to Jeju Airport for an emergency landing.

Radio contact was lost with the aircraft at 04:11[L] when the aircraft crashed 107 kilometers southwest off Jeju Island.

Why 25,000 ft for Fire Suppression?

The manufacturer selected the altitude of 25,000 feet for Class E cargo compartment fire fighting altitude as optimal based on studies of the National Fire Protection Association (NFPA), FAA and other literature available.

NFPA* data indicates the minimum re-ignition energy varies inversely with the square of the pressure and concludes that approximately four times the ignition energy is required to rekindle a fire at 25,000 feet vs. that of 5,000 feet. In addition, FAA experimental fire test data, conducted on ground simulating altitude environments (5K to 25K feet) suggests when the available oxygen quantity is reduced a fire can be effectively suppressed.

*National Fire Protection Association (NFPA)

Passive Fire Suppression

The fire suppression strategy in class E main deck cargo compartments is based on controlling the airflow, oxygen deprivation and fire resistant materials.

Additionally, controlled fire testing performed at the FAA's William J. Hughes Technical Center in Atlantic City, New Jersey have shown that, although depressurization can suppress flaming combustion, the fire continues to propagate, increasing overall compartment temperatures and pyrolizing fuel such that upon the reintroduction of oxygen (for example, as the aircraft descends for landing), the fire resumes at a greater intensity.

Subsequently, experience from this accident in conjunction with FAA experiments suggest that passive fire suppression in large cargo compartments due to oxygen deprivation may not be effective.

QRH SFF Checklist Revision

FIRE MAIN DECK
FIRE MN DK AFT, FWD, MID

Condition: Smoke is detected in the main deck cargo area(s).

1 Don the oxygen masks.

2 Establish crew communications.

3 SUPRNMRY OXY switch . . . . ON

4 MAIN Deck CARGO FIRE ARM switch . . . . Confirm . . . . ARMED

SATCOM will shut down to prevent overheating.

System shuts down two packs and respective PACK EICAS messages are shown.

Select the pack control selectors that have the PACK messages shown.

5 PACK control selectors . . . . Two packs off

6 CARGO FIRE DEPRES/DISCH switch . . . . Push and hold for one second

7 Climb or descend to 25,000 feet when conditions and terrain allow.

8 Plan to land at the nearest suitable airport.

The accident flights NNC is on the left. After completing the vital actions to control the fire, the crew are given the instruction:

Step 7 - *Climb or descend to 25,000 feet when conditions and terrain allow*
Step 8 - *Plan to land at the nearest available airport*

These two steps are analogous to recovering the aircraft, however, based on the fire suppression methodology they are contradictory in their intent.

A fire in a sustained state of combustion will continue to burn or increase the rate of pyrolysis compounding the fire and smoke problem. If the fire has been temporarily suppressed, it will, based on the NFPA data on the inverse square rule for minimum re-ignition, reignite.

The fire suppression methodology does not provide guidance for the transition to approach/landing, advising the crew to remain at 25,000 cabin pressure altitude to suppress a fire or land at nearest suitable airport, without an intermediate step to physically verify or otherwise assess the condition of the fire and the risk to the aircraft if a descent is initiated while there is available combustible material onboard.

<u>The checklist instructs the crew to remain at 25,000’ or land. The contradiction between the requirement to maintain 25,000 ft to control a fire and the requirement to descend and land at the nearest available airfield is not resolved in the checklist methodology.</u>

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Smoke/Fire/Fumes Sim Test – Checklist, CRM ect

Boeing 747 Synthetic Training Device, Seattle, USA: Smoke Filled Environment, Checklist Verification, CRM/Human Factors and Aircraft Handling/Ditching Scenario Testing, USA.

<u>OBJECTIVES:</u>
To document crew procedures and the aural and visual alerts/messages that occur during pack failure and main deck fire events.

To document how crew performance is affected by modifying the font size of crew checklists and various lighting configurations, by removing outside visual references, and during single pilot operations.

The investigation team using a Boeing 747 simulator performed various CRM functionality tests in a Smoke, Fire, Fumes [SFF] environment assessing intra-cockpit communications, crew performance, observations based on ambient visibility conditions, reduced visibility checklist testing and cockpit ergonomics in reduced visibility.

The purpose of this test was not to conduct a systems verification check or replicate any degraded flight control functioning.

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Smoke/Fire/Fumes Revision

The Flight Safety Foundation (FSF) sponsored an industry-wide initiative to improve non-normal checklist procedures for unannunciated smoke, fire or fumes events. Two documents, Smoke/Fire/Fumes Philosophy and Definitions and Smoke/Fire/Fumes Checklist Template, were written by industry specialists representing airplane manufacturers, operators, and professional pilot organizations.

FSF Safety Recommendation:

The numerous checklist enhancements regarding font, size and background colour should be implemented at a regulatory level; particularly where large transport aircrafts are concerned.

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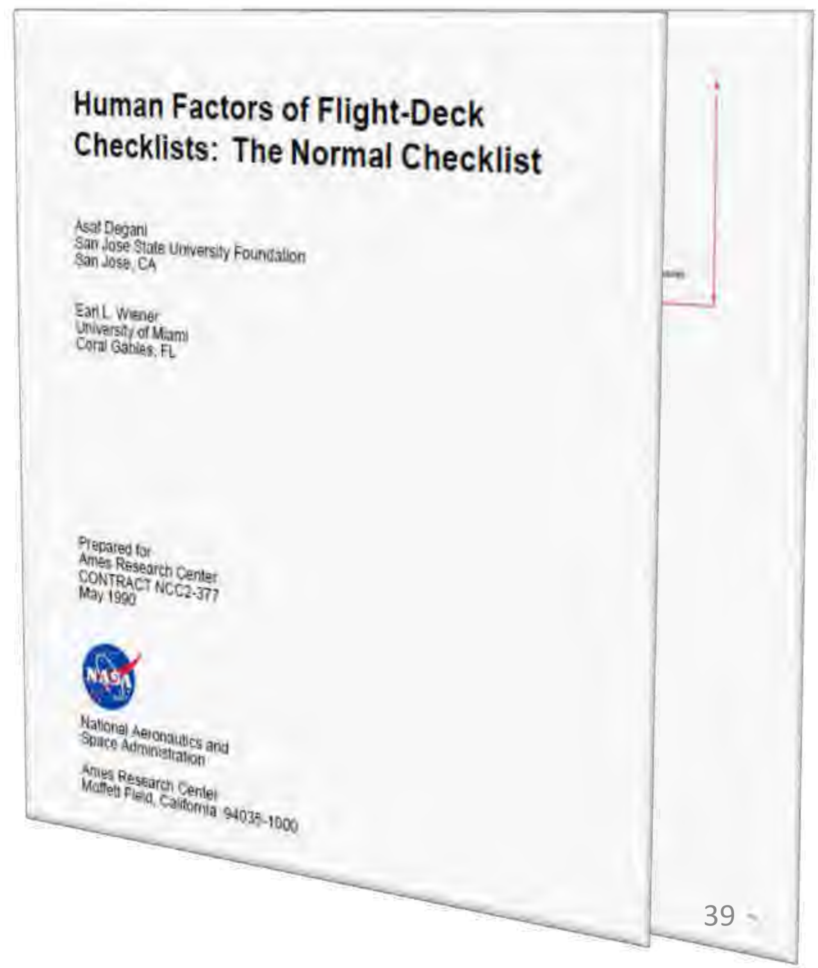
Smoke/Fire/Fumes Checklist Revision Task Force

GCAA Safety Recommendation

Regulators redesign all transport aircraft checklists ‘to include ECLs/EFB’s ect pertaining to smoke/fire/fumes to be consistent with the smoke/fire/fume checklist template for SFF events presented in the Smoke, Fire and Fumes NNC Checklists



Human Factors of Flight-Deck Checklists: The Normal Checklist

Asaf Degani
San Jose State University Foundation
San Jose, CA

Earl L. Wiener
University of Miami
Coral Gables, FL

Prepared for
Ames Research Center
CONTRACT NCC2-377
May 1990

National Aeronautics and Space Administration

Ames Research Center
Moffett Field, California 94035-1000

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Vision Assistance Technology

Type one: rigid inflatable smoke displacement barriers

VisionSafe - Emergency Vision Assurance System

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Vision Assistance Technology

Type two: Head Mounted Thermal Imaging Cameras

Fig. 2. Zeiss See-through laboratory demonstrator

Head mounted camera and display integrated into a face mounted goggle

Head mounted camera and display integrated full face mask

The Electronic Checklist (ECL)

The Electronic Checklist (ECL) is a flight deck display function used by the flight crew to accomplish normal and non-normal checklists.

The checklists are contained in the ECL database installed on the airplane. The checklists are an electronic form of the checklists that are published in the Quick Reference Handbook (QRH).

Integrating ECL technology into Non Normal/Emergency Checklists for SFF methodology where an audible instruction is followed by an action. When a vital action is completed, the Electronic Audible Checklist continues.

(EFB-ECL) provides the pilot a large, easy-to-view interactive Electronic Checklist (ECL) simulator that simulates several popular ECL displays. It features two easy-read font styles and uses the full EFB screen to display.

Audible Checklists

From an operability, flight deck ergonomics and human factors perspective it is counter intuitive to require a crew to acquire functioning information by reading a checklist if the primary obstacle is the inability to view the checklist due to smoke in the flight deck.

GCAA Safety Recommendation

Establish an industry task force of Manufacturers, Investigation Agencies, Regulators and Operators to develop the concept and safety case for audible emergency checklists

Current and existing research is ongoing comparing the effects of simulated, intelligent audible, checklists and analog checklists in simulated flight conditions.

Report Cause

- **A large fire developed in cargo on a pallet on the main deck at or near position 6, consisting of consignments of mixed cargo including a significant number of lithium type batteries, and combustible materials. The fire escalated rapidly into a catastrophic uncontained fire.**

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DXB Over Flight and RH Turn

Auto Throttle/Flap Placard Speed

Auto Throttle

The 747-400 Auto throttle limits the maximum commanded speed to the maximum operating speed (Vcmax) calculated by the FMC.

The FMC uses the VMAX CONF signal from the Modularized Avionics and Warning Electronics Assembly [MAWEA] for the Vcmax when flaps are extended. The MAWEA uses flap position in its calculation. It does not the use flap handle position

The Auto throttle has three functioning modes:

- Speed
- Thrust
- Flight level Change.

In speed mode the auto throttle will limit the target speed to be less than or equal to Vcmax.

In thrust mode the auto throttle will set the speed target to Vcmax and let the thrust limiting function limit thrust to the thrust reference value.

In Flight Level Change [FLCH] mode the autopilot/flight director provides speed control and the auto throttle would not respond to over or under speed conditions.

MENASASI, Abu Dhabi

Terminating Sequence/End of Data

Acoustic Vibration – Triggering Mechanism

Acoustic Vibration as a Triggering Mechanism for Thermal Runaway

Boeing to conduct an acoustic profile specific to the B747 for acoustic mapping .
Further investigation should be performed by the manufacturers to investigate the vibration and acoustic signatures of the cargo areas for harmonic acoustic sympathetic vibration resulting from the combination of engine and fuselage vibration.

This type of mechanical energy with volatile cargo susceptible to this type of extraneous energy particularly in a harmonic form could have the potential for auto-ignition of lithium battery organic solvents.

GCAA Safety Recommendation

Acoustic mapping - Further investigation to be performed by the manufacturer to investigate the vibration and acoustic signatures of the cargo areas for harmonic acoustic sympathetic vibration resulting from the combination of engine and fuselage vibration, cargo susceptibility to this extraneous energy particularly in a harmonic form and the potential for ignition of lithium batteries

Safety Recommendation - Airbourne Image Recording Systems [AIRS]

1. The ICAO Flight Recorder Panel to expedite the ICAO SARP on Airbourne Image Recording Systems [AIRS] amendment to Annex 13 to progress of this subject due to the potential benefit to air accident investigation.

2. The ICAO Safety Information Protection Task Force to expedite the ICAO SARP's required for video data protection

Thank you