

AIRCRAFT INCIDENT REPORT

Smoke in cockpit

M-01709/AIG-12

**N658UA
Boeing 767-300
United Airlines
200 Nm SSW of Keflavik, Iceland
July 20, 2009**



This investigation was carried out in accordance with the law on aircraft accident investigation, No. 35/2004 and Annex 13 to the Convention on International Civil Aviation. The aim of the investigation is solely to identify errors and/or deficiencies capable of undermining flight safety, whether contributing factors or not to the accident in question, and to prevent further occurrences of similar cause(s). It is not up to the investigation authority to determine or divide blame or responsibility. This report shall not be used for purposes other than preventive ones.

1 Factual information

Location and time	
Location:	Approximately 200 Nm south-south-west of Keflavik International Airport, Iceland
Date:	July 20, 2009
Time¹:	Approximately 14:00

Aircraft information	
Type:	Boeing 767-300
Registration:	N658UA
Year of manufacture:	1993
Serial number	27113
Certificate of Airworthiness:	Valid

Other information	
Type of flight:	Passenger transport flight under FAR Part 121 scheduled air carrier
Persons on board:	3 Flight crew 8 Flight attendants 178 Passengers
Injuries:	None reported
Nature of damage:	Burn and overheat damage to static inverter
Short description:	Pilots smelled an odor in the cockpit. Oxygen masks were donned and an emergency was declared. Aircraft was diverted and safely landed at Keflavik International Airport. The source of the smoke was from a faulty static inverter
Owner:	Wells Fargo Bank Northwest Na Trustee
Operator:	United Airlines
Weather:	METAR BIKF 201430Z 03014KT CAVOK 18/07 Q1010
Meteorological conditions:	Visual Meteorological Conditions (VMC) at Keflavik Airport
Flight rules:	Instrument Flight Rules (IFR). Visual approach

¹ All times in the report are UTC which coincides with local time.

Commander											
Age, sex:	60 year old, male										
License:	Holder of an ATP license issued by the FAA. License was valid										
Medical certificate:	First class. Must wear corrective lenses. Certificate was valid										
Ratings:	B707, B720, B737, B757, B767, CE500										
Experience:	<table border="1"> <tr> <td>Total all types:</td> <td>> 19,000:00</td> </tr> <tr> <td>Total on type:</td> <td>5250:00</td> </tr> <tr> <td>Last 90 days:</td> <td>103:00</td> </tr> <tr> <td>Last 28 days:</td> <td>67:00</td> </tr> <tr> <td>Last 24 hours:</td> <td>05:08</td> </tr> </table>	Total all types:	> 19,000:00	Total on type:	5250:00	Last 90 days:	103:00	Last 28 days:	67:00	Last 24 hours:	05:08
Total all types:	> 19,000:00										
Total on type:	5250:00										
Last 90 days:	103:00										
Last 28 days:	67:00										
Last 24 hours:	05:08										
Previous rest period:	28 hours and 15 minutes										

First Officer											
Age, sex:	49 year old, male										
License:	Holder of an ATP license issued by the FAA. License was valid										
Medical certificate:	First class. Shall possess corrective lenses for near vision. Certificate was valid										
Ratings:	B757, B767, L382										
Experience:	<table border="1"> <tr> <td>Total all types:</td> <td>Unknown</td> </tr> <tr> <td>Total on type:</td> <td>2850:00</td> </tr> <tr> <td>Last 90 days:</td> <td>258:00</td> </tr> <tr> <td>Last 28 days:</td> <td>69:00</td> </tr> <tr> <td>Last 24 hours:</td> <td>05:08</td> </tr> </table>	Total all types:	Unknown	Total on type:	2850:00	Last 90 days:	258:00	Last 28 days:	69:00	Last 24 hours:	05:08
Total all types:	Unknown										
Total on type:	2850:00										
Last 90 days:	258:00										
Last 28 days:	69:00										
Last 24 hours:	05:08										
Previous rest period:	28 hours and 15 minutes										

Relief First Officer											
Age, sex:	43 year old, male										
License:	Holder of an ATP license issued by the FAA. License was valid										
Medical certificate:	First class with no restrictions. Certificate was valid										
Ratings:	B757, B767, B737										
Experience:	<table border="1"> <tr> <td>Total all types:</td> <td>12,570:00</td> </tr> <tr> <td>Total on type:</td> <td>5987:00</td> </tr> <tr> <td>Last 90 days:</td> <td>65:00</td> </tr> <tr> <td>Last 28 days:</td> <td>63:00</td> </tr> <tr> <td>Last 24 hours:</td> <td>05:08</td> </tr> </table>	Total all types:	12,570:00	Total on type:	5987:00	Last 90 days:	65:00	Last 28 days:	63:00	Last 24 hours:	05:08
Total all types:	12,570:00										
Total on type:	5987:00										
Last 90 days:	65:00										
Last 28 days:	63:00										
Last 24 hours:	05:08										
Previous rest period:	28 hours and 15 minutes										

1.1 History of flight

The aircraft departed London Heathrow International Airport in the UK at 11:13 as flight UA949. The destination was Chicago O'Hare International Airport in the USA. The flight proceeded normally along NAT track A at FL 370. About 10 minutes west of 61N20W and about 200 miles SSW of Keflavik, Iceland, the flight crew noticed an unusual smell in the cockpit. The source of the smell was not identified or located. The Commander, who was performing the duties of Pilot not Flying (PNF), called the Purser over the interphone and asked if she smelled anything in the galley area. The flight attendants were preparing meals in the galley ovens and did not smell anything unusual. The Purser entered the cockpit and the First Officer, who was performing the duties of Pilot Flying (PF), left to take a bathroom break. The Commander and the Purser discussed the smell in the cockpit. The First Officer returned and the Commander left the cockpit for his bathroom break.

The Purser and the First Officer noticed that the smell was getting stronger and checked if they could feel any warm spots on panels inside the cockpit. At this time they noticed smoke entering the cockpit through the center pedestal area. The Purser and First Officer donned oxygen masks and the Purser contacted a flight attendant in the cabin to ask the Commander to be called back into the cockpit. The Purser also advised the cabin crew that there was an electrical smell and fumes in the cockpit and to be on alert. The Commander entered the cockpit and the Purser went into the cabin and called the relief First Officer, who was on break, into the cockpit.

The Commander noticed a strong odor and smoke when he entered the cockpit. All three pilots had at this point donned oxygen masks and smoke goggles. The Commander and First Officer soon took the goggles off since their vision was better without them. Their eyes were not bothered by the smoke and they felt the goggles were cumbersome to use.

The Commander handed the "B757/B767 Emergency Quick Reference Checklist" (see appendix), to the relief Pilot and instructed him to complete the smoke and fumes section. The Commander declared an emergency with Reykjavik Control at 14:04 and advised air traffic control that they were diverting to Keflavik. The PF started to descend (approximately 2000 ft/min) the aircraft and turned to a northerly heading towards Keflavik. Reykjavik Control cleared flight UA949 to descent to FL270.

The relief First Officer completed the "Smoke and Fumes QRC" checklist and started working on the Aircraft Flight Manual checklist procedure "Smoke/Fumes/Odor" (see appendix). He read the checklist out aloud and completed the required actions and moved onto the "Smoke or Fumes Removal" checklist (see appendix). He advised the Commander that they needed to descend to 9500 feet as per the checklist. The aircraft was leveled off at FL270 for about 2 minutes. The Commander advised Reykjavik Control that they needed to continue the descent to 9500 feet. Reykjavik Control cleared UA949 to descend below FL100 with unrestricted speed.

The Commander asked the relief First Officer to update dispatch on the expected arrival time. The relief First Officer answered that he had already updated dispatch and received ATIS for Keflavik. He also noted that a cabin advisory had been issued. The Commander then took over as PF and handed over non-flying pilot responsibilities to the First Officer. The First Officer briefed the visual approach to runway 02. The crew discussed whether the smoke or fumes were uncontrollable or not, as per the checklist. The crew decided to continue with the "Smoke or Fumes Removal" checklist beyond the "If smoke or fumes are uncontrollable" decision point once the aircraft reached 9500 feet and to remain on oxygen.

Upon reaching 9500 feet the relief pilot had set the equipment cooling selector to the override position as the checklist states. A couple of minutes later the flight crew noticed the intensity of the smoke in the cockpit was decreasing. The Commander asked the First Officer to brief the passengers to prepare for a normal landing with emergency equipment standing by. The relief pilot announced that the aircraft had been depressurised and he completed the "Smoke or Fumes Removal" checklist. The First Officer briefed the landing weight and speeds with autobrake set at position 2 and altimeters set at Keflavik QNH.

The relief pilot informed the Purser of the estimated arrival time (15 minutes). He then briefed the Commander that there was a "lot of haze" still present in cabin. The First Officer reported to approach control that they intended to taxi to parking and requested that emergency crew would follow. The flight crew then discussed evacuation options instead of taxiing to parking. Approach Control confirmed that emergency equipment would be standing by. The relief Pilot received an update from the cabin that there was a "lot of haze moving from front to back along with a strong electrical smell". The

Commander decided on evacuating once they were clear of the runway. The cabin crew was briefed to prepare for evacuation. The First Officer informed approach control that the aircraft would clear the runway before evacuating.

The relief pilot ordered the cabin crew to prepare for evacuation when given the evacuation call. The First Officer repeated to approach control their intention to evacuate upon clearing the runway. Approach control provided instructions to clear the runway and to evacuate onto K-1 taxiway where emergency equipment would be standing by.

The Commander asked the First Officer to read the evacuation checklist after landing. He then said that he would accomplish the tasks and the relief pilot would clear the evacuation route. The Commander asked the relief pilot to call for passenger brace positions but quickly corrected himself. The Commander landed the aircraft on runway 02 and turned left onto K-1 taxiway. He decided to wait with the evacuation as he noticed that airstairs were standing by. The crew's actions were in accordance with the procedures² in United Airlines Flight Operations Manual. The relief pilot directed the passengers to remain in their seats, while the First Officer asked that airstairs be brought up to the aircraft.

The cabin crew were expecting to evacuate the aircraft and were waiting instructions from the cockpit to brace (Brace, Brace, Brace) just before landing. After landing and vacating the runway the cabin crew expected the flight crew to instruct passengers to evacuate the aircraft with the words "Release your seat belts and get out!". Neither of the expected instructions was provided. Instead the relief pilot instructed the passengers to remain seated when the aircraft came to a stop. The passengers and crew evacuated the aircraft safely via the airstairs.

Emergency crews entered the aircraft main electronic equipment compartment with a thermal camera. A distinct electrical smell was noted and the source of the smoke was found to come from an area where the static inverter and transformer rectifier units are located. The thermal camera was also used to verify the location and look for hotspots.

² Flight Attendant Coordination, Cabin Prep/Emergency Evacuation, page 5.10.2 to 5.10.3, United Airlines Flight Operations Manual.

The emergency crew did not have to take any further action as all electrical power had been turned off and there was no fire hazard.

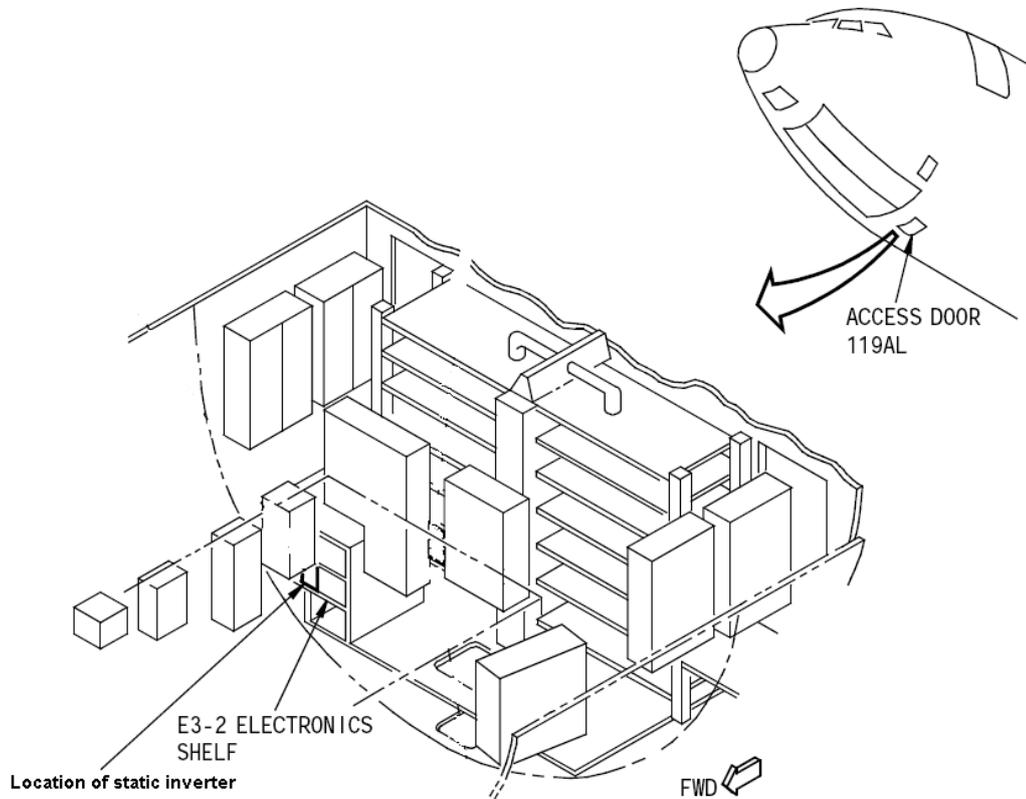


Figure 1: Location of static inverter in main electronics equipment compartment.

1.2 Communications

According to the pilots they felt they had difficulty communicating with each other, air traffic control, and the cabin crew during the emergency. They attributed these problems to the design of the audio panel. The audio panel is shown in the figure below.



Figure 2: Audio Panel

Due to the design of the audio panel pilots have to be alert of which channel they have selected to transmit their message and which channels they have turned up the volume on for monitoring. According to the pilots they were frustrated by having to select different transmitting channels depending on whom they were talking to. During the event the crew communicated with air traffic control (VHF-L), each other (FLT INPH), cabin crew (SERV INPH), and passengers using the passenger address system (PA). That would have required them to switch between four different transmission selections and four associated volume controls.

1.3 Flight recorders

1.3.1 Cockpit voice recorder

The Cockpit Voice Recorder (CVR), Honeywell model 6020 SSCVR 30, serial number 2322, contained approximately thirty minutes and sixteen seconds of audio. The

recording began at about 14:15:07 GMT as the flight crew was preparing for landing at Keflavik International Airport, and ended at about 14:45:23 when the engines were turned off.

The recording consisted of four separate channels of audio information. One channel contained the cockpit area microphone (CAM) audio information. The CAM is typically mounted in the overhead panel between the two pilots. It is designed to capture sounds and conversations in the cockpit area whenever the CVR system is powered.

1.3.2 Flight data recorder

The flight data recorder is a solid state memory flight data recorder from Allied Signal, part number 980-4700-042. The flight data recorder contained information for the whole flight that was downloaded and analyzed during the investigation.

1.4 Engineering investigation

The aircraft underwent an ETOPS pre-departure service check in London (per United Airlines MOP 06-001-06). Following engine start the right recirculation fan was noticed to be off. The fan was switched off and on several times but remained inoperative. The defect was deferred in accordance with United Airlines minimum equipment list as item 2125B.

The left (p/n S282T001-1, s/n 2169) and right (p/n S282T001-1, s/n 1767) transformer rectifier units and static inverter³ (p/n S282T004-8, s/n CV000888) were removed from the aircraft by United Airlines technicians in Keflavik. The components were examined on-site by investigators from the Icelandic Aircraft Accident Investigation Board (IAAIB). The static inverter showed signs of overheating. It was suspected that the failure was caused by a known problem⁴ on certain model static inverters installed on many Boeing aircraft. The problem is due to overheating of a certain R170 resistor.

³ A static inverter changes the direct current (DC) power to alternating current (AC) electrical power. It changes the 28 volt DC from the battery to 115 volt AC to energize the AC standby bus. The AC standby power is necessary for flight safety when the sources of engine supplied AC electrical power are off.

⁴ Boeing Service Bulletin 767-24-0160. ELECTRICAL POWER - Standby Power Generation - Removal and Replacement of the Static Inverter Module. June 30, 2005.

This situation can cause nearby capacitors to overheat and burn. The IAAIB has investigated a number of incidents involving overheated static inverters. In those incidents it has been shown that the overheating creates a significant amount of smoke.

A Boeing service bulletin provides instructions to replace the static inverter on affected aircraft. Furthermore the manufacturer (Avionics Instruments Inc.) of the static inverter provides concurrent requirements to replace the R170 resistor with a new resistor and relocate it to another location on the PCB board in order to move it away from the sensitive capacitors.

United Airlines was allowed to examine the components and report their findings to the IAAIB. United Airlines reported that the static inverter showed signs of extreme overheating in the lower aft area. A shop technician familiar with these types of failures indicated that the static inverter failure was because of an overheated R170 resistor. The overheat damage in the failed static inverter can be seen in the figures below.

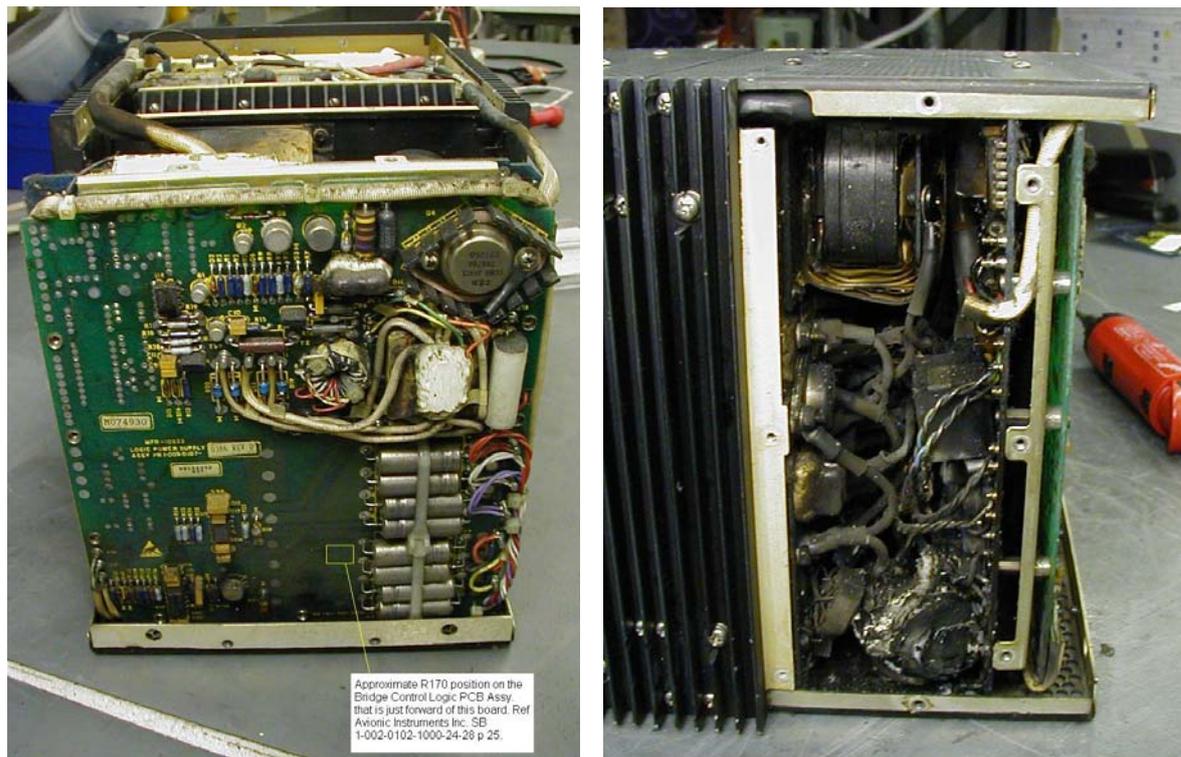


Figure 3: Overheat damage in location of R170 resistor.

United Airlines initiated a campaign to replace and modify affected static inverters on Boeing 747, 757, 767, and 777 aircraft. The campaign was started with a Component Change Order Authorisation (United Airlines CCOA # 0-5710) dated December 7, 2005. The CCOA had an estimated start date of June 5, 2006 and an estimated completion date of December 27, 2008.

The board asked for an update on the campaign on November 12, 2009. The campaign was for unexplained reasons initiated for the 767 fleet in february of 2009. As of November 12, 2009 United Airlines had replaced static inverters on 18 Boeing 767 aircraft. 17 Boeing 767 aircraft remained to be modified including the incident aircraft. According to United Airlines no changes were made to the campaign as a result of this incident or the accomplishment rate – mainly due to spares provisioning.

According to information from the FAA, prior to 2003 there were 39 static inverter failures on 39 airplanes. Since 2003 there have been 15 inverters on 15 airplanes that failed due to the R170 resistor overheating, and approximately 9,400 units have been manufactured. The FAA first issued a NPRM (2002-NM-12-AD) on the static inverter problem on May 17, 2002. Supplemental NPRM's were issued May 26, 2006 and

January 12, 2009. The FAA issued an airworthiness directive (AD 2009-26-03; Boeing Model 737-300, -400, -500, -600, -700, -700C, -800, and -900, and 747-400 Series Airplanes; and Model 757, 767, and 777 Airplanes) with an effective date of February 1, 2010. Boeing 767 aircraft with the above listed static inverter should be modified within 42 months after the effective date of this airworthiness directive.

When AD 2009-26-03 was issued United Airlines generated a new campaign, from scratch, to ensure all inverters would be a the correct part number and in compliance with the AD. The information on the status of the campaign is included in the table below. Other Boeing variants in United Airlines operation are also included in this campaign and information on their status is included in the table.

	Boeing 747	Boeing 757	Boeing 767	Boeing 777
Date of completion	Feb 2015	Aug 2013	Aug 2013	Feb 2015
Total aircraft applicable	30	95	35	52
Total aircraft modified	0	1	0	0
Total aircraft remaining	30	94	35	52

Table 1: Status of United Airlines campaigns to replace static inverters on Boeing aircraft as of February, 2011.

2 Analysis and conclusions

A static inverter on the Boeing 767-300 aircraft, a United Airlines flight 949, failed in-flight causing smoke to move from the main electronics equipment compartment beneath the flight deck area into the cockpit through the center pedestal area. The flight crew immediately donned oxygen masks and smoke goggles and remained on oxygen until after landing. No warnings or alerts were issued to the flight crew to indicate any failures.

The pilots shortly after putting on the smoke goggles removed them and placed them on their foreheads as they felt they were cumbersome to use and the smoke did not irritate their eyes. According to the Boeing 757/767 Emergency Quick Reference Checklist (see appendix) the decision to use smoke goggles is left up to the flight crew and are only to be used if required.

The pilots noted after the incident that at times they were hindered in communicating with each other. They contributed this to the audio panel being designed in such a way that the flight crew must always press the push to talk switch even when communicating with each other. According to United Airlines it is part of their flight simulator training to train pilots in the use of the audio panels during emergency situation and to actively switch between transmitting channel selections.

Reviewing the CVR recording it was evident that the pilots had performed well under a stressful situation. It could not be noticed from the CVR recordings that serious miscommunications were taking place. The pilots however noted that they had the most problems with the audio panels at the beginning of the event. This segment of the flight was however not on the CVR recording.

The cabin crew were expecting to hear a brace call before landing and then to evacuate the aircraft upon landing. The Commander prepared for an emergency evacuation in accordance with the company procedures. When the aircraft was safely on the ground, with the smoke diminishing, and airstars standing by the Commander decided to cancel the evacuation and asked the relief pilot to instruct the passengers to remain seated. The Commander's actions were in accordance with the procedures in United Airlines Flight Operations Manual.

The relief pilot reduced the workload for the Commander and the First Officer. He handled much of the communication with dispatch, the Purser, and the passengers. He also read the emergency checklists out aloud allowing the Commander to monitor his actions. This allowed the Commander and the First Officer to focus on flying the aircraft, diverting to Keflavik, and to update Air Traffic Control on their status.

United Airlines has, since December 7, 2005, had a campaign in place to replace the static inverters according to Boeing Service Bulletin 767-24-160. In 3 years and 11 months 18 Boeing 767 aircraft have been modified and 17 remain to be modified according to information received from United Airlines during the investigation. Later the IAAIB was informed by United Airlines that a new campaign had generated in February 2011 due to an AD issued by the FAA in 2009 on the subject (see below). According to the information only one aircraft has been modified. The remaining 211 United Airlines aircraft affected by the AD will be modified before February 2015. The incident aircraft had not been modified.

The FAA has released an airworthiness directive and applicable Boeing 767 aircraft must be modified before August 1, 2013. It will be more than 11 years since the start of the airworthiness directive process by the issue of the first NPRM on May 17, 2002 until terminating action will be completed for the United Airlines Boeing 767 aircraft.

2.1 Findings as to causes and contributing factors

- 2.1.1 A static inverter on N658UA failed causing smoke to enter the cockpit and cabin of the aircraft.

2.2 Findings as to risk

- 2.2.1 The flight crew removed the smoke goggles and placed on their foreheads as they felt they were cumbersome to use. The airworthiness process of mandating the replacement of applicable static inverters on Boeing 767 aircraft until the aircraft have been modified will take more than 11 years. United Airlines initiated a campaign to replace static inverters on their Boeing aircraft at the end of 2005. Initially the campaign was estimated to be completed in 2.5 years but is still on-going.

2.3 Other findings

- 2.3.1 The design of the audio panel and communication system installed in the incident aircraft can hinder communications during high workload events.

3 Safety recommendations, information, and action taken

3.1 Safety recommendations

3.1.1 None.

3.2 Safety information

3.2.1 United Airlines is encouraged to review the design of the audio panels in use on their aircraft with respect to this incident. There are audio panels available that make flight crew communication easier during high workload events.

3.3 Safety action taken

3.3.1 United Airlines has a campaign in place to replace applicable static inverters on Boeing 747, 757, 767, and 777 aircraft.

3.3.2 United Airlines is currently evaluating the Emergency Descent Quick Reference Checklist (QRC) and the “Smoke and Fumes” Checklist has been completely revised and is now titled “Smoke, Fire and Fumes” Checklist.

3.3.3 The FAA has issued an airworthiness directive to mandate the replacement of applicable static inverters on Boeing aircraft.

Reykjavik, May 26, 2011

Aircraft Accident Investigation Board of Iceland

4 Appendix: Checklists

4.1 Revised Quick Reference Checklists

24 DEC 10 UNITED	
B757/B767 EMERGENCY QRC	
FLY THE AIRPLANE - SILENCE THE WARNING - CONFIRM THE EMERGENCY	
<p>APU FIRE</p> <ul style="list-style-type: none"> ■ APU fire handle Pull and rotate ----- Refer to Reference Action FM page 15.50.1 ----- 	<p>CABIN ALTITUDE/ RAPID DEPRESSURIZATION <i>u</i></p> <div style="border: 1px dashed black; padding: 2px;"> <ul style="list-style-type: none"> ■ Oxygen masks and regulators On, 100% ■ Crew communications Establish </div> <ul style="list-style-type: none"> ■ Engine bleed switches On ■ Pack selectors Auto <p>If cabin altitude is above 14,000 feet:</p> <ul style="list-style-type: none"> ■ Passenger oxygen switch On <p>If cabin altitude is uncontrollable:</p> <ul style="list-style-type: none"> ■ Emergency descent Accomplish <p>----- CHECKLIST COMPLETE -----</p>
<p>FWD (AFT) CARGO FIRE</p> <ul style="list-style-type: none"> ■ Cargo fire arm switch (forward or aft) Push ■ No. 1 bottle discharge switch Push (hold 1 second) ----- Refer to Reference Action FM page 15.50.2 ----- 	<p>EMERGENCY DESCENT <i>u</i></p> <ul style="list-style-type: none"> ■ MCP altitude (safe altitude/10,000) Set ■ FLCH switch Push ■ Heading As required <p>If structural integrity in doubt: Limit airspeed and avoid high maneuvering loads.</p> <ul style="list-style-type: none"> ■ Speed brakes Extend ■ MCP speed V_{MO}/M_{MO} ■ Throttles Idle ■ Transponder 7700 ■ ATC Advise ----- Refer to Reference Action FM page 15.30.9 -----
<p>WHEEL WELL FIRE</p> <ul style="list-style-type: none"> ■ Airspeed Max 270 KIAS/.82M ■ Landing gear Down ----- Refer to Reference Action FM page 15.50.6 ----- 	<p>EVACUATION <i>u</i></p> <div style="border: 1px dashed black; padding: 2px;"> <ul style="list-style-type: none"> ■ ATC Advise </div> <ul style="list-style-type: none"> ■ Parking brake Set ■ Fuel control switches Cut off ■ Pressurization outflow valve Open ■ Evacuation Announce, initiate ■ Engine and APU fire handles Override, pull ■ Illuminated fire handle(s) Rotate <p>If both engines, rotate in opposite directions.</p> <ul style="list-style-type: none"> ■ Sliding windows, escape ropes As required <p>----- CHECKLIST COMPLETE -----</p>
<p>SMOKE/FIRE/FUMES <i>u</i></p> <div style="border: 1px dashed black; padding: 2px;"> <ul style="list-style-type: none"> ■ Oxygen masks and regulators On, 100% ■ Crew communications Establish </div> <ul style="list-style-type: none"> ■ Smoke goggles (if required) On ■ Utility bus switches Off ■ (B757) Left recirculation fan Off ■ APU bleed switch Off ■ Advise flight attendants IFE power switches - Off ----- Refer to Reference Action FM page 15.50.7 ----- 	<p>AIRSPED/MACH UNRELIABLE <i>u</i></p> <ul style="list-style-type: none"> ■ Autopilot Disengage ■ Autothrottle arm switch Off ■ Flight directors Off ■ Attitude, thrust Adjust ----- Refer to Reference Action FM page 15.30.1 -----
<p>UNSCHEM STAB TRIM</p> <div style="border: 1px dashed black; padding: 2px;"> <ul style="list-style-type: none"> ■ Control column Move to oppose trim </div> <ul style="list-style-type: none"> ■ Stabilizer trim cut out switches Cut out ----- Refer to Reference Action FM page 15.30.15 ----- 	
FAA APPROVED	

SMOKE/FIRE/FUMES U

- Oxygen masks and regulators On, 100%
- Crew communications Establish
- Smoke goggles (if required) On
- Utility bus switches Off
- (B757) Left recirculation fan Off
- APU bleed switch Off
- Advise flight attendants IFE power switches - Off

CONTINUED FROM QRC

Diversion may be needed.

If smoke or fumes is the greater threat, accomplish
Smoke or Fumes Removal emergency procedure (15.50.8).

REFERENCE ACTION:

If smoke/fire/fumes source is obvious and can be extinguished quickly:

- Source Isolate and extinguish
Remove power from affected equipment by switch or circuit breaker.

If source is visually confirmed to be extinguished and smoke and fumes are decreasing:

Continue flight and/or restore unpowered items at Captain's discretion.

- Smoke or Fumes Removal emergency
procedure (15.50.8) Accomplish (if required)

END CHECKLIST

If smoke/fire/fumes source is not obvious or cannot be extinguished quickly:

- (B757) Equipment cooling switch Alternate
- (B767) Equipment cooling selector Standby

LAND AT THE NEAREST SUITABLE AIRPORT.

WARNING: Consider Immediate Landing if smoke/fire/fumes is uncontrollable.

WARNING: Do not delay landing to accomplish the remainder of this procedure.

- (B757) Isolation switch Close
- (B767) Left and right isolation switches Close
- Right pack selector Off
Wait 2 minutes unless smoke/fumes are increasing.

If smoke/fumes continue or are increasing:

- Right pack selector Auto
- Left pack selector Off
Wait 2 minutes unless smoke/fumes are increasing.

If smoke/fumes continue or are increasing:

- Left pack selector Auto

CONSIDER IMMEDIATE LANDING.

- Smoke or Fumes Removal emergency
procedure (15.50.8) Accomplish (if required)

Do not accomplish UTILITY BUS OFF, PACK OFF, or RECIRCULATION FAN irregular procedures.

----- **CHECKLIST COMPLETE** -----

SMOKE OR FUMES REMOVAL

WARNING: Accomplish only when directed by the Smoke/Fire/Fumes procedure.

WARNING: Do not turn an operating pack off. Selecting packs off will result in increased smoke concentrations.

WARNING: Do not delay landing in an attempt to complete this procedure.

- Cockpit door Close
- (B767) Equipment cooling selector Override
- Landing altitude indicator Set to 9500 feet
- Auto rate knob Max

If smoke or fumes are uncontrollable:

Descend to 9500 feet or below as soon as conditions permit.

At 9500 feet:

- Pressurization mode selector Manual
- Pressurization manual knob Climb
Maintain until outflow valve is fully open. Depressurizes airplane and maximizes airflow rate.

When smoke has dissipated:

- (B767) Equipment cooling selector Standby
- Remaining Smoke/Fire/Fumes procedure steps Accomplish

----- **CHECKLIST COMPLETE** -----

4.2 Quick Reference Checklists used during incident

1 DEC 06 UNITED	
B757/B767 EMERGENCY QUICK REFERENCE CHECKLIST	
FLY THE AIRPLANE - SILENCE THE WARNING - CONFIRM THE EMERGENCY	
<p style="text-align: center;">FWD (AFT) CARGO FIRE</p> <ul style="list-style-type: none"> ■ Cargo fire arm switch (forward or aft) Push ■ No. 1 bottle discharge switch Push (hold 1 second) <p style="text-align: center;">----- Refer to Reference Action FM page 15.50.2 -----</p>	<p style="text-align: center;">CABIN ALTITUDE/ RAPID DEPRESSURIZATION u</p> <div style="border: 1px dashed black; padding: 2px;"> <ul style="list-style-type: none"> ■ Oxygen masks and regulators On, 100% ■ Crew communications Establish </div> <ul style="list-style-type: none"> ■ Engine bleed air switches On ■ Pack selectors Auto <p>If cabin altitude is above 14,000 feet:</p> <ul style="list-style-type: none"> ■ Passenger oxygen switch On <p>If cabin altitude is uncontrollable:</p> <ul style="list-style-type: none"> ■ Emergency descent Accomplish <p style="text-align: center;">----- CHECKLIST COMPLETE -----</p>
<p style="text-align: center;">GALLEY FIRE/SMOKE u</p> <ul style="list-style-type: none"> ■ Utility bus switches Off <p style="text-align: center;">----- Refer to Reference Action FM page 15.50.6 -----</p>	<p style="text-align: center;">EMERGENCY DESCENT u</p> <ul style="list-style-type: none"> ■ MCP altitude (safe altitude/10,000) Set ■ FLCH switch Push ■ Heading As required <p>If structural integrity in doubt: Limit airspeed and avoid high maneuvering loads.</p> <ul style="list-style-type: none"> ■ Speed brakes Extend ■ MCP speed V_{MO}/M_{MO} ■ Throttles Idle ■ Transponder 7700 ■ ATC Advise <p style="text-align: center;">----- Refer to Reference Action FM page 15.30.9 -----</p>
<p style="text-align: center;">WHEEL WELL FIRE</p> <ul style="list-style-type: none"> ■ Airspeed Max 270 KIAS/82M ■ Landing gear Down <p style="text-align: center;">----- Refer to Reference Action FM page 15.50.8 -----</p>	<p style="text-align: center;">EVACUATION u</p> <div style="border: 1px dashed black; padding: 2px;"> <ul style="list-style-type: none"> ■ ATC Advise </div> <ul style="list-style-type: none"> ■ Parking brake Set ■ Fuel control switches Cut off ■ Pressurization outflow valve Open ■ Evacuation Initiate ■ Engine and APU fire handles Override, pull ■ Illuminated fire handle(s) Rotate <p>If both engines, rotate in opposite directions.</p> <ul style="list-style-type: none"> ■ Sliding windows, escape ropes As required <p style="text-align: center;">----- CHECKLIST COMPLETE -----</p>
<p style="text-align: center;">SMOKE/FUMES/ODOR u</p> <div style="border: 1px dashed black; padding: 2px;"> <ul style="list-style-type: none"> ■ Oxygen masks and regulators On, 100% ■ Crew communications Establish </div> <ul style="list-style-type: none"> ■ Smoke goggles (if required) On <p>WARNING: Leave cockpit door closed, unless required by procedure or greater emergency.</p> <p style="text-align: center;">----- Refer to Reference Action FM page 15.50.7 -----</p>	<p style="text-align: center;">AIRSPED/MACH UNRELIABLE u</p> <ul style="list-style-type: none"> ■ Autopilot Disengage ■ Autothrottle arm switch Off ■ Flight directors Off ■ Attitude, thrust Adjust <p style="text-align: center;">----- Refer to Reference Action FM page 15.30.1 -----</p>
<p style="text-align: center;">UNSCHEd STAB TRIM</p> <div style="border: 1px dashed black; padding: 2px;"> <ul style="list-style-type: none"> ■ Control column Move to oppose trim </div> <ul style="list-style-type: none"> ■ Stabilizer trim cut out switches Cut out <p style="text-align: center;">----- Refer to Reference Action FM page 15.30.15 -----</p>	
FAA APPROVED	

SMOKE/FUMES/ODOR II

- Oxygen masks and regulators On, 100%
- Crew communications Establish
- Smoke goggles (if required) On

CONTINUED FROM QRC

Diversion may be needed.

If smoke or fumes is the greater threat, accomplish
Smoke or Fumes Removal emergency procedure (15.50.9).

REFERENCE ACTION:

- Utility bus switches Off
- (B757) Left recirculation fan Off
- APU bleed air switch Off
- (B757) Advise flight attendants IFE switches - Off

If smoke/fumes/odor source is obvious and can be extinguished quickly:

- Source Isolate and extinguish
Remove power from affected equipment by switch or circuit breaker.

If source is visually confirmed to be extinguished and smoke and fumes are decreasing:

Continue flight and/or restore unpowered items at Captain's discretion.

- Smoke or Fumes Removal emergency procedure (15.50.9) Accomplish (if required)

■ **END CHECKLIST**

If smoke/fumes/odor source is not obvious or cannot be extinguished quickly:

- (B757) Equipment cooling switch Alternate
- (B767) Equipment cooling selector Standby

■ **LAND AT THE NEAREST SUITABLE AIRPORT.**

WARNING: Consider Immediate Landing if smoke/fumes/odor is uncontrollable.

WARNING: Do not delay landing to accomplish the remainder of this procedure.

- (B757) Isolation switch Close
- (B767) Left and right isolation switches Close
- Right pack selector Off
Wait 2 minutes unless smoke/fumes are increasing.

If smoke/fumes continue or are increasing:

- Right pack selector Auto
- Left pack selector Off
Wait 2 minutes unless smoke/fumes are increasing.

If smoke/fumes continue or are increasing:

- Left pack selector Auto

■ **CONSIDER IMMEDIATE LANDING.**

- Smoke or Fumes Removal emergency procedure (15.50.9) Accomplish (if required)

Do not accomplish UTILITY BUS OFF, PACK OFF, or RECIRCULATION FAN irregular procedures.

-----CHECKLIST COMPLETE-----

SMOKE OR FUMES REMOVAL

WARNING: Accomplish only when directed by the Smoke/Fumes/Odor procedure.

WARNING: Do not turn an operating pack off. Selecting packs off will result in increased smoke concentrations.

WARNING: Do not delay landing in an attempt to complete this procedure.

- Cockpit door Close
- (B767) Equipment cooling selector Override
- Landing altitude indicator..... Set to 9500 feet
- Auto rate knob..... Max

If smoke or fumes are uncontrollable:

Descend to 9500 feet or below as soon as conditions permit.

At 9500 feet:

- Pressurization mode selector Manual
- Pressurization manual knob Climb
Maintain until outflow valve is fully open. Depressurizes airplane and maximizes airflow rate.

When smoke has dissipated:

- (B767) Equipment cooling selector Standby
- Remaining Smoke/Fumes/Odor procedure steps..... Accomplish

----- **CHECKLIST COMPLETE** -----