Aviation Investigation Final Report

Location:	Colorado Spring, Colorado	**Incident Number:**	DEN07IA037
Date & Time:	December 15, 2006, 17:08 Local	**Registration:**	N24202
Aircraft:	Boeing 737-824	**Aircraft Damage:**	Minor
Defining Event:		**Injuries:**	1 Minor, 159 None
Flight Conducted Under:	Part 121: Air carrier - Scheduled		

Analysis

The passenger was wearing an Ecoquest Fresh Air Buddy Personal Air Purifier around his neck. According to the manufacturer, it "generates an intense electrostatic ion wind that charges floating particles in the 'breathing zone.' The particles are substantially repelled away from the wearer, creating an almost particle-free 'exclusion zone' for toxic allergens, smoke, dust, viruses, and bacteria. Perfumes and odors can also be minimized by the ion particle-charging-effect." The passenger was observed to be holding a Sprint Trio 700 camera phone up to the window, sometimes talking into it, but he claimed he was only taking photographs. As he held his telephone to the window, there was a noise that sounded "like a fuse." There was a flash and a loud bang, and smoke emanated from the device. The passenger yelled and flung the air purifier from around his neck because it had started to burn him. It exploded into a ball of flames "about the size of volleyball" and fell between the seat cushions, starting a fire. Passengers poured water and other liquids on the smoldering cushions, and a flight attendant used a Halon fire extinguisher to put the fire out. The battery was never recovered. NTSB's fire and explosion expert examined the device. Her report stated that the air purifier originally came with a 3.6V CR123A non-rechargeable lithium primary battery, but a kit containing a charger and a rechargeable lithium-ion battery was available for purchase. The battery compartment cover was melted and deformed, and had two areas of metal splatter. Analysis of this splatter revealed the presence of manganese. Manganese dioxide is a component in primary (non-rechargeable) lithium batteries. The report noted that a short circuit is the most common cause of battery fires, and that charging a non-rechargeable battery could cause an internal short that could lead to thermal runaway, battery failure, and possibly an explosion.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this incident to be:

A short circuit in the primary (non-rechargeable) battery, most likely due to it being recharged. This internal short led to thermal runaway, battery failure, and an explosion.

Findings

Occurrence #1: FIRE
Phase of Operation: CRUISE - NORMAL

Findings
1. (C) PORTABLE ELECTRICAL EQUIPMENT - IMPROPER USE OF - PASSENGER

Factual Information

HISTORY OF FLIGHT

On December 15, 2006, at 1708 mountain standard time, a Boeing 737-824, N24202, operated by Continental Airlines, Inc., as Flight 1065, and piloted by an airline transport-certificated pilot, made an emergency landing at Colorado Springs Municipal Airport (COS), Colorado Springs, Colorado, after the cabin crew reported an in-flight fire. The airplane sustained minor damage. Visual meteorological conditions (VMC) prevailed at the time of the incident. The scheduled domestic passenger flight was being conducted under the provisions of Title 14 Code of Federal Regulations (CFR) Part 121, and an instrument flight rules (IFR) flight plan had been filed. The captain, first officer, four flight attendants, and 153 passengers were not injured. One passenger received a minor burn injury. Six persons were transported to a local hospital. They were treated for smoke inhalation and released. The flight originated at Houston (IAH), Texas, and was en route to Portland (PDX), Oregon.

According to the passenger who was seated in 23B (middle), the passenger seated in 23A (window) was wearing an air purifier device around his neck. He was observed to be holding a cellular telephone up to the window, sometimes talking into it, but claimed he was only taking photographs. As he held his telephone to the window, there was a noise that sounded "like a fuse." He yelled and flung the air purifier device that was around his neck because it had started to burn him. The device exploded into a ball of flames about the size of volleyball and dropped between us in the seats." In the Colorado Springs Municipal Airport Incident Report, this passenger added "he saw a flash and heard a loud bang (like a loud hand clap)." He complained that his ear was still ringing from the loud bang.

The report noted that the passenger was in seat 23C (aisle) heard "a slight noise and noticed smoke coming from the devise that was on a lanyard" around his neck. The passenger pulled the device from around his neck and dropped it between the seat cushions He and the passenger in seat 23B attempted to "douse the area with ice and water provided by other passengers. A flight attendant sprayed the seats with a fire extinguisher. He stated there was "lots of smoke in the area."

The passenger who was seated in 23A told airport officials he had purchased the personal "ionizer" approximately two months ago. He admitted he had taken photographs using his Sprint Trio 700 camera phone. He said he had put the camera phone away and was sitting in his seat when he heard "a hissing-type noise" and heard a "popping sound: with a flash "about 12 inches in diameter" directly in front of him. Smoke poured from the device and he pulled it from around his neck and dropped it between the seats. Examination revealed a quarter-size hole in his shirt and a red area on his chest approximately 2 to 3 inches in diameter.

The aisle flight attendant, who was in the rear galley, said she heard "a loud bang" and saw "a flash of light." The lead flight attendant, who was pushing a food cart up the aisle approximately three rows in front of row 23, heard a noise and saw a flash of light, "lighting up everything in front of her." Seeing smoke coming from seats 23A and B, she rushed aft and told the aisle flight attendant there was a fire and to grab a fire extinguisher. According to the Colorado Springs Fire Department report, a 3-pound Halon 1211 and a 10-pound water fire extinguisher were used to extinguish the fire.

The airplane diverted to Colorado Springs where an uneventful landing was made. Post-incident examination revealed two holes, approximately 2 inches in diameter, on the right side of cushion 23A and the left side of cushion 23B. The foam below both holes "were burnt and blackened." The personal air purifier was impounded and given to Airport Operations. The battery that powered the device was never located.

MEDICAL AND PATHOLOGICAL INFORMATION

The passenger had a small red spot, about the size of a quarter, on his chest, directly beneath where the air purifier was. He refused medical treatment. According to the Colorado Springs Fire Department report, four flight attendants and one passenger were taken to a local hospital, complaining of scratchy throats, headaches, and a "bad taste in their mouths." They were also treated for smoke inhalation.

TESTS AND RESEARCH

The device was described as an "Ecoquest Fresh Air Buddy Personal Air Purifier." According to a sales brochure, it "generates an intense electrostatic ion wind that charges floating particles in the 'breathing zone.' The particles are substantially repelled away from the wearer, creating an almost particle-free 'exclusion zone' for toxic allergens, smoke, dust, viruses, and bacteria. Perfumes and odors can also be minimized by the ion particle-charging-effect."

The device was sent to NTSB's headquarters for examination. According to the Fire and Explosion Specialist's report, "The unit originally came with a 3.6V CR123A size non-rechargeable lithium primary battery (emphasis added). A kit containing a charger and a rechargeable lithium-ion battery was also available for this unit."

"The battery compartment was melted and deformed at the top portion near the clasp. The cover had two areas of metal splatter. Similar material was found along the edges of the battery compartment as well. An EDS analysis of this splatter found the presence of manganese in the splatter material. Manganese dioxide is a component in primary lithium batteries.

The specialist's report noted that in testimony given at NTSB public hearings on the hazards

associated with primary and secondary lithium batteries, a short circuit was "the most common cause of battery fires. The short circuit can be caused either by design flaws, manufacturing defects or improper packaging and handling. Charging non-rechargeable batteries can result in an internal short that can lead to thermal runaway and battery failure. Batteries are generally not designed to be able to contain catastrophic failures, and when they go into thermal runaway they often explode and expel their contents to the environment potentially causing ignition in areas well beyond the initiating battery cell."

ADDITIONAL INFORMATION

Immediately after the incident, Colorado Springs Fire Department personnel attempted to interview the passenger who hade been seated in 23A at his motel. He refused to answer the door.

On January 9 and 10, 2007, an FAA inspector personally and telephonically interviewed the passenger. The passenger refused to answer pertinent questions, citing his impending personal injury and product liability lawsuit against the manufacturer, but he did admit he had a "rechargeable" battery and battery charger. The inspector noted, "I got the distinct impression, though [the passenger] [stopped mid-sentence,] that at the time of the incident, the Fresh Air Buddy was being powered by a rechargeable battery."

Other than the Federal Aviation Administration, there were no parties to the investigation.

The airplane was released back to Continental Airlines on December 15, 2006.

Pilot Information

Certificate:	Airline transport; Flight instructor	**Age:**	57,Male
Airplane Rating(s):	Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):		**Toxicology Performed:**	No
Medical Certification:	Class 1 With waivers/limitations	**Last FAA Medical Exam:**	December 1, 2006
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	March 1, 2006
Flight Time:	25000 hours (Total, all aircraft), 7238 hours (Total, this make and model), 10300 hours (Pilot In Command, all aircraft), 246 hours (Last 90 days, all aircraft), 68 hours (Last 30 days, all aircraft), 2 hours (Last 24 hours, all aircraft)		

Co-pilot Information

Certificate:	Airline transport; Commercial; Private	**Age:**	48,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Right
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 1 Without waivers/limitations	**Last FAA Medical Exam:**	August 1, 2006
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	October 1, 2006
Flight Time:	9958 hours (Total, all aircraft), 807 hours (Total, this make and model), 8345 hours (Pilot In Command, all aircraft), 224 hours (Last 90 days, all aircraft), 60 hours (Last 30 days, all aircraft), 2 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Boeing	**Registration:**	N24202
Model/Series:	737-824	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Transport	**Serial Number:**	30429
Landing Gear Type:	Retractable - Tricycle	**Seats:**	155
Date/Type of Last Inspection:	December 1, 2006 Continuous airworthiness	**Certified Max Gross Wt.:**	174200 lbs
Time Since Last Inspection:		**Engines:**	2 Turbo fan
Airframe Total Time:	21564 Hrs at time of accident	**Engine Manufacturer:**	CFM International
ELT:	Installed, not activated	**Engine Model/Series:**	CFM56-7
Registered Owner:	Wells Fargo Bank Northwest NA Trustee	**Rated Power:**	26300 Lbs thrust
Operator:	Continental Airlines, Inc.	**Operating Certificate(s) Held:**	Flag carrier (121)
Operator Does Business As:	Commercial Service	**Operator Designator Code:**	CALA

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Night
Observation Facility, Elevation:	COS,6184 ft msl	**Distance from Accident Site:**	
Observation Time:	16:54 Local	**Direction from Accident Site:**	
Lowest Cloud Condition:	Scattered / 12000 ft AGL	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	3 knots / None	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	60°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.71 inches Hg	**Temperature/Dew Point:**	11°C / -8°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Houston, TX (IAH)	**Type of Flight Plan Filed:**	IFR
Destination:	Portland, OR (PDX)	**Type of Clearance:**	IFR
Departure Time:	15:48 Local	**Type of Airspace:**	

Airport Information

Airport:	Colorado Springs Municipal COS	**Runway Surface Type:**	
Airport Elevation:	6184 ft msl	**Runway Surface Condition:**	
Runway Used:		**IFR Approach:**	Unknown
Runway Length/Width:		**VFR Approach/Landing:**	Unknown

Wreckage and Impact Information

Crew Injuries:	6 None	**Aircraft Damage:**	Minor
Passenger Injuries:	1 Minor, 153 None	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Minor, 159 None	**Latitude, Longitude:**	38.809165,-104.700836

Administrative Information

Investigator In Charge (IIC):	Scott, Arnold
Additional Participating Persons:	Robert P Soluren; FAA Flight Standards District Office; Denver, CO
Original Publish Date:	June 27, 2007
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=65041