Class E Cargo Compartment Smoke Detection and Active ULD Testing


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Cockpit Voice Recorder Transcript\(^1\)

2333:44 Aircraft cleared to descend from FL 330 to FL 240
2334:39 “Smell like wood burning”
2335:40 “It’s pretty strong now”
2335:54 Cockpit door opened “It’s more in the back”
2338:39 One pack turned off
2343:18 “Fume evacuation”
2343:27 Packs on max flow, recirc fan off
2347:59 Cockpit door opened again “It’s definitely stronger in the back. No haze or smoke when I shined my light back there” At FL 40
2354:42 “Cargo smoke detectors on” At FL 20
2355:48 Landing gear down
2355:57 “Lower cargo compartment aft smoke detectors on”
2359:00 Touch down
2359:02 “Smoke in cockpit”
2359:45 End of transcript. Crew evacuated through L1 door

\(^1\) Source: NTSB Accident Report
NTSB Recommendation A-07-98 to the FAA.

“Ensure that the performance requirements for smoke and fire detection systems account for the effects of cargo and cargo containers on airflow around the detection sensors and on the containment of smoke from a fire inside a container and should establish standardized methods of demonstrating compliance with those requirements. (A-07-98) “
Main Deck Airflow approximately one air change every 5.1 minutes (11.8 air changes/hour). Air from one pack supplied with APU bleed air.
4 Aspirated Photoelectric Smoke Detectors (94-96% light transmission/ft alarm point)

Certified to one minute detection time (FAR 25.858)
Federal Aviation Administration
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727 Freighter 88” cargo container positions
727 Main Deck

Detection Time (seconds)

Position

- Empty Detection Time
- Full Detection Time

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Average detection time for all positions is 20 seconds faster for the fully loaded compartment.
Ventilation airflow provided one air change approximately every 6 minutes (10 air changes per hour). Air source was 2 air conditioning packs supplied with bleed air from the APU.
2 Aspirated photoelectric smoke detectors. Calibrated to alarm at 90.6 +/- 1 percent light transmission per foot.
747SP Aft Cargo Compartment

FWD

27.5'

Air Inlet
Detector Port

Cargo Door

1L 1R
2L 2R
3L 3R
4L 4R
5L 5R

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747 Time of Initial Alarm Regardless of Duration

![Graph showing detection time for different positions in a cargo compartment.]

- Empty Detection Time
- Full Detection Time

Position:
- 1L
- 1R
- 2L
- 2R
- 3L
- 3R
- 4L
- 4R
- 5L
- 5R

Detection Time (secs): 0 to 160
747 Time of Initial Alarm Regardless of Duration

Average detection time for all positions tested is 13 seconds faster for the fully loaded compartment.
"Active" LD-3 Container. Cargo compartment air is drawn in one end of the duct and exhausted out the other end at a rate of 180 ft³/min.
Position 1L

Detection Time (secs)

- Fans 1R, 2R down
- Fans 1L, 2L up
- Fans 2L, 3L, 4L up
- No fans

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Position 3L

Detection Time (secs)
Position 4R

![Diagram showing detection time comparison for no fans vs. fans in position 4R. The chart indicates a significant reduction in detection time with fans active.](image)

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Draft report has been submitted for publishing and will be available on the Fire Safety website shortly.