NATIONAL TRANSPORTATION SAFETY BOARD
Office of Aviation Safety
Washington, DC 20594

SURVIVAL FACTORS SLIDE/RAFT TEARDOWN REPORT

April 23, 2015

I. ACCIDENT

Operator	:	Federal Express
Aircraft	:	McDonnell Douglas MD-11 [N584FE]
Location	:	St. Louis, MO
Date	:	February 24, 2015
Time	:	0616 (cst)[1]
NTSB #	:	DCA15FA073

II. SURVIVAL FACTORS GROUP

IIC	:	David Helson National Transportation Safety Board Washington, DC
Member	:	Peter Wentz National Transportation Safety Board Washington, DC
Member	:	Mike Kret Air Cruisers Company Wall Township, NJ
Member	:	Paul Lacy Air Cruisers Company Wall Township, NJ
Member	:	Eric West Federal Aviation Administration Washington, DC
Member	:	Christopher Alfano Federal Aviation Administration Westbury, NY

[1] All times are reported in central standard time unless otherwise noted.

Member	:	Ken Hysong Federal Express Company Memphis, TN
Member	:	Jim Talay Boeing Company Seal Beach, CA
Member	:	Bruce Wallace Boeing Company Seattle, WA
Member	:	John Gabriele Air Line Pilots Association Memphis, TN

III. SUMMARY

On February 24, 2015, about 0616 central standard time, a FedEx MD-11F, registration N584FE, landed at Lambert – St Louis International Airport (STL), St Louis, Missouri following automatic activation of the main deck fire suppression system. After landing, the four crewmembers deplaned through the left main cabin door using an evacuation slide. One crew member was seriously injured during the evacuation; the other three crewmembers were not injured. The flight was operating under the provisions of 14 Code of Federal Regulations (CFR) Part 121 as a cargo flight from Memphis International Airport (MEM), Memphis, Tennessee, to Minneapolis-St Paul International Airport (MSP), Minneapolis, Minnesota.

IV. DETAILS OF THE TEARDOWN

Members of the Survival Factors Group met at Air Cruisers Company in Wall Township, NJ on April 23, 2015. The group activities include a teardown of slide/raft assemblies (1L), from the Federal Express accident that occurred on February 24, 2015 in St Louis, MO.

V. SLIDE/RAFT INSPECTION

Inspection of Fed Ex Evacuation System 60289-117 serial number 0406.

1. Unit remained in its shipping box, in a quarantine area, unopened prior to inspection.

2. Carrying Case (part number 60522-101 dated 13 Dec 1995 (diagram 1).

    a. Case exterior surface overall in good condition.
        i. Minor dirt marks

ii. All interior aluminum stiffeners remained flat
iii. Zipper teeth all intact
iv. Cord loop for case closure intact
v. Grommets show normal wear – no notable damage
vi. No maintenance card found

b. Side straps
   i. Both found intact and snapped in place on top side of carrying case per installation requirement
   ii. Right (forward) side storage strap – no notable damage
   iii. Left (aft) side storage side strap
      1. This would be over the aspirator
      2. Storage strap shows visible signs of damage
         a. Drag marks across snap top
         b. Torn webbing sections
         c. Friction burn marks and melted fibers at torn edge

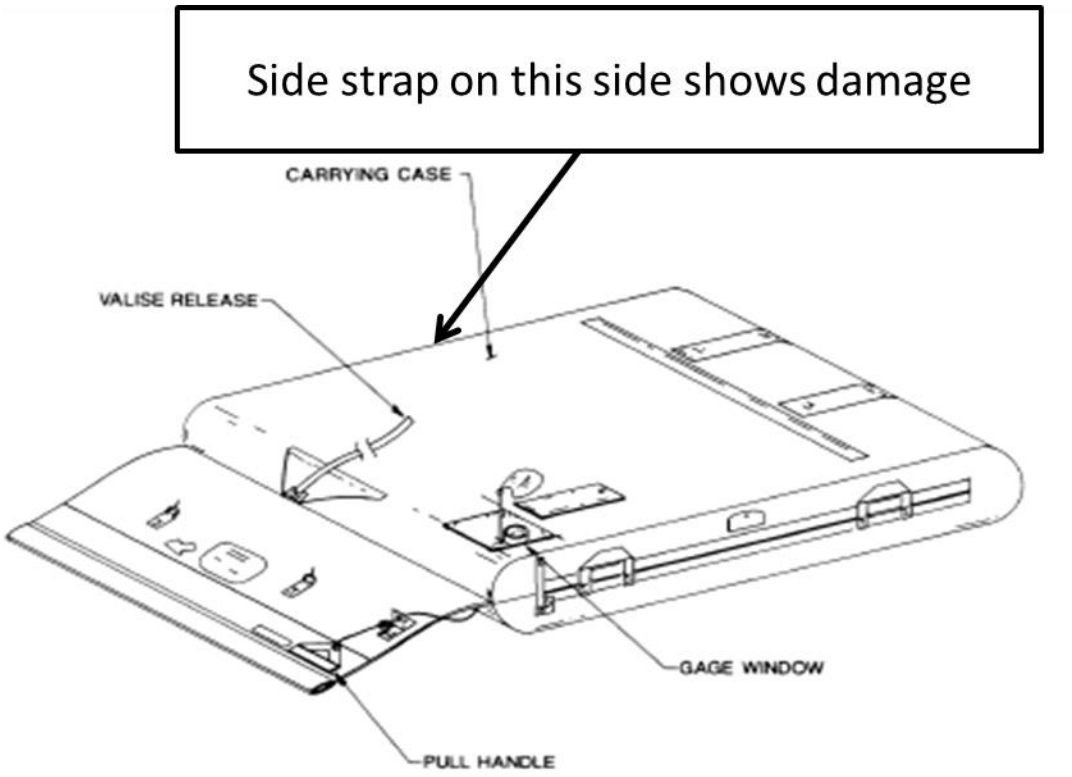


Diagram 1 - Pack slide carry case before installation.

c. Reservoir attachment straps on interior of carrying case.
    i. Both webbing straps torn apart at similar locations
    ii. abrasion marks and dirty at separation point

3. Slide/Raft system
    a. 60289-117 serial number DOM 04/1996.
    b. Last maintenance (overhaul) per grit marking: 3/2013 by Thornton Tech Corp.
    c. Next scheduled maintenance per girt marking: 3/2016.

4. Inflation Cable – P/N 60653-101
    a. Quick disconnect in place.
    b. Cable – not damaged.

5. Frangible Links

    The frangible links were found separated and indicated proper color coordination per location.

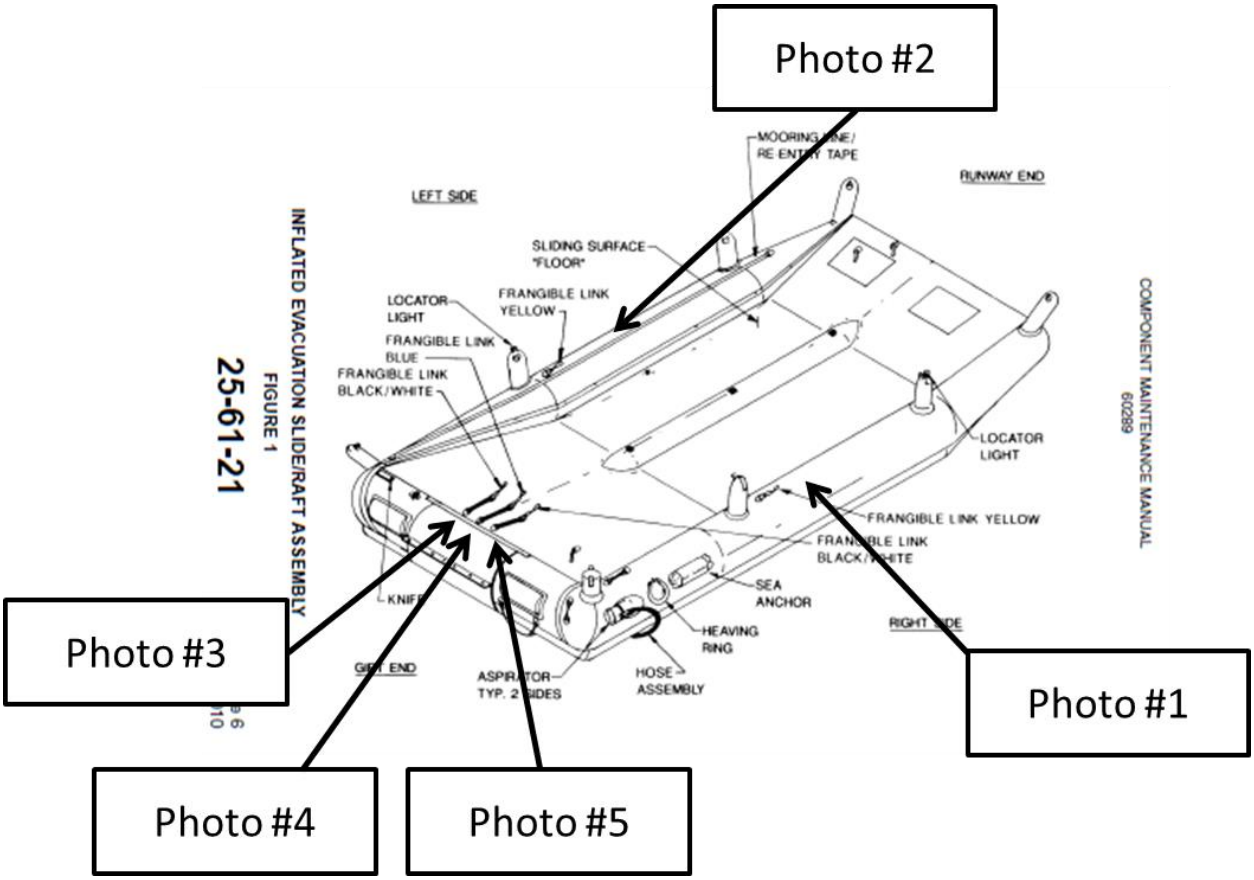


Diagram 2 - Frangible link location.

Photograph 1 - P/N C19347-102 yellow/yellow cord loops.

Photograph 2 - Yellow cord loops only.

Photograph 3 - P/N C19347-107 Lot # 14358 black/white cord loops.

Photograph 4 - One blue cord loop.

Photograph 5 -One white cord loop.

6. Inflation Hose P/N 60517-101 DOM 10/30/1992 S/N 742 mfg by Preece.
    a. Dirty abrasion marks on hose.
    b. Fold marks apparent at various sections (normal condition).
    c. Placard on hose assembly indicated last tested 2005.

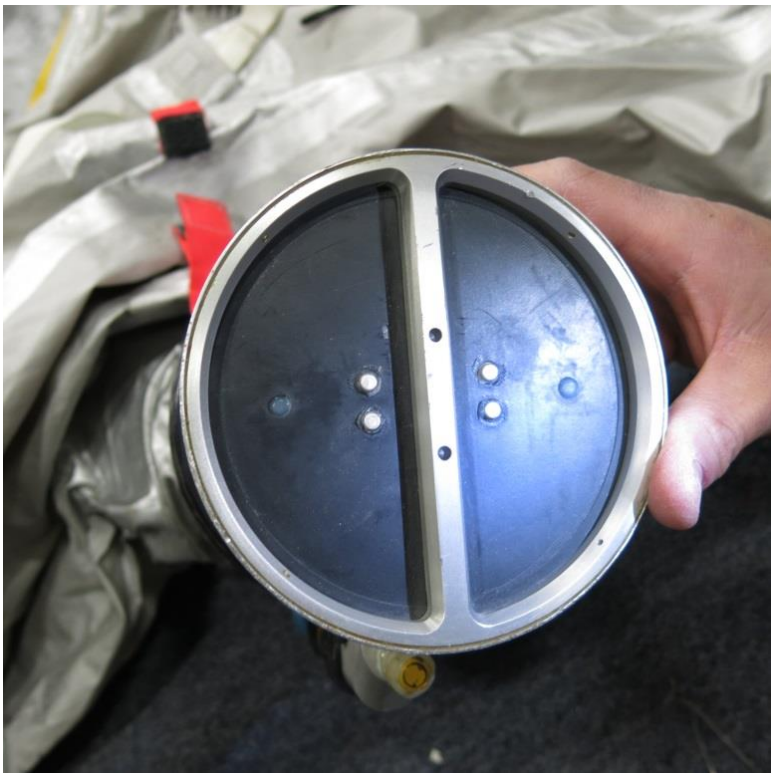
7. Reservoir and Valve Assembly installed.
    a. Sling webbing around sleeve – one of two torn apart.
    b. Sling sleeve – abrasion marks, several holes torn into fabric (photograph 6).

Photograph 6 - Reservoir sling sleeve.

8. Valve Assembly P/N60505-107 DOM 3Q1992 S/N 0337.
    a. The 7 on the dash number looks like it was changed (overstrike).
    b. Vendor part number B18157-1.
    c. Pressure gage glass – intact.
    d. Pressure gage protector (hard sleeve) – cracked.
    e. Fusible plug in place - DOM 1984 Lot #91.
    f. Cable guide appears normal.

9. Reservoir
    a. PMA by Aethra Aviation Technologies – 635 cubic inch volume.
    b. Carbon fiber.
    c. Surface scuffs – match sling damage.

10. Left side aspirator, (aircraft aft side) – for lower chamber of inflatable (photograph 7).



Photograph 7 - Left side aspirator.

a. P/N 61852-101 S/N C1590.
b. Housing P/N D17878-107.
c. Interior nozzle array – good condition.
d. Aspirator tube concentric.
e. Two tracks/scratches down inside of aspirator mixing tube, starting from inlet housing junction to outlet.
f. Inlet ring has ‘dings’.
g. Scuff/drag marks on inlet ring outer edge.
h. Elbow (tape) shows abrasion marks.
i. Flappers – no apparent damage.
    i. Wired open – some wire damage noted
    ii. Operation appears ok
j. Check valve flow direction correct.

11. Right side aspirator – for upper chamber of inflatable (photograph 8).

Photograph 8 - Right side aspirator.

a. P/N 61852-101 S/N C1599 date code 524.
b. Interior nozzle array – good condition.
c. Aspirator tube concentric.
d. Inlet ring has ‘dings’ – not as much as the left side aspirator.
e. Scuff/drag marks on inlet ring outer edge – not as bad as left side aspirator.
f. Flappers – no apparent damage.
    i. Wired open – some wire damage noted
    ii. Operation appears ok

12. Pressure Relief Valves.
    a. 64154-5 Rev E 300067 on the upper tube
    b. 64154-5 Rev E 302077 on the lower tube
    c. Both screwed in tight

13. Power Units for slide lighting.
    a. Activation lanyard still in place on both batteries.

14. Unit partially inflated to form shape with compressed air.
    a. No apparent leaks.

b. No unusual damage found.
c. Lights activated upon lower chamber inflation.
d. Re-Entry / mooring lines not routed correctly.
    i. Loose section in the left side middle of the inflatable
    ii. No discoloration or marks that would indicate ingestion into aspirator

15. Reservoir and valve assembly pressurized and leak checked with leak detection fluid.
    a. Recharged per CMM.
    b. no leakage found.

16. Reservoir and valve assembly reinstalled and flat fire inflation performed successfully (photograph 9).
    a. 2.54 psi upper tube.
    b. 2.43 psi lower tube.
    c. No obvious leak detected on either chamber.

Photograph 9 -Slide/raft after flat fire test.

17. Valve regulator calibration check.
    a. 497 psi peak value recorded.
    b. CMM requirement is 550 psi (+-50) (diagram 3).

c. Pressure warning light switch (press to test) functionally tested no fault found demonstrating gauge switch operated normally.
d. Hose assembly was hydro tested in accordance with the CMM at 900 psi and found no leaks or deformation.

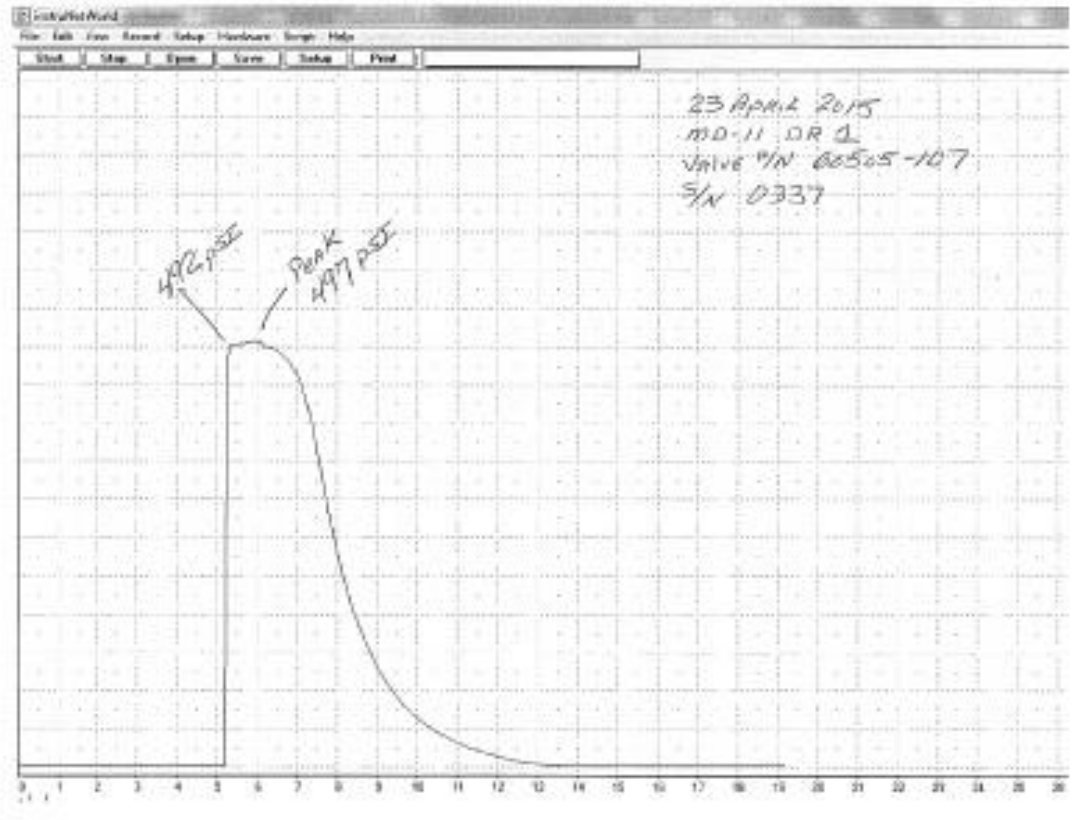


Diagram 3 - Regulator output pressure trace.