



BCA Aviation Safety

National Airlines 747BCF
NAL 102 - Accident
Bagram, Afghanistan
April 29, 2013

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Air Safety Investigation
Boeing Commercial Airplanes

25/26 June 2015

Agenda

- Summary of Event
- Military Vehicles Loaded
- Crash Site Description
- Findings
 - Wreckage
 - Analysis

747-400BCF

Originally Delivered 2/10/1993

BCF Conversion 11/29/2007

National Airline Acquisition 9/02/2010

74,216 Hours 10,018 Cycles



Accident Summary

- April 29, 2013
- National Airlines
- Boeing 747-400 BCF
- 4 crew, 2 mechanics, 1 loadmaster
- Bagram Airfield to Dubai
- Loss of control moments after takeoff
- NTSB led investigation (delegated)

Camp Bastion-Bagram - Dubai



Military Vehicles on NAC 102



M-ATV 28,000 Lbs (approx 12,000 Kg)– Single 96" X 238" pallet



Cougar 40,000 Lbs (approx 18,000 Kg) – Double 96" X 238" pallet



First time NAC transported 18Ton Cougars

M-ATV & Cougar Loaded On Pallet



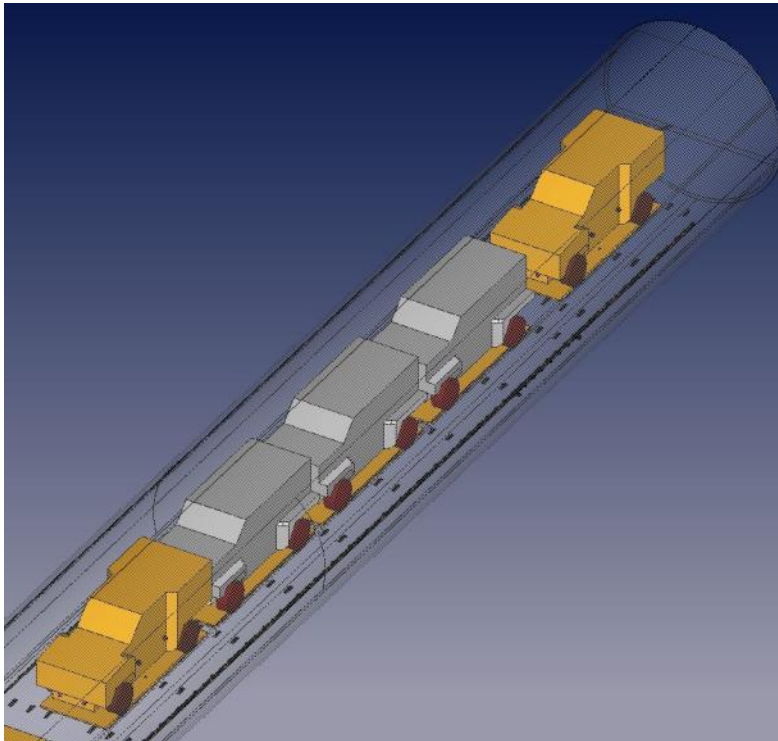
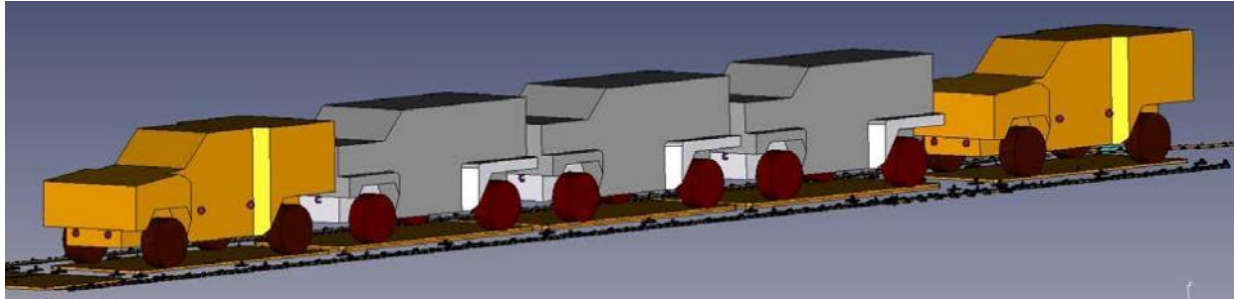
Single pallet – 107 inches high



Double pallet – 121 inches high

Vehicles were shored and chained to the pallet(s) - then loaded onto ball mats and pushed into the center position on the main deck.

M-ATV & Cougar Loaded On the Main Deck



Loaded in the center position

Pallet/floor locks can't be utilized in center position – pallets float

5000 pound straps used to secure

National typically used procedures from their Cargo Operations Manual to secure the load

Exemplar Tied Down – Not Accident Airplane



Dash Cam Video



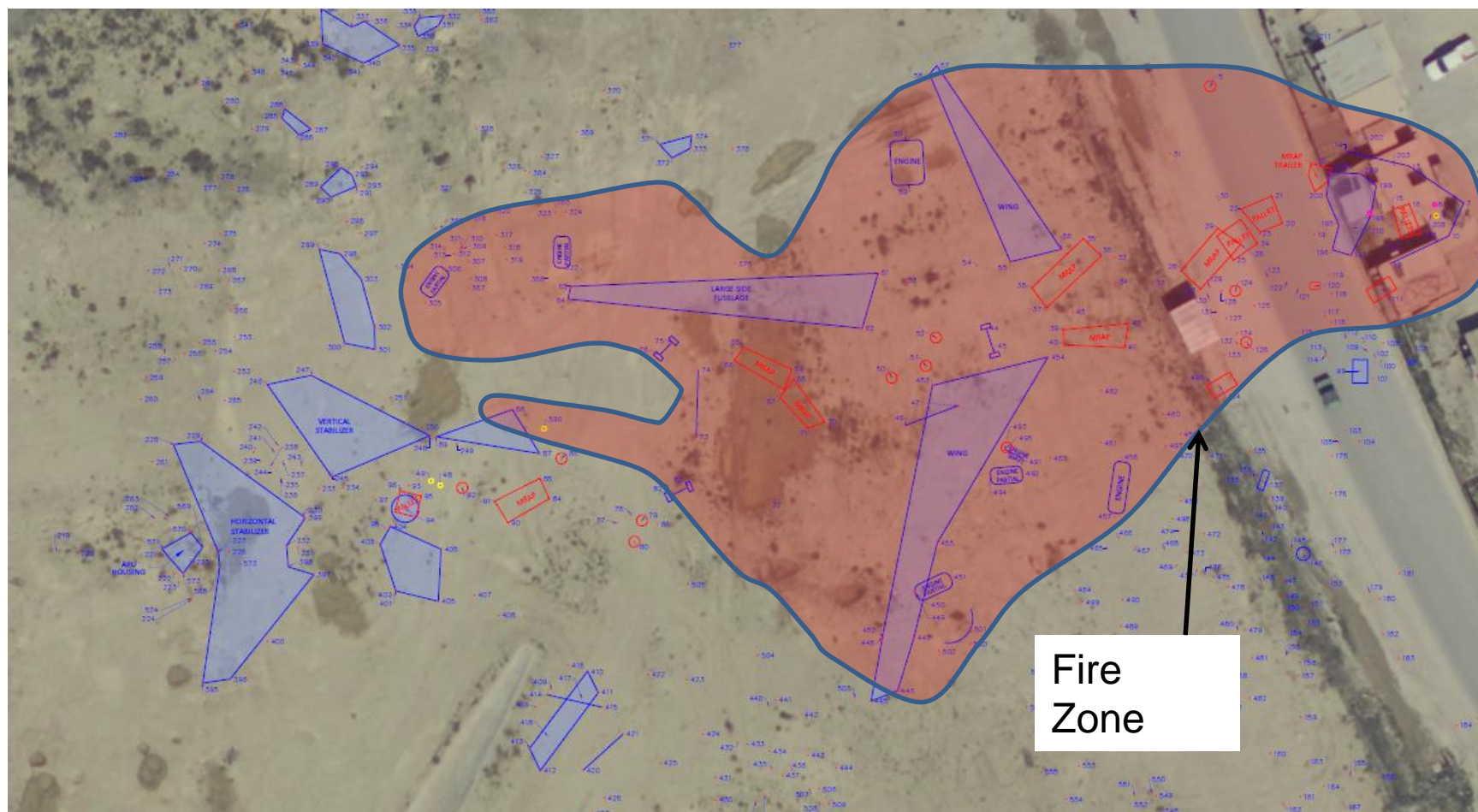
Wreckage Location



Aerial View



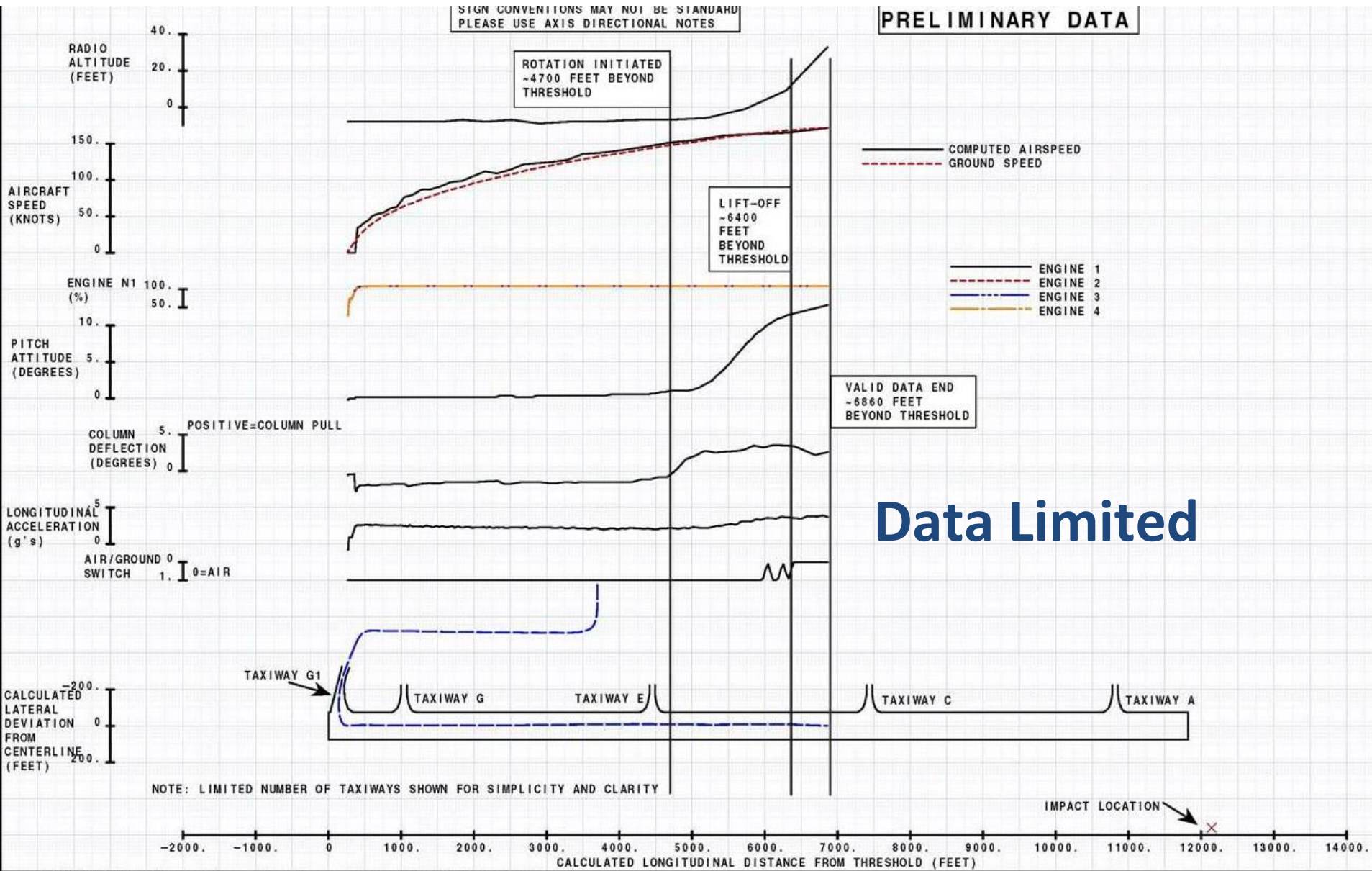
Main Wreckage Field



Findings

- FDR and CVR
- Aft M-ATV
- Parts found near liftoff
- Video/image study
- Simulations

FDR

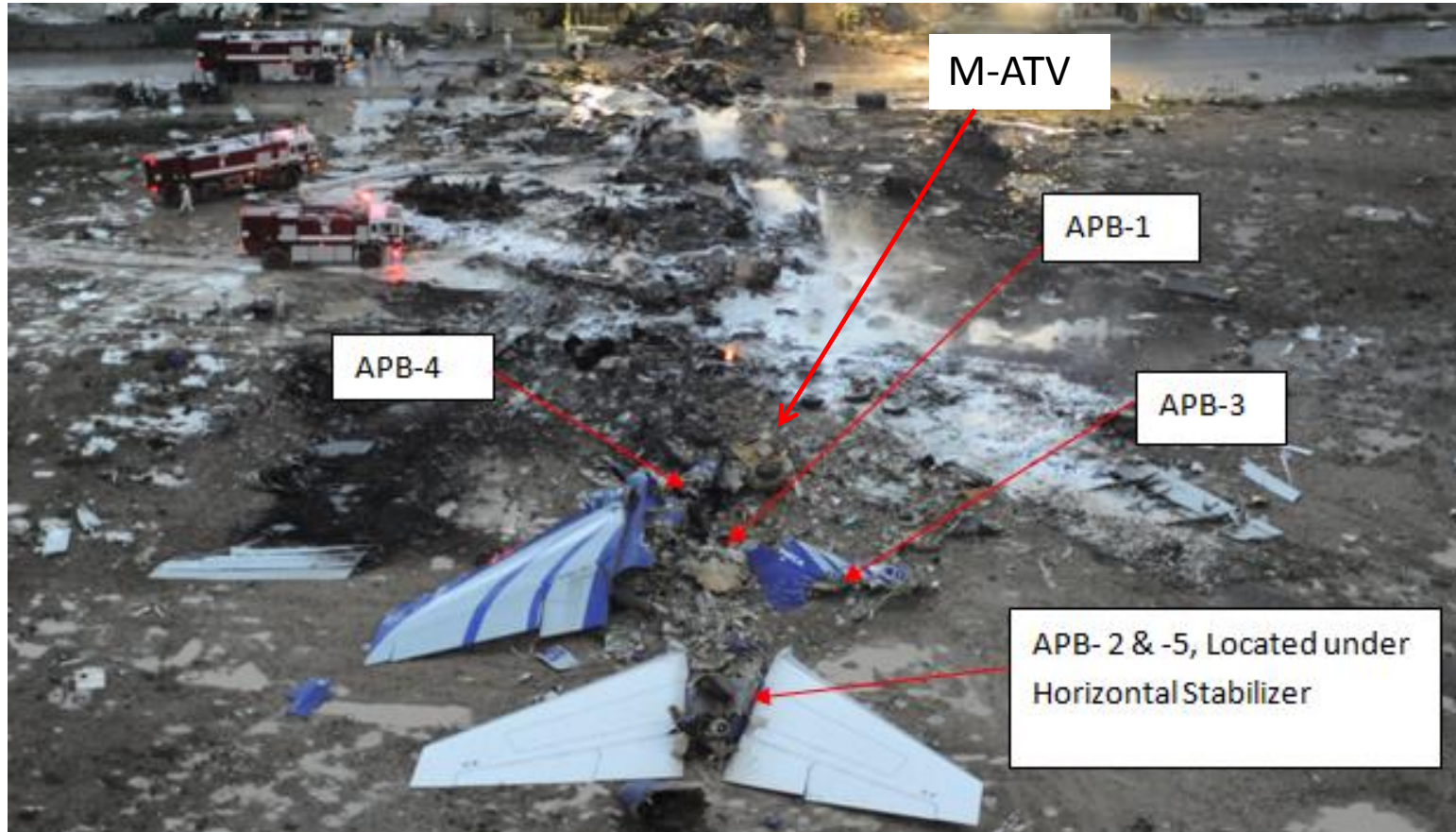


CVR

- During turn at Bagram the crew discussed the following:
 - Brake overtemp during landing
 - A load shift involving one or more MRAPs.
 - Straps securing aft were loose
 - A broken strap (involving a knot)
 - Replacing the broken strap
 - “Cinching down” the loose straps
- CVR and FDR both stop within seconds of liftoff (both are located in E8 cabinet)



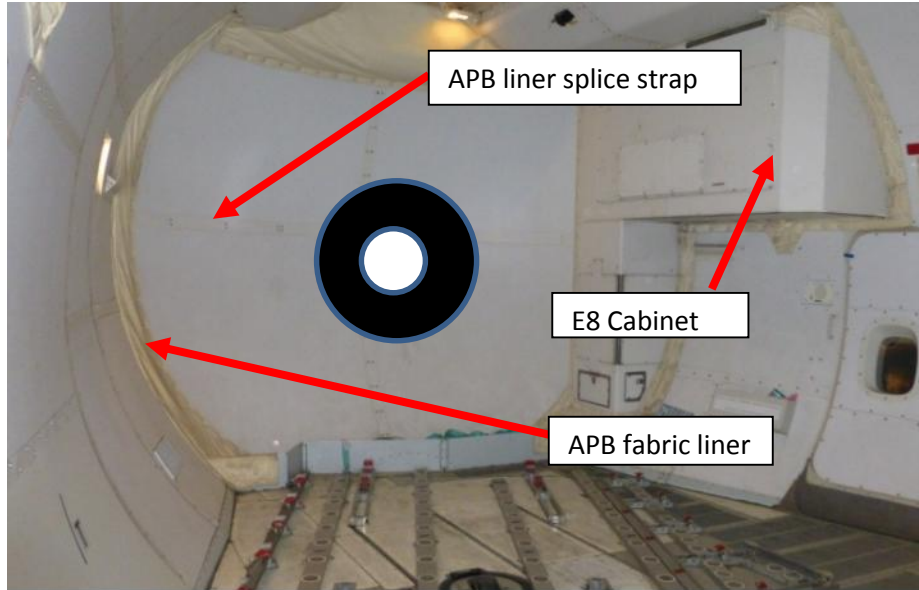
Location of AFT M-ATV



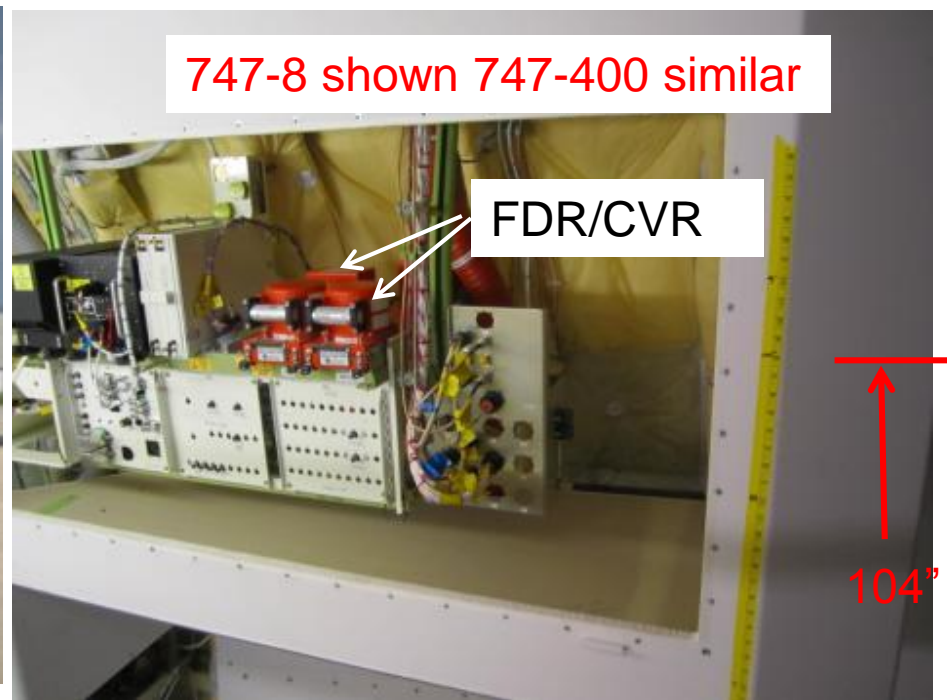
Loose M-ATV



Spare Tire Imprint On APB Liner



- Tire print found on APB liner match tire on aft M-ATV
- APB liner splice strap and fabric liner found trapped in aft M-ATV



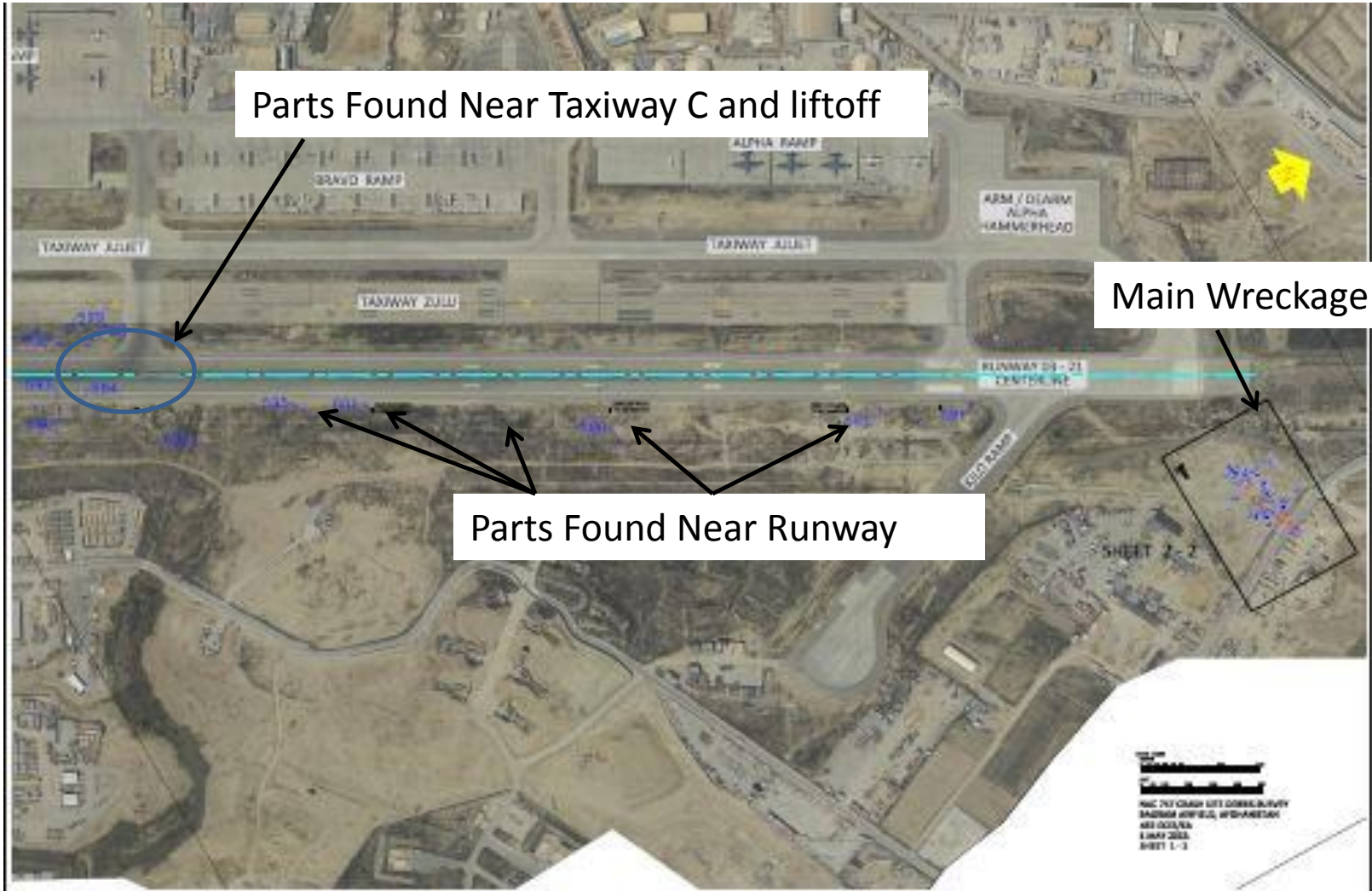
747-8 shown 747-400 similar

FDR/CVR

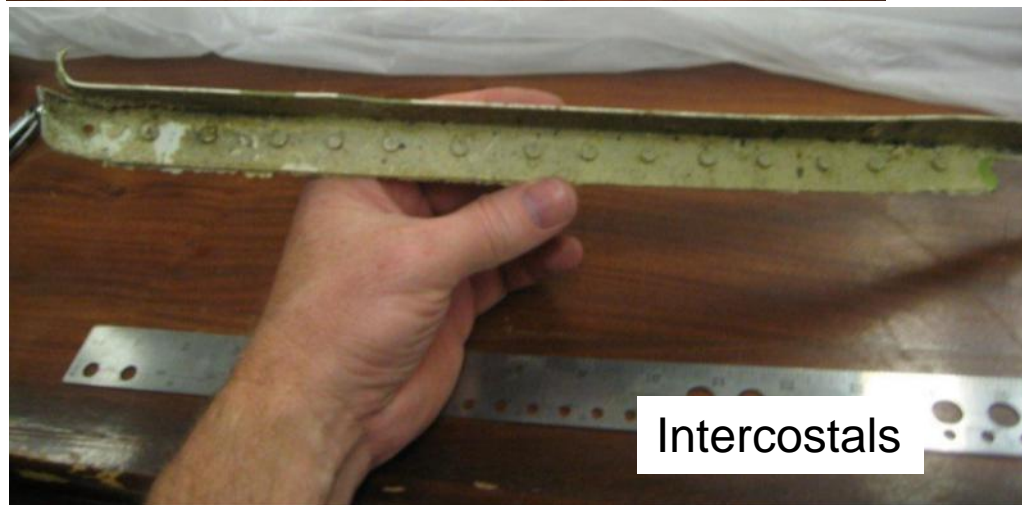
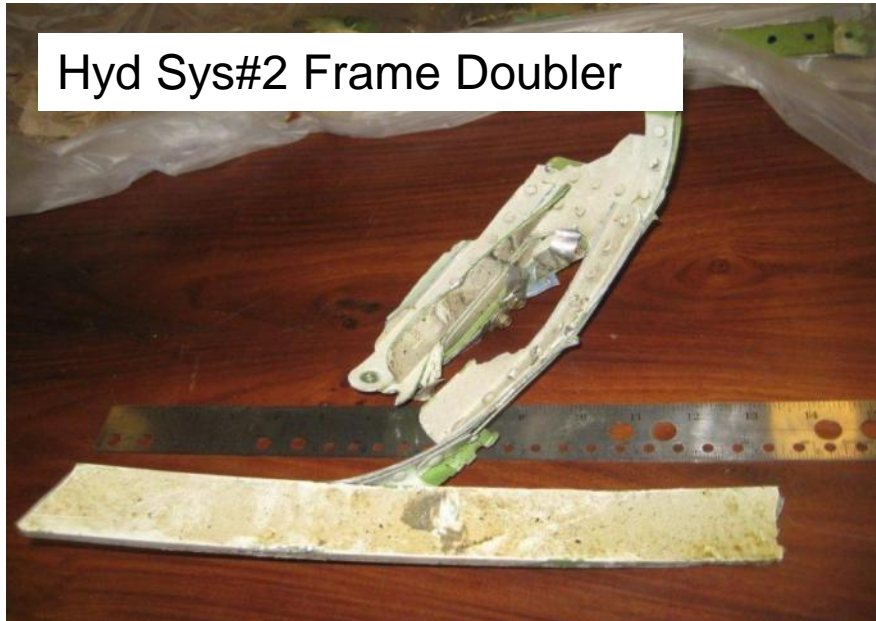
104"

- Orange paint similar in color matches paint transfer on aft M-ATV
- Height of transfer matches height of FDR and CVR in the E8 cabinet.

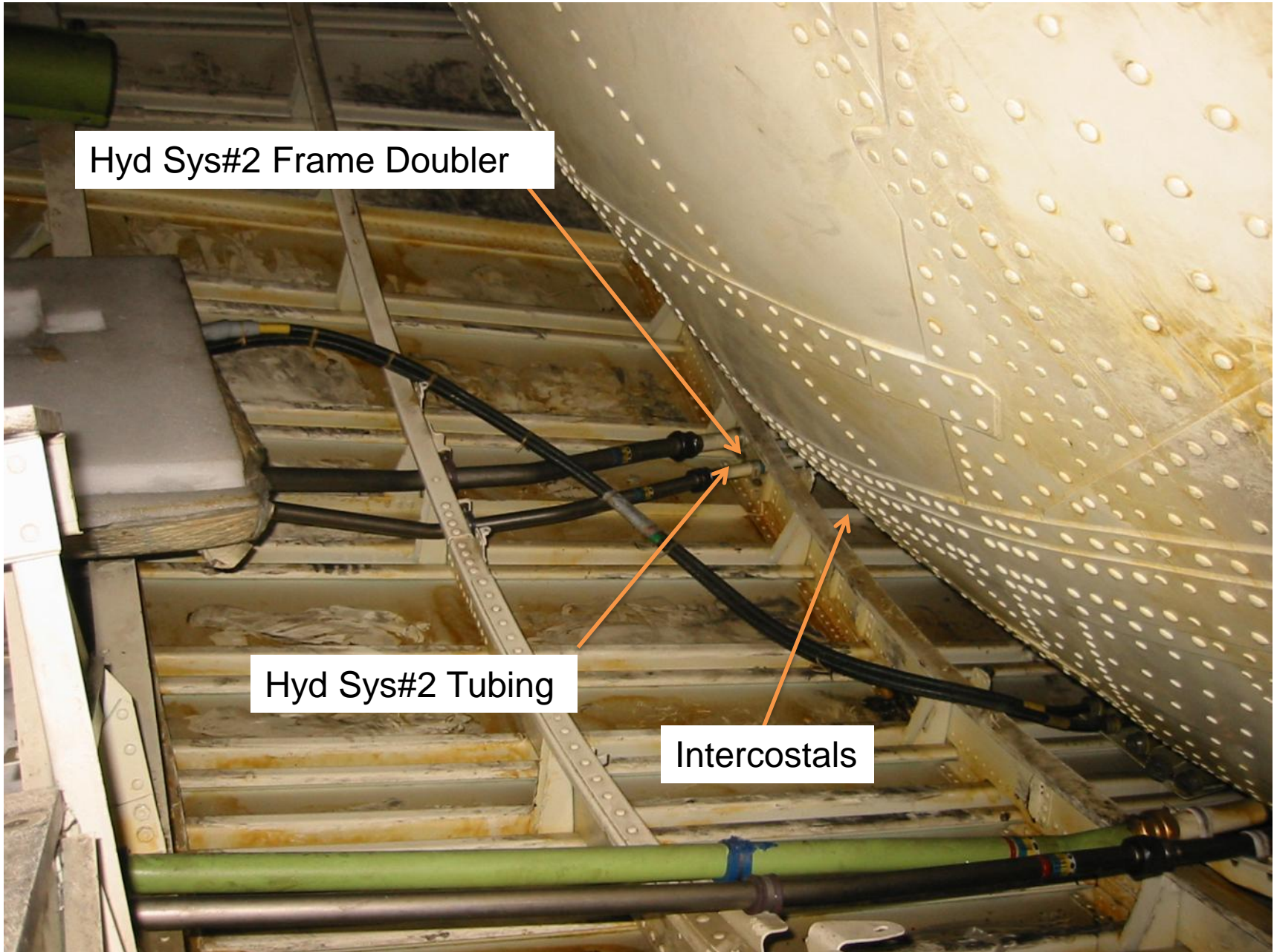
Wreckage Location



Parts Found Near Runway



- Tubing found from Hydraulic Sys #2
- Structure from same area found

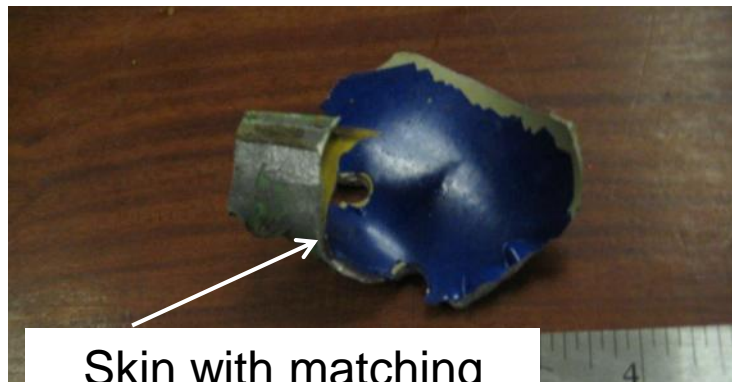


Hyd Sys#2 Frame Doubler

Hyd Sys#2 Tubing

Intercostals

Other Parts Found Next to Runway



Skin with matching blue paint



Stanchion from E8 cabinet



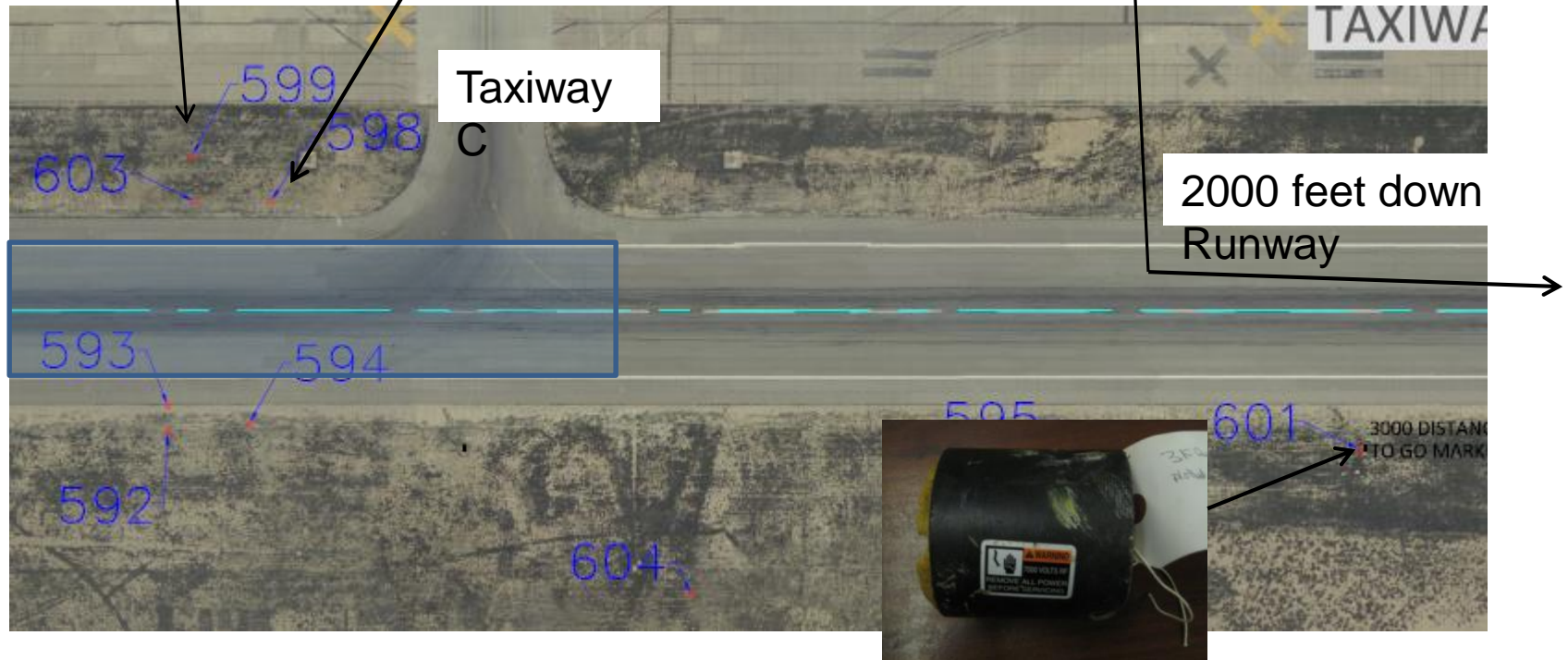
APB liner piece



Antennae part – missing on aft M-ATV



Findings Support At Least One MRAP Loose



Video - Gear Position Hyd Sys#1 Failed

ECP10 29 April 2013

Nose Gear Hyd - Sys #1 Failed
Body Gear Hyd - Sys #1 Failed
Wing Gear Hyd - Sys #4 Ok

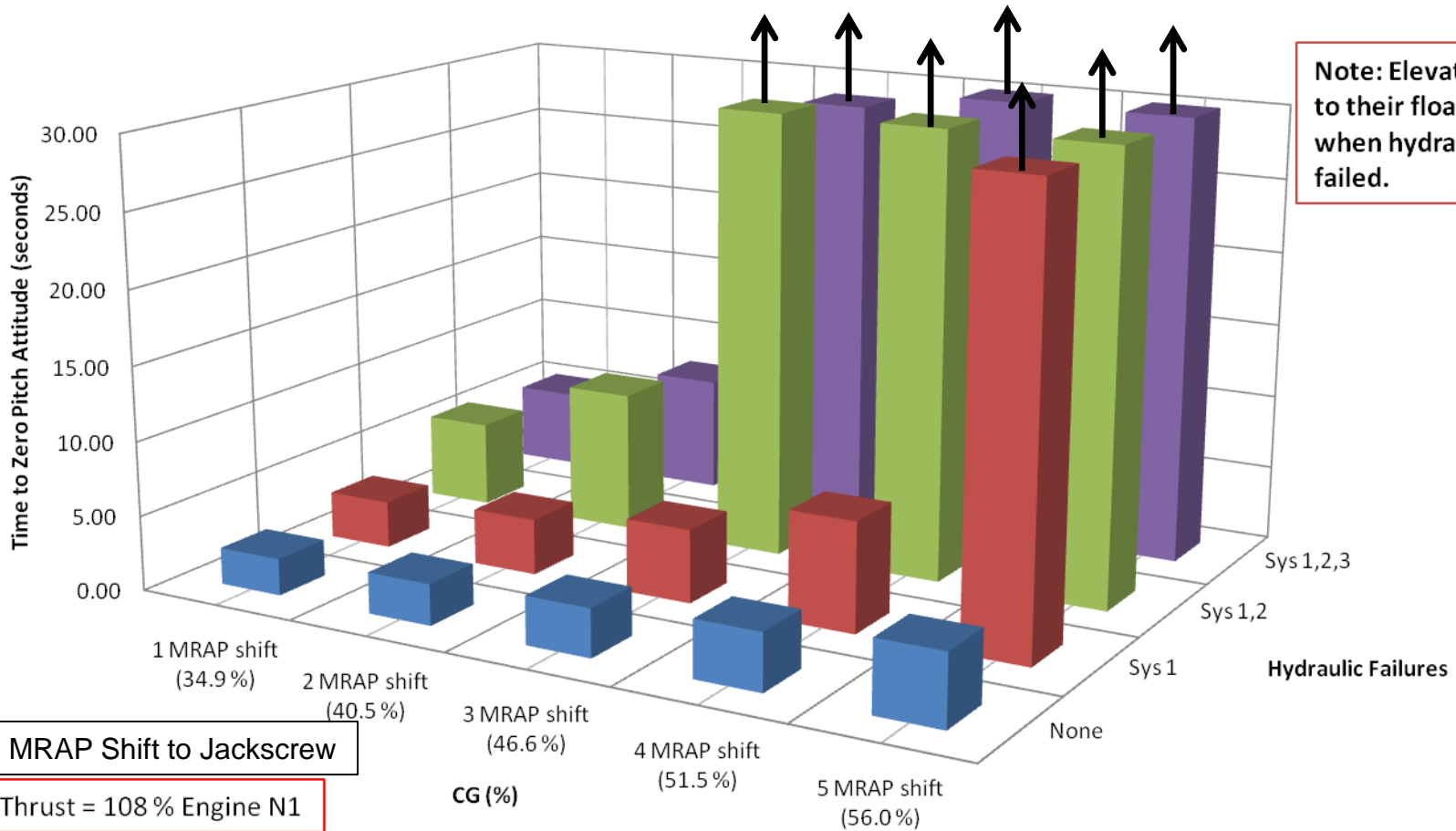
Nose Gear

Body Main Gear

9:22 AM
5/8/2013

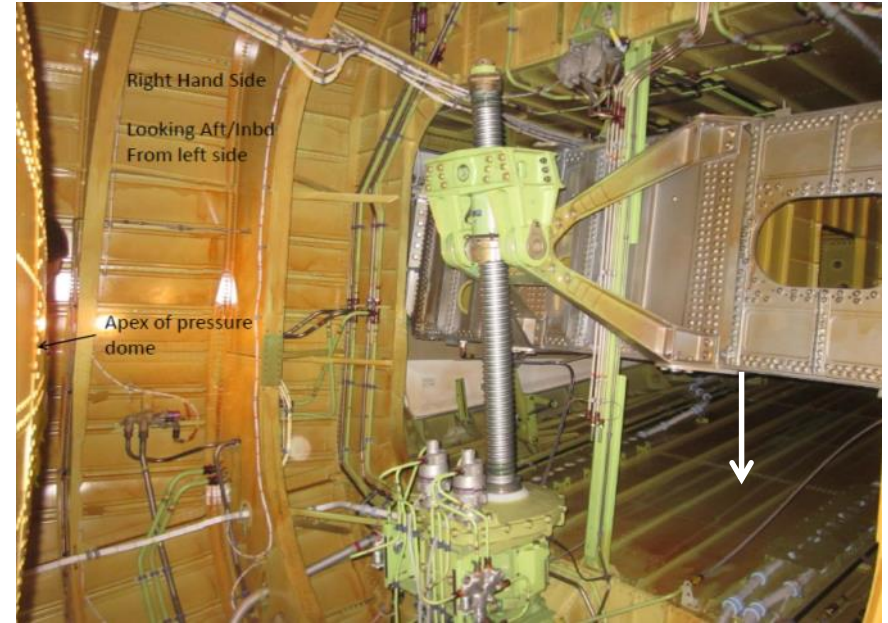
The image displays a video player interface. At the top, the title 'Video - Gear Position Hyd Sys#1 Failed' is shown. Below the title, the video player shows a timestamp 'ECP10 29 April 2013'. The main video frame shows an aircraft in flight over an airfield. Three text boxes on the left list gear status: 'Nose Gear Hyd - Sys #1 Failed', 'Body Gear Hyd - Sys #1 Failed', and 'Wing Gear Hyd - Sys #4 Ok'. Two blue arrows point from the text 'Nose Gear' and 'Body Main Gear' to the respective gear locations on the aircraft. At the bottom of the video player, there are two inset images. The left inset shows a close-up of a gear component with a red arrow pointing to a specific part. The right inset shows a close-up of a damaged gear component with a red arrow pointing to a specific part. The video player controls are visible at the bottom, including a play button and a progress bar. The system tray at the bottom right shows the time '9:22 AM' and the date '5/8/2013'.

Simulation Scenario Results (Max Thrust, MRAP Shift to Jackscrew)



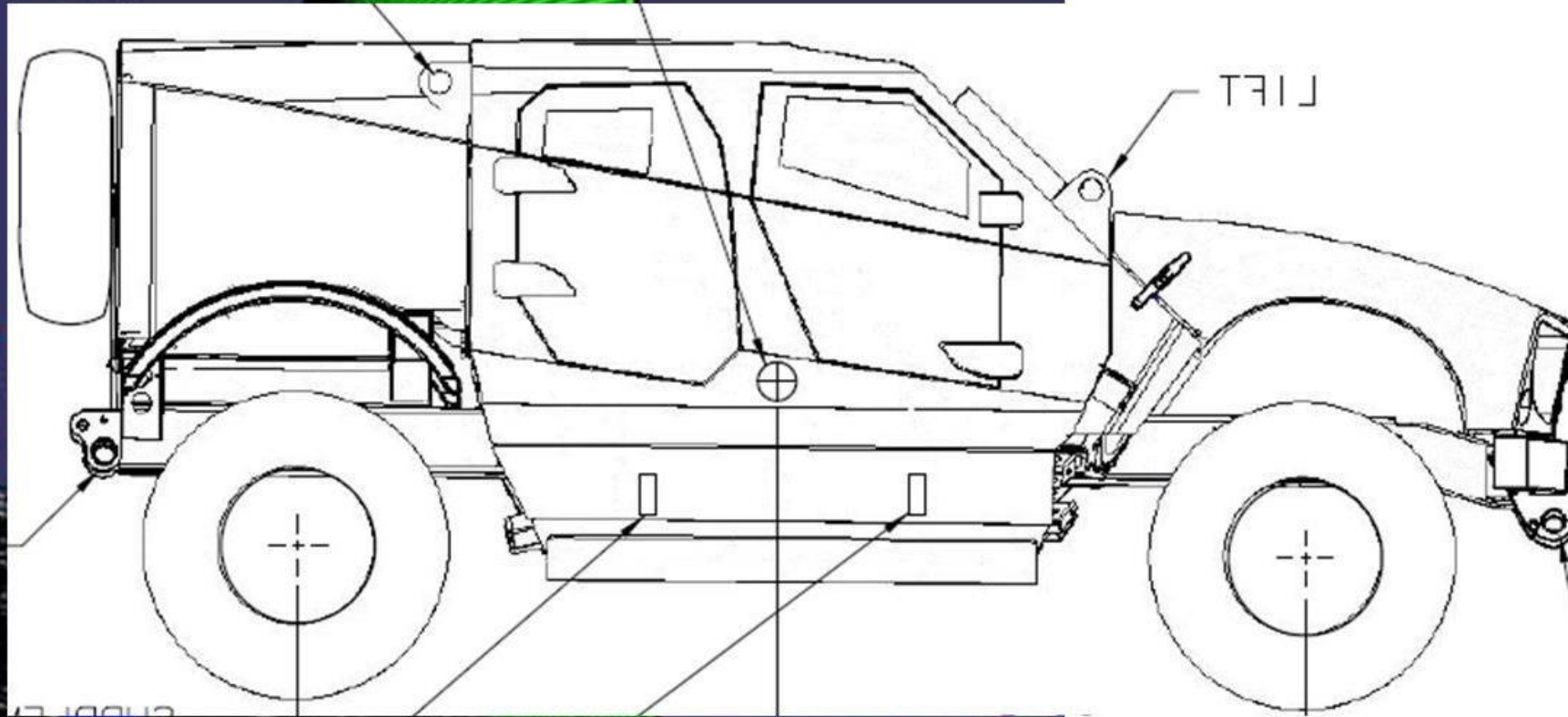
	1 MRAP shift (34.9%)	2 MRAP shift (40.5%)	3 MRAP shift (46.6%)	4 MRAP shift (51.5%)	5 MRAP shift (56.0%)
None	2.46	2.75	3.22	3.81	4.76
Sys 1	3.14	3.74	4.92	7.36	30.00
Sys 1,2	5.73	9.46	30.00	30.00	30.00
Sys 1,2,3	5.24	7.76	28.77	30.00	30.00

Horizontal Stabilizer Jackscrew



- Jackscrew severed sometime during event
- For loss of pitch control, the Horizontal Stabilizer would need to be displaced downward (with Hyd Sys #1 and #2 failed)
 - 16 inches with one MRAP shifted aft
 - 10 inches with two MRAP's shifted aft

M-ATV to Airplane - Size Comparison Only



Cargo Tie Downs

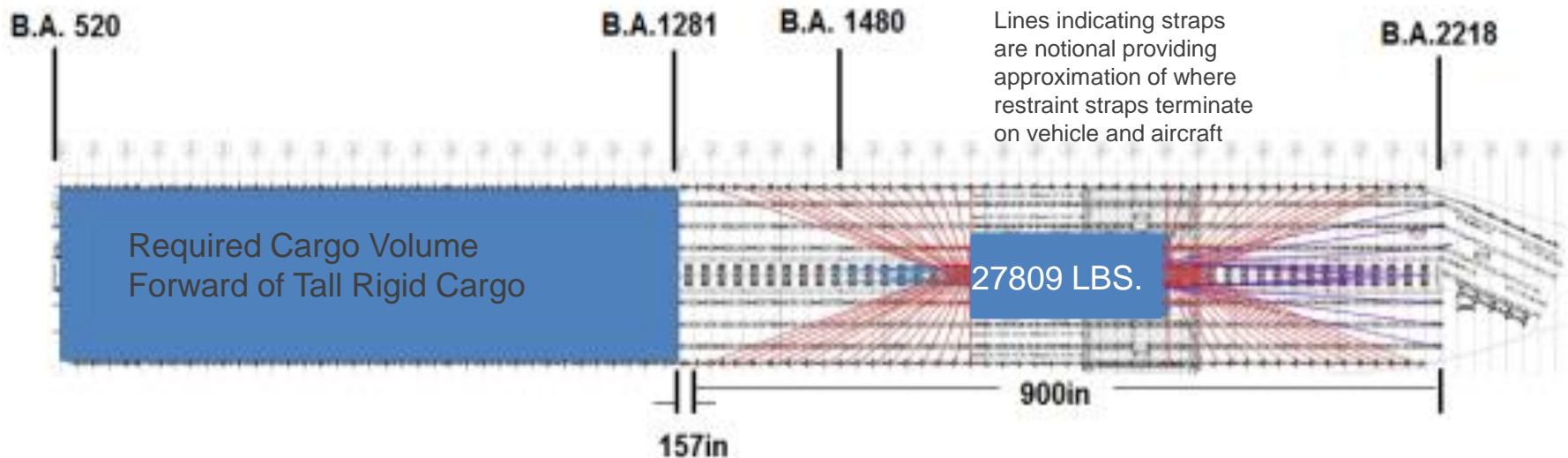
	Straps to secure one M- ATV	Straps to secure one Cougar
Accident Airplane	24*	26*
National Cargo Operations Manual**	32**	44-46**
Boeing WBM	60	Unk

* Information from Interviews

**As performed by National's Loadmaster

Cargo Tie Down

- Per the Boeing and Telair Weight and Balance Manuals, only one M-ATV can be tied down
- 60 straps would be required to restrain the M-ATV using the approved vehicle attach points



Seat Tracks



Issues found with Cargo Operations Manual

- Does not recognize load restrictions at airplane seat tracks attach points taking strap angles into account
- Assumes that the straps are limiting factor
- Does not recognize which airplane seat tracks cannot be used
- The running load limit for the center position is incorrectly represented

Findings Summary

- At least one MRAP become loose (aft most M-ATV) and caused severe airplane damage
 - Hydraulic Systems #1 and #2 failed
 - Hydraulic Systems #4 working, #3 unknown
 - E8 Cabinet
 - APB
 - Horizontal Stab Jackscrew??
- WBM's and NAL COM not followed
- Deficiencies in the NAL COM found

NTSB Activities

- Open Docket (investigation material available)
- Sunshine Meeting 14-July
- Final report will follow





Thank You!!

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