Survivability Notes

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I. ACCIDENT INFORMATION:

NTSB ID: CEN19FA185
Location: Brainerd, MN
Aircraft: Agusta A109S
Tail number: N11NM
Accident date: June 28, 2019 0041 CDT
Injuries: 2 fatal (Pilot/ Passenger), 1 serious (Passenger)

II. SUMMARY:

No one from the FAA's Civil Aerospace Medical Institute (CAMI) launched on this accident, representatives National Transportation Safety Board traveled to the scene and collected on site photos.

III. CONFIGURATION:

There were three occupants inside of the helicopter at the time of the accident. A pilot, located in the in the front right seat, passenger located in the front left seat, and a passenger in the aft right seat in the aircraft.

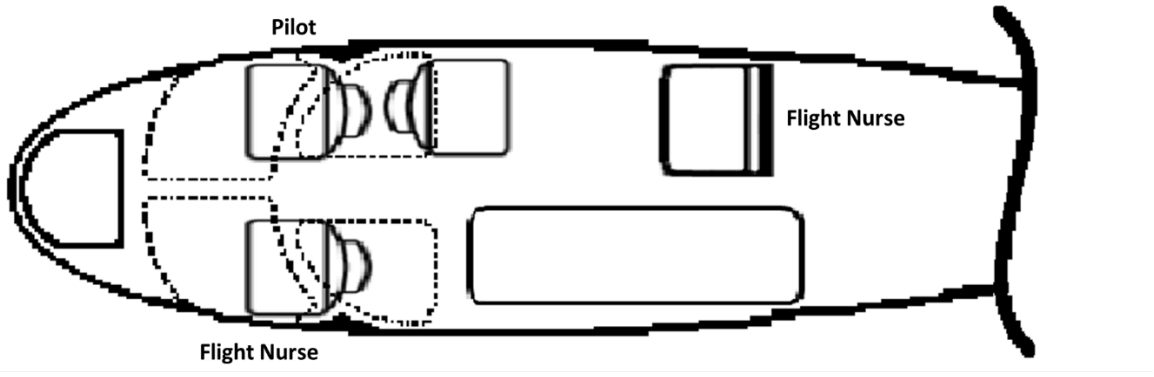
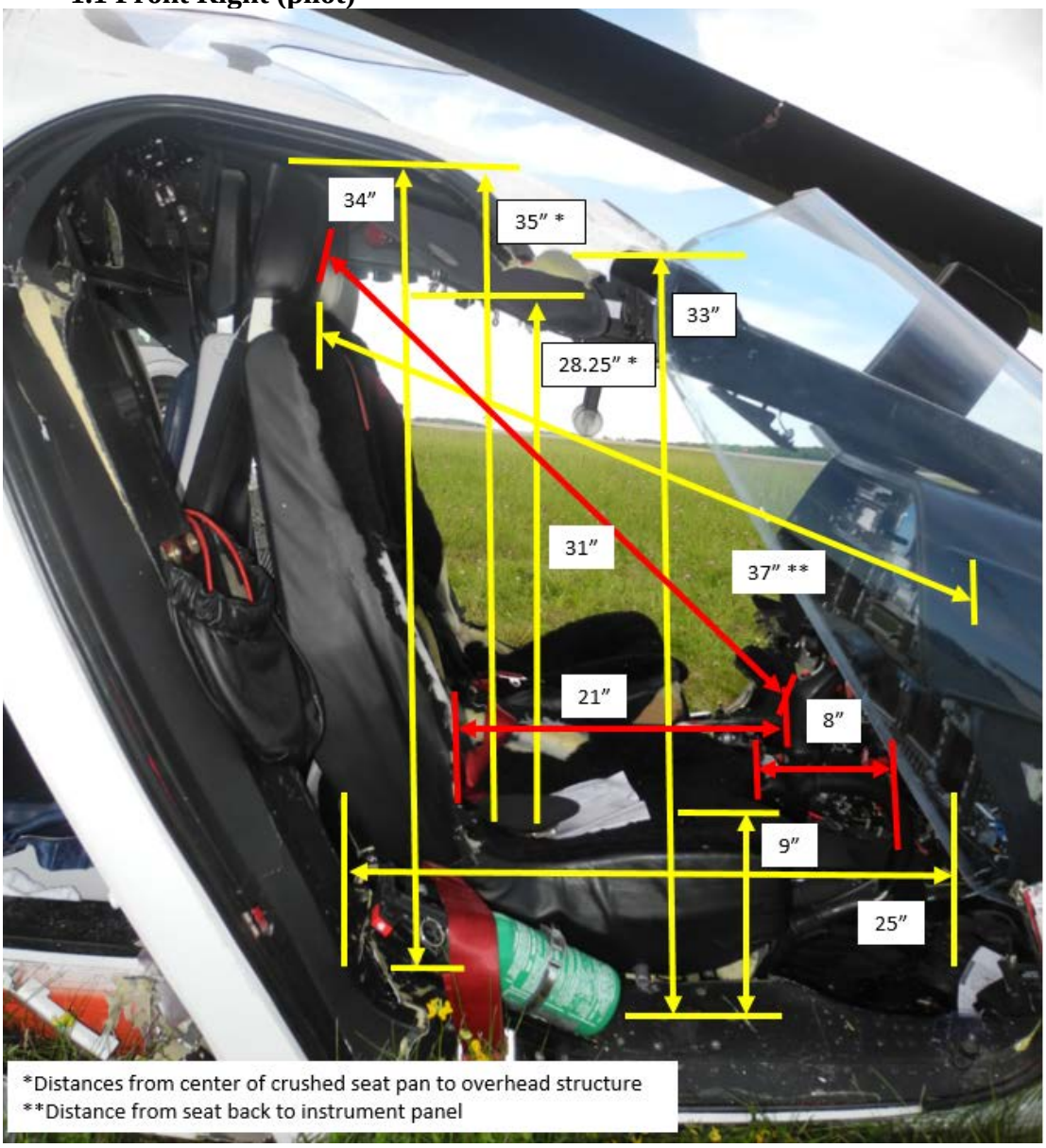


Figure 1 – Helicopter Seat Configuration

IV. SEATS, RESTRAINTS, AND HELMETS:

1.0 Seats

1.1 Front Right (pilot)



Photograph 1 - Pilot Seat Structural Measurements (Side View)

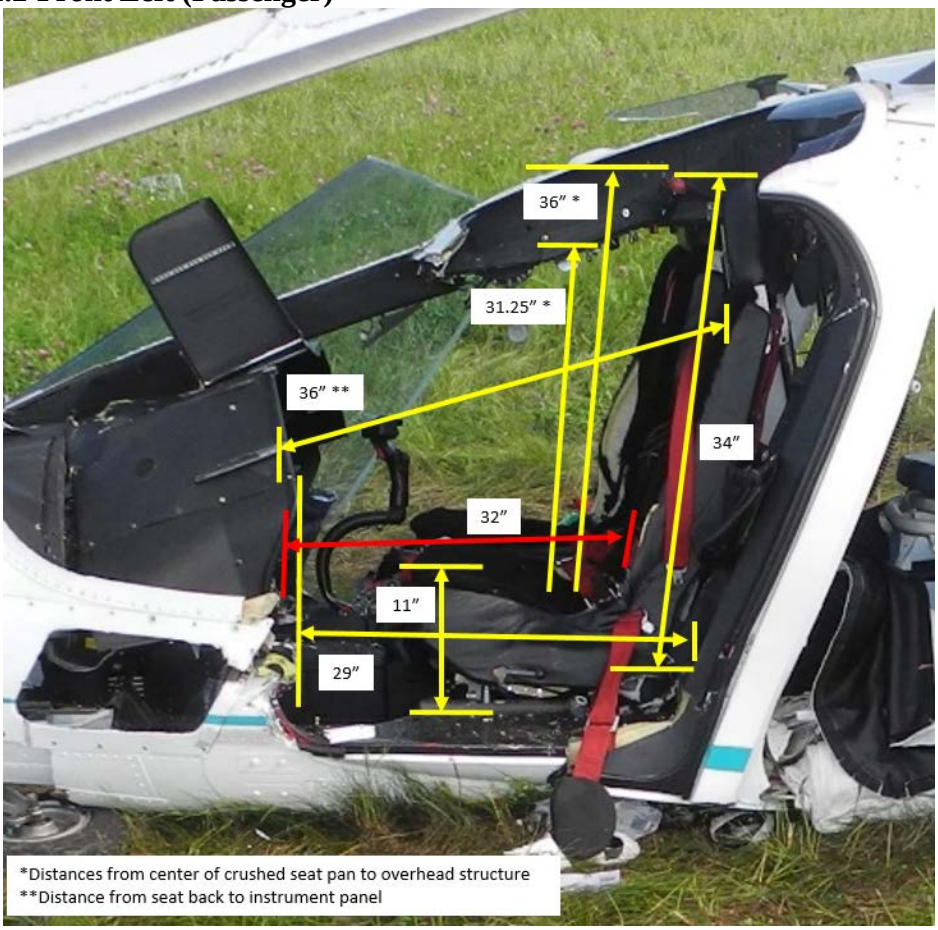
The pilot seat was located on the right side of the cockpit, it is an Agusta seat P/N 109-0700V07-105 and attaches via a seat track to a boxed structure integrated into the aircraft it was still attached to this structure on both sides, and the seat pan crushed downwards.

Distances are:

- Headrest to Cyclic Grip – 31”

- Seatback (Lumbar) to Cyclic Grip – 21”
- Front edge of seat to Cyclic Tube – 8”
- Aft door frame to windscreen – 25”
- Top of door frame to top of seat - 9”
- Seat back to instrument panel – 37”
- Center of crushed seat pan to overhead instrument panel – 28.25”
- Center of crushed seat pan to greenhouse glass – 35”
- Top of door frame structure to greenhouse glass – 34”
- Top of door frame to upper edge of windscreen – 33”

1.2 Front Left (Passenger)



Photograph 2 – Front Left Passenger Seat Structural Measurements (Side View)

The passenger seat was located on the left side of the cockpit, it is an Agusta seat P/N 109-0700V07-105 and attaches via a seat track to a boxed structure integrated into

the aircraft it was still attached to this structure on both sides, and the seat pan crushed downwards. The seat place had no cyclic or collective controls installed.

Distances are:

- Seatback (Lumbar) to front of dash – 32”
- Seat back to instrument panel – 36”
- Center of crushed seat pan to overhead instrument panel – 31.25”
- Top of door frame to top of seat - 11”
- Aft door frame to front door frame – 29”
- Top of door frame structure to overhead structure – 34”
- Center of crushed seat pan to greenhouse glass – 36”

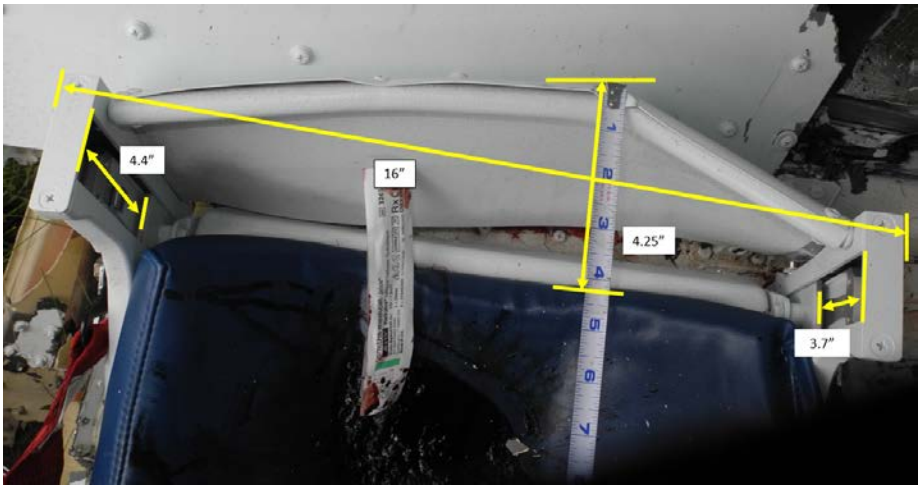
1.3 Aft Rear-Facing Seat (Unoccupied)

Photograph 3 – Aft Rear-Facing Seat

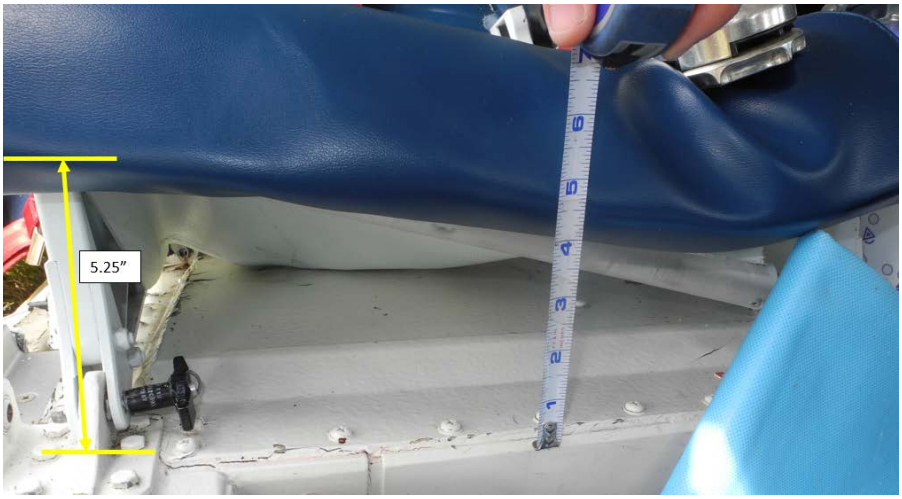
The aft rear-facing seat is located on the right side of the aircraft directly behind the pilot seat, and is still attached to the floor; this seat was unoccupied at the time of the accident. This seat has the ability to swivel to allow access to the patient during flight.

1.4 Aft Forward Facing Passenger Seat (Flight Nurse)

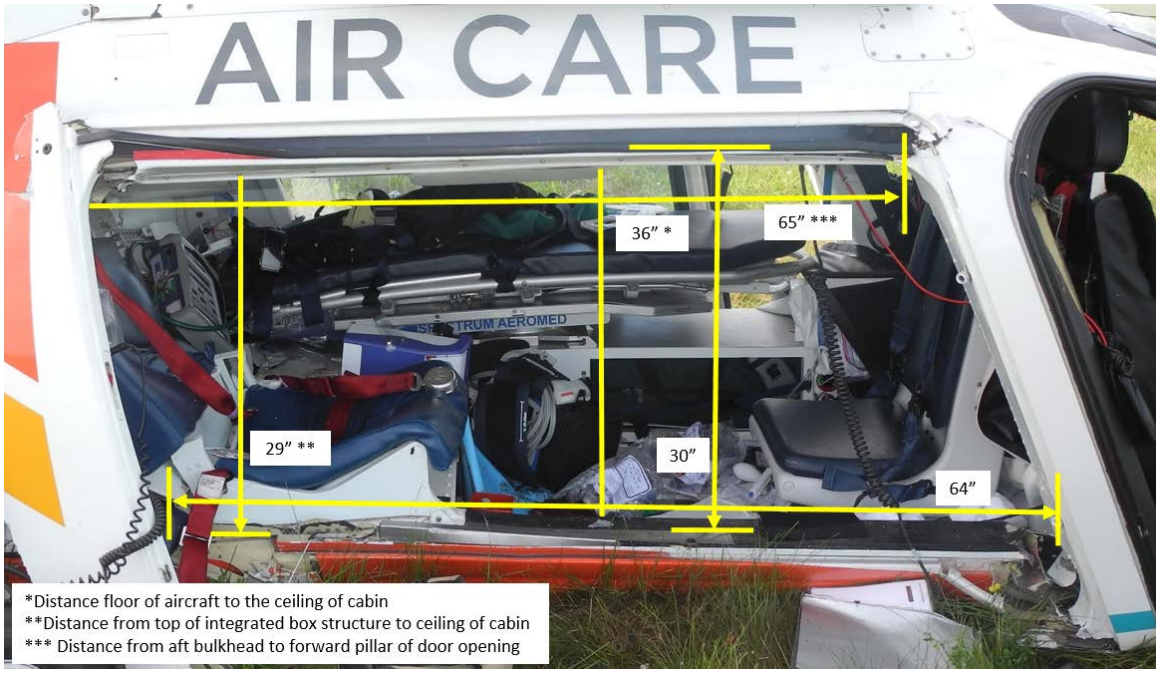
Photograph 4 – Aft Forward Facing Passenger Seat



Photograph 5 – Overhead View and Deformation Measurements of Aft Forward Facing Seat



Photograph 6 – Front View and Deformation Measurements of Aft Forward Facing Seat



Photograph 7 – Right Side Cabin Structure Measurements

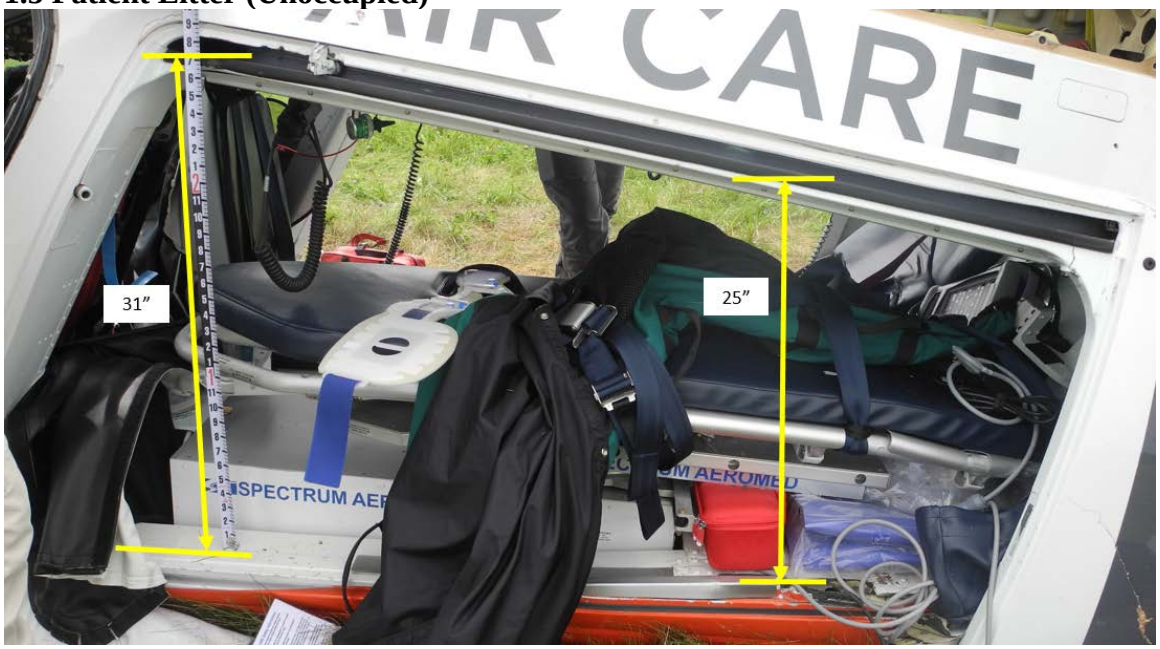
The aft forward facing seat is a forward facing structure-mounted seat located on the right side of the aircraft against the aft bulkhead. It is an Agusta seat P/N 109-0700V07-106, and is secured to a boxed structure integrated into the aircraft structure in the aft part of the aircraft cabin, with the seat back cushion secured to the aft bulkhead;

this is shown in Photograph 5. The seat rear support portions stroked downward, and the front left attachment point failed.

Distances are:

- Seat width - 16”
- Deformation of rear of seat pan – 4.25”
- Right rear seat corner downward stroke - 4.4”
- Left rear seat corner downward stroke 3.7”
- Front right corner to top of seat box – 5.25”
- Distance from the floor of the cabin to the ceiling - 36”
- Distance from top of integrated box structure to cabin ceiling - 29”
- Distance from aft bulkhead to forward pillar of door opening – 65”
- Top of door threshold to bottom of door frame - 30”
- Distance from aft door frame to forward pillar of door opening – 65”

1.5 Patient Litter (Unoccupied)



Photograph 8 – Patient Litter

The patient litter was located in the aft part of the cabin on the left side directly behind the left side cockpit passenger seat. The head of the litter was pointed towards aircraft forward, the litter is an articulating stretcher manufactured by Spectrum Aeromed. The portion of the stretcher closest to the aft bulkhead was bent downwards.

Distances are:

- Top of door threshold to bottom of door frame aircraft forward - 31”
- Top of door threshold to bottom of door frame aircraft aft third - 25”

2.0 Restraints

2.1 Front Right (Pilot)

The pilot seat was equipped with a rotary buckle four-point harness manufactured by SCHROTH Safety Products. The webbing was red in color, with the lap belt portions attached to the side of the seat structure, and the shoulder harness routed up over the seat back down to the inertial reel. The buckle was permanently secured to the left lap belt and the other three straps were secured by inserting the metal tang at the end of each segments into the buckle. The rotary buckle and inertial reel(s) were evaluated and still functioned properly. The shoulder belt portions were cut to remove the occupant from the seat.

The data label on the belt reads:

BAE Systems Safety Products Inc.
Pompano Beach, FL USA
Type: 1-10-R75266YSSR
Sub P/N: s/1-10-R78266YSS
Date MFG: 04/08
TSO-C114
Project Code AGU08017

2.2 Front Left (Passenger)

The seat was equipped with a rotary buckle four-point harness manufactured by SCHROTH Safety Products. The webbing was red in color, with the lap belt portions attached to the side of the seat structure, and the shoulder harness routed up over the seat back down to the inertial reel. The buckle was permanently secured to the left lap belt and the other three straps were secured by inserting the metal tang at the end of each segments into the buckle. The rotary buckle and inertial reel were evaluated and still functioned properly.

The data label on the belt reads:

BAE Systems Safety Products Inc.
Pompano Beach, FL USA
Type: 1-10-015266YSSRevA

Sub P/N: s/1-10-015266YSSRevA
Date MFG: 04/08
TSO-C114
Project Code AGU08017

2.3 Aft Rear-Facing Seat (Unoccupied)

The seat was equipped with a rotary buckle manufactured by Schroth Safety Products and a four-point harness. The webbing was dark blue in color, with the lap belt portions attached to the side of the seat structure, and the shoulder harness routed up over the seat back down to the inertial reel. The buckle was permanently secured to the left lap belt and shoulder belt segments, and the other two segments are secured by inserting the metal tang, which both the right shoulder and lap belt were secured on, into the buckle.

2.4 Aft Forward Facing Passenger Seat (Flight Nurse)

The seat was equipped with a rotary buckle manufactured by Schroth Safety Products and a four-point harness. The webbing was red in color, with the lap belt portions attached to the side of the seat structure, and the shoulder harness routed up over the seat back down to the inertial reel. The buckle was permanently secured to the left lap belt and the other three straps were secured by inserting the metal tang at the end of each segments into the buckle. The harness had two pink half inch wide elastics secured just above the stitched portion of the webbing on the right shoulder belt, as well as one pink and one grey half inch elastic just above the stitched portion of the webbing on the left shoulder belt.

Data label on the belt reads:
BAE Systems Safety Products Inc.
Pompano Beach, FL USA
Type: 1-10-(illegible)
Sub P/N: (illegible)
Date MFG: 04/04
TSO-C114
(Rest of the tag is illegible)

2.5 Patient Litter (Unoccupied)

The litter had dark blue webbing straps secured to the outer frame of the stretcher for securing passengers during flight.

3.0 Helmet

3.1 Pilot (Front Right Seat)

Helmet data label reads:

Helmet Integrated System Ltd., Letchworth SG6 2TU, UK +44 (0) 1462 478
ALPHA EAGLE
Size: X-Large
Part/ Contract No.: ORD 19848
Serial No.: 106763 Date: 7-2015
Interactive Safety Products Inc., Huntersville, NC 28078, USA (704) 664-7377

3.2 Paramedic (Front Left)

Helmet data label reads:

Helmet Integrated System Ltd., Letchworth SG6 2TU, UK +44 (0) 1462 478
ALPHA EAGLE
Size: Medium Bread
Part/ Contract No.: RA 29183 RJA
Serial No.: 93402 Date: 27 June 9
Interactive Safety Products Inc., Huntersville, NC 28078, USA (704) 664-7377

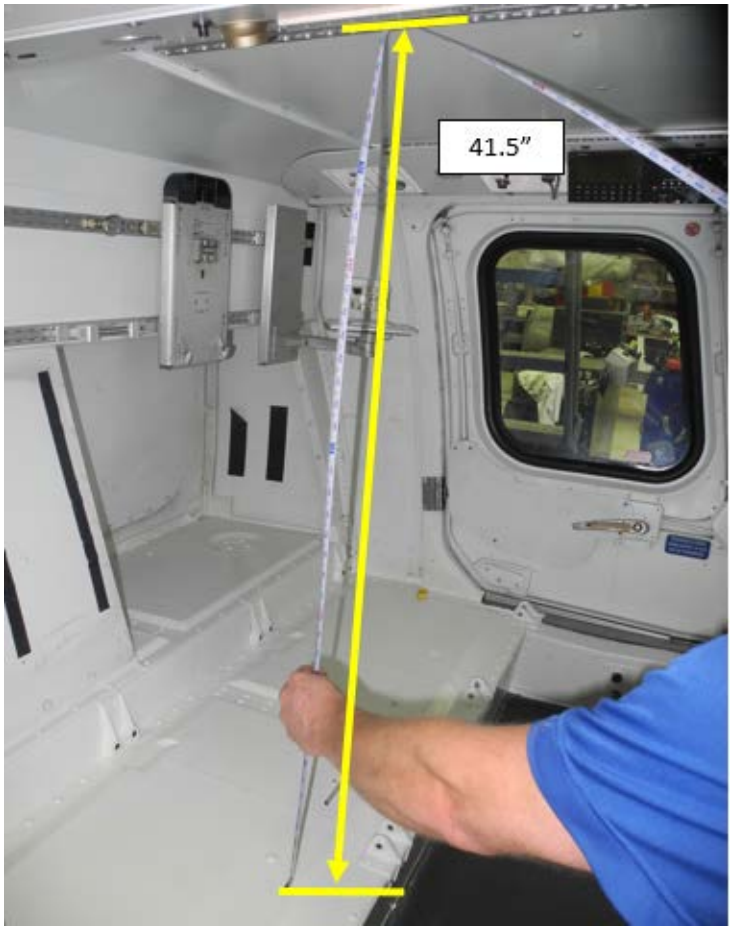
3.3 Nurse (Aft Right Forward Facing)

Helmet data label reads:

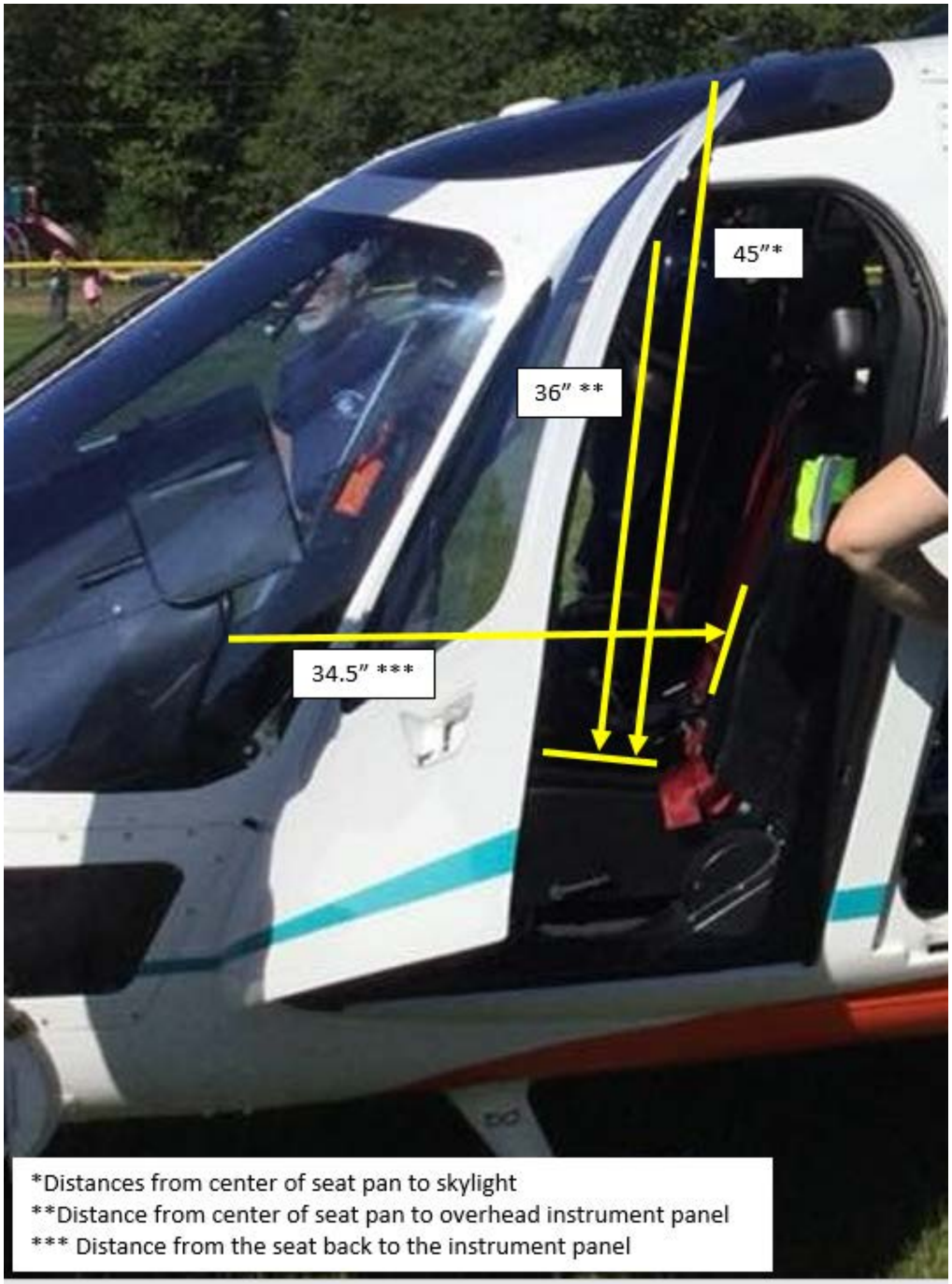
Helmet Integrated System Ltd., Letchworth SG6 2TU, UK +44 (0) 1462 478
ALPHA EAGLE
Size: Medium
Part/ Contract No.: RA 29027 RJA
Serial No.: 93457 Date: 8 Sep 08
Interactive Safety Products Inc., Huntersville, NC 28078, USA (704) 664-7377

V. Exemplar Measurements

While at the scene the investigative team was able to take measurements of an exemplar with a similar configuration.



Photograph 9 - Distance From Top of Inegrated Boxed Structure to Ceiling



Photograph 10 – Cockpit Measurements