

# Insight LiDAR SIL 3

2022

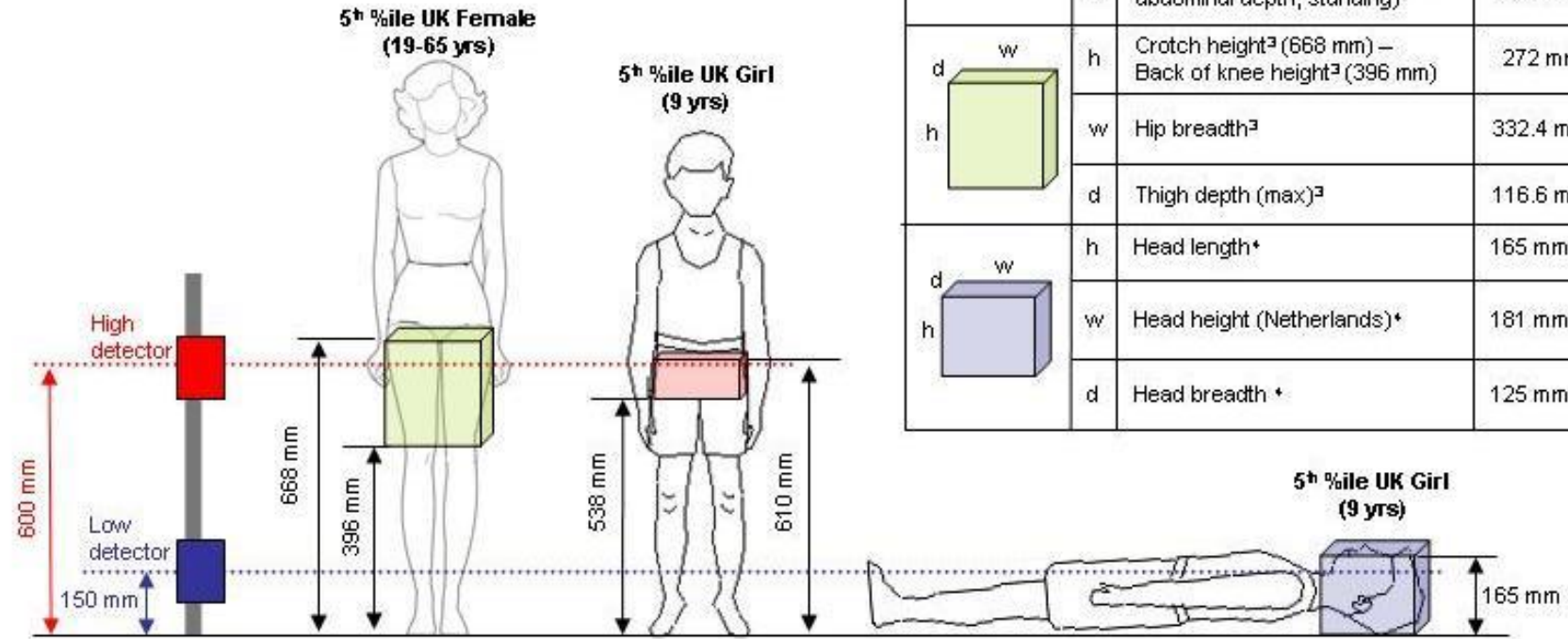
# LIDAR SIL 3 – Years of experience

- > Since implementing our first Obstacle Detection solution for Network Rail in 2010 we have developed a highly reliable set of products that provides Rail Infrastructure managers with the reliability and flexibility required in these challenging environments.
- > Rollout of the system within the national signalling renewal project started in 2012 with 7 crossings implemented in the Anglia region of the UK.
- > 200+ current live UK crossings utilising LIDAR obstacle detection.
- > Further LIDAR SIL0 installations for rockfall and earthworks monitoring



# LB FOSTER – LIDAR SIL 3 – Customer Specifications (UK)

**Source References:**  
 1 - Bodyspace, Pheasant. 2<sup>nd</sup> Edition  
 2 - People Size  
 3 - ADULTDATA  
 4 - CHILD DATA



|  |   |   |          |
|--|---|---|----------|
|  | h | Hip height <sup>1</sup> (610 mm) – Crotch height <sup>2</sup> (538 mm)          | 72 mm    |
|  | w | Hip breadth <sup>1</sup>  | 210 mm   |
|  | d | Chest depth (representative of abdominal depth, standing) <sup>1</sup>          | 115 mm   |
|  | h | Crotch height <sup>3</sup> (668 mm) – Back of knee height <sup>3</sup> (396 mm) | 272 mm   |
|  | w | Hip breadth <sup>3</sup>  | 332.4 mm |
|  | d | Thigh depth (max) <sup>3</sup>  | 116.6 mm |
|  | h | Head length <sup>4</sup>  | 165 mm   |
|  | w | Head height (Netherlands) <sup>4</sup>  | 181 mm   |
|  | d | Head breadth <sup>4</sup>   | 125 mm   |

# LB FOSTER – LIDAR SIL 3 – CCTV Monitoring

- > Full CCTV coverage across all crossing area.
- > Provides post event analysis.
- > Number Plate recording
- > Many hundreds of Dangerous Driving Incidents reported and prosecuted every year.
- > Automatic incident processing.





# LIDAR SIL 3 – Next Generation Development - Europe

- > Higher Safety Integrity Level for automatic control of signalling systems
- > To meet the future requirements for European Markets for their next generation Level Crossings we are currently developing a SIL certified OD system based on the same product set.
- > Replacement for the Honeywell YD136 radar system
- > SIL3 system development currently underway for first application in Germany's Deutsche Bahn network
- > Trial installations at Niederdollendorf and Eitorf



# LIDAR SIL 3 – Deutsche Bahn Initial Trial Analysis

- > Full LIDAR scan data recording and video analysis
- > Direct comparison between LIDAR and traditional SIL3 RADAR systems
- > Unaffected by adverse weather conditions (unlike Radar)
- > Vegetation and snow detected before it becomes a problem

The screenshot displays a video analysis interface for a street scene. The main video window shows a street with pedestrians and a grassy area in the foreground. Overlaid on the video are the following text elements:

- 127 ALG O/D YES
- 127 NOT SHUTTERED
- 16-05-31 07:14:33.443

Below the video is a control panel with the following elements:

- Navigation buttons: Previous, Play, Next, Stop, Start, End, Prev., Next, Mark 1, Date.
- Time and Date: 06:14:33.742 31/05/2016 DST
- Archive start: 31-May-16 6:13:33 AM

On the right side, there are two smaller video windows labeled "Camera 5" showing LIDAR scans of the scene. Above these is a status window with the following text:

- 126 ALG O/D YES 126 LIDAR O/D NOT CLEAR
- START HI 126 NOT SHUTTERED
- RADAR OCCUPIED 16-05-31 07:14:31.179
- 16-05-31 07:14:32.081
- CROSSING START
- YES
- RADAR OCCUPIED

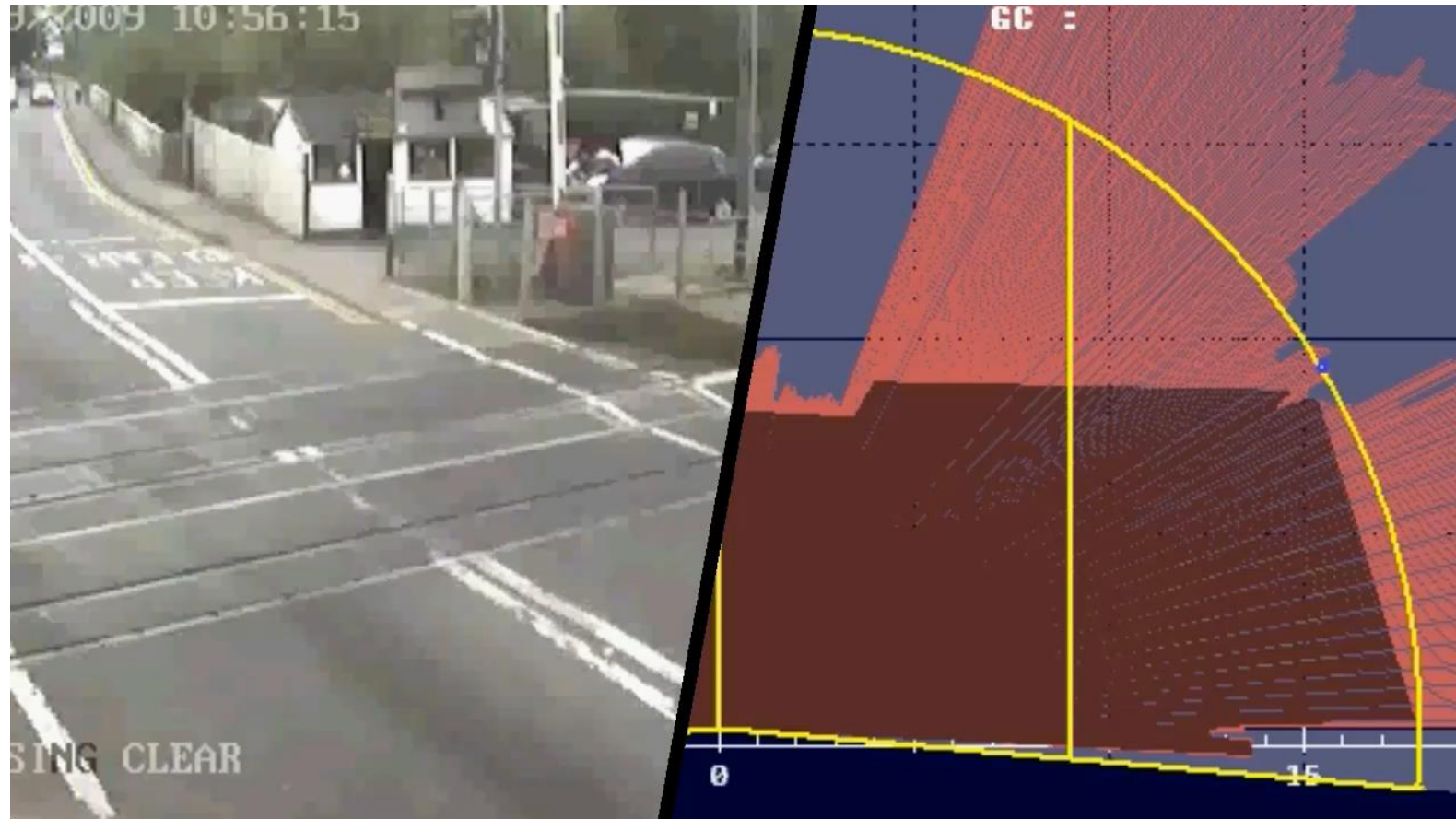
Below the status window is an "Events" table:

| Time             | Event                |
|------------------|----------------------|
| 14:35:28.823 DST | RVRC/Local camera c  |
| 06:14:02.259 DST | Camera Control - Can |
| 06:14:02.298 DST | Camera Control - Can |
| 06:14:47.273 DST | Camera Control - Can |



# LIDAR SIL 3 – Algorithm Development

- > To enable reliable obstacle detection down to 115mm over a 30m range, new on-scanner algorithms have been developed
- > Proven to be highly reliable and immune from all environmental conditions including direct sunlight, fog, rain, etc.



# LIDAR SIL 3 – Availability Considerations

- > DB specify that the OD System is to have an availability of 99.9829% which means the system is permitted to be in a safe failed state for up to 6 hours in 5 years. Therefore:
- > The overall system MTBF has to be less than 1 in 5 years or > 40,000 hours
- > A failed system has to be repairable within 6 hours, to include 2 hours for mobilisation of repair teams. That gives a MTTR of 4 hours.
- > Both factors have to be addressed by design. To meet the MTTR, we modularise the system and minimise any commissioning activities by design.



# LIDAR SIL 3 – Safety Integrity Summary

- > Random Hardware Failures are controlled by use of components with long MTBF values and redundancy where appropriate.
- > Systematic integrity is assured by our design process which includes careful assessment of all system components, our decision making algorithm and our design implementation.
- > We specify the methods by which our OD system must be installed, commissioned and maintained.
- > We trust the design and in summary, we can meet the requirements of SIL 3.