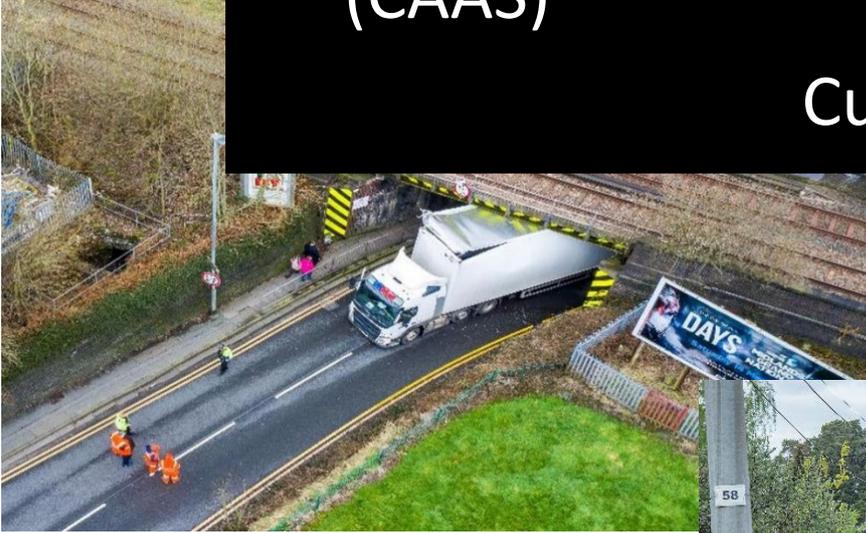


\*LSM BridgeSense® Bridge Impact  
(CAAS)

\*LSM TrainSense® Rail Level Crossing  
(CAAS)

Current Position Paper



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LSM Technologies

10/05/2024

■ Tech Sheet: Rail Level Crossing and Bridge CAASystems

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**1. LSM- BACKGROUND / EXECUTIVE SUMMARY .**

LSM Technologies has been providing occupational health and safety technology solutions in heavy industries for over 20 years.

Among our clients are Operators within the Australian Road Networks, dealing with heavy vehicles where over-height impacts are as costly and common as railway level crossing incidents, both in Australia and globally. Similarly, the issue of Railway Bridges being hit by over-height vehicles is as frequent as incidents involving Road Bridges / Structures.

About 12 months ago, while engaged with our LSM [BridgeSense](#)® technology (Impacts on Rail Bridges), we incidentally began addressing Railway Level Crossing (RLC) collisions. This led to the development of our LSM [TrainSense](#)® for Railway Level Crossing Collision Avoidance Systems (CAAS).

The purpose of this discussion document is to:

- Outline our proposed mitigation controls.
- Explain the benefits and features of the proposed technology.
- Detail how our proposed technologies are a low-cost and effective solution that meets all the criteria of the [2024-Feb National Level Crossing Safety Strategy 2023-2032](#)
- Request assistance in supporting our efforts to secure funding for the technology.

**2. TRADITIONAL MITIGATION CONTROLS.**

Long-standing conventional for Road and Rail CAAS mitigation control include:

- **Over-height vehicle impacts:** For active and static signage, rumble curtains, lasers, holographic imaging, and sacrificial structures.
- **Rail Level Crossings:** For “active” crossings feature visual / audible warnings, signage, and boom gates; “passive” crossings utilise static signage like stop or give way signs.

Additional technologies have been developed for remote RLC’s include solar-powered warning alerts, more elaborate visual / audible alerts, enhanced visibility / sound warnings for trains, and educational programs which are vital for mitigation.

Other deterrent measures include increased fines, damage cost recovery, removal of road assets from operating (for a period of time) , driving bans, and even suggestions of driver incarceration.

However, while these mitigation “tools” have been somewhat effective, they do not fully address the **human error and behavioural** issues of drivers, which is where we believe a more comprehensive solution is necessary.



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**3. LSM MITIGATION CONTROLS- WHAT ARE THEY?**

Our safety mitigation control concepts are as follows:

- LSM **TrainSense®** (int.pat.pend): **Rail Level Crossing** (CAAS) Collision Awareness / Avoidance System, designed to eliminate / avoid Rail mounted Vehicle impacts with Road Vehicles travelling over these Crossings.
- LSM **BridgeSense®** (int.pat.pend): **Vehicle Over-height** (CAAS) Collision Awareness / Avoidance System designed to eliminate / **avoid** Over- Height Vehicles / Loads and Over- Width impacting on Bridges / Tunnels (overhead structures), as well as providing Over- Bridge protection from vehicle Over- Weight / Dimensions.

It's clear that LSM **TrainSense®** and LSM **BridgeSense®** can be seamlessly integrated into **a single mitigation solution**, effectively addressing both over-height impacts on road network (rial bridges) and interactions at railway level crossings on rail networks.

While the focus in this discussion document remains on LSM **TrainSense** for RLC mitigation, references to LSM **BridgeSense®** will still be included due to their shared CAAS objectives for rail bridge networks.



**4. WHY DO OTHER MITIGATION CONTROLS STRUGGLE WITH INEFFECTIVENESS?**

There is substantial research confirming that **human behaviour and errors** significantly impact vehicle driver safety, underlining the need for effective solutions to enhance mitigation efforts. It is well-documented that these **human factors** present significant challenges that existing mitigation controls are unable to fully address.

Some common behavioural and human error issues exhibited by drivers include:

- **Navigation Tasks:** Drivers might not use a navigation (if installed) device, forget to enter pre-routing information, or fail to update routes for detours.
- **Distraction:** Various distractions such as using radio communications, phones, talking with passengers, eating, drinking or even listening to music can cause drivers to miss critical road warnings.
- **Route Knowledge:** Inexperienced or new drivers may have limited familiarity with routes.
- **Complacency / Ignoring Warnings:** Some drivers may consciously disregard safety alerts and signs.
- **Deadline Pressures:** Under time constraints, drivers might prioritise speed over safety.
- **Fatigue:** Tired drivers may respond slowly or miss warnings altogether.
- **Overconfidence / Disregard:** A false sense of security might lead some drivers to underestimate risks or just blatantly disregard warnings.
- **Scenic Overlay:** Environmental factors, like foliage, can obscure important signage.
- **Inattention:** May simply miss / overlook warning signs as they drive past.



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To address these human factors and complement existing safety technologies like visual and audible warnings, the design concepts behind our LSM [TrainSense®](#) and LSM [BridgeSense®](#) mitigation controls have been developed.

**5. HOW DOES LSM MITIGATION TACKLE HUMAN ERROR / BEHAVIORAL ISSUES?**

The LSM [TrainSense®](#) and LSM [BridgeSense®](#) are autonomous mitigation systems designed to reduce dependence on human intervention and address behavioural factors by:

- **Minimising Driver Intervention:** These systems decrease the need for drivers to manually add routes to navigation devices (if installed in the vehicle) or use unreliable Apps.
- **Always Active:** The mitigation Device is permanently mounted in the vehicle and is **always ON** and monitoring vehicle position.
- **Dynamic Vehicle Monitoring:** Once the vehicle is in motion, the system automatically and dynamically compares stored GPS coordinates and vehicle data with the vehicle's current GPS location and data.
- **Proactive Driver Warnings:** They provide drivers with audible pre-warnings and detour instructions.
- **Integrating Additional Sensors:** Sensors ensure that truck crane, tipper trays, or bins are lowered before the vehicle moves.
- **Delivering Audible and Visual Alerts:** Alerts are provided **inside the driver's cabin** to ensure visibility and audible alerts are heard.
- **Enabling Safety Mechanisms:** The systems offer capabilities for vehicle deceleration, braking, or automatic emergency braking (AEB), bringing the vehicle to a stop if warnings are ignored.



Also other benefits worth a mention are:

- **Cellular Communication:** Overcoming the limitations of unreliable cellular network (drop- out) communications (e.g., iCloud / Apps).
- **Utilising Reliable GPS:** By leveraging a dependable GPS satellite network, these systems ensure reliability and accuracy, especially in remote areas.

**6. EXPECTED OUTCOMES OF LSM MITIGATION CONTROLS.**

The benefits of LSM Technologies proposed safety mitigation controls can be outlined as follows:

- **Simple Standalone Solution:** This involves a compact device installed inside the vehicle's cabin, eliminating the need for additional railway level crossing safety infrastructure or support personnel for off-site monitoring (if cellular is available in remote areas). The LSM device avoids the logistical challenges of traveling to remote locations for repairs, managing replacement costs, and addressing false alerts to drivers (failed system) - a significant advantage in areas where responding to infrastructure failures could take days.
- **Cost-Effective Solution:** These controls are low-cost and simple to deploy, either by being permanently affixed inside vehicles or integrated by Original Equipment Manufacturers (OEMs). This means the initial investment is likely minimal, potentially allowing for full cost recovery (e.g., added to vehicle registration costs), could generate significant returns on investment for governments or no cost (to user) if integrated into the vehicle by OEMs during manufacturing.
- **Savings in Lives and Costs:** Effective implementation of these mitigation controls could result in substantial savings by preventing loss of life, reducing injuries, and decreasing costs related to infrastructure damage, road closures, traffic congestion, repairs, and emergency responses.

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- **Enhancement of Existing Infrastructure:** These controls would complement and enhance existing traditional safety infrastructures, such as visual and audible alerts, boom gates, and signage. They also help avoid the extensive costs associated with the installation, repair, and maintenance of additional traditional safety systems at "Passive" Rail Level Crossings, particularly in remote areas.
- **Economic and Industry Growth:** Implementing these mitigation controls could lead to the creation of a significant new industry, fostering job creation, tax revenue, and economic expansion. Additionally, there is potential for substantial export sales, which would further contribute to the economy and diversify revenue streams.

**7. AUSTRALIAN- NLCSAFETY STRATEGY / GRANT FUNDING.**

You may find the [2024-Feb National Level Crossing Safety Strategy 2023-2032](#) of interest, as referenced in the links below. This strategy aims to reduce fatalities and injuries at level crossings, with a particular focus on exploring enhanced in-vehicle technologies and telematics, aligning closely with the goals of our mitigation device project.

The National Level Crossing Safety Committee (NLCS) has been active for over two decades since 2001. While it has achieved notable success in mitigation, significant occurrences of interaction events (including both over-height and railway level crossing incidents) continue to be reported.

**1.1 Grant Funding- Australia.**

To further develop these technologies, we sought funding through the [Australian 2024-Level Crossing Grant Safety Research-Innovation Grant](#). Despite the technical, commercial, and safety advantages of our proposed solutions, our application was unfortunately not successful, primarily due to the absence of a support letter from a State or Territory Minister.

The tight time frame between our discovery of the grant opportunity and the application deadline did not allow us sufficient time to secure the necessary support letters from the relevant Ministers.

However, we were successful to obtain support letters from Mr. Todd Hacking, CEO of the Australian National HVIA (Heavy Vehicle Industry Association), and Ms. Heather Neil, CEO of the Australian TrackSafe Foundation (NLCS member)- as per the below links.

We have now reached out to various Ministers, Rail Operators, and Regulators requesting letters of support (not endorsements or preference) to enable us to resubmit our grant application for funding to further develop the proof of concept for our technology, and are currently awaiting their responses.

**2.1 Why Does LSM Require Funding?**

Road and Rail Network Stakeholder support is crucial as we (and I am sure others) seek the necessary government funding to bring these innovations to fruition.

Unlike other commercial developments aimed at general industry, which may attract commercial equity or investor funding, our technologies and mitigation controls are uniquely designed for a specific industry and end-user- namely, federal and state governments.

This is because respective government organisations, in particular, bear the cost burden of maintaining and repairing road and rail network infrastructure.

Subsequently, we plan to resubmit our proposal; however, we currently have no information on when or if additional funding will become available.

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**8. WHY IS LSM TECHNOLOGIES REACHING OUT TO YOU?**

The primary objectives of reaching out to international stakeholders involved with railway level crossing and road network assets and safety mitigation include:

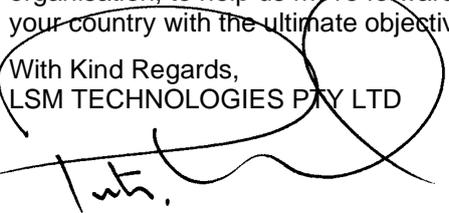
- **Identifying Key Contacts:** To seek assistance in identifying the appropriate contacts within railway stakeholders- such as rail safety advocates, operators, managers, and government organisations- who are in a position to evaluate / gauge the effectiveness of our LSM **TrainSense®** and LSM **BridgeSense®** mitigation solutions.
- **Facilitating Dialogue:** To initiate discussions that provide feedback, gather opinions, and address any questions that may arise during the evaluation of our technologies concepts.
- **Gaining Support:** To seek support (not necessarily endorsement or preference) that will aid in advancing the development and proof of concept for our proposed mitigation solutions, ultimately leading to grant approvals.

**9. CONCLUSION.**

So far, the consensus we have gathered is that LSM **TrainSense®** and LSM **BridgeSense®** are considered "no-brainers" (an Australian expression), indicating that such straightforward technologies would be seen as cost-effective and efficient mitigation solutions.

Consequently, I am reaching out to you for assistance in gaining traction within your country or organisation, to help us move forward with a proof of concept- either here in Australia or possibly within your country with the ultimate objective to implementation.

With Kind Regards,  
 LSM TECHNOLOGIES PTY LTD



PETER WOODFORD  
**ENGINEERING DIRECTOR / CEO**  
 (Email- [peter.woodford@lsm.com.au](mailto:peter.woodford@lsm.com.au))

**10. LINKS / REFERENCES.**

For more detailed information, please refer to these hyperlinks:

<p><b><u>LSM TrainSense® CAASystem</u></b></p> <ul style="list-style-type: none"> <li>• <a href="#">Web Site Link</a></li> <li>• <a href="#">Product Technical Information.</a></li> <li>• <a href="#">Rudimentary Schematics</a></li> </ul>	<p><b><u>General Information / Reports</u></b></p> <ul style="list-style-type: none"> <li>• <a href="#">2024- LSM TrainSense® and BridgeSense® News Article</a></li> <li>• <a href="#">2024- Feb National Level Crossing Safety Strategy 2023-2032</a></li> <li>• <a href="#">2024 Australian Level Crossing Safety Research Grants</a></li> <li>• <a href="#">2023- Monash Trials to Improve Train Passive Level-Crossings</a></li> <li>• <a href="#">2021-QUT- CARRS Railway Level Crossing Safety Report</a></li> </ul>
<p><b><u>LSM BridgeSense® CAASystem</u></b></p> <ul style="list-style-type: none"> <li>• <a href="#">Web Site Link</a></li> <li>• <a href="#">Product Technical Information</a></li> <li>• <a href="#">Rudimentary Schematics</a></li> </ul>	<p><b><u>Support Letters:</u></b></p> <ul style="list-style-type: none"> <li>• <a href="#">2024- April 04- HVIA Support Letter</a></li> <li>• <a href="#">2024- TrackSafe Support Letter</a></li> <li>• <a href="#">2024- TMR Support Letter</a></li> <li>• <a href="#">2025- Hon Scott Bucholz Support Letter</a></li> </ul>

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