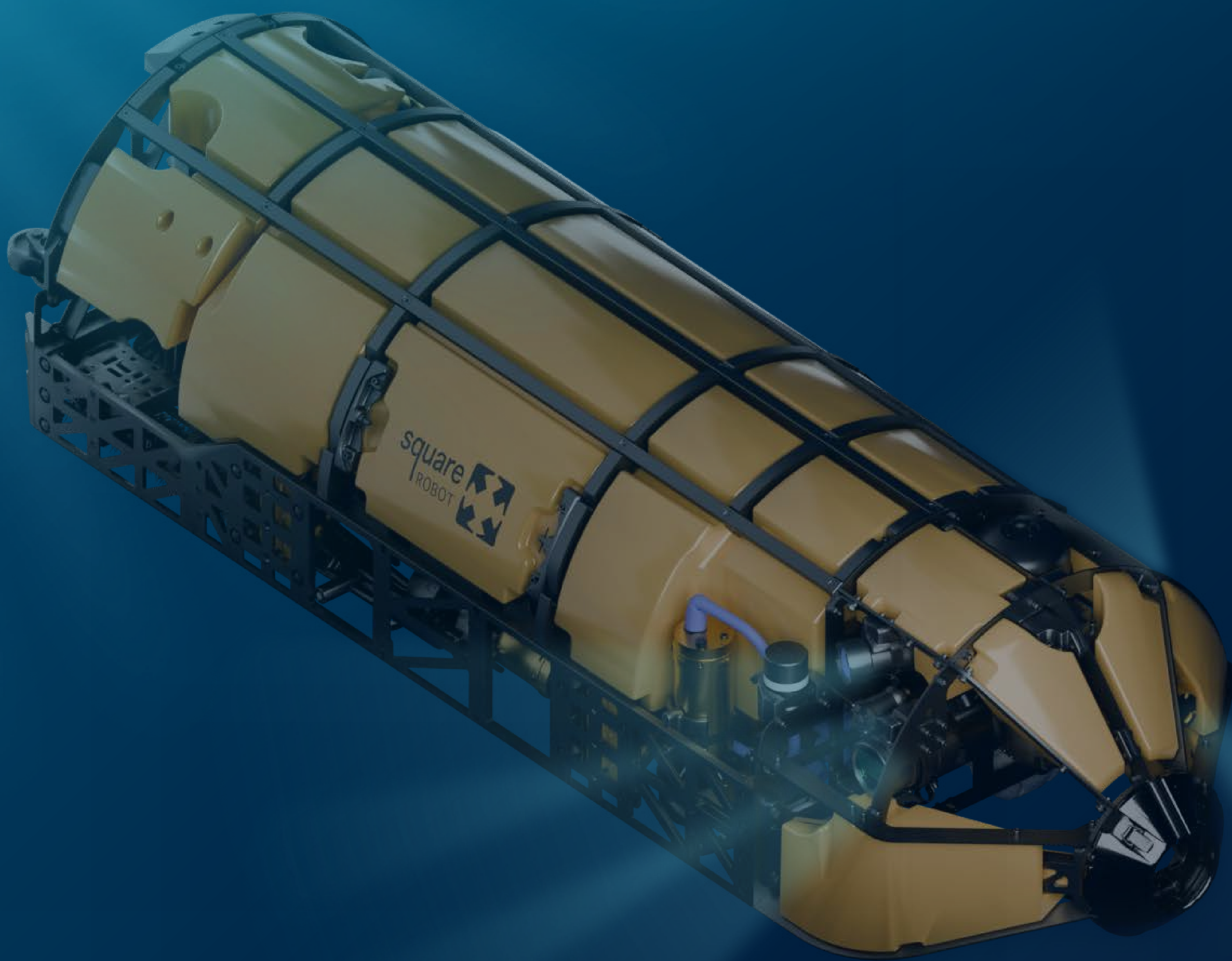


# Square Robot



The **world leader** in  
robotic tank inspection



# Advanced Robotics

## State of the Art Sensors

## High Density Data Acquisition



### Operational Efficiency

- Minimal tank downtime
- No alternate storage required
- Inspection data to support optimized repair turnaround
- Minimal operational disruption

### Environmental, Social, Governance

- Zero confined space entry
- Reduced work at heights
- \*Carbon Equivalent releases contained per tank:
  - Diesel > 5 Tons
  - Gasoline > 20 Tons

\*Source - Third Party Verified for 100' diameter tank

### Comprehensive Data for Predictive Repair and Maintenance

- Hi confidence / Hi resolution data
- Big data feed / Advanced processing for API 653/ RBI / EVA / Digital Platforms
- Multiple, State-of-the-art sensor sets

### Commercial Efficiency

- \*\$100,000 - +\$2M savings per tank operation
- Risk-based vs time-based inspections
- Tank and inspection cost level loading
- Informed resource and project planning

\*Source - Solomon Associates 2018 Fuels Study



# Quality & Performance

## New Generation:

# SR-3

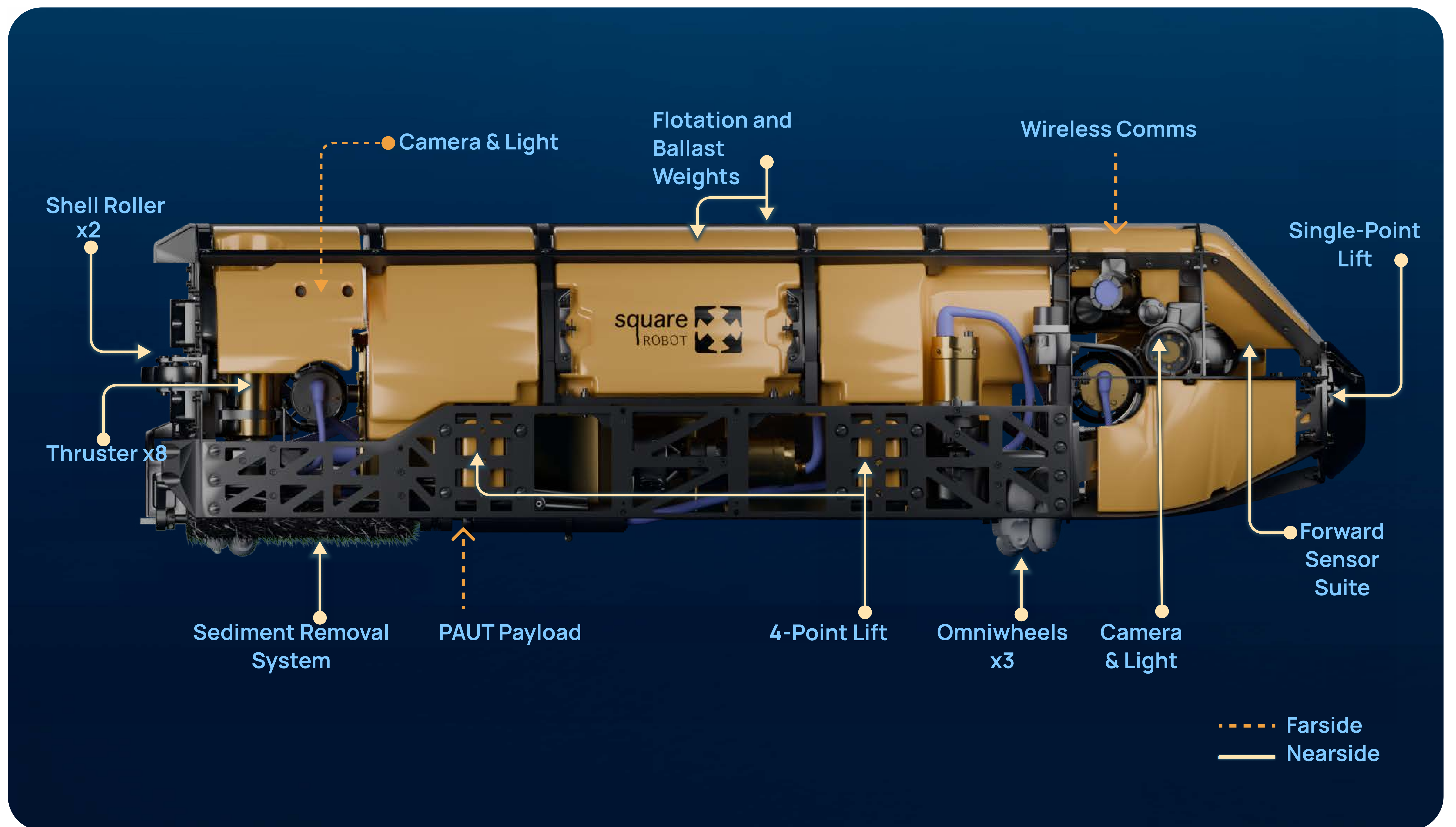


Square Robot's autonomous, submersible robots and advanced inspection technology enable safe, informed above-ground storage tank utilization by eliminating the need to take tanks containing volatile products including diesel, jet fuel, and gasoline out of service for required internal inspection,

The inspection robots are Factory Mutual, Class 1 Division II certified to operate in explosive environments and combine our state-of-the-art, patent protected, autonomous navigation capability with inspection payloads including phased array ultrasonic and high definition video cameras to safely survey the critical areas inside a storage tank without taking the tank out of service.



# In-Service Above Ground Storage Tank Inspections



Designed to operate in gasoline, Diesel, Lube Oils, and more. Contact us for more product compatibility information.

Launch SR-3 into a tank through a roof or a shell manway. Designed to launch through a manway with a minimum inner diameter of 22.75" (0.58 m)

## Compliance at a lower cost:

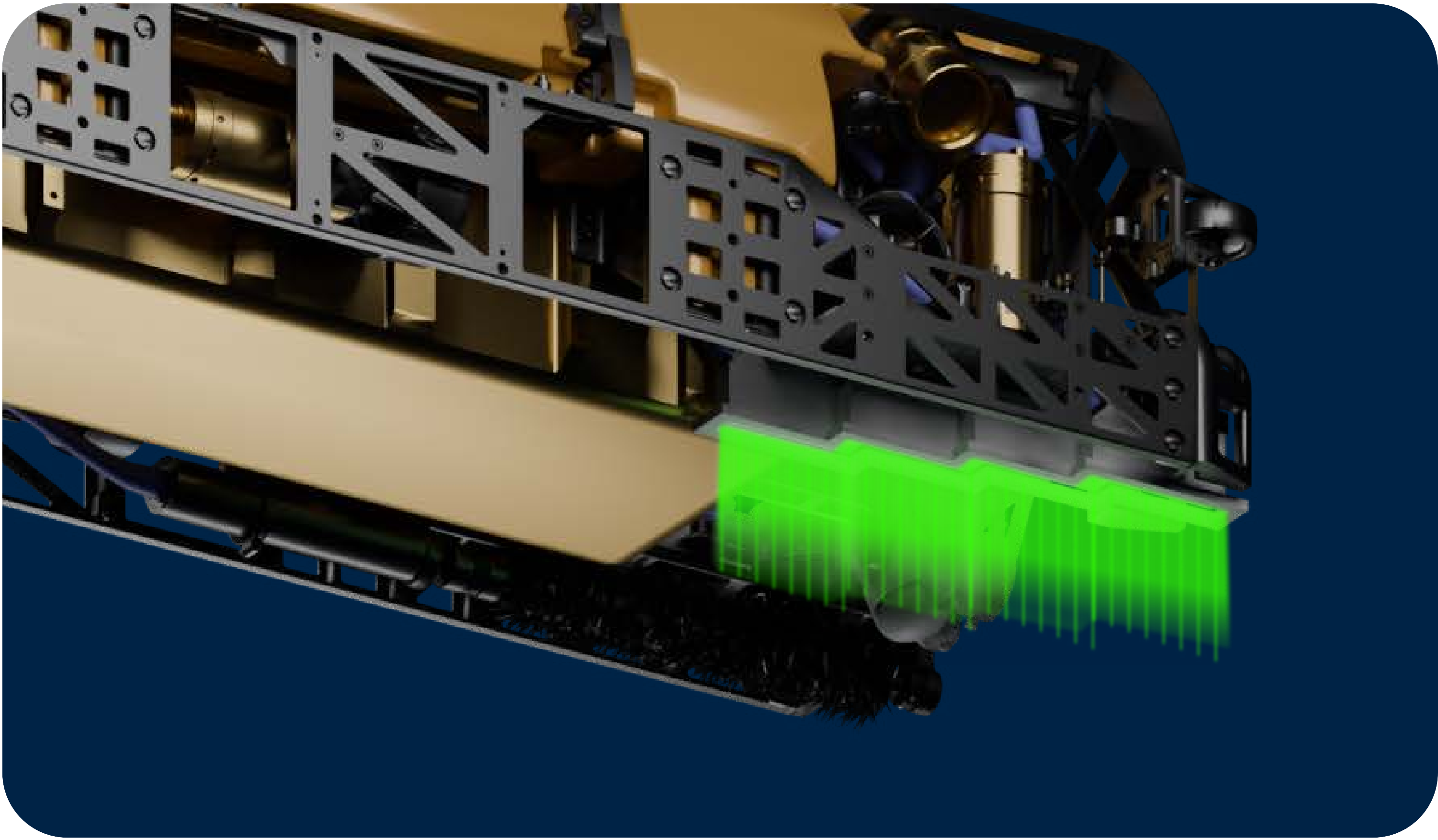
- Internal, visual inspection
- Tank bottom inspection
- In-service tank bottom settlement characterization

Dimensions	1.70 x 0.51 x 0.45 m (67 x 20 x 18 inches)
Weight	120 kg (265 lbs)
Max Operating Pressure	275 kPa (40 psig)
Operating Temperature	0°C to 40°C (32°F to 104°F)
Minimum Product Density	680 kg/m <sup>3</sup> (SG = 0.68)



## SR3 FEATURES

# Phased Array Ultrasonic Testing PAUT



The robotic systems are engineered for optimal inspection of tank bottoms, focusing on the critical zone near the tank shell where corrosion can cause major failures.

The payload includes a 256-Element Phased Array Ultrasonic Transducer to provide detailed corrosion and thickness mapping, delivering 18,096 ultrasonic testing data points per square foot. This high-density data enables clients to make well-informed maintenance and repair decisions related to their tank bottom.

## PAUT Specifications:

- Probes: 4 probes, 64 elements each, staggered, operating at 10MHz
- Overlap: 6-element overlap between adjacent probes
- Pitch: 1.5 mm
- Aperture: 7 elements
- Measurements: 208 measurements per sequence, spanning a 312 mm length
- Speed: 44 sequences per second

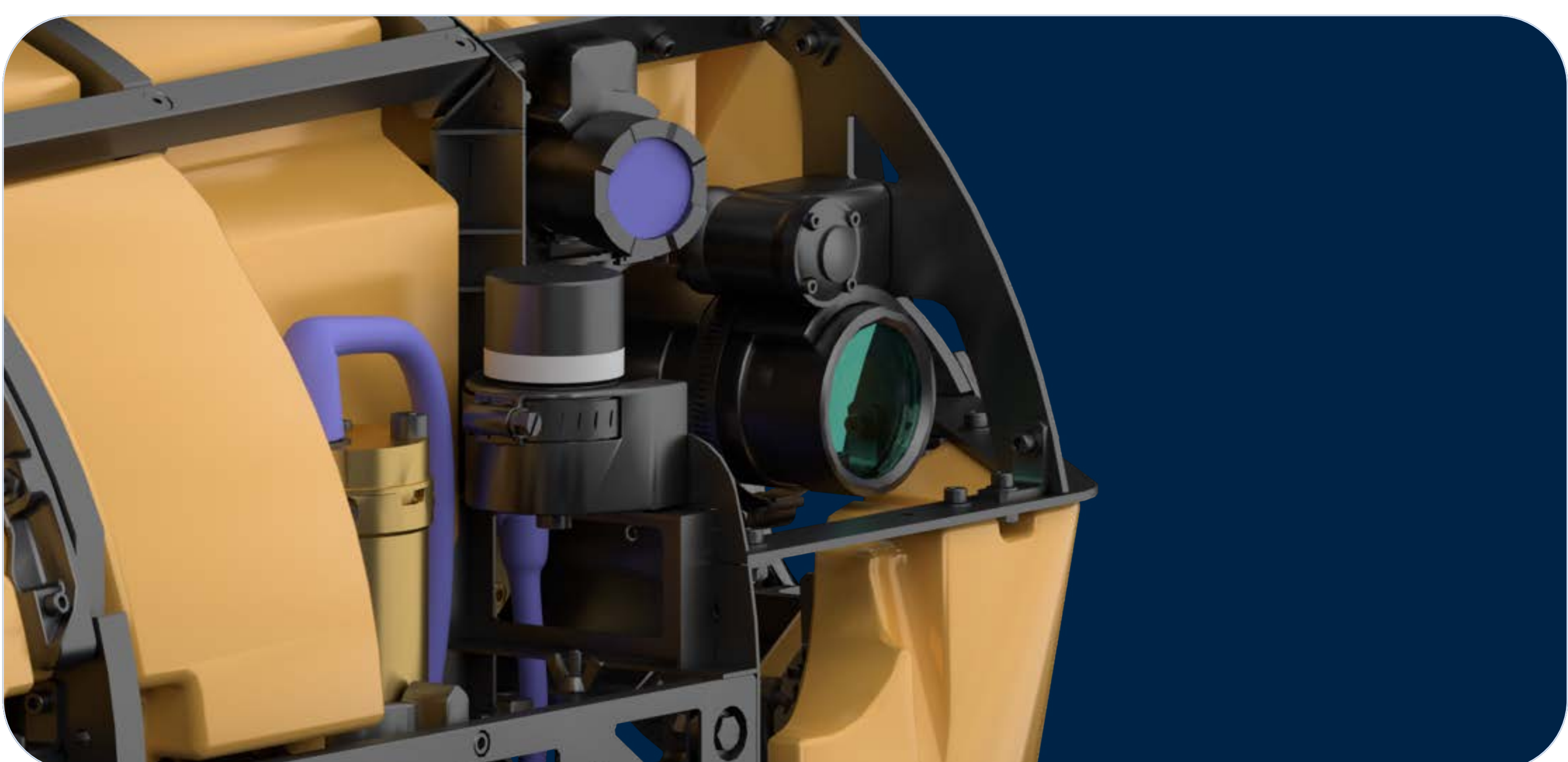
## Elevation Mapping

Using its onboard pressure sensor, our robotic inspection system provides a novel and safe approach to conducting differential bottom elevation measurements and surveying above-ground storage tanks.

The system allows tanks to remain filled with product, thereby collecting bottom elevation data under fully loaded conditions. Our approach uses one data set to assess the tank shell, edge, and localized bottom settlement, providing tank owners with asset integrity information without service disruptions.



## Visual - Camera Functionality



Multi-directional views from the high-resolution cameras allow the robot to record visual datasets on the condition of internal coating, structures, nozzles, and sediment accumulation levels. Our robot correlates its position in the tank with Phased Array Ultrasonic Testing and high-resolution visual data of the same location.

In simpler terms, when corrosion is visible, we can examine the PAUT data for that specific spot, providing information about its location, appearance, and the extent of corrosion in that area

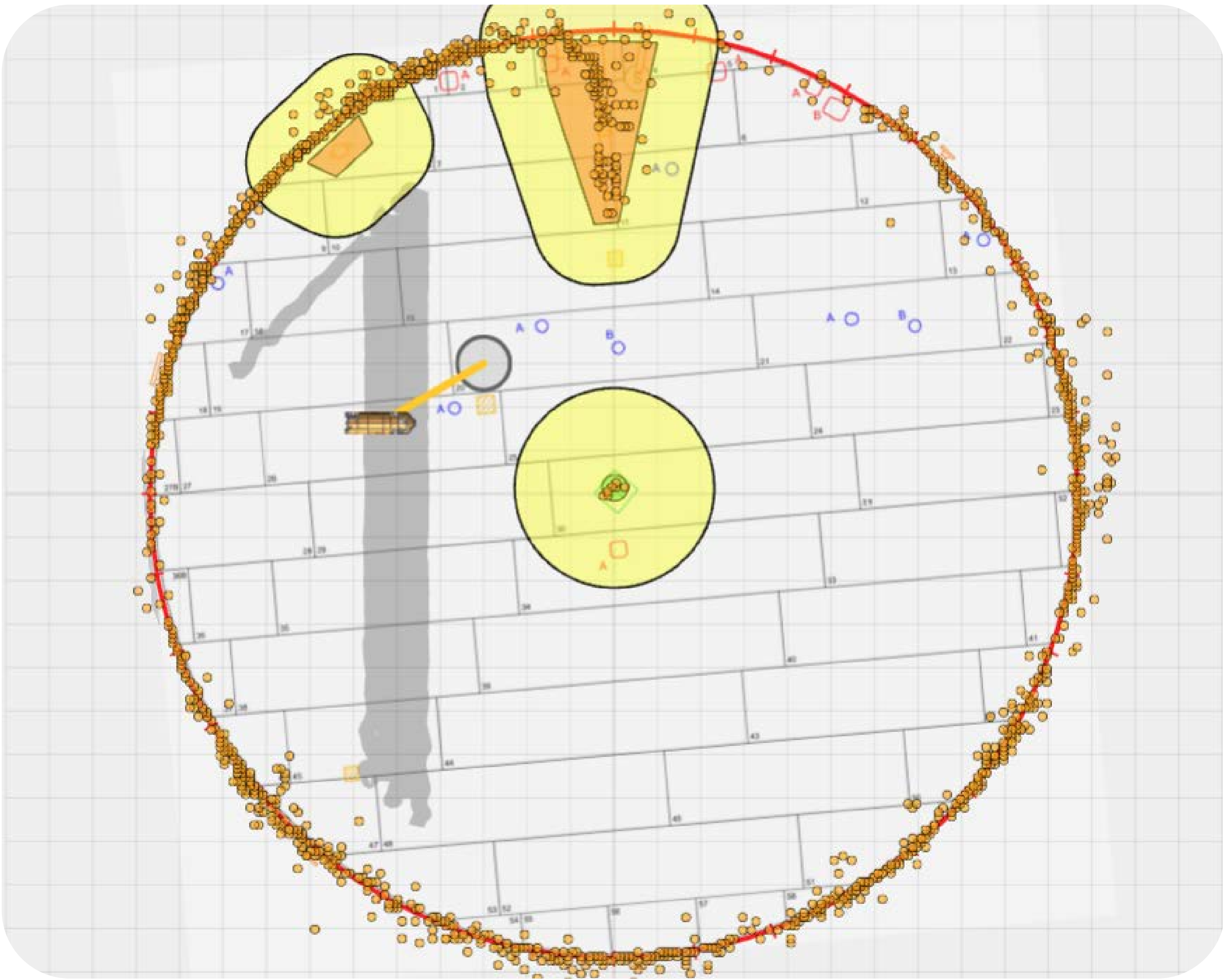


SR3 FEATURES / ROBOT LAUNCH CAPABILITIES

# Advanced Navigation Technology

Square Robot’s suite of tank inspection robots comes equipped with our proprietary navigation solution that allows the system to accurately and autonomously navigate inside GPS denied environments within storage tanks.

The robot executes pre-planned missions accurately, seamlessly, and in close proximity to the tank shell and internal tank appurtenances. Throughout each inspection mission, the robot maintains consistent and precise movement, continuously collecting data and accurately locating areas of concern so asset owners can properly manage their assets.



# Roof and Shell Launch and Recovery Systems

Square Robot’s SR3 can be launched and recovered into the tank for inspection through a minimum 24-inch roof or shell manway, depending on project requirements.

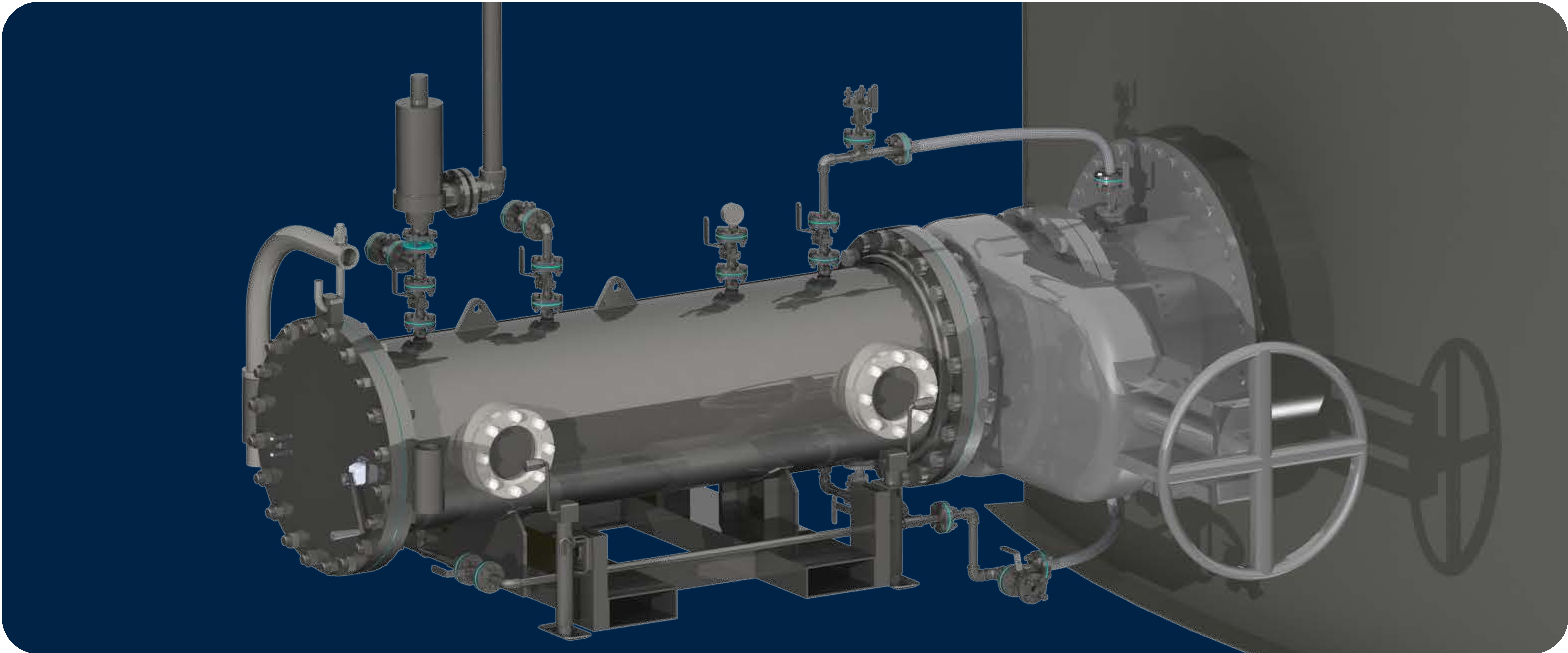
## SR-3 Robot Launch and Recovery Considerations

Item	Roof Launch	Shell Launch
Roof Type	<ul style="list-style-type: none"><li>Fixed, External Floating, Geodome</li></ul>	<ul style="list-style-type: none"><li>Internal Floating, Geodome</li></ul>
Product Type	<ul style="list-style-type: none"><li>High Flash Point including Water, Distillates, Lube Oil, Other</li></ul>	<ul style="list-style-type: none"><li>Low or High Flash Point including Gasoline, Naphtha, Ethanol, Methanol, Other</li></ul>
Manway Size	<ul style="list-style-type: none"><li>24" (610mm) Manway (22.75" ID)</li></ul>	<ul style="list-style-type: none"><li>24" (610mm) Manway (22.75" ID)</li></ul>
Manway Access	<ul style="list-style-type: none"><li>External and internal obstructions that restrict access</li></ul>	<ul style="list-style-type: none"><li>External and internal obstructions that restrict access</li><li>Minimum 20' x 5' (6.1m x 1.5) work footprint near manway</li></ul>
Lifting Equipment	<ul style="list-style-type: none"><li>Mobile Crane (~35 Ton)</li></ul>	<ul style="list-style-type: none"><li>Forklift or Crane</li></ul>
Ancillary Equipment	<ul style="list-style-type: none"><li>Provided by Square Robot</li></ul>	<ul style="list-style-type: none"><li>Nitrogen, Vacuum Truck, Bubbler, Tote, Cribbing</li></ul>
Additional Considerations	<ul style="list-style-type: none"><li>Roof and lift safety</li><li>Manway access</li></ul>	<ul style="list-style-type: none"><li>Install manway adaptor/valve/blind by lowering product level below manway or hot tap shell manway</li></ul>



## ROBOT LAUNCH CAPABILITIES

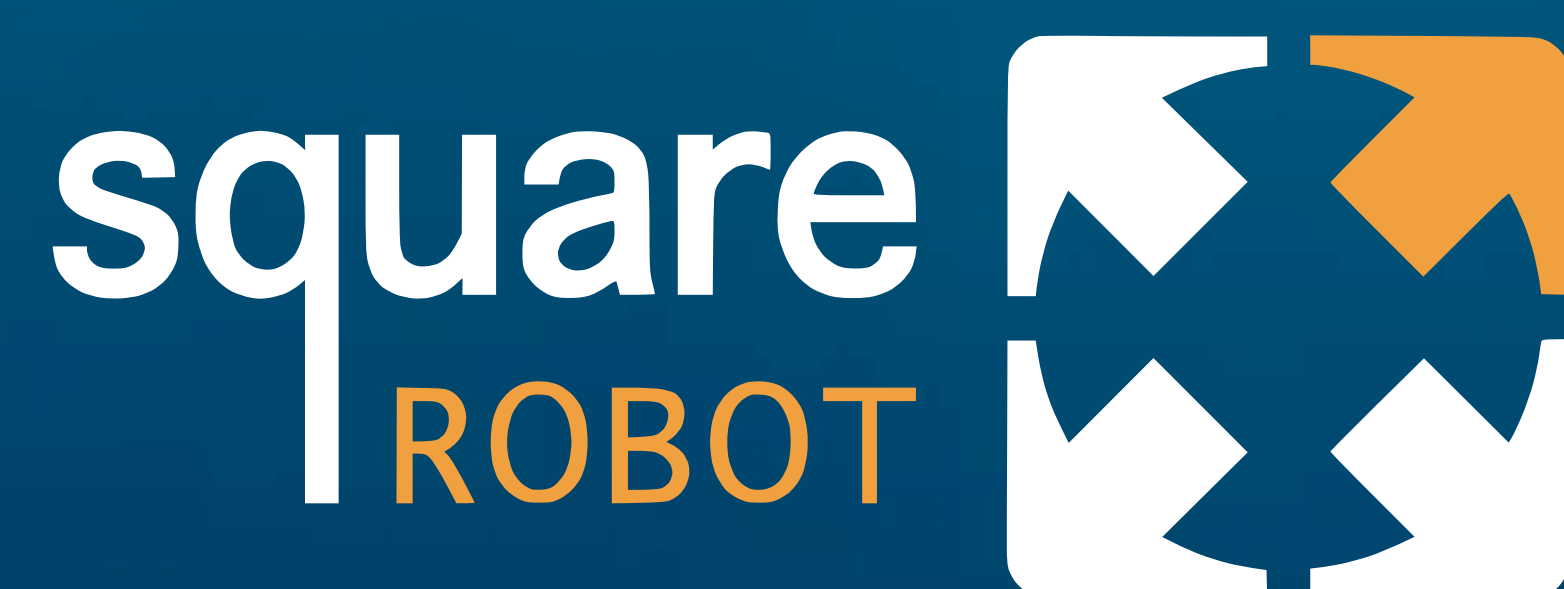
# Side Launcher



Function	Enables the launch and recovery of an SR-3 robot from a AST's shell manway
Dimensions (excludes manway adapter and primary isolation valve)	7.5' L X 24" Dia
Weight (one vehicle chamber)	Empty: 2500 lbs (1130 kg) Filled: 3750 lbs (1700 kg)
Compatible Shell Manways Diameter	24" Diameter minimum
Shell Manway Ground Clearance	20.9" minimum to manway center



At Square Robot, we offer a comprehensive solution for optimizing efficiency and safety during your routine tank inspections.



To gain insight into how our industry leading above-ground storage tank inspections robots can benefit your operations, contact our team of experts: [info@squarerobots.com](mailto:info@squarerobots.com)



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