

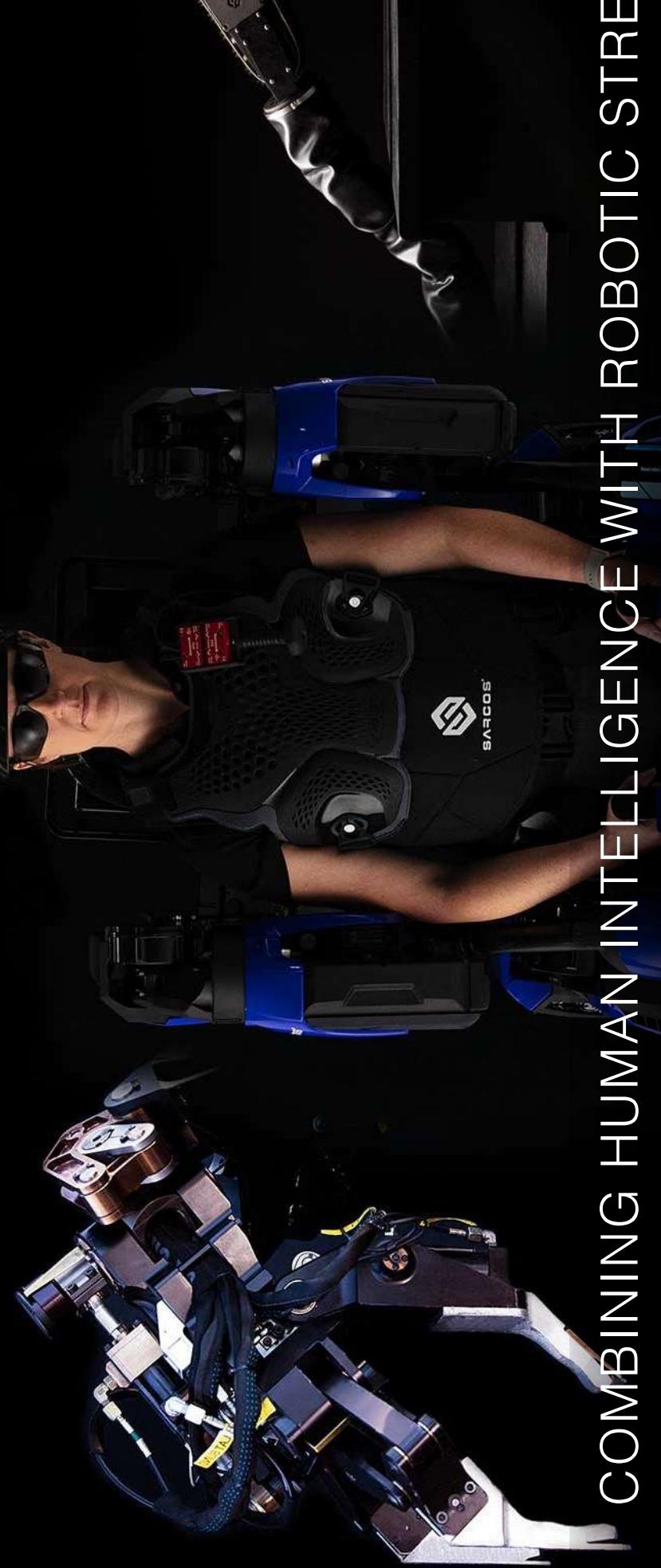


JTEG TECHNOLOGY FORUM – FEBRUARY 2021



EXTENDING SUSTAINMENT OPERATIONS AND WORKER SAFETY USING ROBO

THE SARCOS MISSION: TO DELIVER FORCE-MULTPLYING TECHNOLOGIES YIELD DECISIVE CAPABILITIES



COMBINING HUMAN INTELLIGENCE WITH ROBOTIC STRENGTH,
ENDURANCE, AND PRECISION FOR COMPLEX AND
UNSTRUCTURED TASKS IN DYNAMIC ENVIRONMENTS

OPPORTUNITIES FOR DOD

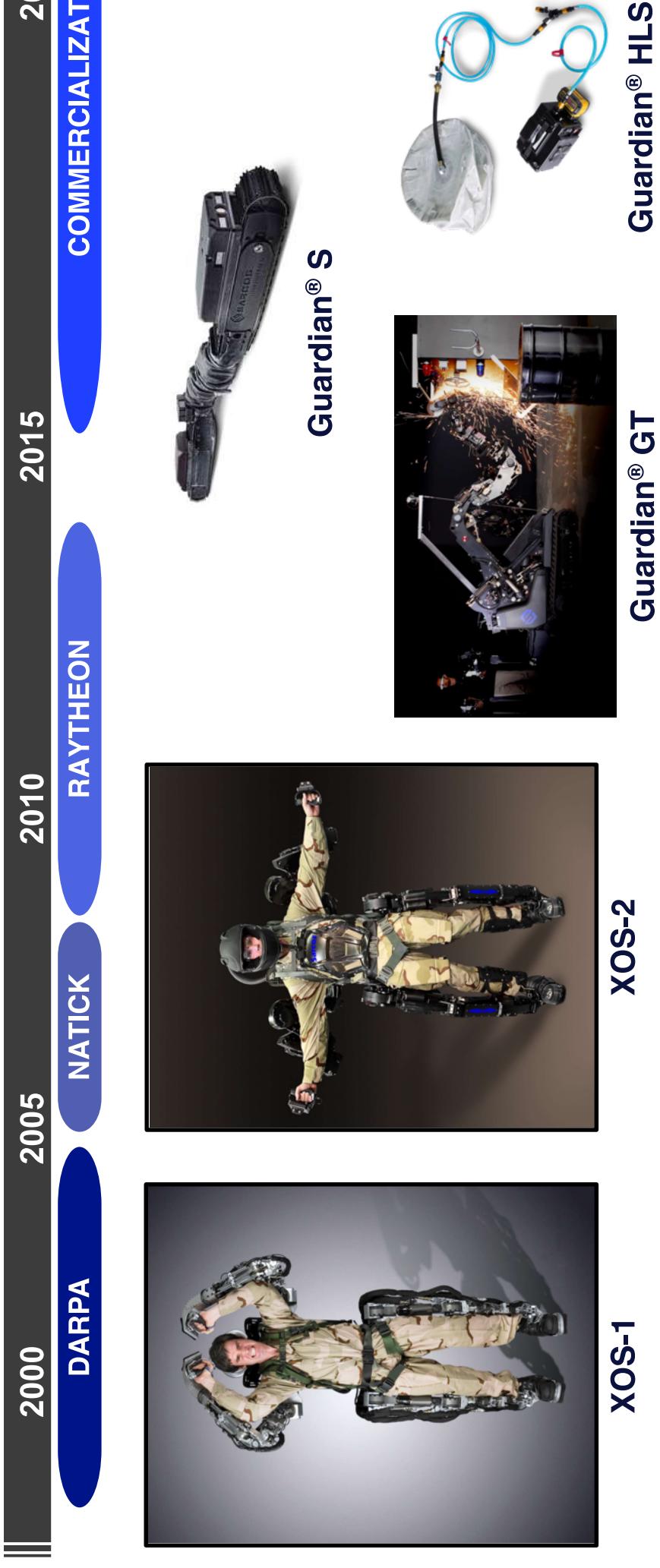


The Sarcos suite of dexterous robotic solutions can support DoD sustainment operations while underway, deployed, and in the yard by:

- Conducting maintenance in forward and unsupported locations
- Expediting battle damage repair
- Speeding up yard turnaround time
- Improving recruitment and retention by making maintenance jobs cool instead of boring and back-breaking
- Enhancing the high-tech competencies and skill sets of the DoD workforce

RETURN ON GOVERNMENT INVESTMENT

- More than 80 government and commercial customers have contributed to our **prolific research and development**
- **Unmatched technical knowledge**, achieved through diverse investments, enable singular product development
- Since its inception, **>\$300 million has been invested** to develop Sarcos technology.
- **More than 140 patents** have been granted that are relevant to core products.



THE COST OF MUSCULOSKELETAL INJURIES (MSKIs)

2,996

LOST WORKDAY
INJURIES TO TH
AND ANKLES OF
AIRCRAFT MAIN
CORPS

MILITARY TIMES, 2018

> 2 MILL

ANNUAL NUMBER
NONCOMBAT IN
ACTIVE COMPO

MILITARY MEDICINE, SEP-OCT

4%

OF ACTIVE COM
CANNOT DEPLO
TIME DUE TO MS

MILITARY MEDICINE, SEP-OCT



63%

of upper extremity injuries reported were in the shoulder, caused by overexertion while lifting or lowering¹

20 DAYS

median number of limited duty days taken by the mechanics due to injury²

chance the discharge will soldiers' first year caused by mechanical in

EXISTING SOLUTIONS

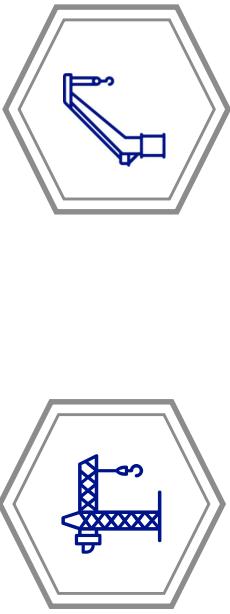
DON'T GET THE JOB DONE

Not suitable for tight spaces

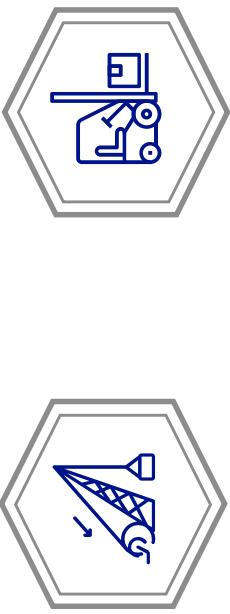
Require structured environments

Require specialized training or licensing

Are perceived as boring and back-breaking instead of the cool tech of the future



Overhead Crane **Fixed Lift Assist**



Portable Crane **Forklift**

GUARDIAN® XO®

Full-Body, Powered Exoskeleton

Augment Strength & Endurance

Reduce Injuries

Optimize Productivity



BENEFITS

- Multiples of power
1 person + 1 Xo
- Extend useful life
- Opens aperture

FEATURES

- Lift and dexterous
up to 200 lb (90 kg)
- Near-continuous
hot-swappable
- Capable of 10 cycles
- < 30 seconds



APPROACH

INTUITIVE CONTROLS

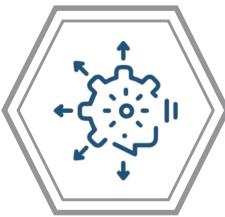
- Easy to Use
- Integrated Feedback



Modelled after human movement

HUMAN-LIKE DEXTERITY

- Versatile
- Adaptable



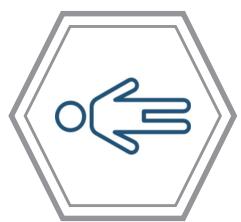
Requires human ability to operate in complex, unstructured terrain

AUTONOMOUS

- All-Day Use
- Weightless



Reduced consumption
6,800



Designed with human body ratio



Capacity
100%

BACK SUPPC

Maintenance
and invento
equipment



HANG / FLIGHT MAINT

- Material (parts, p tool kits,
- Pushing, support
- Torquing platform



SUPPLY MUNITION SUPPLY

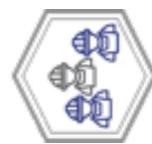
- Material
- Pre-assessment sequence
- Munition



ANY BASE, ANY PLACE

GUARDIAN® DX – TELEOPERATED ROBOTIC SYSTEM

Challenges



More support required



Cost of equipment

Worker fatigue & injury



Hazardous conditions

Features

- Lift and manipulate up to 200 lb (typical laborer can lift 40 lb)
- HD immersive experience
- Force feedback to control precision and use off-the-shelf tools
- Can mount to a variety of mobile and telescoping bases
- Indoor and outdoor use



Benefits

- Optimize productivity for precise tasks in dangerous environments
- Reduce at-height and overhead fatigue, injury & exposure to hazardous conditions
- Mitigate risks and associated costs

GUAR

APPLI

- Non test insp
- Over heig
- Use imp tool
- Live rive
- Stea



GUARDIAN® GT

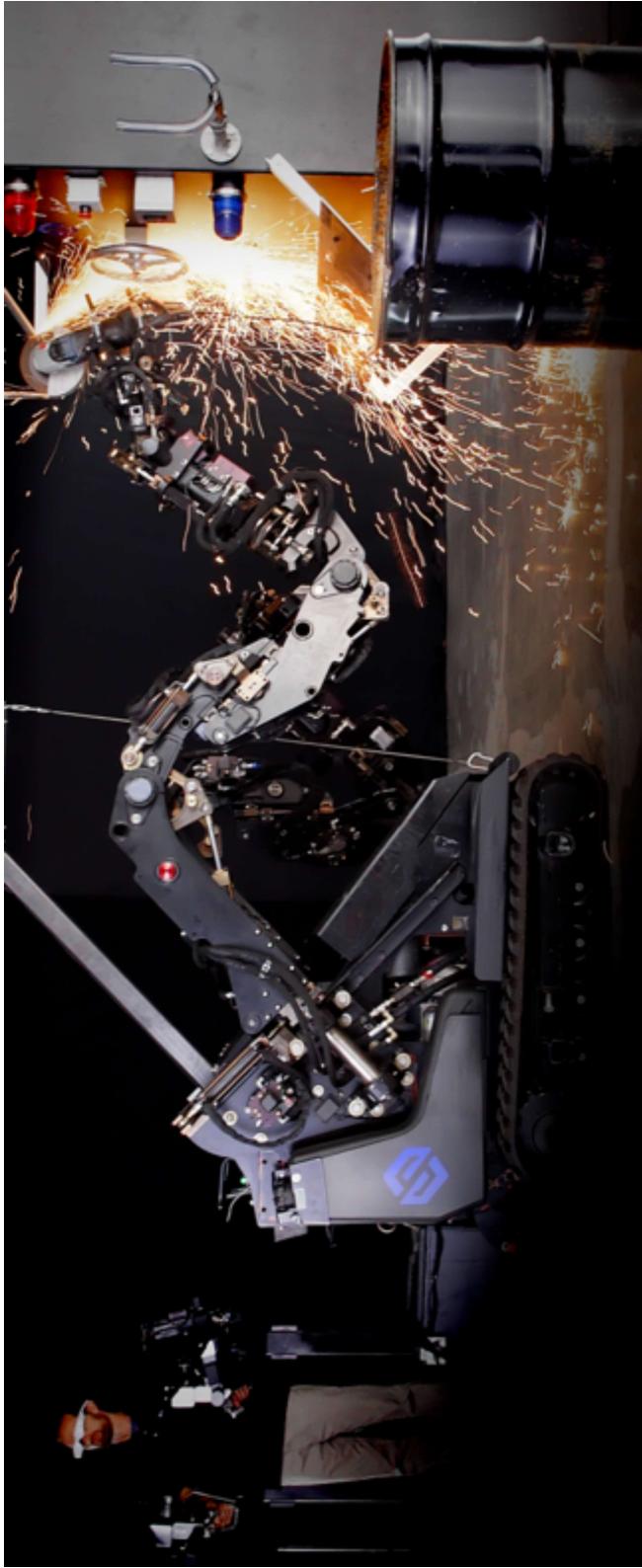
Unparalleled Combination of Dexterity & Strength

USES

- Fabricate, weld, glue
- Safe structure de-assembly
- Assemble and join
- Palletize and depalletize

FEATURES

- 7 ft arms lift 1,000 lbs
- High-fidelity force control
- Can use off-the-shelf tools
- Remote or local control



SEE IT IN ACTION

<https://www.sarcos.com>



Construction



Manufacturing



Nuclear/Hydro



Maritime

OCONUS BATTLE DAMAGE REPAIR / MAINTENANCE IN FORWARD

EOD

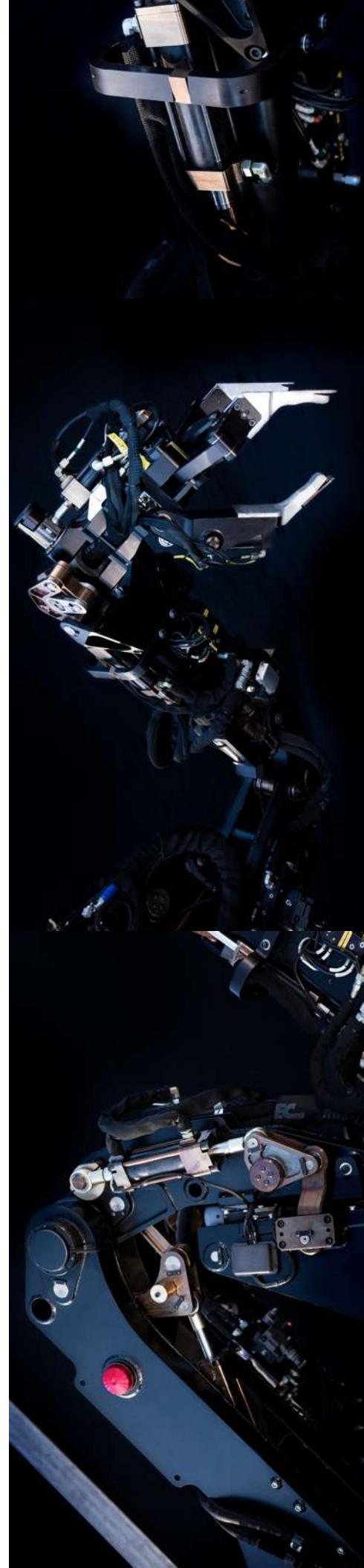
DISASTER RECOVERY

LOGISTICS

- Render hazardous, explosive devices safe
- Evacuate and relocate hazardous materials and munitions
- Disable or safely detonate, with operator out of harm's way
- Manage vehicle-borne IEDs or larger ordinance

- Build and repair structure and equipment
- Erect temporary storage structures
- Aid in safe structure demolition and removal
- Repair machinery and exchange parts

- Transport and re-palletize and de-unloads supplies
- Handle unmanned challenging terrain
- Move heavy rock controlled manner



GUARDIAN® S

Modular Sensor-based Inspection Platform

USES

- Industrial inspection
- Confined spaces
- Infrastructure
- Non-destructive testing
- Surveillance



FEATURES

- IP65
- ~3 miles travel
- ~17 lb + access
- Cloud-based software



ROBOTIC INSPECTION: A PART OF YOUR O&M TOOLKIT

Remote Visual Inspection
Robots provide a complement to other inspection tools

WHEN-YOU-NEED-IT INSPECTIONS

- Quick deployment
- Urgent and emergent situations; incurring downtime, potential hazards

ADVANCED MANEUVERABILITY & EXTENDED RUN TIMES

- ~3 miles travel or 12 hours surveillance
- Traverses stairs, pipes, tanks, culverts, and vertical ferromagnetic surfaces
- Able to access confined spaces with 7" diameter openings

BEYOND VISUAL LINE-OFF-SIGHT

- Camera feeds, pitch & roll indicators, and robot avatar on OCU increases situational awareness
- Camera capabilities / stability

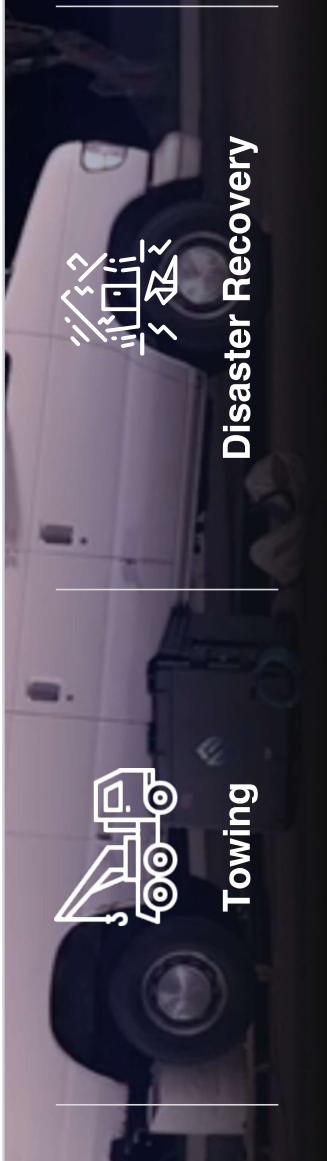
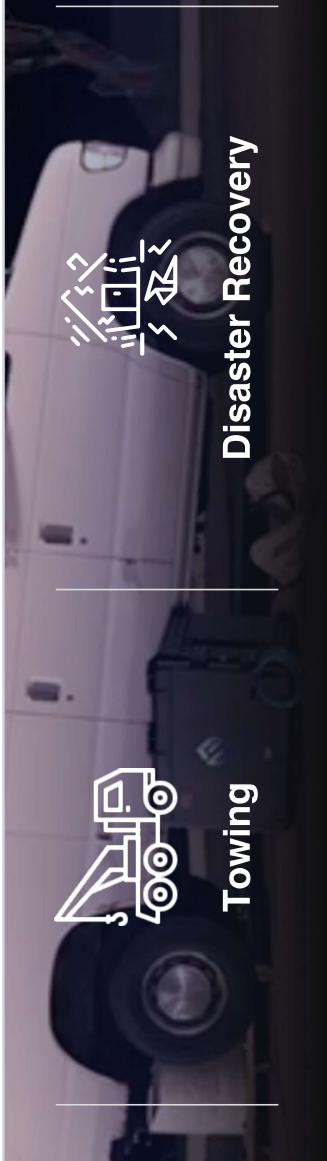
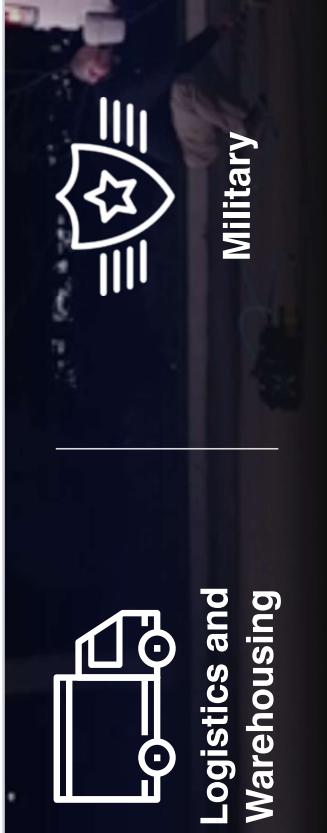
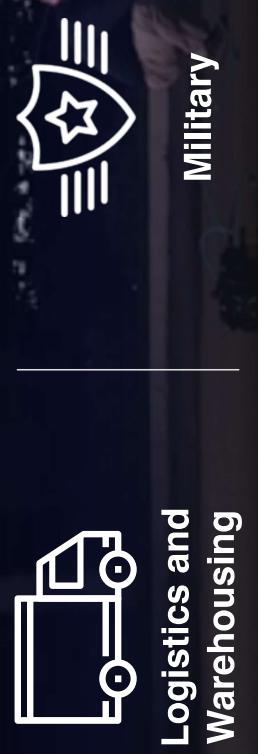
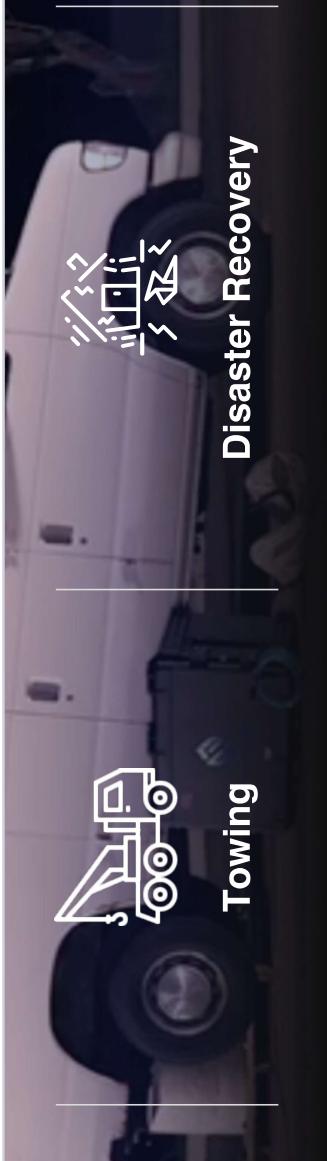
GUARDIAN® HLS FIELD APPLICATIONS

POWERFUL LIFTS WHEN TIMING IS CRITICAL

- Emergency response
- Vehicle recovery
- Routine maintenance in unstructured terrain
- Structure collapse
- Combat search and rescue

FEATURES

- Single-piston, pneumatic compressor lifts up to 1,000 lbs
- Made of durable HDPE plastic with superior strength
- Lightweight, portable
- Common battery; fielded tools



AWARD WINNING PRODUCTS

Guardian® XO®

Time Magazine 2020

Best Inventions of 2020, Productivity

Fast Company 2020

Finalist: Innovation by Design

Nat'l Center for Mfg. Sciences 2020

Winner: Commercial Technologies for Maintenance Activities Technology Competition



Guardian® GT

Frost & Sullivan 2018

Best Practices in Tech: Dexterous Mobile Robotics

IEEE Robotics 2018

Robot of the Week

Digital Trends 2020

Top Emerging Technology

PCmag.com 2020

Best Robot of CES

Wired 2020

Smartest Technology on Show Floor

Venture Beat 2020

Best Idea & Product of CES

Time Magazine 2010

50 Best Inventions, Military

Guardian® S

IEEE Robotics 2018

Product Innovation &

TechConnect Defense

Innovation: Warfighting

Fast Company 2018

Honorable Mention: Innovation

Popular Science 2018

Best of What's New: 100 Most Incredible and Innovative Technologies

Best in Business

Gold: Most Innovative

Sarcos

Dexterous Robots & of the Year

Robotics Business

Top 50 Robotics Companies



THANK YOU

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