SPOT

Boston Dynamics

FY 2024 PORT SECURITY GRANT PROJECT

Introduction and Background

- Founded at M.I.T.
- Manufactured and Headquartered in Massachusetts
- Boston Dynamics has deployed nearly 1000+ robots
- Experienced in robotic design and research for approximately 30 years

SPOT Basic Specs

- SPOT weighs approximately 100lbs (depending on payload)
- Can carry up to 30lbs of payload
- Has a battery runtime of 90min and can be hot swapped.
- Fully depleted battery recharge time is one (1) hour.

SPOT Fleet Testing

- 100 robots tested and run 24/7
- Total runtime is 9000km per month (approx. 5500miles)
- Drop tested for durability
- Heat tested for temperature resistance

Three (3) most difficult tasks for Robots

- **Going up stairs**
- **Getting up after falling over**
- **Opening Doors**

Terrain

- Spot is designed to operate in unknown, tough, and antagonistic areas
- Uses perception cameras to decide where to place feet and stabilization algorithms to stay balanced
- Navigates every build of stairs

SPOT Using Stairs

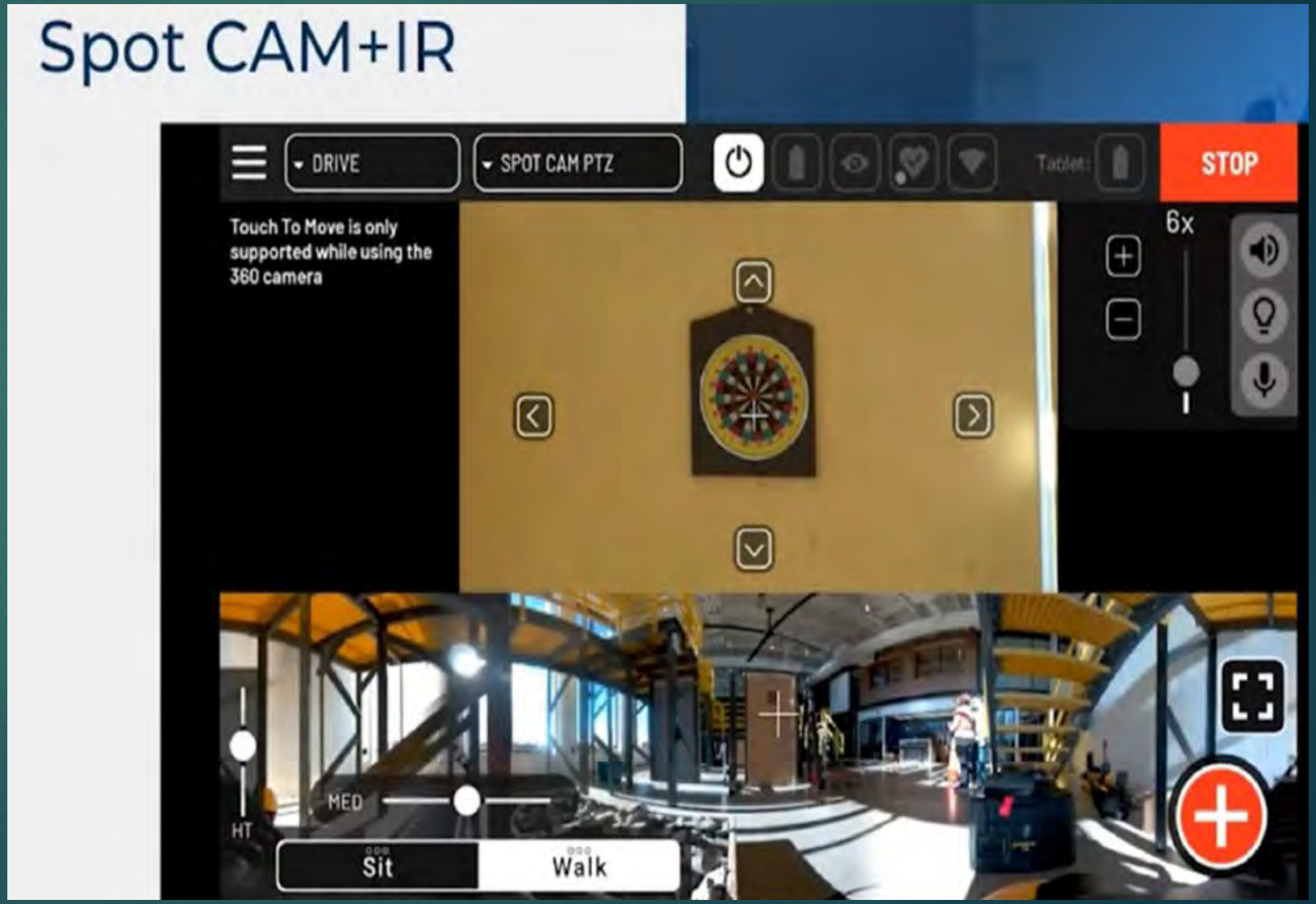
(click image to view video)

SPOT Normal Pacing (Click image to view video)

- Averages 3MPH
- Constantly maps terrain to avoid obstructions in its path

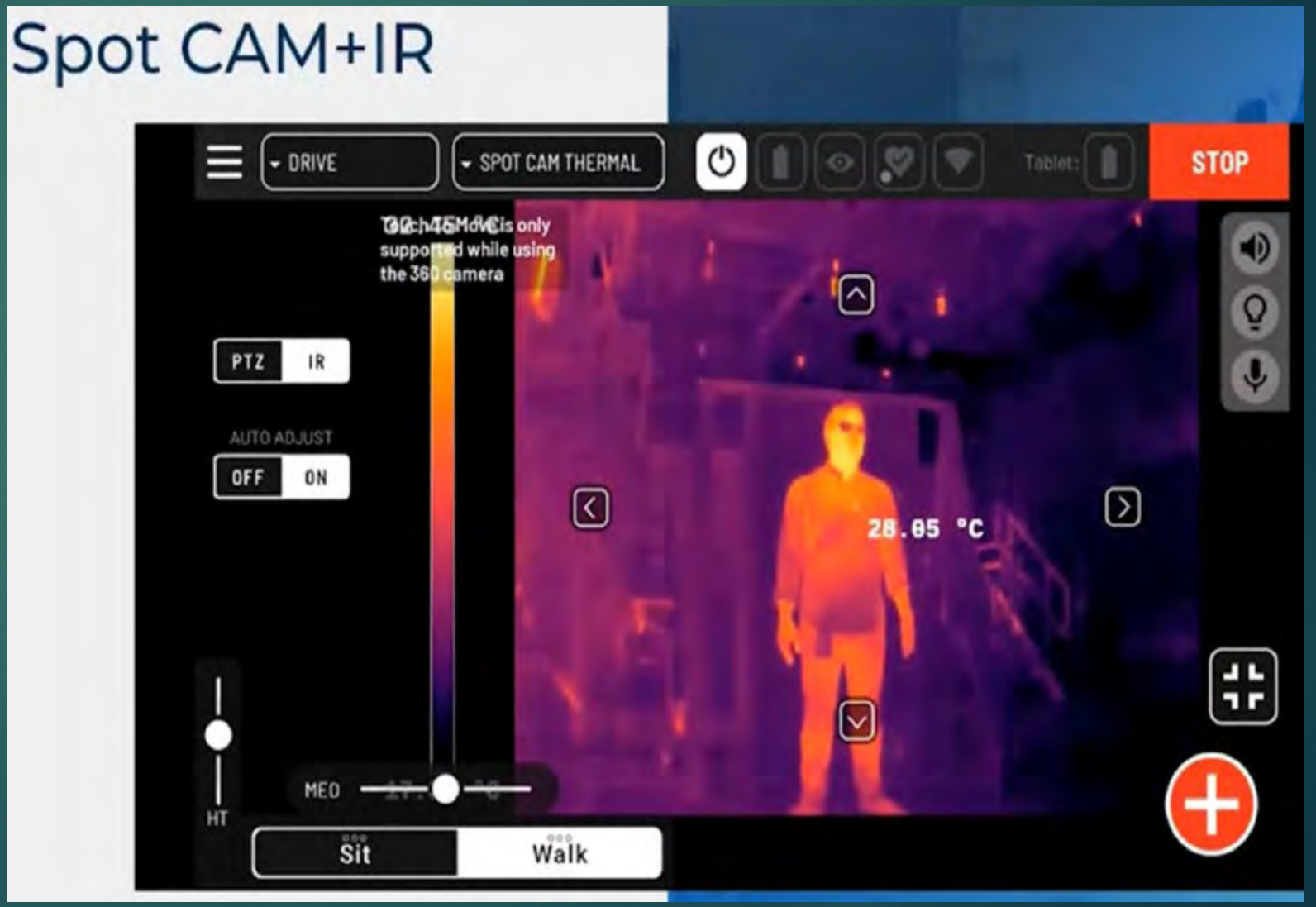
Camera System

- Uses a 360 PTZ 30x Camera
- Enabled with 2-way Control of camera from operator to SPOT



Camera System

- Built-In Thermal and Infrared settings for SPOT to navigate in low light and complete darkness



Custom Payloads

- Boston Dynamics is partnered with companies to customize quick disconnect attachments
- CBRNE
- Sensor Packages
  - Industries can custom outfit SPOT to detect certain chemicals that may be industry specific

Inspecting and Picking Up Objects

- SPOT can pick up approximately 20lbs and walk with approximately 10lbs
- SPOT'S arm has cameras that allow him to see the object the operator tells to pick up
- SPOT, after being told what to grab, will analyze the object and determine the best way to pick up the object

Inspecting and Picking Up Objects

- SPOT picks up object
  (Click image to view video)

Dragging Objects

- If an item is too heavy for SPOT to lift there is a dragging feature.
- SPOT can typically drag up to 50lbs depending on the terrain

Dragging Objects

- SPOT dragging object
  (Click image to view video)

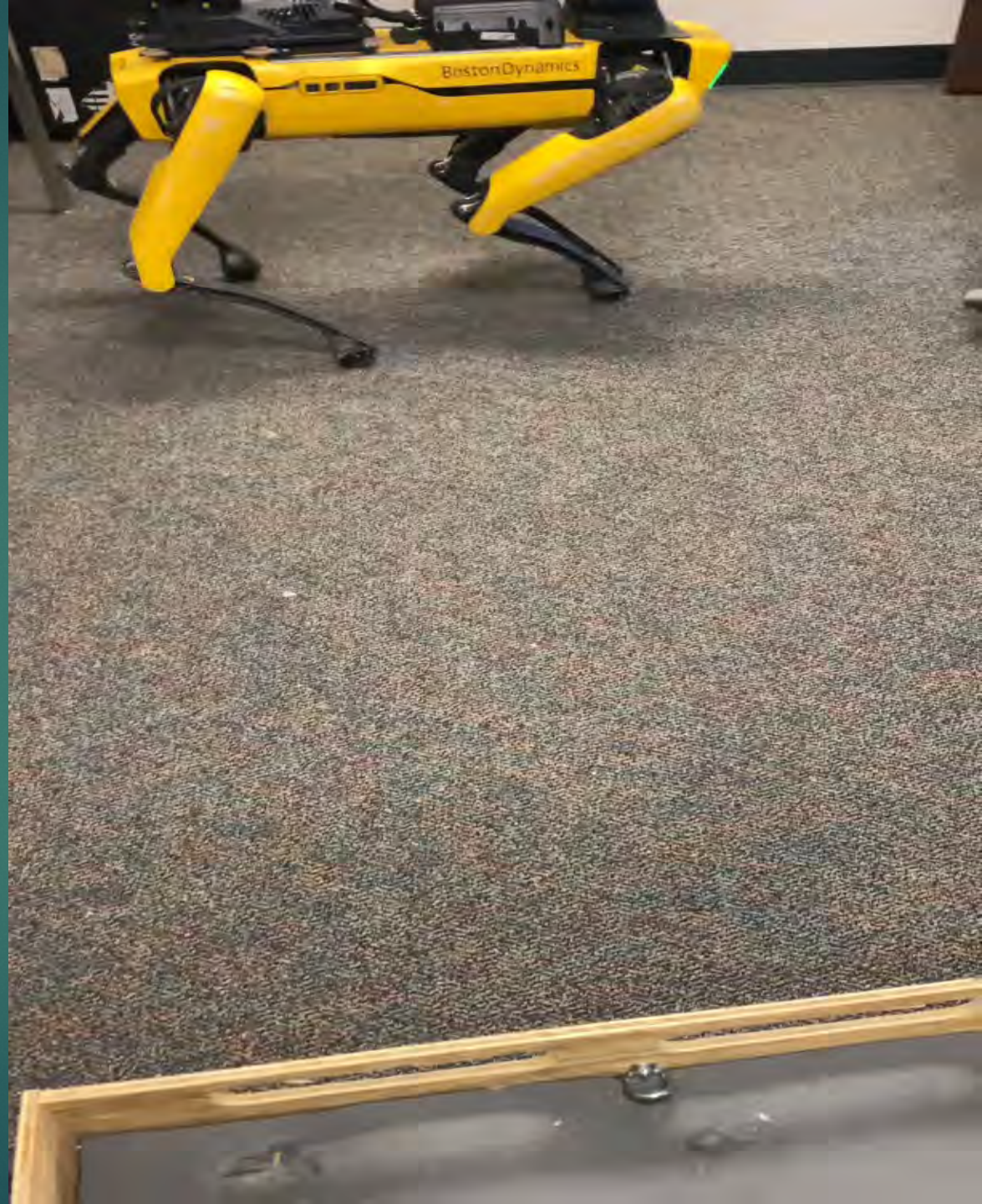
Opening Doors

- SPOT is able to open most doors pointed by the operator from the handheld controller

- Spot analyzes:
  - The type of grip to use
  - Which side of the door the hinges are located
  - If the door is spring loaded or not

Opening Doors

- SPOT opening door
  - From inside (Click image to view video)

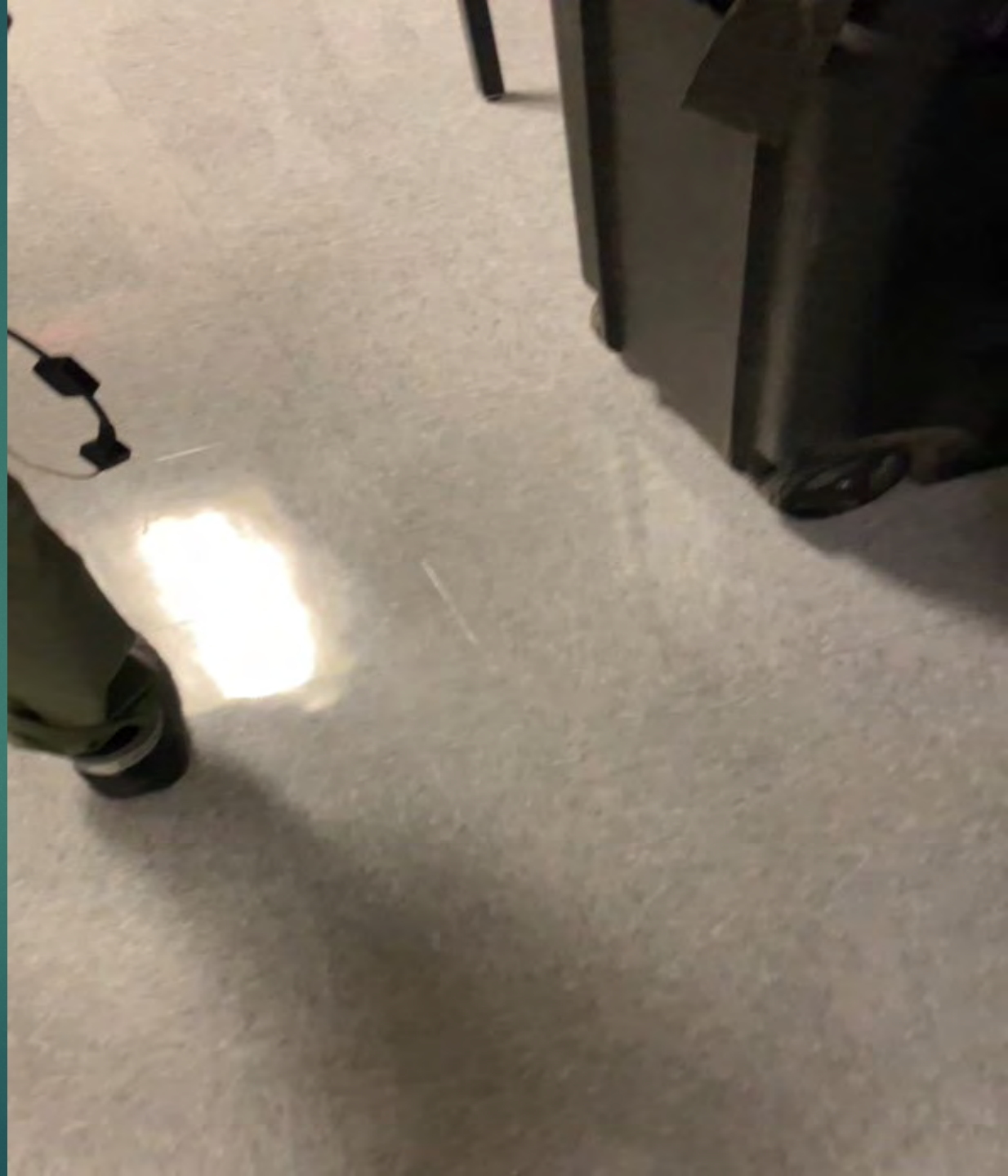


Opening Doors
(Click image to view video)

- SPOT opening door
  - From outside

Opening Doors
(Click image to view video)

- Door with push bars
- Balance Test



Fall Recovery-Self Righting

- SPOT is designed and programmed to self-right himself when stumbling or having fallen over

- When he is instructed to self-right and the first attempt doesn't work he will continue moving until he gets up.

Fall Recovery-Self Righting (Click image to view video)

- SPOT self rights himself

Demo-Test

(Click image to view video)

Case Study Deployments

Case Study: FDNY

EMERGENCY RESPONSE

- Parking garage collapsed, unstable terrain to send in responders.
- Spot navigated the complex terrain to search for survivors
- Quickly deployed, was able to provide more information about the scene to responders

Source

Case Study Deployments

Case Study: CBRNe

THREAT DETECTION

- Spot being used for CBRNe threat detection and more at Indy 500, Boston Marathon, and more.

Source

Case Study Deployments

Case Study: MA State Police

SUSPICIOUS PACKAGE INVESTIGATION

- Suspicious device discovered outside gas station
- State Police Bomb Squad deployed Spot for investigation
- Quick deployment, and reduced time on target

Source

Case Study Deployments

Case Study: Houston PD

BARRICADED SUSPECT

- Received call regarding individual with firearm and machete walking outside hotel rooms
- Spot navigated to second floor to investigate and was pulled into suspects room.
- Second Spot was deployed to establish communication - situation ended peacefully.

Source

Boston Dynamics

Houston Police Dept. Statistics

Since March 2021

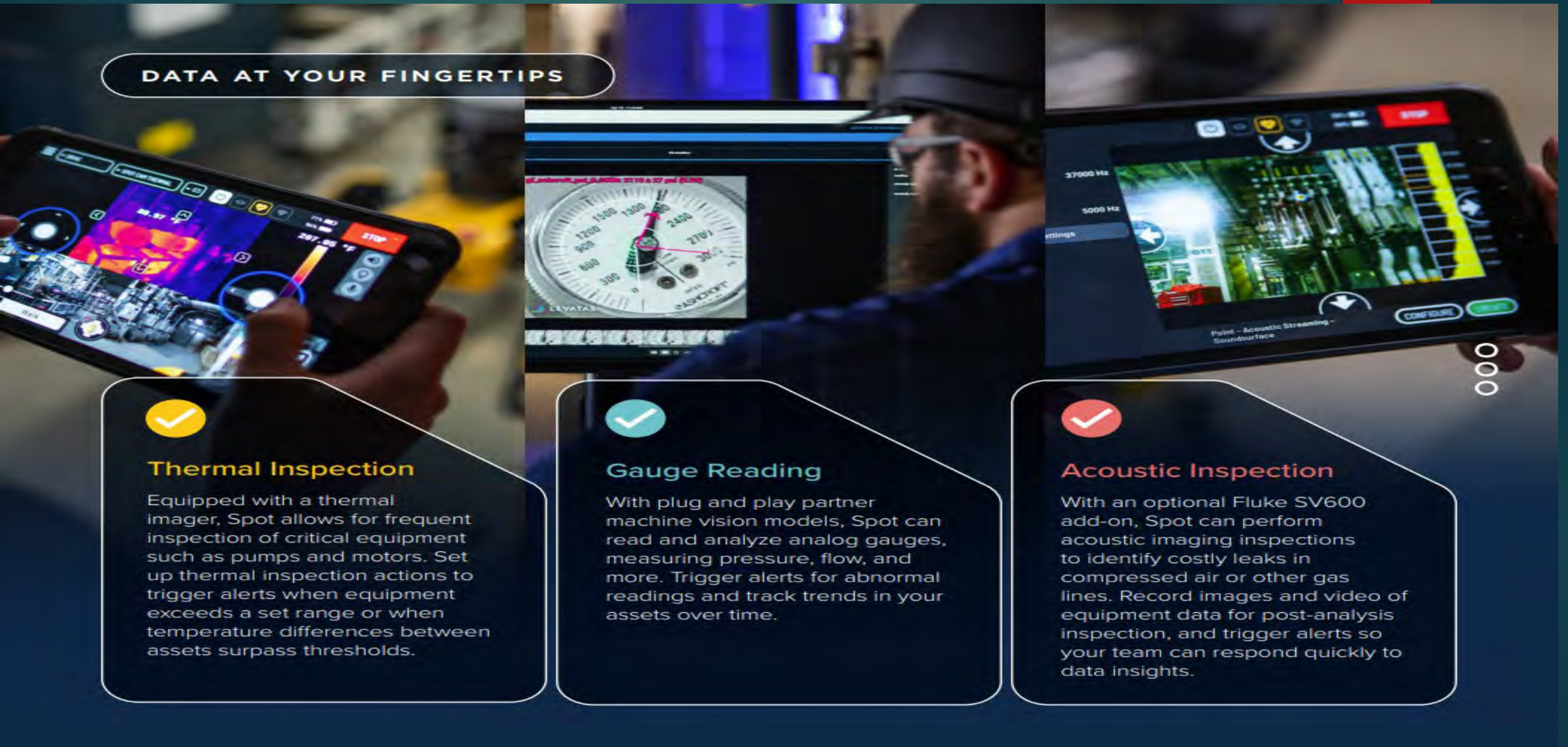
- Barricaded suspect(s) callouts: **150**
- SPOT deployments from these callouts: **120**
- Number of barricaded suspects shot by HPD during SPOT deployments: **ZERO**

Industrial Field Applications

- SPOT can:
  - Perform Thermal Inspections
  - Monitor pumps, motors, and electrical points for overheating
  - Read gauges to determine condition of analog systems
  - Streamline routine tasks
  - Identify air and gas leaks
  - Identify equipment with degraded equipment

Oil & Gas: Monitor equipment for safe, reliable operation

Enterprise Asset Management (EAM Kit)



Thermal Inspection

Equipped with a thermal imager, Spot allows for frequent inspection of critical equipment such as pumps and motors. Set up thermal inspection actions to trigger alerts when equipment exceeds a set range or when temperature differences between assets surpass thresholds.

Gauge Reading

With plug and play partner machine vision models, Spot can read and analyze analog gauges, measuring pressure, flow, and more. Trigger alerts for abnormal readings and track trends in your assets over time.

Acoustic Inspection

With an optional Fluke SV600 add-on, Spot can perform acoustic imaging inspections to identify costly leaks in compressed air or other gas lines. Record images and video of equipment data for post-analysis inspection, and trigger alerts so your team can respond quickly to data insights.

Typical Q&A's For SPOT

- **Can Spot Operate in complete darkness?**
  - *Yes. SPOT uses IR to successfully navigate and operate in low light and complete darkness*

Typical Q&A's For SPOT

- **What type of routine maintenance is required?**
  - No regular-standard maintenance required
  - Certain items can be replaced (air filter, footpads, etc)
  - Troubleshooting can be handled by phone
  - 5 to 10 day turnaround for repairs if needed
  - "Spot Care" package recommended includes 1yr warranty
    - Plan may be extended as desired

Typical Q&A's For SPOT

- **How does SPOT fair on slick surfaces?**
  - SPOT's stability constantly improves with automatic software updates
  - Adjustments can be made by the user through obstacle avoidance settings. (Less friction-More Friction – Tip Toe)

Typical Q&A's For SPOT

- **How does SPOT handle high heat and/or Fire applications?**
  - SPOT has been deployed in burning buildings to assess structural integrity prior to sending in firefighting personnel
  - Boston Dynamics testing reveals that SPOT continues to demonstrate his ability to endure and operate under high and higher levels of sustained heat.

View Full SPOT Webinar

https://bostondynamics.com/webinars/how-spot-is-changing-the-game-for-public-safety/

SCAN ME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