



# Collision Avoidance and Traffic Awareness Technology

# Company Information

- Started in aviation in 2003
- More than 14,000 small aircraft have been equipped
- Developed for surface mining with AngloAmerican
- >11,000 units installed, >800 with live tracking & reporting
- >32 mines operating on 4 continents

Sales & Support,  
Oakland, USA

Production, Test  
and Logistics  
Sissach,  
Switzerland

Administrative  
Headquarters,  
R&D  
Baar, Switzerland

Sales & Support,  
Test  
Brisbane, Australia

Indutronica

Quimica Suiza

HRI

Devex

Trysome

Davesmen

SatNetCom

Mineworks

# Some Deployments to Date

- Anglo Coal (South Africa)



*SAFEmine on all vehicles in all their mines:*

*Landau, Klein Kopje, New Vaal, Mafube, Kriel, Isibonelo*

*Installed: >2500 units*

- Sishen Mine (South Africa)



*7th largest open pit mine in the world*

*34 millions tons of iron ore per year*

*Installed: >1500 units*

# Some Deployments to Date

- Peace River Coal (Canada)

*Installed: >175 units*



- Hecla Greens Creek Mine (US - Alaska)

*Surface access road application*

*Installed: >60 units*



- Cerrejon (Colombia):



*Largest export coal mine in the world*

*Installed: >1100 units*



# Some Deployments to Date

- Prodeco (Colombia)



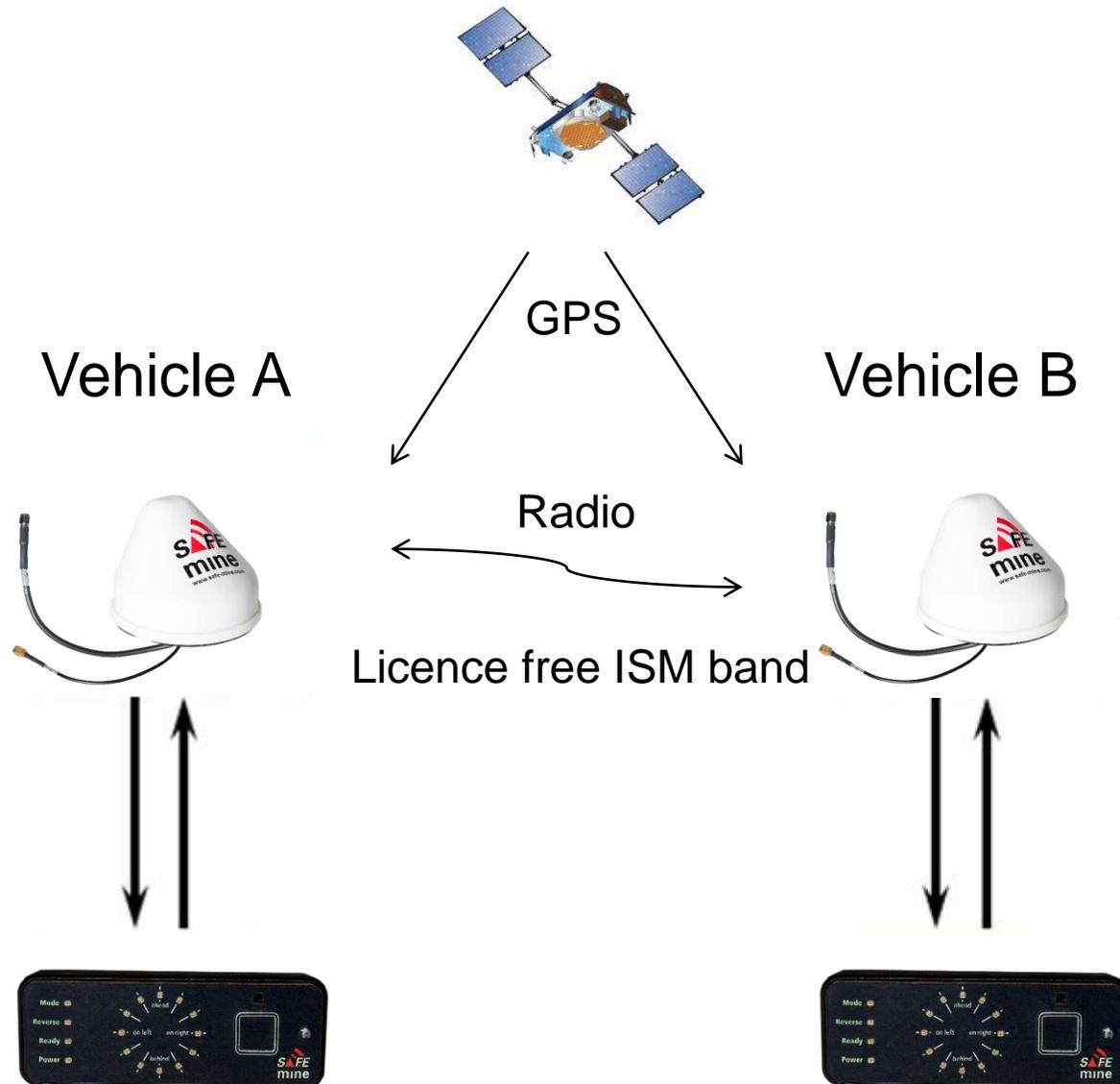
- Curragh North (Australia)
- Commodore mine (Australia)
- Premier Wesfarmers (Australia)
- Tarong (Australia)
- New Acland (Australia)
- Jellinbah / Lake Vermont (Australia)



# Components – simple and rugged design



# Operating Principle



Peer to peer network  
No other infrastructure  
required

360° protection

~500 meter range

No line of sight required

Updates every 250ms

# Operating Principle

## I. Traffic awareness (visual indications):

- Prevent dangerous situations **before** they occur
- Simple display indicates surrounding vehicles

## II. Collision avoidance (audible alarms):

- Correct dangerous situations **when** they occur
- Intelligent warnings alert the driver



- Provides operators with a greater awareness of the vehicles around them



LEDs correspond to vehicle locations

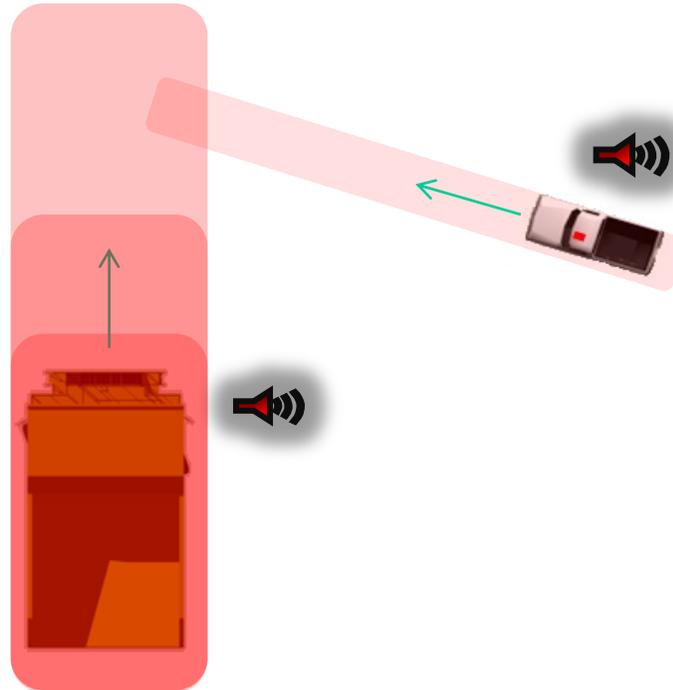
- Uses LEDs to indicate vehicle proximity
- Unit has a full 360° field of view up to 500 meters away
- Distances are fully customizable

# Traffic Awareness



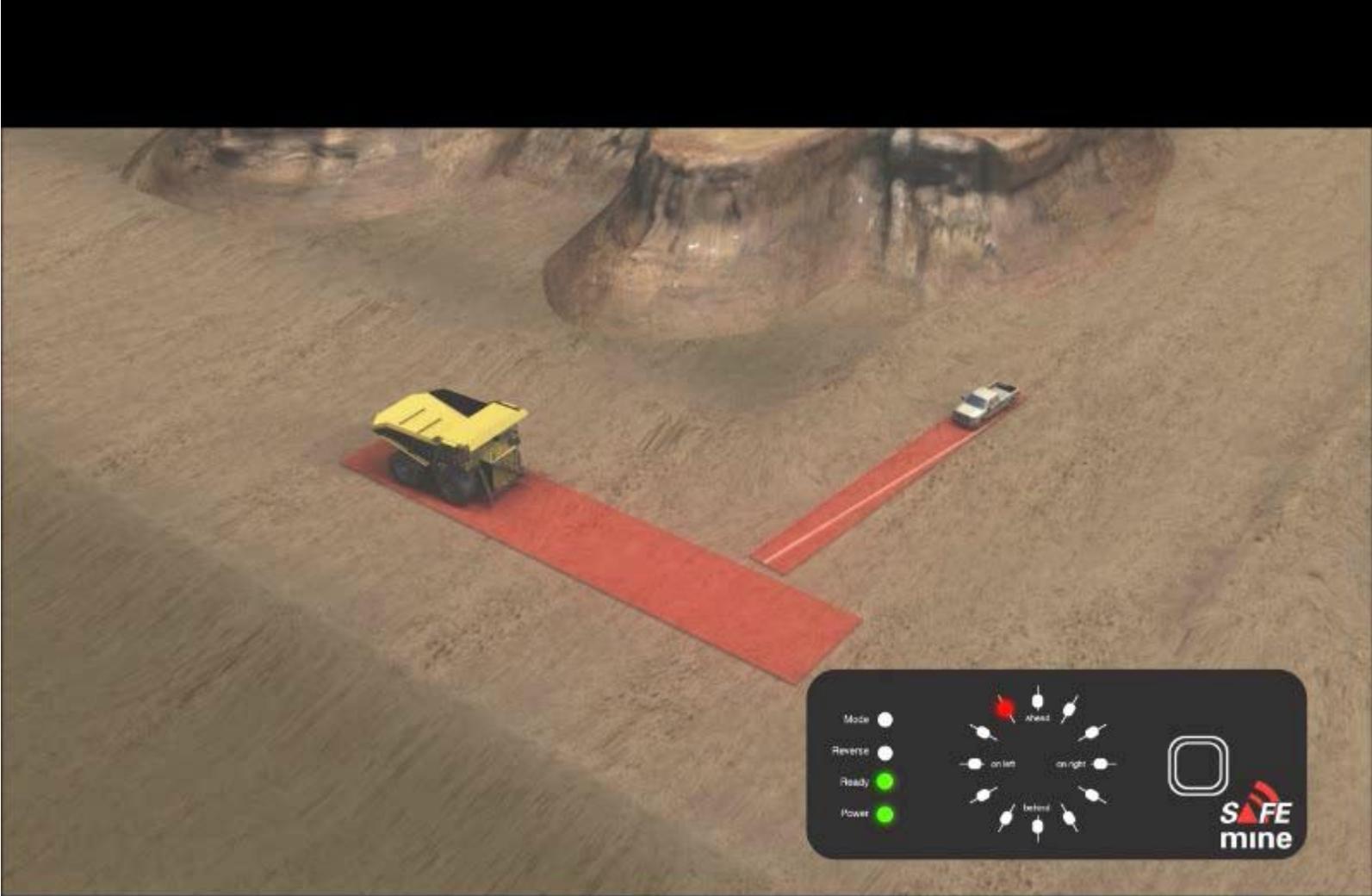
Dynamic collision zone takes into account:

- Vehicle speed and direction
- Vehicle type and braking distance
- Operator reaction time



System provides operators with a Collision Alert (Flashing LED & audible alarm) if it predicts a possible collision with other vehicles

# Collision Avoidance





# **Additional Capabilities and Products**

# Speeding Alert



- If vehicle faster than individual speed limit (configurable)
- Option: geographic speed limit

# Voice Announcements



“Light vehicle ahead”



- Speeding
- Obstacles
- Type of vehicle nearby...



# Geo-fences

## Obstacles:

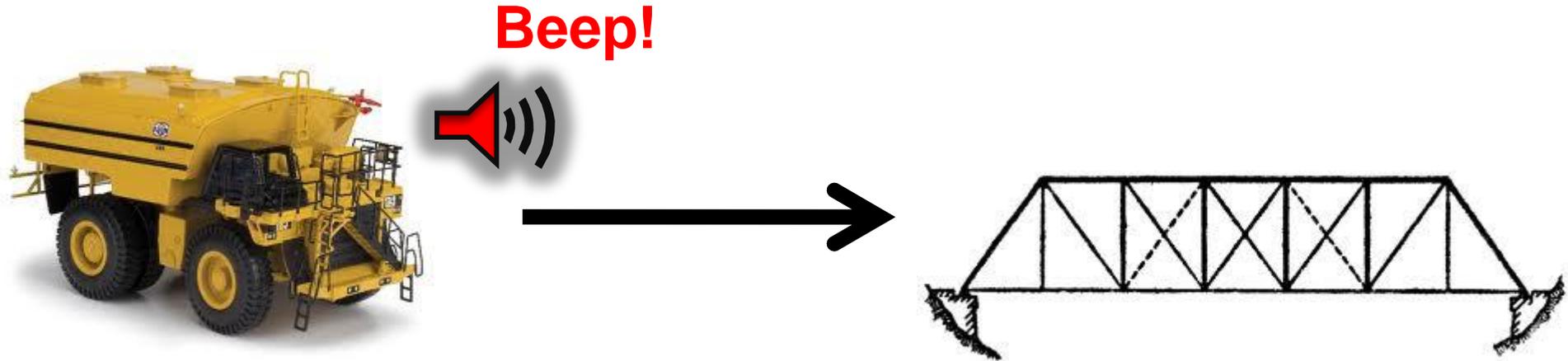
- Static obstacles, eg. power lines, pillars
- Defined via GPS coordinates
- Trigger an operator alarm on approach

## Areas:

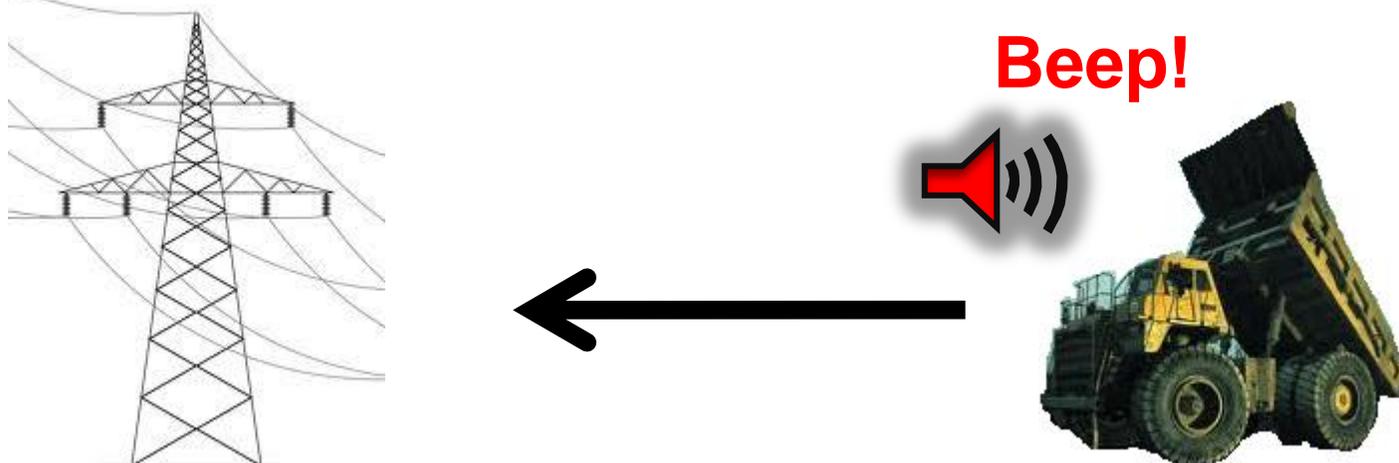
- Static areas, eg. speeding zones, exclusion areas
- May be of any shape
- Defined via GPS coordinates
- Trigger an operator alarm on approach

# IVMS and Dispatch Systems Integration

Overloaded water cart approaching a bridge



Haul truck with box up approaching a power line or underpass





# Access Control



# Track and Event Recording



# SAFEmine TRACK

## Tracking (on-/off-site) & In-Vehicle Monitoring

The screenshot displays the SAFEmine TRACK software interface. The main map area shows a geofence (red polygon) with several vehicles (black triangles) inside. Callouts indicate: "Alert: M 83-451 is leaving the mine" (pointing to a vehicle leaving the geofence), "Speed Alert: SO 83-585 is driving above the 30 km/h limit" (pointing to a vehicle), and "All the vehicles" (pointing to the geofence area). A callout also says "See where any vehicle has been whenever you want" pointing to the track points list.

**Map** | View | Offline | Zoom to view | Follow selected | Center on click | Show trace | Logged in as: mbaAdm Application: Test Demo VehicleTracker - 3.0.0.2583

**Vehicles**

Vehicle Name	Last seen	Track	Show	Status
SO 83-585	02:58:04	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
E 37-019	02:58:04	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
P 83-347	02:58:04	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
M 83-451	02:58:04	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
M 83-455	02:58:04	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
P 83-510	02:58:03	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
SO 83-590	02:58:03	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
SO 90-126	02:58:03	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
M 72 141	02:58:03	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

**Tracks (Selected vehicles)**

Start: 2011-03-17 07:51:08 | Stop: 2011-04-01 07:51:08 | Search

**Track points (selected tracks)**

Advanced filters | Export | Draw tracks

**Geofence**

(82 active alarms) | Test Geofence | Geofence mode: Tag mode | Geofence name: Test Geofence | Advanced | Select tag: -- None --

**Vehicle info**

Vehicle Info:	Description:	Position info:
Login ID: M72141		Latitude: 47.19603
Vehicle name: M72 141		Longitude: 8.52519
		Altitude: 495.0 m
		Speed: 23.0 km/h
		Heading: SE, 148.0°
		Last updated: 2011-03-31 02:58:00

- + SMS / Email alerts
- + Distance reports
- + Speeding reports
- + Area reports
- + In-/activity reports
- + IVMS

# SAFEmine TRACK

## Reports (HTML or Excel)

Period: Saturday, August 01, 2009 - Monday, August 31, 2009

Car: 007, CAT 1

Day	Start	Stop	Total Time	Travel Time	Idle time	Distance	Avg Speed	Max Speed
Monday	8/3/2009 11:36 AM	7:58 PM	08:21:59	00:40:53	07:41:06	16 km	22.8 km/h	64.5 km/h
Tuesday	8/4/2009 5:52 AM	5:59 AM	00:06:59	00:06:59	00:00:00	5 km	40.2 km/h	62.5 km/h

Distance 20 km Travel time 00h 47m 52s Avg. speed 25.4 km/h Max. speed 64.5 km/h

Date: 8/3/2009	Start	End	Travel Time	Distance	Avg Speed	Max Speed
----------------	-------	-----	-------------	----------	-----------	-----------

Idle: 00:02:11

11:36 AM	11:59 AM	00:23:05	9 km	24.7 km/h	64.5 km/h
<a href="#">Guaiira, Colombia</a>	<a href="#">Guaiira, Colombia</a>				

Idle: 00:29:27

12:28 PM	12:31 PM	00:02:29	1.0 km	23.1 km/h	41.0 km/h
<a href="#">Guaiira, Colombia</a>	<a href="#">Guaiira, Colombia</a>				

Idle: 01:29:19

2:00 PM	2:01 PM	00:01:30	0.5 km	21.9 km/h	47.5 km/h
<a href="#">Guaiira, Colombia</a>	<a href="#">Guaiira, Colombia</a>				

Idle: 00:04:00

2:05 PM	2:09 PM	00:03:59	0.7 km	11.2 km/h	34.9 km/h
<a href="#">Guaiira, Colombia</a>	<a href="#">Guaiira, Colombia</a>				

7:48 PM	7:58 PM	00:09:49	4 km	23.4 km/h	60.9 km/h
<a href="#">Guaiira, Colombia</a>	<a href="#">Guaiira, Colombia</a>				

Distance 16 km Travel time 00h 40m 53s Avg. speed 22.8 km/h Max. speed 64.5 km/h

Date: 8/4/2009	Start	End	Travel Time	Distance	Avg Speed	Max Speed
----------------	-------	-----	-------------	----------	-----------	-----------

Idle: 09:54:08

5:52 AM	5:59 AM	00:06:59	5 km	40.2 km/h	62.5 km/h
<a href="#">Guaiira, Colombia</a>	<a href="#">Guaiira, Colombia</a>				

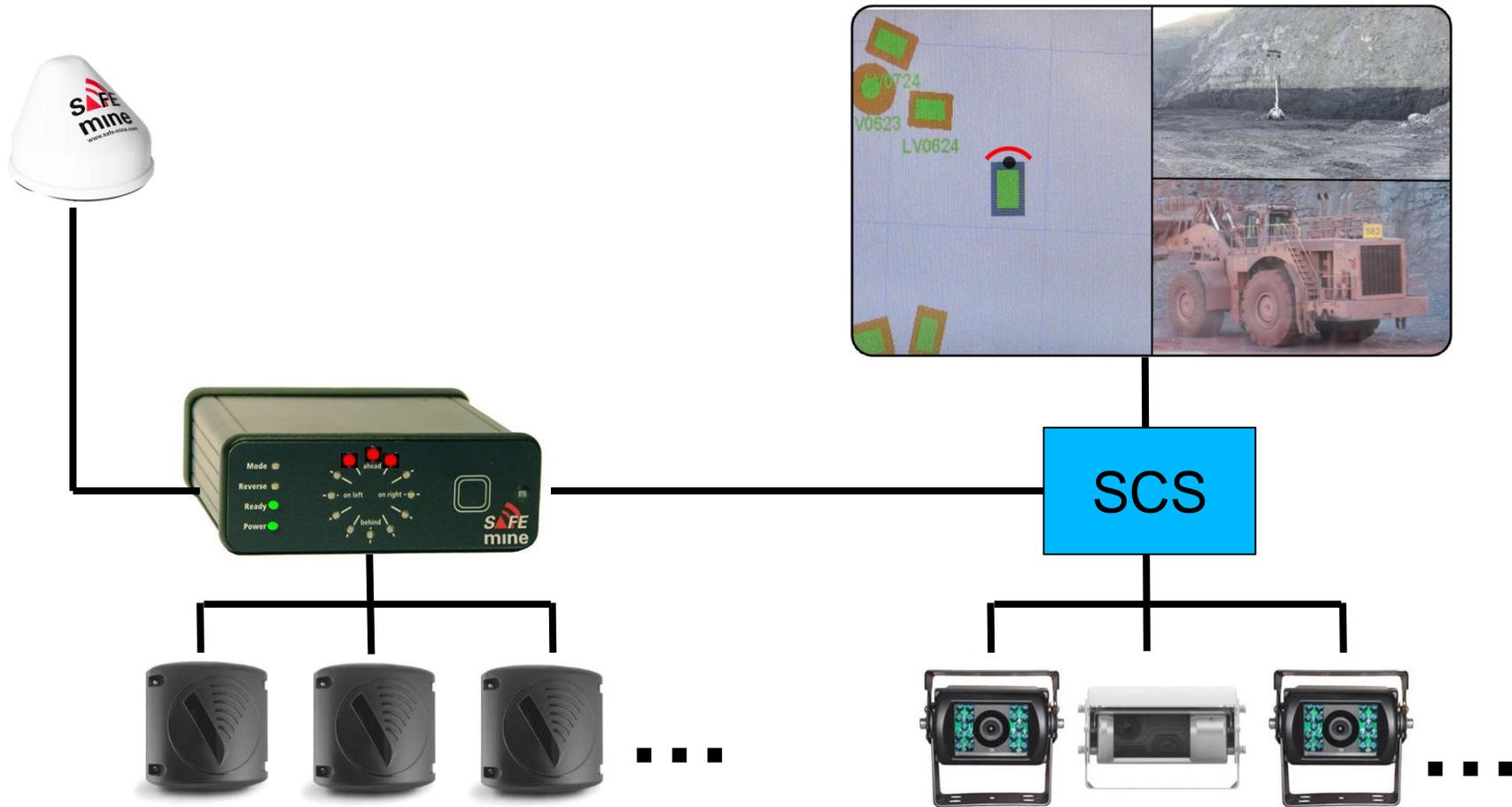
Distance 5 km Travel time 00h 06m 59s Avg. speed 40.2 km/h Max. speed 62.5 km/h

## Email or SMS

From: track@safe-mine.com Sent: Fri 3/9/2012 8:54 AM  
To: tru@safe-mine.com  
Cc:  
Subject: Toyota TRU speed alarm

Speed zone alarm for Toyota TRU traveling at 44.9 km/h kph in geofence Suncrest. Occurred at 03/09/2012 08:54:35.

# SAFEmine + Radar + Cameras = Safety Center

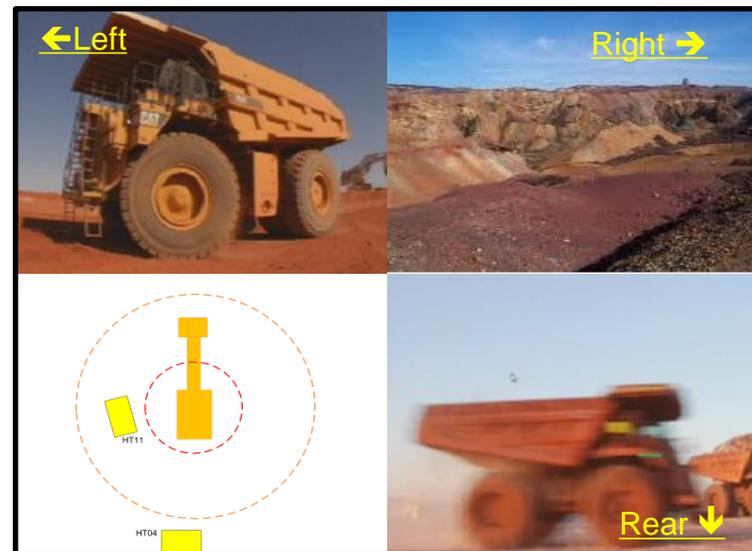


➤ Safety Center integrates all 3 technologies = best performance

# SAFEmine Shovel Product

## Integrate GPS and cameras:

- Provide top view of traffic in shovel area
- Provide view of 3 cameras (left, right, rear)
- Touchscreen to select full screen view and other controls
- Large overall screen size for easier viewing



# SAFEmine Product Comparison

	QC230	QC240	QC250	QN555	Safety Ctr	SM Shovel
GPS-based Collision Avoidance	Yes	Yes	Yes	Yes	Yes - in combination with QC2xx	Yes
Display	LED or video touch screen	LED or video touch screen	LED or video touch screen	LED	LED and/or video touch screen	Video touch screen
Voice Option	Yes	Yes	Yes	No	Yes - in combination with QC2xx	Yes
IVMS (In Vehicle Monitoring)	No	Yes	Yes	No	Yes	Yes
SM TRACK	No	Yes (GSM)	Yes (WiFi)	No	Yes - in combination with QC240/250	Yes - in combination with QC240/250
Object Detection Option (Radar)	Yes	Yes	Yes	No	Yes	Yes
Personnel Detection Option (Radar or RFID tags)	Yes	Yes	Yes	No	Yes	Yes
Camera Integration	No	No	No	No	Yes	Yes
Access Control (with boom gate or test station)	Yes	Yes	Yes	Yes	Yes - in combination with QC2xx	Yes

Thank you for your kind attention

**SAFE**  
**mine**

