

A large yellow autonomous haul truck is shown in an open-pit mine. The truck is positioned in the center of the frame, facing forward. It has a large, rounded roof and a prominent front grille. The background shows a deep, rocky excavation site with a forest of tall trees in the distance. The lighting is bright, suggesting daytime.

***Recent Experiences with Autonomous
Haul Trucks in Open Pit Mines***

**Presented by
Les T. Zoschke
Modular Mining Systems Inc.**

Introduction

- *History of Autonomous Trucks*
- *Vehicle Control - Drive and Navigation*
- ***Supervisory Control - Optimization***
- ***Demonstrations***

Vehicle Control



Major Components of Unmanned Mining Trucks



Vehicle Navigation System



The Result !



Haul Road

Supervisory Control

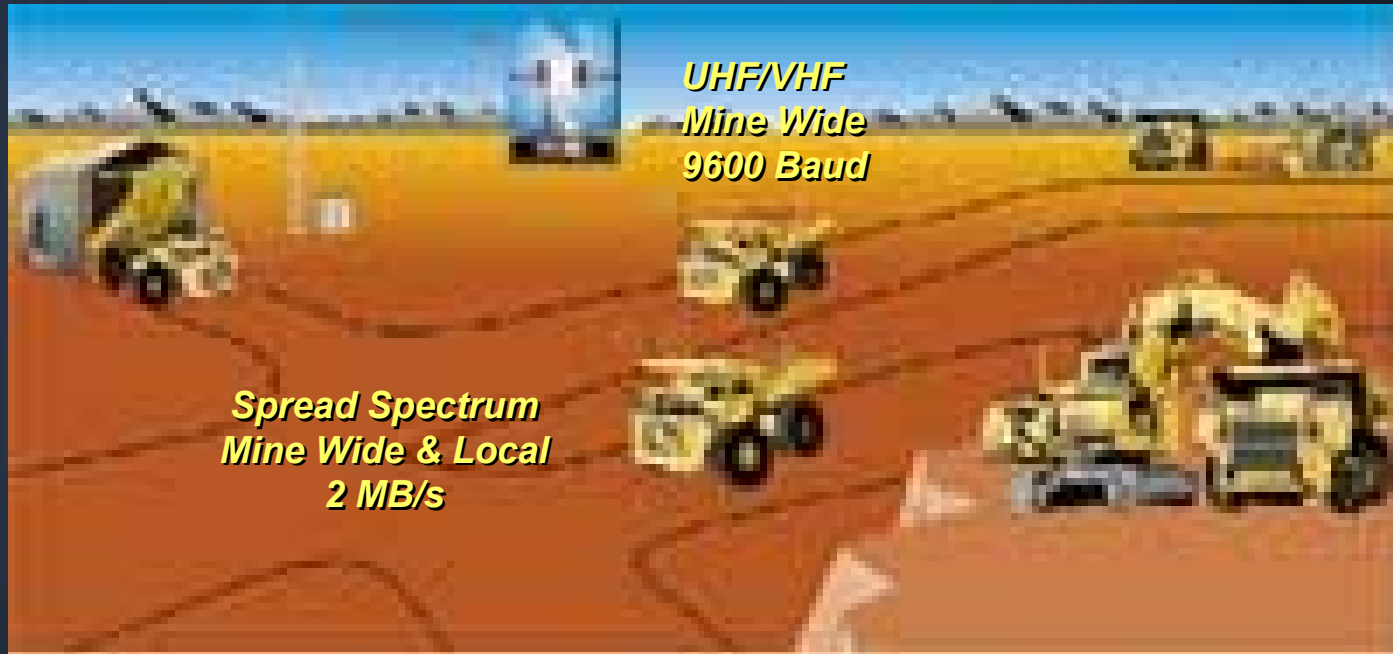


Control Room



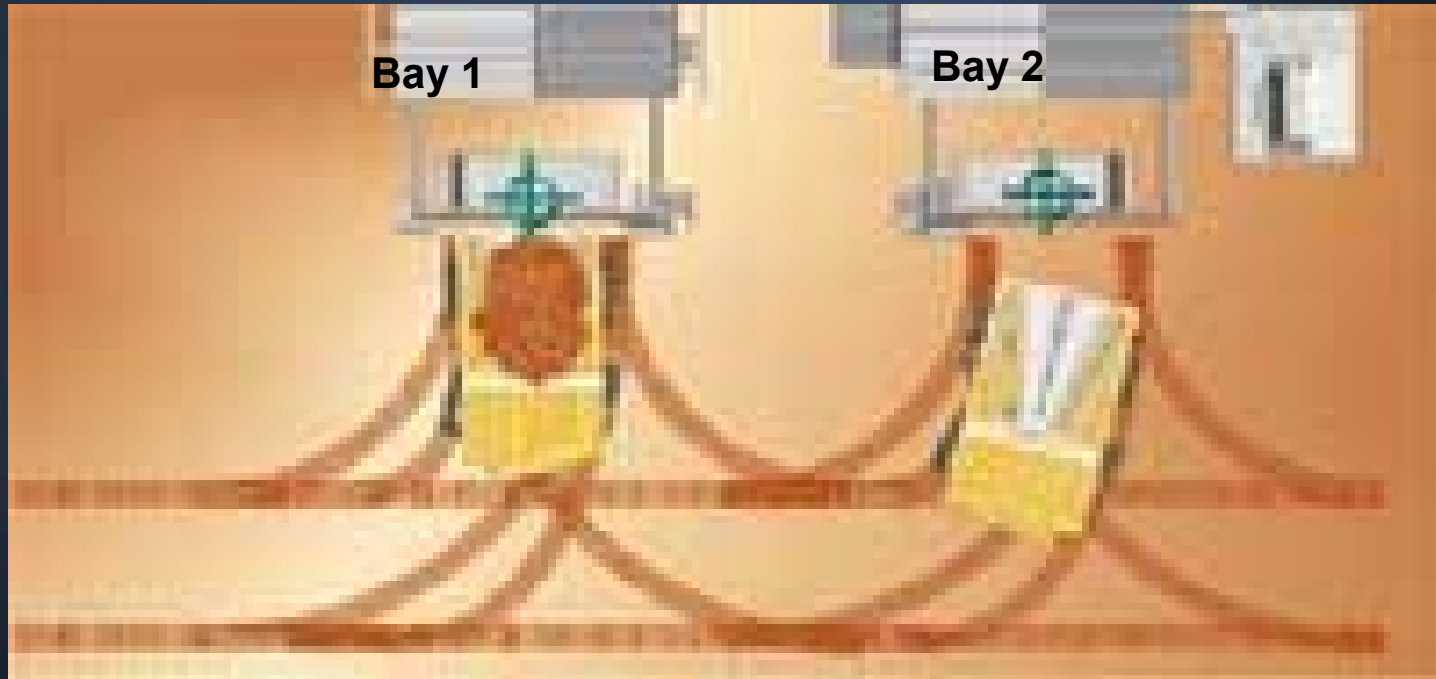
Pit Patroller





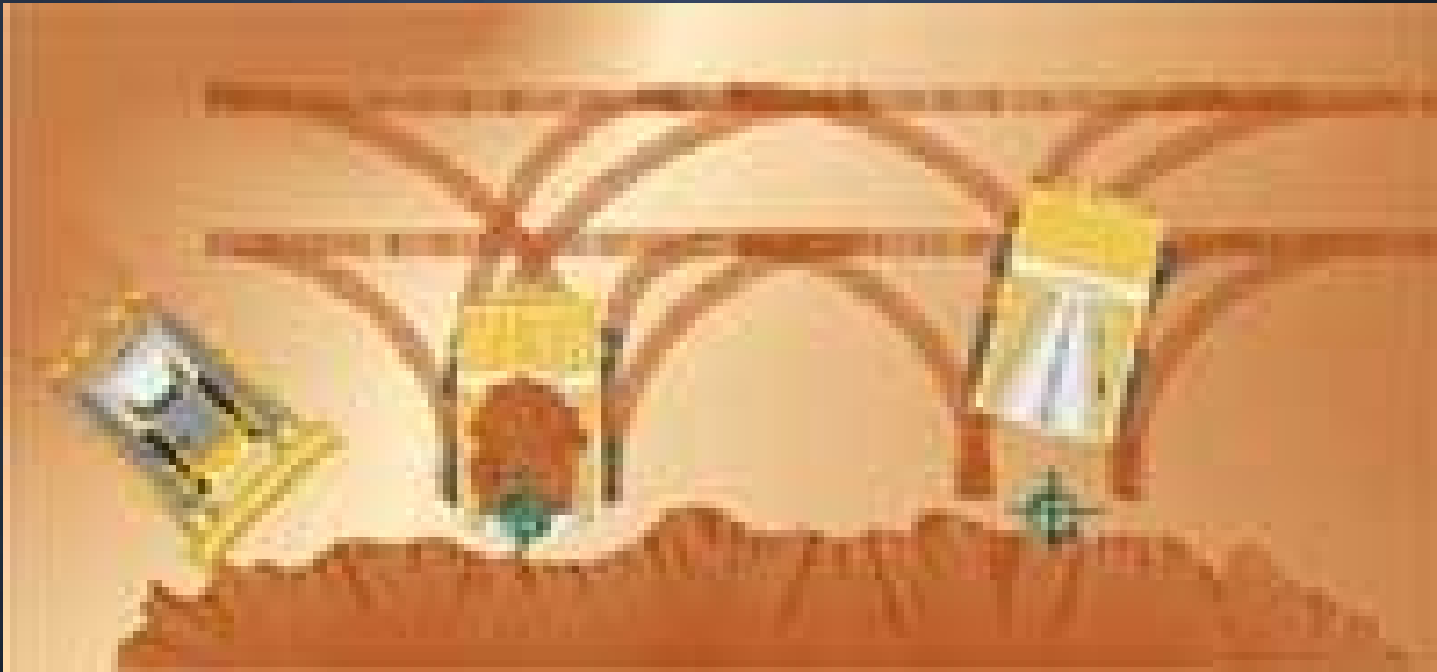
Communications Network
“Open Systems” Standards

Autonomous Haulage System



Dumping at Crushers

Autonomous Haulage System



Dumping at Stockpiles/Waste Dumps

The Results !



Autonomous Haulage System



Truck Back-up Strategies

Autonomous Haulage System



Top Loading

The Introduction of Autonomous Trucks

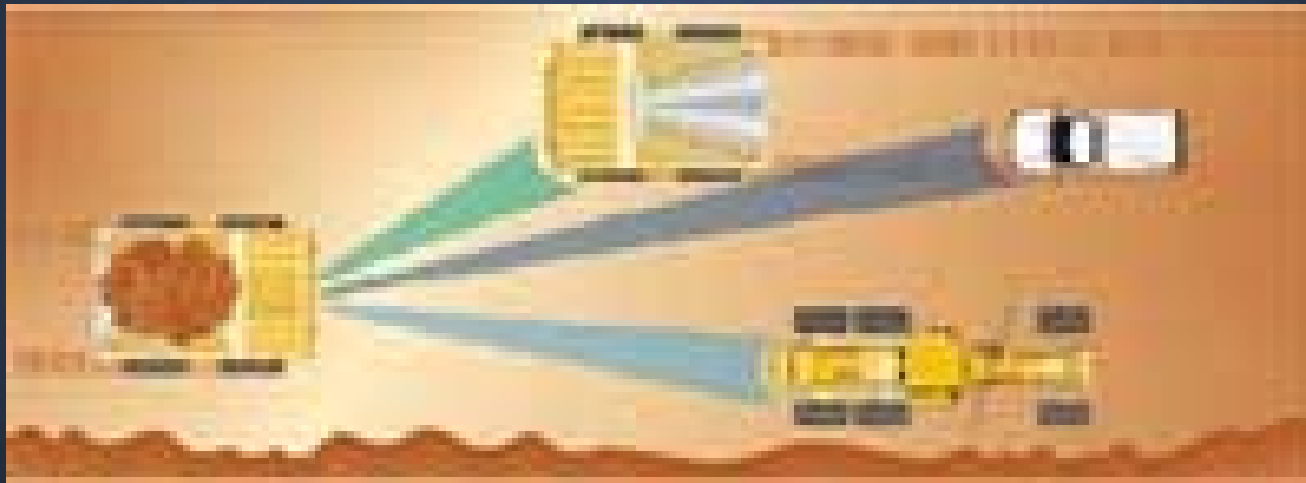


Safety & Adaptability



Obstacle Detection Systems

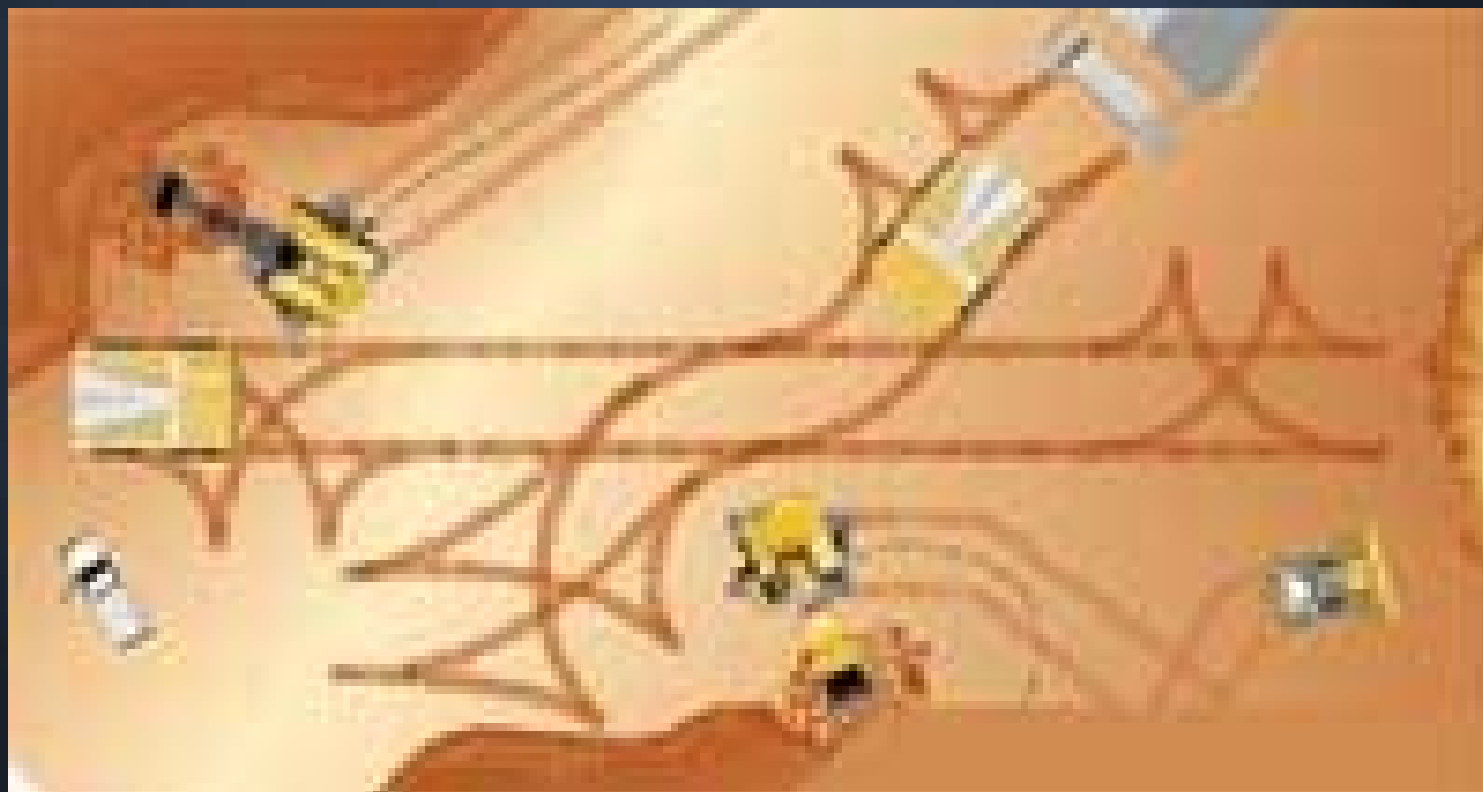
Safety & Adaptability



Vehicle Detection

- ***Proximity Communications***
- ***Obstacle Detection***

The Result !



Demonstrations



Obstacle Detection Systems









System Benefits

- *Improved Material Flow Control*
 - **Improved Blending**
 - **Positive Material Destination Control**
- *Improved Fleet Availability*
 - **Improved Fleet Monitoring**
 - **Reduced Wear and Tear**
 - » **Improved Fuel Efficiency**
 - » **Predictable Component Wear**
- *Improved Use of Availability*
 - **Significant Reduction in Break Times**
- *Improved Fleet Control (Dispatching)*
 - **Events Happen When Expected**
- *Improved Mine Safety*
 - **No Operator Stress**
 - **Minimal Manned Interaction**

Thank You!

