Run-Away Truck Escape Ramp, A Truckers Safety Net

Presented by:

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Run-Away Truck Escape Ramp
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Topic of discussion – This presentation will cover the various systems used to automate the detection and verification of vehicles as they enter the Run-Away Truck Escape ramp.
Escape Ramp History

- What is a Run-Away Truck Ramp?
- Types of escape ramps
  - Arrestor bed
  - Gravity escape ramp
  - Sand pile escape ramp
Escape Ramp

- 1st installed in Castaic, CA – 1956
- 15 total in CA
Escape Ramp

- Located just south of Grapevine Road on NB Interstate 5
- One of the nation’s steepest and longest sustained grades on an Interstate with a descending grade of 6% for over 5 miles
Escape Ramps
Escape Ramp

- Peak Month Average Daily Traffic (ADT) of 86,000 and an average Truck percentage of 25%.
Escape Ramp

Ramp usage reported by CHP at about 30-35 times/year.

What happened before they were installed?

- Trucks would use whatever resources were available to dissipate large amount of kinetic energy in order to decrease their travel speed. This would include:
Escape Ramp

- Rubbing on the cut-slopes or metal beam guard rails
- Riding out the runaway vehicle until the vehicle slowed-down enough to allow the use of gears to safely slow the vehicle down to a safe stop
The Request

- A request was sent to our group to enable video surveillance of the escape ramps for verification of vehicle entries.
- Existing system consisted of automated EMS activation based on vehicle entry to ramp.
The Request

Many challenges had to be overcome

- No communications in the area
- Nearest Telco service over 3 miles away. Other attempts to install communications had failed.
- How would video be captured locally at site?
- How would “trigger” activate video recording?
- How would the “trigger” work?
Initial Design Ideas

- Full video streaming recording, not just snapshots
- Needed to provide CHP a means of resetting EMS’s without waiting for Caltrans maintenance
- Caltrans maintenance needed a way to test the system
Project Components – Phase I

1st phase of project
- Original budget: $4000 (h/w and s/w)
- Components used
  - Video decoders – Axis 292 decoders
  - Used exiting “ruggedized”
  - Relays, wiring, misc.
  - Existing items: Signal cabinet with 170E Controller; CCTV system
Relay Control System

Phase I

170E CONTROLLER

SWPK-2-GRN (120VAC ON/OFF)

TB0-12 (120VAC)

TB0-1 (TO EMS)

CR

EMS

CR

CCTV

CR

LIGHT

Pin 3 on Axis Codec
Pin 2 on Axis Codec

CAB. LGT

POLICE PANEL
AUTO
TEST

POLICE PANEL
AUTO
TEST

RESET

TB2-1

TB2-2

TERM.-T30 (120VAC ON/OFF)

NEUTRAL

Pin 3 on Axis Codec
Pin 2 on Axis Codec

Phase I
Relay Control System
Relay Control System
Vehicle Detection System

- 222 Card
- Input file I/I
- 170E
- Output File/Load Bay

Phase I
Vehicle Detection System
System Testing

Phase I
Visual Verification Light

Phase I
Video Verification System

- **Axis 241S video encoder**
  - Simultaneous Motion JPEG and MPEG-4 streams in resolutions up to 704x576.
  - Built-in motion detection and powerful event management.

- “Ruggedized” computer
Video Verification System

Phase I
Video Verification System

3950 Series

Phase I
Escape Ramp – Phase I
Escape Ramp – Phase I
Video Verification System

Normally Opened

Phase I
Video Verification System

Phase I
Escape Ramp – Phase I
Video Verification System

► Results

- System worked!!!
- PC issues - drive space; headless; PC crashes
- Cameras worked intermittently
- Needed to drive to site to download video
- No communications in area
Escape Ramp – Phase II

2nd phase of project
- Minor B Project initiated to replace cameras and enable communications
- Included upgrading two other CCTV sites
- Components used
  - Cohu 3960 series cameras
  - Video decoders – Axis 292 decoders
  - Existing “ruggedized” pc
  - Axis Camera Recorder software
  - Network switches
  - Trango Broadband point-to-multipoint wireless system
Communications Network

Caltrans - Fresno

TMC Network

T1 Circuit

TELCO

T1 Circuit

Field Network

S.U. #1

S.U. #2

S.U. #3

Wireless Access Point

S.U. #4

Phase II
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<th>Longitude</th>
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Wireless Network

Phase II
Wireless Network

Phase II
Wireless Network

Phase II
Escape Ramp – Phase I
Cohu 3960 series camera
Video Verification System

- Upgraded to video recording software system by Axis Communications.
Escape Ramp – Phase II

Results

- Still had issues with drive space; PC would still crash
- CHP Inspection facility building interfered with RF signal
- Video could now be downloaded remotely via FTP
- CHP would not always alert TMC/Caltrans of ramps being used
- Escape ramp usage verification was cumbersome
- Video length set to 10 min time frame; FTP download to TMC would take 5-10 min to transfer
- Video clips automatically generated
Escape Ramp – Phase III

- 3rd phase of project
  - TMC network connection to Caltrans Enterprise network established
  - Alert notification system implemented in TMC
  - Video recording portion change to record remotely from TMC (snapshots only)

- Results
  - Actual usage of escape ramps is about 60-70 times/year based on alarm notifications
  - Standard Operating Procedure (SOP) issues surfaced
Video Verification System
TMC Computer Room
Text Message Alarm in TMC
System implemented now what?

- Performance measures
  - What are response times of CHP/Caltrans?
  - Percent of actual truck usage versus car usage
- Implement traffic fines/fees for usage?
- Is current grade of road too steep?
- What other datasets can we acquire?
Future Implementation

- Use a 2070 controller with URMS s/w to measure the speed of vehicles as they enter ramps
- Add remote reset capabilities using 2070 controller
- Striping at ramp entry point needs to be re-evaluated – false alarms
Run-Away Truck Escape Ramp

►► Video clips
Run-Away Truck Escape Ramp

►► Questions?