



Challenge - Highway Safety. “Those Darn Flashing Lights!”

Design, build and test computer and full scale simulations of emergency vehicle lighting to prevent rear ending collisions.

Save lives by preventing drivers from rear ending vehicles!

Those Darn Flashing Lights Sponsor - Rick Davids. rcdavids1@verizon.net

The Problem and Challenge



- Flashing lights attract attention, but...
- Flashing lights can be distracting and confusing.
- Over a dozen different configurations of flashing lights on patrol cars among states, typically called 'Mars' lights.
- No apparent coding for the public other than to attract your attention.
- People can experience the 'moth to the flame' phenomenon (phototaxis); you are attracted to the light.
- By attracting your attention flashing lights contribute to errors in judgment of distance and location of the source of flashing lights, resulting in rear-end collisions and fatalities.

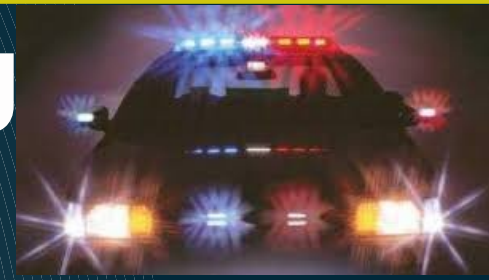
Our Challenge - research and develop a better system of alerting drivers

What are some of the variables?



- Flashing light coding variables are:
 - Intensity, location, flash rate, wavelength (color), number.
 - Examples of color codes: status (white), information (blue), warning/caution (orange), danger (red).
- Driver variables are: fatigue, alcohol, drugs, distractions (texting, radio, navigation systems, etc.)
- Environmental factors are: daytime, night time, rain, snow, road configuration (straight-away vs. abrupt curve).
- Vehicle variables are: windshield clarity, speed of approach, distance to first sighting

Who uses flashing lights on vehicles?



- Highway state patrol cars
- Municipal and town police patrol cars
- Ambulances
- USPS delivery trucks
- Tow trucks
- Utility vehicles (power, telephone)
- Fire and public safety vehicles
- Sanitation vehicles
- School buses

Do flashing lights on these vehicles improve 'situational awareness'?

The Capstone Project



- Conduct research about color coding, including cultural preferences, visibility, human vision, etc.
 - Flash, color, location, intensity, etc.
- Research what experiments done to date on flashing lights on patrol cars, especially Florida.
 - http://www.hendonpub.com/resources/article_archive/results/details?id=3959
- Research the uses, constraints and limitations of flashing lights on town, municipal and state police vehicles, especially state highway patrol cars in Rhode Island.
 - The objective of an ambulance speeding to a victim or hospital may be different than that of a highway patrol car stopped by the side of the highway.
 - POCs non-emergency for RI Scituate State Police Barracks are:
 - Front desk: Derek Borek (401-444-1000)
 - Planning and Research Department is Lieutenant Assumpico (401-444-1212).
 - Fleet and Light Package Department is Officer Tom Peck (401-444-1048).
- Develop computer simulations of flashing light packages (or non-flashing lights), conduct experiments to identify optimal configurations and report results to RI State Police.

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Benefits



- Research history and rationale for blinking, flashing lights
 - Hint - sea coast light houses
- Perform systems engineering tradeoff studies.
- Experience developing working models to test configurations.
 - Computer generated models and full / partial scale 3D model
- Develop test methods using human subjects and identify optimal models consistent with existing state patrol cars.
- Develop optimal configurations for high priority vehicles, preferably highway patrol vehicles.
- Greater familiarity with state, municipal and local community safety issues.
 - Would be a good project for someone interested in law enforcement career
- Greater understanding of human perception and limitations.

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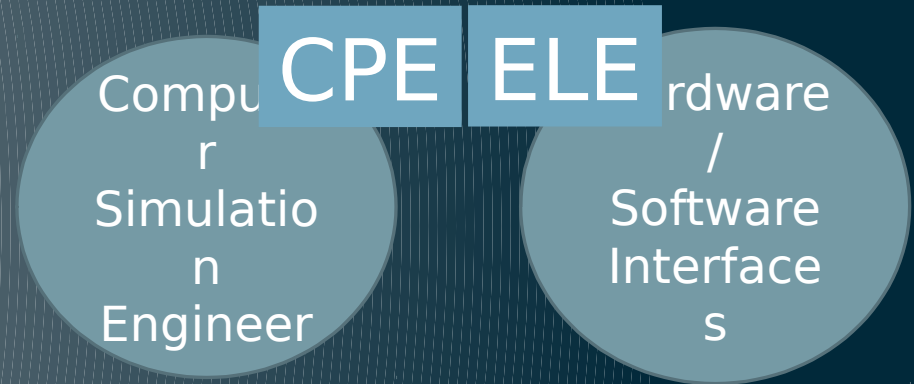
Challenges



- What is the meaning of the red, white and blue flashing lights on patrol cars?
- Are there interstate differences in configurations of flashing lights?
- Is the flashing sequence a secret code for first responders? Should they be?
- Why use flashing lights?
- What colors are most visible at night time? Day time?
- Does the sequence and location of flashing lights on patrol cars make a difference?
- When vision is degraded (DUI), what effect do flashing lights have on decision making?
- How many parked emergency vehicles are hit (rear ended) annually?
- Are there cultural differences in how people perceive flashing lights?
- What do people think the flashing lights on patrol cars mean?

Skills, Roles and Responsibilities

- Computer / Hardware Simulation
 - Computer simulation development
 - Timing circuits
 - Rise / decay timing
 - Replicate environmental conditions
 - Experimental design and statistical analysis
 - Human factors engineering
 - Good personnel interface skills to work with town, municipal and state police.



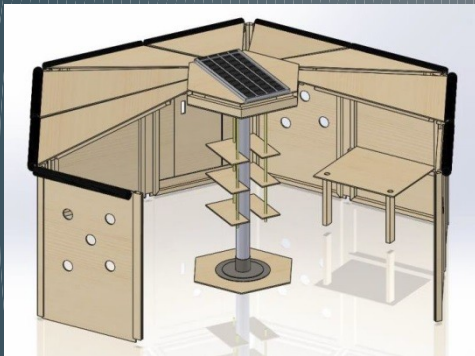
Deliverables

- Computer Simulation
 - Phase One
 - System / detail requirements
 - Functional analysis
 - Tradeoff studies
 - Notional architecture / schematics
 - Tool selection
 - Prototyping / demonstration
 - Interim report
 - Phase Two
 - Iterate design and demonstrate compliance to top level requirements
 - Interim prototype and demonstration
 - Interim report
 - Phase Three
 - Final integration and demonstration
 - Final report

emphasis is on less writing and more demonstration of compliance to requirements

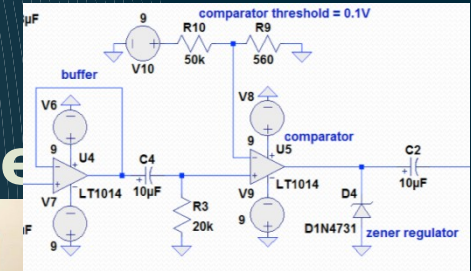
Capstone projects I've sponsored

HOME

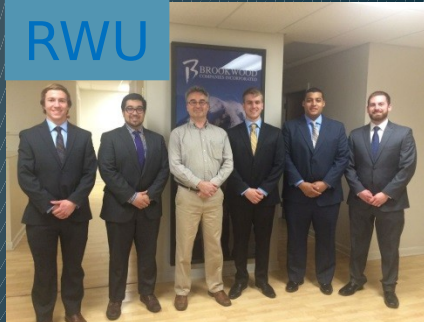


CircuiTreat

RWU



InstaPlow



What I do as a Sponsor

- Assist developing system and detail requirements.
- Assist writing a System Specification, if required.
- Attend any team meetings.
- Offer advice on systems engineering, analytic tools, methods, metrics, progress, etc.
- Review any reports.
- Conduct reviews
 - Requirements, concept and design

Originator: Rick Davids, human factors engineer, 831-359-6851,
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My Background

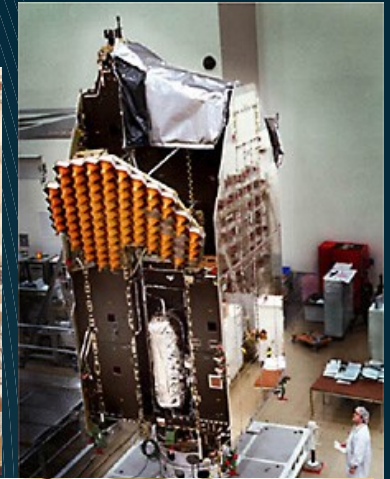
- BA (Psychology, Biology), URI, 1971.
- MA (Engineering Psychology), NMSU, 1974.
- Senior Staff Human Factors and Systems Engineer, Lockheed Martin, Sunnyvale, CA, 1974-2007.
- Applied human factors engineering principles and design standards to mobile shelters, large facilities, missiles, ships, planes, spacecraft, command centers, equipment racks and consoles, transportation systems, handling fixtures, railcars, support equipment, and computer human interfaces.
- Worked with mechanical and electrical engineering, systems engineering, manufacturing, training, logistics, processes, facility and field engineering and DOD suppliers.
- Taught Specialty Engineering, CONOPS, HFE classes.
- Certified Human Factors Engineer #529.
- Retired 2007 after 33 years in aerospace industry.
- Married Julie Yingling (URI 1970) September 2008.
- Moved to West Kingston, November 2008.



and Julie at Turtle Soup.

My Background - 1974 - 2008

- Senior Staff Human Factors Engineer, Lockheed Martin Space Systems Company, Sunnyvale, California
- Managed Specialty Engineering technical and business inputs for aircraft, missile, and spacecraft programs
- Provided Human Factors Engineering program plans and technical input missile, spacecraft, ground systems.
- Wrote HFE guidebooks and processes.
- Coordinated Specialty Engineering training program.
- Developed Systems Engineering CONOPS training course.
- Project manager for 'lessons learned' web site.
- Developed architecture and web based Test Engineering Requirements database.
- Developed UI style guides for Electronic Data Information Management Systems.
- Developed User Guides for Iridium Software Test System and MILSTAR.
- Designed and maintained interactive System



My Background - 1974 - 2008

- Developed first CAD Operational Sequence Diagrams for large solar array manufacturing operations.
- Developed system and detail design hardware and facility layouts for OSD Crisis Coordination Center, Space Station, DOT (BART), Air Force, and Army (GBI) proposals and programs.
- Created the first Lockheed Martin human computer modeling program.
- Lead Engineer for 5 human factor engineers in FBM Systems Engineering department.
- Directed soft and hard mockup exercises and noise testing to validate Trident II missile maintenance tasks onboard submarines and during field level operations.
- Designed, tested, and implemented a family of OSHA-compliant high visibility warning signs for high value hardware.
- Prime Human Factors Engineer on RPV (Army), FBM (Navy), Air Force, and many classified programs.

