Driver Simulation Review Report

Alice H. Wright
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Disclaimer:
"The enclosed information was gathered at the request of the Professional Development Program Advisory Committee. The committee is the advisory board for training and development programs supported by the North Carolina Department of Transportation/Public Transportation Division. The committee neither endorses, nor disapproves any of the products reviewed."
Simulation is a field that has been around for a long time and is growing each day. It has a strong background in flight and military training by offering hands-on training experiences without the multiple costs of training in an actual vehicle. The interest in driver training simulation is spreading, but is primarily focused on large vehicles such as over-the-road transport trucks and buses. There are not many simulation options for the rural driver who operates 15-passenger vans and cutaways. This report will summarize these options currently available.

There are different types of simulation products on the market. Simulators are referred to as open-loop video, low-end, mid-range or high-end simulators. Open-loop video simulators, like the Doron unit NCDOT currently owns, are not interactive. The driver reacts to the motion of the vehicle on the video screen. The simulator tests such things as reaction time and direction of reactive action. Low-end simulators are computer-based programs that offer the consumer an interactive simulation training and, sometimes, assessment tool without having a large separate unit to find room for and maintain. This type of simulator is more portable and more of a turnkey system than the larger, separate simulation training units.

Mid-range simulators are a step above low-end simulators, but in a unit similar to the open-loop units. These simulators are interactive, more complex and expensive than the other simulators, but also provide a more real driving experience. High-end simulators will not be discussed due to the complexity and cost of the system. This type of simulator primarily benefits metro bus drivers and transport truck drivers. There are options available if the request is made for further research in the future.

There are so many different designs of simulators that some of those products on the market will not be mentioned in this report. The only simulators mentioned are those that would be most compatible with existing driver training programs within the transit systems throughout North Carolina. The goal of this report is to relay gathered information about simulation training options for drivers so a decision can be made about how to proceed.
driVR™
By
Imago Systems, Inc.

I. Company Profile and History

Imago Systems, Inc. is a leader in the driving simulation industry by providing affordable technology worldwide. The company was founded by Linda Hirsekorn, the current president. Imago Systems, Inc. developed a PC-based driver training program called driVR™ to be used for research, rehabilitation and training.

II. Products of Interest

A. driVR™ II

1. Brief Description
   driVR™ II allows the driver to enter and travel around in a realistic 3D artificial world creating an interactive and immersible driving experience. The driver is guided through the program by visual and auditory signals.

2. Components
   - Computer
   - Pedals
   - Software package
   - Steering wheel
   - Virtual reality (VR) headset (optional)

3. Curriculum
   - 12 Scenarios
   - Practice Course Module
   - Tactical and Strategic thinking skills

4. Features
   - Dataviewer
   - Integrated Help Menu
   - Playback Viewer
   - Route Builder
   - Scenarios Library
   - World Environment Selector

5. Media
   - PC based 3D graphics software on CD-ROM

Revised 03/09/03
AW
6. Modes
   Single driver

7. Performance Management
   Dataviewer
   Playback Viewer

8. Programming Capabilities
   Customize routes   Replay driver’s actions
   Customize driving conditions   Monitor skill development progress

9. Special Effects
   Buildings   Fog
   Road surface   Season
   Time of day   Weather conditions

10. System Specifications
    Pentium® II Processor PC, 3D Graphics Accelerator Card
    300 MHz, 64 Mbytes Monitor (15” minimum)
    PCI sound card for 3D sound Sound Blaster Card compatible game card
    Windows™ 95/98

11. Usage
    Evaluate driver skills

12. Vehicles
    None specified

III. Expected Results/Benefits
    Using the driVR™ product, drivers could improve tactical and strategic thinking skills through the assistance of being able to rehearse and be given immediate feedback on their performance. The program also focuses on cognitive, psychomotor and visual perception skills. Agencies using this simulation program could experience lower insurance premiums and a decrease in the number of accidents in which drivers are involved.

IV. Capabilities/Stand-outs
    driVR™ compliments any fleet driver training program by allowing the curriculum to be specifically designed towards the agency’s needs.

V. Customers
    Michelin Driving School

VI. Product Pricing
    A. driVR™ II Basic Software
       User Manual
       Software CD
       $3,898
    B. Complete System w/o computer
       User Manual
       VR Headset
       Steering Controls
       Software CD
       $5,998
    C. Add Dell computer to complete system
       $1,599

Revised 03/09/03
VII. Summary

This seems to be a valuable tool for training and assessing driver skills. This program is a realistic possibility for the transit systems. It is not terribly expensive and is easy to install and implement. driVR™ can be used with the Elumens® VisionStation® to provide the driver with a wider and more realistic field-of-view.

Profiler™

By

Research Triangle Institute (RTI)

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Research Triangle Park, NC 27709
Phone (877) 254-1808
Fax (919) 541-6965
http://www.profiler-vr.com
bward@rti.org

I. Company Profile and History

Mission Statement: Research Triangle Institute (RTI) is dedicated to improving the human condition through multidisciplinary research, development and technical services that meet the highest standards of professional performance.

RTI is a worldwide organization that conducts research and development. It provides technical support in the areas of education and training, environment, health and pharmaceuticals, and technology commercialization. In 1958, North Carolina Universities founded RTI as the first scientific organization in the Research Triangle Park and made it the centerpiece of the park.

II. Products of Interest

A. Profiler™ Driving Assessment Station

1. Brief Description

Profiler™ is a low cost, computer based driving simulator and valuable evaluation tool for driver skills assessment. This is a self-administered program involving a 15-minute simulation with real-time feedback, personalized results and a diagnostic graph.

2. Components

Color Printer   Computer
Pedals     Steering Wheel

3. Curriculum

Accuracy   Audio responsiveness
Decision-making   Hazard perception
Reaction testing   Scanning
Steering

4. Features
Add scores to national database
Exportable data for comparable studies and risk assessment
Instructor’s toolkit allowing
  point-and-click setup
  data management
  test interpretation
  graph printing
  instructor specified options
On-line purchase of tests
Receive latest norm files
Web access

5. Media
   CD ROM
6. Modes
   Single driver
7. Performance Management
   Diagnostic color graph
   Driver performance database
8. Programming Capabilities
   N/A
9. Special Effects
   N/A
10. System Specifications
   16-bit Windows® compatible sound card and speakers
   19” Monitor (recommended)
   250 MB of Disk Space
   64 MB RAM (128 MB recommended)
   At least one system per site should have a 28.8k modem
   CD-ROM or DVD drive
   Color printer (recommended)
   Direct input force feedback steering wheel with foot pedals (accelerator and brake)
   - Logitech Wingman Formula Force (recommended)
   - Microsoft® Sidewinder Force Feedback
Microsoft® compatible mouse and keyboard
PCI or AGP Video Card with a 4 MB Video RAM
Pentium® III-500 Processor or better
Windows® 95/98
11. Usage
   As an objective third party for evaluation of drivers
   To identify immediate issues
   Acts as a review, training and improvement tool
   On-going alertness activity
   Demonstrates distraction impacts
   Reduces tunnel vision

Revised 03/09/03
AW
12. Vehicles
- Ambulance
- Fire Engine
- Patrol car
- School bus

III. Expected Results/Benefits
The Profiler™ program does not teach or measure motor skills. It is a tool to measure and correct skills such as decision-making, hazard perception, multi-tasking, reaction time, tunnel vision and scanning. The program helps to increase best practices while decreasing training and overall costs.

IV. Capabilities/Stand-outs
Profiler™ allows the instructor to perform ongoing evaluations of drivers, show demonstrations, increase risk management and allow for safe competition between drivers. Feedback of the driver’s performance is immediately available through a printed graphical output of assessment. This allows the instructor to interpret what skills need the most work. An instructor’s toolkit is also included on the CD-ROM. This gives the instructor a chance to personalize setup, manage data from drivers’ tests, interpret the tests, print graphs and specify options.

V. Customers
- Birmingham, Alabama Police Department
- Chapel Hill, NC Police Department
- FLETC
- Mountain Driving Instructor’s School
- North Carolina State Highway Patrol
- Southpeak Interactive
- The Ranch
- Wake County Public School System

VI. Product Pricing
A. Profiler™ Assessment Station
   Includes:
   - 19” Monitor
   - Color printer
   - Computer
   - Profiler™ license package
   - Software CD
   - Speakers
   - Steering wheel
   Limited license (20-50 drivers) $2,998
   Annual license (unlimited drivers) $4,998

B. Software only choices
   - Starter Kit 10 tests $ 99.50
   - Limited License 100 tests $ 499
   - Annual License Unlimited # of tests $2,499

C. Logitech Force Feedback Wheel/Pedals $ 100

VII. Summary
Profiler® is the most compatible and impressive driver skills assessment tool reviewed thus far. It would be a great asset to NCDOT in any form or fashion. The program is compatible with the Elumens® VisionStation®, which provides a different driving experience.
I. Company Profile and History

Systems Technology, Inc. (STI) was founded in 1957 as a research and development company. It is now a research and consulting company concentrating on the subjects of vehicle dynamics, manual/automatic controls, and human factors of aerospace and ground vehicles. For the past 20 years, STI has conducted research in driver behavior associated with different types of impairments, visibility, traffic control devices, intersection complexity, decision making and vehicle control situations. The company’s product design is based on over 40 years experience in research and simulation.

II. Products of Interest

A. STISIM Drive™ Simulation System
   1. Brief Description
      This is a fully interactive program that measures driver performance. It offers regular or wide field-of-view and head mounted display options.
   2. Components
      Brake and throttle pedals w/ optional manual transmission
      Desktop Computer
      Driving display monitor
      Head-mounted display unit (optional)
      Simulator operator display (optional)
      Steering unit w/ additional input controls and optional speed sensitivity
   3. Curriculum
      Passing
      Reaction testing
      Speed control
      Steering control
      Turning
   4. Features
      Cab design and ergonomics available
      Interactive driving
   5. Media
      Simulation software CD
      Windows™ compatible
   6. Modes
      Single driver
   7. Performance Management
      Accidents
      Driving time
      Speed limit violations
      Driver performance
      Response/reaction time
      Time-to-collision measurement
Vehicle performance Vehicle Dynamics Analysis, Non-Linear

8. Programming Capabilities
   Adapt simulator and scenarios to certain needs
   Program driver tasks and events
   Scenario Definition Language (SDL)
   Simulator configuration options
   Windows™ user interface

9. Special Effects
   Immediate visual and auditory feedback

10. System Specifications
    CD ROM
    Game port (analog to digital) and high resolution digital interface
    High fidelity sound processing
    High speed graphics accelerator w/ texturing, shading and lighting
    Intel (min 400 MHz)
    Minimum 128 MB RAM
    Pentium® based computer
    Simulation hardware
    Windows™ operating system

11. Usage
    Assess human cognitive and psychomotor ability
    Driver Evaluation and training
    Human factors research
    Measure and document driver performance and progress
    Medical research
    Research and Development

12. Vehicles
    Validated high-fidelity, non-linear, vehicle and tire models
    Range from automobiles to heavy trucks to articulated vehicles

III. Expected Results/Benefits
    One benefit of STISIM Drive™ is its ease of operation and maintenance.

IV. Capabilities/Stand-outs
    With the STISIM Drive™ program, the instructor/trainer can configure the simulation experience based on driver needs. Examples of configuration changes available are vehicle dynamics, visual scene, sound and driving controls. This program also provides a measurement of driver performance and it also includes a vehicle and tire dynamics simulation model, Vehicle Dynamics Analysis, Non Linear (VDANL).

V. Customers
    No information available

VI. Product Pricing
    No information available
VII. Summary

This driver training simulation software seems to offer the training concepts needed rural transit systems around NC. More information is needed about the product including product pricing.
I. Company Profile and History

FAAC, Inc. is a privately owned company that has been providing products to the United States government, as well as the private industry for over 30 years. The corporate headquarters is stationed in Ann Arbor, Michigan. The company’s first commercial product was an interactive, reconfigurable truck-driving simulator, the developed Driver Training System (DTS).

FAAC, Inc. has a strong history of providing quality products throughout the US and the world. Since 1971, FAAC, Inc. has contracted with the US Department of Defense. In 1991, they were the first company to present a full-mission tractor-trailer simulator to the market. The US Marine Corps operates 36 of FAAC, Inc.’s driving simulators daily while Mexico’s Department of Education has 24 simulators by FAAC, Inc.. Over the years FAAC, Inc. has delivered 120 plus simulators worldwide and has trained over 53,000 drivers using the DTS products.

II. Products of Interest

A. Paratransit Simulator MB-1000-V5 and MB-1000-V1
1. Brief Description
   Interactive simulation system
2. Components
   Computers
   Instructor Operator Station
   Koll-Morgan Steering System
   Open-air cab
   Remote closed-circuit camera
   Tethered instructor keypad
   Networked desktop driving station (instructor)
3. Curriculum
   Customized training scenarios available
4. Features
   Equipment racks
   High resolution displays
   Integrated equipment racks with canopy
5. Media
   N/A
6. Modes
   Networkable
   Single driver
7. Performance Management
   Replay/redrive
8. Programming Capabilities
   N/A
9. Special Effects
   Different views for replay/redrive
Rear view information is presented by viewport insets embedded in forward display monitors.

10. System Specifications
   Image generators
   Modem
   Networkable

11. Usage
   Assess driver skills
   Overall driver training
   Right-side clearance
   Observe mirror usage
   Rehearse driving practices
   To better understand pivot points

12. Vehicles
   Different types

B. Desktop Simulator
   DT-1000-V1

1. Brief Description
   It is available as a desktop mount or floor standing model.
   Interactive

2. Components
   29” high-definition monitor
   Brake
   Headlight switch
   Gear selector
   Keyed Ignition
   Main application computer
   Speedometer/Tachometer
   Hydraulically dampened driving controls

3. Curriculum
   Customized training scenarios available

4. Features
   Rugged steel construction
   Steering feedback

5. Media
   N/A

6. Modes
   Network multiple drivers
   Single driver use

7. Performance Management
   N/A

8. Programming Capabilities
   N/A

9. Special Effects
   N/A

10. System Specifications
    Image generator

11. Usage
    Certification
    Entertainment
    Record and replay
    Role-play bad drivers
    Education
    Focus on driver behavior
    Research
### 12. Vehicles

<table>
<thead>
<tr>
<th>Category</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automobiles</td>
<td>Commercial trucks</td>
</tr>
<tr>
<td>Emergency vehicles</td>
<td>Helicopter (joystick mode)</td>
</tr>
<tr>
<td>Public transit vehicles</td>
<td>Trucks and SUVs</td>
</tr>
</tbody>
</table>

### C. Scenario ToolBox™

1. **Brief Description**
   - Simulator world manipulation software.

2. **Components**
   - Workstation option

3. **Curriculum**
   - New or remedial training

4. **Features**
   - 2D map of all entities
   - 3D simultaneous view
   - Export scenarios on disk
   - Mouse or joystick control

5. **Media**
   - CD Software
   - Windows® compatible

6. **Modes**
   - Single user (instructor/trainer)

7. **Performance Management**
   - No information available

8. **Programming Capabilities**
   - Control traffic elements
   - Control weather conditions
   - Control pedestrian hazards
   - Control navigational hazards
   - Create custom training missions
   - Create library of scenarios

9. **Special Effects**
   - Hazards
   - Pedestrians
   - Traffic
   - Weather

10. **System Specifications**
    - No information available

11. **Usage**
    - Preview training missions
    - Reconstruct accidents
    - Record and replay
    - Shared agency scenarios
    - Supports CBT kiosks
    - Supports Intranet usage

12. **Vehicles**
    - No information available

### III. Expected Results

The benefits of FAAC, Inc.’s products such as, the Driver Training System (DTS)™ have been experienced by its customers and have proven results. FAAC, Inc.’s products allow the drivers to receive comprehensive training by introducing real hazards and allowing training scenarios to be repeated to improve lesson reinforcement. Some customers have shared the benefits of using FAAC, Inc.’s DTS™ and other products compared to using only traditional training methods. The US Army has estimated that the DTS™ training method is three times
faster. Accident percentage has decreased for several of customers using FAAC Inc.’s products. A 19% decrease in accidents was reported by the German Army while North American Van Lines reported a 22% decrease and New York City Transit reported a 43% decrease in preventable accidents. Some other benefits of FAAC, Inc.’s products are improved fuel economy, lower costs of training, accidents and insurance. There is also an obvious increase in the life span of actual vehicles.

IV. Driver Training System (DTS)™ Capabilities/Stand-outs

There are capabilities that the DTS™ has which most other simulator providers don’t offer. FAAC, Inc. offers interchangeable cabs with their DTS™ product. A driver can maneuver the vehicle anywhere in the virtual environment. The instructor has the capability to configure scenarios and define specific parameters for each training session. Simulators are available for many types of vehicles including sedans or SUVs and buses (articulated or straight).

V. Customers

The following is a list of FAAC, Inc.’s customers from over the years.

- Crash Rescue of Dallas Texas
- Dallas Area Rapid Transit (DART) – University of Massachusetts
- Department of Education in Mexico
- Detroit Metropolitan Airport
- Excel Driver Services of Denver, Colorado
- Federal Highway Administration – Office of Motor Carriers
- German Army
- Israel-US Bi-National Industrial Research & Development (BIRD) Foundation
- Landstar in New Orleans
- Metropolitan Community Colleges – Kansas City, MO
- Metropolitan Transit Authority of Harris County (Houston) Texas
- Montgomery County Texas
- MTA Driving Schools
- North American Van Lines
- Rochester (NY) – Genesee Regional Transportation Authority
- Schlumberger – Pipeline Division – US Land Division
- Star Mountain – in coordination with the Federal Highway Administration
- US Army
- US Army 131st Transportation Command in Mannheim Germany
- US Department of Energy – Transportation Safeguards Division
- US Marine Corps
- Ventura, CA Fire Department
- Visteon
- Washington (DC) Metropolitan Area Transit Authority

VI. Product Pricing

*V in product name denotes number of high resolution (800 x 600) video display channels*

A. Paratransit Simulator

- MB-1000-V5 $150,000 / $180,000 (upgrade)
- MB-1000-V1 $100,000 / $115,000 (upgrade)

B. Desktop Simulator

- DT-1000-V1 $50,000
C. Scenario ToolBox™ $25,000

D. Options
1. MOOG 6 DOF motion base $80,000
2. 3 DOF Motion (Seat Shaker) $40,000
3. Software Upgrade Program $10,000 / yr per site
4. Basic extended warranty 3% of product price per year
5. Full extended warranty 5% of product price per year
6. Interchangeable Driving Cabins $59,000 (standard), $70,000 (custom or cut-down)

VII. Summary

FAAC, Inc. is a company proven to provide quality simulation products. Their products would be beneficial to NCDOT transit systems throughout the state. The Paratransit simulator would be a great asset to the program, in the future. It is still aimed toward larger vehicles, which is not the primary need. The desktop simulator would be beneficial, however comparable products are available at a lower cost. The most impressive product is the Scenario ToolBox™.
GE Capital I-Sim

I. Company Profile and History

GE Capital I-Sim is a leader in the world of driver simulation technology and training systems. The company provides programs for many types of industries. Emergency Vehicle Operators (EVO) agencies, fire departments, law enforcement agencies, long-haul freight carriers, motor coach carriers, private fleets and public transportation companies can all benefit from the programs GE Capital I-Sim has to offer. In 1991, GE Capital I-Sim was formed in Salt Lake City, Utah and became a part of GE Capital Commercial Equipment Financing in December 2000.

II. Products of Interest

A. TranSimVS™

1. Brief Description
   This simulator is geared toward bus and truck driving. It is an open seat simulator with realistic controls.

2. Components
   Actual vehicle cabs      Functioning gauges
   Motion base available   Open-seat driver station
   Truck-like look        Truck-like ergonomics

3. Curriculum
   Multiple interactive driving scenarios
   Teach critical decision-making

4. Features
   Icon menu
   Special effects
   Visual databases

5. Media
   Windows™-based operating system

6. Modes
   Network with other stations
   Single Driver

7. Performance Management
   Performance evaluation package

8. Programming Capabilities
   Fully programmable

9. Special Effects
   Traffic features
   Weather conditions

Revised 03/09/03
10. System Specifications
   Real-Time image generation

11. Usage
   Bus driver training
   Scenario rehearsal
   Improve learning and training retention
   Enhance judgement
   Truck driver training
   Year-round training

12. Vehicles
   Artificial intelligence scenario vehicles

III. Expected Results

   With all of GE Capital I-Sim products, the customer can expect to see a decrease in the amount of accidents and an increase in the overall skills of the drivers within the system. The products also aid in reducing equipment maintenance/repairs and risk management expenses.

IV. Capabilities/Stand-outs

   The GE Capital I-Sim products are modular and can be upgraded depending on training needs. The simulators have an open-seat driver station with truck-like look and ergonomics and standard truck functioning gauges.

V. Customers

   Ace Relocation Systems, CA
   Adanac Truck Training School, Toronto
   Alliance Corporation, NC
   Anderson Trucking Service, Inc., MN
   Applegate Drayage Co., CA
   Asplundh Tree Export Service, PA
   B.R. Williams Trucking Inc., AL
   Blue Ridge Community College, VA
   BlueLine Transportation, OR
   Bob Young's Transport Training Institute, Ontario
   Boise State University, ID
   Bordentown Driver Training School, NJ
   Builders Transport (Schneider), SC
   Butte College, CA
   C-1 Professional Training, IN
   California Truck School, CA
   Cargill, Inc., NE
   Carnegie Mellon Research Institute, PA
   Carrier Compliance Services, PA
   Celadon Trucking Services, Inc., IN
   Central Transport International, MI
   Classic Motor Lines, PA
   Commercial Trucking Academy, LA
   Corporate Express, TX
   Cresco Lines, Inc., IL
   D & H Express, AZ
   D & L Tractor-Trailer School, CT
   Dedicated Logistics, Inc., MN
   Dekalb Technical Institute, GA
   Delta Beverage Group, LA
   Dependable Highway Express, CA
   Diesel Institute of America, MD
   Dirksen Transportation, CA
   ECS Risk Control, PA
   Evergreen Sanitation, WA
   Federal Express Corporation, TN
   Federal Highway Administration (FHWA), Washington, D.C.
   Fox Valley Technical College, WI
   Fresno P.D., CA
   Gary Olson Trucking, CA
   Georgia Driving Academy, GA
   Gypsum Express, NY
   Harris Transportation System, VA
   Harris/Culligan Water, CA
   Hughes Space Communications, CA
   HyVee Foods, IA
   Indian Hills Community College, IA
   J. & R. Schugel Trucking, MN
   J.F. Fick & Co., VA
   Johns Manville International, VA
   Kenneco Packaging, TN
   Key Power Inc., FL
   KKW Trucking, Inc., CA
   KLLM, Inc., MS
   Labor Leasing, Inc., IL
   Lambert Transfer Co., TX
Truck Training Schools Association of Ontario, Ontario
TruLine Corporation, NV
U.S. Express, TN
USF Logistics Services, WI
Utah Valley State College, UT
Valley National Gases, Inc.,
Vance Trucking, Inc., NC
Victory Express, OH
Warren Distribution, NE
Waste Management, Inc., IL
Watkins Truck Lines, Inc., FL
Welborn Transport, Inc., AL
Werner Enterprises, NE
West Covina P.D., CA
William Height Industries, CA
Wilsonart International, TX
Winders Tractor Trailer Driving School, NJ
Worldmaster/Trek USA, AR

Lanter Company, IL
Logix Services, OH
Marcon, Inc., ID
Metro Truck Driving School, NY
Morgan Drive Away, IN
Motor Carrier Service, OH
Motor Transport Association, ID
National Tractor Trailer School, NY
North American Van Lines, IN
North Georgia Technical Institute, GA
Northeast Community College, NE
Orange Co. Sheriff's Dept., CA
PA Veri Trucking, Inc., Ontario
Parker Professional Driving School, MA
Parret Trucking, Inc., VA
Paschal Truck Lines, KY
Payne Trucking, Inc., VA
Penske Dedicated Logistics, PA
Physical Distribution Services, Inc., MN
Pitt Ohio Express, PA
Praxair, Inc., NY
Professional Safety Consulting, NE
ProFleet Transport, IN
R.J. Miles Company, CA
Raleigh P.D., NC
Raytheon Systems Co., CA
Richard's Truck Driving School, Ontario
Roadmaster Driving School, FL
Roberson Transportation, IL
Robert Hansen Trucking Robert Orr
Sysco, TN
Roehl Transport, Inc., WI
Ruan Transportation, IA
Ryder Integrated Logistics, FL
Safety Alert Network, LA
Safety Management Council, Idaho
San Antonio P.D., TX
San Diego P.D., CA
San Jose P.D., CA
Shawnee Community College, IL
Single Source Transportation, GA
Stidham Trucking Co., CA
Swift Transportation, AZ
Sysco Food Services, OR
Teresi Trucking, CA
The Connection Company, OH
The Men's Wearhouse, TX
TLC Services, CA
Transervice Logistics, Inc., NY
TransportSafe Learning Center, LA
Tree of Life, Inc., FL
Tri-State Motor Transit Co., MO
VI. Product Pricing

A. TranSimVS™ $86,000 (until 7/15/02)
   Installation included

B. Extended Factory Warranty $ 4,000
   Replacement parts on exchange basis and phone support for one year

C. Full Service Agreement
   One year $ 6,880
   Two years $13,760
   Three years $20,640

VII. Summary and Recommendation

The TranSim VS™ is a high quality simulator. It can be geared toward rural transit
systems, but would be more beneficial to the program in the future.
Doron Precision Systems, Inc.

William Koran, Eastern Regional Sales Manager
102 Carol Drive Phone (717) 872-7747
Washington Boro, PA 175282
www.doronprecision.com doronprecision@doronprecision.com

I. Company Profile and History

Doron Precision Systems, Inc. was founded in 1973 and is a world leader in the development and manufacturing of driving simulation systems. The BUS currently has two (2) Doron L-301 simulators.

II. Products of Interest

A. DVD Conversion Package
   1. Components
      DVD player
      Code cable adapter
   2. Modes
      Networkable
      Open-Loop
      Single driver
   3. Vehicles
      Bus
   4. Media
      DVD
      Old laser discs
   5. Usage
      Driver skills assessment
   6. Features
      Cleaner image than laser discs
      Realistic display

III. Expected Results

Doron Precision Systems, Inc. offers simulation products that help to reduce the amount of behind-the-wheel training for new drivers, therefore reducing training, fuel, and maintenance costs along with reducing the number of training vehicles needed. There is also a potential for reduced insurance costs for a company using the simulators.

IV. Capabilities/Stand-outs

Doron Precision Systems, Inc. offers optional closed captioning for the hearing impaired. They also offer bar coding as an option.
V. Customers

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<tr>
<th>Customer</th>
<th>Location</th>
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<tbody>
<tr>
<td>A.C. Transit, CA</td>
<td>New Jersey Transit, Camden, NJ</td>
</tr>
<tr>
<td>Cleveland Regional Transit, OH</td>
<td>New Orleans Regional Transit Authority, LA</td>
</tr>
<tr>
<td>Delaware Area Regional Transit, DE</td>
<td>Orange County Transportation Authority, CA</td>
</tr>
<tr>
<td>Greater Hartford Transit District, CT</td>
<td>SEPTA, PA</td>
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<tr>
<td>Greater Richmond Transit, VA</td>
<td>TRANSPO, IN</td>
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<td>Hampton Roads Transit, VA</td>
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<tr>
<td>New Jersey Transit, Maplewood, NJ</td>
<td></td>
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</tbody>
</table>

VI. Product Pricing

A. DVD Conversion Package $1,195.00

B. Installation/Setup w/ maintenance agreement $ 270.00
   w/o maintenance agreement $ 810.00

C. Audio Visual Programs $ 495.00
   Each w/ 15 year liscense
   Each when ordering 10 or more $ 390.00

D. Optional $ 350.00
   Closed Captioning Decoder Set
   Bar Code System $ 550.00

VII. Summary

The reason no Doron Precision, Inc. simulator products are reviewed is because they consist of what NCDOT already has in its position. The DVD conversion package would be beneficial if the company supplied updated or new scenarios/curriculum.
Elumens® Corporation

Judy Umeck – Manager of Inside Sales
Eric Knisley – Technical Coordinator/Systems Engineer
1100 Crescent Green, Suite 211
Cary, NC 27511
www.elumens.com

I. Company Profile and History

Elumens® Corporation is a world leader in advanced projection technology that includes the communication and presentation of digital information. This information includes 3D graphics, video, computer-aided design and real-time applications. The Elumens® Corporation was founded by Ray Idaszak and David Bennett and was incorporated in 1993 as the Alternative Realities Corporation.

II. Products of Interest

A. Visionstation® 800
   1. Brief Description
      The Visionstation® 800 is a 1.5-meter hemispherical screen used to display images via a projector with 180° image span. The curved screen provides a more realistic image and expands the field-of-view.
   2. Components
      - 1.5 meter hemispherical screen
      - HDIS Monitor Cable Extension
      - Mouse cable extension
      - Power cables
      - Projector w/ trutheta lens
      - Storage desk for projector
      - User’s guide
   3. Curriculum
      N/A
   4. Features
      - 180° Field of view
      - Usable with many types of media
   5. Media
      - Compatible with any basic computer
   6. Modes
      - Single user
   7. Performance Management
      N/A
   8. Programming Capabilities
      N/A
   9. Special Effects
      N/A
   10. System Specifications
      - Projector
         - Display Technology: LCD Poly-Silicon TFT; active-matrix
         - Display Resolution: SVGA 800 x 600 (480,000 pixels)
         - Input Resolution(s): SXGA, XGA, SVGA, and VGA

Alice Wright
Revised 03/09/03
Color Reproduction: 16.7 million colors (24 bit)
Contrast Ratio: 400:1
Brightness: 1100 ANSI lumens
Vertical Frequency: 50-85 Hz
Power: AC 100 to 240V 50/60Hz; 350W
Lamp: 150 W (user replaceable estimated 1000 hrs)
Inputs: HD15, S-Video, Video, Audio (R/L)
Remote Control: Keystone, Source select, and Image settings

Standard Software
- Image Stitch/.AVI Out: TruFrame Spherical Correction Utility
- Open-GL: SPIclops API 1.0 for Winows® NT/2000 & IRIX
- Performer: SPI Performer for IRIX
- DirectX 7&8:SPI-API 1.0 for Windows® 2000
- Video Codec: TruMotion® for Windows® 98/2000 by On2

Standard Equipment
- 1.5 Meter Hemispherical Screen
- Projector with trutheta Lens
- Storage Desk for Projector and User Guide
- Power Cables
- HD15 Monitor Cable Extension
- Mouse Cable Extension

11. Usage
   In conjunction with simulation software packages
   Simulate routes, vehicles, and buildings

12. Vehicles
   N/A

III. Expected Results/Benefits
   With Elumens® products, the user can expect more realistic visual effects and a tool for
different types of training.

IV. Capabilities/Stand-outs
   One of Elumens’® products is a hemispherical display system that’s portable and cost-effective.

V. Customers
   Wake County Public School System

VI. Product Pricing
   A. Visionstation® 800 $21,000

VII. Summary of Findings
   The Elumens® VisionStation® is a product that would be beneficial to the NCDOT. It is
compatible with most simulation software programs and would provide another perspective of
driving in a virtual reality world.
## PRODUCT PRICING SHEET

### OPEN-LOOP VIDEO SYSTEMS

**Doron Precision Systems, Inc.**

<table>
<thead>
<tr>
<th>Description</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. DVD Conversion Package</td>
<td>$1,195</td>
</tr>
<tr>
<td>B. Installation/Setup w/ maintenance agreement</td>
<td>$270</td>
</tr>
<tr>
<td>B. Installation/Setup w/o maintenance agreement</td>
<td>$810</td>
</tr>
<tr>
<td>C. Audio Visual Programs</td>
<td></td>
</tr>
<tr>
<td>Each w/ 15 year license</td>
<td>$495</td>
</tr>
<tr>
<td>Each when ordering 10 or more</td>
<td>$390</td>
</tr>
<tr>
<td>D. Optional</td>
<td></td>
</tr>
<tr>
<td>Closed Captioning Decoder Set</td>
<td>$350</td>
</tr>
<tr>
<td>Bar Code System</td>
<td>$550</td>
</tr>
</tbody>
</table>

### LOW-END SIMULATORS

**driVR™ by Imago Systems, Inc.**

<table>
<thead>
<tr>
<th>Description</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. driVR™ II Basic Software</td>
<td>$3,898</td>
</tr>
<tr>
<td>B. Complete System w/o computer</td>
<td>$5,998</td>
</tr>
<tr>
<td>C. Add Dell computer to complete system</td>
<td>$1,599</td>
</tr>
</tbody>
</table>

**Profiler™ by Research Triangle Institute (RTI)**

<table>
<thead>
<tr>
<th>Description</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Profiler™ Assessment Station</td>
<td></td>
</tr>
<tr>
<td>Includes:</td>
<td></td>
</tr>
<tr>
<td>Limited license (20-50 drivers)</td>
<td>$2,998</td>
</tr>
<tr>
<td>19” Monitor</td>
<td></td>
</tr>
<tr>
<td>Color printer</td>
<td></td>
</tr>
<tr>
<td>Profiler™ license package</td>
<td></td>
</tr>
<tr>
<td>Annual license (unlimited drivers)</td>
<td>$4,998</td>
</tr>
<tr>
<td>Speakers</td>
<td></td>
</tr>
<tr>
<td>Steering wheel</td>
<td></td>
</tr>
<tr>
<td>B. Software only choices</td>
<td></td>
</tr>
<tr>
<td>Starter Kit 10 tests</td>
<td>$99.50</td>
</tr>
<tr>
<td>Limited License 100 tests</td>
<td>$499</td>
</tr>
<tr>
<td>Annual License Unlimited # of tests</td>
<td>$2,499</td>
</tr>
<tr>
<td>C. Logitech Force Feedback Wheel/Pedals</td>
<td>$100</td>
</tr>
</tbody>
</table>
STISIM Drive™ by Systems Technology, Inc. (STI)
- Brake and throttle pedals w/ optional manual transmission
- Desktop Computer
- Driving display monitor
- Head-mounted display unit (optional)
- Simulator operator display (optional)
- Steering unit w/ additional input controls and optional speed sensitivity

No Product Pricing information available

FAAC, Inc.
- A. Scenario ToolBox™
  - Software CD
  - $25,000
- B. Desktop Simulator DT-1000-V1
  - 29” high-definition monitor
  - Accelerator
  - Brake
  - Gear selector
  - Headlight switch
  - Keyed Ignition
  - Main application computer
  - Speedometer/Tachometer
  - Turn signals
  - Hydraulically dampened driving controls
  - $50,000

MID-RANGE SIMULATOR UNITS

FAAC, Inc.
- Paratransit Simulator
  - MB-1000-V5
  - $150,000 / $180,000 (upgrade)
  - MB-1000-V1
  - $100,000 / $115,000 (upgrade)

GE Capital I-Sim
- TranSimVS™
  - $86,000 (until 7/15/02)

DISPLAY UNITS

Elumens® Corporation
- Visionstation® 800
  - $21,000