CONNECTED VEHICLES-INFRASTRUCTURE UTC:

Six Month Update and Review
The Fall Research Call ended in just under $1.5M spent on 10 research projects.

One-half of the projects funded were from VTTI.

Two UVA projects were funded.

Two collaborative projects were funded (UVA and VTTI, and Morgan State and VT).

One-third of the projects have a graduate student in a lead research position.
<table>
<thead>
<tr>
<th>Research Projects:</th>
<th>Primary Investigator</th>
<th>School</th>
<th>Secondary Investigator(s)</th>
<th>School</th>
<th>Budget/Funding</th>
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<tbody>
<tr>
<td>Safety and Human Factors of Adaptive Stop/Yield Signs Using Connected-Vehicle Infrastructure</td>
<td>Michael Baird</td>
<td>VTTI</td>
<td>Tom Dingus</td>
<td>VTTI</td>
<td>149,999.00</td>
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<tr>
<td>Connected Vehicle Applications for Adaptive Overhead Lighting</td>
<td>Ronald Gibbons</td>
<td>VTTI</td>
<td>Alejandra Medina</td>
<td>VTTI</td>
<td>150,000.00</td>
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<tr>
<td>Intersection Management Using In-Vehicle Speed Advisory/Adaptation</td>
<td>Ismail Zohdy</td>
<td>VTTI</td>
<td>Hesham Rakha</td>
<td>VTTI</td>
<td>150,000.00</td>
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<td>Field Testing of Eco-Speed Control Using V2I Communication</td>
<td>Raj Kishore</td>
<td>VTTI</td>
<td>Hesham Rakha</td>
<td>VTTI</td>
<td>150,000.00</td>
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<tr>
<td>Innovative &quot;Intelligent&quot; Awareness System for Roadway Workers Using Dedicated Short-Range Communications</td>
<td>Darrell Bowman</td>
<td>VTTI</td>
<td>Tom Martin</td>
<td>VT</td>
<td>150,000.00</td>
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<tr>
<td>Emergency Vehicle-to-Vehicle Communication</td>
<td>Pamela Murray-Tuite</td>
<td>VT</td>
<td></td>
<td></td>
<td>146,380.00</td>
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<tr>
<td>Connected Vehicle Enabled Freeway Merge Management - Field Test</td>
<td>Brian Smith</td>
<td>UVA</td>
<td>Hyungjun Park &amp; Tanveer Hayat</td>
<td>UVA</td>
<td>150,017.03</td>
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<tr>
<td>Infrastructure Safety Assessment Using Connected Vehicle Data</td>
<td>Brian Smith</td>
<td>UVA</td>
<td>Robert Kluger</td>
<td>UVA</td>
<td>79,868.91</td>
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<tr>
<td>Infrastructure Pavement Assessment and Management Applications Enabled by the Connected Vehicles Environment Research Program - Phase I: Proof-of-Concept</td>
<td>Gerardo Flintsch</td>
<td>VTTI</td>
<td>Brian Smith</td>
<td>UVA</td>
<td>199,466.85</td>
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<tr>
<td>Connected Vehicle-Infrastructure Application Development for Addressing Safety and Congestion Issues Related to Public Transportation, Pedestrians, and Bicyclists</td>
<td>Manoj Jha</td>
<td>Morgan</td>
<td>Shinya Kikuchi</td>
<td>VT</td>
<td>150,000.00</td>
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</tbody>
</table>

1,475,731.79
### RESEARCH PROJECT NEEDS

**“Adaptive Stop Yield” Baird/Dingus:**
- Estimated test time February – May 2013
- Need Smart Road Time
- Need 2 vehicles
- Need a semi-truck (for obstruction)
- Will have outside participant data

**“Adaptive Lighting” Gibbons/Medina:**
- Estimated test time January-May 2013
- Need Smart Road Time w/weather and lighting needs
- Need NOVA test bed
- Need 2 vehicles
- Will have outside participant data

**“Intersection Management” Zohdy/Rakha:**
- Estimated test time January-May 2013
- Need Smart Road Time w/weather
- Need to use VT’s Roundabout on Main Street
- Need 1-2 vehicles (at least 1)
- Might use outside participants

**“Eco-Speed Control” Kishore/Rakha:**
- Estimated test time January-June 2013
- Need Smart Road Time
- Might do NOVA test bed
- Need 1-2 vehicles (at least 1)
- Might use outside participants

**“Work Zone Safety” Bowman/Martin:**
- Estimated test time May-October 2013
- Need Smart Road Time
- Need 1-2 vehicles (one may be a heavy vehicle)
- Does not need outside participants

**“Emergency Vehicles V2V” Murray-Tuite:**
- Estimated test time September 2012-May 2013 (flexible, could be later if necessary)
- Need NOVA test bed
- Need 1-2 vehicles (one may be a heavy vehicle)
- Need traffic camera data from VDOT
- Might use outside participants

**“Infrastructure Safety Assessment” Smith/Kluger (UVA):**
- Estimated test time June-August 2013
- Need NOVA test bed
- Need 1-2 vehicles (at least 1)
- Does not need outside participants

**“Merge Management Field Test” Smith/Park/Hayat (UVA):**
- Estimated test time January-July 2013
- Need Smart Road Time
- Need 4 vehicles
- Does not need outside participants

**“Safety and Congestion Issues…” Jha/Kikuchi (Morgan State/VT):**
- Unclear about their research needs
- Mentions using NOVA test bed
- But will double check on vehicles and participants

**“Pavement Assessment” Smith/Flintsch (UVA/VTTI):**
- Estimated test time January-May 2013
- Need Smart Road Time
- Need NOVA test bed
- Need 1-2 vehicles (at least 1)
- Does not need outside participants
What was purchased?

- 55 Savari RSEs and 12 Savari OBEs ($360K).
- 12 DENSO OBEs ($36K).
- 14 DAS units ($31K).

The Savari delivery and remittance is complete, but DENSO and DAS are still in the process of delivery.

Just under $430K has been invested in equipment, funded through VDOT cash match for purchase and RSE installation.

This initial estimate is higher when labor costs are factored in for installation and development.
Smart Road:

- 11 RSE units will be active on the Smart Road (red dots).
- 3 have the ability to be mobile units, and are able to be adjusted per research project.
- Current Challenge: Data storage (may need additional server).
- Estimated Completion: December/January (at the latest).
Northern Virginia:

- **Phase 1**: 8 RSEs will be installed on I-66 (October 2012).
- **Phase 2**: Routes 29 and 50 (est. 18 RSEs; Fall 2012).
- **Phase 3**: Gallows Road and I-495 (est. 18 RSEs).

**Current Challenges:**

- Major construction on Gallows and I-495
- Cox, Verizon, and Comcast updating communication cable
- May need to purchase new cabinets/wireless communications
- Finding opportune times to install because of traffic

**Estimated Completion**: February/March (at the latest).

- But research can still occur on the different roads at earlier completion times because of the phased roll-out schedule.
RSE location installation plans – to be completed in Fall 2012
Fall Call for Short Courses resulted in 10 proposals; with one certificate program suggested:

- The Cost-Benefit Analysis of Connected Vehicles (Schaudt/Medina; VTTI)
- Development, Testing, and Verification of Algorithms that Trigger Warnings/Countermeasures in Vehicles (Perez; VTTI)
- Connected Vehicles and the Environment (Rakha; VTTI)
- Modeling of Connected Vehicle Applications (Rakha; VTTI)
- Cooperative Adaptive Cruise Control Systems (Rakha; VTTI)
- An Introduction to CVI Technology to Improve Safety (Medina; VTTI)
- An Introduction to CVI as a Workshop and Distance Learning Practicum (Park; UVA)
- CVI Technology for Roadway Health Assessment and Road Monitoring (Flintsch; VTTI)
- Various Optimization Techniques and Optimal Control Theory for CVI Applications (Kishore; VTTI)
- Artificial Intelligence, Game Theory, and Various Soft Computing Techniques for CVI Applications (Zohdy; VTTI)
- Traffic Safety and Human Factors Certification Program (Antin; VTTI)
Each Short Course will cost $20K, and the certification program will cost $140K per year to fund four GRAs.

- The certification program may not be a current viable option through the UTC since it requires a large long term investment.
- The short courses should be combined when applicable, further developed, and edited for the UTC needs for Spring and Fall 2013 presentation.
- However, it is possible to fund 10 short courses through the life of the grant ($200K over 2 years) – so it is valuable to try and make each submitted short course an asset to the UTC, or anticipate a second call at a later date to gain exemplary, on point courses.
- CVI-UTC is working with the VT CPE (Center for Professional Education) to help further develop short courses that will be funded.
CUTC Winter Meeting and Student Awards Banquet in Washington DC (Jan. 2013)

TRB Winter Meeting in Washington DC (Jan. 2013)
  - Booth and Reception

ITS America in Nashville, TN (April 2013)
  - Booth (could do a reception, but not required)

CUTC Summer Meeting in Memphis, TN (June 2013)

Applied for VT/VTTI to be host school for CUTC Summer Meeting 2014 - working the Inn and Skelton Conference Center to enhance application and competitiveness.
WEBSITE

http://www.connectedvehicleinfrastructure-utc.org
Spring 2013 research call:

- Who to call?
  - Do we still want to consider outside consortium applicants and how do we target them?
- Morgan State involvement, look to increase their research participation and visibility in the consortium
- Should we hold another call?
  - Or do we want to expand upon the 10 currently funded projects,
  - Revise old submissions from the fall call,
  - Or something else: like focus on a large scale naturalistic driver testing of the test bed in NOVA with the ASDs for a human factors type of research?
UPCOMING CHALLENGE: EQUIPMENT

- Installations for the available vehicles to be highly instrumented for research
  - Estimated at 3-4 light vehicles and the motorcoach and the semi-truck
- Installation and customization of OBEs and DAS
  - Based on scope, what can be internal or contracted?
- Resource Sharing during research Spring 2013
  - Using vehicles for research in NOVA
  - Allowing all researchers access to equipment in a timely manner
- The initial plan of the 220 aftermarket safety devices for research purposes?
Awaiting future funding notification.
- Emails from grant managers at RITA of possible additional $3.5M funding in 2013, but this requires a rush to find cash match if so, and not confirmed as of Fall 2012.

Applying for 2014-16 UTC grant.
- Funding will decrease from $3.5M to 1M for two years.
- Suggestions from grant managers at RITA that application may be available in October 2012.

Changes in reporting structure
- 6 months versus quarterly; and focused primarily on research funded through the UTC.
About $2.26M of funding is currently committed to various UTC projects of research, outreach and education.

This commits about 30% of the initial $7.7M fund.

(However, this “spent percent” could be higher, maybe closer to 40% funds committed, since cost-matching funds are not all spendable dollars.)
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