CONNECTED VEHICLES-INFRASTRUCTURE UTC:
The Spring Research Call ended in just under $1.2M spent on 8 research projects.

- Two-thirds of the projects funded were from VTTI.
- One UVA project was funded.
- One Morgan State project was funded.
- One collaborative project was funded (UVA and Morgan State).
- Half of the projects have a graduate student in a lead research position.
Overall, a little over $2.6M has been spent on research for the two research calls in 2012-2013.

This equates to about 58% of the total UTC fund has been spent on research.

With the additional funding acquired from RITA in Nov. 2012, two similar research calls could take place between 2013-2016 funding an additional 16-18 projects at around $150K each.

This also depends on Equipment, Education, and Outreach needs during that same time period.
## FUNDED RESEARCH PROJECTS

<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>
</tr>
</thead>
<tbody>
<tr>
<td>Connected Motorcycle Crash Warning Interfaces</td>
<td>Zac Doerzaph</td>
<td>VTTI</td>
<td>Shane McLaughlin</td>
<td>VTTI</td>
<td>166,025.00</td>
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<td>Connected Motorcycle System Performance</td>
<td>Reginald Viray</td>
<td>VTTI</td>
<td>Zac Doerzaph &amp; Shane McLaughlin</td>
<td>VTTI</td>
<td>149,604.00</td>
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<tr>
<td>Developing and Evaluating a Smartphone Application Aimed at Reducing Crashes Involving Motorcycles and Bicycles</td>
<td>Arash Jahangiri</td>
<td>VTTI</td>
<td>Hesham Rakha &amp; Tom Dingus</td>
<td>VTTI</td>
<td>149,999.00</td>
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<td>Developing and Test Connected Vehicle Freeway Speed Harmonization Systems</td>
<td>Hao Chen</td>
<td>VTTI</td>
<td>Hesham Rakha</td>
<td>VTTI</td>
<td>150,001.00</td>
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<td>Reducing School Bus/Light-Vehicle Conflicts Through Connected Vehicle Communications</td>
<td>Darrell Bowman</td>
<td>VTTI</td>
<td>Andy Shaudt</td>
<td>VTTI</td>
<td>150,000.00</td>
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<tr>
<td>Next Generation Transit Signal Priority with Connected Vehicle Technology</td>
<td>Byungkyu (Brian) Park &amp; Jia Hu</td>
<td>UVA</td>
<td>Young-Jae Lee</td>
<td>Morgan</td>
<td>149,861.00</td>
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<td>Prototyping and Evaluating a Smartphone Dynamic Message Sign Application in the CVI-UTC Testbed</td>
<td>Brian Smith</td>
<td>UVA</td>
<td>Jiaqi Ma</td>
<td>UVA</td>
<td>110,481.84</td>
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<td>Measuring User Acceptance of and Willingness to Pay for CVI Technology</td>
<td>Hyeonshic Shin</td>
<td>Morgan</td>
<td>Michael Callow, Young-Jae Lee &amp; Andrew Farkas</td>
<td>Morgan</td>
<td>149,733.00</td>
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<td>1,175,704.84</td>
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<tr>
<td>Project Name</td>
<td>Principal Investigators</td>
<td>Estimated Test Time</td>
<td>Additional Requirements</td>
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<tr>
<td>&quot;Motorcycle Crash Warning&quot;</td>
<td>Doerzaph/McLaughlin</td>
<td>June - December 2013</td>
<td>Estimated test time June - December 2013, Need Smart Road Time, Need 2 CV light vehicles, Need 2 CV motorcycles, Will have outside participant data</td>
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<tr>
<td>&quot;Motorcycle System Performance&quot;</td>
<td>Viray/Doerzaph/McLaughlin</td>
<td>June - October 2013</td>
<td>Estimated test time June - October 2013, Need Smart Road Time, Will do NRV testing off testbeds, Need 2 CV light vehicles, Need 2 CV motorcycles, Will have outside participant data</td>
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<tr>
<td>&quot;Smartphone App Motorcycles/Bikes&quot;</td>
<td>Jahangiri/Rakha/Dingus</td>
<td>January - July 2014</td>
<td>Estimated test time January - July 2014, Unsure of needs; but fairly sure no testbed or vehicle requirements, Does not need outside participants</td>
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<tr>
<td>&quot;Freeway Speed Harmonization&quot;</td>
<td>Chen/Rakha</td>
<td>June - December 2013</td>
<td>Estimated test time June - December 2013, Need NOVA test bed, Need 1-2 vehicles (at least 1), Might use outside participants</td>
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<tr>
<td>&quot;School Bus/Light Vehicles&quot;</td>
<td>Bowman/Schaudt</td>
<td>August - December 2013</td>
<td>Estimated test time August - December 2013, Need VIR Time, Need 1-2 vehicles (at least 1), Need 1 motorcoach/bus, Will have outside participant data</td>
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<tr>
<td>&quot;NextGen Transit Signal Priority&quot;</td>
<td>Park/Hu/Lee (UVA/Morgan State)</td>
<td>Need to determine time frame, estimate Summer 2013</td>
<td>Need NOVA test bed, Need Smart Road Time, Need 2-3 motorcoaches/buses, Does not need outside participants</td>
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<tr>
<td>&quot;Smartphone DMS&quot;</td>
<td>Smith/Ma (UVA)</td>
<td>October - December 2013</td>
<td>Estimated test time October - December 2013, Need NOVA test bed, Need 1-2 vehicles (at least 1), Will have outside participant data</td>
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<tr>
<td>&quot;User Acceptance and Willingness to Pay&quot;</td>
<td>Shin/Callow/Lee/Farkas (Morgan State)</td>
<td>January-April 2014</td>
<td>Estimated test time January-April 2014, Need NOVA test bed, Need 1-2 vehicles (at least 1), Will have outside participant data</td>
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</tbody>
</table>
What was purchased?

- 65 Savari OBEs ($117K).
- 3 DGPS Units ($24K).
- 220 DAS units ($500K).
- Smart Road Control Center Equipment and Server Upgrades for Research Data. ($5K)

Just under $1.2M 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: Complete installation and begin research.
- Estimated Completion: End of January.
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
- 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.
- Also with plans for mobile RSE trailers, research can still take place without a fully installed testbed – especially in locations with unique infrastructure attributes.
Here are the current Short Courses that will be continued to be adapted and developed through 2013:

- 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)
Each Short Course will cost $20K for a total of $200K currently invested in the short course program.

- There has been no additional short courses proposed at this time – maybe a spring call?
- We can look into a second call for short courses this spring to fund in the 2013-14 academic year, and devote another $200K for education.
- We would like to see additional consortium participation and anticipate this will occur upon research completion this spring.
- We could also consider using education funding to bring in relevant and useful outside “guest lecturers” from other universities, organizations, and CVI industry to perform 1 to 2.5 day “short courses”? 
UPCOMING PLANNED OUTREACH 2013

- ITS America in Nashville, TN (April 2013)
  - Booth only
- CUTC Summer Meeting in Memphis, TN (June 2013)
- Do we want to have participation in the Automated Vehicle Conference sponsored by TRB in Stanford, CA (July 2013)?
- Individual consortium schools outreach projects with local community members.
- We will also again seek to apply for to be the CUTC Summer Meeting host school in 2015.
Third Research Call (June 2013?):

- Who to call?
  - Do we still want to consider outside consortium applicants and how do we target them?

- Should we hold another call?
  - Or do we want to expand upon the 18 currently funded projects,
  - Revise old submissions from the past two research calls,
    - There is a collection of 12 advisory board highly-ranked older submissions that may do well as “insta-submissions” because of the current work being done/completed and the testbed finalization and progression by the time the research would be up for review.
Installations for the available vehicles to be highly instrumented for research
- 2 motorcycles, 6 light vehicles and the motorcoach and the semi-truck for an initial fleet of 10.

Installation and customization of OBEs and DAS

Resource Sharing during research Spring 2013
- Using vehicles for research in NOVA
- Allowing all researchers access to equipment in a timely manner
- We can work directly with Ray Resendes on this; initial discussion of housing the fleet vehicles at VT Arlington parking garage because of high security levels and close proximity to I-66
Additional 2013 Funding a Success!
- Funds were delivered from RITA to VTTI during TRB for a project total of $13,897,600 (with consortium cost share).

Applying for 2014-16 UTC grant.
- Funding will decrease from $3.5M to 1.5M for two years (with possibility of an additional $1.5M to be offered if available on the successive year).
- CVI-UTC will remain a Tier 1 UTC.
- Due March 19, 2013
About $4.46M of funding is currently committed to various UTC projects of research, outreach and education.

This commits about 32% of the initial $13.9M fund.

(However, this “spent percent” could be higher, maybe closer to 45% funds committed, since cost-matching funds are not all spendable dollars.)
CONNECTED VEHICLES-INFRASTRUCTURE UTC: