The Utah Transportation Center (UTC) continues to grow and provide students with unique opportunities within the transportation discipline. In the spring, four students graduated. These students were funded through the Tier 1 UTC and worked on various transportation related research projects. In addition, we supported an undergraduate student in attending the Advancing Women in Transportation Annual Conference. Lastly, three new projects were selected that will support graduate students.

The UTC supported Kailey Jackson so that she could travel to Philadelphia, PA to attend the Advancing Women in Transportation Annual Conference from May 15-17. The theme of this year’s conference was, “Liberty in Transportation for All.” This was the first time that Ms. Jackson had attended an engineering conference of this kind. She said, “I was very appreciative of the opportunity and enjoyed meeting the different people.” This was the third Advancing Women in Transportation conference that the UTC has supported and plans to continue this support in the future.

Researchers at Utah State University and Virginia Polytechnic University were awarded a collaborative proposal to investigate the feasibility of using a limited number of sensors for a short (two week) duration instead of permanently instrumenting a bridge with a large array of sensors for continuous monitoring. Both schools are working with Bridge Diagnostic Inc. in order to develop the equipment. It is anticipated that the equipment will include six to eight sensors and will be able to function for a two-week period on a bridge.

Two additional projects were also initiated through the Tier 1 CAIT Center. The first involves the forensic testing of four, post tension, precast concrete, bridge girders. These bridge girders were salvaged from a bridge near Orem, Utah. The bridge girders represent a unique opportunity to investigate the behavior of post-tensioned members with rods. The second project that was selected was an investigation into the effects of changes in temperature in concrete bridges. This project will look to collect concrete bridge temperature data for over two years. The measured data will then be compared with predictive methods in accordance to the AASHTO LRFD Specifications.

While the research is promising and exciting, the UTC primary focus continues to be on the education of students. We are proud of the students that have been supported and have graduated with engineering degrees. We look forward to their continued success within the transportation discipline.
Carbon Fiber Shear Retrofit of 42-year-old AASHTO I-Shaped Girders

A significant number of bridges on the existing highway system are currently structural deficient due to deterioration, increased truck loads, and changes in design codes. This research investigated state-of-good repair in terms of the ultimate in-service shear capacity of eight AASHTO prestressed girders. These eight girders, representing two span lengths and reinforcing configurations. These bridge members presented a unique opportunity to investigate CFRP retrofit schemes to enhance the shear capacity of underreinforced girders that were nonrectangular. Four destructive tests were performed to quantify the in-service strength of the girders and the remaining twelve tests were performed on CFRP retrofitted girders. In all, five configurations of the CFRP reinforcement were evaluated. Two anchoring techniques were investigated which either involved epoxying a horizontal CFRP strip over the vertical strips or a new methodology of epoxying a CFRP laminate into a groove over the vertical strips that was cut at the web to flange interface. Two methodologies, that predicted the shear contribution of the carbon fiber reinforcement, were compared with the test results. A carbon fiber reinforcing scheme of vertical strips and horizontal anchorage strip was found to be the most effective in resisting the applied shear. Figure 1 is a picture of the bridge where the girders were salvaged.

The experimental program consisted of sixteen ultimate shear capacity tests performed on eight girders. The test setup consisted of a simply supported beam loaded with a single concentrated load and girder cross sectional dimensions are shown in Figure 2. Each test had the applied load positioned at a distance of d (depth of beam) plus 30.5 cm (1 ft) from the center of the bearing plate. Because bridge girders are design in accordance to the AASHTO LRFD Specifications, the loading location was selected so that it was applied near the AASHTO critical shear load location.

Figure 1 (above). The bridge where the girders were salvaged.  
Figure 2 (below). Single concentrated load and girder cross sectional and dimensions.
UTC Mourns the Death of Long-time Advisory Board Member, Jim McMinimee

We were saddened to learn of the death of UTC Advisory Board member, James C. (Jim) McMinimee in Washington DC on May 10, 2012 at the age of 51. Jim has served on the Advisory Board since the reauthorization of the Utah Transportation Center and provided great insight into the direction the Center should take to fulfill its critical mission. Jim’s insight and expertise will be sorely missed.

Jim spent 25 years in dedicated service with the Utah Department of Transportation. During that time he served as Region 2 director (the youngest in UDOT history), worked on Olympic operations for the 2002 Winter Olympic Games, and later served as Director of Project Development and Chief Engineer.

He brought national recognition to himself and the State through his pioneering work in accelerated bridge construction and CMGC contracting. Later he worked as a consultant for ARA and AASHTO.

Our deepest condolences go out to Jim’s wife, Sally, and their children.

In happier times—Jim joined the rest of the Advisory Board at a UTC Advisory Board meeting held at Utah State University.
Center Projects in Progress

“Work Zone Design Evaluation,”
Dr. Kevin Heaslip, PI.
Co-funded by UDOT and UTC.

“Forecasting Network Traffic for Small Communities in Utah,”
Dr. Anthony Chen, PI.
Funded by UTC.

“Investigation of the Use of Texel Cameras for Counting Passengers on Public Transportation, Phase II,”
Dr. Scott Budge, PI.
Funded by UTC.

“Forensic Testing of Prestressed Girders,”
Dr. Paul J. Barr, PI.
Funded by Tier 1 CAIT at USU.

“Accelerated Bridge Construction Deck Testing,”
Dr. Marv W. Halling, PI.
Co-funded by UDOT and Tier 1 CAIT at USU.

“Sign Management,”
Dr. Kevin Heaslip, PI.
Funded by Tier 1 CAIT at USU.

“A Two-Stage Approach for Estimating a Statewide Truck Trip Table,”
Dr. Anthony Chen, PI.
Funded by the Mountain-Plains Consortium.

“Develop Design Guidelines for Integral Abutment Bridges,”
Dr. Paul J. Barr, PI.
Co-funded by UDOT and the Mountain-Plains Consortium.

Dr. Kevin Heaslip, PI.
Funded by the Mountain-Plains Consortium.