University Consortium for Intermodal Transportation Safety and Security – Highlights of Research Activities

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INTRODUCTION

The University Consortium for Intermodal Transportation Safety and Security (UCITSS) is a federally funded research Center which is presently headquarted at the Civil Engineering Department, Florida Atlantic University. UCITTS was established in 2004 and was mainly funded by the U.S. Federal Transit Administration (FTA) and the U.S. Federal Highway Administration (FHWA). The consortium involves all of the eleven public universities within the State of Florida, maintaining a strong partnership with the Lehman Center for Transportation Research (LCTR) at Florida International University (FIT), the Center for Urban Transportation Research (CUTR) at University of South Florida (USF) and the Center for Advanced Transportation Systems Simulation (CATSS) at University of Central Florida (UCF). Since its establishment, the research expenditures of the consortium exceeded $7,500,000 for projects related to the safety and security of transportation infrastructure.

This paper summarizes four on-going research projects of the Center which are being conducted in cooperation with other Universities.

HIGHLIGHTS OF CURRENT RESEARCH

Among other endeavors and research activities, UCITSS is involved, in cooperation with other Universities, in the following four major projects:

- Unmanned Areal System (UAS) for Emergency Operations
- Weight-In-Motion (WIM) Systems for Commercial Vehicle Compliance
- Washington Metropolitan Area Transit Authority (WMATA) Simulation and Security Training
- City of Baltimore – Emergency Evacuation due to a Catastrophic Event

A brief discussion of the above projects is provided in the following sections.

Unmanned Areal System (UAS) for Emergency Operations

This project is funded by the US FHWA and managed through the Florida Department of Transportation (FDOT). The goal is to develop and test procedures for deploying an Unmanned Aerial System (UAS) into National Air Space (NAS) for the purpose of real-time surveillance of infrastructure in a post-disaster environment. This project is a joint effort amongst academia (Florida Atlantic University (FAU) and University of Central Florida (UCF)), public sector (Florida Emergency Operations and Florida Department of Law Enforcement) and the industry (Cyber Defense Systems, Inc). Current UAS operations in the NAS are subject to regulations that require a Certification of Authorization (COA) process filed 60 days prior to operation (Figure 1). Thus, two tests were conducted using the CyberBug (Figure 2) an UAS from Cyber Defense Systems, Inc. The first test flight took place on May 10, 2007 at St. Petersburg, Florida and the second on September 18, 2007 at Avon Park, Florida. During the CyberBug test flights utilize satellite feed stream real-time video directly into the main situation room in the Florida Emergency Operations (EOC) in Tallahassee, Florida. During the second test multiple day and evening flights were included utilizing both color and low lights camera technologies.

Figure 1: Current UAS Operations in NAS

Tegucigalpa, Honduras   **June 4-6, 2008**
6th Latin American and Caribbean Conference for Engineering and Technology
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Weight-In-Motion (WIM) Systems for Commercial Vehicle Compliance

This project is funded by the Incident Management and Commercial Vehicle Operation Programs, FDOT and the US FHWA. This is also a joint effort between FAU, UCF and the private industry (Horizon Service Group). A pilot facility of a commercial Remote Operated Compliance System (ROCS) has been installed and tested at the Blount Island, Jancksonville Port in Florida (Figure 3). That includes an outbound Weigh-in Motion system that automatically records any real-time violation including: vehicle weight, size/length and speed (Figure 4). The system also records vehicle identification (including container number and US DOT number) and electronically transmits the data to the Motor Vehicle Compliance Officers.

Figure 3: Remote Operated Compliance System
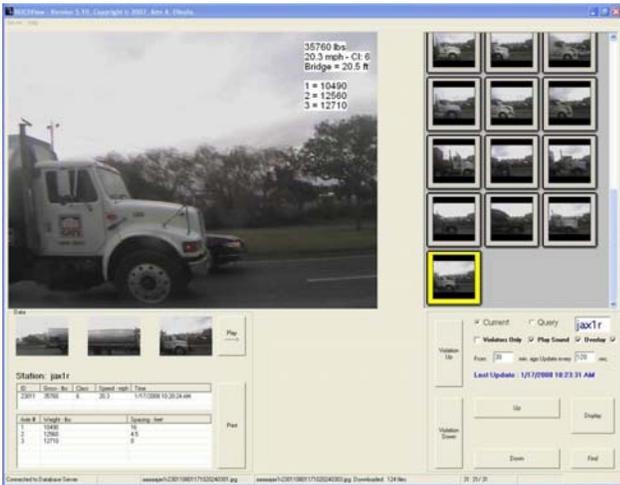
Figure 4: WIM Data Logging

Washington Metropolitan Metro Transit Authority (WMATA) Simulation and Security Training

This project is funded by the US Federal Transit Adminstration (FTA) and involves interactive visualization/animation modeling for addressing safety and security issues related to prevention, response, recovery and reconstruction of transit facilities. The animation model developed utilized AutoCad, GIS and the PRESAGIS software (formely known as MultiGen-Paradigm) to replicate the WMATA facility (Figure 5). The focus of this project's platform is to reinforce "Observe and Report" lessons based on the National Transit Institute brochure on "Emplyee Guides to System Security". The training includes all four of the FTA "Heavy Rail Employee Security Guide" that is stations, right-of-way, tunnels and rail cars as stated in the report "Top 20 Security Program Action Items for Transit Agencies".

Figure 5: WMATA Animation

City of Baltimore – Emergency Evacuation due to a Catastrophic Event

This project is funded by the US Department of Homeland Security and is a joint effort among the John Hopkin's University, Florida Atlantic University, University of Alabama and Florida A&M University. The project evaluates emergency evacuation from the City of Baltimore due to a chemical explosion. The road network (2.3-km x 2.3-km area) is coded in the simulation software (Figure 6). Travel demand is defined along with an Origin/Destination matrix regarding the city's population during the day and time of the Chemical Disaster. The existing road network of the evacuation area is critically evaluated since it is often limited in number and insufficient in capacity to handle the unusual surge in demand due to concurrent evacuation activities. The responsibilities of local and State authorities are assessed. The model is calibrated and validated and the emergency evacuation methodologies developed are evaluated according to their effectiveness.

Figure 6: City of Baltimore Emergency Evacuation