

Transportation

Homeland Security

Serious Gaming

Military



V M A S C

Education in modeling & simulation

Medical modeling & simulation



HR Hurricane Evacuation

- ▼ **Focuses on the six primary exit routes**
- ▼ **Based on 2000 census updated with predictions for 2010**
- ▼ **Uses latest flood zone maps from US Army COE**
- ▼ **CITILAB's CUBE transportation**
- ▼ **Assesses feasibility of the Commonwealth's evacuation plan**
- ▼ **Considers residents in three categories: permanent structures, mobile homes, and transient (tourists)**
- ▼ **Assesses impact of accidents and incidents**

Significant Findings

- ▼ **Category two and stronger storm evacuations require more time than originally planned due to increased impacted populations**
- ▼ **Existing timed phased evacuation improves traffic flow**
 - **Improvements are enhanced when phases are separated by an overnight period**
- ▼ **Accidents and incidents increase travel time for immediately affected groups, but have only minor affect on total evacuation time**
- ▼ **Evacuee compliance with planned evacuation routes and Emergency Managers coordinated use of traffic information systems are critical**

Evacuation Simulation Assumptions

- ▼ **No individual evacuations begin between 8 pm and 6 am**
 - **Current Commonwealth plan relies on continuous evacuations beginning at the time of the initial order**
- ▼ **Higher participation rates than actually expected**
 - **Conservative test of system**
 - **Reflects higher potential number of evacuees in the event of multiple storms in a short period**
- ▼ **Residents comply with planned evacuation routes**
- ▼ **Roads are not yet affected by weather**
 - **Plan assumes evacuation complete before tropical storm winds arrive**
- ▼ **Destinations based on results of survey conducted separately**

Available User Selections

- ▼ **Hurricane Strengths 1 to 4 (Saffir-Simpson Scale)**
- ▼ **Time of evacuation order and phase 2 start**
- ▼ **Background traffic density**
 - Adds up to 280K vehicles per day
- ▼ **Fraction of evacuees leaving before evacuation ordered**
- ▼ **Fraction of shadow evacuees (evacuees from areas not under an evacuation order)**
- ▼ **Tourist season – yes or no (adds over 30,000 evacuees)**
- ▼ **Accident and incident settings (four settings possible);**
- ▼ **Evacuee compliance level**
- ▼ **Contraflow (use or non-use)**

Evac Order Timing Demonstration

- ▼ **Two Category 2 Hurricanes with only phase start times changed**
- ▼ **Scenario 1: Phase 1 at 0600, Phase 2 at 1600**
- ▼ **Scenario 2: Phase 1 at 0600, Phase 2 at 0600 next day**
- ▼ **During tourists season**
- ▼ **Early Evacuations: 10%**
- ▼ **Shadow Evacuation: 20%**
- ▼ **Background traffic density: High**
- ▼ **Accident and incident setting: Typical**
- ▼ **Contraflow not used**

Sample Scenarios Tested

- ▼ **Two scenarios using Category 2 Hurricanes**
- ▼ **First scenario simulates phase 1 and phase 2 of evacuation on same day**
- ▼ **Second scenario simulates same time for phase 2, but begins phase 2 on morning of following day (14 hours later)**
- ▼ **Both scenarios assume:**
 - **During tourist season**
 - **High background traffic levels on day 1**
 - **10% of evacuees leave before ordered**
 - **20% shadow evacuees**
 - **Typical accident and incident levels**
 - **Contraflow not used**

Sample Scenario Results

With 14-hour delay until second day for phase 2 start:

- ▼ Time required for all evacuees to clear Hampton Roads increased by only two hours
- ▼ Time required for 95% of evacuees to reach destinations decreased by two hours
- ▼ Time required for all evacuees to reach destinations decreased by one hour
- ▼ Phase 2 evacuees spent up to 14 fewer hours in traffic
- ▼ Scenario requires beginning the phase 1 evacuation one day earlier to ensure all evacuees clear area prior to storm arrival

Questions?

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