### MCEER RESEARCH TASK STATEMENT

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<th>Thrust Area:</th>
<th>2</th>
<th>Budget</th>
<th>Yr 9 Assigned Project Number:</th>
<th>9.2.12</th>
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**Task Title:** Seismic Rehabilitation Decision Analysis for Acute Care Facilities

**Investigator/ Institution:**

Detlof von Winterfeldt/ USC

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<th>Statement of Project Goals:</th>
<th>(Conceptually describe what the work is intended to accomplish, in 100 words or less. Do not provide detailed description here.)</th>
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At the end of year 8, we will have adapted the STRATACAP software to accommodate capital projects involving risk, and, in particular, to accommodate seismic rehabilitation projects. In year 9, we will test the usefulness of this revised version of STRATACAP in selected capital allocation decisions of the MCEER West Coast demonstration hospital. We also expect to contribute to providing a close link between the outputs of the seismic rehabilitation model by Mircea et al and STRATACAP.

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<th>Problem Description and Research Approach of Proposed Work for Year 9:</th>
<th>(Detailed description of research to be conducted and methodology to be used.)</th>
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We expect to start year 9 with a working model of STRATACAP than can handle project proposals that involve high risks. In year 9, we want to find one or two real projects considered by the MCEER West Coast demonstration hospital and test the implementation of STRATACAP using these projects as tests.

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<th>Assessment of State-of-the-Art:</th>
<th>(Describe other relevant work being conducted within and outside of MCEER, and how this project is different.)</th>
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STRATACAP is a state-of-the-art capital resource allocation model. It currently does not handle uncertainties and risks. The main innovation is to add the capability to compare projects with relatively little risk (e.g., building a new addition to the emergency room) with projects with high risks (e.g., seismic retrofits).

A screenshot of STRATACAPS user interface is shown in the figure below. This interface allows users in group settings to explore various ways of ranking project proposals, to identify the sure winners (two green marks) and the sure losers (two red marks) and to focus the discussion on the few contenders (shaded in blue).
Progress to date: (If applicable, a short description of achievements in previous years. Clearly distinguish progress achieved in the past year, i.e., accomplishments from April 1, 2004, to March 31, 2005.)

The main progress during the past year was to obtain and experiment with a “stripped down” version of STRATACAP to explore the mathematical capabilities of this software to handle projects involving high-end risks (both on the positive and negative side). We also have developed a preliminary set of input criteria that can be used in STRATACAP and a preliminary multicriteria model that would fit with this software package. There are still some unresolved questions related to how to handle the extreme tails of the consequences of an earthquake with or without retrofits (see below, under challenges). Don Kleinmuntz, the principal designer of STRATACAP has agreed to participate in a significant way both in years and 8 and 9.

Role of Proposed Task in Support of Strategic Plan: (Describe how the effort will make a unique, useable contribution to the MCEER strategic plan.)

This project will bring MCEER’s work from the shake table to the board room. We have a clear vision of how to connect the outputs of the basic engineering work, through the decision analysis model, to STRATACAP. Since STRATACAP is used in the boardroom, the key link is between the decision analysis models and STRATACAP.
**Task Integration:**  (Describe how the work performed interfaces with other tasks and researchers funded by MCEER.)

An important integration is with Mircea Grigoriu’s task. We need to make sure that the model of his outputs match the needs of STRATACAP. Our team remains to be involved with the design of Mircea’s decision analysis model, especially regarding consequence and economic modeling.

The other important integration is with the work by Petak and Alesch. This work provides the larger context of hospital decision making, going beyond the capital allocation context and covering strategic issues.

**Possible Technical Challenges:**

1. Assuring a tight link between the outputs of Grigoriu’s model and STRATACAP
2. Dealing with probability distributions in STRATACAP, especially the extreme tails

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<th>Anticipated Outcomes and deliverables: (Also indicate those of particular benefit to IAB members and other end users.)</th>
<th>Potential end-users beyond academic community: (IAB members and others.)</th>
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| 1. A revised STRATACAP model  
2. A test of this model in selected boardroom decisions | 1. Hospital boardrooms  
2. Hospital CFOs |

**Educational outcomes and deliverables, and intended audience:**

1. Software for use in educational settings  
2. Case study material for use in education settings

**Project Schedule and Expected Milestones for the Project:**  (Milestones and estimated time of achievement; e.g., Fall, Spring, Summer.)

Fall, 2005: Complete STRATACAP adaptation and link to Grigoriu’s model  
Spring, 2006: Identify cases for testing STRATACAP  
Fall, 2006: Complete tests and write up results

**Team Members:**  (If known, provide names of team members associated with project including project leader, other faculty and their departments, undergraduate students, graduate students, postdoctoral students, industrial participants.)

Project leader: Detlof von Winterfeldt  
Major consultant: Don Kleinmuntz  
Student: TBD
Possible Direction of Work in Subsequent Years:

Writing up results and dissemination.

Multi-Hazard Statement:

a) (Conceptually describe in 200 words or less how some of the work you are conducting as part of your MCEER Year 9 research task can be exported/applied to other natural or man-made hazards including multi-hazard research.)

In addition to the work for MCEER, we are working on using STRATACAP for allocating funds for alternative homeland security projects. This effort is much less clearly defined, but it will be informed in useful ways by the MCEER work. One way to integrate the two pieces would be to find a two-hazard context with hospitals where resource allocations (either by hospitals or by the DHS) would reduce both earthquake risks and HS risks. This should not be too difficult and it should demonstrate to both communities (earthquake and HS) that one can get dual benefits for example, from earthquake rehabilitation or from increasing emergency room capacity.

b) If you are seeking supplemental multi-hazard funding, describe the multi-hazard milestones that you plan to complete as part of your Year 9 research.

Fall, 2005: Workshop with MCEER, DHS, and Hospital communities to identify selected dual benefit projects
Spring, 2006: Work plan for evaluating dual benefits projects using STRATACAP and possibly adaptation of the software
Fall, 2006: Test implementation of STRATACAP software with dual benefits