Project Code and Title

B.02.01.03.07 Advanced Material Modeling

Project Objective

To develop advanced DYNA3D material models to better characterize the response of dummy components and biological tissue in finite element models.

Background

A major limitation with existing models of anatomic structures and dummies is the lack of appropriate material models in the DYNA3D finite element analysis code. Currently available material models do not provide accurate representations for biological soft tissues, which are known to be hyperelastic and viscoelastic. The current viscoelastic model is very crude and the current hyperelastic model is overly complicated. This project will provide more useful material models to better characterize hard and soft biological tissue, rubber, and various types of foam.

Problem Definition

Currently available material models do not provide accurate representations for biological soft tissues, which are known to be hyperelastic and viscoelastic. The current viscoelastic model is very crude and the current hyperelastic model is overly complicated. This project will provide more useful material models to better characterize hard and soft biological tissue, rubber, and various types of foam.

Potential Impact/Application

All crashworthiness programs involving finite element modeling of hyperelastic or viscoelastic structures.

RESOURCE REQUIREMENTS	FY 95	FY 96	FY 97	FY 98	FY 99
Contract Money ($K)	0	0	0	0	0

Funding included under project B.02.01.03.05.

Project Manager(s)

Mike Kleinberger (202) 366-4698

Project Tasks

Task	**Title and Description**
Task 1	Define materials essential to biomechanical modeling, including both anatomic and dummy components.
Task 2	Determine whether an available material model could be used to characterize each essential material.
Task 3	Modify existing material models, if possible, to provide appropriate characterizations for essential materials.
Task 4	Develop new material models for any essential material not covered by Tasks 2 or 3.
Task 5	Conduct experimental tests of anatomic or dummy components to determine specific parameters required by the material models established in Tasks 2-4.

Task	**Start Date**	**Projected Completion Date**	**Status/Responsibility**
1	9/94	12/94	Completed.
2	12/94	3/95	Completed.
3	3/95	12/95	In progress. Transversely isotropic viscoelastic model developed in NIKE. Inclusion in DYNA is underway.
4	12/95	12/96	In progress. New hyperelastic model developed in DYNA. Quasilinear viscoelastic model is currently being developed.
5	12/96	12/97	