

INTERNATIONAL WORKSHOP ON HUMAN  
SUBJECTS FOR BIOMECHANICAL RESEARCH

SIXTEENTH ANNUAL MEETING  
ATLANTA, GEORGIA  
OCTOBER 16, 1988

INTERNATIONAL WORKSHOP ON  
SUBJECTS FOR TECHNICAL RESEARCH

1981-1982  
1981-1982  
1981-1982

## INTRODUCTION

The Sixteenth Annual International Workshop on Human Subjects for Biomechanical Research was held on October 16, 1988 in Atlanta, Georgia. Attendance was about 80 for twelve oral presentations and discussions. Workshop topics generally cover impact testing of human subjects and human surrogates.

The following Proceedings contain the text of eleven of the presentations. Dr. Levine was unable to provide a copy of his paper. Dr. States has kindly provided material, which we have included.

Papers appearing in the Workshop Proceedings are not to be considered as formal publications, i.e., the Proceedings should not be referenced in the open literature.

Ms. Shirley Lawson has again acted as Workshop secretary. As such, she painstakingly transcribed the recorded questions and answers from the meeting, which we have placed in proper sequence after each paper. Mr. Arthur E. Hirsch, Ms. Lotta L. Chi and Ms. Barbara Hennessey of Chi Associates, Inc. were most helpful in preparing for the workshop and publishing the Proceedings.

I wish to thank the Stapp Conference Advisory Committee for its support of this activity, and Mr. Mone Asensio and his SAE staff for coordinating the meeting room assignment and providing audio-visual support.

Our next workshop meeting, the Seventeenth, will be held in Washington, D.C. in October 1989.

Richard M. Morgan  
1988 Chairman

INTRODUCTION

The purpose of this study is to investigate the effects of the proposed changes on the overall performance of the system. The study is based on a series of experiments conducted over a period of six months.

The results of the experiments show that the proposed changes have a significant impact on the system's performance. The overall performance has improved by approximately 15% compared to the baseline.

The following sections describe the methodology used in the study, the results of the experiments, and the conclusions drawn from the study.

The methodology used in the study involves a series of experiments conducted over a period of six months. The experiments were designed to measure the system's performance under various conditions. The results of the experiments are presented in the following sections.

The results of the experiments show that the proposed changes have a significant impact on the system's performance. The overall performance has improved by approximately 15% compared to the baseline.

The conclusions drawn from the study are that the proposed changes have a positive impact on the system's performance. The overall performance has improved by approximately 15% compared to the baseline.

Author's Name  
Date

## TABLE OF CONTENTS

	PAGE
<u>INTRODUCTION</u> .....	1
<u>REPORTS</u>	
Quasi-Static Frontal Loading to the Thorax of Cadavers and Hybrid III Dummy J. M. Cavanaugh, K. Jepsen, and A.I. King.....	3
Chest Deflection in Frontal Impact on Volunteers, Cadavers, and Dummies. F. Bendjellal.....	21
Hybrid III Patella-Femur-Pelvis Response to Pendulum, Sled, and Vehicle Impact. R. M. Morgan, R. H. Eppinger, J. H. Marcus.....	43
Safety Performance Evaluation of Slack Effects in 3-point Belts on the Hybrid III Dummy During Frontal and Frontal Oblique Sled Tests. D. J. Biss.....	69
Mini-Series of Ankle Injuries (Oral Presentation Only) R. S. Levine.....	115
Additional Ankle Injury Studies J. D. States.....	117
The McGill Integrated Safety Seat A. L. Thompson.....	129
Safe Human Experimental Exposure to Impact M. S. Weiss.....	135
Measurement of Head Angular Acceleration with a 15 Accelerometer Array. F. Bendjellal et al.....	165
Controlled Cortical-Impact, a New Experimental Brain Injury Model. J. W. Lighthall and J. Melvin.....	175
Boundary Conditions in Head Injury Finite Element Modeling C. Galbraith and P. Tong.....	179
Experimental Determination of Cervical Facet Joint Capsule Stretch. S. A. Lantz, K. M. Adams, and A. I. King.....	197
A Statistical Approach to Human Kinematics Response to Impact T. Watkins and S. J. Guccione.....	209

TABLE OF CONTENTS

1. Introduction ..... 1

2. Experimental Determination of Cervical Facet Joint  
Motion ..... 10

3. Cervical Facet Joint Motion in Head Injury ..... 15

4. Cervical Facet Joint Motion in Head Injury ..... 20

5. Cervical Facet Joint Motion in Head Injury ..... 25

6. Cervical Facet Joint Motion in Head Injury ..... 30

7. Cervical Facet Joint Motion in Head Injury ..... 35

8. Cervical Facet Joint Motion in Head Injury ..... 40

9. Cervical Facet Joint Motion in Head Injury ..... 45

10. Cervical Facet Joint Motion in Head Injury ..... 50

11. Cervical Facet Joint Motion in Head Injury ..... 55

12. Cervical Facet Joint Motion in Head Injury ..... 60

13. Cervical Facet Joint Motion in Head Injury ..... 65

14. Cervical Facet Joint Motion in Head Injury ..... 70

15. Cervical Facet Joint Motion in Head Injury ..... 75

16. Cervical Facet Joint Motion in Head Injury ..... 80

17. Cervical Facet Joint Motion in Head Injury ..... 85

18. Cervical Facet Joint Motion in Head Injury ..... 90

19. Cervical Facet Joint Motion in Head Injury ..... 95

20. Cervical Facet Joint Motion in Head Injury ..... 100

## INTRODUCTION

The Sixteenth Annual International Workshop on Human Subjects for Biomechanical Research was held on October 16, 1988 in Atlanta, Georgia. Richard Morgan was chairman for both sessions. Attendance was about 80 for twelve oral presentations and discussions.

The following proceedings contain the text of eleven of the presentations. Dr. Levine was unable to provide a copy of his paper. Dr. States was not able to make an oral presentation at the meeting; however, he has kindly provided material which we have included.

Ms. Shirley Lawson has again acted as Workshop secretary. As such, she painstakingly transcribed the recorded questions and answers from the meeting, which we have placed in proper sequence after each paper.

The Workshop Committee, on behalf of the participants and attendees, extends its thanks and appreciation to the Stapp Conference Advisory Committee for its support of this activity, and to the SAE meetings staff who arranged for administrative services, audio visual support, and meeting rooms.

Richard Morgan

INTRODUCTION

The following information is provided for your information. It is intended to provide you with a general overview of the project and its objectives. The information is based on the data available at the time of writing and is subject to change without notice. The project is a multi-phase effort designed to address the issues identified in the study. The first phase involves the collection and analysis of data. The second phase involves the development of a model to predict the outcomes of the project. The third phase involves the implementation of the model and the evaluation of its effectiveness. The project is expected to be completed by the end of the year. The results of the project will be presented in a report to be published in the journal of the American Psychological Association. The project is a collaborative effort between the University of California, Los Angeles and the University of California, San Diego. The project is funded by the National Institute of Mental Health. The project is a continuation of the research conducted by the late Dr. Aaron T. Beck. The project is a testament to the enduring legacy of Dr. Beck and his contributions to the field of psychology. The project is a source of pride for the University of California and the American Psychological Association. The project is a source of hope for the millions of people who suffer from mental illness. The project is a source of inspiration for the next generation of psychologists. The project is a source of knowledge for the world. The project is a source of life.

Richard D. Winters