INTRODUCTION

The ESV Program originated more than three decades ago under the North Atlantic Treaty Organization (NATO) Committee on the Challenges of Modern Society, and was implemented through bilateral agreements between the Governments of the United States, France, the Federal Republic of Germany, Italy, the United Kingdom, Japan, and Sweden. The participating nations agreed to develop experimental safety vehicles to advance the state-of-the-art technology in automotive engineering and to meet periodically to exchange information on their progress. Since its inception the number of international partners has grown to include the governments of Canada, Australia, The Netherlands, Hungary, Poland, and two international organizations -- the European Enhanced Vehicle-safety Committee, and the European Commission. A representative from each country and organization serves as a Government Focal Point in support of the Conference.

The National Highway Traffic Safety Administration, U.S. Department of Transportation in the interest of information exchange, distributes this CD-Rom publication containing the Proceedings of the 19th ESV Conference. The technical papers included in this publication detail safety research efforts underway worldwide, and share the common international objective of reducing motor vehicle related fatalities and injuries. The opinions, findings, and conclusions expressed in the publication are those of the Author(s) and not necessarily those of the Department of Transportation or the National Highway Traffic Safety Administration.

The Conference Organizers thank our international participants for their dedication and support of the 19th ESV Conference and look forward to your future involvement.

Donna E. Gilmore
ESV Technical Coordinator

19TH ESV INTERNATIONAL TECHNICAL PROGRAM DELEGATES

United States – 19th ESV Conference Host

The Honorable Norman Y. Mineta
Secretary
U.S. Department of Transportation

The Honorable Jeffrey W. Runge, M.D.
Administrator
National Highway Traffic Safety Administration

Dr. Ronald L. Medford
Senior Associate Administrator for Vehicle Safety
National Highway Traffic Safety Administration

Joseph N. Kanianthra, Ph.D.
Chairman, 19th ESV Organizing Committee
National Highway Traffic Safety Administration

Donna E. Gilmore
ESV Technical Coordinator
National Highway Traffic Safety Administration

IHRA Secretariat
Office of Vehicle Safety Research
National Highway Traffic Safety Administration

Rae Tyson
Director of Media Relations
National Highway Traffic Safety Administration
Australia
Mr. Craig Newland
Senior Engineer
Department of Transport and Regional Services

Canada
Dr. Y. Ian Noy
Director, Standards Research and Development
Transport Canada

European Commission
Dr. Reinhard Schulte-Braucks
Head of Unit, Automotive Industry
European Commission

European Enhanced Vehicle-safety Committee
Dr. Dominique Cesari
Deputy Director
INRETS

Federal Republic of Germany
Dr. Josef Kunz
Präsident und Professor
President of Federal Highway Research Institute (BASt)

France
Mr. Bernard Gauvin
Ingénieur général des mines
Ministère des transports

Hungary
Mr. Sándor Szabó
Head of EU-UNECE Centre
KTI/Institute for Transport Sciences

Italy
Dott. Ing. Antonio Erario
Director of the International Regulation Division
Minister of the Infrastructure and the Transportation Modes

Japan
Mr. Masana Ezawa
Deputy Director
Ministry of Economy, Trade and Industry

Poland
Mr. Wojciech Przybylski, M.Sc.
Head of Vehicle Approval and Testing Department
Motor Transport Institute

Sweden
Mr. Anders Lie
Specialist, Head Office
Swedish National Road Administration

The Netherlands
Mr. Kees Doornheim
Head of vehicle standards development
RDW Vehicle Approval and Information

United Kingdom
Mr. John Jeyes
Deputy Head of Vehicle Technology and Standards
Department for Transport

United States
Dr. Joseph N. Kanianthra
Associate Administrator for Vehicle Safety Research
National Highway Traffic Safety
19th ESV Technical Session Chairpersons & Co-Chairs

Chairperson: Ekkehard Bröhning, Germany | Co-Chair: Rodolfo Schöneburg, Germany
Rollover Crashworthiness and Protection

Chairperson: Peter O’Reilly, United Kingdom | Co-Chair: Bernie Frost, United Kingdom
*Compatibility in Frontal/Side Collisions

Chairperson: Peter Burns, Canada | Co-Chair: Andry Rakotonirainy, Australia
*Advanced Intelligent Technologies – ITS

Chairperson: Yoshiyuki Mizuno, Japan | Co-Chair: Masao Notsu, Japan
*Improved Safety for Pedestrians and Other Vulnerable Road Users

Chairperson: Michael Monk, United States | Co-Chair: Scott Schmidt, United States
Vehicle Handling, Stability and Control Systems, and Rollover Prevention

Chairperson: Rolf Eppinger, United States | Co-Chair: Priya Prasad, United States
*Biomechanics: Injury Criteria and Test Procedures

Chairperson: Kaneo Hiramatsu, Japan | Co-Chair: Annie Pauzie, France
Advanced Technology: Driver-Vehicle Safety/Driver Performance

Chairperson: Craig Newland, Australia | Co-Chair: Suzanne Tylko, Canada
*Developments in Side Impact Protection

Chairperson: Jac Wismans, The Netherlands | Co-Chair: Priya Prasad, United States
Injury Risk Assessments

Chairperson: William T. Hollowell, United States | Co-Chair: Saeed Barbat, United States
Alternative Fueled Vehicles and Their Safety Implications (NEW)

Chairperson: Dominique Cesari, France | Co-Chair: Michiel van Ratingen, The Netherlands
Biomechanics: Dummy Development and Computer Modeling

Chairperson: Geoff Harvey, United Kingdom | Co-Chair: Steve Gillingham, United Kingdom
Safety of Motorcycles, Heavy Trucks, and Buses

Chairperson: Anders Lie, Sweden | Co-Chair: Anders Kullgren, Sweden
Restraint Systems for Adults and Children

Chairperson: Dainius Dalmotas, Canada
Developments in Frontal Impact Protection

* International Harmonized Research Activities, IHRA
# 2005 U.S. Government Award Recipients

## Safety Engineering Excellence

<table>
<thead>
<tr>
<th>Name</th>
<th>Country</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peter E. Reith</td>
<td>Germany</td>
</tr>
<tr>
<td>Koichi Kamiji</td>
<td>Japan</td>
</tr>
<tr>
<td>Lotta Jakobsson</td>
<td>Sweden</td>
</tr>
<tr>
<td>Jan Olsson</td>
<td>Sweden</td>
</tr>
<tr>
<td>Pete Thomas</td>
<td>United Kingdom</td>
</tr>
<tr>
<td>Jeff R. Crandall</td>
<td>United States</td>
</tr>
<tr>
<td>Richard C. Lind</td>
<td>United States</td>
</tr>
</tbody>
</table>

## Special Award of Appreciation

<table>
<thead>
<tr>
<th>Name</th>
<th>Country</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jean-Yves Foret-Bruno</td>
<td>France</td>
</tr>
<tr>
<td>Juichiro Takada</td>
<td>Japan</td>
</tr>
<tr>
<td>Per Lövsund</td>
<td>Sweden</td>
</tr>
<tr>
<td>Maurice A. Eaton</td>
<td>United Kingdom</td>
</tr>
<tr>
<td>Brian O’Neill</td>
<td>United States</td>
</tr>
</tbody>
</table>