INTRODUCTION

The Enhanced Safety of Vehicles (ESV) program originated in 1970 under the North Atlantic Treaty Organization (NATO) Committee on the Challenges of Modern Society, and was implemented through memorandums of understanding between the Governments of the United States, France, 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 safety 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, Republic of Korea, and two international organizations the European Enhanced Vehicle-safety Committee, and the European Commission. A representative from each country/organization serves as a Government Focal Point in support of the ESV program.

In the interest of information exchange, The U.S. Department of Transportation, National Highway Traffic Safety Administration (NHTSA), distributes the Proceedings of the 24th International Technical Conference on the Enhanced Safety of Vehicles. The technical papers in this publication detail safety research efforts underway worldwide, and share the common interest of reducing motor vehicle related fatalities and injuries.

The opinions, findings, and conclusions expressed in the publications are the original written work of the author(s) and not necessarily those of the U.S. Department of Transportation, National Highway Traffic Safety Administration. Traditional papers are accepted after the corresponding abstracts undergo technical review. To enhance the scientific content, twenty one papers were accepted for peer-review and published in a special edition of *Traffic Injury Prevention* 16(S1), by Taylor and Francis Group. These papers are available to the public via [http://www-esv.nhtsa.dot.gov/](http://www-esv.nhtsa.dot.gov/).

On behalf of the Conference Organizing Committees we thank our international participants for their dedication and support of the 24th ESV Conference and look forward to your future participation.

Donna E. Gilmore
ESV Technical Coordinator & Scientific-Secretariat
USDOT/NHTSA
24th ESV INTERNATIONAL PROGRAM DELEGATES

UNITED STATES – 24th ESV CONFERENCE SPONSOR

THE HONORABLE MARK R. ROSEKIND, PH.D.
Administrator
National Highway Traffic Safety Administration

NATHANIEL BEUSE
Chairman, ESV Government Focal Points
Associate Administrator for Vehicle Safety Research
National Highway Traffic Safety Administration

DONNA E. GILMORE
ESV Technical Coordinator & Scientific-Secretariat
National Highway Traffic Safety Administration

STEPHEN A. RIDELLA
ESV Lead Technical Advisor
Director Office of Vehicle Crashworthiness Research
National Highway Traffic Safety Administration

ARTHUR CARTER
ESV Student Safety Technology Design Competition Coordinator
National Highway Traffic Safety Administration

SWEDEN – 24th ESV CONFERENCE HOST

ANNA NILSSON-EHLE
Director
SAFER Vehicle and Traffic Safety Centre

YNGVE HÅLAND
Senior Advisor
SAFER Vehicle and Traffic Safety Centre

ANDERS LIE
ESV Government Focal Point
Specialist, Swedish Transport Administration

PETER KRONBERG
Safety Director
AB Volvo

LISA KNUTSSON
Communications Manager
SAFER Vehicle and Traffic Safety Centre

PER LÖVSUND
Professor
Chalmers University of Technology

ULRIKA LANDELIUS
Program Director FFI
Swedish Transport Administration

HANS G PETTERSSON
Ministry of Enterprise, Energy and Communications

ANDERS EUGENSSON
Director Governmental Affairs
Volvo Car Corporation

JAN OLSSON
Senior Advisor
Autoliv
24th ESV CONFERENCE GOVERNMENT FOCAL POINT MEMBERS

AUSTRALIA

Robert Hogan
General Manager,
Vehicle Safety Standards Department of Transport and Regional Services

CANADA

Peter Burns
Chief, Ergonomics & Crash Avoidance, Transport Canada

EUROPEAN COMMISSION

Philippe Jean
Acting Director, European Commission

EUROPEAN ENHANCED VEHICLE- SAFETY COMMITTEE

Bernd Lorenz
Head of Section F2 – Passive Vehicle Safety, Biomechanics,
Federal Highway Research Institute (BASt)

GERMANY

Stefan Strick
President and Professor, Federal Highway Research Institute (BASt)

FRANCE

Daniel Kopaczewksi
Head – Department Vehicle Security and Emissions,
Ministry of Ecology, Sustainable Development and Energy

HUNGARY

János Déak
Head of the Technical Co-ordination Centre for EU and –UN-ECE Activities on Road Vehicles, KTI/Institute for Transport Sciences
<table>
<thead>
<tr>
<th>Country</th>
<th>Name</th>
<th>Organization</th>
</tr>
</thead>
<tbody>
<tr>
<td>ITALY</td>
<td>Dott. Ing. Antonio Erario</td>
<td>Head of Division I, International Regulation Affairs, Ministry of Infrastructure and Transport, Department for Transport</td>
</tr>
<tr>
<td>JAPAN</td>
<td>Masayuki Shima</td>
<td>Director of Engineering Policy Division, Road Transport Bureau, Ministry of Land Infrastructure Transport and Tourism (MLIT)</td>
</tr>
<tr>
<td>POLAND</td>
<td>Wojciech Przybylski</td>
<td>Director for Technology and International Cooperation, Motor Transport Institute (Instytut Transportu Samochodowego)</td>
</tr>
<tr>
<td>REPUBLIC OF KOREA</td>
<td>Hyun Sung Shin</td>
<td>Deputy Director, Motor Vehicles Management Division, Ministry of Land, Infrastructure and Transport (MOLIT)</td>
</tr>
<tr>
<td>SWEDEN</td>
<td>Anders Lie</td>
<td>Specialist, Traffic Safety Division Trafikverket, Swedish Transport Administration</td>
</tr>
<tr>
<td>THE NETHERLANDS</td>
<td>Peter E. Th. Striekwold</td>
<td>Manager, Vehicle Standards Development, RDW</td>
</tr>
<tr>
<td>UNITED KINGDOM</td>
<td>Bernie Frost</td>
<td>Principal Engineer, Department for Transport</td>
</tr>
<tr>
<td>UNITED STATES OF AMERICA</td>
<td>Nathaniel Beuse</td>
<td>Associate Administrator for Vehicle Safety Research, National Highway Traffic Safety Administration</td>
</tr>
</tbody>
</table>
### Technical Session Chairpersons/Co-Chairpersons

<table>
<thead>
<tr>
<th>Technical Session Topics</th>
<th>Chair</th>
<th>Country</th>
<th>Co-Chair</th>
<th>Country</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protection of Vulnerable Road Users</td>
<td>Suzanne Tylko</td>
<td>Canada</td>
<td>Jim Hand</td>
<td>UK</td>
</tr>
<tr>
<td>Testing and Modeling of Structural Performance in Frontal Crashes</td>
<td>Younghan Youn</td>
<td>Korea</td>
<td>Stephen Summers</td>
<td>U.S.</td>
</tr>
<tr>
<td>Biomechanics #1: Development, Validation and Use of Human Body Models in Assessment of Crash Injury</td>
<td>Matthew Craig</td>
<td>U.S.</td>
<td>Rainer Hoffmann</td>
<td>Germany</td>
</tr>
<tr>
<td>Testing and Modeling of Structural Performance in Side Impact and Rollover Crashes</td>
<td>Bengt Pipkorn</td>
<td>Sweden</td>
<td>Mark Terrell</td>
<td>Australia</td>
</tr>
<tr>
<td>Crash Avoidance #2: Challenges for a Safe Human-Machine Interface Design</td>
<td>Peter Burns</td>
<td>Canada</td>
<td>Jost Gail</td>
<td>Germany</td>
</tr>
<tr>
<td>Biomechanics #2: Advances in Crash Test Dummies, Instrumentation and Data Analysis</td>
<td>Philippe Vezin</td>
<td>France</td>
<td>Yasuhiro Matsui</td>
<td>Japan</td>
</tr>
<tr>
<td>Restraint System Design and Performance Challenges: Addressing the Needs of Diverse Populations (Age, Gender, Stature)</td>
<td>Lotta Jakobsson</td>
<td>Sweden</td>
<td>Lex van Rooij</td>
<td>The Netherlands</td>
</tr>
<tr>
<td>Crash Avoidance #3: Connected and Automated Vehicles</td>
<td>Tim Johnson</td>
<td>U.S.</td>
<td>Jonas Sjöberg</td>
<td>Sweden</td>
</tr>
<tr>
<td>Advanced Fuels Crash Safety</td>
<td>Jost Gail</td>
<td>Germany</td>
<td>Lars Hoffmann</td>
<td>Sweden</td>
</tr>
<tr>
<td>Consumer Information Approaches To Improve Global Safety</td>
<td>Andre Seeck</td>
<td>Germany</td>
<td>David Ward</td>
<td>U.K.</td>
</tr>
<tr>
<td>Technologies and Policies of Driver Monitoring</td>
<td>Trent Victor</td>
<td>Sweden</td>
<td>Dominique Cesari</td>
<td>France</td>
</tr>
<tr>
<td>Integrated Safety from Pre-Crash to Crash to Post-Crash Assessment of New and Improved Field Data Collection, Analysis and Benefits Assessment Methods</td>
<td>Stephen Ridella</td>
<td>U.S.</td>
<td>Jac Wismans</td>
<td>The Netherlands</td>
</tr>
</tbody>
</table>
U.S. GOVERNMENT AWARD RECIPIENTS
Presented at the 24th ESV Conference
Gothenburg, Sweden

U.S. Government Special Awards of Appreciation
In recognition of and appreciation for outstanding leadership and special contributions in
the field of motor vehicle safety

Robert Zobel      Germany
Dr. Sadayuki Ujihashi,    Japan
Jonas Ekmark      Sweden
Farid Ahmed-Zaid    United States
Matthew Reed, Ph.D.     United States

U.S. Government Awards for Safety Engineering Excellence
In recognition of and appreciation for exceptional scientific contributions in the field of
motor vehicle safety engineering and for distinguished service to the motoring public

Gerhard Steiger      Germany
Naoto Muto       Japan
Jae Wan Lee, Ph.D.      Korea
Asso. Prof Astrid Linder   Sweden
Trent Victor    Sweden
Dr. David Hynd    United Kingdom
Dr. Hariharan Krishnan United States
24th ESV 2015 INTERNATIONAL STUDENT SAFETY TECHNOLOGY DESIGN
COMPETITION FINALISTS

**ASIA PACIFIC – KOREA, REGION 1**
REGIONAL COORDINATOR: PROF. YOUNG HAN YOON, KOREA
KoreaTech University
“Development of the Sensor and Motor Driven Automatic Height Adjustable Rear Seat Cushion to Best Fitting Adult Seat Belt for Older Child Protection”

**ASIA PACIFIC – JAPAN, REGION 1**
REGIONAL COORDINATOR: MR. MASASHI YUKAWA, JSAE, JAPAN
Shibaura Institute of Technology

**EUROPE, REGION 2**
REGIONAL COORDINATOR: BERND LORENZ, BAS, GERMANY
Chalmers University of Technology
“Urban Personal Vehicle Safety Strategy”
Technical University Berlin
“Developing a Pedestrian Airbag for Secondary Impact”
Hochschule für Technik und Wirtschaft des Saarlandes (University of Applied Sciences), Saarbrucken
“High Dynamic Driving Simulator for ADAS HIL Testing”

**NORTH AMERICA, REGION 3**
REGIONAL COORDINATOR: ARTHUR CARTER, NHTSA, UNITED STATES
University of North Texas
“Motorcycle Helmet with Crash Detection and Airbag Deployment”
Stanford University
“The Obstacle is the Path”
University of Alaska
“Dynamic Lights”