



# INTERNATIONAL BALLISTICS SOCIETY

The International Ballistics Society (IBS) promotes the science of ballistics internationally. The IBS provides for technical interchange via an International Symposium on Ballistics and provides professional development for its members by providing opportunities for publication, short courses, student programs, and other activities to promote career development.

## Letter from the President



It is a great honour for me to be the 2<sup>nd</sup> President of the International Ballistics Society. My objective will be to expand the services we offer our members with a particular emphasis on education and professional training. I know I have a strong act to follow! In this my first newsletter I want to tell you about some of the things we are planning for the future.

Our first General Election was a success with you re-electing Bo Janzon and Dennis Baum and electing Clive Woodley for the first time. The new Board held its first meeting in Miami.

### Thank you

First of all however, there are two people whose efforts I wish to acknowledge for getting the Society off to such a strong start. The first is Jack Riegel, our founding President. He first proposed the idea of a society at the Vancouver meetings of the International Ballistics Committee (IBC). His clear vision of what we might achieve was infectious and gradually his idea gathered momentum and support until we were able to found the Society in Beijing in May 2010. Jack has put an enormous amount of time and effort in defining and putting in place the Constitution, finance, secretarial and other governance processes a good society needs.



The second person I wish to thank and acknowledge is Mike Murphy. Mike has been a key supporter of the International Ballistics Symposium for over 20 years and served on the IBC in a number of capacities; including Chairman; technical co-chair as well as being a founding Society Board member. He was pivotal in setting up the Society's website and has worked hard to establish our Points of Contact network to spread knowledge of the Society around the world. His experience and counsel have been invaluable in establishing a strong Society. As members we all owe Jack and Mike our profound thanks.

### Membership Benefits

I would very much like to hear from you about the kinds of benefit *you* would like to have as a member of the Society. As part of the membership package we are introducing free downloads of five (5) previous symposium papers for all members. There are other suggestions we are considering, but we really would also like to hear from you – just drop me a line at [president@ballistics.org](mailto:president@ballistics.org).

### Archive

We have created an archive space where member can deposit articles, papers, photographs etc. that are concerned with ballistics science. These can include:

- Photographs from previous symposia or concerned with our history and members for our gallery. Peter Nel for example kindly provided some photographs from the 18<sup>th</sup> Symposium in Midrand South Africa – have a look at the Gallery.
- Copies of papers that were not published in original proceedings or are missing from proceedings in the on-line store.
- Related articles, drawings etc. concerned with ballistics and our history.
- Remember to make sure the paper is suitable for general release and has all the necessary publication approvals.

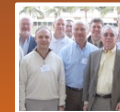
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## Help Needed from Members!

1. **Recruit new members** – spread the word and get your colleagues to join
2. **Get involved** – see the website for a list of committees and projects with contacts
3. **Send or post cool photos** – we want good photos showing ballistic events in each field
  - Interior Ballistics
  - Exterior Ballistics
  - Launch Dynamics
  - Vulnerability
  - Terminal Ballistics & Impact Physics
  - Explosion Mechanics

Please upload photos at  
[www.ballistics.org](http://www.ballistics.org)

*Remember to be responsible with sensitive or restricted information!*

*...Letter from the President Continued*

Simply log onto the website and click on 'Projects/Committees' and then under 'Archive' click on 'sign up' and you are all set to load documents by following the instructions.

**Education**

The other task the Board has set is to promote on-going training and education for members. Our initial plan is to expand the short courses, provided immediately before or after a symposium. Manfred Held established two half day courses on warheads and armour, which were well attended. We are beginning to explore a number of possibilities but we would like to hear from you in particular whether you would be interested in these kinds of courses and what courses. Please contact me or Jack Riegel the chair of the Education Committee.

**Looking Back to Miami and Forward to Freiburg**

It is now over 3 months since our most successful International Symposium on Ballistics in Miami. A total of 525 delegates is something to be especially proud of and we should all be aiming to make the 27th Symposium in Freiburg in April 2013 an equally successful event. The planning for this symposium has already started so watch the website and start working on your papers and posters. Equally important start telling your colleagues about the Society and the Symposium and encourage them to join and consider coming to Freiburg in 2013.

There is already a wealth of information on our website ([www.ballistics.org](http://www.ballistics.org)) which is growing all the time with new links to future events and other features. It is also a useful way to send messages to other members. We are always interested in receiving new ideas to improve the website, just drop us an email.

There is a lot going on as we move towards Freiburg. Why not get involved? We would welcome your support in any way.

I hope you find the remainder of this newsletter of interest and will contribute to future ones.

With every good wish.

Ian Cullis  
President  
International Ballistics Society



## 26<sup>th</sup> International Symposium on Ballistics

*A Great Success!*

A very successful 26<sup>th</sup> International Symposium on Ballistics was held from September 12 -17 at the Hyatt Regency hotel in Miami, FL. The symposium was hosted jointly by the International Ballistics Society and the National



Industrial Defense Association. 525 ballisticians from 31 nations gathered at the symposium to present, review and discuss the latest developments in ballistics technology. A



total of 226 papers from different countries were presented. 60 papers were oral presentations and 166 were poster presentations. The oral presentations were organized into an agenda that included topical sessions on

exterior ballistics, interior ballistics, launch dynamics, explosive mechanics, terminal ballistics/impact physics and vulnerability. Additional presentations included a keynote presentation on forensic ballistics by the Miami-Dade Police Department, an invited technical presentation on Explosive Reactive Armor, an overview presentation on the new International Ballistics Society and a Memorial Presentation for Dr. Manfred Held. The symposium facilities included a large auditorium, an exhibit and poster area and the beautiful outside waterside area. The exhibit area included booths with representatives from 12 companies and organizations. A three level ship docked at the waterside and boarded the symposium participants for a four hour cruise of Miami harbor on the Wednesday



afternoon. On Thursday evening the waterside area was used for the symposium banquet, which included dinner and dancing on a wonderful starlight evening. In all, the symposium was both greatly technical productive and greatly enjoyed by the participants.



## Lou Zernow Receives The Ballistic Science Fellow Award

On October 25<sup>th</sup> Jack Riegel and Dennis Baum presented the Society's Ballistic Science Fellow Award to Lou Zernow at his home in California.

The President, in his letter to Lou, recognized his role as one of the founding ballisticians of the International Ballistics Symposium and his dedication to a wide range of ballistics science

Throughout his long career Lou worked hard as both a researcher and a manager to create an environment that encouraged, guided and stimulated those who worked with him and for him. He used his enthusiasm to inspire new generations of ballisticians to meet the challenges presented by the ever-changing international situation.



Although he worked in a wide range of areas of ballistics science he developed a keen interest in shaped charge design and the nature of the jet and its particulation behaviour. He spent many hours at symposia discussing details of the importance of geometry and material properties that defined the jet.

Perhaps Lou's greatest strength, however, has been his passion for promoting good in-depth science of the highest quality. This special interest led him and his wife, Edith to create the Lou and Edith Zernow Award with its focus on the improvement of the science, which has driven the search for excellence.

He is truly a Founder of the International Symposium on Ballistics and the Key Person who has consistently emphasized the pursuit and presentation of advances of science within ballistics. The ballistics community is, as a result, very much in his debt.

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## Website [www.ballistics.org](http://www.ballistics.org) Offers Awesome Online Store

On every page of the IBS web site you will see a statement at the top of the page that the society promotes the science of ballistics and provides for technical interchange. We accomplish those goals by organizing the International Symposium on Ballistics on a regular basis. By organizing the ISB, the society is carrying on a tradition started over 35 years ago – a tradition that fosters the science and interchange.

But, it isn't enough. Very few attendees at the 26<sup>th</sup> ISB in Miami attended the first ISB. I only know of one – Ake Persson. Ake had to miss one ISB, but has attended 25 of the 26. So, Ake is in a great position to have access to all of the past proceedings. But, what about the rest of us? Unless you work in an organization that has a complete set of proceedings, it is difficult to locate past papers.

The society has changed that condition by providing nearly all of the past papers through the online store on our website.

I didn't say all papers. As it turns out, there were a few papers that didn't make it to press in time. In several cases, individuals like Bill Flis and Joe Backofen have located copies of missing papers. With their contributions, we are getting closer to our goal of having every paper available.

Not only are they available, they are searchable. Most are fully searchable. For some papers the quality is such that the OCR (Optical Character Recognition) system couldn't determine what a word was and so it may have left a word or sentence as an image. But that is the exception. I believe you will be pleasantly surprised at how well the search system works.

Our membership committee has undertaken efforts to make some papers available at no additional cost as an added benefit of being an IBS member. We expect that our Symposium Committee will require more detailed abstracts be submitted in the future and that abstracts include a list of the planned references. Like the authors, reviewers will be able to use the online store to search by keywords to see if there are other papers that should be referenced. The fact that an author did not attend a meeting will no longer be an excuse not to know what was presented at the conference.

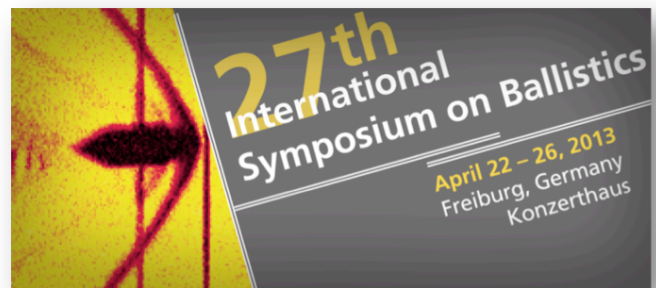
The creation of this online store, with fully searchable papers, is one of the most significant actions that the IBS has taken to date. The words at the top of each web page are nice, but the creation of the online store is one of the things that changes those words into reality. We encourage you to search the store on a regular basis. It is a simple, quick, and effective way to find out about the prior art.

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## Get Ready for ISB 27!!!

*Written by*

Matthias Wickert, Manfred Salk, Chairmen of the 27<sup>th</sup> ISB



27<sup>th</sup> International Symposium on Ballistics hosted by Fraunhofer Institute for High-Speed Dynamics, Ernst-Mach-Institut, EMI

Fraunhofer EMI will host the next symposium in Freiburg, Germany. EMI is the abbreviation for Ernst-Mach-Institut, and research at the institute is still closely related to the physicist and philosopher Ernst Mach. He lived from 1838 to 1916, and most famous is probably the term Mach number, the ratio that relates a velocity to the speed of sound.

*...27<sup>th</sup> ISB Continued*

It was Ernst Mach who first applied schlieren photography to visualize the shock wave ahead of supersonic projectiles. In his early schlieren photos recorded in Meppen, Germany, two vertical lines can be recognized. These are electrical wires, which are short-circuited by the projectile thus generating the trigger signal for the spark-gap light source recording. Fraunhofer EMI used to keep a collection of documents related to Ernst Mach like a personal letter addressed to Albert Einstein before handing those documents over to the German Museum for Science and Technology in Munich. However, the institute's research work in the present still relates to those foundations through the application and development of new techniques and methods to precisely record, analyze and model high-speed dynamic processes. For this reason, we have chosen an original schlieren photo of 1888 to serve as the motive for the design of the logo for the International Symposium on Ballistics in 2013. It will be the second symposium Fraunhofer EMI is responsible for after its engagement in the 3<sup>rd</sup> Symposium in Karlsruhe in 1977 which was the first symposium held outside the US.

Below, the key dates are given for the 27<sup>th</sup> International Symposium on Ballistics, April 22–26, 2013. Fraunhofer EMI is pleased to welcome you in Freiburg.

**27<sup>th</sup> ISB Key Dates**

*February 1, 2012 – Call for Papers Released*

*July 1, 2012 – Abstracts Due*

*July 1, 2012 – Scientific Journal Manuscripts Due*

*October 8, 2012 – Authors Notified*

*November 1, 2012 – Program Released*

*November 18, 2012 – Formal Papers Due*

*April 1, 2013 – PowerPoints Due*

*April 22, 2013 – Symposium Commences*

## Membership Continues to Grow!

**Membership numbers**

The membership of the IBS has grown steadily in its first two years of existence. The IBS is sincerely grateful to all individual and corporate members who supported it by becoming Founding Members and particularly to those who renewed. All types of individual Founding Member (i.e. Student, Ordinary and Lifetime) should have received by now a membership card and membership certificate on card in the post. If you have not received these then please contact the Membership Committee at [membership@ballistics.org](mailto:membership@ballistics.org).

At the 26<sup>th</sup> ISB, over 300 people became members of the IBS for the first time. If you are one of those then why don't you consider becoming a Lifetime Member? Upgrading your membership in 2011/2 will cost only US\$250 (if over 50) or US\$450 (if less than 50). All new members who attended the 26<sup>th</sup> ISB should have been emailed their username and password by now. If you have not received these then please contact the Membership Committee.

It is particularly encouraging that so many first year members renewed their membership of the IBS – our drop-out rate was only 55% which is good compared with similar societies. In fact that drop-out rate included a substantial number of Honorary Student members who helped at the 25<sup>th</sup> ISB in Beijing. Ignoring these numbers means the drop-out rate was only 45%.

New members are always welcome. Please encourage your friends and colleagues to join. You could also encourage your employer to join as a corporate member. The benefits available for corporate members were described in the previous newsletter.

**University Membership**

The IBS has been discussing with some universities the benefits that would attract them to become University Members of the IBS. We are pleased to announce the following benefits and criteria have been agreed by the Board of the IBS:

- University gets free membership of the IBS for 1 term (note that this is not the same as the registration fee for an International Symposium on Ballistics (ISB))
- Thereafter, IBS membership fees are waived provided at least one Professor/Doctor attends an ISB in the next term AND at least one student from that university presents a paper at that same ISB (note that an ISB will be at the start of a term) – university staff will pay the normal \$50 (or whatever it might be if reduced for students) for membership of the IBS when paying the ISB registration fee
- If a university does not fulfill the above obligations then it will cost that university \$100 to join the IBS again
- Universities will be treated as a separate membership category
- Universities must meet the following criteria:
  - Must offer degrees to the public
  - Must provide a CV to the Membership Committee giving details of their courses or research that are related to the field of ballistics
  - Must complete an application form in which they state that it is their intention to participate in the ISB
- The Membership Committee will review the application and grant it or not
- The university will nominate a lead Professor/Doctor as a Point of Contact (POC) who will be treated as an ordinary member; a second Professor/Doctor at the university may also be nominated
- The university can nominate up to 4 student delegates
- The university can choose a set of printed proceedings from either the 13<sup>th</sup> or the 20<sup>th</sup> ISB, subject to availability, first come, first served – this is a once only benefit
- A university gets a free CD/DVD/download of the proceedings from the ISB of their choice (not necessarily the last one as they might have that from attending) – this is a once only benefit
- Each university gets 3 copies of the appropriate issue of JAM for its faculty/department (subject to availability) – this is a once only benefit and would be received only if a university



## Membership (Continued)

joins in a term after the relevant ISB has taken place

- Each term, a university member can download up to 20 papers free of charge from previous ISB
- Information about the university (~250 words) on the web site and links to a university website. Opportunity to place up to a quarter-page advertisement within any newsletters that the IBS publishes at no cost. Acknowledgement of IBS membership in ISB symposium brochure and website.
- Additionally, all universities will be entitled to the following benefits on first joining:
  - An announcement will be sent to all IBS members informing them that the university has joined.
  - Sending of a newsletter, produced by the university, to all the IBS members - this letter should introduce the university to the IBS members and should cover the ballistics activities of the university.

The IBS now has its first three University Members: the first is the Pennsylvania State University, the second is the Nanjing University of Science and Technology and the third is Cranfield University at the Defence Academy, Shrivenham.

Other universities have been invited to consider becoming University Members. If you are interested then please contact the Membership Committee for further details.

### Senior & Fellow Members

Many of the IBS members are likely to be eligible for Senior and Fellow Membership. For example, anybody who has won the Young Author award might be eligible for a Senior Member. Similarly, a Zernow award winner might be eligible to become a Fellow Member.

The onus is on the individual to apply, with support from Fellow Members, as appropriate. If any member is uncertain on their eligibility then please contact the Membership Committee. We are waiting to here from you!

### IBS cotton shirts (short sleeve)

These have been very popular with the members and would make a great present. Dozens were sold at the 26<sup>th</sup> ISB.

The IBS still has several blue shirts available for US\$30 each (plus postage). Each shirt has the IBS logo embroidered on the left hand sleeve and the words "International Ballistics Society" embroidered just above the pocket (see photo). Sizes available are M, L, XL and 2XL. Some shirts are available in S size without the pocket for US\$25 (plus postage).

If you are interested in purchasing one or more then please contact the Membership Committee.

### Credits for Members

These are available only for downloads of individual papers (not complete proceedings) from previous ISB.

5 credits per term for Ordinary and Student Members

10 credits per term for Lifetime Members

5 additional credits to be used by 21 April 2013 for Founding Members

As each paper is generally in the range US\$10-15 then these free credits represent tremendous value and, if used, soon pay back the costs of term and lifetime memberships.

A term lasts from the start of one ISB to the day before the start of the next ISB. So the current term started on 12 September 2011 and ends on 21 April 2013.

## Did you know...

Punkin Chunkin, simply put is the act of launching an 8-10 lb. pumpkin as far as possible with a mechanical device and energy (other than created by explosives). That's right... ballistic pumpkins! The World Championship Punkin Chunkin Association (WCPCA) is a trademark nonprofit that raises money for scholarships, as well as organizations that benefit youth and the local



community. They host a signature pumpkin-launching event each year, fueling innovative engineering and science-based ideas that draw spectators from all over. They believe that Punkin Chunkin cultivates the odd, challenging, and competitive quest for distance that inspires creativity, ingenuity, teamwork, and passion. It is this very dedication that drives teams to compete using science and engineering skills and brings spectators to the gate which allows them to continue their never ending thirst to support their scholarship and charitable programs. The following table shows the World Records currently held by each category.



<u>Machine Type</u>	<u>Distance (ft)</u>	<u>Team Name</u>
Air	<b>4483</b>	Young Glory III, 2008
Centrifugal	<b>2737</b>	Bad to the Bone, 2006
Catapult	<b>2862</b>	Fibonacci Unlimited II, 2005
Trebuchet	<b>2034</b>	Yankee Siege, 2009
Human Power	<b>1984</b>	Pumpkin Slayer, 2009
Torsion	<b>3091</b>	Chucky II, 2008
Centrifugal HP	<b>229</b>	M2S2 Spinumpkin, 2005



Information and Photos from  
<http://www.punkinchunkin.com>

## Member Profile:

### *Interview with*

## Pieter Nel



**Q: Please describe the type of work you have done in the field of ballistics?**

**A:** I was involved in the technology work preceding the development of the combustible cartridge cases for the 155mm charge system. Being part of ARMSCOR meant that I was obliged to do more technology management as I would have like to. I attended the University of Potchesstroom for undergraduate studies and received a Phd in Chemistry from the University of Africa. My thesis work was actually in the area of radiation of gasses and I was on the Atomic Energy Board. I have worked in the area of ballistics for about 25 years.

**Q: What was the the most exciting discovery, result or invention you participated in?**

**A:** The most exciting was that we were able to develop a combustible cartridge case which worked perfectly in a weapon system (specifically the 155mm system) without help outside the RSA. I have always worked in the field of combustion and mostly focused on the 155mm system.

**Q: In your opinion, what is the greatest contribution to the field of ballistics made by South Africa?**

**A:** Again, the 155mm system, both on wheels and towed, changed the face of the war in the 1970's and 80's on the border. Also, the V-Hull protective design for anti-mine vehicles is a huge contribution worldwide.

**Q: How long have you been involved in ISB's and the IBC? What was the most fun you had at a past symposium?**

**A:** I attended the first ISB in San Francisco in 1992. And since then missed only one (China). I served first as Secretary and then as Chairperson of the IBC from 1999 to 2003. These were most enjoyable years! We hosted the ISB in 1998 which was great fun, although we did not think so at the time (because we didn't realize how much work and preparation was required)! The symposium I enjoyed the most was probably the one in Switzerland due to the beautiful country and excellent services.

**Q: What are your thoughts about the sensitivity of ballistics work in an international organization (especially considering terrorism and global defense)?**

**A:** Ballistics is a sensitive subject and should be treated as such. However, all presentations and documents are unclassified. Therefore no "secrets" will ever be revealed. People attending symposia are mostly engineers and scientists and as such are mainly interested in furthering the science of ballistics. Furthermore, care is taken not to discuss any weapons. All papers should be cleared by proper authorities before publication.

**Q: As previous Chairman of the IBC, are you surprised about the growth over the years and eventually the formation of the International Ballistics Society?**

**A:** Yes, I am surprised and I am convinced that the hard work by the Board has much to do with this. It is interesting to see the formation globally with people spread all over the world.

**Q: What would you like to see in the future regarding the Society and the Symposia?**

**A:** I think the Symposium is pretty much sorted out. I would like to see more participants attending an event. The symposium is pretty expensive – a little cheaper will be a bonus! The Society is the best thing that could have happened and I am sure it will go from strength to strength.

**Q: How do you think the Society should try to attract new members?**

**A:** The web page is valuable for attracting new members. It must be professional as it is now. The Society must also be promoted in different media, e.g. science journals, at various symposia, etc. If you can increase participation at symposia you will attract new members but that is difficult due to the cost to attend symposia including travel. Defense budget restrictions make it difficult for people to travel. Maybe a web-based online symposium might help for some that cannot afford to travel. Also, the society can be used as a tool for education (seminars) but that will take some work to start and keep it going.

**Q: What are you going to do in the future after retirement?**

**A:** I have photography as a hobby and plan to pursue it further. Then I have 7 grandsons (all nearby) and me and my wife, Janie, would like to spend more time with them. We also plan to do a little traveling, both in the RSA and abroad. Then there is always maintenance work, gardening, etc. at home which needs attention. Relaxing is the most important! It is a difficult and dramatic change. Feels like holiday.





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SECRAb Security Research works with research and technology, mostly within public safety and security, especially in connection with the EU 7th Framework Program. Some specific competences:



- Elaboration and planning of large projects, research applications. consortium forming, coordination and project management
- Scientific publications, reviews, seminars, conferences and symposia
- Analysis of safety and security problems
- Energetic materials, effects, detection and remediation of explosives, protection against effects
- Rock blasting, underwater blasting and shaped charges
- Threat, Risk and Consequence Analysis, foremost in connection with energetic materials
- Protection of critical infrastructure against physical attack, explosives, fire

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innovative and high-quality products onto the world market while meeting customers' deadlines and budgets. Descending from Giat Industries, Nexter is continuing a long tradition that could be considered to start in the XVII century, during the reign of Louis XIV in France, when the Royal Arsenal was created at the Bastille, and Colbert developed the arms manufacturing sites.

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**中国兵工学会**  
China Ordnance Society

Founded in April, 1964 and affiliated with the China Association for Science and Technology, the China Ordnance Society is an academic social group composed of science and technology workers for China Ordnance.

The purpose of the China Ordnance Society is to serve the defense construction and economic development by organizing science and technology workers and to promote and develop scientific ideas and disciplines. Its main task is to organize academic exchange, publish academic periodicals, promote the development of science and technology, propagate scientific information and popularize scientific knowledge.

The Society has general members, senior members and fellows and so on. It has all together 22562 members, among which more than 585 are senior members and 34 are fellows.

**Southwest Research Institute (SwRI)** is a nonprofit engineering R&D center. The main facility is a 1200-acre campus in San Antonio, Texas where over 3000 employees perform contract research for both government and industry. SwRI's Engineering Dynamics Department in the Mechanical Engineering Division works on armor and impact physics.

1. SwRI maintains multiple indoor and outdoor ballistic range facilities, where small and medium arms are tested against various armor configurations.
2. At a facility further out of town large explosive tests, including land mines, IEDs, and arena tests are performed to assess the survivability of vehicles and structures.
3. Low, medium, and high-strain-rate laboratory testing facilities provide the ability to characterize materials and then develop constitutive models for use in computational tools.
4. SwRI has extensive experience with the three primary software tools used for ballistics and explosive-loading: CTH, LS-DYNA, and EPIC. SwRI has modified all three for new constitutive models and boundary conditions.

Thus, SwRI's numerical work is directly applicable and available to the armor community. The armor and shielding program at SwRI has been funded over the years by the Army, Navy, Air Force, Marines, Department of Energy, NASA, and DARPA.

Please, visit  
[www.engineeringdynamics.swri.org](http://www.engineeringdynamics.swri.org)  
for more information or  
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# Fraunhofer

## EMI

The Fraunhofer Institute for High-Speed Dynamics, known under the name Ernst-Mach-Institut (EMI) is one of the 60 institutes of the German Fraunhofer society. Fraunhofer is a non profit organization which specialises in applied research and has close links to German government authorities. It is the biggest research organization in its field in Germany and one of the essential European research organizations.

**Bisalloy Steels, producer of Bisplate, is Australia's sole manufacturer of armour steel plate products for military applications.**

In addition to having produced over 3500 tonnes of steel for the Australian Bushmaster program, Bisalloy Steels also supplies huge amounts of armour plate for US Vehicle programs such as MTRV's (Medium Tactical Vehicle Replacements), MRAPs (Mine Resistant Ambush Protected vehicles) and M-ATV's (MRAP – All Terrain Vehicles)

Bisalloy Steels is honoured to be a founding member of the International Ballistics Society.

**Bisalloy Steels**

[www.bisalloy.com.au](http://www.bisalloy.com.au)

**BAL : The Department of Weapon Systems & Ballistics of the Belgian Royal Military Academy**

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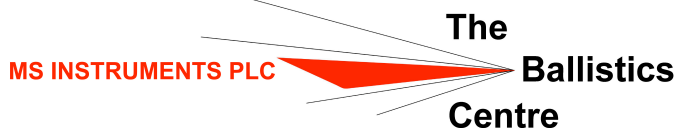
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