

Statement of Mr. Andy Goldfine
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Andy Goldfine was born in Duluth MN, where he still resides today. He founded Aero Design & Manufacturing in 1982 to pioneer textile protective riders clothing. In 2000, Mr. Goldfine organized the Ride to Work Day advocacy program, which develops the world's largest motorcycle event by number of participants. He has served on the board of directors of the American Motorcyclist Association since 2005.

In 1995, Mr. Goldfine rode his motorcycle across frozen Lake Superior, and in 1996 he motorcycled 17,000 miles from Duluth to Mongolia, crossing Siberia and retuning via China and Japan. Motorcycling has long been, and continues to be, the most important part of his professional life.

Aerostich Experiences Making and Selling Textile Motorcycle Riders Clothing

- Prepared for the NTSB Public Forum on Motorcycle Safety, October 12th, 2006
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- Attachments - Dressing Up, Cycle World Editorial by Steven L. Thompson
 - Summary of Aerostich Internal Crash Repairs, 2000-2006

We began making textile riders' clothing twenty-three years ago. At that time, except for the standards set by race-sanctioning bodies, there were no formal benchmarked standards for motorcycle riders' clothing, other than a de facto norm for leather protective suits, and added rubber or quilted-felt padding materials at the elbow, hips, and knees. So we developed our own benchmarks. We designed and built a test sled for dragging sandbags of various leathers and textiles down little-used country roads, and carefully measured back-to-back material-wear results. For other equally important areas including versatility, ergonomics, comfort, impact energy absorption, quality, and style, we used other kinds of self-developed benchmarks. We also directly gathered as many riding experiences as possible and studied as much related information as we could find. Our goal was to make sure a customer's new Aerostich suit would be

superior to whatever they had been wearing. Our mission was (and still is) to profitably provide better products to help increase the adoption of motorcycles.

Those are some of the reasons we never used the European CE standards for Personal Protective Equipment for developing and benchmarking our products, and why we have never marketed our products as meeting those standards. In 1992, when the CE standards were first adopted, we added the following still-in-use disclaimer to our catalog and marketing materials:

“Legal Notice: These garments are not considered to be personal protective equipment as defined in or within the scope of, the personal protective equipment (EC Directive) regulations 1992 (S.I.1992/3139) and no liability will be accepted arising out of these garments non-compliance with such regulations.”

I studied the CE standards at the time of their development and questioned several things. Despite their laudable purpose, it almost seemed like the standards were partly some form of non-tariff trade restraint. Inexpensive Asian sourced riders gear was flooding into Europe and appeared to be threatening many established manufacturers there. I also remember reading about someone who was writing the standards while he was also an active stakeholder in a for-profit UK company developing proprietary impact protective armor. This apparent conflict of interest was not reassuring.

Despite those concerns, the new CE standards had value. They contained useful guidelines and test methodologies which provided empirically comparative metrics. We sent Aerostich TF2 systems to the CE lab in England for testing in 2001, and at the same time, built an exact duplicate of the CE's test apparatus for ourselves. Below is a brief summary description of our impact pads and tests:

- *Aerostich TF2 pads are multilayer composites having a hard shelled central area and a softer surrounding area.*
- *Under the hard shell areas, Aerostich TF2 pads transmit a range of about 14 to 30 kN of force, and the average transmitted force is about 20 kN.*
- *In the surrounding soft areas, the range of force transmitted is between about 40 kN and 70 kN, and the average force transmitted is about 43 kN (the 70 kN number was far out of the pattern).*
- *The less force transmitted, the better. Anything under 50 kN of transmitted force passes the test*
- *The hard shelled areas of the TF2 pads cover about 80% of the area required by the CE standard. The total sizes of the TF2 pads (hard + soft) cover about 120% of the area*

required by the CE standards.

- Comparing kN force result numbers from the Aerostich TF2 pads in areas only under the hard shell, our pads do very well. Using a mean number combining the force-transmitted kN results from both the soft and hard areas, the Aerostich pads are about average.
- Impact pad kN comparisons are listed below. (A lower number is better. All pads received the same 50 joule impact force. These tests were made in 2001 with our duplicate of the CE test device.)

Pad	Average / typical force transmitted (in kN's)
Hiprotec	about 15 kN
Astrosorb 18	about 19 kN
Aerostich (hard shell areas)	about 20 kN
Memory V9	about 21 kN
Astrene 8mm	about 22 kN
Knox	about 26 kN
T Pro	about 27 kN
Aerostich (mean of all areas)	about 29 kN
Aerostich (soft areas)	about 43 kN
Rukka - air	about 45 kN

Note 1 - These are not definitive or exact numbers. They are extrapolations. For this paper I reviewed our charted results and estimated from specific measured minimums, means and maximums. There were multiple tests, with multiple pads, which produced a range of numbers. The tests showed that TF2 pads were "in the ball park" compared to the other CE approved pads. In the hard shell areas they were close to the best of all the tested pads.

Note 2 - Both pads which absorbed slightly more kN than the Aerostich TF2 (hard shell areas) have functional problems in areas unrelated to energy absorption. Hiprotec pads are made of EPS (expanded polystyrene, or 'Styrofoam') which is a single-impact-only material. They are also semi-rigid, which some riders find less comfortable. In their favor, they are very lightweight. The Astrosorb is a significantly heavier material compared to both TF2 and Hiprotec.

We were producing and selling a version of the TF2 pad ten years before the CE standards were written. TF2 pads have always combined excellent energy absorption performance, acceptably lightweight and versatile wearing comfort. Despite such synergistic qualities, TF2 pad systems have never complied with the European CE standards. This explanation is included in Aerostich catalogs, and is also available on the aerostich.com website:

"CE impact standards involve both energy absorption capability and pad shape and size. Aerostich TF2 pads do not match these European standards because of their shapes, not their energy absorption capabilities. In hard-shelled areas, TF2 armor tested significantly better than most other CE approved armor. Around the softer edges, it tests

lower. TF2 armor was tested at a CE lab in England and using a duplicate of the test apparatus here. TF2 pads were developed (years before CE standards existed) to provide effective protection when fitted into the oversuit designs of Roadcrafters and Dariens. Because of this, TF2 pads allow comfort with various combinations of street clothing better than CE shapes. Roadcrafter suits were the first riders garments to use removable armor pad systems, and the first to use an advanced energy absorbing material like TF2. When we introduced TF2 armor, all protective garments, including road racing suits, featured sewn-in paddings made from felt, foam rubber or other less effective materials.”

Benchmarking always involves making assumptions that influence the process. For example, the CE standards require impact pad shapes that are more closely fitted to the body than Aerostich TF2 pads. I believe this is because the underlying European research involved more race-type leather suits and sports/racing motorcycles than what is common here in the United States. Their standards resulted in impact-pad designs that are notably less insulation-layering-versatile and comfortably fitted, yet are not more effective at protecting riders from impacts than our larger and more loosely fitted TF2 systems.

It is unlikely that any American riders' clothing designers, manufacturers, distributors, retailers or consumers would welcome the adoption CE-type standards here in the United States. All regulations and certifications exist within larger societal environments. There are significant differences between Europe and the United States, not only in most motorcycle-culture and motorcycle-safety related areas, but also in many directly related social, legal and political areas. American approaches to increasing motorcycling safety must recognize these differences.

We can benefit from European experiences, but our solutions should be uniquely American. Regulating the exact size and shape of an elbow pad, or how it may respond to slightly more or less impact energy on a test apparatus, is not as important as knowing what effect the establishment of such regulations would have on the overall risks of riding a motorcycle in the United States.

Establishing CE style standards for riders protective clothing transfers control of these products from entrepreneurial designers, manufacturers, distributors, marketers and sellers to lawyers, consultants and certification administrators. That would seriously undermine America's unique abilities to innovate and compete. The market for personal

protective equipment is world-wide. Having a business environment here that remains free from regulatory interference is a crucial key to retaining one of America's most important competitive advantages. European CE standards should serve us well as guidelines, and allow Americans to have the best of both worlds: Useful comparative metrics for those who are interested, and the freedom to out-innovate and out-compete with ever better, and possibly non-compliant, products.

This is vital, because (with the exception of helmets) motorcycle rider's gear is an unregulated area. A significant consequence of this is that, thus far, there have been almost no liability lawsuits involving this type of protective equipment. That's the opposite of what everyone making, distributing and selling motorcycle helmets has experienced. In the US, motorcycle helmets are designed, produced and sold within a complex framework of certifications and standards. Layers of costly insurance litigation surround that structure. Because of this closely regulated and highly litigious environment, it would be impossible for anyone to pioneer, for example, a new helmet type positioned half-way between a bicycle and a motorcycle helmet, intended for use by the riders of smaller displacement scooters. And at the other extreme, there are some indications that many models of certified motorcycle helmets may actually be too stiff to provide riders with optimal levels of energy absorption for the majority of head impacts experienced in typical accidents.

More than anything else, it is the highly competitive free marketplace that exists in the United States - not in Europe or any other areas where the CE standards regulate innovation - that is responsible for the rapid advances in both motorcycle rider's gear designs and the underlying materials technology. The best gear is steadily becoming lighter, better functioning, and easier to wear. Newer items are often more visible, versatile, durable, affordable, fashionable, and protective than similar products that were only recently considered benchmarks. Such advancements would be harder to develop and would arrive more slowly if CE-type standards were to be implemented in our country.

Future advances will offer motorcyclists even greater levels of comfort, style, convenience and protection. Beyond acknowledging generally improved functionality and value, it is easy to take informal guesses about a few desirable specifics. The

abrasion-resistant and kinetic energy-absorbing properties of new materials will continue to exceed the performance levels of the materials available today. There are also some entirely new design and engineering ideas that have considerable potential. Asian-made CO₂ inflating air bag-type vests and jackets have recently become available, and a larger company in Europe has independently developed a sophisticated sodium azide (NaN₃) version of this idea. Also in development are several promising range-of-motion-limiting cervical collars. Unfortunately, these advances all will probably face increased difficulty becoming accepted within any CE regulated markets.

Further ahead may be an ultralight-wireless-proximity-controlled-rapid-inflating-semi-rigid-cervical collar that could self-deploy in a nano-second from the bottom of an otherwise-conventional helmet to encase the riders neck in a relatively stiff cone of pressurized sil-nylon. The regulatory and legal environment that surrounds helmets in this country may never permit such technology to be developed...but if it ever did become available, and if the helmet it was attached to felt and functioned like any typical better quality helmet, I'd have the first one.

After an accident many Aerostich wearing riders will excitedly remark: "This suit saved my life!" The truth is that most of the time a protective suit merely reduced injury severity. Which is wonderful in itself, but not same as truly life-saving benefits. In most accidents riders fall vertically a few feet to the ground. Unless there is an impact with another vehicle or a piece of roadside furniture, most of the post-accident kinetic energy will be dissipated by road-surface friction. Personal protective equipment usually provides less than an inch of space to mitigate all possible impacts and abrasions. Gear must be lightweight and flexible enough to be comfortable, and remain easy to wear in conditions that range from tropical heat to arctic cold. Until about twenty-five years ago there was a very loose crash injury equivalence between cars and motorcycles. During an accident a vehicle's occupants would hit the hard inside surfaces of their automobiles with forces similar to those a crashing motorcycle rider experienced. Both cars and motorcycles have since become much safer, but the playing field is no longer nearly as level. Passive safety systems in automobiles became many times more effective than the advances in personal protective equipment that are available to motorcyclists. An encapsulated driver is now far better protected from collision caused injuries than a well-

dressed motorcyclist. Adopting CE regulations on personal protective equipment would help further lock-in the imbalance.

Except for populist repeals of mandatory helmet use laws in many states, none of the reasons for the increasing motorcycle injury rates are closely related to personal protective equipment. The types of injuries most greatly reduced by wearing protective clothing are broken bones and skin abrasions. These can sometimes be quite serious, but neither are normally life-threatening. The likelihood of severe and life-threatening head injuries is usually reduced by wearing helmets, and similarly severe and life-threatening internal injuries can be reduced by wearing fairly bulky back and torso pads. Unfortunately, these articles of personal protective equipment are not highly popular.

People who choose to ride motorcycles understand (though they sometimes deny) the risks involved. Riders freely accept risk-benefit ratios based on their individual needs and circumstances. Motorcycling is partly about riders reconciling nature, culture and technology. Those who wish to wear denim and leather are going to continue to do so, and those who do not want to wear boots, impact padding, thick gloves, helmets, or other forms of personal protective equipment, won't.

Motorcycle-related injuries and deaths have increased mainly because there are now so many more motorcycles and motorcycle riders, and because the motorcycles themselves are being designed and marketed as ever-narrower forms of entertainment. As a result of being consumed largely as toys, motorcycles have become more specialized in ways that, in my opinion, have probably contributed to the increasing accident rates. Cruiser and sports styles are currently the best selling motorcycles, far outselling all other types combined. Effects unique to these two styles may be increasing the accident numbers.

Many cruiser and sport bikes feature smoothly shaped bodies or smoothly curving windshields, and this smoothness makes them harder to see. An irregular silhouette helps drivers better notice riders. In addition, both styles feature less safety-desirable rider ergonomics: The higher handlebars and foot-forward cruiser rider position makes cruiser motorcycles less nimble. And the low handlebars of sports motorcycles make them harder to control on slippery surfaces. Other possible contributors to increasing

injury rates are the humped gasoline tanks on sport bikes, which seem to increase injury severity in frontal collisions, and the hard saddle bags and trunk boxes popular on cruisers that may similarly increase injury potentials in rear-end collisions.

Possibly just as influential is that neither the cruiser or the sportbike is ideally configured for higher mileage riding. As a consequence of this and several other factors, the average distance covered by the average motorcycle has fallen to around 1500 miles per year. This means that riders can't develop the risk-management skills needed to ride in greater safety in all environments and conditions. Another effect of the lower mileages ridden is that the less a motorcycle owner rides, the less motivated he or she is to own and wear a wardrobe of specialized personal protective equipment.

Changes in the driving population, the density and mix of the surrounding vehicles, and other environmental factors also account for some of the recent increases in the motorcycle accident rates. Roads have become increasingly crowded as automobiles have been more widely adopted by a broader range of people. As a result, the makeup of the driving population may have changed slightly. Demographic and economic shifts may be causing there to be slightly higher numbers of less-capable drivers than there were twenty years ago. Cars are also changing in ways that continue to provide their occupants with safer and more isolating inside environments. Streets and highways are changing, too. There are now more miles of smoother, straighter, wider roads. All of these changes may be producing a less engaged and less attentive driving population.

Somewhat more narrowly, there are now more light trucks and SUV's in traffic. This increases the risks of riding a motorcycle because of their bulk and height. In conventional car-motorcycle collisions, a rider may bounce or arc over the car, landing on the roadway beyond, and the result is usually a non-fatal injury. However, when a motorcycle collides with a taller vehicle, the rider is less likely to be ejected to a comparatively safe landing on the far side, frequently slamming into the vehicle itself, so there is less opportunity for kinetic energy to be slowly dissipated (which is what happens when a rider tumbles along the ground). Finally, of course, the threat environment surrounding the contemporary American motorcyclist has been made worse by today's longer commute distances, which promote driver distractions such as cellular telephone use, eating, personal grooming, and other "multi-tasking" behaviors

that make it less likely that a driver will be able to see and avoid a motorcyclist, no matter what the motorcyclist is riding or wearing.

One recently encouraging safety advance is motorcycle air bag technologies. These handlebar-level systems (from Honda and Yamaha) provide both controlled rider deceleration and possibly an enhanced upward ejection vector - both very desirable in frontal impacts. I wish this technology were available as a compact tank-bag-mountable accessory. I'd have the first one available. Again, regulatory and litigation considerations in the United States can discourage such innovations.

For better or for worse, America has the world's most effective and efficient product-effectiveness feedback system already in place: Our legal profession and the attendant court system. Nothing like it exists in Europe, or anywhere else. Because this system is so awesomely strong and powerful, we must be extremely careful about how, when and where it is used. Regulating personal protective equipment in the United States would create a number of unholy alliances in this area that I believe could help to further dismantle American motorcycling.

We have repaired crash damaged Aerostich gear for more than twenty years. Because textile riders clothing is inherently lighter and more sacrificial than leathers, the availability of fast, efficient, cost-effective repair services are important. Since 2001 we've repaired over 500 crash-damaged rider's jackets, pants and suits. We've found that modern lightweight textile gear usually provides somewhat more crash and impact protection than anticipated. Our first design, the Roadcrafter, in some ways now seems 'overbuilt', especially for riders who respect speed limits. We've learned also the average speeds of the majority of motorcycles that are involved in accidents is lower than most riders and non-riders realize, so for the kinds of injury risk that personal protective equipment needs to mitigate most, less can sometimes be enough.

Noise, traffic and environmental regulations make our lives better. However, motorcyclists will continue to insist on the freedom to choose the styles of bikes they ride and the kinds of riding clothing they wear. Whenever new standards are enacted at the federal level, they create enormous backward liability-tails which encourage litigation that would not otherwise exist. These long liability-tails can have far-reaching and

unanticipated effects, among them, causing manufacturers with such liability problems simply to shut their doors rather than to fight every liability lawsuit or settle out of court, as is standard practice in many highly regulated industries today. In other words, because of the substantially different legal environments of the United States and Europe, if CE-style standards for personal protective equipment were to become a part of United States regulatory law, there is no way to be certain that the regulations would not seriously and broadly harm both riders and motorcycling in unintended ways.

Many riders choose motorcycling because it is fun, but on another level they may also be responding to the seemingly increasing compartmentalization, sterilization and capsulization of modern living. Perhaps some riders need to experience the affirmation that comes so easily and directly from riding's kinesthetic outdoor realities. For some, the helmet/no helmet choice might be more about celebrating their connections with the world - the sense that we all belong to this planet, and it to us. All motorcycles, from folk-art cruisers to the most efficient sports models, help their riders feel good. And everyone appreciates the natural experience of apprehending the universality of interdependence. Motorcycles and scooters are an extraordinary form of public automobility. Riding them embodies a kind of innate and natural parsimony which is inseparable from the human magic that connects us all.