



Mawashi Science & Technology
Corporate Resume
Projects & Accomplishments

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MAWASHI
SCIENCE & TECHNOLOGY

2014 Project P104 Biomimetic passive exoskeleton – This project aims to enhance and improve the prototype of the non-powered passive exoskeleton developed during Project P102 (which details cannot be revealed due to confidentiality reasons).

It aims to supply a prototype of a non-powered exoskeleton that redistributes the load in accordance to human biomechanics, removes added (surplus) load from weaker muscles and redirects it to the body's strongest muscle groups, thus enabling the warfighter to carry loads faster and with less apparent effort. **TRL 6**

2013 Project P103 ADA Helmet – Development of a lightweight ballistic protection helmet for Australian soldiers using (UHMWPE) Spectra composites. Mawashi was specifically trying to ensure the integrity of the helmet on impact tests remains compliant to specific standards.

TRL 3

2013-present Project P101 Raytheon ISSP – Provide design services related to the realization of this project which consists to manufacture a Modular Load Carriage Vest and develop an ensemble of Modular Load Carriage Pouches for the Battery, Radio and Display, according to the specifications provided by Raytheon Canada for the ISSP project. **TRL 7**

2013 Project P100 New military Thermoregulation system – Development of an enhanced (new generation) personal thermoregulation system for the dismounted soldier to be worn under the ballistic vest. The objective is to combine a smart air convection element with a cold or hot conduction element to enhance the body's natural thermoregulation and keep the skin dry.

TRL 4

2013 Project P99 Firefighter PCM Vest – Design and development of a Phase Change Material (PCM) Vest destined to the firefighters. The conception of this vest entails the use of high ergonomic concepts enhanced with interesting textile properties and characteristics (no melt, no drip, highly breathable, wicking, quick-dry, etc. **TRL 5**

2012 Project P98 Modular Helmet – Development of a modular helmet with a mandible and eyewear protection for special operations (specifically for SOCOM). **TRL 3-4**

2012-2014 Project P97-Toronto Police Suit – Development of a lightweight, highly mobile, highly breathable personal protective equipment for the Toronto Police Personnel. **TRL 6**

2012 Project P96 Advanced Soldier Thermoregulation System – Development of an enhanced personal thermoregulation system for the dismounted soldier to be worn under the ballistic vest, using a completely new and different approach. The objective is to combine a smart air convection element with a cold or hot conduction element to enhance the body's natural thermoregulation and keep the skin dry.

TRL 4

2012 Project P95 SAR Tech Trouser with Integrated Kneepads – During this project, Mawashi assisted the Directorate of Soldier Systems Program Management (DSSPM) of the Canadian Department of National Defense (DND) with the development of Flying Suit Trousers with an Integrated Knee Pad System, to be worn by Search and Rescue Technicians (SAR Techs). Mawashi designed the Flying Suit Trousers and Integrated Knee Pad System to be compatible with the Flying Suit shirt and Free Fall Bush Suit. The new trousers and knee pads were designed to fit the SAR Techs properly and allow them to perform at their best in all types of terrain, weather, and environmental conditions, as well as in all types of operations involving rescue helicopters and fixed-winged aircrafts on land and sea during aid to civil power involving air evacuations and response to natural disasters. All features and components of the operational equipment were fastened securely to prevent any Foreign Object Damage (FOD), during typical SAR Tech duties, including: Parachuting, Jumpmaster, dispatching equipment from fixed wing aircraft, hoisting from SAR helicopters, and loading/off-loading equipment from aircraft. Mawashi introduced an improved design with integrated, protective, and comfortable knee pads to prevent injuries when kneeling on uneven surfaces, besides patients or when operating in a confined space such as in a helicopter or while maintaining equipment in their sections.

TRL 6

2012 Project P94 Hybrid Crowd Control Protective Suit – Develop a lightweight, highly mobile, highly breathable personal protective equipment for crowd management. **TRL 6**

2011 Project P91 General Service Respirator (GSR) – During this project realized for the manufacturer AirBoss-Defense, Mawashi designed 2 new concepts for a General Service Respirator to be used by Army, Air Force and Navy personnel. The design requirements included Standard NATO Chem Bio Protection, enhanced protection against Toxic Industrial Materials (TIM), decreased breathing resistance, increased field of view and peripheral vision angles, accommodation of users wearing corrective lenses, interface of respirator with in-service communication devices, improved seal for facial beard, integration with protective clothing and in-service weapons, as well as increased hydration capacity. **TRL 5**

2011 Project P88 Advanced Soldier Exoskeleton – Project "Tergum" (in Latin, meaning "the cuticular plates covering the dorsal surface of a body segment of an arthropod"), initiated and conducted by Mawashi, strives for the utter completion of an ideal Biomimicry-enhanced Non-Powered Exoskeleton, based on a revolutionary concept entailing the creative use of an approach underlying Human Factors Engineering and Biomimicry. Unlike any other such product, it is not power driven, therefore preventing the infantryman of any minimal risk due to electronic or power unit failure. It is a state-of-the-art product which balances and redirects the load to the legs which are the most powerful muscular groups of the body, by comparison with the torso muscles. Finally, when it comes to preventing injuries, reducing load, and enhancing performance of the dismounted soldier, Mawashi's Exoskeleton is the Solution. **TRL 4**

2011 Project P87 Combat Respirator Facepiece – This project consisted to design a new concept for an Advanced CBRN Combat Respirator Facepiece for Special Forces, to set a new standard in respiratory protection. There was a critical emphasis put on the Human Factors aspect during the design stage in order to offer the best solution to users. The need for this project came from the latest hypotheses on war scenarios and asymmetric world conflicts (hot / humid / arid / temperate environments, short or long mission duration, in urban areas instead of trenches) that don't match with the existing platforms for respiratory protection on the market. Moreover, the criteria related to Human Factors (thermal comfort, low respiratory resistance, etc.) are now at the center of the requirements for these products, unlike the products developed in the past. **TRL 3**

2011 Project P86 Integrated Soldier System Project (ISSP) – The Integrated Soldier System Project (ISSP) is an initiative from the Canadian Department of National Defence (DND) to provide the soldier with an integrated suite of equipment that includes weapon accessories, electronic devices, sensors, individual equipment and operational clothing. This soldier system will significantly increase soldier performance, facilitate effective and timely interaction, enhance situational awareness and allow greater synchronization of activity. The Modular Load Carriage Solution (MLCS) is a key component of the ISSP set of deliverables, and includes a harness on which modular pouches secure the C4ISR electronics, ammunition, grenades, first aid kit, hydration system, and other accessories. The MLCS is tailored in four different configurations: Assaulter (Rifleman), Machine Gunner, Grenadier (M203 Gunner), and Commander. **TRL 7**

2011 Project P85 C-IED Protection for the Extremities – Designed a Biomimicry-Enhanced Protection for the Extremities of the dismounted soldier against Improvised Explosive Devices (IED), with a Revolutionary Wrinkle Technology. **TRL 7**

2011 Project P83 Improved Helmet Suspension System for ACH Helmet – The configuration of the US Army ACH helmet protects against various threats, including blunt-trauma. However, as of today, the highest injury statistics from all the threats to the head area are related to Traumatic Brain Injury (TBI). In order to remedy this problem, the head scientist of the US Army, Dr. Zheng, asked Mawashi to find a solution to this situation. Through this project, Mawashi designed a liner based on Biomimicry and made a prototype with a composite structure combining nano-resin and carbon fibers, which has demonstrated true potential so far in representing a solution to address that issue. Scientific literature proved that proper shapes, outlines and profiles can enhance sonic velocity. Consequently, Mawashi believes that geometry and combination of materials are the cornerstone of the concept leading to the optimal solution regarding this mandate. Mawashi went beyond the usual pads that constitute the inner liner system of most US Army Helmets (PASGT, MICH, ACH, LWT, etc.) to enhance the helmet's stability, heat management and comfort, while upholding all US Army standard requirements. **TRL 5**

2009 Project P81 Telescopic Shin and Knee Protection – Develop a high level state of the art Shin/Knee Protection. Requirements; high mitigation capability, ambidextrous, one size fits all protection (presently on the market, the standard offers 7 sizes), flexible knee covering (lobster tail effect), spacing with the wearer/protection for ventilation, changeable pad/material for the 3 pressure points area touching the leg, high level comfort when walking / bending / resting in knee position. **TRL 9**

2009 Project P80 Gas Mask Load-Carriage – Develop a for a law enforcement clients, a pouch with semi-rigid fabrics which will reduce the counter balancing movement the pouch does when in motion. To increase the user friendliness aspects when opening the flap to place or retract the gas-mask, and delivering a modern look accepted by law enforcement tactical groups. **TRL 9**

2009 Project P79 MANPAD Cueing Device (Modular Aiming Electronic Device (AED) and Computer fastened on a handheld rocket launcher) – Develop optimal industrial design enhancements for both items. Deliver human factors and ergonomics enhancements for the operation of these items. Account the critical aspects and challenges of human interactions which are present in using these devices. Note the cylinder part is discarded after every use; therefore the two devices are detached/attached after every single launch. AED: enhanced visual and functional targeting capability (wider view for incoming target, enhance targeting pointer, other error reduction “visual helpers”). Computer: visual aid for use and clear directives for repetitive assembly (color diversity within camouflage criteria's, various arrows, user friendly symbols indicating function etc.), low error attachment cable systems (lockers which permit to connect the devise in one direction only, user friendly cable orientations etc.). **TRL 7**

2009 Project P78 Human Thermoregulation Study and Market Study on Cooling and Heating Systems for the Dismounted Soldier – Mawashi was selected by Defense Research & Development Canada (DRDC) – Valcartier to evaluate and document existing off-the-shelf personal thermoregulation products to determine the best possibilities for the Canadian Forces. Since the result was not satisfying, we recommended via depictions a complete new solution for the soldier in all environments. **TRL N/A**

2009 Project P77 Tactical Knee and Elbow Protection for Dismounted Infantry – During operational & tactical manoeuvres, the soldier quickly changes position from standing, running, kneeling on one or both knees, crawling, or laying prone. His knees, elbows and shoulders are constantly hitting the ground, some rocks, walls, and other sharp edges. The current knee pads issued to the soldiers turn, twist, and fall down along the leg. These pads offer generally poor mobility & flexibility at the joints. This project consisted to develop innovative knee and elbow pads to enhance the soldier's mobility and flexibility. Through Biomimicry, a study was performed on the mechanisms behind the shell of the Lobster Tail. We scanned a lobster tail and used the exact blueprint design to provide a flexible and yet full coverage protection system. **TRL 8**

2008 Project P76 Powered Air-Purifying Respirator (PAPR) (Racal) Load Carriage System – Develop a “versatile” load carriage system that will offer ergonomic load transport, distribution, balance, and stabilization in addition to offering functionality/compatibility with required routine tasks, actions, equipment, tools, vehicles, etc.; where the load carriage system will be suitable for workers in industrial environments. **TRL 5**

2008 Project P75 Blood Pathogen Resistant Coverall - Develop a textile material that would cover the Cell-Extraction Personal Protective Equipment used by Correctional Officers against unwanted liquids seen in this environment (HIV positive blood, fesses, urines, Molotov cocktails etc...) The gear must be; tear resistant, abrasive resistant, breathable and anti-bacterial and anti-fungal for the life of the garment. **TRL 5**

2008 Project P74 Industrial Load Transfer Belt for a Remote Crane Controller – Mawashi designed an Ergonomic Belt to enhance the individual transport of a crane controller throughout an Aluminium plant. An operator uses this instrument to control the motion of molten metal transfer crucibles. Weighting about 8 lbs, the controller is positioned in front of the body and has control levers operated manually. The Load Transfer Belt designed by Mawashi is body-moulded, semi-rigid and adjustable to fit different sizes. It integrates two Aluminium Lateral Telescopic Arms which hold a support tray. The lateral arms transfer the load located in front of the Pelvis to the Central Vertical Axis of the body. The load is repositioned in a way that the skeletal system supports it more easily, which reduces tensions and muscular fatigue, increases the biomechanics effectiveness in walking, and increases the motor response effectiveness of the hand muscles at work, resulting in higher productivity and safety in this environment. **TRL 8**

2008 Project P73 Portable Commander Computer (PCC) Load Carriage – Develop a Specialized/Tailored Load Carriage System for PCC. Durable, reliable, functional, ergonomic, military appearance. Durable, reliable Design and construction. Secure, stable holding of PCC in left or right hand via Holder/Stabilizer. Secure, stable installation of PCC in Load Carriage System. Secure, stable carrying of PCC via Load Carriage System. Simple, easy ambidextrous usage of PCC and Load Carriage System. Full access to PCC buttons and features via access flaps. Simple, easy install/remove of PCC Stylus and Secondary PCC Stylus. Simple, easy flip-up/down Sun-Shade for PCC Screen. Simple, easy install/remove of PCC with respect to Load Carriage System. UK desert-camo polyester/cotton fabric with tan nylon fabric reinforcement, tan trim materials, plastic reinforcement (not visible), and foam padding. **TRL 7**

2008 Project P72 QIOPTIQ-HHD (Hand-Held Display) Load Carriage System - Develop a Load Carriage System comprised of a reinforced backing panel with a carrying pouch to position and secure the QIOPTIQ-HHD; access flap on the top front portion of the carrying pouch to allow the user to take hold of the QIOPTIQ-HHD; body side of the reinforced backing panel with a MOLLE attachment system to facilitate placing and fixing the QIOPTIQ-HHD onto a given military vest with corresponding MOLLE attachment system. **TRL 7**

2008 Project P71 Electronic Vertical Fore Grip (grip on the front of a firearm that helps control the rifle) – Develop via sketches this device. Objective to apply human factors & ergonomics capabilities and expertise into an electronic push button Vertical Fore Grip device to operate the C4I systems. Integrate the physical and psychological challenges of operating a weapon while operating an electronic device in theatre. **TRL 7**

2008 Project P70 C4ISR Electronic Packaging | Soldier Backbone Computer – This lightweight, wearable central computer connects to all other electronic devices, and offers ergonomically enhanced exterior design informed by human factors. Critical design factors include the human interactional challenges of using electronics (e.g. button function confusion), and human aspects and challenges of wearing and/or carrying electronics (e.g. discomfort due to shape of components). Increased protection of the connectors, and improved organization of the cables on the housing. Industrial Design enhancements to improve the ruggedized military look of the item, and create a family of products with similar aesthetics. **TRL 8**

2008 Project P69 Exoskeleton Biomimicry Load Distribution – Develop via sketches: a low bulk, light carbine fiber Exoskeleton mechanism that works to reduce fatigue when load is placed onto an individual that has to carry or displace heavy cargo. This device would distribute surplus load from the muscular system towards mechanicals levels and multiple small gears reducing effort (similar to the mechanism of a 10 speed bicycle). The system is powered by the human muscles, contrary to hydraulic power Exoskeleton systems seen on the market. The technology is based on mechanical levels, Biomimicry (redirection fundamental understanding) and high-end ergonomics. **TRL 3**

2008 Project P68 Industrial Load Distribution Harness for Emerson CSI Machinery Analyzer – Develop a load carriage system that will transport, support, stabilize, position, weight-distribute, and balance the Emerson CSI Machinery Vibration Analysis (instrument) carried by an individual in an industrial setting. Operators carry these heavy units (some models weight about 5 lbs) with a single strap around the neck throughout the plant to verify the status of different machines. These incorrectly balanced and undistributed loads caused severe injuries and short-term disabilities to some workers. In regard to this issue, Mawashi designed an ergonomically shaped Load Carriage Harness to distribute the load properly on the skeletal system, and a lightweight Docking Station to stabilize the load against the body. The adjustable harness is body-moulded to reduce pressure points over the shoulders and integrates two load-transfer rods on the hips to take off the load from the Stomach. **TRL 8**

2008 Project P67 C4ISR Electronic Packaging | Personal Digital Assistant – Mawashi helped defence contractors in offering not just providing very good electronics equipment but providing electronics equipment that integrates exceptionally well onto the soldier's body and works very well within the soldier's missions, operations, and actions. Mawashi delivered optimal ergonomics, human factors and industrial design enhancements for the exterior packaging of C4ISR electronics to improve Soldier Acceptance, User Friendliness, Intuitive Use, Human-Machine Interface, and Aesthetics Electronic Packaging Design for a military Personal Digital Assistant (PDA). The item includes side buttons and thumb cursor, all accessible with one hand. Mawashi improved intuitivity, ease-of-use, and motor response of the hand. Prototypes were field-tested to validate soldier acceptance. **TRL 8**

2008 Project P66 - Future Infantry Soldier Technology System (FIST) - In this project an electronic specialist manufacturer client wanted to be awarded with the new UK, FIST contact. As a result they mandated us to assist them in a new product development specific for this program. Mawashi's given directive: to achieve the next generation state of the art personnel electronic devise. We developed 3 new devices; a battery prototype, a core computer prototype and a Human Machine Interface (HMI) prototype. Our challenge was to conceive these devices that were more high-tech then in those in existence with human factors and Biomimicry as the guidelines for the design. **TRL 7**

2008 Project P65 Police Personal Data Recorder (PDR) System – In the police world more and more operation deployments are recorded. In this project we developed 3 carbine fibers PDR mock-ups for field evaluation. Their criteria: Provides Durable/Solid "Police Duty Gear" appearance, provides secure attachment for handcuffs on front side, provides secure attachment to Police belt, permits access/use for indicators, buttons, and connectors, permits simple removal of PDR pouch and replacement with handcuff pouch and handcuffs on Police belt, without dismantling or removing other Police belt items - cables concealment set (Velcro-Hook/Loop and/or webbing – black), provides low-profile durable/solid appearance, provides secure/non-impeding attachment of cables to belt, provides concealment of cables on interior side of police belt, permits easy adjustment and/or removal of cables. **TRL 7**

2007 Project P64 Future Soldier Modernization Program – A defense prime contractor specialized in C4ISR Electronics mandated Mawashi to stabilize and balance the added load in regards to their 16 existing electronic devices carried on the soldier in the aim to enhance the human factors aspect of the individual. Therefore we built pouches that do not impede on optional needs, does not flip, jerk or bounce while in motion, along with design aspects that allow the end-user faster access to the equipment and that can be operated with only one hand when accessing any button or clip. The electronic items were: 2x Batteries, GPS, Camera, Helmet-mounted Camera and Display, Dead-Reckoning Module (DRM), Hand-Held Display (HHD), NACRE Quietpro, Radio, Soldier Backbone Computer (SBC) and Target Acquisition Unit (TAU). Design and Engineering of 16 different items (modular pouches, docking stations & holsters) for Rifleman and Commander variants. Ergonomic body mapping of the electronics components to balance and stabilize the load on the skeletal system and enhance the soldier's mobility, flexibility and comfort. Human factors enhancement to improve the soldier's cognitive & motor response. Industrial Design enhancements with concept drawings, mock-up building and several prototypes iterations. **TRL 7**

2007 Project P63 Use-of-Force Training Helmet – Law Enforcement & Military professionals need to train in realistic environments that are close to the real occurrences. Hence they need equipment that has higher levels of protection compared to duty gear when performing their simulations. Presently all existing use of force and duty helmets cannot properly protect them if repeated impacts are carried out to the individuals head. Therefore, Use-of-Force Training Helmet was developed to protect users against repeated impacts and blunt-trauma, and that is several times more impact resistant than a football helmet. A rigid shell is covered by foam for an optimal protection of the defender's skull, and of the attacker's limbs. The rigid faceguard is covered by foam and wrapped in a ventilated mesh to enhance breathability. A curved visor protects the eyes and assures a good visibility, a large field of view and minimizes fogging. An adjustable retention system stabilizes the helmet during movements and impacts. The head has a high level of mobility with no restraints on lateral and front-back movements. A comfortable inner padding is interchangeable for different head sizes. **TRL 9**

2006 Project P62 – PPE Sub-Harness System - With the understanding that personal protective equipment (PPE) are made from hard and semi-hard materials when worn on the torso counters the natural balance and rhythm of the human anatomy in locomotion. Consequently we developed a Sub-Harness System that would stabilize the flopping and bouncing created from walking and/or running. Hence, increasing stability, comfort and reducing the energy consumption of the wearer in locomotion. **TRL 9**

2006 Project P61 – IED Smart System - The Canadian Department of National Defense (DND) have an increasing threats in theatre with Improvised Explosive Devices (IED). Consequently Defense Research and Development Canada (DRDC) requested solutions from industry. We responded with 4 innovative counter IED “smart systems”: a versatile ergonomic Helmet, legs, arms, and torso CIED protection. Included in all protection; passive heat evacuation systems, high adjustable assemblies minimizing sizes, pressure point reduction aspects, hard/soft reflection systems from blast. Increased ease of motion/range of motion, increased agility, user friendly enhancement, high-tech military look, gravity/balance weight management, stability mechanisms for the added gear, and telescopic one size fits all systems helping the logistic aspects, etc. **TRL 3**

2006 Project P60 - The project consists to integrate NIJ level III ballistic plate protection on the exterior of our existing crown management L2 model Personal Protection Equipment. The client has high risk rifle threats within their crowd control situations. We developed a solution in harmonizing the supplementary protection as on product and minimize the restriction of ease of motion and range of motion. **TRL 9**

2006 Project P59 - Biomimicry project, to develop a revolutionary weight redirection load carriage system for the Military in theater. Based on the observations of the human anatomy weight gain, with the understanding of where individuals place gain body fat on the human anatomy (in the study severe over weight individuals of 900-1200 lbs were observed and other biped animals as well). “Nature” places gain body fat in strategic areas, mainly to allow our species as “bipeds” to minimize energy in locomotion. (Note supplementary body fat does not dominantly position itself on the back segment of human anatomy because of our biomechanical structure, yet solders place most of their carried load in that area?). It is understood that it is impossible for a soldier to place his backpack in other areas for normal operational function. Therefore we developed a redirection mechanism that allows the backpack to stay on the back area however redirect the 60-80 pounds load that the solders carries to the correct placement for improved locomotion. **TRL 5**

2006 Project P58 - Develop the ergonomics of the “next generation bomb suit”, using material furnished by the client. With our human factors and ergonomics experience structure, increase the PPE to more comfortable levels, and increase the ease of motion, range of motion, compared to already existing products for Military applications. **TRL 2**

2006 Project P57 - Develop a mechanism that will reduce Behind the Helmet Blunt Trauma (BHBT), to be inserted in a Military helmet to reduce BHBT by 50-90% from projectiles and/or to reduce blunt impact trauma from objects thrown or personnel being thrown, for Military applications. **TRL 4**

2006 Project P56 - How to develop a high-tech modularized body envelope armour system with optimized Ergonomics and Biomimicry; the result is envisioned as the most advanced hybrid gear technology in the Military world for personal protection. The protection coverage for the exposed human anatomy will be established in accordance with current and future threats for Military applications. **TRL 3**

2006 Project P55 - Develop a hybrid elbow protection system – with blunt impact, ballistic trauma, and blast wave protection for the elbow in a lightweight flexible design for Military applications. **TRL 3**

2006 Project P54 - Develop a hybrid knee protection system – with protection for blunt impact, ballistic trauma, and blast wave for the knee in a lightweight flexible design for Military applications. **TRL 5**

2006 Project P53 - Develop a hybrid shoulder protection system – with supplementary mobile structures that provide protection for blunt impact, ballistic trauma, and blast wave for the shoulder region in a lightweight flexible design for Military applications. **TRL 4**

2006 Project P52 - Develop a multi-threat plate concept (NIJ ballistic level IV) with a hybrid ceramic structured in accordance with our Biomimicry knowledge, as well as being shaped for proper human anatomical considerations for Military applications. **TRL 4**

2006 Project P51 - Develop or enhance the ballistic and fragmentation protection aspects of the standard military helmet as well as increase blast-wave redirection/protection, while maintaining weight and thickness maximum ranges for Military applications. **TRL 3**

2006 Project P50 - Develop a complete new blast/ballistic protection vest that would replace the fragmentation vest presently in service – this semi soft-hard vest has thermoregulation system in place, combine with overall protection (anti-stab, anti-blast, anti-ballistic level 3A & level 3, anti-trauma, anti-riot compliant CSA Z617. It will be designed based upon human anatomy, advanced ergonomics and advanced mobility protocols for Military applications. **TRL 3**

2006-2009 Project P46 Blunt-Trauma Protective Suit – Development of a Personal Protective Equipment (PPE) against Blunt-Trauma for Crowd Management and Corrections. This Suit includes a Load Stabilization Harness, a set of Stab and Slash Resistant Composite Armor Plates, and a Passive Cooling System. This equipment is a marvel of ergonomics resulting in outstanding flexibility, mobility and range of motion, while offering superior protection and being compliant with the CAN/CSA Z617-06 standard. **TRL 9**

2006 Project P45 - Develop advanced composite (carbon fibers) material against blast from IED or other explosive devices for Military applications. **TRL 5**

2006 Project P44 - Develop an anti-trauma upper torso protection vest for rodeo mounted participants (protection level 400 Joules) for equestrian & Rodeo sports. **TRL 5**

2006 Project P43 - Enhance ergonomics, reduce bulkiness; for the client on a revised anti-trauma PPE training gear for Law Enforcement. **TRL 7**

2005-2006 Project P42 - Develop blunt-trauma knee protection with advanced mobility capability, heat evacuation systems, and camouflage technology for dismounted foot soldiers for Military. **TRL 7**

2006 Project P41 Drop-Impact Durability "Add-On" for Ceramic Plates – Develop an add-on protection cover, over Ceramic high velocity rifle plates Level 3 and 4, protection against “when dropped or struck” for Military. Drop-Impact Resistance & Crack/Fracture Resistance. Add-On/Upgrade Cover Configuration. Compatible with NIJ III, NIJ IV, and SAPI Ceramic Plates. **TRL 7**

2005-2006 Project P40 - Develop Ballistic knee protection level 2A for dismounted foot soldiers for Military. **TRL 7**

2005-2006 Project P39 - Develop Up-Armour (add-on armor to protect from blasts) against IED and ballistic level 3 protection for HUMVEE, HEMTT, PLS, FMTV, and HET (“low levels of protection” vehicles) for Military. **TRL 5**

2005-2006 Project P38 - Enhanced fragmentation protection materials – objective to build various hybrid plates with Biomimetics technology vs. regular fragmentation protection materials – validation with V50 Testing was performed, for Law Enforcement - Military. **TRL 5**

2005-2006 Project P37 - Detailed investigation on various composite material, to elaborate the ideal structure and hybrid layering material composition against impact for various applications. **TRL 9**

2005-2006 Project P36 - Detailed investigation on how to enhance the modernization of the Future Soldier for Military. **TRL N/A**

2005-2006 Project P35 - Develop a soft-insert device to be placed behind soft body armor (level 3A) to reduce the “behind the armour blunt trauma” for Law Enforcement and Military. **TRL 4**

2005-2007 Project P34 - Develop new concept soft body armour - the final product is ballistic protection that will be between NIJ level 3A & level 3, while we anticipate it being 10% lighter compared to standard Aramid soft body armour, additionally we anticipate a reduction of 80% of the “back face signature” for Law Enforcement – Military. **TRL 4**

2005-2006 Project P33 - Develop a comfortable, thin, extremely light weight, “hard body” plate that can be inserted behind soft body armor that will reduce “behind the armour blunt trauma” and protect anti-stab level NIJ 2 for Law Enforcement – Military. **TRL 4**

2005-2006 Project P32 - Develop an anti-trauma light weight headgear to be integrated to P25 PPE for Law Enforcement – Military. **TRL 7**

2004-2005 Project P31 - Enhance the Martial art chest guard to maintain the level of protection at 300 joules, while reducing weight of the unit by 20-40 %, for Martial arts. **TRL 9**

2004-2005 Project P28 - Develop a neck - throat anti-stab, anti-slash and anti-trauma protection unit for correctional officers for Law Enforcement – Military. **TRL 9**

2003-2006 Project P25 Full-Body Use-of-Force Training Suit

This gear includes 2 passive cooling systems, advanced exoskeleton design that encompasses a balance of protection and mobility - advanced ergonomics aligned with human factors integration (called Tegman “Real Ergonomic Design”- RED) for Law Enforcement & Military.

P46 Multi-Threat Protection PPE: The most advanced anti-trauma/anti-stab PPE in its class. Includes cooling, load equilibrium, and stabilization technology. It offers the best elements required in a PPE on the market; surpassing most competitors in terms of mobility, protection and coverage. It is a marvel of ergonomics resulting in the ideal ‘fit’ between the human anatomy and ideal protection. It is compliant with the CAN/CSA Z 617/6 standard - concept for Correctional and Law enforcement personnel. **TRL 9**

2003-2006 Project P25 - Develop a “use of force” full body PPE - including 2 passive cooling systems, advanced exoskeleton design that encompasses a balance of protection and mobility - advanced ergonomics aligned with human factors integration (called Tegman “Real Ergonomic Design”- RED) for Law Enforcement - Military **TRL 9**

2003-2004 Project P24 - Develop an automatic impact drop tower for validation of experimentation. **TRL 9**

2003-2005 Project P23 - Develop Anti-trauma/fire resistance gloves, protection level of 65 joules of impact for Law Enforcement - Military (April 2003 ~ October 2003) **TRL 9**

2003-2005 Project P22 Back Face Signature Reduction "Insert-Plate" for Individual Protection – Develop a thin mechanism that can be inserted behind hard body armor level 3 or 4, that will significantly reduce the back face signature for Law Enforcement – Military: Average 80% Reduction in Back Face Signature; Ultra-Thin Insert-Plate for Existing Plates/Vests; Compatible with NIJ III, NIJ IV, and SAPI Plates. **TRL 7**

2003-2007 Project P21 Active Microclimate Cooling System – Develop a mechanical cooling person system tailored to be inserted behind firemen protective equipment or other tactical PPE – promotes cooling, keeps the user dry and comfortable equally in hot dry, humid and arctic conditions - with 8-16 hrs cooling capability for Law Enforcement - Military (**Patent pending**) **TRL 8**

2003-2004 Project P20 - Develop an anti-trauma shin protection telescoping device; to reduce 7 traditional sizes to “one size fits all” for Law Enforcement – Military. **TRL 8**

2003-2004 Project P19 - Develop a new “all in one” composite production process- includes female/ male vacuum high temperature molds, reducing 10 processes into one for production optimization. **TRL 9**

MAWASHI EQUIPMENT FOR MARTIAL ARTS INC.

Most projects include a Biomimicry approach integrated with Human Factors & Advanced Ergonomics.

2000-2001 Project P18 - Develop an anti-trauma PPE for Marine Law Enforcement agencies with an adequate level of buoyancy in case they fall overboard into the water (Client: Canadian Federal Department of Fisheries and Ocean) for Law Enforcement – Military. **TRL 8**

2000-2001 Project P17 - Developed various impact testing equipment, 1- drop tower up to 400 joules, 1- pendulum device, and various accessories for experimentation and validation for Production optimization. **TRL 9**

1999-2001 Project P16 - Ergonomic development – to improve better fit and comfort on PPE, we developed production molds cast directly on living human bodies (utilizing secure, ethical protocols) resulting in realistic ergonomic fitting. Phase two, adjust the overall shapes to fit more sizing – 10 regions from the body were produced for Production optimization. **TRL 9**

2000-2001 Project P15 - Develop a personal cooling system with mesh-textile & foam to add circulation and evacuation of the heat and sweat produced by the human body; worn under tactical protection clothing for Law Enforcement – Military. **TRL 9**

2000-2001 Project P14 - Develop a shin & forearm martial arts protection padding, shielding up to 75 joules of impact for Martial arts. **TRL 9**

2000-2001 Project P13 - Develop a riot-gear helmet with gas-mask integrated (Law Enforcement/Military). **TRL 3**

2000-2001 Project P12 - Develop a discrete anti-trauma duty hat for Canadian regular Patrol Officers (equivalent to the British MET police “Bobbies”) for Law Enforcement – Military. **TRL 7**

2000-2001 Project P10 - Develop a compression air pressure glue injection system for rapid production for Production optimization. **TRL 9**

1999-2000 Project P9 - Develop our own convection oven for rapid thermoforming for Production optimization. **TRL 9**

1999-2000 Project P8 - Develop our own thermoforming prototype and/or production devise (no specific device for our needs available on the market) for rapid production capability for Production optimization. **TRL 9**

1999-2000 Project P7 - Develop an absorption carrying case for defibrillator devices - "criteria" to be dropped from a height of 6 feet without damage to the device (Medical). **TRL 6**

1999-2000 Project P6 - Develop a light weight device that helps athletes to exercise the muscular systems while travelling or at the gym (called Power kick/ Punch apparatus). **TRL 9**

1999-2000 Project P5 - Develop a back torso protection pad anatomically suited to the ergonomics of the back torso and spine (200 joules of impact). **TRL 9**

1999-2000 Project P4 - Develop a unisex martial arts chest guard with new impact management technology (sophisticated air chambers that would transfer on impact air/impact from one chamber to another) that will keep from harm's way the user when struck to levels up to 250 joules of impact; (called TK-Air). **TRL 9**

1998-2000 Project P3 - Develop an anti-ballistic (NIJ level 3A), anti-stab (NIJ level 2) and anti-trauma protection PPE all in one covering the torso area (product line called – "Pro Max") for Law Enforcement – Military. **TRL 9**

1999-2003 Project P2 - Develop a product line of Anti-Trauma Personal Protective Equipment (called Tegman); approximately 20 models for different clients were developed - clients such as New Zealand federal Police, RCMP, various Correctional agencies, Toronto Met. Police and London Met. Police, etc., Law Enforcement – Military. **TRL 9**

1998-2001 Project P1 - In collaboration with the National Research Council Canada (NRC), develop a unisex headgear that will allow full blows to the head (300 joules of impact) while allowing mobility, acceptable or superior visual range, and remaining at an acceptable weight (Martial arts). **TRL 9**

1997-2000 Project P0 - In collaboration with the National Research Council Canada (NRC), develop a unisex martial arts chest guard that will keep from harm's way the user when struck to levels up to 300 joules of impact (Martial arts). **TRL 9**