

ROADRUNNERFOOT ENGINEERING



ROADRUNNERFOOT
ENGINEERING S.R.L.



Team leader: Daniele Bonacini

Amputee Below knee, 1993

Mechanical Engineer. 2001. Phd: Project management and development of a prosthetic running foot. Politecnico di Milano.

Athlete. In 1998 he begins athletic career: he won 10 Italian Championship about 100m, 200m and Long jump, 4^o for 200m and long jump in European Championship 2003, 8^o for 100m and 200m at World Championship 2002 and 6^o for long jump at **Athens Paralympic Games 2004**

Founder and CEO of Roadrunnerfoot Engineering srl, 2007, spin off from Politecnico Innovazione. Roadrunnerfoot is a company producing prosthetic components and devices for persons with disabilities



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Awards for the mission and the activities of Bonacini



Federsalute 2009



Piazza dei mercanti 2009



Quirinale 2012: onorificenza di Commendatore



Mission and core business

Roadrunnerfoot Mission is: *TECHNOLOGY ACCESSIBLE TO ALL USERS*

Roadrunnerfoot's aim is to reach a ratio quality/prices superior to competitors cause of innovative engineering process and ethical code. Products have a high quality level, with high quality components, tested during the production process and certified by CE 93/42 and ISO 10328. Products and production are MADE IN ITALY patented in Europe and US.



Roadrunnerfoot is the first and only one Italian Company patenting, designing, producing and selling disabled devices and prosthetic components.

Roadrunnerfoot is nowadays the leader in research, development and production of devices for disabled people thanks to the unique operational process: each product is realized thinking the user's needs and has the goal to reduce the gap with sound limb. This modus operandi requires innovation and high cost technologies, like optoelectronic systems.

The core business of Roadrunnerfoot is the carbon fiber and material composites aids for disabled people or traumatic patients : starting from the high release energy prosthetic feet, from the Ice sledge hockey and track wheelchair until the hinge and components of orthosis. The three big fields of disabled people aids are prosthesis, orthosis and wheelchair.



Distribution products sales network

Year 2014:

Roadrunnerfoot supplies only 30 orthopaedic workshops in Italy (5% of budget incoming) and help these to develop and research new materials and devices

In Europe: Belgium, Hungary, Rumania, Switzerland, Slovakia, Estonia, Russia, Germany, Spain, Danemark, Finland, Norway, Sweden, Holland

In Asia: Saudi Arabia, Lebanon, Qatar, Bahrein, Egypt, Syria, Kuwait, Oman, Iraq

In Africa: Kenya, Tanzania, Lybia, Ethiopia, South Africa

In America: USA, Mexico, Perù, Costarica, Cile



Orthopedic prosthesis' structure

SOCKET prosthesis custom fit component, custom-made on user's stump and produced with carbon fiber braided sleeves and lamination resin.

LINER soft and elastic material, protect stump to impact, usually made by poliurethane, silicon, styrene and thermoplastic gel.

PYLON AND MODULAR ADAPTER joints and transmits weight and loads between socket and foot. Titanium or carbon fiber

FOOT is the prosthesis active component, stores and releases energy and guarantee a comfort during the walking. Laminated with Carbon fiber.

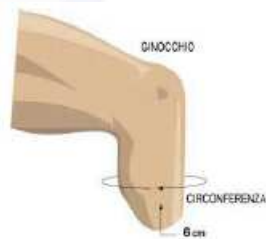
COVER, foam esthetic cover in silicon, poliurethane or pvc

MECHANICAL OR ELECTRONIC KNEES for above knee amputee



Transtibial Prosthesis

Above knee amputee
Prosthesis



Transtibial Stump



Silicon Liner



Cover



Pylon's structure



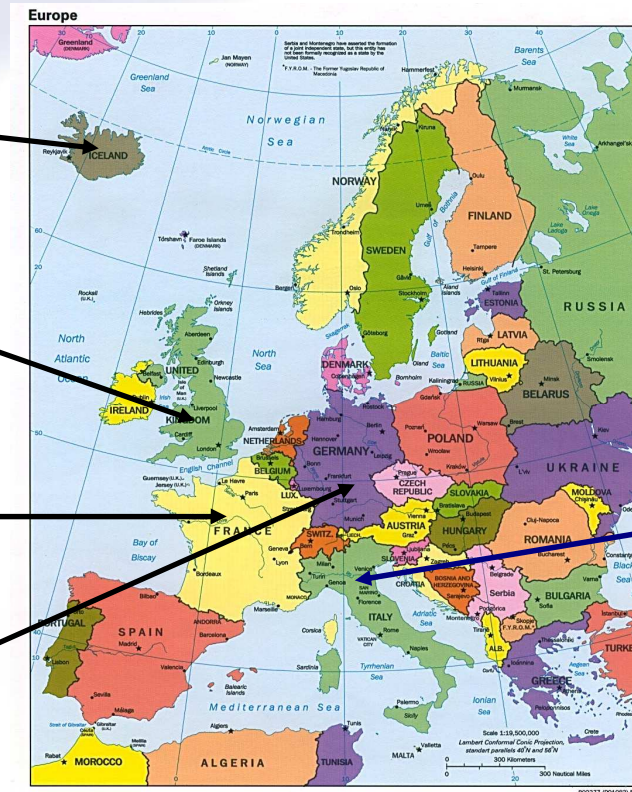
Competitors: prosthetic components manufacturers

Islanda Ossur ex
Flex Foot

Inghilterra
Blatchford-
Endolite,
Ortho Europe

Francia:
Proteor

Germania:
Otto Bock, Medi,
Streifeneder



EUROPA: Each European country has a national producer with great advantage for users, while each Health Systems provides for devices. The amputee people in Italy are 250.000 and there is about 10.000 new amputees per year.

Until 2007 there was not a company that design and produce the carbon fiber feet, but only orthopaedic laboratory that use components and feet imported (Prosthetic center INAIL and Rizzoli)

From March 2007 come..Roadrunnerfoot

In U.S. – place where the first fiber carbon foot was made – are the main players as Ohio Willow, College Park, Freedom Innovation, Ossur (ex Flex Foot). In U.S. there are 2.500.00 amputees and 100.000 every year. **There are 8 manufacturers of carbon fiber feet with high quality in all the world (4 in USA, Otto Bock in Germany, Endolite in UK, Roadrunnerfoot in Italy, Proteor in France)**



Roadrunnerfoot products 2014



SPRINTER'S KING
running foot **patented**



ROADWALKING walking
foot **Patented**



ROADFLEXION walking
foot **patented**



WALKING MP walking foot
patented



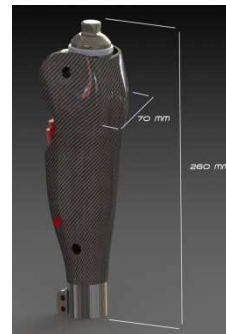
COVER IN EVA



Strutture tubolari



Knee joints



liners



covers



Modular components



Ice sledge hockey



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Sprinter's King: the running foot

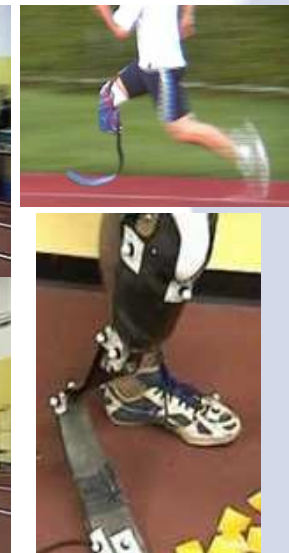
It's the best for agonistic athletes because it has the highest performance. It's good also for beginners or for people jogging because it allows them to run with the lowest effort, maximizing push, not overloading on the hip. The aims we reached patenting this foot:

- Elimination of the negative weight component, in advance direction (F_x)
- Reach the highest performance, the nearest to a healthy limb: gastrocnemio-soleo muscle and Achille's tendon give the 90% of elasticity
- Obtain Propulsive Force after mid stance allowing the user to maximize elasticity
- Giving an advancing propulsive force greater than the vertical one.

To reach these aims, Roadrunnerfoot start from analysis of walking and running of athletes disabled and not, defining in this way limits of foot on market, features needs and all strategies to fit real users' needs.



CE



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ETHIOPIA



TAI'ZANIA



KENYA



NAPLES

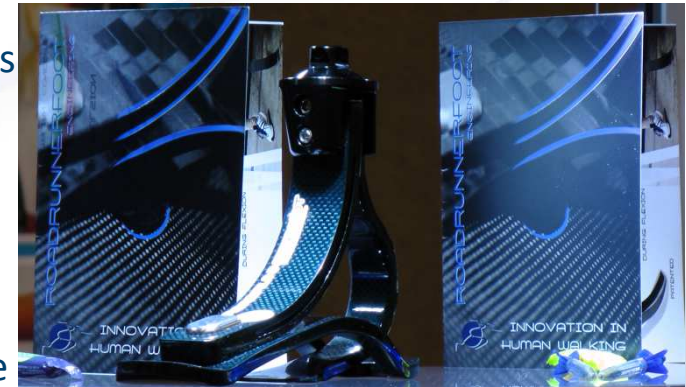


ETHIOPIA



Roadwalking: walking foot High Performance

Roadwalking foot is an highly dynamic foot for young and very active people, with a mobility **level 3-4 (K-level)**. The 3 laminates structure allow a foot's response during all stance phase: in every moment at least 2 laminates work together to support the amputee user in his/her daily activities. One inferior laminate, which define the calcaneus and the forefoot; one posterior laminate, which define the heel and functions like soleus-Achilles' tendon apparatus; one superior laminates, which define the instep and functions like anterior tibialis muscle.



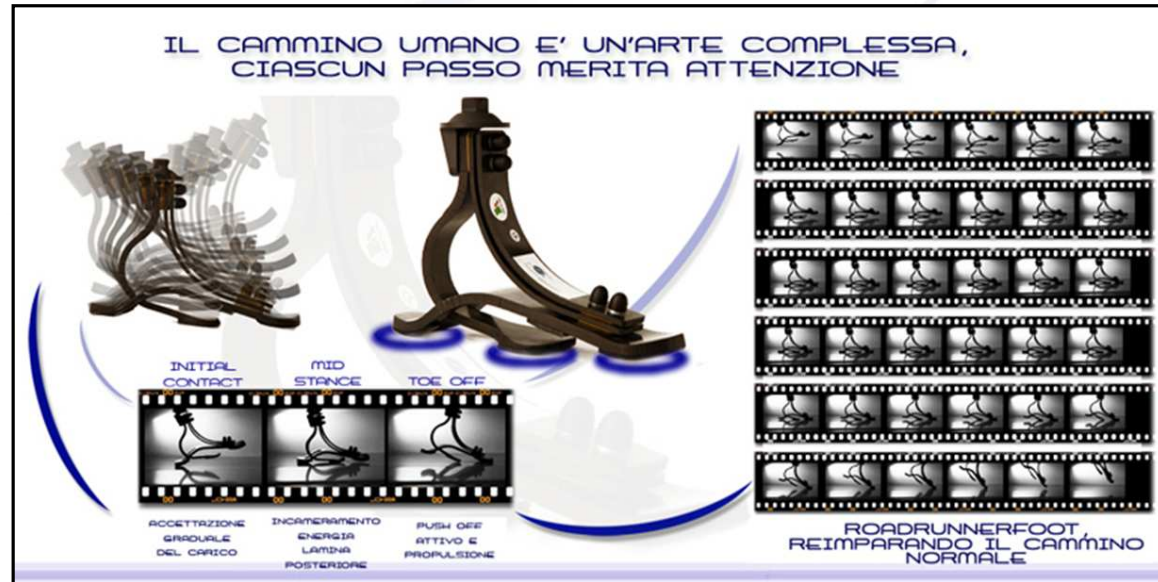
The inferior laminate starts its work during Initial Contact: the durability and elasticity must allow load acceptance and storage with a shock absorption function to guarantee comfort to the user, but at the same time stability. Its functions stops during the final phase of Toe-off, when the forefoot gives the final propulsion. The posterior laminate functions like Achilles tendon and soleus , which work in eccentric contraction during second rolling, to steady the foot on the sagittal plane; when the foot reach the contact with the ground, during mid-stance, the posterior laminate starts loading and it release propulsion, allow the transition from Mid-stance to final stance phase. The superior laminates function like the anterior tibialis muscle permitting a gradual foot roll-over until forefoot contact to the ground managing the transit from Initial Contact to the Mid-stance phase. Through their loading, they guarantee dorsiflexion during Mid-Stance phase and plantar-flexion during final propulsive phase . Tested with ISO 10328 standard. Roadwalking foot is CE marked.



Roadwalking : walking foot High performance

The only one foot in the world with 3 contact-points on the ground!

BIG INNOVATION ON THE PROSTHETIC FIELD that allows a complete assistance during the stance phase on the ground and the continuum roll over between heel and forefoot



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Roadflexion: walking foot High Performance

Roadflexion walking foot is an highly dynamic foot for young and very active people, with a mobility **level 3** (K-level). This is a new development of Roadwalking. The 3 laminates structure allows a foot's response during all stance phases: in every moment at least 2 laminates work together to support the amputee user in his/her daily activities. This prosthetic foot is composed by 3 main laminates: the inferior laminate defines the calcaneus and the forefoot; the posterior laminate defines the heel and has the function of cushioning; the superior laminates defines the instep and functions like anterior tibialis muscle.

A pyramid adapter closer to the ankle helps the pylon attachment. The inferior and posterior laminates start to work during Initial . Contact: the durability and elasticity must allow load acceptance and storage with a shock absorption function to guarantee comfort to the user, but at the same the balance and stability. Its functions stops during the final phase of Toe-off, when the forefoot gives the final propulsion. The posterior laminate works as shock absorber during initial contact and store energy that the laminate release after mid-stance phase until toe-off during the propulsion phase; the superior laminates works like the anterior tibialis muscle permitting a gradual foot roll-over until forefoot contact to the ground; This foot is tested according to ISO 10328 standard. Roadflexion foot is CE marked.



Walking foot Media Performance: WALKING MP

Key Level 2

The main characteristic of the Walking foot MP is the simple morphology that includes two carbon fiber laminates; the Walking foot MP is perfectly suitable to the patients that need a medium but dynamic mobility. The morphology and the connection between the laminates gives the following functional advantages: Load acceptance with higher cushioning during initial contact with gradual rollover between the heel and forefoot, because of the superior laminate working as anterior tibialis muscle; an effective dorsiflexion and high balance during mid-stance; plantar flexion and propulsion between mid-stance and push off phase guaranteed by superior and inferior laminates.

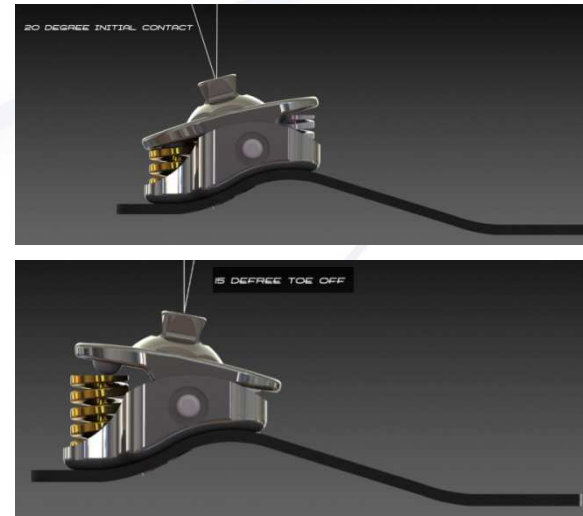


CE



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Roadrunnerfoot products development 2014: prosthesis



Research and Development 2014

- The new walking-running foot: maximum performance in two different activity
- New type of swimming prosthesis:
(high aestetical definition and high resistance mechanical)

The next steps.....the future (2015-2016)



Roadrunnerfoot products development 2014: wheelchair



Research and Development 2014

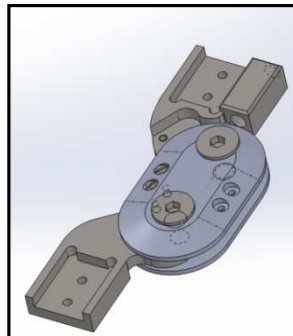
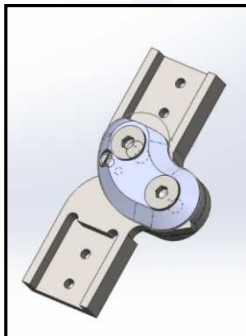
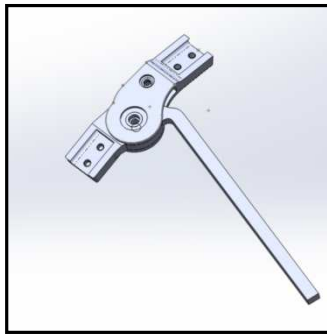


The next steps.....the future (2015-2016)

Project of sustainable mobility: EXPO 2015



Roadrunnerfoot products development 2014: orthosis



Research and Development 2014



Roadrunnerfoot testing machine



Roadrunnerfoot is the only one company in the world that realize the test of products for CE marked out of the company (By University of Milan-Politecnico). Since this year Roadrunnerfoot realize a second test machine for the mechanical reliability control of production

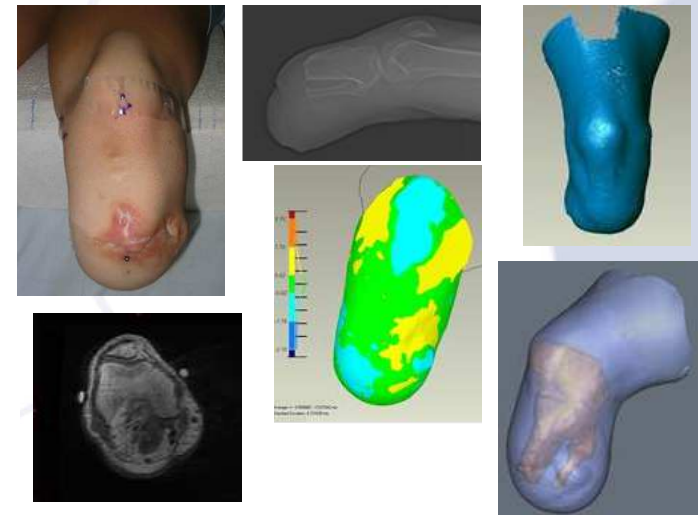
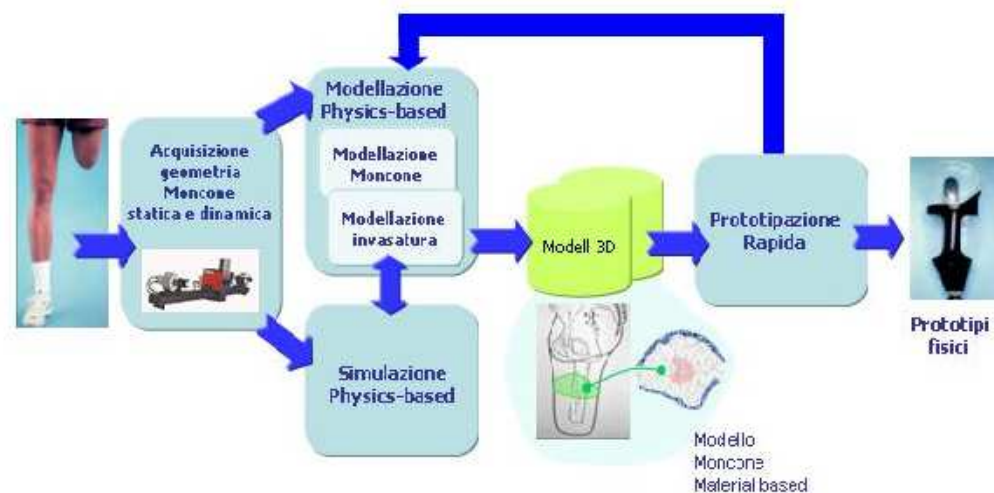


RESEARCH activity : PRIN2006 – during PhD Bonacini by Politecnico

Four divisions from University of Bergamo, Firenze, di Udine and Politecnico di Milano engaged in a research project with the following aims:

- Definition of a new development paradigm for custom-fit products based on new methodology and technology
- Creation of a place to design custom-fit products (it don't exist now) with:


- * reverse engineering instruments for automatic or mid-automatic acquisition of users's morphology – in our case, the stumps – in static and dynamic conditions
- * a place for modeling physics-based custom-fit products allowing the products' descriptions as composite materials (behind limits of existing systems about only rigid objects of a omogeneous material).
- * a place for physics-based simulations to analyze interaction between stump and potting and verify functionalities
- * instruments for creating speed pottings allowing validation of the virtual product and modifications



RESEARCH: CUSTOM FIT (VI FPQ) – during Phd Bonacini by Politecnico


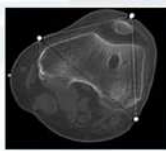
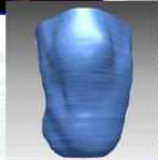
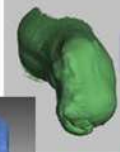

Custom-Fit Project: a new approach to produce custom fit objects allowing to reduce productive times and to improve life quality. Applications will be for orthotics, dental prosthesis, helmets and handgrip. Politecnico di Milano is partner for orthopedics aids.


Custom-Fit




CASE Studies for prosthesis field

- Different technologies for stump imaging and data acquisition:
 - non contact laser technology for external geometry
 - CT for bones geometrical model
 - MRI for 3D reconstruction of internal structure and specially of soft tissue and muscles
 - Motion Capture (Vicon) for the acquisition of the different deformation on stumps during the walk. This should allow to identify interactions areas between socket and stump.





Politecnico di Milano - Facoltà di Ingegneria Meccanica
Ing. Bonacini PhD

23 November 2005 



Approaching disability worldwide

At least **650 million people with disabilities worldwide** nowadays. Wars, conflicts and poverty increase higher rates of disabilities in the less developed world. Many are invisible citizens, forced to deal with discrimination, social exclusion, isolation and poverty.

In developing countries the main cause of the 90% of prosthesis users is amputation due to landmine explosions: according to the International Red Cross, landmine victims come from military actions (13%), playing (8%), fieldwork (20%), travelling (15%), demining (4%), non- military actions (38%) and others (2%).

International organizations report about 1.500.000 victims. According to the International Campaign to Ban Landmine(ICBL), more than 80% out of 15.000/20.000 victims/year are civilians; 1 out of 5 is a child.

The most affected countries are: Cambodia, Afghanistan, Angola, Mozambique, ex- Jugoslavia, Somalia, El Salvador, Kurdistan, Kuwait, mostly located in Africa and Middle-East countries.

The Landmine issue is strictly connected to child fighting in wars. More than 300.000 under 18 are recruited as warchildren; hundreds of thousands fought during the last decade, some of them in government army, some others in the opposition ones. Most of them are between 15 and 18 years old, with an increasing tendency to recruit younger children. 5% of landmine victims are warchildren.

Only 5–15% of people of these countries who require assistive devices and technologies have access to them: production is low and often of limited quality, there are very few trained personnel and costs may be prohibitive (sources: WHO)

Our answer: the objective of prosthetics is to restore, as close as possible, the functional capacity formerly held by a limb deficient person, in the west as in developing countries. High health technological devices can be accessible for all. This means: for companies, innovations to bring down prices always more and more without losing the best results, implementing corporate social responsibility projects to donate prosthesis to people who can't afford it; for states and all other entities promoting persons with disabilities rights, provide access to devices for all.



Projects No profit and cooperation and development

Roadrunnerfoot is a young company but has already begin to work with Institutions, Foundations, Associations and NGOs, from small projects to greater and greater.

- **2009 Milan: Above knee amputee prosthesis for a focomelic.** Partner: Croce Rossa – Disabili No Limits.
- **2010 HAITI, I^a mission: 300 prosthesis for children, equipment for an assembly plant, raw materials .** Partner: Fondazione Francesca Rava
- **2010 Milan: 20 feet donated from Municipality of Milan, without funds.** Partner: Comune di Milano –Disabili No Limits.
- **2011 June, Iraq** – 77 kit prosthesis for Emergency
- **2011 June, Syria:** 12 feet for Iraq regugees by Terre Des Hommes, Prosolidar, UNHCR.
- **2011-2012 HAITI: II mission taking 700 prosthesis to Haiti children by Lions, A Leg to Stand On, World Rehabilitation Fund, Prosthetika**
- **2012 ICRC** Ethiopia materials lamination
- **2012 CUAMM** Walking prosthesis and running prosthesis for 4 african people
- **2012 PROSOLIDAR** Walking prosthesis and running prosthesis for 10 people
- **2012 Italian Foreign affairs ministry** Project in Benghazi-Libia for 100 amputee



HAITI 2010: workshop, prosthesis and volunteering



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RELIEF HAITI

Prosthetic Program for amputee children.

A project of

*Fondazione Francesca Rava - N.P.H Italia Onlus
for haitian children injured by earthquake.*

*Location: N.P.H. Rehabilitation Centre
"House of Little angels",
Port au Prince*



The Prosthesis

1 week

*1 orthopaedic laboratory,
3 orthopaedic technicians,
130 prosthesis sended.*



Today

*240 prosthesis sended
(190 Foundation RAVA, 50 Disabili No Limits),
150 children now walking.
12 missions of orthopaedics technician
and physioterapists,*

WE MADE IT



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Haiti 2011-2012-2013

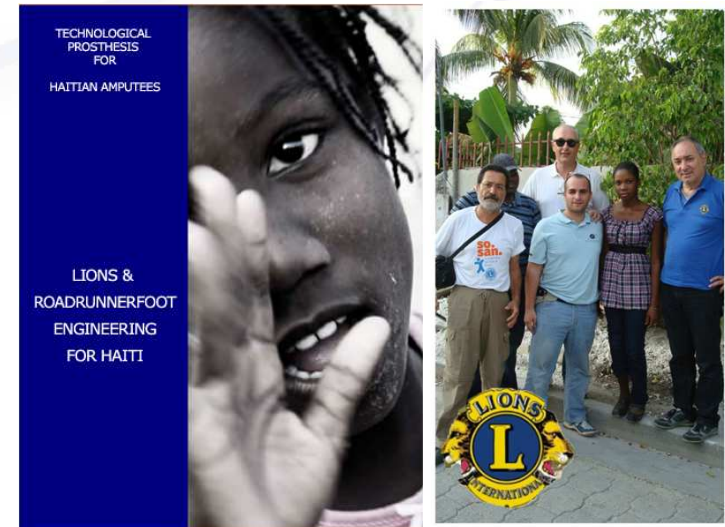
“Prosthesis for each young amputee in Haiti”

Lions Districts 108 Ta1, Ta2 e Ta3 (Trentino Alto Adige, Veneto e Friuli Venezia Giulia) joint their efforts to take prosthesis to young (3-18 years old) amputees. **Lions, not only funders but as active subjects in International Cooperation, choose to operate in the framework of Haiti Emergencies for a direct and valuable action: take prosthesis for Haitian amputees.**

Today, this engagement is great: send carbon fibre prosthesis and coordinate the distributions to local organizations.

STEPS:

- Verify datas about amputees thanks to Lions doctors volunteering in Haiti, coming from Italy and not
- Find locally partners with rehabilitation units
- Verify the best way to distribute prosthesis
- Present the project to LCIF to have another financial aid to sum to fundraising activities
- Propose the project to other Lions Districts in Italy and Europe to share aims and funds



Libia 2011-2012: prosthesis for war victims amputee

Roadrunnerfoot, participated in two humanitarian missions (oct. 2011-febr.2012), to help all war amputees: the aim is rehabilitation physical and social.



In the second half of 2012 Roadrunnerfoot win a tender of Italian Foreign affair ministry to supply 100 prosthesis for lybian amputee and realize one project of rehabilitation for disabled people with new prosthesis during one months by Rehabilitation Cenetr in BENGHAZI



Awards



1° WT Award 2011 - Accessibilità - Well Tech Awards



ITALIA DEGLI **INNOVATORI**

Agenzia per la Diffusione delle Tecnologie per l'Innovazione
Presidenza del Consiglio dei Ministri

2010 – Award for Roadwalking

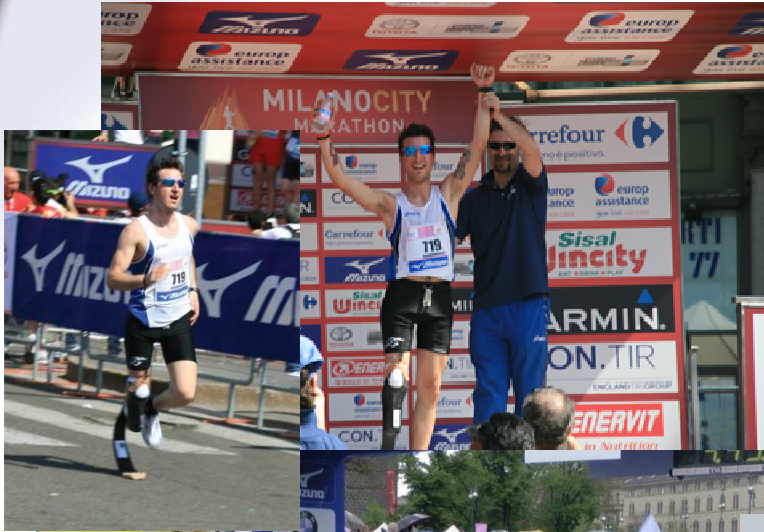
- Award Brambilla 2006 - Innovative enterprise. Comune di Milano.
- Creative enterprise 2006 -Provincia di Milano www.provincia.milano.it - www.impresecreative.it
- Bando ATP 2009 –Research and development / New materials - POR-FESR 2007-2013, ASSE 1, DG INDUSTRIA, ARTIGIANATO, EDILIZIA, COOPERAZIONE, REGIONE LOMBARDIA "Progetto di sviluppo di una protesi transfemorale completa".
- BANDO REGIONE MIUR POR-FESR 2007-2013, ASSE 1, Dg industria, artigianato, edilizia, cooperazione, regione lombardia " Progetto Tutori di arto inferiore"



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Athletic: Marathon 2011-2012-2013

High technological prosthesis for sport are a privilege due to the high cost. Roadrunnerfoot is always engaged to promote sport activities for amputees, the founder of the company was a paralympic athlete. We are trying to make every day new economic efforts to bring down prices.



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<http://www.youtube.com/user/RoadrunnerfootEngSrl>



<http://www.flickr.com/photos/roadrunnerfoot>



<http://it-it.facebook.com/Roadrunnerfoot>



<http://www.linkedin.com/companies/roadrunnerfoot-engineering-srl>



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