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### 1. Project Proposal Information

<b>Project Proposal Title</b>	Vehicles security, comfort and fuel economy increasing, using the new revolutionary European VZN damper concept
<b>Project Proposal Acronym</b>	AUTOVZN
<b>Keywords</b>	active security, pasive security, stability, handling, comfort, protection, crash, fuel consumption, pollution, road vehicles, rail vehicles, aerial vehicles, damper, shock absorber, constant damping characteristic, progressive damping characteristic
<b>Abstract (Max. 2000 words)</b>	<p>The new European VZN damper concept changes automatically the damping coefficient according to the vehicle load state and the road unevenness amplitude, without electronics and mechanism.</p> <p>The VZN damper react softly at the stroke beginning, medium to the medium stroke and hard and very hard at the stoke end, both on compression and rebound, thus according the damping coefficient with the road and load conditions.</p> <p>So it gives comparative to standard ones:</p> <ul style="list-style-type: none"> <li>• Increased vertical body stability giving SKYHOOK behavior;</li> <li>• Increased pitch and roll stability increasing roll and pitch damping coefficients exponentially with the roll, respective pitch angles, and favoring redressing with low damping coefficients at big roll respectively pitch angles;</li> <li>• Increased comfort at unloaded vehicle state, having low damping coefficients (on compression);</li> <li>• Increased adherence, having low damping coefficients at rebound stroke beginning;</li> <li>• High protection at stroke ends, reducing the number and the intensity of the stopper bumper collision;</li> <li>• Reduced fuel consumption eliminating unwanted piston movement;</li> <li>• Reduced pollution in correlation with reduced fuel consumption</li> </ul> <p>The VZN damper concept consist in placing the damping valves along the inner cylinder. At the cheap solution the damping valves are reduced to the metering orifices.</p> <p>The VZN damper concept is realized at the same prices with the standard one.</p>

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	<p>Two rear VZN shock absorbers placed on Logan Dacia car, were tested on 20 000 km of a large road conditions.</p> <p>The VZN solutions are granted with European Patents EP 1 190 184 and EP EP 2 078 168, United States Patent US 2 010 044 173, and Romanian patents</p>
<p><b>Project Description (Main Work Packages)</b></p>	<p>The general research objectives are to adjust the VZN dampers for each applicability areas, to demonstrate its superiority comparative to the standard and rheological ones and it for industry supplying.</p> <p>The proposed research areas are:</p> <ul style="list-style-type: none"> <li>• Road, rail and aerial suspension;</li> <li>• Seat and cabin suspension;</li> <li>• Damper in bumper (VZN dampers give constant deceleration)</li> </ul> <p>The research will evolve in parallel for each VZN damper application areas</p> <p>For each applicability domain the research activity will contain 2÷3 stages, presented below:</p> <p style="text-align: center;">THE FIRST STAGE</p> <ol style="list-style-type: none"> <li>1 Study the state of the art (solutions, dimensions, characteristics, performances, requests);</li> <li>2 The technical requirements/ tunings for the 1st VZN dampers releases (for normal or reduced models);</li> <li>3 Models and simulation for proposed VZN devices, to optimize the tuning;</li> <li>4 Drawings for the VZN devices;</li> <li>5 The VZN devices manufacture;</li> <li>6 The VZN devices dimensions, characteristic evaluation and their correction if necessary</li> <li>7 The VZN devices tests on rigs and in real condition (road - for vehicles etc.), comparative to the standard ones and technical test report release;</li> </ol> <p style="text-align: center;">THE SECOND STAGE</p> <ol style="list-style-type: none"> <li>8 The technical requirements/ tunings for the 2nd VZN dampers releases;</li> <li>9 the steps 3-5 repeated;</li> <li>10 the steps 6-7 repeated</li> </ol>

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	<p style="text-align: center;"><b>THE THIRD STAGE</b></p> <ol style="list-style-type: none"><li>11 The technical requirements/ tunings for the 3rd VZN dampers releases ( if is necessary);</li><li>12 The steps 3-5 repeated;</li><li>13 The steps 6-7 repeated;</li><li>14 Final technical test report releases;</li></ol> <p style="text-align: center;"><b>PERMANENT ACTIVITIES</b></p> <ol style="list-style-type: none"><li>15 Solution protection;</li><li>16 Results dissemination on papers, books, congresses, seminars, salons etc.</li></ol> <p>The same the researches in 3 steps for cars are justified by the great number of car shock absorber variants depending by:</p> <ul style="list-style-type: none"><li>• the damping characteristic tuning possibilities for metering orifices/valves<ul style="list-style-type: none"><li>o with internal tuning (imposes dismantling)</li><li>o with external tuning (2 or more steps on rebound and compression);</li></ul></li><li>• the solution for the piston rod volume compensation:<ul style="list-style-type: none"><li>o internal balance chamber</li><li>o external balance chamber</li></ul></li><li>• rigid with the outer (reservoir) cylinder</li><li>• independent</li><li>• pressurized or not</li></ul> <p>The others research areas only first 2 steps will be touched, but enough to demonstrate the VZN dampers capabilities, comparative to the standard ones.</p> <p>The ROAD VEHICLES RESEARCH will be realised in 2÷3 stages, based on the below desiderates.</p> <p>The performances will be established by simulations, on rigs and on roads.</p> <p>In the simulation, the evaluation parameters are: the maximum and RMS (the root mean square) body movements for stability evaluation; the adherence force and the number and the time in which the contact wheel ground is lost, for adherence evaluation; the maximum and RMS (the root mean square) acceleration for</p>
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	<p>comfort evaluation; the maximum and average forces in the stopper bumpers for passengers and body protection evaluation; the dissipated energy by damper, to evaluate the influence in the fuel consumption.</p> <p>On the road research will have in attention active and passive security and function of the destination the comfort, fuel consumption, speed, stability, passing capacity function vehicle load state, thus: A1-cars (stability, comfort, fuel consumption), A2- racing cars (stability, speed), A3-off road cars (stability, passing capacity, fuel consumption, speed), A4-trucks (stability, passing capacity, speed), A5- Vans (comfort at loaded/unloaded), A6 -ATV (stability, passing capacity, fuel consumption, speed), A7- Motor bike (stability, passing capacity, speed), A8- bike (passing capacity, comfort).</p> <p>The road tests will be made in polygons, then on roads by past and present racing pilots, participating in the national and international competitions, included in the research team. They are:</p> <ul style="list-style-type: none"><li>• Dan Necula (past Senior Researcher – Dacia –Renault Factory, past racing pilot, past Dacia cars racing team head)</li><li>• Romeo Duicu (motorbike pilot, biker to the 2009 Paris – Dakar racing)</li></ul> <p>In the FIRST STAGE will realise VZN car dampers with planar filling valves and metering orifices with characteristics established based on the studies of the shock absorbers made by the consecrated companies Monroe, Ohlins, Bilstein, Fichtel Sachs, Lord etc. After efficiency at speeds between 0.05÷2.5 [m/s] and temperatures of 20°C and 80°C and the test anti-blockage at -30°C evaluate, the improving solutions if necessary will do, e.g. synthetic oil, metering orifices arrangement and dimension changing, or using long pistons (to increase efficiency on rebound), levelling pistons (to increase efficiency an compression and rebound and for anti-blockage at -30°C), solutions for metering orifices control (the active number, dimension, flowing control), solution with damping valves. This reason a damping diagram rig with thermal chamber must be purchased.</p> <p>The practical solutions established in first stage will apply to all kind of vehicles but realised function the each application specific condition. Internal and/or external tuning control will be provided for easy damping characteristic control. Thus a large shape of the</p>
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	<p>damping diagrams will have, permitting to evaluate their influence in the vehicle suspension behaviour.</p> <p>Will develop a new damping valves solution, more compact, and adapted to the VZN dampers. For damping valve theoretical/by simulation characteristic evaluation, the team will be reinforced with the Lecturer Anghel Huminic from the Transilvania University.</p> <p>Will be tested the body-ground clearance adjustment, closing the metering orifices from inner cylinder ending, other VZN shock absorber facility. Thus the wheel stroke is limited only in area in which the metering orifices are open. So the car becomes proper for speed (low clearance) or off road (increased clearance) easiest. Thus we will transform our car suspension, proper for speed car/standard/off road.</p> <p>The easiest solutions for metering orifices/slots adjustment changes are to increase the orifices dimension, or placing an annular body having desired metering orifices/slots centred or convenient rotated.</p> <p>The simulation will be realised in Mat Lab and in ADAMS software.</p> <p>At the rail vehicles will apply VZN concept for vertical and horizontal (hunting movement) improving The tests on railway (only second step) will be made based an arrangement with the AFER Company - National Railway Authority.</p> <p>The VZN (pressurized) on aerial landing gear, will research for drone and small planes, theoretically, by simulations and on landing gear rig. A landing gear test rig will be purchased. The carrying force will be realised by inner pressure, realised with nitrogen at high pressure in two solutions. First solution the nitrogen is introduced directly in the reservoir chamber (outer cylinder) but need an increased seal, to avoid the gas losses. Second solution will avoid the gas loses, using a gas compartment isolating the gas by oil with a floating piston or with a diaphragm, or an annular sleeve when the gas chamber is annular.</p> <p>All the new solutions implied by specific destinations will be patented.</p>
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	Based the new European VZN concept the vehicles will become more 20% safety and 5-8 % economic and low pollution.
<b>Current Consortium (Partners, Organisation Types)</b>	University Transilvania Brasov, AFER (Romanian Authority for Railway Transport, Aerospatiale Engineering Faculty, Faculty of Transports
<b>Deadline for Responses</b>	30 days

## 2. Profile of the Partners Sought

<b>Organisation Type</b>	Dampers/Shock absorbers Factory, Automotive Research Institute, Automotives Factory
<b>Required Skills and Expertise</b>	Dampers manufactory, Automotive manufactory, Dampers and suspensions Researches
<b>Role in the project</b>	Lead partner/partner
<b>Other Requirements</b>	availability to develop VZN damper concept

## 3. Project Proposer Information

<b>Name of the Organisation</b>	Institutul de Mecanica Solidelor-Institute of Solid Mechanics
<b>Organisation Type</b>	Research Institute
<b>Country</b>	Romania
<b>Fields of Activity</b>	Vibration mitigation and control using VZN and standard dampersl
<b>Contact Person</b>	Adrian Ioan NICULESCU
<b>Position in the Organisation</b>	VZN Program Manager
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URL	http://imsar.ro
Previous FP Projects Participated	No

Please send filled in form by 25. 3. 2011 to: [fg.tec@uni-mb.si](mailto:fg.tec@uni-mb.si)