

SYMPOSIUM ON BUILDING BLOCKS FOR FUTURE SPACE EXPLORATION AND  
DEVELOPMENT (D3)Novel Concepts and Technologies to Enable Future Building Blocks in Space Exploration and  
Development (3)

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COST-EFFICIENT AUTONOMOUS NAVIGATION FIELD TRIALS THROUGH REMOTELY  
ACCESSIBLE SELF-SUSTAINING ROVER PLATFORM**Abstract**

There is an increasing need in autonomous long range navigation capabilities for mobile robots for planetary exploration. To verify new software, sensors or exploration strategies robots have to be deployed in terrain which is representative of its final operational environment. Realistic simulations are time consuming to develop and lack the accuracy and the random element of a field trial. On the other hand field campaigns are time consuming to organise and expensive to conduct. Furthermore institutes and companies that excel at developing autonomy software might not have a robust terrestrial platform built for outdoors or long range. This paper shows that it is possible to deploy a terrestrial rover in a representative environment, for example the Atacama Desert and access it remotely over the internet. It is also shown that such a rover could be built to be fully self-sustainable and re-used for many field trials all year around for several years. This would dramatically reduce the cost of testing autonomous behaviour in a real environment and greatly increase the confidence that it will perform without a problem in the target environment, verify sensors and long-term strategies. The proposed base set of instrumentation can be used for most autonomy tests and new instruments can be shipped out and integrated at a much lower cost than full field trials. The deployment of such a facility would be similar in cost to a single field trial but could be used for continuous field trials throughout the year with minimal maintenance and running costs. The infrastructure for the remote trials facility has been tested during the SAFER trials and at RAL Space as proof of concept. The infrastructure can also be used to deploy additional rovers in the future to test concepts such as collaborative and swarm exploration. Testing in the real world and collaborative development are most important to succeed in building robust autonomous systems for exploration.