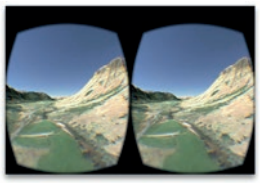
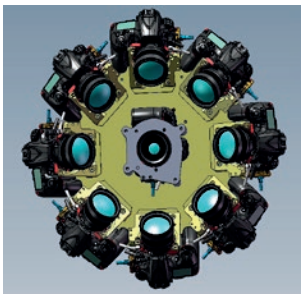
Ordnance Survey Data Gives Reality to a Virtual World

The spectacular setting of Ben Nevis provides the backdrop for an Oculus Rift game created by Ordnance Survey (OS) developers in which players race against the clock to find a hidden trig pillar. The recreation of Britain's highest mountain has been constructed by OS at 1:4 scale using OS data and covers an area of 10km x 10km. Britain's mapping agency, with a 224-year history of collecting and using data in imaginative and useful ways, has also released a virtual reality (VR) tour of the same rugged Ben Nevis mountainscape that is featured in OS's Oculus Rift game. The virtual tour is available for both iOS and Android devices to be used with Google Cardboard.

▸ **http://bit.ly/1XsU1R3**



Virtual-reality view of Ben Nevis.



Octoblique MIDAS survey camera.

Lead'Air Launches 360-degree Coverage Survey Camera

Lead'Air, the manufacturer of Track'Air aerial survey products, is unveiling a new 9-camera MIDAS system with 1 vertical camera and 8 oblique cameras covering a true 360 degrees. Instead of the classic arrangement with 4 oblique cameras, facing forward, backward, left and right, the new Octoblique MIDAS adds 4 additional oblique cameras which fill the gaps, thus doubling the amount of oblique photos collected without an increase in flying time. With 8 cameras spaced at 45 degrees from each other instead of 4 cameras spaced at 90 degrees, the Octoblique looks in all directions around the aircraft and generates twice as many oblique views as any other system, leaving no angular blind spots uncovered.

▸ **http://bit.ly/1XsVwP7**

Geodesy, Water and War

The branch of science dealing with obtaining precise measurements of the Earth, mapping points on the surface and studying its gravity field is known as geodesy. One of the advanced offshoots resulting from the efforts of geodetic scientists is the Grace Mission (Gravity Recovery and Climate Experiment), a joint German and USA undertaking. Grace consists of a constellation of two identical satellites launched in March 2002. The twins, nicknamed 'Tom & Jerry' by the press, follow each other 220km apart in a near-circular polar orbit and the instruments on board continuously measure the distance between the two satellites in a very accurate manner. Changes in the distances measured reveal variations in the Earth's gravity field. Analysing the changes thus provides insight into the dips and bumps of the gravity field and enables monitoring of how gravity changes affect Earth's natural systems over time.

Fresh water is the most valuable resource on Earth but its volume is limited. Food supplies and human, animal and plant health heavily depend on the availability of high-quality water. Humanity could survive for centuries without oil, gas and coal, but without water people would be doomed. No water means no life. A lot of fresh water is stored in aquifers, i.e. bodies of permeable rock that can contain or transmit groundwater. The Grace measurements provide clues for determining changes in the amount of water stored in groundwater basins.

In a joint effort, researchers from NASA and other institutions analysed the Grace gravity data which they derived from the distances measured at an altitude of 500km and reported their findings in *Water Resources Research* (mid-June 2015). About one third of Earth's largest groundwater basins are being rapidly exhausted by exploitation for human use, including irrigation, manufacturing and domestic use, they observed. The most overstrained aquifers are in the world's driest areas, where people draw strongly on water tapped from aquifers. The Arabian aquifer system, a vital resource for over 60 million people, the Indus Basin aquifer of north-western India and Pakistan and the Murzuk-Djado Basin in northern Africa are the most overstrained in the world, respectively in that order. The Grace mission also revealed that in the period 2003-2010 Iran, Iraq, Syria and parts of Turkey lost nearly 150 billion cubic metres of stored fresh water; this equates to the amount of water households in the Americas and Europe together flush through their toilets annually. This observation begs the question: What happens when a highly strained aquifer is located in a territory with high geopolitical or socioeconomic tensions? History provides the answer: violent confrontations erupt over access to water resources and can escalate into wars. Conflicts over water quadrupled in the last decade, and they are increasing because of population expansion and lack of good governance. Is it an exaggeration to state that water shortages lie at the heart of the present migration wave from the Middle East to Europe? Add to this the impact of climate change and the risk of war will surge in the coming years. Not only will the Middle East, northern Africa and southern Asia increasingly face shrinking water stocks but also the western and central parts of the US and southern Europe will experience water scarcity and desertification. Watering crops and playing fields, cleaning cars and buildings and manufacturing textile materials – all these activities take fresh water from the same waning supply. Water shortages threaten food security and access to safe drinking water, which puts a further burden on governors fraught with tackling poverty and appeasing social clashes. The geodetic mission, called Grace, has issued authorities and global leaders with a wake-up call to think about the effects of shrinking water stocks and to negotiate peaceful solutions. ◂