

Press release

27 May 2016

Norman Foster's Droneport Prototype goes on show at the Venice Biennale 2016

The Norman Foster Foundation: Making the Droneport Prototype

15th International Architecture Exhibition, La Biennale di Venezia

A full-scale prototype for a droneport, built on site in the Arsenale in Venice, was unveiled at the 15th International Architecture Biennale on Thursday 26 May. The droneport prototype is the first project to be presented by The Norman Foster Foundation.

The proposal is to create a network of droneports to deliver medical supplies and other necessities to areas of Africa that are difficult to access due to a lack of roads or other infrastructure and the ambition is that every small town in Africa and in other emerging economies will have its own droneport by 2030.

The pilot project – which will be launched this year – is based in Rwanda, a country whose physical and social geography poses multiple challenges. The initial plan for three buildings, to be completed by 2020, will enable the network to send supplies to 44 per cent of Rwanda. Subsequent phases of the project could see in excess of 40 droneports across Rwanda, and the country's central location could allow easier expansion to neighbouring countries such as Congo, saving many thousands more lives.

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Jonathan Ledgard, Founder of the Pioneering Redline Cargo Drone Network, a concept he developed at the Swiss federal institute of technology in Lausanne (EPFL), approached Norman Foster with the concept because of his combination of airport design experience and knowledge of flight as a pilot of sailplanes, helicopters and aircraft. Foster then shared the challenge with his colleagues Narinder Sagoo and Roger Ridsdill Smith at Foster + Partners. Working with their teams, the basis of a modular vaulted system evolved. It has fallen to The Norman Foster Foundation to advance it beyond early feasibility stage and has led to the present team to design, engineer and implement the project through to a built reality.

Lord Foster, Chairman and Founder of Foster + Partners and Chairman, The Norman Foster Foundation:

“Africa is a continent where the gap between the population and infrastructural growth is increasing exponentially. The dearth of terrestrial infrastructure has a direct impact on the ability to deliver life-giving supplies, indeed where something as basic as blood is not always available for timely treatment. We require immediate bold, radical solutions to address this issue. The Droneport project is about doing ‘more with less’, capitalising on the recent advancements in drone technology – something that is usually associated with war and hostilities – to make an immediate life-saving impact in Africa. Rwanda’s challenging geographical and social landscape makes it an ideal test-bed for the Droneport project. This project can have massive impact through the century and save lives immediately.”

Jonathan Ledgard, Founder, Redline:

“It is inevitable on a crowded planet, with limited resources, that we will make more

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intensive use of our sky using flying robots to move goods faster, cheaper, and more accurately than ever before. But it is not inevitable that these craft or their landing sites will be engineered to be tough and cheap enough to serve poorer communities who can make most use of them. Droneport is an attempt to make that happen, and to improve health and economic outcomes in Africa – and beyond. We are proud to have Norman Foster – an architect with extensive personal experience of flying – as THE DESIGN LEAD on this project.”

Cargo Drones

Cargo drone routes have utility wherever there is a lack of roads. Just as mobile phones dispensed with landlines, cargo drones can transcend geographical barriers such as mountains, lakes, and unnavigable rivers without the need for large-scale physical infrastructure. Just a third of Africans live within two kilometres of an all-season road, and there are no continental motorways, almost no tunnels, and not enough bridges that can reach people living in far-flung areas of the continent. It would require unprecedented levels of investment in roads and railways to catch up with the exponential growth in Africa’s population, which is set to double to 2.2 billion by 2050. An ‘infrastructural leap’ is essential using drone technology and clean energy systems to surmount the challenges of the future.

The specialist drones can carry blood and life-saving supplies over 100 kilometres at minimal cost, providing an affordable alternative that can complement road-based deliveries. Two parallel networks would operate services, the Redline using smaller drones for medical and emergency supplies; and the commercial Blueline that would transport crucial larger payloads such as spare parts, electronics, and e-commerce, complementing and subsidising the Redline network.

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The Droneport

The Droneport offers a new typology for a building, which it is hoped, will grow into a ubiquitous presence, much like petrol stations have become dispersed infrastructure for road traffic. The proposal will have a strong civic presence, based on sharing and multiple uses. It allows for safe landing of quiet drones in a densely packed area, and includes a health clinic, a digital fabrication shop, a post and courier room, and an e-commerce trading hub, allowing it to become part of local community life.

The project is an evolution of Norman Foster's previous experience in building airports, as well as earlier lunar building studies conducted in association with the European Space Agency. Just as the structures designed for the moon use a minimal inflatable framework and 3-D printed lunar soil, the Droneport is imagined as a 'kit-of-parts' where only the basic formwork and brick-press machinery is delivered to site, and the raw materials, such as clay for bricks and boulders for the foundation, are locally sourced, reducing material transport costs and making it more sustainable. The central idea is to 'do more with less' and the vaulted brick structure with a minimal ground footprint, can easily be put together by the local communities. Multiple vaults can also link together to form flexible spaces based on demand and needs of the particular place, and the evolution of drone technology. The Droneports will also be manufacturing centres for drones, generating employment opportunities for the local population. By giving the local people the construction knowledge, the project seeks to leave a legacy that will initiate a change that is bigger than the building itself.

The Norman Foster Foundation Pavilion

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The creation of a Biennale pavilion was made possible by The Norman Foster Foundation which brought together professors and students from five universities across Europe, the UK and America along with a foundation for the building industry and its related research laboratory. Its theme fits perfectly with Alejandro Aravena's motto "Reporting from the Front". Its construction in Venice was filmed to serve as a model for replication by local communities in emerging economies such as Africa, South America and parts of Asia. Although initially a response to the droneport, the construction system is applicable to a wider range of needs – markets, schools and medical facilities for example.

Its location at the end of the Arsenale is symbolic as the gateway to a newly opened public park. The possibility of it remaining as a permanent legacy is now under consideration. The colouration of the earth-based products, which were specifically made for the project, are a careful match with the historic buildings which surround it. It would be a timeless addition to the Biennale site and virtually maintenance free.

The project has been realised by The Norman Foster Foundation on a very tight timescale, 6 months overall, 4 weeks on site – made possible by the financial support of the LafargeHolcim Foundation for Sustainable Construction and The Norman Foster Foundation, and the close links between the engineer partners of Ochsendorf DeJong & Block, LLC and their universities. John Ochsendorf teaches at MIT, Matthew DeJong at Cambridge and Philippe Block, with his research group at ETH Zurich. Jonathan Ledgard, originator of the drone port concept and founder of Redline, developed the idea at EPFL in collaboration with the Laboratory of Intelligent Systems (LIS) of Dario Floreano.

An interim feasibility study involved the construction of a half size vault at the Polytechnic University of Madrid headed out by Professor Santiago Huerta Fernández. This was realised by a Master Mason, Carlos Martín Jiménez, attached to the project with two

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students from MIT – Sixto Cordero and Luisel Zayas. The same team, expanded with Segundo Victor Simba and Luis Alfonso Tituania Male moved on to Venice to create the present pavilion.

The Madrid exercise enabled the combined resources of the LafargeHolcim Foundation for Sustainable Construction and their research laboratory in Lyon to develop a special earth-based product for the project. 18,000 customised elements have been produced for the pavilion. The challenge was to ensure a compressive strength of at least 10 MPa whilst minimising the weight and size of each brick.

The prototype vault comprises two outer layers of this custom product with an inner layer of traditional tiles. The special product is of stabilised earth – a reliable, affordable and environmentally friendly building material that does not require intensive use of fuel to achieve their performance. LafargeHolcim developed a naturally cured building block made of compressed earth and cement termed 'Durabrick'. The mix design for the droneport was optimised in close cooperation with MecocoConcept in Toulouse.

The Norman Foster Foundation has collaborated with the Studio Olafur Eliasson and Little Sun to explore the potential of a new building component called 'SolarBrick', which could be incorporated into the structure of the droneport vaults. The 'SolarBrick' will have solar cells on its outer surface, charging a long-life battery and then powering a LED lamp on the inner surface. The units, which could be 3D printed within the droneports themselves, could become common place in local buildings, providing light where electricity is scarce.

The Norman Foster Foundation: Making the Droneport Prototype. Arsenale, 15th International Architecture Exhibition, Venice. Thursday 26 May onwards.

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Saturday 28 MAY 17:00 : Casa dell'Ortolano, Isola della Certosa. SKY OVER HORIZONTAL METROPOLIS, Droneports in Africa for Redline project. Conversation with Norman Foster, Ricky Burdett (LSE), Jonathan Ledgard (Redline) and Paola Viganò (EPFL, IUAV)

Notes to Editors:

The Norman Foster Foundation is based in Madrid and has the following objectives:

To promote the importance of architecture, infrastructure and urbanism to serve society

- Through experimental and research projects. Some of these would be of a humanitarian nature and outside the sphere of conventional architectural practice. Instances would be migrant settlements, Favelas or responses to disasters.
- Through temporary exhibitions of selected projects in the Foundation or other venues.
- Through the archive of the Foundation and access to the works of Norman Foster and the practices that he has founded or co-founded.

To promote interdisciplinary thinking to help new generations of architects, designers and artists to anticipate the future

- Through an educational programme of think tanks, symposia, films and publications.
- Through networks with selected universities and research institutions.

To promote the links between architecture, engineering, design and art

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- Through the display within the archive of significant works of art and design.
- Through exhibitions promoting these links in selected museums in major cities.

Norman Foster

Norman Foster was born in Manchester. After graduating from Manchester University School of Architecture and City Planning in 1961 he won a Henry Fellowship to Yale University, where he was a fellow of Jonathan Edwards College and gained a Master's Degree in Architecture.

In 1967 he established Foster Associates, now known as Foster + Partners. Founded in London, over nearly five decades the practice has been responsible for a strikingly wide range of work, from urban masterplans, public infrastructure, airports, civic and cultural buildings, offices and workplaces to private houses and furniture design. Major projects include Beijing Airport, Millau Viaduct in France, 30 St Mary Axe (also known as the Gherkin) and the Great Court at the British Museum in London, the Hearst Headquarters tower in New York, and the Museum of Fine Arts, Boston. Current projects include the Apple Campus in California, Bloomberg's European Headquarters in London, and the Norton Museum of Art in Florida.

He became the 21st Pritzker Architecture Prize Laureate in 1999 and was awarded the Praemium Imperiale Award for Architecture in Tokyo in 2002. In 2009, he became the 29th laureate of the prestigious Prince of Asturias award for the Arts and was awarded the Knight Commander's Cross of the Order of Merit of the Federal Republic of Germany. In 1990 he was granted a Knighthood in the Queen's Birthday Honours, and in 1999 was honoured with a Life Peerage, becoming Lord Foster of Thames Bank.

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Jonathan Ledgard

JM Ledgard is a novelist and a leading thinker on advanced technology, risk, and species survival in emerging economies. He was director of Afrotech, a future Africa initiative at the Swiss Federal Institute of Technology in Lausanne (EPFL) and is a longtime foreign correspondent for The Economist newspaper. He founded the Redline cargo drone network of leading roboticists, architects, and logisticians to invent and build the world's first droneports and cargo drone lines in Africa. At The Economist he authored lead stories from over 50 countries and several wars – for the last decade out of Africa. His second novel Submergence was a New York Times Book of the Year and is presently being adapted for Hollywood by Wim Wenders.

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