Regulator approves first Ventilator Challenge device

Penlon's Prima ES02 model is now authorised by the Medicines and Healthcare products Regulatory Agency (MHRA) for use in hospitals. It follows extensive final testing of these devices in hospitals to ensure that they are safe and effective.

Penlon has worked with the VentilatorChallengeUK consortium, which includes a number of groups including High Value Manufacturing Catapult, Ford, a number of UK based F1 teams and Siemens.

The Penlon device is a newly-adapted ventilator design, adapted from previous models, that meets the rapidly manufactured ventilator system specification. It is a fully intubated mechanical ventilator designed to provide support to critically ill patients with a range of functions including volume and pressure controlled ventilation.

Following the device's approval, the Government has confirmed an order for 15,000 Penlon devices. Hundreds of units are expected to be built over the next week, with production being further scaled up in the coming weeks.

The first dispatch of 40 Ventilator Challenge Penlon devices will be sent to MOD Donnington today and will be delivered to the NHS front line very shortly.

The news follows the arrival of an existing ventilator model by paraPAC to the NHS front line across all four nations last weekend. 80 paraPAC devices were produced last week, with production being ramped up into the hundreds over the next few weeks. As an existing device, the paraPAC already had MHRA approval.

Chancellor of the Duchy of Lancaster Michael Gove said:

> The approval of Penlon's device underlines the significant progress being made in the Ventilator Challenge.
>
> I pay tribute to the incredible ingenuity and commitment of our manufacturing industry, coming together as part of the national effort to protect the NHS and save lives.

Last month the Prime Minister called on some of the biggest names in British manufacturing to help step up ventilator supplies, in order to save lives during this coronavirus pandemic. Following this, the government has partnered a number of the UK's leading technology and engineering firms with smaller manufacturers to rapidly build existing, modified or newly designed ventilators at speed.

Currently, over 10,000 mechanical ventilators are available to NHS patients, which is set to increase further through these new devices as well as through additional orders from overseas.

Special feature: Data science at GAD

Our increasingly digitalised modern world produces more data in a wider variety of formats than ever before. Data science techniques allow us to process, analyse, gain insights and communicate results from this increasing volume of data. As part of our growth as a learning organisation, this is also a key area in which we are investing to further increase our expertise.

This article provides an overview of data science and discusses how GAD's actuaries are increasingly utilising its techniques to enhance the quality and efficiency of our work. In particular, we explore the use of machine learning.

Overview of data science

Data science includes algorithms, mathematics, statistics, analytics, data mining and programming. The graphic below highlights some key data science themes and the value they can add to real world problems.

Making sense of 'big data'

The work of GAD's public sector clientele often exposes us to datasets much larger than those used by equivalent private sector actuarial firms. For example, GAD's work on actuarial valuations of the (unfunded) public service pension schemes requires the analysis of data for around 15 million individuals.

The volume and complexity of the data held for this exercise, and other GAD projects, continues to increase. Through increased adoption of data science techniques GAD is able to:

- process, query, analyse and report on larger datasets more efficiently
- improve and streamline current processes through automation
- adopt more sophisticated forms of analysis and modelling, through techniques such as machine learning (discussed in more detail below)
- innovate our client advice by using interactive models, dashboards and visualisations to report on data and other analysis results

The benefits of this are twofold: to increase the efficiency of the work we undertake and to allow our actuaries to provide more meaningful advice to facilitate better-informed client decisions. Increased availability of data can also introduce new problems to which GAD's analysis can add value.

Examples include analysis of health data, disaster risk financing and analysing risks associated with climate change.

Machine learning

At GAD, machine learning techniques can play a key role in enhancing our understanding of, and advise in relation to, areas of future uncertainty. Our case study provides one such example, by discussing how machine learning techniques supported GAD's work on the sale of student loans by UK Government Investments.

Machine learning uses statistics, operational research, mathematics and computer science to build logic for algorithms (a sequence of well-defined rules/instructions) to produce predictions. These algorithms can aid understanding of, and provide insights in relation to, a wide variety of problems. Ways machine learning techniques can add value include the following:

- Enhancing existing processes: GAD's work regularly uses statistical 'supervised learning' techniques such as linear regression and decision tree analysis. Examples include predicting future earnings for UK graduates and identifying factors driving mortality rates from pension scheme member data.

- Identifying new patterns in existing data: by identifying new patterns algorithms can learn to group data items with similar characteristics through 'unsupervised learning'. GAD recently used this technique to segment data on the financial performance of 2,000 UK defined-benefit pension schemes into groups with similar characteristics. This enabled us to effectively tailor our data analysis and reporting to our clients' needs.

- Independent decision making: some new or very complex problems require the use of 'reinforcement learning'. This is where algorithms learn to react with, and to make decisions in, an environment through a trial and error approach. While this is still a developing area, its complex applications are helping to drive a host of new technological innovations, such as the development of automated cars.

Future focus

Going forwards the volume of data available is only set to increase, with so called 'big data' here to stay. Data science is a rapidly evolving discipline and GAD remains committed to staying at the forefront of these new developments and building our expertise accordingly.

Our actuaries will continue to apply the latest data science techniques in new and innovative ways, producing meaningful advice to assist our clients with the challenges of the future.

Universal Credit claimants to verify identity through Government Gateway

- Only go outside for food, health reasons or work (but only if you cannot work from home)
- If you go out, stay 2 metres (6ft) away from other people at all times
- Wash your hands as soon as you get home

Do not meet others, even friends or family.

You can spread the virus even if you don’t have symptoms.

GAD and COVID-19

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NATS eligible for funding of up to £92 million to maintain services

- air navigation service providers to receive a share of £1.1 billion support package to maintain critical services as income plummets due to coronavirus
- the UK’s NATS would be eligible to receive up to £92 million in support
- the government continues to work closely with the aviation sector to support organisations affected by coronavirus

Air navigation service providers across Europe will share a £1.1 billion support package to maintain services, as the fall in air traffic has led to a dramatic reduction in their income.

The UK, along with other European states, has supported the intergovernmental organisation, EUROCONTROL, which manages charging for air navigation services across Europe, in securing a loan of £1.1 billion to maintain critical air navigation services, which have been affected by the fall in air traffic from coronavirus.

As the UK's enroute air navigation service provider, NATS would be eligible to receive up to £92 million in support, enabling it to continue providing services, supporting cargo and repatriation flights as well as ensuring the organisation can return to full operations at the appropriate time, to help the recovery of the aviation sector.

Following the announcement last week that airlines would be able to temporarily defer payments for route charges for up to 14 months, this arrangement provides financial relief to air navigation service providers also facing disruption as a result of coronavirus.

The UK government holds a 10% share in the vote for any such action passed by EUROCONTROL and voted in favour of pursuing the loan. Founded in 1963, the organisation has 41 member states and is not an agency of the EU.

Transport Secretary Grant Shapps said:

> The effect of coronavirus is being felt right across the aviation sector which is why we have announced an unprecedented package of support measures to help firms through this extremely testing period.
>
> Air navigation service providers rely on airlines operating for their revenue, so this support will enable them to continue providing their safety critical services, as we help stranded Brits get home and transport vital medical supplies.