LINCAD
POWER MANAGEMENT SYSTEMS

CONTACT

The Newsletter of Lincad Ltd, the Battery Specialists

Lincad, a leader in the design and manufacture of bespoke batteries, chargers and power management systems.

SPRING 2020

WELCOME TO THE SPRING EDITION OF CONTACT

In this newsletter we take a look back at last year and forward to new opportunities coming up this year. 2019 was a year of growth for us in all senses of the word. The year saw a major expansion of the facilities at our premises here in Ash Vale. In the stories below, you can read about the expansion of our Research & Development capabilities, the opening of our new training facility, and the creation of a new mezzanine area which has opened up additional manufacturing and office space.

Lincad is classified as a key supplier to the UK MOD and therefore will be staying operational during the COVID-19 pandemic. It is imperative that Lincad remains open for business to support our customers with critical defence and medical battery supply.

Find out more as you read on.

Janet Rowe and Peter Slade
Joint Managing Directors


Janet Rowe


Peter Slade

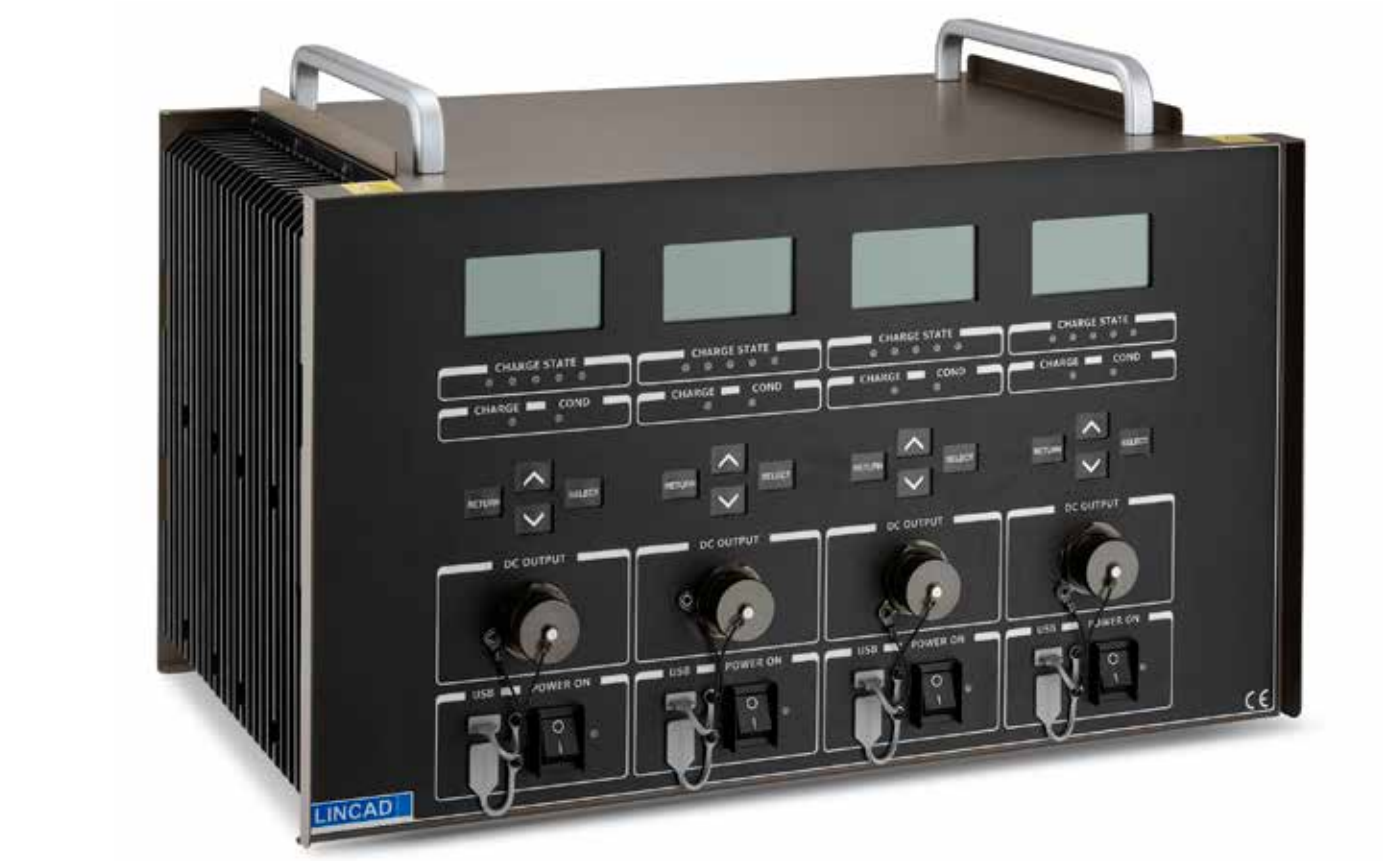
IN THIS ISSUE

CREATING MORE SPACE TO SUPPORT OUR BUSINESS GROWTH
SEE PAGE 3

BATTERY TRANSPORTATION
SEE PAGE 6

HOW LINCAD BECAME A LEADER IN LITHIUM-ION BATTERY TECHNOLOGY FOR MILITARY APPLICATIONS
SEE PAGE 10

NEW ORDERS FROM UK MOD FOR THE FOUR CHANNEL CARAVEL MK2 CHARGER



New four channel Caravel MK2

Representing the very latest in battery charger technology and design, our new Four Channel Caravel Mk2 charger is set to join a line of Caravel charger products which have seen front-line service with British and international armed forces for over 15 years.

New orders from the Ministry of Defence prove that!

The multi-chemistry charger is designed to meet the battery charging and management requirements of our LIPS (Lithium Ion Power System) suite of batteries, in addition to other batteries of any electrochemistry from any original equipment manufacturer.

It can charge batteries ranging from 2 to 58V through a series of interchangeable BIAs (battery interface adaptors) including products not originally intended for use with a third-party charger. With the ability to work with up to four batteries at once, an entire fleet of batteries can be simply managed from a single type of charger. With four USB ports, it can also charge smartphones, tablets and other mobile devices, and can be configured for wireless or Ethernet communication for central monitoring.

This upgraded model also features a transport mode to allow the discharge of any lithium-ion battery to less than 30% state-of-charge in line with current International Air Transport Association (IATA) regulations, making it the default charger for organisations in the lithium-ion battery supply chain.

Orders from MOD

CREATING MORE SPACE TO SUPPORT OUR BUSINESS GROWTH

Not only have we been investing significantly in expanding our workforce, we've doubled the size of our Head Office facilities here in Ash Vale.

Over the summer we held a staff party to celebrate the official opening of a new mezzanine area designed to create additional office space and release more floor area for the critical areas of production, testing and research & development.

In the words of Peter Slade: **"It was a great pleasure to celebrate the opening of our new floor with all of our loyal, hard-working people. The fact that we were able to do this is a direct result of the consistent growth in demand that we have seen for our products and expertise."**

PCB inspection

Production area

Research and development

Testing

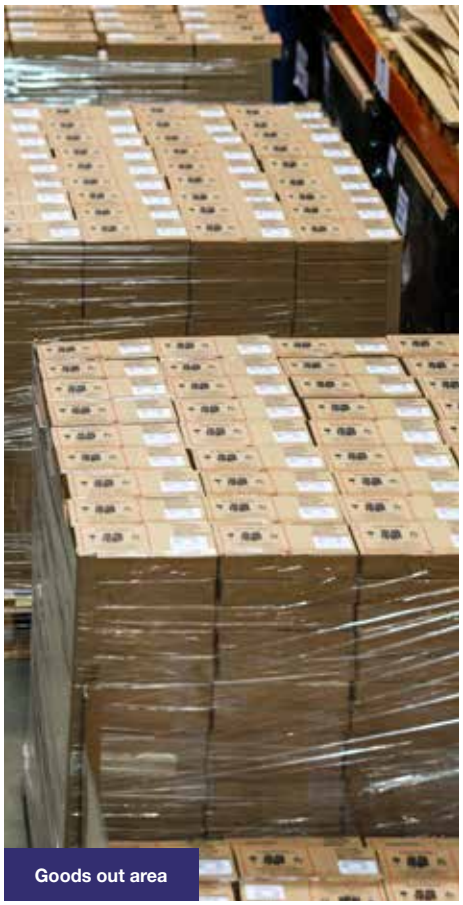
NEW CONTRACT WIN FROM TEAM LEIDOS

Already delivering successfully on a multi-million pound contract with Team Leidos to supply a wide range of cells and batteries for the UK Ministry of Defence, we were obviously delighted when they decided to extend that contract.

Most of the lithium-ion and some other battery cell chemistries must be suitable for mission-critical environments and therefore have to be approved to UK Defence Standards. The expansion of our in-house testing facilities means we are able to both approve products and demonstrate continued product performance over time.

We're also able to package and label products for all modes of transport, including full adherence with the stringent IATA regulations, supported by our Dangerous Goods Safety Adviser.

MOD end user



Goods out area

HQ loading bay

LINCAD AT DSEI

We were proud to have the opportunity in September to exhibit our products at DSEI (Defence & Security Equipment International) at ExCel London. DSEI is a world-leading event bringing together governments, national armed forces, industry, thought leaders and the global defence and security supply chain on an unrivalled scale.

We were keen to showcase the Caravel Mk2 battery charger, the new four-channel Caravel Mk2 and the Armada six channel battery conditioner which attracted considerable interest.

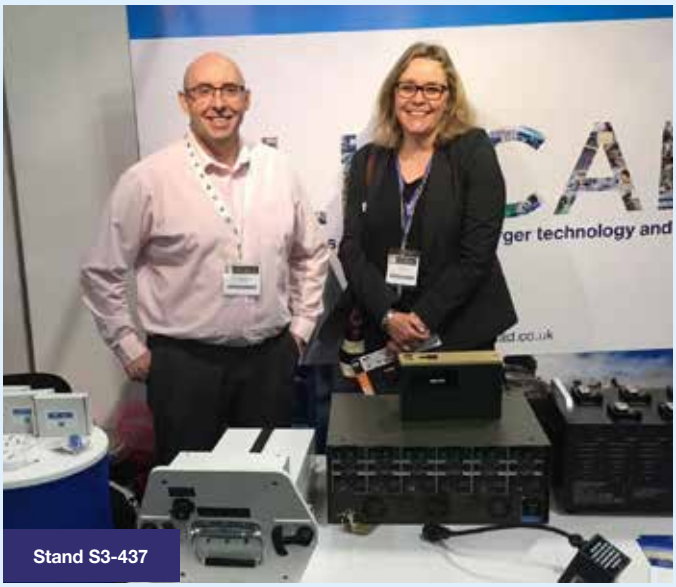
The use of batteries by the military is expanding all the time. While lithium-ion is very much the front-running battery technology in terms of energy and power densities, batteries based on other chemistries still play a crucial role and their use is likely to continue for some considerable time, which presents significant logistical challenges to planners of any kind of operational exercise.

Representing the very latest in battery charger technology and design, the multi-chemistry Caravel Mk2 charger is an enhanced, cutting-edge replacement for the original Caravel charger which has seen frontline service with British and international armed forces for almost 20 years.

This new, four-channel variant maintains all the full functionality of our Caravel Mk2 but allows up to four batteries to be charged at once, allowing faster charging of a fleet of batteries in a barracks environment.

The Armada is a six-channel battery conditioner designed for the state-of-charge management of lithium-ion and other battery types. It has similar functionality to the Caravel Mk2 chargers but is designed for absolute simplicity of operation. Specifically designed to reduce lithium-ion batteries to less than 30% state-of-charge for air transport using its transport mode, it also incorporates a storage mode to prepare batteries to 50% state of charge for long-term storage.

Both the Caravel Mk2 chargers and the Armada conditioner are compatible with IrDA and SMBus smart batteries as well as those with no communications interface. In order to improve operational flexibility and provide a high degree of future proofing, they can accept field software upgrades via a laptop or mobile app.



Stand S3-437


DSEI

HOW THE ARMADA IS CAPABLE OF CONDITIONING ANY BATTERY TO BE IN A TRANSPORT MODE

An Interview with Peter Copplestone, Operations Director

Q. Peter, can you start by explaining what you mean by a battery conditioning system?

A. The idea is that the six-channel Armada will take any chemistry of battery, but it's particularly important for lithium-ion batteries because of the IATA law that came in a couple of years ago. The regulations require that they can only be flown at 30 per cent or less state-of-charge. And that can be difficult to achieve.

So, rather than simply charging or discharging a unit, the Armada is capable of conditioning any battery to be in a transport mode, a storage mode or fully charged.

Q. And how will it help your primary customers in the defence sector?

A. The defence sector is covered by exactly the same transport laws. It's slightly different if they use the battery on a rotary aircraft or a fixed wing aircraft but if it's just being transported from somewhere to somewhere, lithium-ion batteries have to be at 30 per cent state-of-charge unless they get a specific exemption from every single country they fly over. Not that easy to obtain.

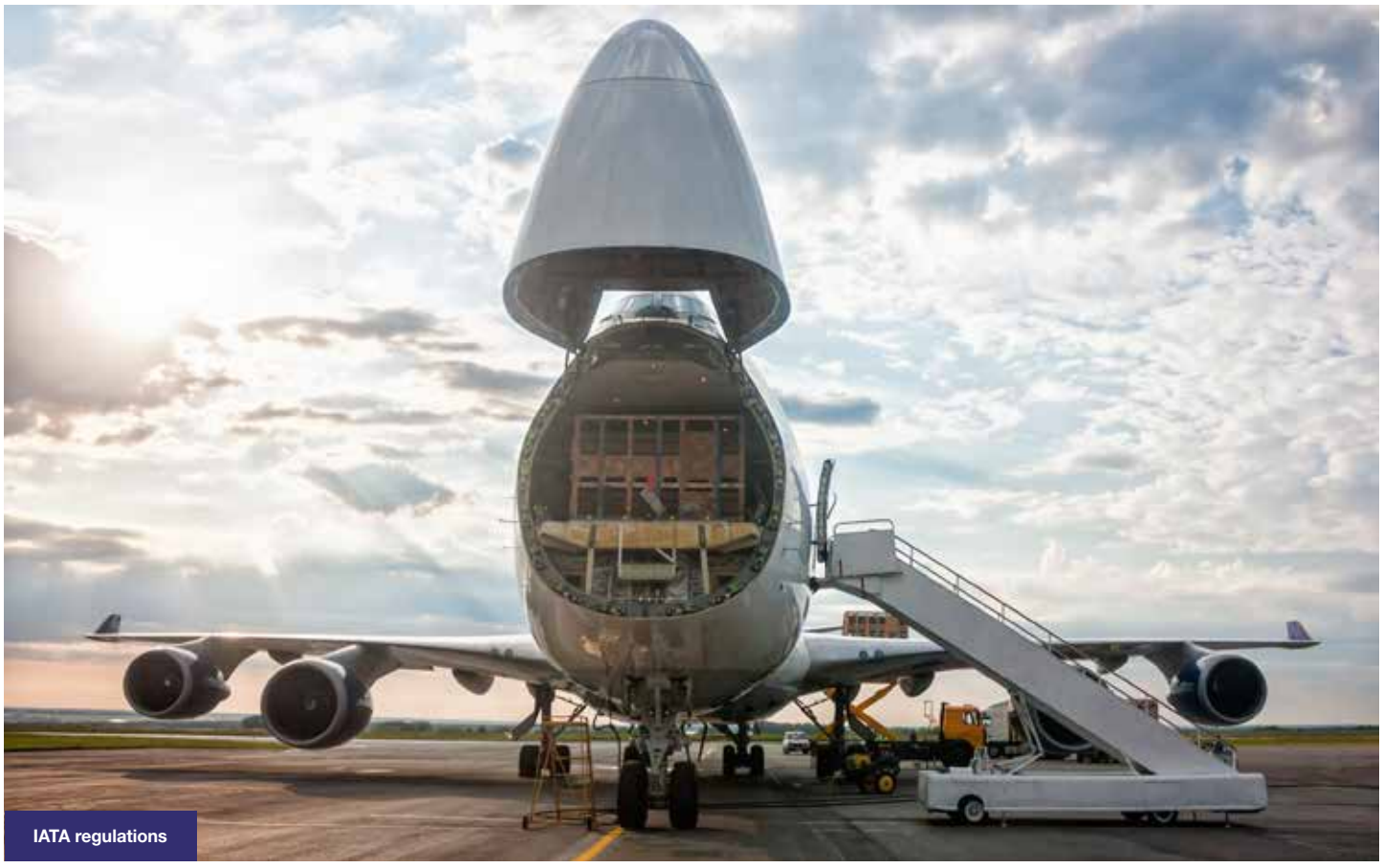
Q. Are we just talking about air transport?

A. Well, at this moment in time maritime is not covered by the IATA regulations. However, there is talk that both road and maritime will eventually go the same way and expect any lithium-ion batteries being transported to be at less than 30 per cent state-of-charge. In fact, some ferry companies between Ireland and mainland UK are already insisting on that.

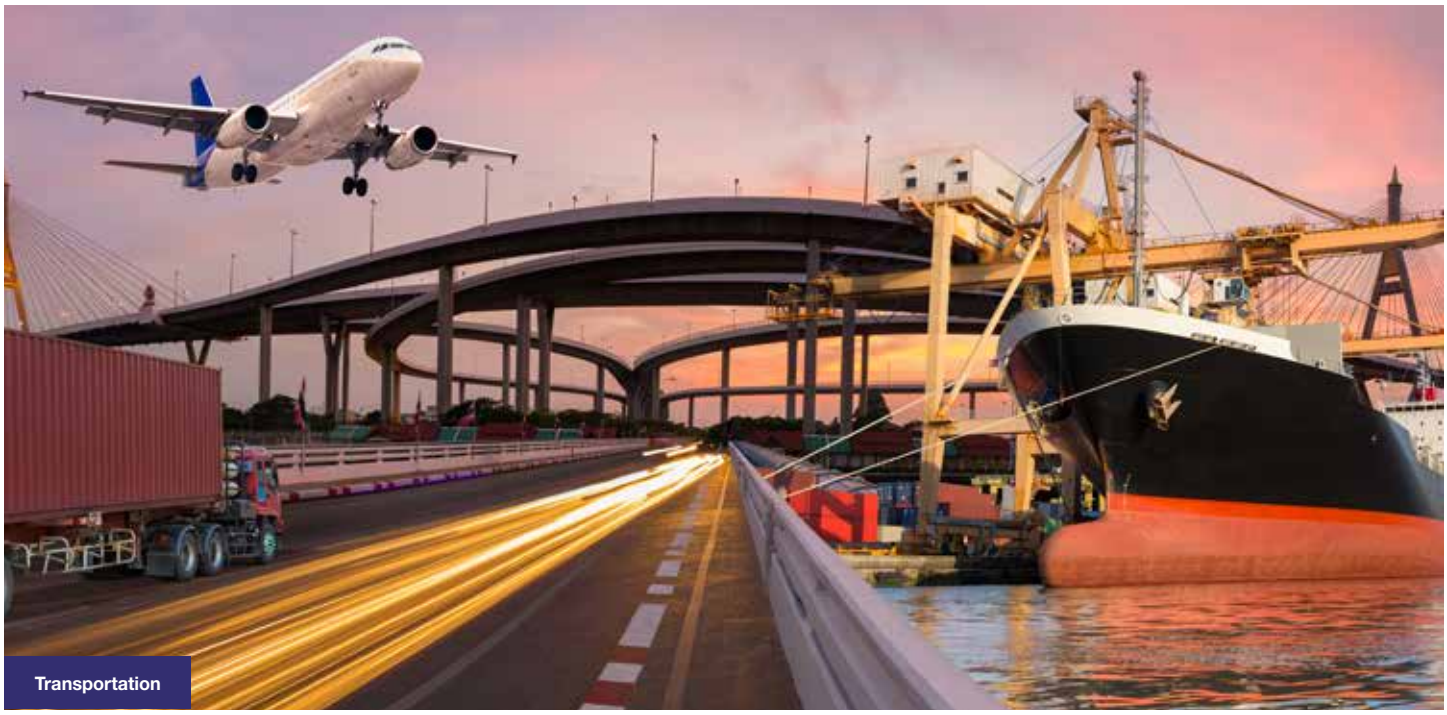
Q. What markets are you looking at for the Armada?

A. We're already selling it to the UK Ministry of Defence and we've also sold it to some of the major defence primes. Going forward, we're also looking at European defence forces.

Because the Armada's power requirement ranges from 90 volts up to 264, it can be used anywhere around the world, in Japan for example which has low voltage. Obviously we would like to sell to the Americans but they tend to develop their own kit. However, we are certainly going to target countries like Australia, New Zealand and Canada.



IATA regulations



Transportation

Q. Once a customer has bought an Armada, are there any maintenance issues?

A. No, it's effectively maintenance-free, so you don't have to do anything to it. Once we've provided the right Battery Interface Adaptor, the Armada doesn't need calibrating. It doesn't need anything. We're also working to future-proof it with software upgrades which we could easily send out to customers.

As far as I'm aware, the Armada is a unique product. Nobody else is producing anything equivalent. And because it has six ports, all of which can take a different battery chemistry type, you can set a lot of batteries to the state-of-charge you need.

Another great thing about the Armada is that it's not that big, 180 millimetres by 440 by 355, and it only weighs about 16 kilos. So, it's soldier-portable.

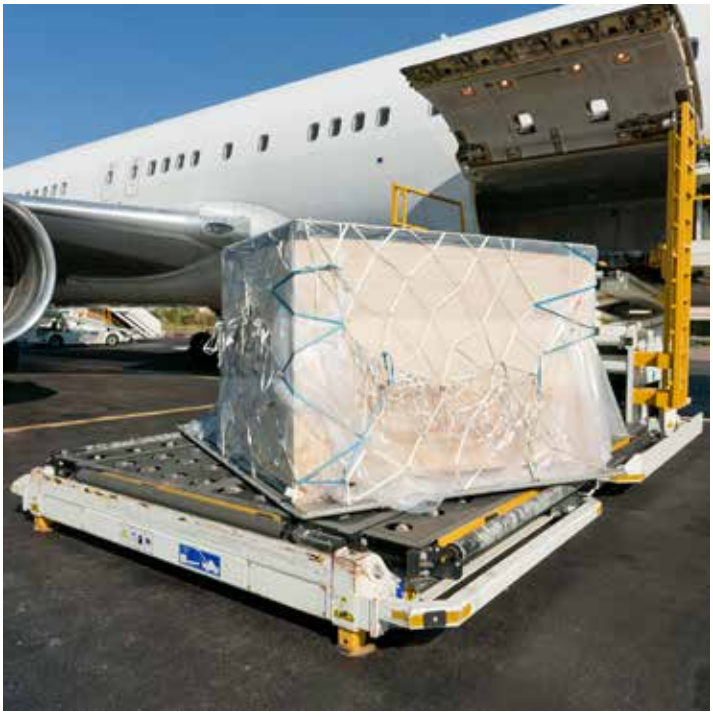
Q. Will you have an example of the Armada on the Lincad stand at DSEI this year?

A. Yes, we definitely will and we'll have it working on some of our products, some of our list products. So, people can ask questions and see it demonstrated. We'll also have our latest Caravel chargers on display as well.

Q. Any final comments you'd like to make?

A. Yes, it's important to point out that we are an entirely UK company. Everything we design and manufacture is done here in Surrey. So, exhibiting at DSEI with its international audience will be good for British business and will hopefully encourage a global market to buy more British products.

Aircraft loading



SPONSORING FORCE ATLANTIC

LINCAD sponsored a British Army team which competed in the annual Talisker Whisky Atlantic Challenge, considered the toughest rowing race on the planet.

IIn December the Force Atlantic boat, along with more than 20 other crews, set off to row the 3000 nautical miles from La Gomera in the Canary Islands to English Bay in Antigua.

Fewer people have rowed the Atlantic than have climbed Everest or travelled into space. Even the fastest crews take up to five weeks to complete the course, facing physical and mental challenges as well as everything the ocean can through at them.

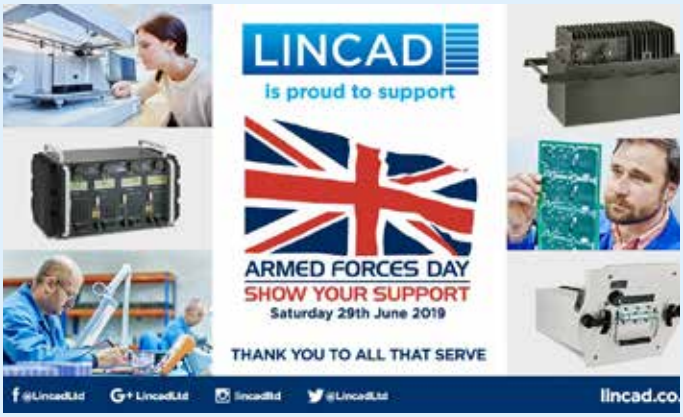
Force Atlantic was crewed by the Commanding Officer of the UK's Army Foundation College, two Captain instructors and one of the junior soldiers on course at the college. They competed as the British Army's official entry to successfully complete this extraordinary race.

The Army Foundation College is a unique institution that transforms the lives of over 1000 16 and 17-year-olds a year, turning civilians into soldiers. Many students come from disadvantaged or disaffected backgrounds and had dropped out of training, education or employment until the Army gave them a new career and purpose in life, such as this challenge.

Sponsored vessel


Crew

ALDERSHOT ARMED FORCES DAY



We were also proud to have sponsored Armed Forces Day in nearby Aldershot back in June. Armed Forces Day is an opportunity for people to show their support for the men and women who make up the military community, from currently serving troops to service families, veterans and cadets.

Festivities opened in Princes Gardens at 11am in advance of an army parade and everyone who came along was able to enjoy a variety of live music on the bandstand, food and drink stalls, free face painting and bouncy castles. The army parade then returned for a traditional Drum Ceremony with support from Hart Male Voice Choir.

We made our own particular contribution by presenting a celebration cake in the shape of one of the Landing Craft which were made so famous on D-Day, 1944, which was recently commemorated.

LINCAD WINS SME NEWS BEST SPECIALIST BATTERIES MANUFACTURER AWARD

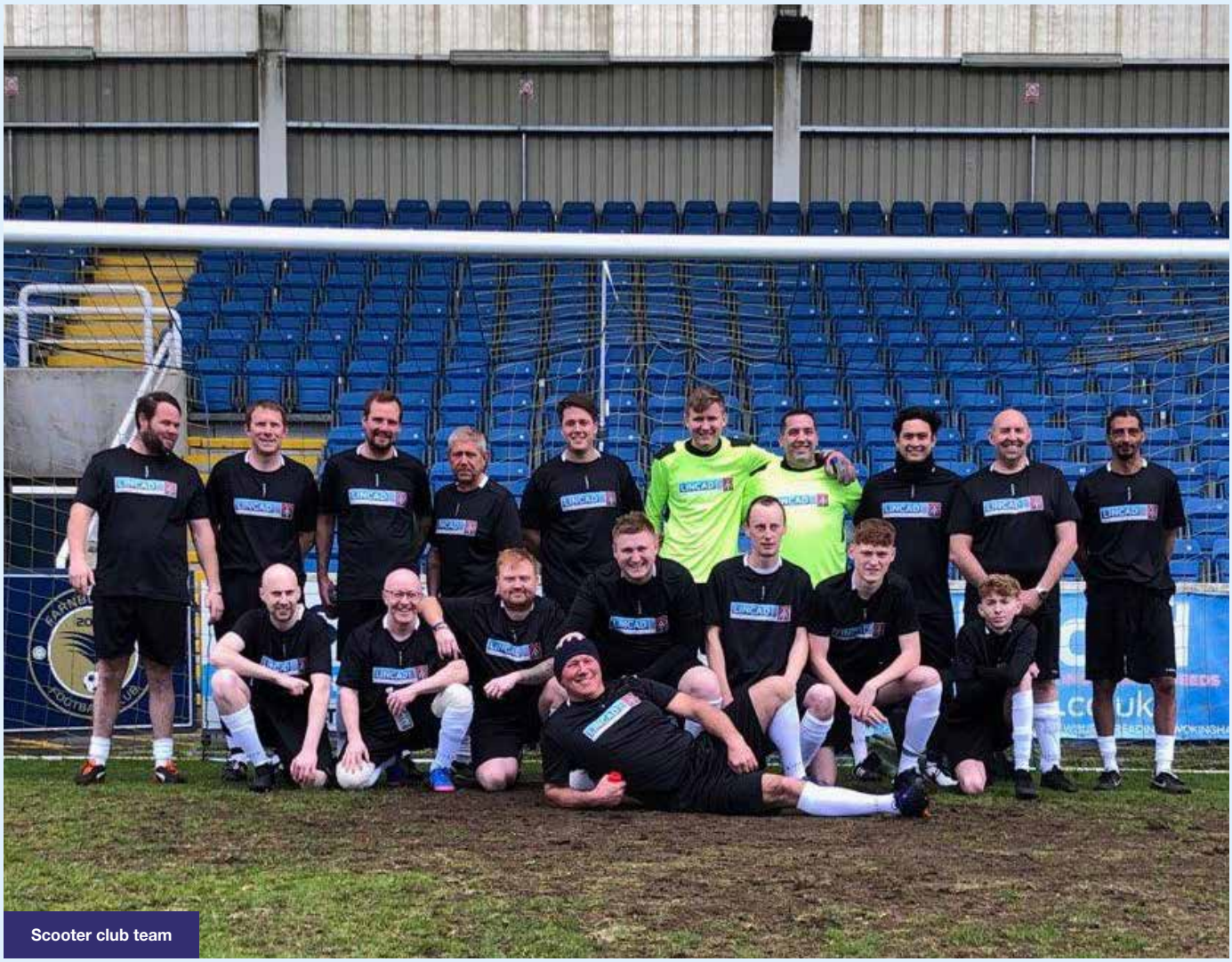
We were delighted to have recently won the SME NEWS Best Specialist Batteries Manufacturer Award

Why did we win? We attribute our success to our long-standing expertise in taking product performance to new limits, producing lighter, more powerful batteries with faster, more flexible charging solutions. Currently at the forefront of lithium-ion battery technology, we see our mission as one of remaining at the cutting edge of battery design and manufacture in order to meet ever evolving market needs. In order to achieve that we continue to invest significantly in our people and in new technology.

In addition to our industry-leading capability, we have an unrivalled record of experience in lightening the load on the UK's armed services personnel serving in the front line. Moreover, as an SME and a family business, we have the agility and flexibility to respond to customers' needs more quickly than competitors who have to deal with internal 'red tape'.

Prestigious award

SUPPORTING OUR LOCAL COMMUNITY



Scooter club team

Lincad has given its support to the Aldershot A5 Scooter Club, which took part in a charity football tournament organized by the Farnborough Hurricanes Scooter club recently, Funds raised by the event are to support efforts to pay for medical treatment for local Twins.

Lincad sponsored the full kit for Aldershot A5 Scooter Club's football team, including specially designed shirts that carried the Lincad logo. The inspiration for the sponsorship came from Lincad employee, Pete Copplestone, who approached Lincad for help as part of the company's ongoing commitment to supporting local charities and other worthy community initiatives.

Aldershot A5 Scooter Club was one of four teams of scooter enthusiasts to enter the football tournament. They were joined by Devizes Scooter Club, Farnborough Hurricanes Scooter Club and Bracknell Scooter Club, who all swapped their scooters for football boots during the fiercely-contested event. Afterwards, participants enjoyed a fun evening do that was accompanied by a live band.

Pete Copplestone, Operations Director at Lincad, commented: **"As a lifelong scooter enthusiast and member of the Aldershot A5 Scooter Club, I was delighted when I heard that Lincad were going to support us in our fundraising football tournament. The company provided us with a smart new set of branded shirts and we all felt proud to run out onto the pitch wearing them. A huge thank you to Lincad and to everyone who has supported this extremely worthy cause."**

HOW LINCAD BECAME A LEADER IN LITHIUM-ION BATTERY TECHNOLOGY FOR MILITARY APPLICATIONS

AT THE END OF THE LAST CENTURY...

Now at the forefront of lithium-ion (Li-ion) battery technology, Lincad began its journey into this chemistry back in 1999. It was then that the company became involved in the development of a Li-ion battery for soldier-portable radio equipment in partnership with the UK Ministry of Defence (MOD) and a global cell manufacturer.

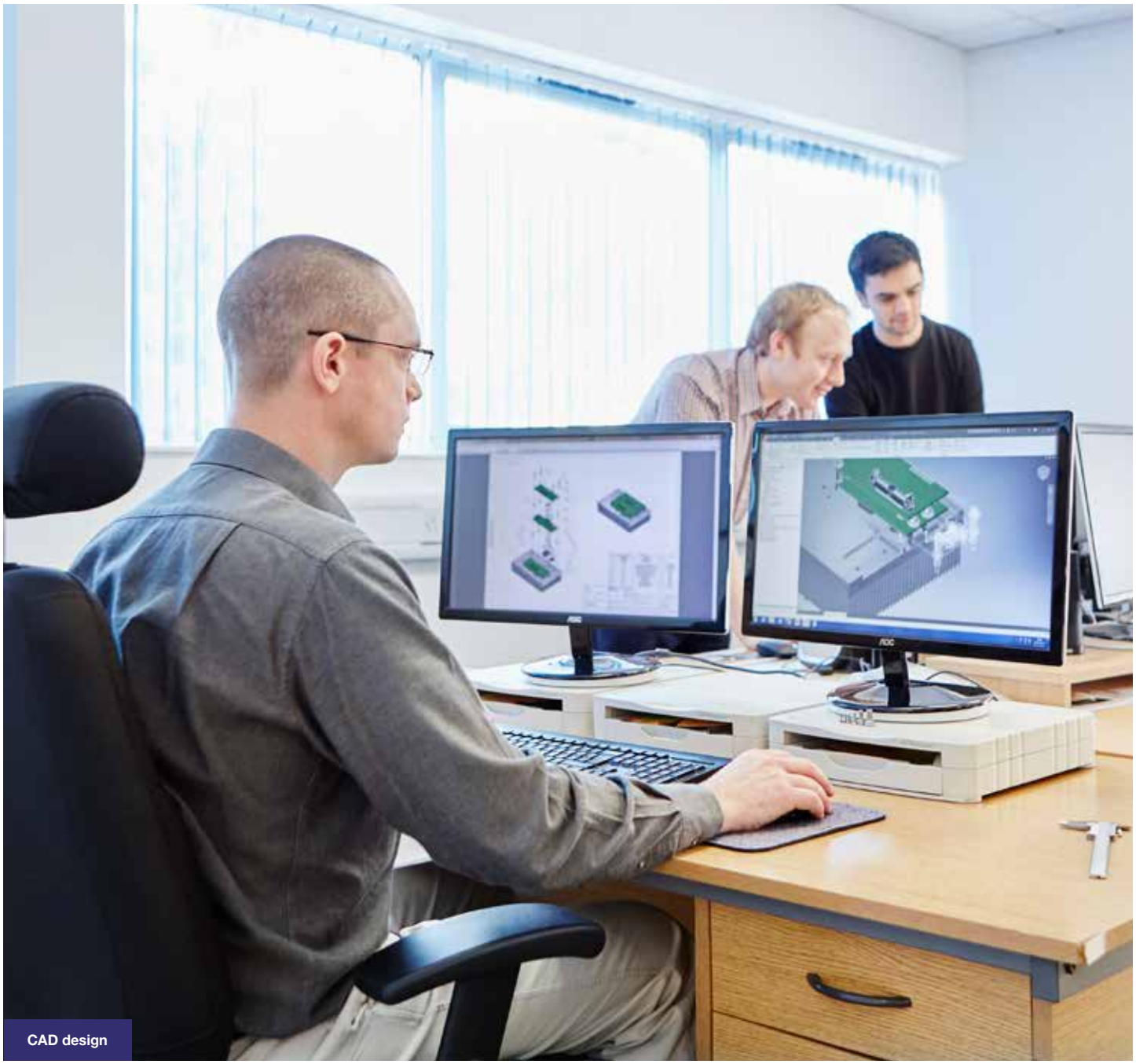
The new technology offered a 300% improvement on the energy density of some of the most common batteries in use at the time, a dramatic improvement for armed forces personnel who were already experiencing an upsurge in the use of portable powered equipment. The new battery was designated the LIPS (Li-ion Power System) 1 and had a capacity of 12Ah at a nominal 24V in a 3.6kg package.

Lincad continued to seek improvements to the products on offer to the MOD by producing a specific Li-ion equivalent to the then dated nickel cadmium (NiCd) battery used for the Clansman radio.

The Clansman was an integrated radio system, sometimes called a Combat Net Radio (CNR), which was not only much lighter than its predecessor but also more flexible and more reliable. Its main advantage was that it used switched channels as opposed to a variable tuning scale which provided frequency stability and removed the need for frequent tweaking to maintain a signal.

The new battery, entirely designed, developed and manufactured by Lincad, provided a 400% increase in available energy in comparison with the NiCd Clansman battery. This unit was designated the LIPS 2 and entered service in 2004 with a 14Ah capacity at a nominal 24V in a 3.2kg package.

End of line testing



CAD design

FURTHER DEVELOPMENTS

Although the rechargeable Li-ion battery was first proposed by chemist M Stanley Whittingham at Exxon in the 1970s and developed by John B Goodenough at the University of Oxford in 1980, the technology first started to gain wide commercial acceptance in the early 2000s. Further advances in cell technology enabled Lincad to replace the LIPS 2 with the LIPS 9, a battery which provided an improved 19Ah within the same footprint and weight.

The LIPS 9 marked the end of the development of the Clansman interface. However, the original LIPS 1 style interface continued with other LIPS-designated battery styles being generated in response to specific military requirements.

The next step in the LIPS 1 style interface was the LIPS 5 battery, which was introduced into service in 2005. The LIPS 5 provided a large capacity increase over the LIPS 1, to 19Ah with only a marginal weight increase to 3.7kg.

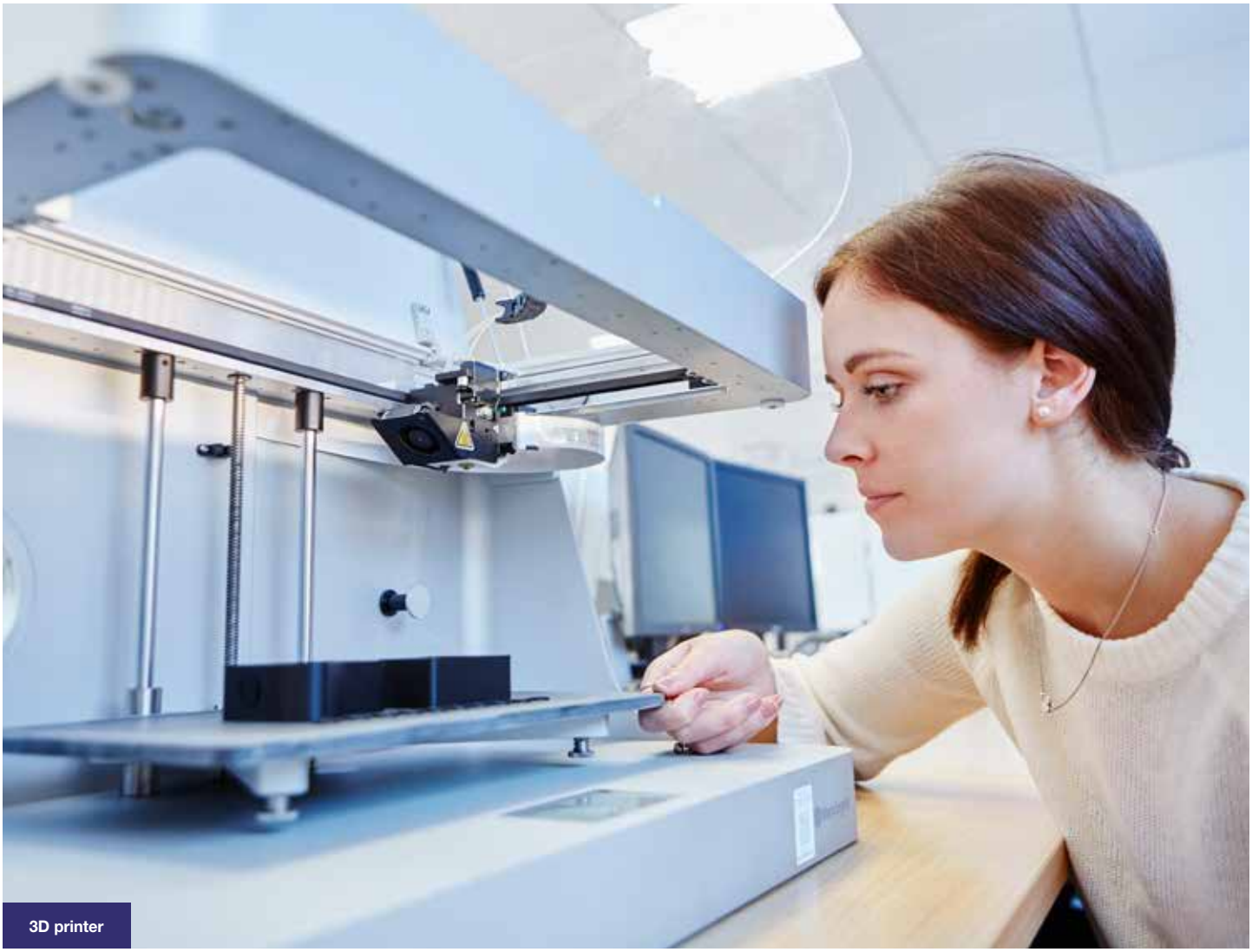
Further developments saw the evolution of the LIPS 5 into the LIPS 10 which maintained the exact style, weight and voltage of the LIPS 5 but with a further capacity increase to 23Ah. The LIPS 10 came into service in 2009. The LIPS 11 and LIPS 12 were size variants based on the LIPS 10, offering a two-thirds and one-third capacity at a reduced weight and size.

INTO THE FUTURE

Lincad's absolute commitment to investing in research and development has led to its newest battery, the LIPS 15. Maintaining the same packaging, weight and voltage, the LIPS 15 offers a 27Ah capacity. Further step changes in the LIPS 15 have included configurable software within the battery management system as well as greatly improved logging and diagnostics for fleet management.

20 years after its first concept was developed, Lincad continues to lead the way in Li-ion battery technology for military applications.

LINCAD INVESTS IN 3D PRINTING TECHNOLOGY TO TRANSFORM ITS BATTERY HOUSING MANUFACTURE



3D printer

Lincad has invested in a 3D printer which is already being used on a daily basis for the design and build of the cases that house its batteries.

3D printing, also known as additive manufacturing, is having a transformative effect across a number of industries. The ability to create an object from a digital file allows for the rapid design of prototypes as well as a faster, more efficient manufacturing process, including a significant minimization of wastage in the materials used.

"This investment is a major step forward for us", said Peter Slade, Joint Managing Director of Lincad. **"The installation of our 3D printer is already having a measurable effect on an important part of our manufacturing operation and will, undoubtedly, open up exciting new opportunities in the design and build process."**