

# We help Sweden's lightweight technologies take off.

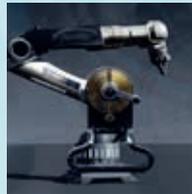
Technology leaps through collaboration



## Ready for radical solutions

LIGHTer Academy focuses on three areas of lightweight research: sustainability, internationalisation, and multifunctional materials and structures.

page 4–5



## Stronger, lighter and more durable

New techniques reduce weight, increase durability and speed manufacturing. The form of funding "Feasibility studies" is spawning even more leaps in lightweight technology – with improved sustainability.

page 6–7

## Stapes and stronger steel

3D printing of the stapes, the smallest bone in the human body, and stronger steel in a lighter gearbox are just some of the new innovations funded by LIGHTer SME.

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## Lightweight for PhDs

The LIGHTer PhD Network offers PhD students a broad perspective on both research and the industrial use of lightweight technologies.

page 10–11

## Europe looks to Sweden

The Swedish cross-disciplinary lightweight initiative is inspiring lightweight efforts across Europe, which highlights lightweighting as a game changer in the Green Deal.

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# We're growing with new actors

**W**e've had the biggest ever applicant pool in our calls. Many interesting new actors from various industries have joined LIGHTer's network. It just goes to show that industry's need for lightweight solutions is huge.

During the year, we saw technological leaps that resulted in radically lower weight and lots of good ideas for cross-industry lightweight technology. Swedish industry and research are now reaping the fruits of our funders' long-term perspective in the LIGHTer strategic innovation programme. The long-term perspective creates a sense of security, community, creativity and innovation. Thanks to this, we can report full activity in our new day-to-day lives where, despite a closed society, we have succeeded in expanding our partnerships.

## International interest

There is a great interest in LIGHTer around the world. When Germany hosted the European Lightweighting Network during its EU presidency year, we were highlighted as a model. We are now building European cooperation in lightweighting. Sustainability is gaining in importance in all our activities. One example is the collaboration with RE:Source, which involves several projects focusing on circular lightweight solutions. By joining forces, we can together develop new technologies that are sustainable throughout the life cycle.

## A lightweight summit

In 2021, for the first time, we will be arranging the LIGHTer Summit, two annual industry days in the field of lightweighting. The first year will be held completely online. Our hope is then to meet in person at the 2022 LIGHTer Summit. In the meantime, we'll help to meet challenges that are new to all of us.

### Cecilia Ramberg

Director  
 SIP LIGHTer



Learn more about SIP LIGHTer and all our ongoing projects at [lighter.nu](https://lighter.nu)

## This is SIP LIGHTer

SIP stands for Strategic Innovation Programme and is funded by Vinnova, the Swedish Energy Agency and Formas. SIP LIGHTer was one of the first five SIPs to receive funding. In total, 17 programmes have been awarded funding.

Lightweight technology is one of Sweden's industrial powerhouses. Now we are in stage three of four, which runs from 2020 to 2022. The roadmap, indicated in the Lightweight Agenda, aims for 2039.

For more information, see [lighter.nu/lva](https://lighter.nu/lva)

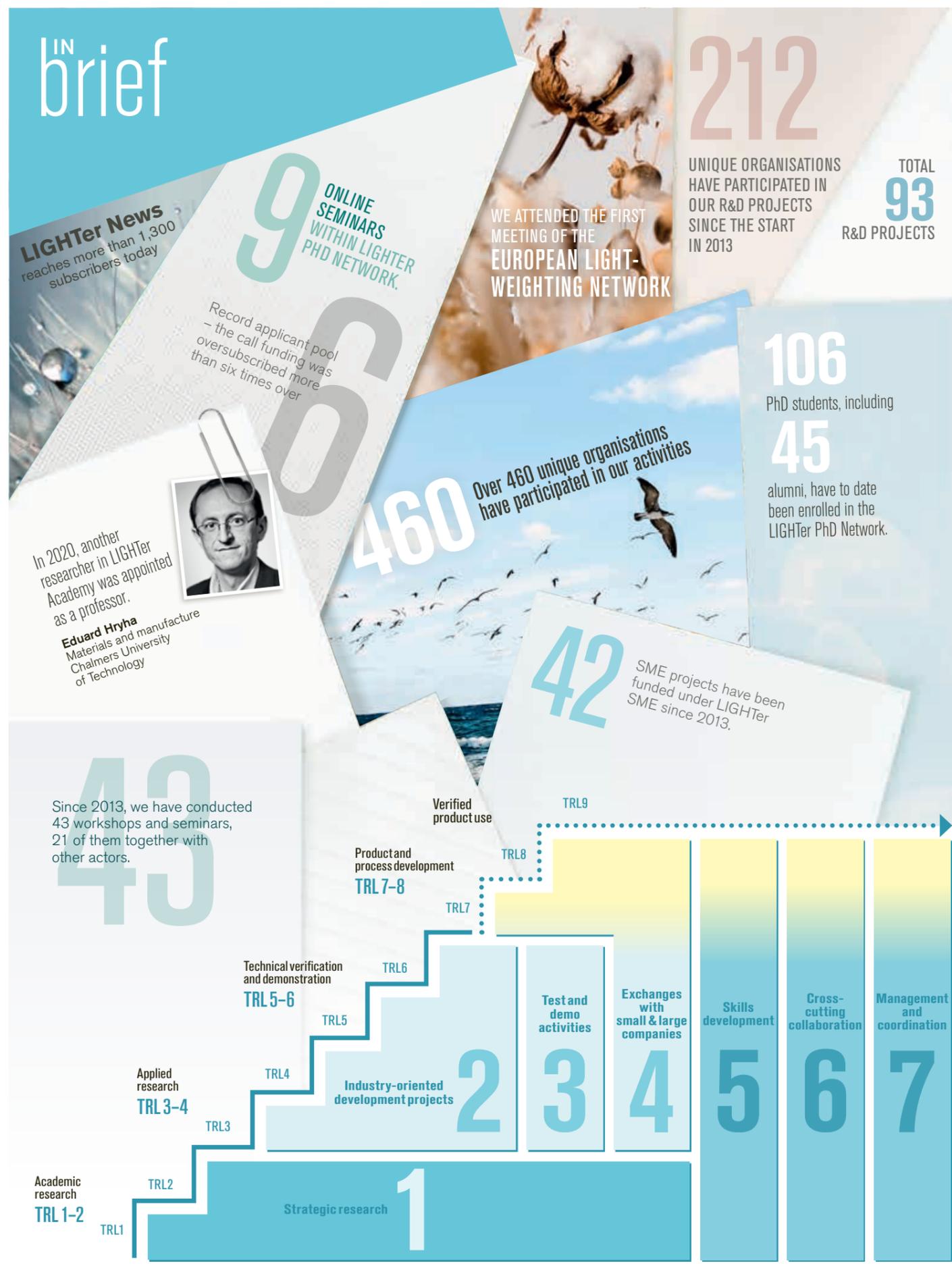
In this annual report for 2020, we want to show how SIP LIGHTer has evolved as we take a look at the future. We showcase a number of successful cases and meet some of the people are driving lightweight technology forward. We start with our seven innovation mechanisms in our common Lightweight Agenda.

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**The Lightweight Agenda's seven innovation mechanisms** can be linked to the steps of **the technology readiness levels (TRL)**. This illustrates the need for interaction at all levels. SIP LIGHTer's operational function extends up to TRL 6 with a focus on creating an effective structure for developing technologies, test environments, materials and people. In this annual report, we follow up on some of the concrete results we have already achieved.

**Strategic research**

Creating new structures for strategic Swedish research boosts cross-disciplinary research collaboration between industry and academia.

**LIGHTER ACADEMY**

# Strong research network ready for radical lightweight solutions

LIGHTer Academy welcomed five new companies into the network in 2020. We have now entered stage 3, where we focus on three areas of lightweight research: sustainability, internationalisation, and multifunctional materials and structures.

In 2020, five new companies joined the network. LIGHTer Academy now consists of 12 researchers from universities, 20 from industry and 3 from research institutes. This makes us a powerful network with broad expertise, ready to take on even greater societal challenges and create radical, sustainable future lightweight solutions.

**Important part of research strategy**

Gestamp HardTech in Luleå is one of the companies in our network. The company has a long tradition of developing and manufacturing body components for the automotive industry. They have a strong focus on lightweighting and crash safety. High sustainability targets are forcing the automotive industry to look for new breakthroughs in lightweight technology.

“Being part of the national network that LIGHTer Academy brings together is an important part of Gestamp’s research strategy. Our collaboration within LIGHTer Academy has already yielded results in the form of development projects, and we look forward to continuing our work,” says Rickard Östlund, team leader in research, simulation and testing at Gestamp HardTech in Luleå.

**Seminars with international researchers**

In the autumn of 2020, LIGHTer Academy kicked off an online seminar series. The participants get to meet invited guests, often international researchers, who discuss the latest research. The seminars are given once a month and are open to anyone. They are advertised on LIGHTer’s website, where we also have links to scientific publications from LIGHTer Academy.



“Taking part in the national network that LIGHTer Academy brings together is an important part of Gestamp’s research strategy,” says Rickard Östlund at Gestamp HardTech in Luleå.

**“Our collaboration within LIGHTer Academy has already yielded results in the form of development projects.”**

**Rickard Östlund**  
Team Leader, Gestamp HardTech

**MANAGEMENT TEAM**

**LIGHTer Academy’s 12 part-time funded researchers**



**Malin Åkermo**  
Lightweight constructions  
KTH Royal Institute of Technology



**Dan Zenkert**  
Lightweight constructions  
KTH Royal Institute of Technology

Andreas Borg, GKN Aerospace Engine Systems, is also a member of the management team.



**Leif Asp**  
Material and computational mechanics  
Chalmers University of Technology



**Anna-Lena Ljung**  
Fluid mechanics and experimental mechanics  
Luleå University of Technology

Please contact one of the academic researchers if you have ideas or want to talk about technology and the future: [lighter.nu/la](http://lighter.nu/la)



**Fang Liu**  
Materials and manufacture  
Chalmers University of Technology



**Martin Fisk**  
Material science & applied mathematics  
Malmö University



**Lars-Erik Lindgren**  
Material and solid mechanics  
Luleå University of Technology



**Martin Fagerström**  
Material and computational mechanics  
Chalmers University of Technology



**Lars Nyborg**  
Industrial and materials science  
Chalmers University of Technology



**Greta Lindwall**  
Materials science  
KTH Royal Institute of Technology



**Eduard Hryha**  
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Chalmers University of Technology



**Håkan Hallberg**  
Solid mechanics  
Lund University of Technology

**Five results**  
from new research at LIGHTer Academy

**Nitrogen content important for carbon fibre**

Nitrogen content and its chemical configuration play a key role in the electrochemical properties of carbon fibres. This is something that LIGHTer Academy researcher Fang Liu has demonstrated. Her discovery makes it possible to design carbon fibre for multifunctional applications.

She studied a tiny piece of carbon fibre in the form of a cone, about 50 nm in diameter and 60 nm long. The sample was analysed, atom by atom, in three dimensions using atomic probe tomography (APT), an advanced analytical device with the highest spatial resolution for chemical analysis. In addition, Liu has also shown how nitrogen atoms bind to other atoms using so-called Hard X-ray Photoelectron Spectroscopy (HAXPES) at DESY, a synchrotron plant in Germany. LIGHTer Academy researcher Leif Asp collaborates in the project.

**More efficient manufacturing of metal additives**

The productivity of laser-based metal additive manufacturing can be increased by 44 percent compared with the standard process. This is the outcome of a study conducted by LIGHTer Academy researchers Camille Pauzon, Eduard Hryha and Lars Nyborg in partnership with Linde Gmbh. The study finds that helium, thanks to its low density combined with high specific heat capacity, stabilizes the process during laser melting. This enables an increase in the productivity of laser-based metal additive manufacturing without compromising the properties of the materials. The study broadens the perspective on the development of customised gas mixtures. These in turn provide improved process stability and increased productivity for laser-based metal additive manufacturing.

**Behaviour of composites during crashes crucial for auto industry**

Stepping up the use of composite materials in the automotive industry requires more knowledge of what happens in a crash. The development of predictive, effective calculation models and methods describing the behaviour of composite materials over the course of a crash is needed. Swedish partners have been conducting research towards achieving this goal for seven years. In 2020, the Swedish consortium “Modelling of crash behaviour in future lightweight vehicles” published four journal articles on the theme of composite materials in collisions. Two of the articles published new models for the behaviour of composite layers under mechanical loads equivalent to a crash, and two articles presented a more efficient calculation method for describing the formation and growth of delamination cracks. The work that served as input to the articles was carried out in collaboration between PhD students and senior researchers at Chalmers and RISE. The consortium includes a total of seven LIGHTer organisations led by LIGHTer Academy researcher Martin Fagerström.

**Generic particle model**

The GEPRE LIGHTer project is developing a generic tool to predict microstructure development in nickel-base alloy components. The research is based on data from Calphad databases. The tool should be able to be integrated into a finite element program. GEPRE members include LIGHTer Academy researchers Greta Lindwall (KTH), Martin Fisk (MAU) and Lars-Erik Lindgren (LTU), together with Sandvik Materials Technology and GKN Aerospace Sweden.

**Tools accelerate composite manufacturing in aviation**

Targeted research makes the production of aerospace components in composite materials more time- and energy-efficient. It leads to products with consistently better quality. One example is an innovative preforming technique that allows structural composites to harden to perfect geometry in concave cure tools. This is the result of industry PhD student Tommy Grankäll’s research together with LIGHTer Academy researchers Per Hallander from SAAB and Malin Åkermo from KTH. They have also succeeded in extending the durability of composite tools with underlying support structure. And they have reduced the forming time by 80 percent while improving the quality of the component. Their studies were based on solid industrial experience and the development of numerical models describing heat conduction and the formation of residual voltages. New verification methods have been used for mapping material movements using tomography, for example. All the studies are now published, the majority as open access.

**12 RESEARCHERS** from five Swedish universities receive part-time funding from SIP LIGHTer, and about 23 active researchers from research institutes and industry interact with LIGHTer Academy. The aim is to formulate the right research questions together in order to meet the future needs of companies. This strengthens Swedish industry through both incremental development and radical innovative solutions within lightweighting.

**BROAD EXPERTISE** is represented in metals, composites, modelling, simulation, manufacturing processes, multimaterial solutions, additive manufacturing, multifunctional materials and advanced characterisation methods. This creates an effective transfer of knowledge to industry and promotes lifelong learning.

**Industry-oriented development projects**

Through innovation projects with implementation within five years and more visionary projects at lower technology readiness levels, we strengthen several industries and supplier levels at the same time

**LIGHTER INDUSTRIAL PROJECTS**

# 93 projects since inception

Through LIGHTer Industry projects, 93 research projects have been initiated since 2013. Cross-cutting initiatives give rise to new forms of collaboration that both deliver concrete results and strengthen value chains among the different technology readiness levels.

The Extreme project is just one of many examples that prove this. Read more at [lighter.nu/li](http://lighter.nu/li)

**PROJECT: EXTREME**

## Stronger aluminium challenges titanium and steel

With casting methods for a strong aluminium alloy, the Extreme project aims to open the door to new lightweight materials that can challenge titanium and steel in the aerospace and automotive industries.

**What was Extreme all about?**

"Extreme was about investigating material properties and developing casting methods for a new and very strong aluminium alloy. We wanted to gain weight and cost savings compared to titanium alloys for aircraft engines, and possibly also replace steel components in the automotive industry with aluminum components," says Ceena Joseph of GKN Aerospace.

**What results did you get?**

"We characterised the material well and confirmed its good mechanical properties. We studied two casting processes: precision casting for engine components for the aerospace industry, and solid

mould casting for ground vehicle components. The precision casting worked well, while the few attempts with fixed tools did not produce the desired results."

GKN Aerospace was trying to find a replacement material for a highly charged jet engine component that can withstand a large number of load changes. The Extreme project concluded that the fatigue properties are not good enough to justify a material change for the intended jet engine component. However, the material can function for components that are less fatigue-stressed.

**How does this type of project benefit GKN Aerospace?**

"We've been able to evaluate new material in a network of people who have relevant and deep expertise. The work has not only produced technical results, but has provided new expert networks that will benefit us in the future."

**What's the next step?**

"We've begun a next-step project within SIP Innovair that the core from Extreme – RISE, Jönköping University and a German foundry – is working on in two tracks. One is to develop the casting method an additional step to minimise material defects that can limit the fatigue properties. Another track involves investigating whether the material is suitable for additive manufacturing."

**How will the field develop in 10–20 years?**

"Hopefully, both the aerospace and automotive industries will have managed to introduce new lightweight materials by then."



Ceena Joseph of GKN Aerospace Engine Systems has been involved in developing manufacturing methods for a new strong aluminium alloy.

**PROJECT EXTREME**

GKN Aerospace and Fundo Components took part in the Extreme project as industry partners. Jönköping University and RISE provided material simulation support, and RISE was the project manager.

**FEASIBILITY STUDIES**

# New form of funding gives technology leap

The new form of funding "Feasibility studies" makes it possible to increase risk-taking in research based on the needs of industry.

The testing of radical ideas in groups that possess a wide range of skills increases the chances of achieving greater results in the long term.

LIGHTer's network is the core for developing ideas into industrial performance.

Here are 10 examples of projects that show how collective ownership of risks and the creation process pave the way for the industrial lightweight solutions of the future.

**G-LEC / Graphene**

**A scalable spraying process lowers the weight of graphene-coated aluminium and retains its ability to conduct heat.**

The project has developed a scalable spraying process for the manufacture of graphene-coated aluminium. This makes it possible to lower the weight of aluminum components while maintaining their ability to conduct heat. It opens the door to new lighter solutions than the aluminium currently used for industrial thermal management.

**Novela / Light metals**

**The Novela project demonstrated exceptional properties for light alloys at room temperature and elevated temperatures when implementing high-entropy alloys.**

Light alloys have limited applications at elevated temperatures. Novela wanted to develop aluminium and titanium alloys for elevated temperatures according to the entropy concept and to develop a material that has a density close to aluminum alloys but with mechanical properties close to titanium alloys. The project produced exceptional results. The fatigue limit of alloys increased up to 31% at room temperature, and ductility improved by up to 47% at 200°C compared with the reference alloy (Al-A357).

**xPress / Nylon**

**Crosslinked nylon has the potential to become a new material in the luxury car and aerospace industries.**

The xPRESS project has tested a new material and manufacturing concept using short-fibre crosslinked nylon reinforced with fibreglass. The crosslinker provides a much stronger material as well as less shrinkage and heat expansion. The mechanical properties, together with the process properties, are very promising

**BBC4A / Birch bark**

**Birch bark can replace minerals as plastic fillers and provide both lower weight and better sound absorption. This could provide new opportunities for the European car industry, which must adapt to legal requirements for recyclability.**

The cross-industry project BBC4A showed promise for birch bark to replace minerals as plastic fillers.

Birch bark produces composites with similar mechanical strength but a much lower weight and improved sound absorption properties. This can result in lighter car parts and create business opportunities for the forestry industry.

**LIGHTCON / Concrete**

**The LIGHTCON project showed that corrosion-resistant reinforcements have the potential to save weight in concrete structures.**

The weight savings comes from a reduced amount of concrete in the overlay. It is highly likely that the concrete overlay on edge beams in bridges and also on bridge decks can be reduced. It might also be possible to build bridge decks without insulation and asphalt on bridge decks, reducing both weight and material costs.

**YMPMAT / Aluminium**

**Solidification cracking is a problem when certain aluminium alloys are welded. The addition of nanoparticles to the melt can provide a more favourable solidification.**

The YMPMAT project showed that adding nanoparticles to welding melt produced significantly less grain in the welding material, reducing the risk of solidification cracks and liquation cracks. The technology itself works, but the way nanoparticles are added must be developed in order to be commercially viable.

**HiSLow8 / AM alloys**

**HiSLow8 demonstrated the potential to significantly reduce costs and accelerate the development of high-strength aluminium using computational materials design.**

The empirical development of high-performance materials for additive manufacturing can be both expensive and time-consuming. Computational materials design could significantly reduce costs. The project used selected computational tools to design an alloy with hardness values in the 7075-T6 class without complicated finishing. In addition, processability was demonstrated during TIG and laser welding without heat cracks, similar to AlSi10Mg. The prototype alloy for additive manufacturing shows great potential for the aerospace industry.

**EV Lightweight / Batteries**

**EV Lightweight wanted to enable electric vehicles (EVs) to charge in 6 minutes with a cheap, lightweight battery that had a long service life. This was accomplished through tab cooling.**

There is potential within the entire automotive market. The project conducted simulations using an evidence base, without friezing. It also used the world's first property measurements of 3D iExtrusion profiles, carried out by Professor A. Jarfors. The results showed very low and even temperatures. This opens the way for combining 6-minute fast charging with a long service life. The land and air EV industry has expressed an interest, and the results will be validated at RISE's battery lab.

**Newcoat / Thermal spraying**

**Environmental barrier coatings (EBC) is a pioneering research topic in the aerospace industry aimed at protecting certain composite materials at high temperatures.**

Ceramic matrix composites (CMCs) are extremely interesting to the aerospace industry, with their low weight and exceptional thermomechanical properties. At high temperatures, CMCs must be protected with an EBC. Newcoat was the first in Sweden to use thermal spraying of EBC. The results confirmed that thermal spraying temperature and speed are key parameters for achieving a crystalline, leak-proof coating.

**UVAM-LIGHT / Aluminum alloys**

**The UVAM-LIGHT project set out to find a machining process that reduces tool wear using ultrasound and pressurised liquid nitrogen.**

Reducing the weight of electric vehicles is becoming increasingly important. An aluminium SIKA material with silicon carbide from AC-Floby shows great promise for reducing the weight of many products. But it wears heavily on the tools, entailing a high machining cost. UVAM-LIGHT was able to show that ultrasound-assisted machining during drilling in combination with pressurised liquid nitrogen can have an impact on the cutting process and extend tool life.

**Test and demo activities**

We must continue to increase availability, minimise business risks and create synergies along the entire value chain and across industries.

**LIGHTest**

# Hardens carbon fibre composite with induction

The LIGHTest testbed project is now entering its final phase, with several goals achieved:

- 13 pilot projects have developed sustainable materials and processes
- Mandatory sustainability analysis of results
- The open project form created at least seven new partnerships between large and small enterprises
- In 2020, the testbeds were digitalised so that customers could participate in experiments remotely

The collaboration continues between the testbed nodes in Piteå and Olofström.

The latest approved project, "Effective direct heating process", is about the production of carbon fibre composite. It was carried out for Corebon AB, with Lund University as pilot manager and RISE as partner. Carbon fibre prepreg was hardened and consolidated using two different methods: traditional, using heated metal tools, and with the new technology, direct heating of carbon fibre composite via induction.

The feasibility study shows that it is possible to achieve the same degree of hardening with the new technology. This could bring great production benefits in terms of significant energy savings and shorter cycle times.



"Hardening carbon fibre composite with induction was overall a highly successful project," says Kenneth Frogner from Corebon.

**A total of 13 LIGHTest pilot projects have been launched.** Five more projects, with a special focus on SMEs, have been implemented. We present two of them that delivered outstanding value through rapid time-to-market:

**Swedfoam Development**

**Material development via manufacturing method in lightweight materials**

Agile processing in the testbed allowed Swedfoam to respond swiftly to a customer request. Together with experts from LIGHTest, a resource-efficient moulding of foam materials was developed.

**Nils Malmgren AB**

**Syntactic epoxy for battery applications**

Swedfoam also took part in this project, which developed new material variants and sparked the interest of several potential customers. The work continues, with a large-scale prototype in a project funded by Region Västra Götaland.

**Digi Demo Day** For the fourth consecutive year, we hosted an inspirational day in September around testbeds where we showcased industrial digitalisation. This year's theme was networked testbeds for digitised production systems. The focus was on production of lightweight products with shorter lead times and reduced costs.



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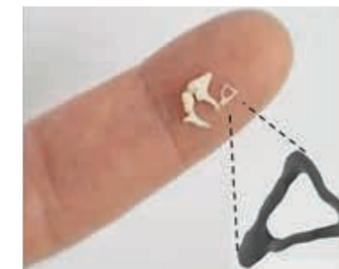
**Exchanges with small & large companies**

We need to find the optimal interaction between small tech-oriented companies and Sweden's major global manufacturing industries.

**LIGHTER SME**

# How new value chains are built

LIGHTer SME is a series of calls for proposals to develop Swedish small and medium-sized enterprises (SMEs). Since autumn 2017, two calls have been issued every year. 2020 was a record year, with 36 applications. Read more about two of the projects.



"Through 3D printing, we have succeeded in creating an imprint of the smallest bone in the human body, the staples, in graphene oxide-reinforced composite," says Gustav Skog, project manager at Grafren in Linköping.

**GRAFREN, LINKÖPING**

**Can composite replace the staples in the ear, the smallest bone in the human body?**

Grafren is a company that works on industrial implementation of graphene in the field of lightweighting. In April 2020, the company carried out its first project under the LIGHTer SME call. It involved demonstrating an implant prototype for the staples, the smallest bone in the human body, critical to our hearing. The prototype used a newly developed graphene oxide-reinforced composite for 3D printing using digital light processing, or DLP, a technology that can print advanced details with high accuracy. With this prototype, the project

wanted to re-create the natural bone structure of the staples and provide the best possible functional properties. Mechanical properties were tested together with vibration properties. The results show great potential for future medical implant applications.

Last autumn, Grafren was awarded a grant to conduct the feasibility study "Ultralight coating for electrically conductive textiles" within the framework of LIGHTer's major call in 2020. In total, nine out of 59 applications received were awarded a grant.

Grafren is located in Linköping and has partners in several countries, both in academia and industrial research institutes.

**AUTOINVENT TRANSIP, FALUN**  
**Swedish innovation and clean steel in electric car powertrains bring lower weight, increased mileage and lower manufacturing costs.**

The transition to electrified transport places new demands on electric car components. Within LIGHTer SME, AutoInvent Transip has developed a concept for an integrated powertrain for electric cars with a patented gearbox solution, Belix®. Their goal is to create a gearbox with low weight, small interior dimensions, high efficiency and longer range.

**"The project shows how technology, design and materials become strong together. Our goal is to move forward and build real prototypes."**

**Niklas Bennstedt**  
Founder, AutoInvent Transip

In collaboration with Ovako, they have used Ovako's product family of ultra-clean steels, IQ-Steel®, which have better fatigue properties and conditions to meet high system requirements. New technology and clean steel in the drivetrain components provide a lighter, smaller gearbox at a lower manufacturing cost and increased mileage.

The next step is a prototype for assembly and demonstration in an electric vehicle. The Belix® technology can be used in other areas, such as in wind turbine gearboxes.



Niklas Bennstedt, AutoInvent Transip, shows a powertrain concept and gears that can be used in new electric cars in the future.



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**Skills development**

By continuing to develop forums for skills exchange and training with a multidisciplinary mindset, we complement the industries' own training.

**LIGHTER PHD NETWORK**

# A sustainable network for PhD students

The idea behind the LIGHTer PhD Network is to create a sustainable network for PhD students, senior researchers at higher education institutes, and industry actors in lightweight technologies.

The LIGHTer PhD Network offers PhD students studying lightweighting a broad perspective on both research and the industrial use of lightweight technologies.

This takes place in an annual PhD course offering lectures and study visits to five industrial companies over a total of ten days. The companies also talk about their sustainability efforts. The examination takes place in conjunction with a SIP LIGHTer event.

The host of the LIGHTer PhD Network is Luleå University of Technology, which together with the Royal Institute of Technology, Chalmers University of Technology and RISE develops activities for the long-term PhD student Network.

One of the novelties in 2020 was online seminars given monthly by PhD students, alumni and invited researchers.

"It's been a challenge because there's great value in meeting in person. Industry players have partic-

**"This is one of the highlights of the year when we get to know some fantastic and enthusiastic researchers. And who knows, maybe some of them will eventually become employees at Saab."**

**Per-Olof Marklund**  
Head of Innovation & Technology at Saab Aeronautics.

ipated in a fantastic way despite completely new circumstances," says Pär Jonsén, project manager at Luleå University of Technology.

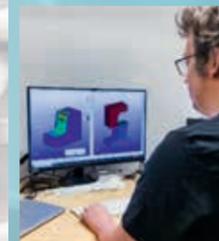
**International contacts**

Several of the network's alumni are involved in exciting research at global companies and universities in the U.S., Switzerland and other countries.

"We have a great experience of LIGHTer and we encourage our own industry PhD students to participate in the network so they can become a natural part of the research community around lightweighting," says Per Hallander, technical specialist in composite technology at Saab Aeronautics.



*In 2020, the in-person meetings and company visits shifted to online activities.*



*Online demonstration of production method for lightweight detail in the LIGHTer testbed at the course in collaboration with GKN Aerospace.*

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LIGHTer PhD Network's unique PhD course runs for ten days with five training sessions and offers academia-industry collaboration:

- |   |   |  |  |   |
|---|---|--|--|---|
| <b>1. Material selection</b><br>Chalmers, Volvo Car Group in Göteborg | <b>2. Composite materials</b><br>KTH, Saab in Linköping | <b>3. Cellular materials and sandwich constructions</b><br>KTH, DIAB in Laholm | <b>4. Metalliska material</b><br>LTU, RISE, GKN, Brogren Industries in Trollhättan | <b>5. Manufacturing of metal structures</b><br>LTU, Gestamp Hardtech in Luleå |
|---|---|--|--|---|

**LIGHTER INDUSTRY COURSES**

## Much-appreciated course on vacuum injection

During the year, we published the first part of our online course on composite materials. The course was on vacuum injection and was much appreciated.

"The video about vacuum-injected composites is good. I like the whole arrangement. It's also fun to see images from industrial production," says Anders Sjunnesson at GKN Aerospace Engine Systems, a course participant.

**European industry courses**

LIGHTer industry training has started a partnership with EIT Raw Materials Academy. This means that

in 2021 LIGHTer can offer a sampling of courses from the Lightweighting Professionals training programme.

In the courses, participants learn how to design and manufacture lightweight products with the support of leading European experts.

We will also offer members of the Lightweight Membership Programme good discounts on the entire programme. For more about the programme, visit [lightprof.eitrawmaterials.eu](http://lightprof.eitrawmaterials.eu)



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**LIGHTER PRODUCT OPTIMISATION**

## Lighter products in less time

Industry demand for lighter products in less time has put product optimisation on the lightweight agenda.

Product optimisation is yet another example of how SIP LIGHTer creates networks where industry, academia and research institutes together develop new, smarter work methods for lightweight designs.

"But it's also about developing the employees so that they can use these new methods," says Harald Hasselblad, analytical engineer at Volvo Car Group and member of SIP LIGHTer's management team. He runs the LIGHTer Product Optimisation network together with Mikael Thellner, technical expert at Scania.

In the automotive industry, as in others, it can traditionally be a time-consuming process for designers and com-

putation managers to produce relevant results.

A more optimisation-driven development minimises time-to-market. Here, there is scope for more ambitious efforts to work in parallel as well as new virtual tools that focus on weight reduction.

"In industry, we want to develop lighter and better products in less time. With LIGHTer Product Optimisation, we're developing new methods to achieve this," Thellner says. Product optimisation has taken a step into the Lightweight Agenda.

"We're now designing an online course to reach even more people," Hasselblad says.

**Activities in LIGHTer Product Optimisation**

- Seminars
- Initiation and coordination of degree projects and applications of research projects
- Industry-oriented development projects
- Development of online courses



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**Cross-cutting collaboration**

The interaction among regional, national and global stakeholders is a key success factor, and we are always seeking regular collaboration with public-sector funders, industry organisations and other strategic innovation programmes.

LIGHTer INTERNATIONAL

# Sweden inspires Europe

The Swedish cross-disciplinary focus on lightweighting has become a source of inspiration for several European countries as they make similar lightweight investments.

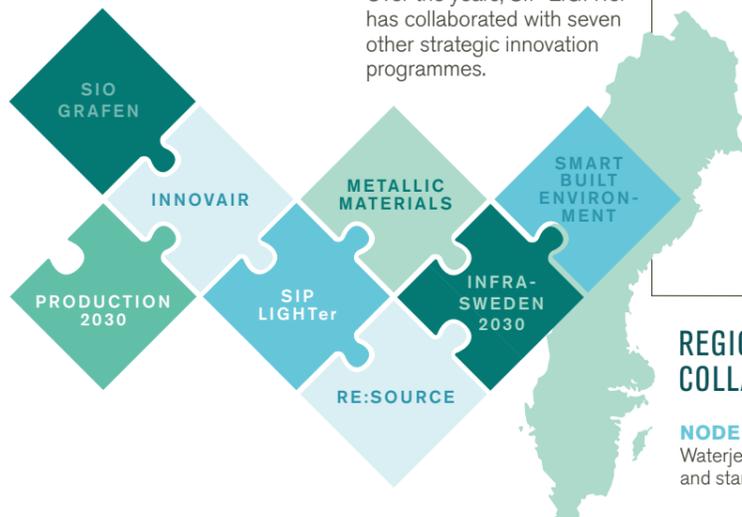
Since the beginnings of LIGHTer in 2013, other European countries have been inspired by our approach, which spans multiple industries and diverse topics. Germany launched a similar lightweight initiative seven years after Sweden. France is thinking along similar lines. Switzerland, Austria, England, Spain and the Netherlands all want to work with us.

**Essential for the EU's Green Deal**

Lightweight development in Swedish industry and research is international in nature. LIGHTer is also the driving force behind major European research efforts in interdisciplinary new lightweight technology, a necessary piece of the puzzle in the EU's Green Deal. In the Green Deal, new lightweight technology is becoming a vital part of developing electric vehicles, wind power and wave power in remote locations, and more efficient hydrogen-powered aircraft.

**NATIONAL COLLABORATION**

Since its inception in 2013, SIP LIGHTer has arranged 43 workshops and seminars around Sweden, 21 of which were arranged with others. Over the years, SIP LIGHTer has collaborated with seven other strategic innovation programmes.



**INTERNATIONAL COLLABORATION**

**BILATERAL COOPERATION WITH SWITZERLAND**

During the year, we continued to engage in dialogue with partners in Switzerland. We are planning a trade mission and participation at the Swiss-Swedish Innovative Initiative (SWII) conference. A bilateral call will open in conjunction with the conference.

**FIRST EUROPEAN LIGHTWEIGHTING NETWORK MEETING**

In November, LIGHTer attended a meeting hosted by Germany's Federal Ministry for Economic Affairs and Energy. Germany wants to establish a European lightweight network, and LIGHTer was one of five invited networks to present its activities.

**CONTINUED WORK WITH ELCA**

We are now a paying member of the European Lightweight Cluster Alliance (ELCA) and have agreed to continue to lead a working group. In more news, ELCA will build a LinkedIn-like network.

**REGIONAL COLLABORATION**

Several regions have taken the initiative to create SIP LIGHTer Nodes with different orientations:

- NODE Blekinge**  
Waterjet cutting and stamping
- NODE Småland**  
Strategies for meeting customer requirements
- NODE Västra Götaland**  
SME collaboration

**Management and coordination**

The ability to coordinate financial resources and the roles of cross-industry partners is an important prerequisite for creating long-term viability and a clear direction in a large portfolio of research and development projects.

**STATEMENT OF THE CHAIRMAN OF THE BOARD**

# Expertise and enhanced cooperation produce results

The year 2020 was unlike any other. A milestone that we will all relate to in many different ways and have different impressions of, forever. For LIGHTer, 2020 brought a shift in much of our work to a completely new workspace on digital platforms.

LIGHTer's activities are largely driven by personal face-to-face interactions. But now that we need to meet each other online, we have together become accustomed to interacting and working remotely. As for myself, I came home to Sweden on 24 January 2020 from an intense period in China. At the time, I was convinced that Lamera and I would be back within a month and continue our work to build sustainability around the world with the help of Swedish lightweight innovations. It was a lot more complicated than that.

**“Together, we are making the world lighter and Sweden's competitiveness stronger”**

As a representative of the Board, I would like to highlight the importance of LIGHTer in achieving the UN's 17 sustainable development goals. With full force, our management team is connecting Swedish excellence and Swedish innovations in lightweighting with

our common global challenges. Together, we are making the world lighter and Sweden's competitiveness stronger. To the delight of myself, the entire Board of Directors and the management team, we noted that in 2020 LIGHTer had the highest applicant pool ever from all of your companies and research practitioners in Sweden who were seeking research and development support for lightweighting. We are both pleased and grateful that we will get a larger budget in 2021. This gives LIGHTer greater opportunities to strengthen the ties among academia, larger and smaller companies and international activities in the field of lightweighting.

**Bengt A.G. Nilsson**

*Chairman of LIGHTer's Board of Directors, CEO of Lamera*

SIP LIGHTer BOARD 2021



**Bengt Nilsson**  
*Lamera  
LIGHTer Chairman*



**Ingegerd Annergren**  
*Scania  
LIGHTer Vice-Chair*



**Johan Lindqvist**  
*Volvo AB*



**Malin Åkermo**  
*Royal Institute of Technology*



**Anders Sjunnesson**  
*GKN Aerospace Engine Systems*



**Eva Lindh-Ulmgren**  
*Sandvik*



**Henrik Blycker**  
*Oxzon*



**Magdalena Sandström**  
*Diab*



**Anna-Karin Jönbrink**  
*AFRY*



**Tomas Ireman**  
*Saab*



**Pernilla Walkenström**  
*RISE*

SIP LIGHTer MANAGEMENT TEAM 2021



**Marie Jonsson**  
*Saab Aeronautics*



**Harald Hasselblad**  
*Volvo Car Group*



**Lars Nyborg**  
*Chalmers University of Technology*



**Marie Fredriksson**  
*RISE*



**Pär Jonsén**  
*Luleå University of Technology*



**Eva-Lis Odenberger**  
*RISE*

“When I present Volvo Cars and LIGHTer at the Hanover Fair’s lightweight session in 2021, we’ll clearly show how we together boost Sweden’s competitiveness through an industry-wide lightweight arena.”

**Richard Johansson**  
Technical Leader, Volvo Car Group

“We’re pleased with our cooperation with LIGHTer, and we look forward to further strengthening our ties at our trade mission in Switzerland as soon as we can meet in person again. Until then, we look forward to many fruitful discussions online.”

**Stève Mérillat**  
Managing Director, Composites United, Switzerland

“Over the next few years, I look forward to many exciting lightweight solutions that use high-strength steel. This is an area of Swedish world-class excellence. And especially thrilling since sustainability will increase thanks to fossil-free steel production.”

**Joachim Larsson**  
Head of Product Development, SSAB

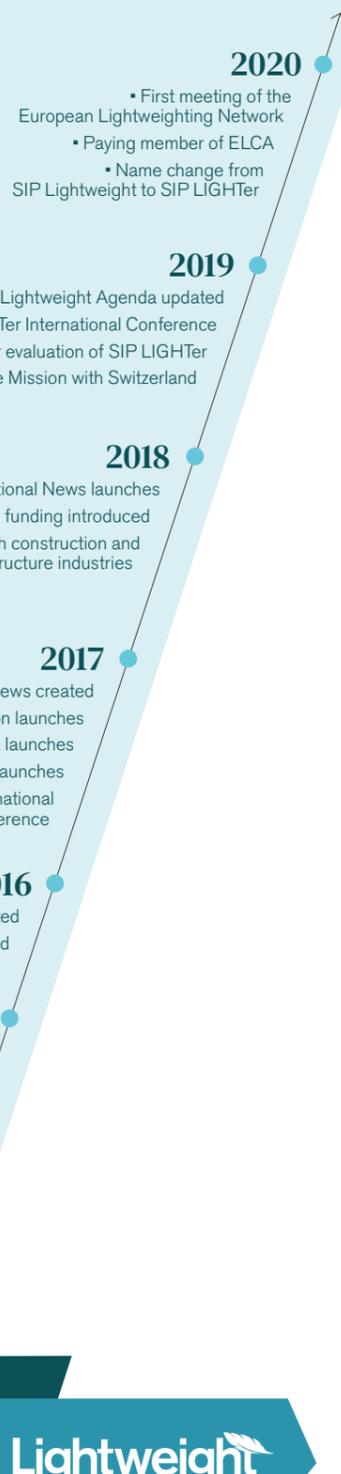
“We’re looking forward to the launch of LIGHTer’s online course in product optimisation. With this course, we hope to reach more people in the industry and give them tools to develop radical lightweight solutions more quickly.”

**Mikael Thellner**  
Technical Manager, Scania

Key strategic events over the years

**LIGHTer**

STRATEGIC INNOVATION PROGRAMME  
SIP LIGHTer

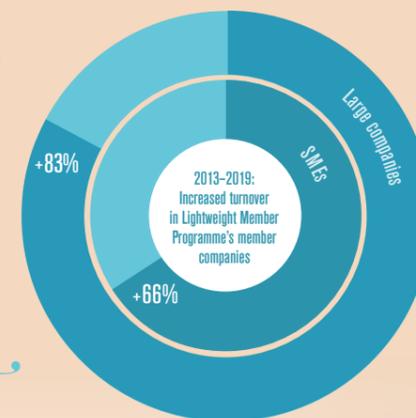
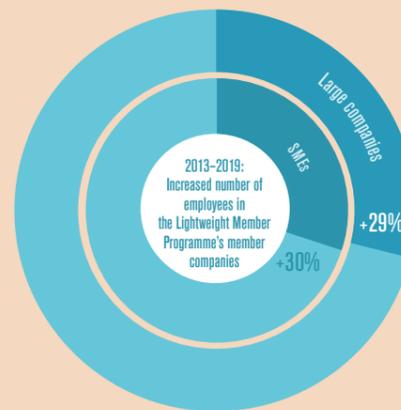


**Lightweight**  
MEMBER PROGRAMME

**Lightweight Member Programme** is independent of SIP LIGHTer and is run by its own board. However, the member programme and SIP LIGHTer share the management team.



Several small and medium-sized enterprises (SMEs) in the Lightweight Member Programme increased their turnover by 100-300% in 2013–2019.



**Lightweight**  
MEMBER PROGRAMME

*In the Lightweight Membership Programme, the 66 member organisations get access to a unique network of companies, universities and research institutes – all involved in lightweight technology. The programme is where personal contacts are made and experts interact.*

The Lightweight Membership Programme is a way to work on lightweight technology in Sweden. It is a long-term network with many industries that bring research initiatives and investments to Sweden to generate innovations.

As a member you get access to the latest news in lightweighting, strategic investments, business intelligence, professional development and networking. The programme offers exciting discussions about future projects, study visits to industry colleagues, and technology group meetings with plenty of opportunities to build strong personal networks. During the year, members could also take

part in online training.

The network includes major export companies, SMEs, industry associations, research clusters, higher education institutions and research institutes. Any organisation that has a Swedish company registration number can apply for membership.

The Lightweight Member Programme is independent of SIP LIGHTer and is run by its own board. However, the member programme and SIP LIGHTer share the management team. Many discussions in the Lightweight Membership Programme then become suggestions for updates to the Lightweight Agenda.

“For us at Diab, the Lightweight Membership Programme means contact between people who create sustainable innovations. We need this in Sweden, more than ever before.”



**Magdalena Sandström**  
CTO  
Diab International AB



**CONTACT**  
MEMBER PROGRAMMES  
LIGHTWEIGHT  
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010-228 49 34

Quick facts, 2013–2020



Read more at [lighter.nu/mpl](http://lighter.nu/mpl)

**CONTACT  
US TODAY!**

## LIGHTer Management Team

Want to get involved in strengthening Sweden's competitiveness in lightweighting by developing new skills and testing new initiatives and ideas? SIP LIGHTer has a lot to offer thanks to a cross-industry approach. We on the management team are always eager to explore new initiatives. We look forward to hearing from you!



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Research  
Institutes  
of Sweden

## LIGHTer

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