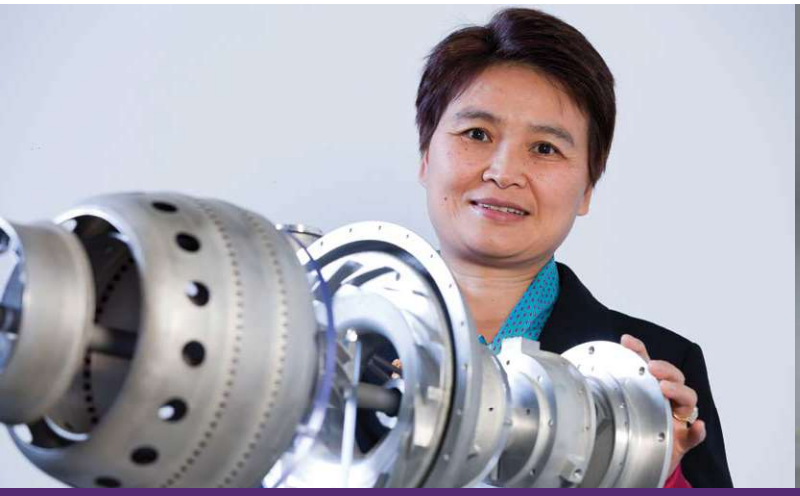

From sky to hospital

Working together to create advanced manufacturing industries

The maiden flight of the COMAC C919 airliner in May 2017 illustrated China's ambition in advanced manufacturing.

Many of the airliner's parts are made using 3D printing, and Australian engineers are working with their Chinese colleagues to develop the technology further.

3D printing in metal enables fast prototyping, lighter and simpler construction, and the creation of complex designs that can't be made by casting. But it's a challenging and complex technology to master. Components can take days to print and printing flaws can weaken a part.

Australian engineers led by Professor Xinhua Wu are masters of the technology. In 2015 her team at Monash University in Melbourne announced that they had produced the world's first printed jet engine by scanning and printing a Safran auxiliary power unit.

China is investing heavily in 3D printing for the C919 airliner, which can carry 168 people and is scheduled to start commercial operations in 2021. There are already 785 orders for the new medium-range aircraft, which will use engines developed by Safran and their US partners.

The Monash University team are contributing to the development of the C919 by printing prototypes of a range of components, including an 80cm-long aluminium door hinge and more than 20 other metal alloy components.

In 2017 the University signed a memorandum of agreement with COMAC in the presence of the Premier of Victoria, the Hon Daniel Andrews MP.

Through this agreement, Monash and COMAC will collaborate on the design of specialised new 3D printed alloy components for aerospace applications, including the design and construction of the C919.

Printing for health

Metal 3D printing also offers new scope in medicine. Implants—tailored to each patient's body—can be created within 24 hours once the design has been finalised, compared to the months and years that traditional manufacturing may need.

The Monash team are collaborating with hospitals in Guangzhou Southern Medical University and Melbourne Alfred Hospital to create personalised implants for cancer patients. Chinese cancer surgeons are often required to remove large cancerous growth and need to replace the cancer with an implant that helps everything stay in place. In the case of spine cancers in the past they use cement to fill up cavities.

Now the surgeons at Guangzhou Southern Medical University can order a customised latticed implants with precise fixing holes to do the job.

The metal alloys used are already rated to aerospace manufacturing standards, which are even more rigorous than those necessary for international biomedical devices.

"This is just one example of how 3D printing can replace the 'one-size-fits-all' attitude of the past," says Professor Wu.

Also...

Cars need steel. BaoSteel and Deakin University are working on next-generation alloys and future metal forming processes that could make cars lighter and more energy efficient.

Improved steel manufacturing, new alloys and cathodes for lithium batteries are some of focuses of BaoSteel's partnership with four Australian universities through the BaoSteel Joint Research and Development Centre hosted by the University of Queensland.

Photos: English side, top left, Xinhua Wu led the project to print a jet engine (Monash University); English side, bottom left, 3D printed vertebra (Monash University); Chinese side, top left, C919 (Jordan Tan, Shutterstock); Chinese side, top right, 3D printed vertebrae (Monash University); Chinese side, bottom left, Jet engine 3D printed at Monash University; all other images courtesy Shutterstock.

For further information visit www.china.embassy.gov.au

Australian Government

ADVANCED MANUFACTURING

从航空到医疗

携手打造先进制造业

2017 年 5 月，中国C919 客机的成功首飞彰显了中国在先进制造业的雄心壮志。

该客机的许多部件均通过 3D 打印制造。为了进一步发展这项3D 打印技术，中澳工程师已携手合作多年。

金属 3D 打印可快速仿制原型，让构造更轻便、简单，甚至完成无法通过铸造实现的复杂设计。但这项技术极富挑战性且十分复杂，不易掌握。打印零件可能花上好几天，而打印中的瑕疵也会让零件变得脆弱。

由吴新华教授带领的澳大利亚工程师团队是运用这项技术的大师。2015 年，她在墨尔本蒙纳士大学的研究团队宣布，他们通过将赛峰辅助动力装置扫描后打印出来的方式制造出世界上第一台3D打印的喷气式发动机。

中国斥巨资投入 C919 客机3D 打印，打造出载客容量为 168 人的客机，并计划于 2021 年投入商业运营。这一新型中程客机采用由赛峰集团及其美国合作伙伴联合开发的发动机，并已斩获新机订单700多架。

蒙纳士大学的研究团队用 3D 打印技术鼎力支持 C919 的研发：他们打印出C919客机的一些部件原型，如 80 厘米长的铝制门铰链和 其他20 多种金属合金部件。

2017 年，在澳大利亚维多利亚州州长丹尼尔•安德鲁斯的见证下，蒙纳士大学与中国商用飞机有限责任公司 (COMAC) 签署了一份协议备忘录：双方合作设计新型 3D 打印合金部件用于航空航天领域，包括设计和建造C919 客机 。

为健康而打印

金属 3D 打印还为医学开辟了新天地。用传统生产工艺为病人量身打造植入物需要数月甚至数年，但是结构设计完成后，用金属3D打印只需24小时即可完成。

蒙纳士大学、广州南方医科大学和墨尔本阿尔弗雷德医院展开合作，旨在为癌症患者量身打造植入物。癌症外科手术往往要清除大块的癌变组织，然后使用植入物替代癌变组织，让身体组织保持在原位。例如，外科医生曾在脊柱癌的治疗中用胶合剂填充空腔。

而现在，广州南方医科大学的外科医生可以定制带精确固定孔的定制网状植入物来进行填充。制造植入物所使用的金属合金达到了航空航天制造标准，甚至超过了国际生物医学设备所要求的质量标准。

“这仅仅是3D 打印技术改变过去‘一成不变’医疗理念的一个例子。”吴教授如此说道。

更多合作

汽车离不开钢铁。宝武钢铁和澳大利亚迪肯大学正在携手研发下一代合金和面向未来的金属成型工艺，使汽车更轻、更节能。

通过总部位于昆士兰大学的宝钢-澳大利亚联合研发中心，宝钢与四所澳大利亚大学展开密切合作，研究重点包括先进的钢铁制造技术、新合金和锂电池阴极等。

英文版左上角：吴新华教授带领的喷气式发动机打印项目（蒙纳士大学）；英文版左下角：3D打印的脊椎骨（蒙纳士大学）；中文版左上角：C919客机（图片来自Jordan Tan, Shutterstock）；中文版右上角：3D打印的脊椎骨（蒙纳士大学）；中文版左下角：蒙纳士大学用3D技术打印的喷气式发动机；其他图片鸣谢Shutterstock

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