

THE IMPACT OF ADDITIVE MANUFACTURING ON KENTUCKY REVENUE

Additive Manufacturing Center of Excellence at Somerset Community College

Additive Manufacturing (AM), also referred to as 3D printing, is currently impacting the future of almost every industry. Already estimated to be a **\$12 billion** industry this year alone¹, AM has quickly transitioned from a new method of creating prototypes to an end-use production method. Many companies are manufacturing their consumer products using AM technology, as opposed to conventional manufacturing methods. Large companies such as GE², Boeing, Airbus³, Caterpillar⁴, John Deere⁵, Ford⁶, Adidas⁷, BMW⁸, Porsche⁹, Warren Buffett at Berkshire Hathaway¹⁰, Honeywell¹¹, Siemens¹², Lockheed Martin¹³, and all of the armed forces¹⁴, are spending millions, and in some cases, billions of dollars on Additive Manufacturing. These companies are citing the significant savings, reduction of supply chain issues, and advanced products they are now able to create using AM technology that were previously impossible via conventional manufacturing. Because AM also allows for part consolidation versus combining an assembly of parts, it even further reduces the need for multi-part contracts and vendors. In some cases, AM has also completely replaced the need for casting parts and services.

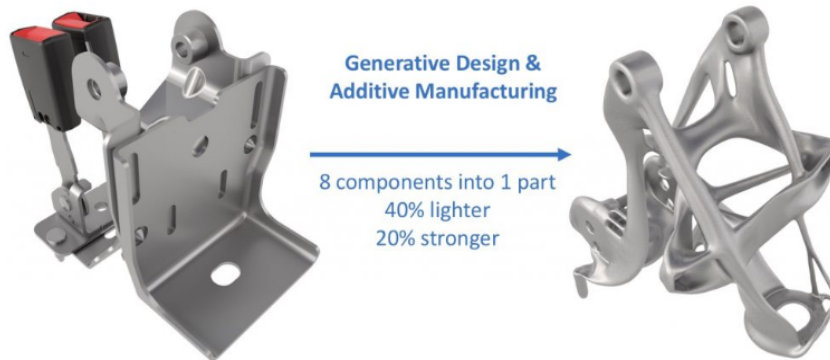


Figure 1: Consolidation of conventional 8-part seat belt bracket, down to a single part produced by metal 3D printing, General Motors publication.

These trends and announcements stand to have extreme significance, and possibly a dangerous impact, on Kentucky's economics. According to the Kentucky Cabinet for Economic Development, in 2017 Kentucky made nearly **\$31 billion** in exports, and close to **\$12 billion** of that income was specifically from aerospace products and parts. The next highest was the automotive industry generating roughly half that value with **\$5.5 billion** in exports. Although automotive and agricultural industries are a vital part of our state's economic makeup, the fact is that aerospace manufacturing generates 38% of Kentucky's export income. Although this type of work is a boon for Kentucky as a contract manufacturing state, the majority of this work is currently done by conventional manufacturing processes.

Yet, many Tier 1, or enterprise level companies, are spending millions, and in the case of GE and Warren Buffett, **billions of dollars to transition toward additive manufacturing**. The industry specific sector that is the most aggressive in this transition through research, infrastructure and acquisition, is the aerospace sector. The aerospace companies that Kentucky works for, such as GE, Boeing, Honeywell, and Lockheed Martin, are moving

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toward production contracts that are based on additive manufacturing as the primary production method. Like many states, **Kentucky has little additive manufacturing production capability and almost no technicians trained in the technology.** Given our heavy reliance on aerospace contracts for a stable economy, the threat of the loss of those production contracts is very real. In fact, other states such as Arizona, are promoting themselves as being the destination for aerospace additive manufacturing^{15,16} in efforts to capture those production contracts during this manufacturing transition.

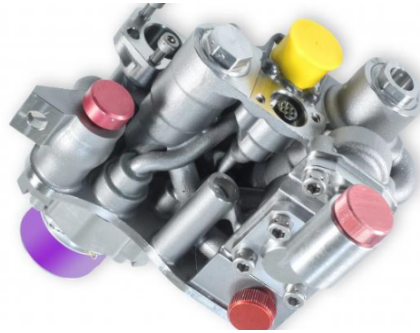


Figure 2 & 3: GE fuel nozzle, 20 conventional parts replaced by a consolidated metal, 3D printed production version (left). Airbus metal, 3D printed single hydraulic assembly (right).

Somerset Community College (SCC), a member of the Kentucky Community and Technical College System (KCTCS), has been funded to create an Additive Manufacturing Center of Excellence in efforts to combat the losses this manufacturing transition is poised to create on our state's economics. In 2016, SCC created the state's first technician certificate in 3D printing/additive manufacturing and has been a leader in making the training in this technology available statewide. SCC's AM program has already introduced nearly 600 students to the technology through our courses. SCC has created the curriculum and laid the groundwork to convert this economic disruption into an incredible opportunity for Kentucky.

SCC is now expanding the program to include advanced powder-based additive manufacturing technician training, including polymers and full metal 3D printing. SCC is expanding through KCTCS to create more skilled technicians and bringing the power of this advanced manufacturing technology to our industry partners, contract manufacturers, entrepreneurs, and small businesses.

SCC is inviting partners to join us in raising awareness of the technology and the potential disruptive impact on the heart of Kentucky's export industry. With the help of industry, educational, and political partners, SCC is uniquely positioned to not only save jobs statewide, but open the door to new aerospace, automotive, and manufacturing production opportunities that were previously inconceivable.

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References cited may be found within the full version of this document, see SCC's webpage and research button at <https://somerset.kctcs.edu/education-training/program-finder/digital-printing-technology-3d-printing.aspx>

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References

1. <http://www.3ders.org/articles/20180111-global-3d-printing-spending-to-increase-by-nearly-20-percent-in-2018-to-12-billion-dollars-idc.html>
2. <http://www.fabbaloo.com/blog/2017/9/10/ge-expands-but-in-a-different-way>
3. <http://www.fabbaloo.com/blog/2017/10/6/arconic-talks-installing-3d-printed-bracket-on-series-production-commercial-airbus-airframe>
4. http://reports.caterpillar.com/ar/_pdf/2016_cat_ar.pdf
5. <https://www.additivemanufacturing.media/blog/post/am-conference-speaker-john-deere>
6. <https://www.cio.com/article/3214471/3d-printing/3d-printing-is-now-entrenched-at-ford.html>
7. <https://techcrunch.com/2018/01/18/adidas-joins-carbons-board-as-its-3d-printed-shoes-finally-drop/>
8. <https://www.bmw.com/en/innovation/3d-print.html>
9. <https://newsroom.porsche.com/en/company/porsche-classic-3d-printer-spare-parts-sls-printer-production-cars-innovative-14816.html>
10. <http://www.forgingmagazine.com/forming/precision-castparts-buys-aerospace-3dp-specialist>
11. <https://3dprintingindustry.com/news/honeywell-approves-sintavia-3d-print-metal-aerospace-components-127230/>
12. [https://www.siemens.com/press/en/pressrelease/?press=/en/pressrelease/2018/digitalfactory/pr2018040255dfen.htm&content\[\]=DF](https://www.siemens.com/press/en/pressrelease/?press=/en/pressrelease/2018/digitalfactory/pr2018040255dfen.htm&content[]=DF)
13. <https://news.lockheedmartin.com/2018-07-11-Giant-Satellite-Fuel-Tank-Sets-New-Record-for-3-D-Printed-Space-Parts>
14. <http://www.digitalistmag.com/digital-supply-networks/2017/08/09/military-applications-for-emerging-technology-of-3d-printing-05281588>
15. <https://azbigmedia.com/arizona-becomes-additive-manufacturing-3-d-printing-leader/>
16. <https://www.industrial-lasers.com/articles/2017/02/additive-manufacturing-research-center-opens-in-arizona.html>