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DigitalCNC

AMRC / Tier 1 Aerospace

Reducing Machine Trials by 60–80% and Eliminating Days of Prove-Out on Complex Aerospace Components

Case Study

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DigitalCNC

Working with the Advanced Manufacturing Research Centre (AMRC), DigitalCNC enabled a leading global aerospace Tier 1 supplier to predict real machine behaviour before cutting metal — removing the need for repeated physical trials, improving planning confidence, and reducing cost and programme risk.

Key Outcomes

- 60–80% reduction in machine trials
- Cycle time prediction accuracy improved from >4x error to within ±5%
- 3–5 days of machine capacity freed per optimisation decision (£15,000–£25,000 avoided per iteration)
- Sub-2 hour decision cycles vs multi-day prove-out loops
- Reduced NPI iteration across complex parts and programmes
- Improved confidence in meeting programme timelines and delivery commitments

The Challenge

For complex aerospace components, even small inaccuracies in cycle time prediction create significant downstream cost and risk. In this case, a critical toolpath segment was programmed at 40 seconds, but actual execution exceeded 3 minutes — a 4.5x error. Resolving this required multiple physical trials, each consuming:

- High-value machine time (~£5,000 per day)
- Skilled operator input
- Material and setup cost

More importantly, this was not an isolated issue. These discrepancies occur repeatedly across parts, toolpaths, and programmes — compounding into:

- Delays in NPI
- Unreliable delivery commitments
- Increased cost per part
- Heavy reliance on individual experience rather than repeatable process

Where CAM Breaks Down in Production

CAM systems describe programmed intent, not actual machine behaviour.

In practice:

- Machine kinematics alter feedrates
- Controller behaviour introduces variability
- Complex geometries amplify performance deviations

As a result:

- Cycle times are routinely wrong by 20–50%+
- Problems only surface during physical trials
- Critical knowledge remains locked in experienced engineers

This creates a structural dependency on trial-and-error at the machine — the most expensive place to solve problems.

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The Approach

AMRC deployed DigitalCNC to simulate real machine behaviour before execution. Instead of relying on programmed values or post-process assumptions, engineers were able to:

- Evaluate actual feedrates and cycle times in seconds
- Identify constraints and performance bottlenecks early
- Test and compare alternative strategies without cutting material

What previously required multiple machine iterations could now be resolved digitally, upstream.

“The accuracy sold them on the trustworthiness of the software.”

The Results

Reduced machine trials by 60–80%

Improved cycle time accuracy from >4x error to within ±5%

Eliminated 3–5 days of prove-out per optimisation decision

Reduced decision time from days to under 2 hours

Across a typical programme, where this pattern repeats across multiple parts and toolpaths, the cumulative impact is significant:

- Tens to hundreds of thousands in avoided machine cost
- Faster progression from programme to production
- Greater confidence in delivery timelines

These improvements reduce direct machine cost, free up high-value capacity, and improve confidence in meeting delivery timelines on complex parts.

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Business Impact

By shifting problem-solving upstream, DigitalCNC fundamentally changes where decisions are made. Instead of consuming machine time to discover problems:

- Issues are identified and resolved before execution
- High-value machine capacity is freed up for production
- Quoting becomes more accurate and defensible
- Programme risk is reduced, particularly on first-off parts

For aerospace manufacturers, this translates directly into:

- Lower cost per part
- Improved throughput without additional capital investment
- Reduced reliance on trial-and-error
- More predictable, scalable operations

AMRC Perspective

"DigitalCNC removes the need to 'learn on the machine'. We can validate strategies upfront, avoid days of trial-and-error, and make better decisions earlier — which directly reduces cost and de-risks the programme."

Tom McCready, Head of Machining Group

Key Takeaway

- **CAM shows what should happen**
- **DigitalCNC shows what will happen**
- **That shift moves decision-making upstream — reducing reliance on machine trials, freeing up capacity, and removing avoidable cost and risk from every programme.**