ASX ANNOUNCEMENT

15 March 2021

Companies Announcement Office
ASX Limited
Level 6, 20 Bridge Street
Sydney NSW 2000

CFOAM - AEROSPACE TOOLING COST STUDY

CFOAM Limited, CFOAM Corp (74.34% owned by CFOAM Limited, 25.66% owned by CONSOL Energy Inc) and its operating entity CFOAM LLC, Triadelphia, West Virginia, (CFOAM) are providing a presentation which is used to present a comparison of various tooling material systems for medium to larger aerospace bond tools of varying complexity.

CFOAM® Carbon Foam tools have the potential to alter the economics of composite tooling for commercial and military aerospace applications.

CFOAM® Carbon Foam is extremely lightweight compared to INVAR 36, easy to bond, machine and repair, and has thermal expansion equivalent to carbon fiber composite, making it well-suited for achieving tight tolerances on composite designs for commercial and military aerospace applications.

This ASX release has been approved for release by Gary Steinepreis on behalf of the Board of Directors

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About CFOAM Limited

CFOAM® products are an inorganic carbon material that is manufactured from coal, pitch or lignin feedstock. CFOAM® products manufactured in this process have a rigid foam structure, similar in appearance to pumice stone, but with entirely different properties. CFOAM® products are currently used across a wide variety of markets including composite tooling for the aerospace sector, energy absorbing applications and defence applications. Additional markets such as automotive applications for energy absorption and fire resistance are also expected to become significant to the Company over time.

CFOAM® products were developed to meet the growing demand for ultra-high-end performance engineering materials in the industrial, aerospace, military and commercial product markets.

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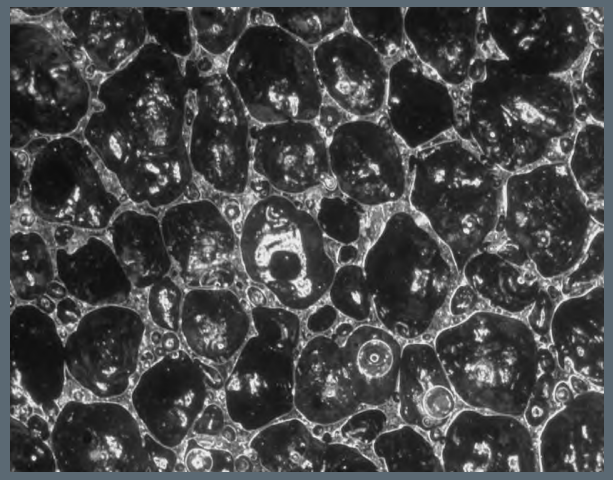
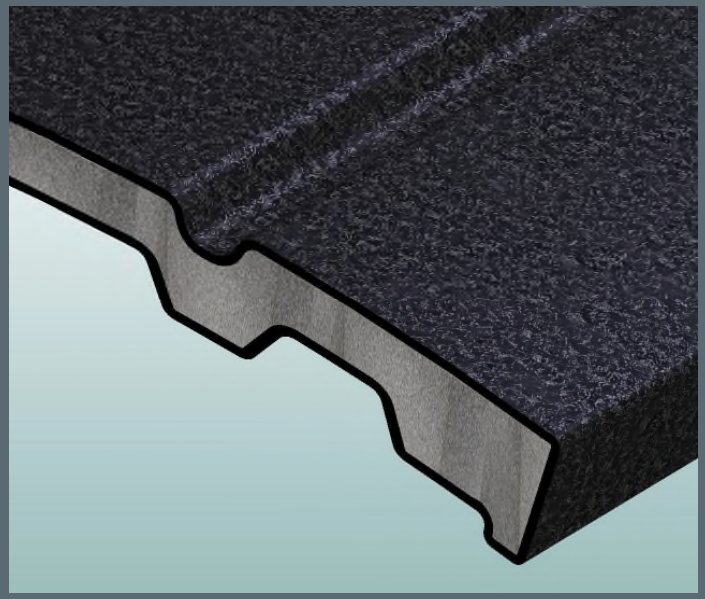
FOAM

Coal Based Carbon Foam Aerospace Tooling Cost Study

CFOAM 30® tooling costs are presented in comparison with metallic and other non-metallic tooling material systems for medium to larger aerospace bond tools of varying complexity.

Properties, attributes, advantages, and disadvantages of aerospace tooling materials are presented.



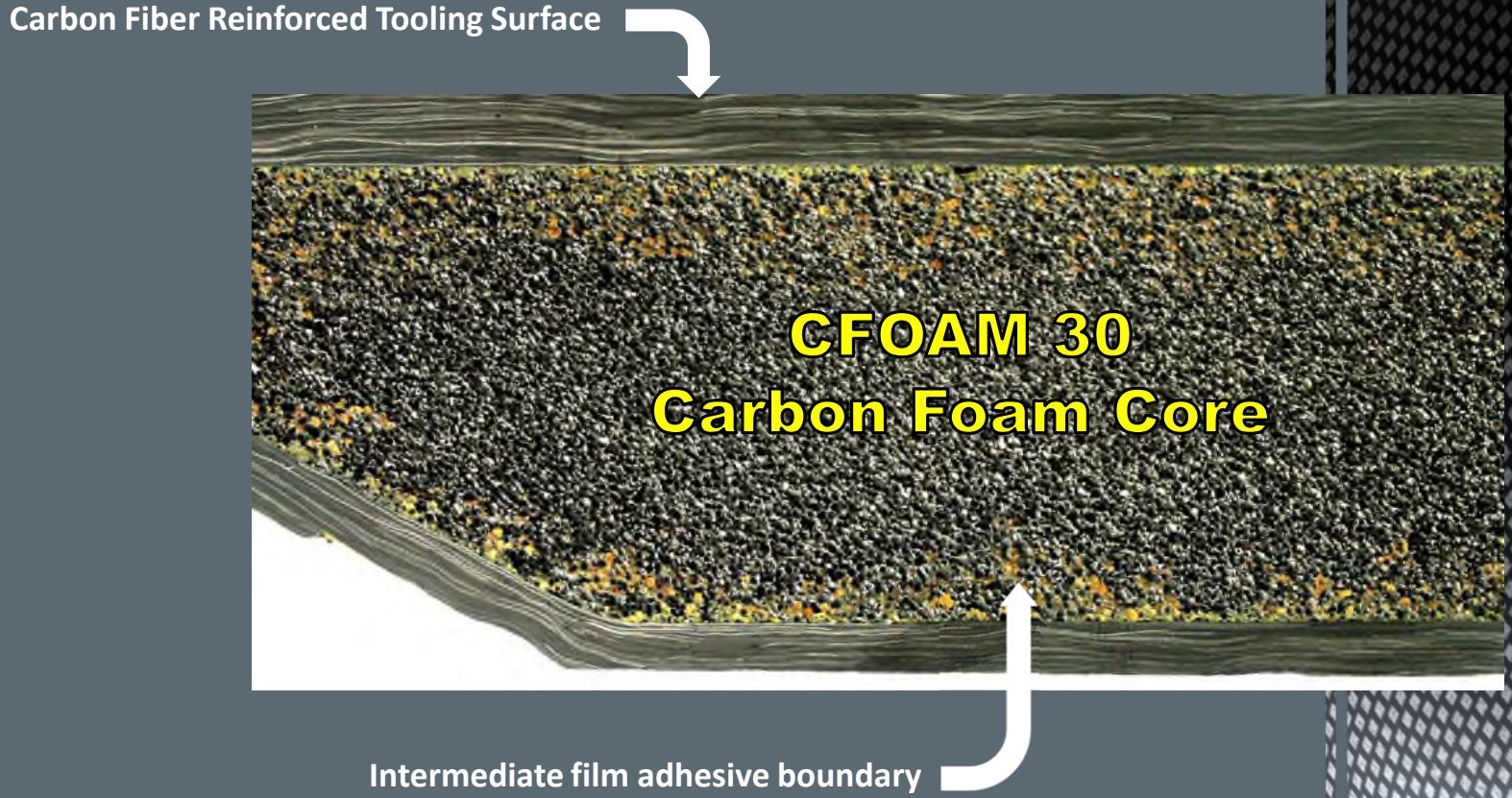


Note: It is assumed the reader has some familiarity with CFOAM 30 tooling. Technical information for producing CFOAM 30 tooling is available from your CFOAM 30 customer representative.

Given:

- Every tooling requirement is different and needs to be evaluated on a case-by-case basis
- No single tooling material system solves all requirements

- **CFOAM 30** is a proven low mass, competitively priced, thermally-stable tooling material



Tooling Material System Considerations:

- **Processing Temperature:** Cure and post-cure temperatures
- **Cure Process:** Autoclave augmented or Out-Of-Autoclave pressures
- **CTE Stability:** Tool expansion distortive effects on part
- **Tool Mass:** Weight of tool. Effects on handling, inertia, safety, other
- **Program Requirements:** Lead-times, risk, customer issues
- **Finish:** Structural or cosmetic appearance driven part
- **Thermal Conductivity:** Heat-up, cool-down rate affects cycle time
- **Production Rate:** Prototype or high/low production rates affect tool life
- **Cost:** Total costs for design, materials, fabrication thru delivery
- **Durable:** Toughness, survival over production life
- **Repairable:** Ease and cost of repairing damage
- **Reconfigure:** Accommodation of design changes
- **Recycle:** Waste stream, salvage or re-use
- **Make or Buy:** In-house tool fabrication or outsource

Tool Material Types:

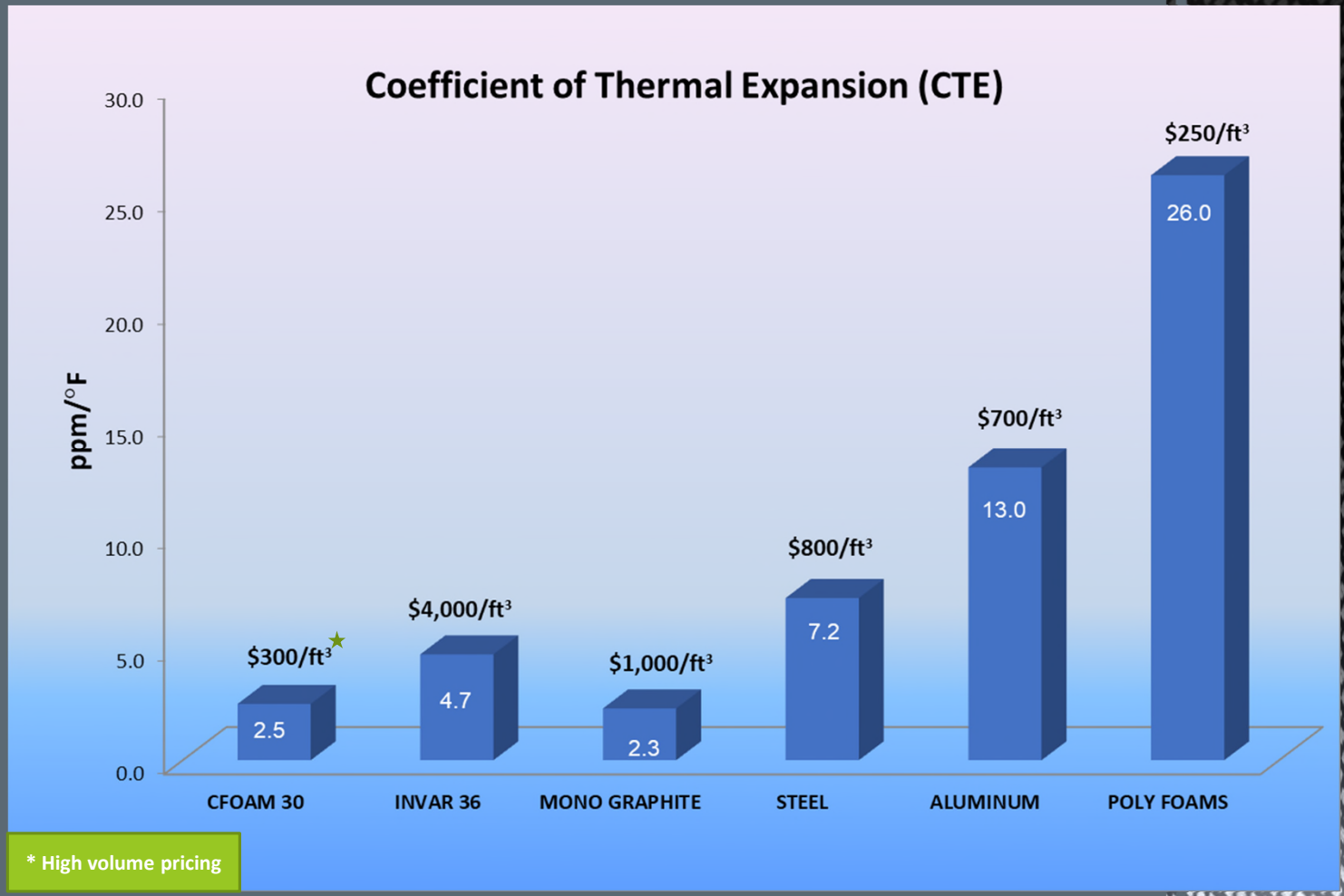
- **CFOAM 30 Production:** CFOAM with facing of carbon fiber BMI laminate
- **CFOAM 30 Prototype:** CFOAM with filled surfacing gel coat or other release surface
- **INVAR 36:** Refers to nickel-alloy tool steel
- **Steel:** Refers to common low carbon steel
- **Aluminum:** Refers to weldable alloys and Mic-6 plate
- **Poly Foam:** Refers to polyurethane blocks and epoxy pattern boards
- **Mono Graphite:** Refers to amorphous bulk graphite blocks

CFOAM 30 tooling has greatest value on 350°F to 450°F cures (ex: BAC5317-1/-4/-6), when low thermal distortion tolerance, low tool mass, and cost, are drivers on prototype and low to moderate production level tools.

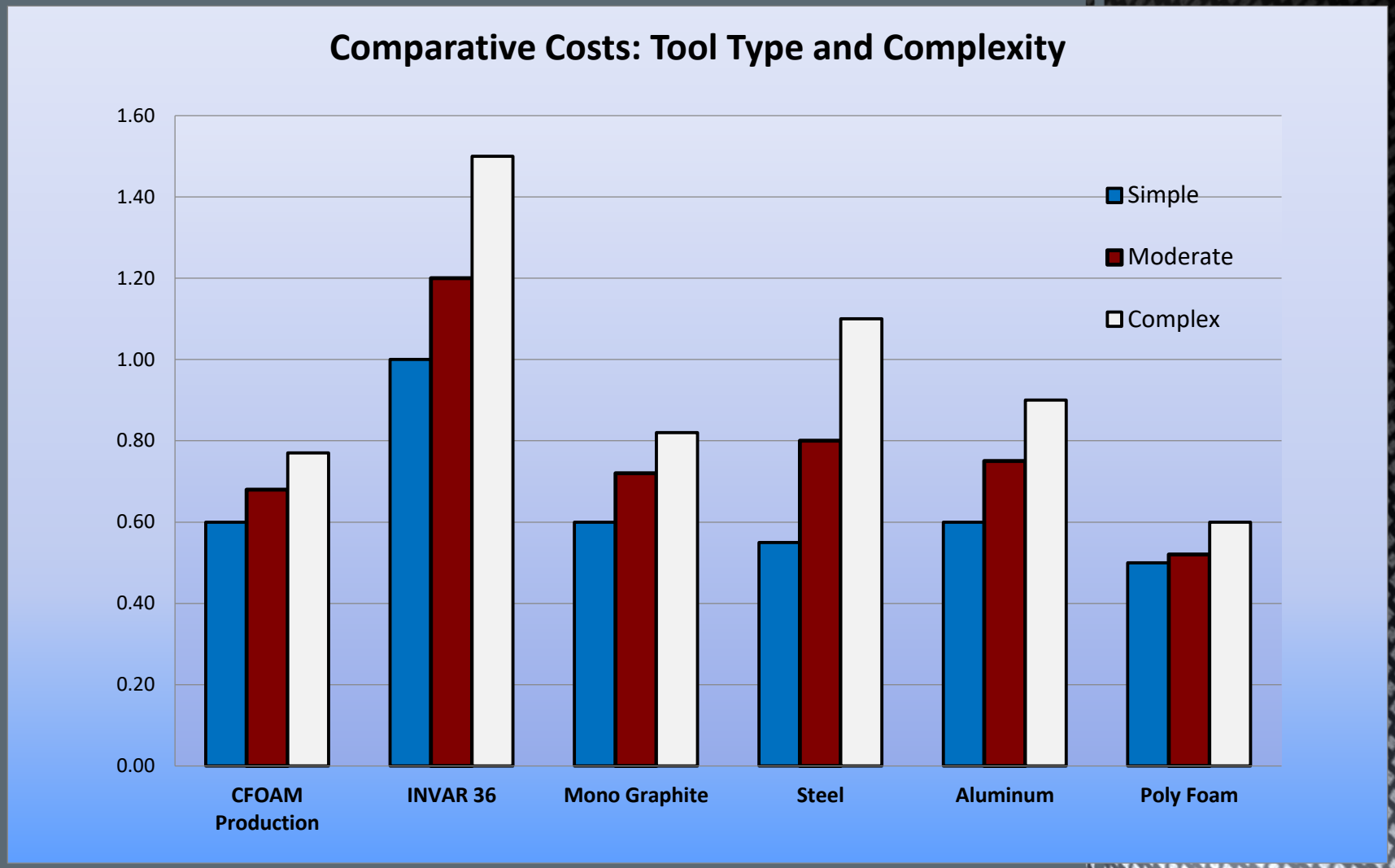
Note: Although listed, Aluminum and Poly Foam materials are not typically considered acceptable for precision composite parts cured at 350°F and above, due to high coefficient of thermal expansion (CTE) which creates undesirable part distortion.

CFOAM 30 tooling with durable composite surface facings produce a very lightweight, thermally stable, high stiffness tool with low coefficient of thermal expansion (CTE) and high glass transition temperature (Tg) for excellent processing of advanced composite parts.

Chart below depicts the relative CTE of tooling materials, along with volume costs.



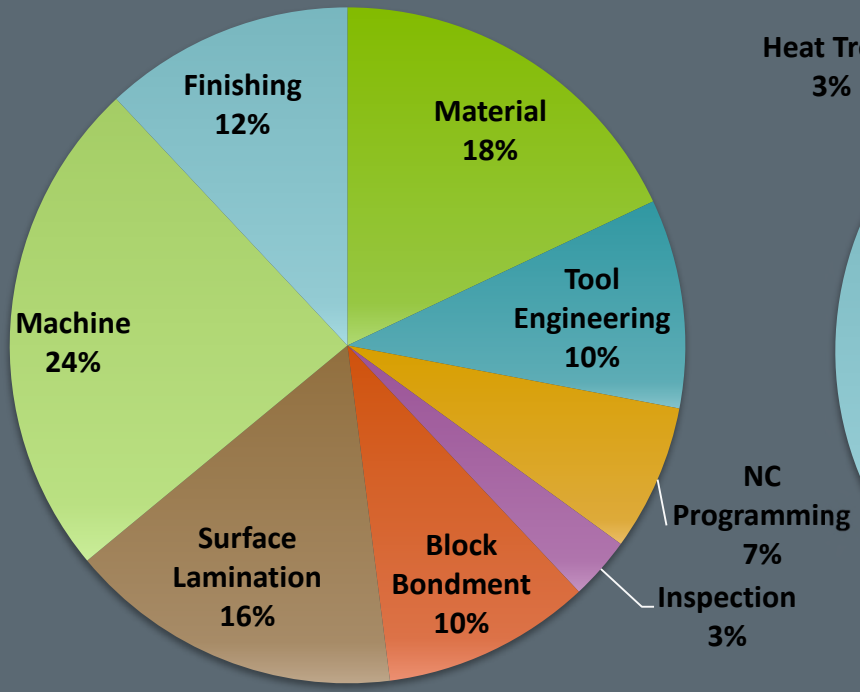
CFOAM 30 Production tool costs increases linearly with size and complexity
INVAR 36 tool costs increase **exponentially** with size and complexity.



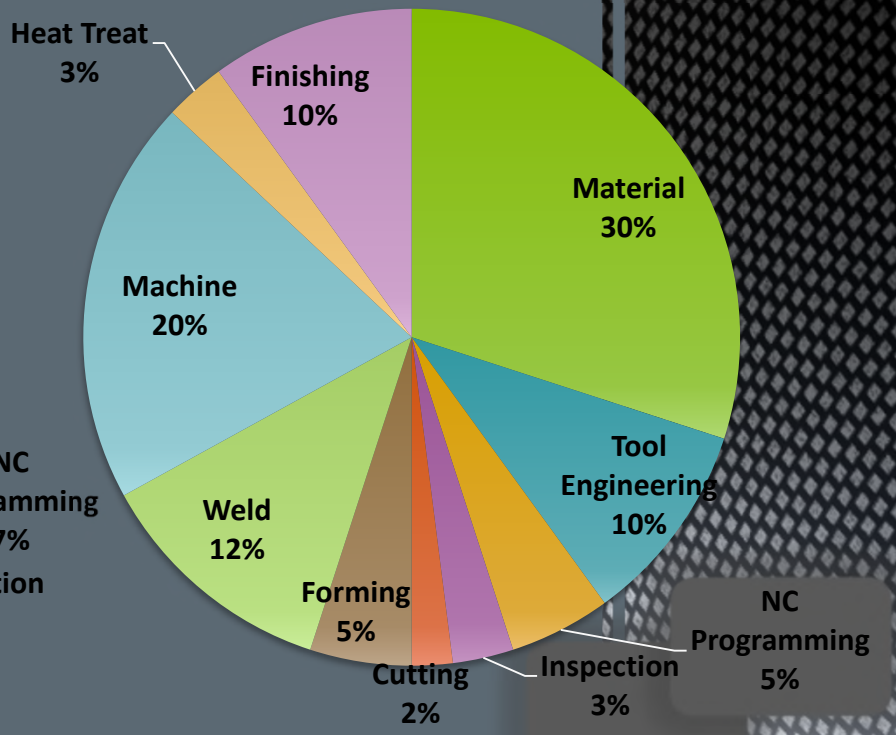
Cost elements for **CFOAM 30** Production tooling and INVAR 36 are shown in charts below.

CFOAM 30 has much better machinability than INVAR 36 and requires no welding, forming, or heat treatment for stress relief.

CFOAM Tool Cost Elements

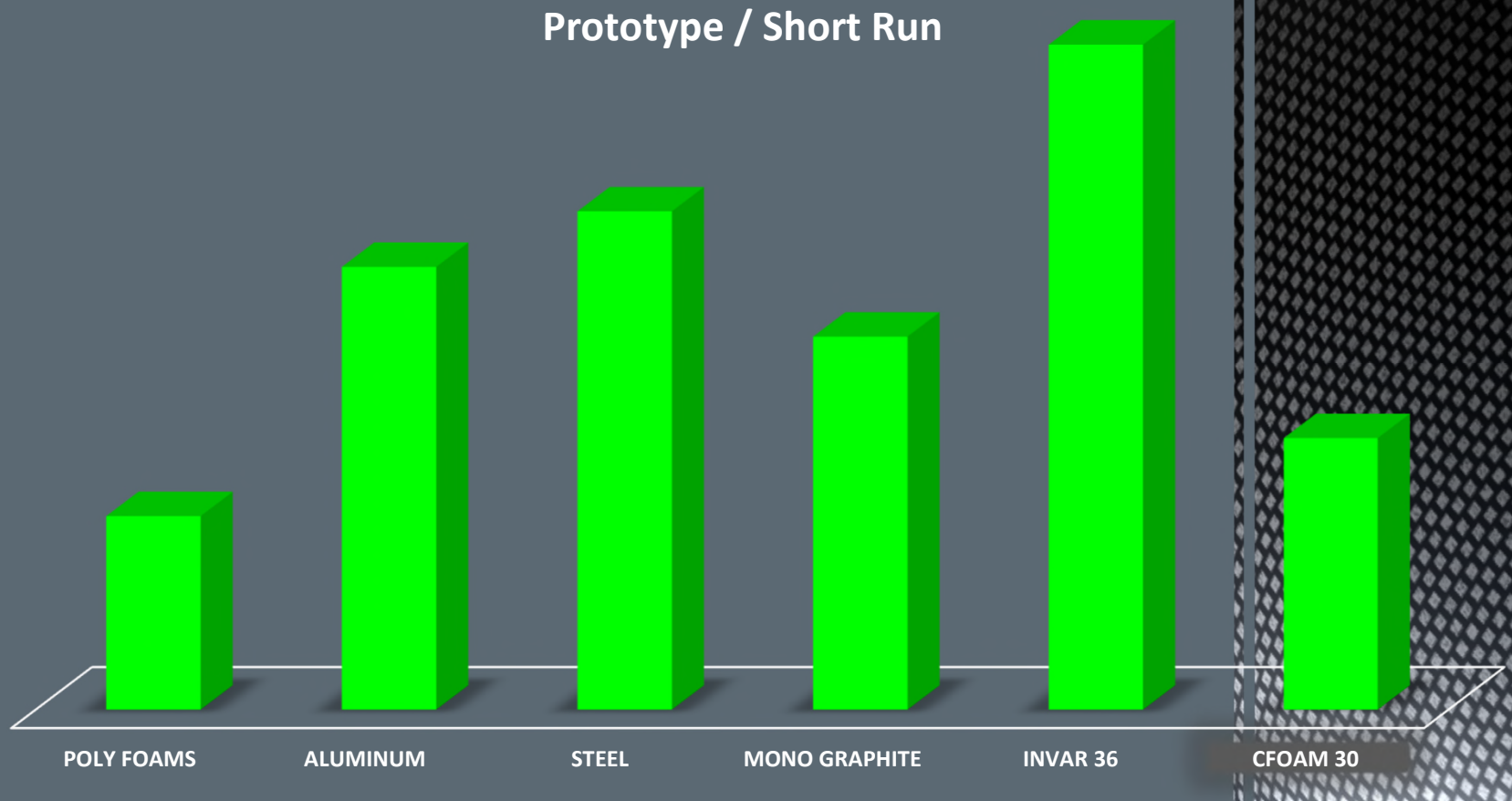


INVAR 36 Cost Elements



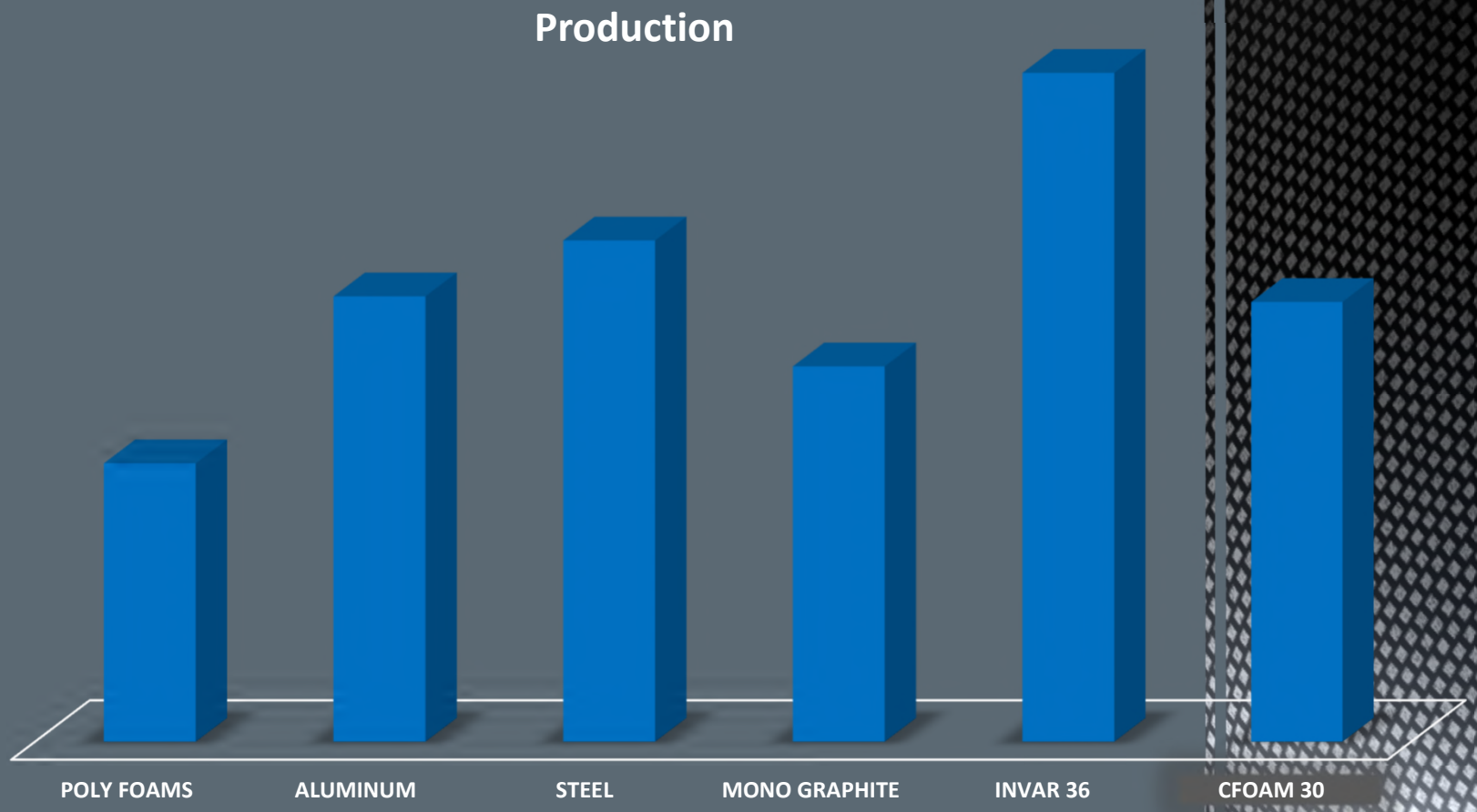
CFOAM 30 Prototype tooling (and other non-metallic tools) use low cost facing materials, support structures, and manufacturing methods for limited part fabrication use. Metallic tools generally cannot be made less costly for prototype use.

Chart below depicts cost for a bond tool approximately 5 ft. X 10 ft., for 350°F use, with moderate complexity geometry, designed for **Prototype** low volume use (< 10 parts).



CFOAM 30 Production tools use durable facings of carbon fiber reinforced BMI tooling prepreg (HexTool®M61 , Solvay DURATOOL DT450®, HTM512, or Airtech BETA Benzoxazine). CFOAM Prototype tools can be converted to Production tool with facing rework.

Chart below depicts costs for a bond tool, approximately 5 ft. X 10 ft., for 350°F cure with moderate complexity geometry, designed for **Production** use (> 10 to 200+ parts).



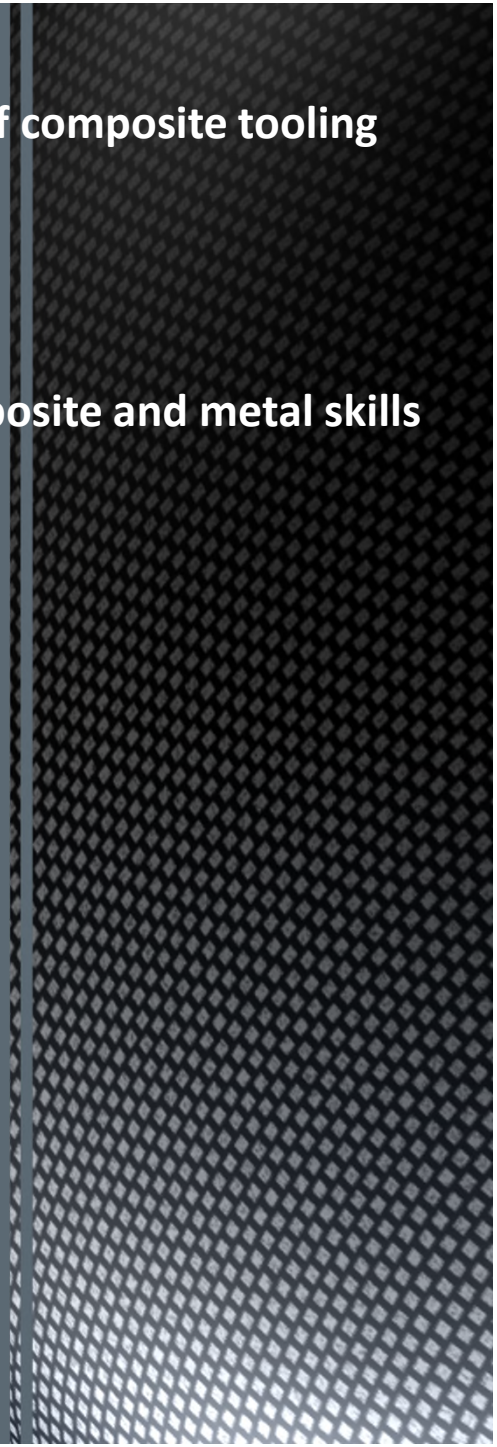
CFOAM 30 tools have the potential to notably alter the economics of composite tooling for commercial and military aerospace applications.

Pros

16 times lighter than INVAR 36
Easy to reconfigure and repair
Machines easily
Very good heat-up and cool-down rates
Low CTE
High temperature capabilities

Cons

Newer technology
Requires both composite and metal skills

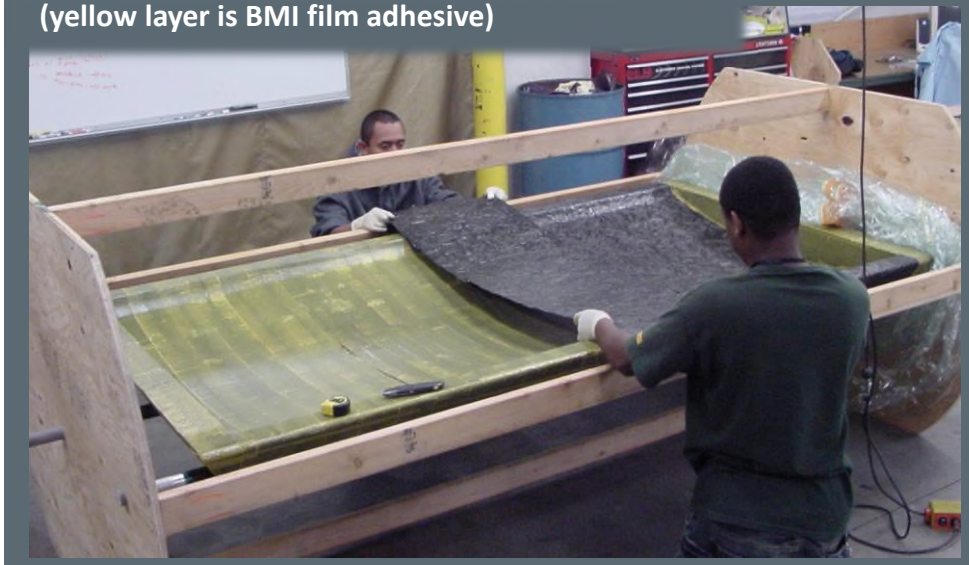


The following slides are examples of medium to large CFOAM 30 tools

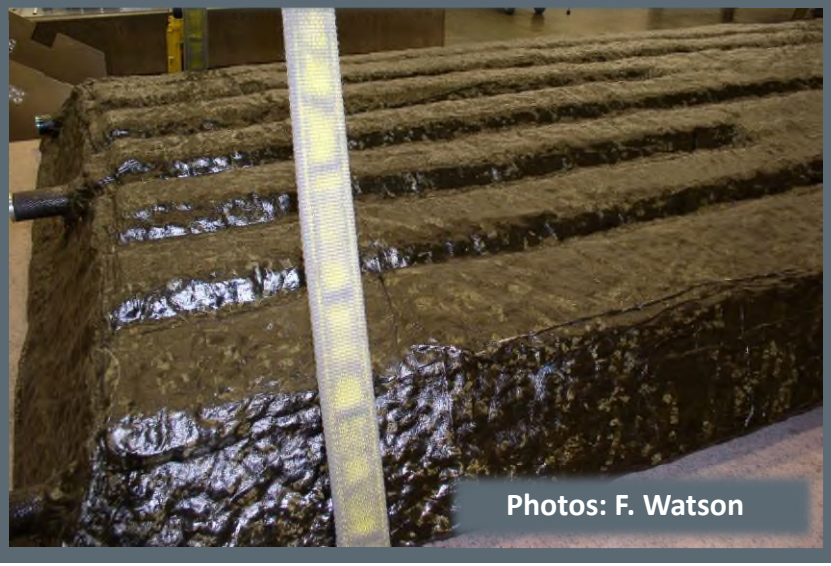
CFOAM 30 with BMI film adhesive and HexTool M61 CFRP tooling prepreg.

CFOAM machined bondment prior CFRP/BMI facing

CFOAM bondment during layup of CFRP/BMI facing (yellow layer is BMI film adhesive)

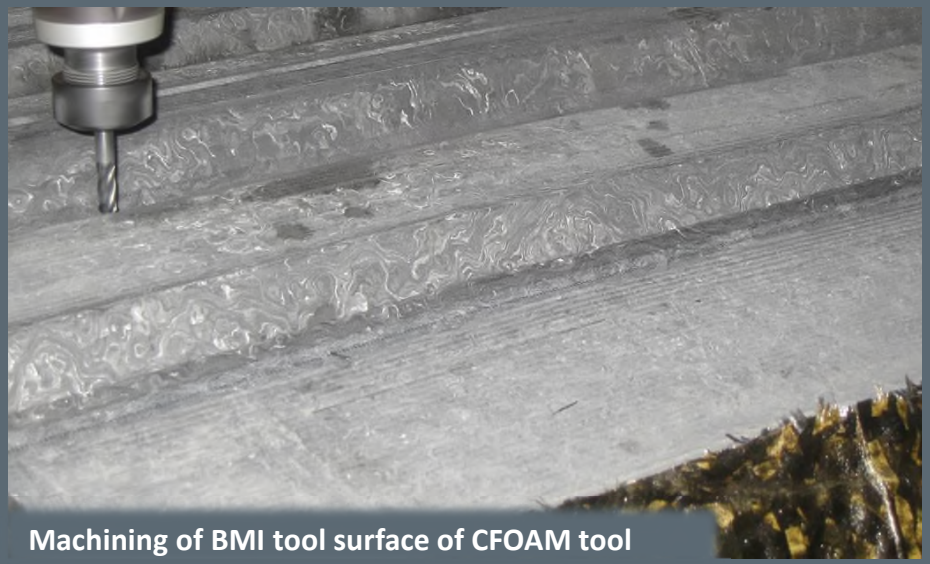


CFOAM autoclave cured tool before machining



Photos: F. Watson

Fuselage Demonstrator Tool

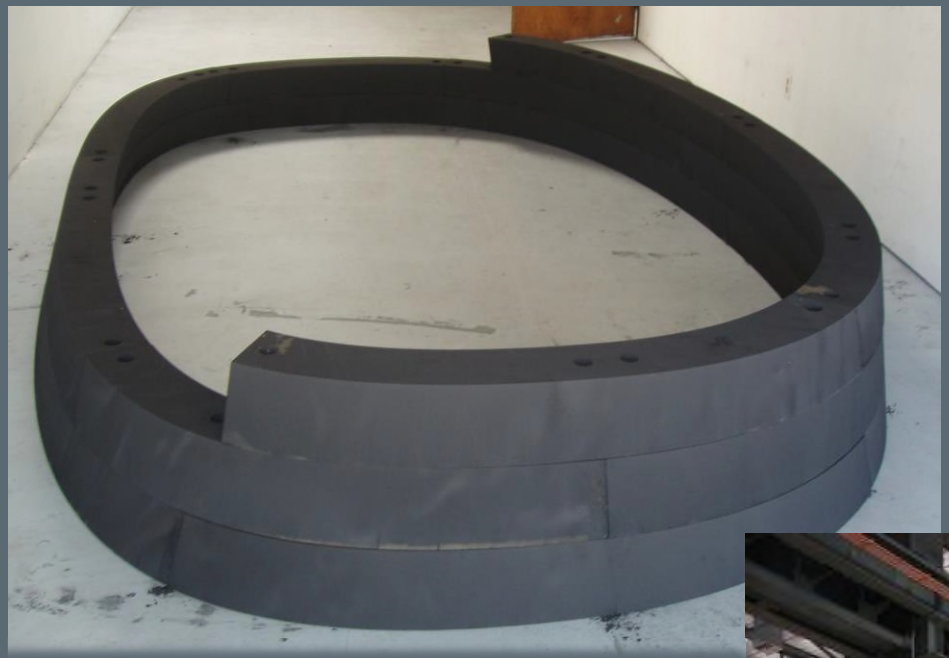


Machining of BMI tool surface of CFOAM tool

Hand finishing BMI tool surface of CFOAM tool

CFOAM tool after polishing and sealing. First demo fuselage skin part pulled from CFOAM tool

Tail Cone Master Tool



CFOAM 30 “wedding cake” bondment of 5-axis AWJM carbon foam rings, pinned with CFOAM dowels and bonded with X-Pando refractory cement.

CFOAM 30 bondment prior to BMI tool surface application.

CFOAM tool with autoclave cured BMI surface prior to machining.

Photos: F. Watson

Tail Cone Master Tool

CFOAM 30 male master tool with Hextool M61 surface, polished and ready for rate tool production.

Solid CFRP/BMI laminate female rate tool with eggcrate exterior reinforcement pulled from CFOAM 30 master source tool.

Photos: F. Watson

Tail Cone Beaded Skin Production Tool

Above: AWJM CFOAM 30 ‘slabs’ during bondment assembly.

Below: Completed CFOAM tool during inspection.

CFOAM 30 bondment prior to Hextool BMI application and subsequent machining

C-17 Tail Cone shown below

Photos: F. Watson