

CAPE Support Commitment

{Team Name}
{Competition Year}

Submitted By:

{Names of CAPE Staff working
on this document}

Outline: *(Text in red is intended as guidance, remove or overwrite it as appropriate.)*

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I. Introduction

The following is CAPE’s proposed support for the {YEAR} {TEAM NAME} team. Below you will find suggestions for team training, evaluations for the individual proposed projects, any special suggestions or requirements, and the total dollar-value amount of support offered by CAPE.

II. Composites Lead Member

The official Composites Lead Member for this year will be {NAME.} This person will be responsible for scheduling equipment usage and meeting times with CAPE staff, and will be accountable for the team’s credit with CAPE. All usage of that credit must be approved by the Composites Lead. This person will also be assigned the team’s user account on the CAPE on-line equipment schedule.

III. Training

Considering the experience of members on your team and their willingness to assist newer members, CAPE will not require that your team have members attend any additional training.

Considering the lack of experienced members on your team, CAPE will require that your team have at least two members attend a training session to gain an overview of the entire composites manufacturing concept.

Etc.

III. Project List

The following list of projects submitted by your team has been reviewed by the CAPE staff. Comments and additional requirements may be listed, as well as approximate material, equipment and time expenses.

Existing/Modified Projects

FROM SUPPORT REQUEST

Project: *Mid-sized Widget*

Mold Requirements: *Existing mold will be modified to smooth sharp edges by sanding and re-sealing*

Process: *VARTM with oven cure*

Material: *Previous year’s build required 25 square feet of 9oz fiberglass and two pounds of epoxy. Modified design will require approximately the same.*

This project will require no significant time on behalf of CAPE, aside from reviewing the final manufacture plan.

Approximate costs: Fiberglass 25 sq.ft. \$15

Epoxy 2 lb \$15

Staff Time 1 hr. \$35

New Projects

FROM SUPPORT REQUEST

Project: Oversized Widget

Mold Requirements: New mold will be machined from laminated MDF, sanded, sealed and checked to ensure +/- 0.010" tolerance.

Process: VARTM with oven cure, or pre-preg with autoclave cure.

Material: Part area is approximately five square feet, and will require approximately 40 square feet of material. Carbon-fiber is preferred for weight savings.

This project will require design consulting and machining time on behalf of CAPE, in addition to materials for both the mold and the part. Use of carbon fiber vs. fiberglass must be justified in your Manufacture Plan. Because of the size of the part and complexity of the mold, a fiberglass prototype should be made before making the final carbon-fiber part. Because this widget will be used in a critical safety role, a thorough stress analysis must be completed on the proposed design before any building will take place. The mold should be made with a large flange on which a flat plaque can be co-constructed with the part. This plaque will be cut into test samples which will be used to confirm that the final properties of the composite support the assumptions made in the stress analysis.

| | | | |
|--------------------|---------------|-----------|-------|
| Approximate costs: | MDF | 2 sheets | \$70 |
| | Carbon | 40 sq.ft. | \$80 |
| | Epoxy | 4lb | \$30 |
| | CAM | 2hr | \$70 |
| | Milling | 4hr | \$140 |
| | Mech. Testing | 2hr | \$100 |
| | Staff Time | 6hr | \$210 |

Staff Time includes meetings, assisting in manufacturing and test specimen fabrication.

Innovative Processes

Innovative processes which expand the capabilities of the CAPE lab may be considered for additional support.

FROM SUPPORT REQUEST:

Project: Widget Bracket

Mold Requirements: A new mold will be built using the rapid-prototyper. This mold will include integrated vacuum and resin channels for more efficient infusion processing, and a thin wall cavity for improved heat transfer during oven curing. Additionally, a newly available mold-coating product, ToolKote, will be tested for use as a low-cycle mold surface.

Process: VARTM processing and oven cure.

Material: To be initially tested and validated with fiberglass and epoxy. Upon validation of the complete process, final parts will be made from Kevlar and epoxy.

Innovations: *The integration of processing aids, in this case flow channels and heat transfer aids, into a rapid-prototyped mold has not previously been attempted at CAPE, and is not a common practice in industry. Additionally, the use of ToolKote tool surface material has not been demonstrated on plastic molds. This material was featured in the January 2009 issue of the SAMPE (Society for the Advancement of Material and Process Engineering) Journal and has been widely adopted for use on foam molds, but searching journals and other literature has shown no documented use on plastic molds. We will be investigating its suitability and compatibility.*

Validation: *In order to demonstrate the viability of these innovations, several tests will be performed on simple prototypes.*

- 1. A small, simple (i.e., a rectangular bar) mold with integrated flow channels will be built in the rapid-prototyper. A part will be built to demonstrate that the mold can be adequately clamped and sealed.*
- 2. ToolKote tool surface material will be bonded to a simple sheet of material from the rapid prototyper. A flat composite test plaque will be infused on the tool surface and oven cured to simulate the processing of a final part. The ToolKote and the plaque will be inspected to confirm durability and performance.*

This project will require consulting and equipment time on behalf of CAPE. Because this project explores a new molding approach and the use of a new tooling material, CAPE will provide all of the required materials and staff time, pending approval of the Manufacture Plan.

The validation of the process should also include measurements of the small mold (part 1) before, during and after the cure cycle to be sure that the thin walls do not allow the mold to bend or twist with changes in temperature during the cycle. Due to the stratified nature of the rapid-prototyped mold, it should be thoroughly inspected for leaks, and may require a sealing coat be applied to the entire surface. This same attribute may also allow a texture to show through to the surface of the part – multiple layers of ToolKote may be required, and the total thickness of these layers must be accounted for in the design of the mold.

IV. Summary

Support Commitment

The total approximate expenses for the above projects are \$765. These figures are intentionally estimated very conservatively to account for unplanned setbacks and consulting time. CAPE will grant the team \$765 of credit to be used for materials, equipment and personnel time toward accomplishing these projects.

Comments

Have fun.