A Proposal

Defining an Optimal Heating Profile for Field Repairs of Composites

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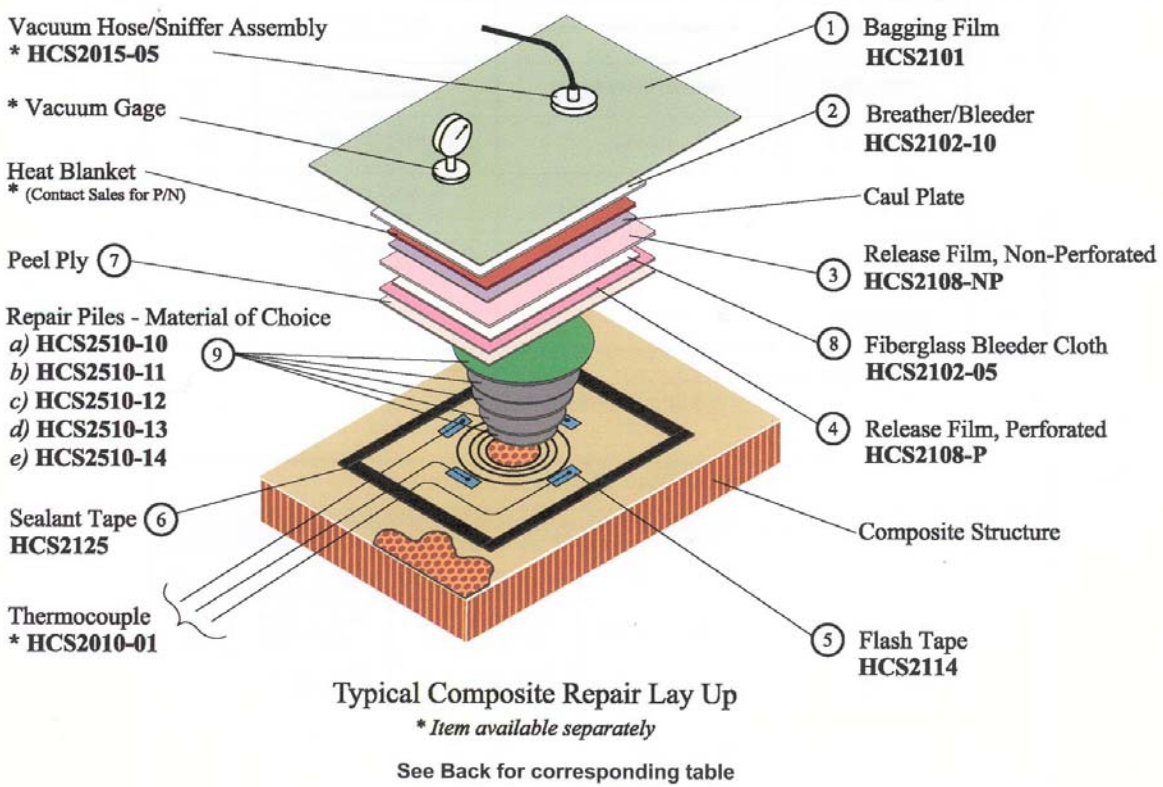
Repairing Composites requires that the material be raised to a specific temperature for a specific curing time by the **controlled** application of heat

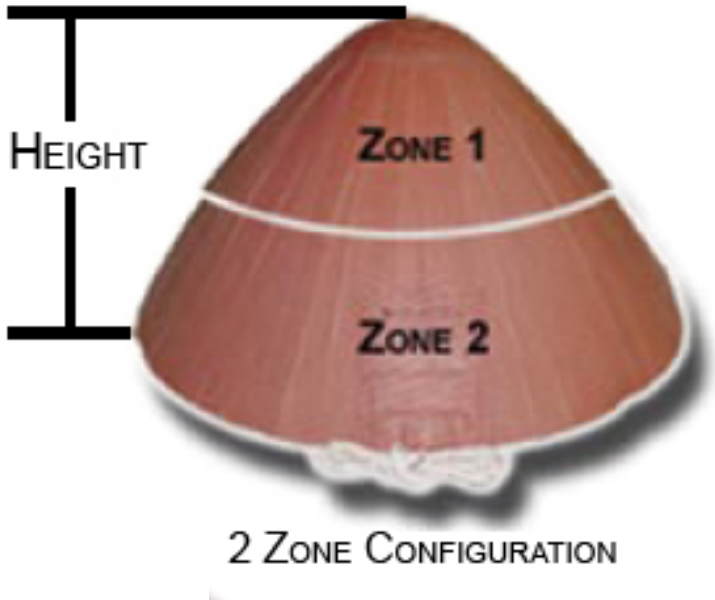


Small parts that can be removed from the system

Environmental Concerns:

external ***none***

internal ***none***

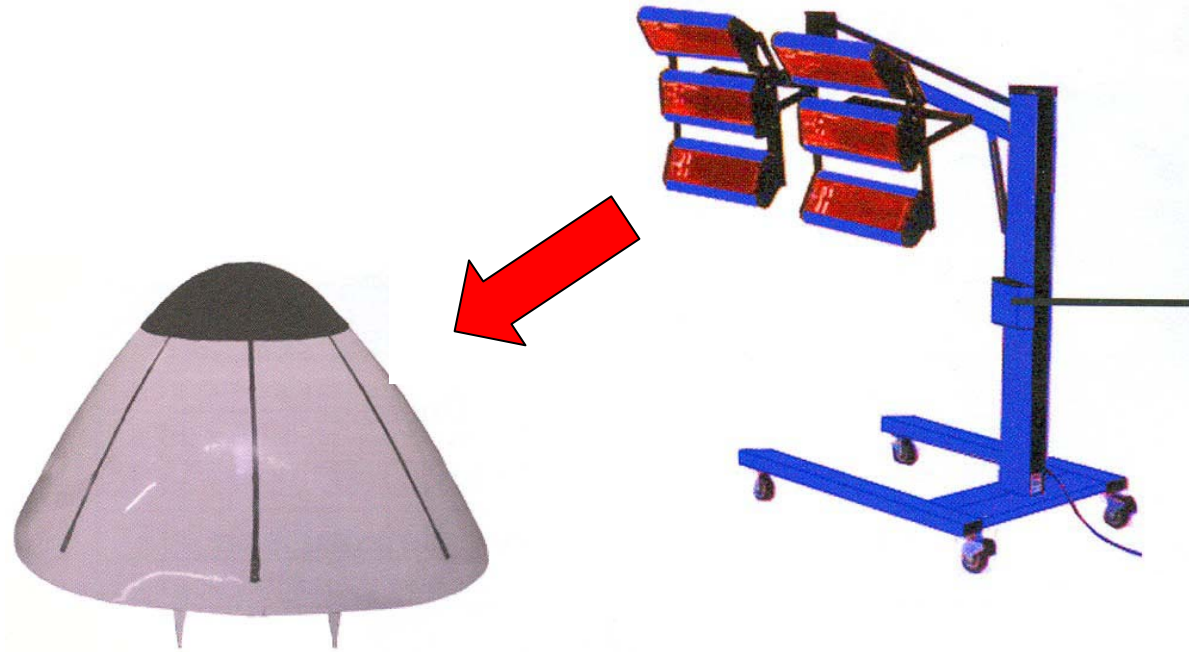


Heater made to fit the part

Environmental Concerns:

external ***modest***

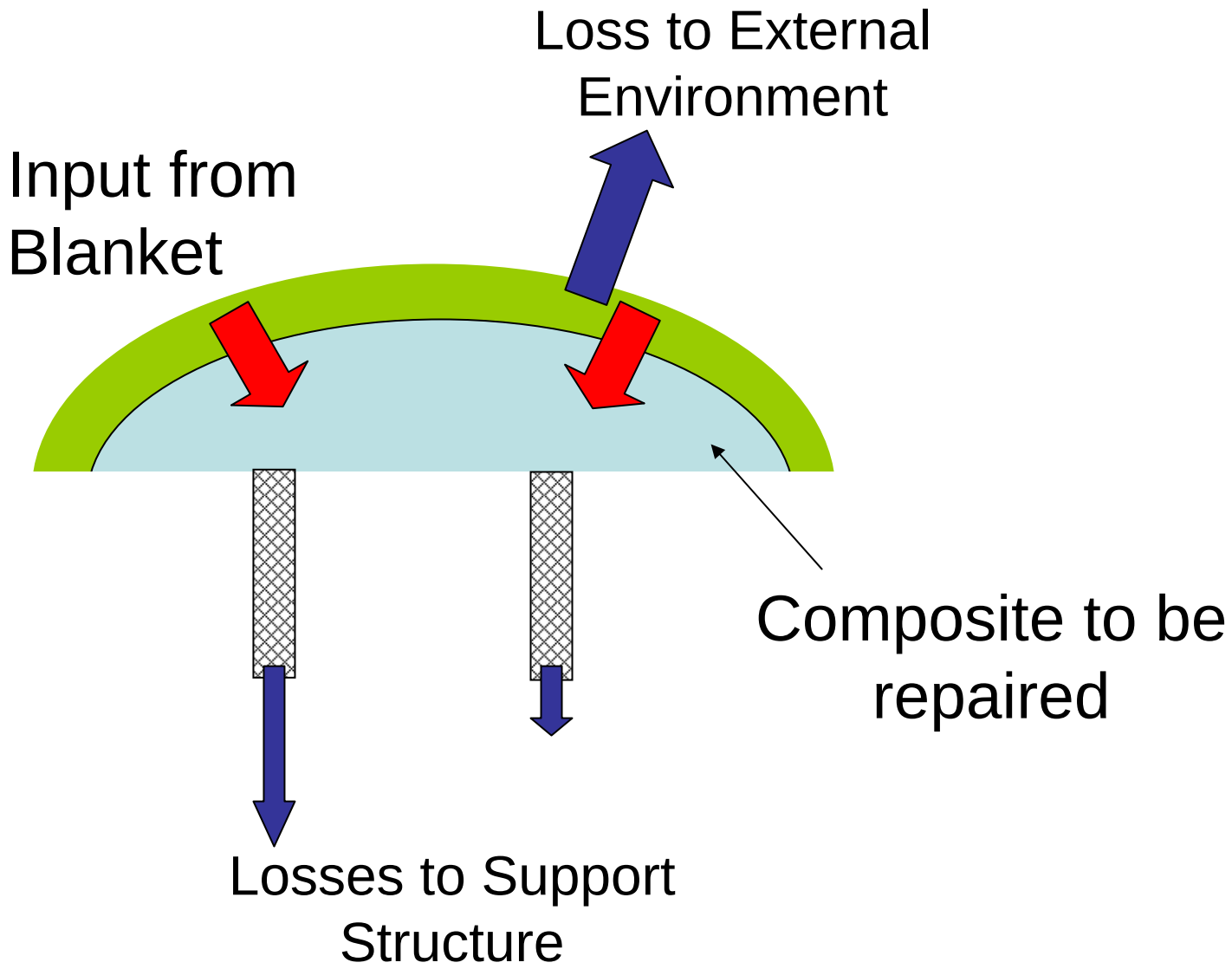
internal ***designed to account for***

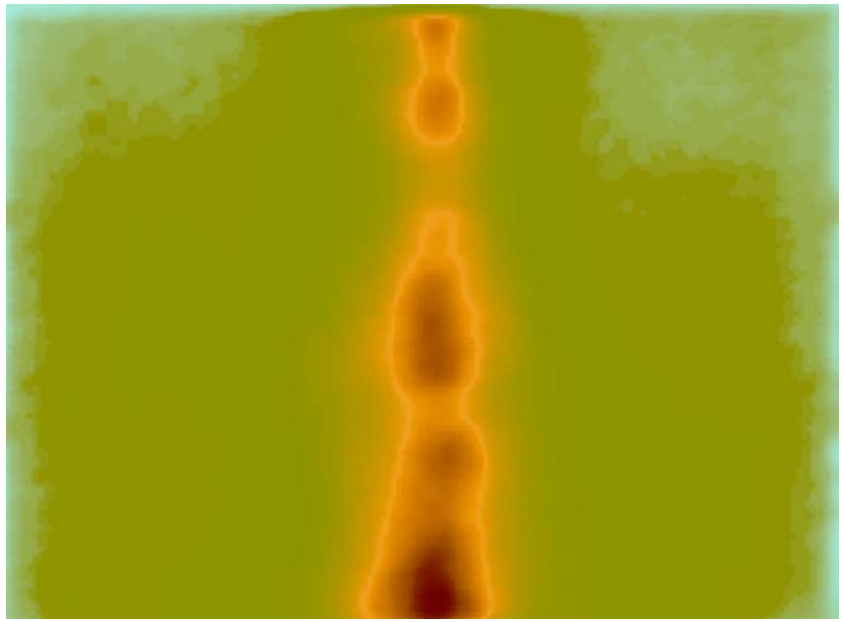


Field Heating

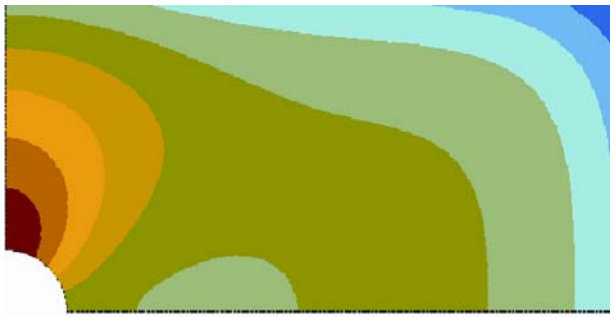
Environmental Concerns: external	***high***
internal	***may be very high***

Where the heat goes





Showing the effect of a stringer acting as sink to the heat flow



(a)

More Complex Structure

Finite Element Analysis

The goal in the field

Achieve a prescribed temperature of the repair zone

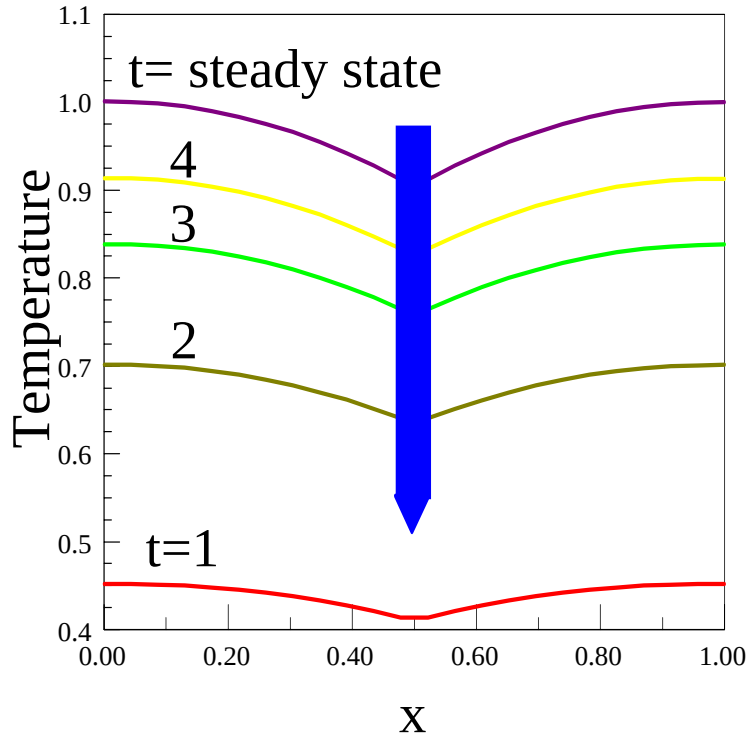
Maintain this temperature for a fixed time

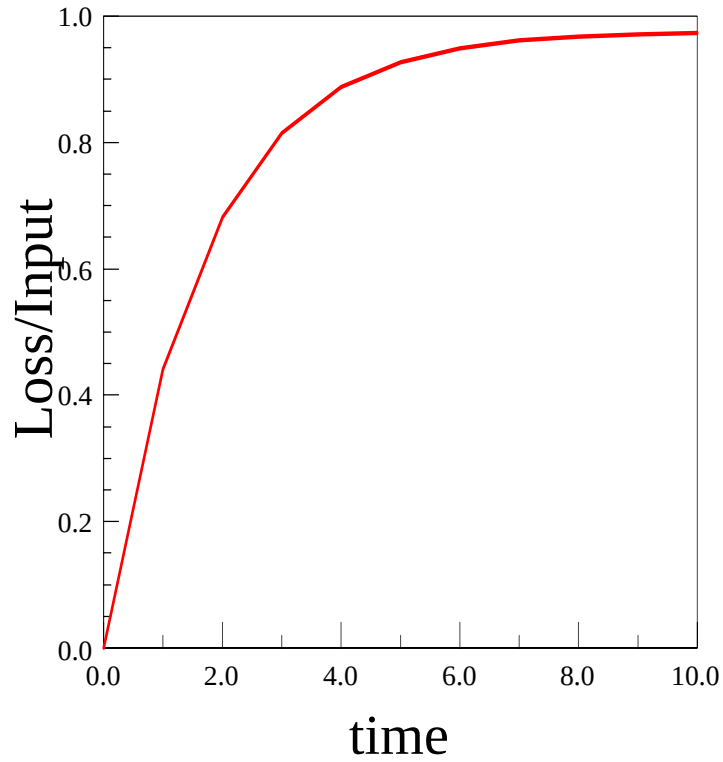
Avoid overheating neighboring parts

Solution

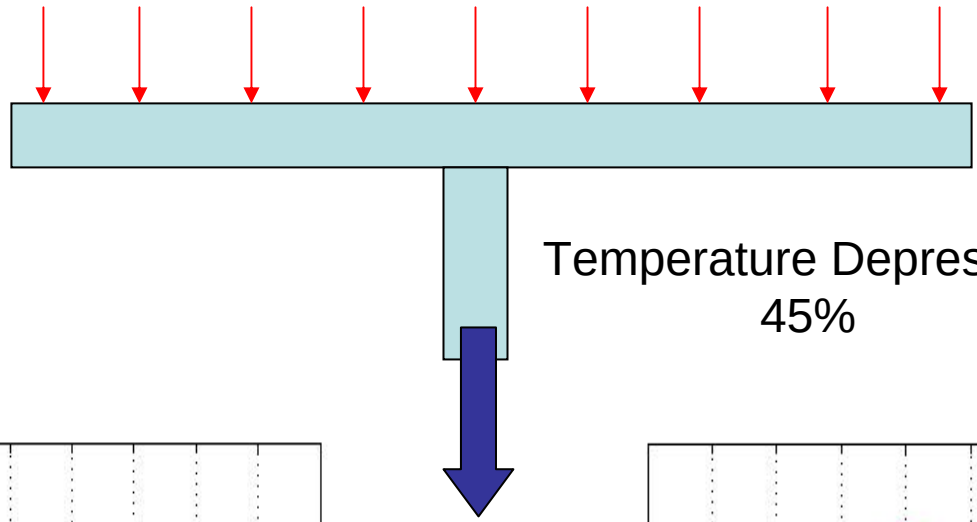
Finite Element Thermal Analysis

Finite Element Simulation of the Stringer Effect

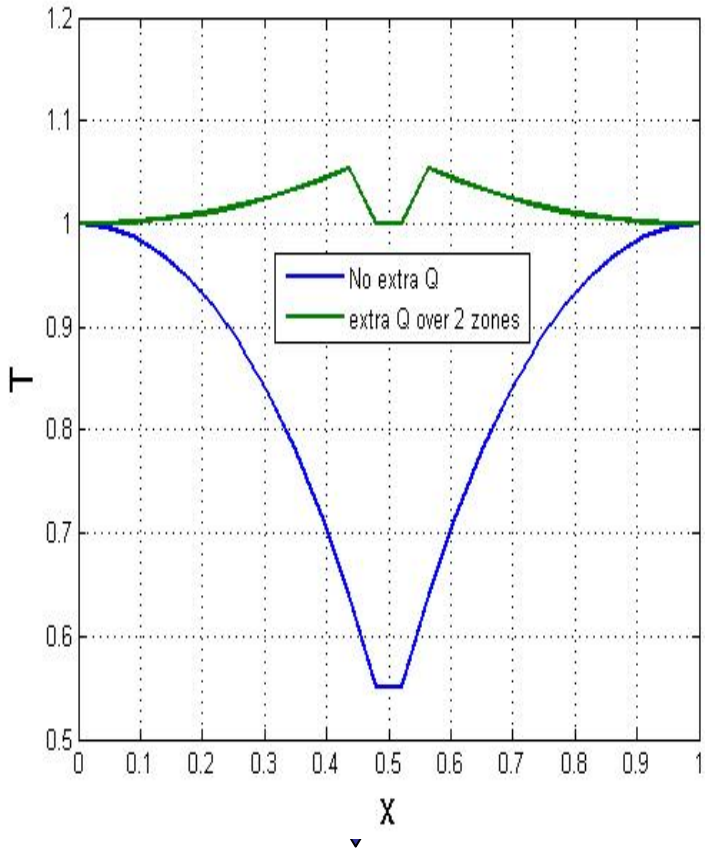


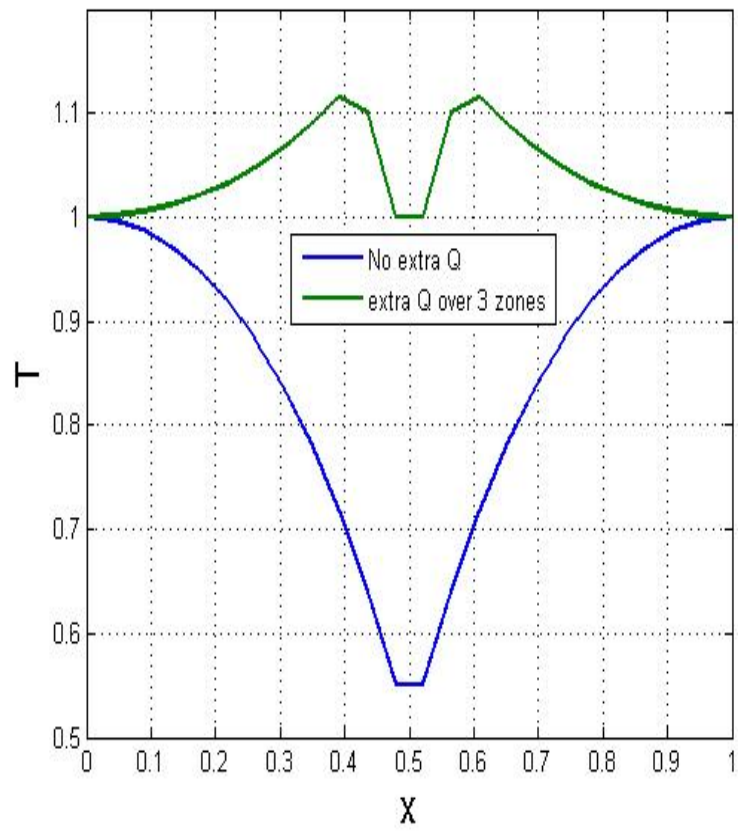


What does it take to reduce the depression?



Temperature Depression
45%





Ideas

1) Characterize typical configurations of heat loss to the environment and to the substructure

2) Define metrics of performance

3) Create simulation models for use in the field.

4) Define reasonable models for providing extra heat..

5) Test the models numerically, and then experimentally.

Sensitivity to Spatial Distribution of Extra Heat