



# Development of Advanced Carbon-Carbon Composite for Spaceplane Application\*



## *Synopsis:*

*Advanced carbon-carbon composites for spaceplane application have been developed which have high mechanical properties and good oxidation resistant coating. The C/C composites are reinforced with two dimensional...*

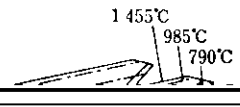
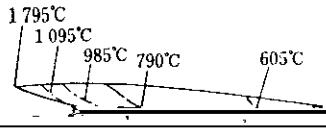
The 21st century will witness the development of com- growing space activity expected during and after the

able to take off and land horizontally.

being conducted by each nation.

Several projects are currently under development; the

Photos 1 and 2 show conceptual illustrations of two



composites using a UD (uni-directional) structure, 2D structure or 3D structure as in the case with general resin matrix composites. **Table 1** gives a classification of



and so on and the surface of outer side of the tip fin will reach up to 1300°C, and those of the nose cap and wing's leading edges will reach up to 1600°C<sup>3)</sup>. These

Ceramic/metal coating  
Solution ceramic coating  
Plasma spray

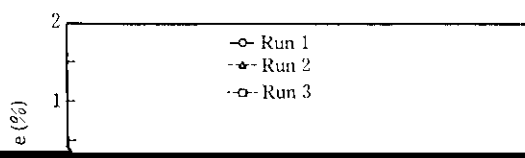
was coated upon the CVD-SiC layer. This viscous layer

fixed at the back of the specimen. The testing tempera-

CVD-SiC layer.

### 4.3 Anti-Oxidation Properties

repeated ten times for each specimen under an expo-  
sure time of 6 minutes per cycle. The weight and the  
thickness of the specimen were measured following  
each exposure. Figure 6 shows the weight loss of the



as attractive structural and oxidation protection materials for spaceplanes, especially HOPE. The following results were obtained:

(1) The present ACC reinforced with 2D carbon fiber fabric showed excellent mechanical properties.