COMMERCIAL AIRPLANE GROUP

September 6, 1972

6-8733-ASD-106

Dr. John D. Buckley
Head, Heat Shield Section MS 206
NASA Langley Research Center
Hampton, Virginia 23365

Dear Dr. Buckley:

Enclosed is the introduction to the "Adhesive Bonding Session" you requested. I hope that this is the type of introduction you had in mind.

Thank you for asking me to be Chairman of the Adhesive Bonding Session.

Very truly yours,

THE BOEING COMPANY
Commercial Airplane Group

J. E. McCarty

Enclosure

ADHESIVE BONDING SESSION

J. E. McCarty , Chairman

The capability of adhesives to meet the rigorous satellite requirements of temperature and space outgassing is but one illustration of adhesive bonding versatility. The many functional components of a satellite system requires that several types of adhesive be available to meet both environmental and functional requirements. The extensive application of adhesive on the Application Technology Satellite (ATS) demonstrates that material systems are available today for a wide range of usage.

In Space Shuttle the unique requirements to reliable attach the Reusable Surface Insulation (RSI) called for development of a specific adhesive system. A low density foam system has been developed and tailored to these unique requirements. This system provides strain isolation for the RSI from the support structure and remains structurally stable in the Space Shuttle thermal environment. These unique applications continue to expose adhesive bonding as a valuable tool which is available to solve both common place and unique design problems.

Corrosion of the metal adherend in an adhesive bonded component is an environmental effect common to almost all of the aerospace bonded systems. The effect of the surface preparation and its stabilization by the adhesive primer system are the most important factors in preventing corrosion from reducing the reliability and durability of an adhesive bonding component. The development and application of corrosion resistant adhesive primer has given adhesive bonding a very significant step up in its capability to resist the corrosion induced by exposure to a humid environment.

These improved and unique material characteristics have given bonding the ability to be used in a wide spectrum of applications. However, before these adhesive systems can be used to effectively join various components,

there is the continuing need to expand the engineering understanding of bonded joint design. As the design/analysis discipline for bonded joints is expanded by application of more discriminating analysis techniques the joint strength reliability and fatigue durability will correspondingly be improved. This improvement will open up bonded joint applications which are not presently available to bonding.

One of these potential new applications is in combination with advanced composites. The characteristics of composites makes adhesive bonding the first choice of all possible joining techniques for composites. When applying advanced composites as a reinforcement to metal structures adverse residual stresses are established during the adhesive bonding elevated temperature cure cycle. Development of manufacturing techniques to remove this residual stress, can offer the composite reinforced metals structure concept an opportunity to be applied in a cost effective manner to airframe structures.

The progress in expanding the use of adhesive bonding as a reliable, durable and cost effective joining technique continues in both specialized and general application areas of space and aircraft systems. The specific development refered to above and expanded on in these papers, shows that there is an across the board development and application of adhesive bonding occurring today.