

## 1.2 Durable Redundant Joint to Build Structures from Sections of Composite Sandwich Panel

**Statement:** A new adhesively bonded joint concept for curved and flat panel sandwich architectures. A pre-form, inserted into the seam between sandwich panels, provides a larger total bonding area and multiple load paths for an improved distribution of load through the joint.

**Problem addressed:** Adhesive bonded joints are susceptible to manufacturing defects that result in a failure between the adhesive and the surface. Such manufacturing defects may significantly decrease the load carrying capacity of the adhesive joint.

**Solution:** The new durable redundant joint offers improved safety and load carrying capability for sandwich structures when compared to conventional H-type joints. The new joint uses a composite pre-form to connect two ends of a curved, composite sandwich panel to form, for example, a cylindrical or elliptical segment.

**Technology description:** Systems, methods, and apparatus for increasing durability of adhesively bonded joints in a sandwich structure. This includes two face sheets, and an insert structure having a sandwich core material. A primary bond line may be coupled to the face sheet(s) and the splice. This technology reduces the load, provides a redundant path, reduces structural fatigue, and/or increases fatigue life.

**Benefits of the product:** The new joint provides more durable load transfer and redundant load paths compared to current state-of-the-art adhesively bonded strap joints. In brief, the listed advantages of the present technology are:

- Increased safety factor: reduced stress concentration on the joint.
- Dual bond line for mitigation of manufacturing defects: redundant load path allows load redistribution in the case of partial joint failure Improved mass-efficient load transfer capability that can be tailored for specific applications.
- Decreased circumferential load strains compared to a conventional strap-type joint.
- Cost and time savings in producing the pre-form insert as a single piece and later co-bonding the joint into place.
- Overlap length: additional bond area allows for decreased bond length (which translates into lower mass structures) when compared with a conventional strap or H-type joint.

**Areas of application:** This technology has numerous applications where composite materials are extensively used. Examples are composite structures, shells for storage tanks, masts and blades for wind power industry.