Peen forming is the preferred method of forming aerodynamic contours into aircraft wingskins. It is a dieless forming process that is performed at room temperature. The process is ideal for forming wing and empennage panel shapes for even the largest aircraft. It is best suited for forming curvatures where the radii are within the elastic range of the metal. These are large bend radii without abrupt changes in contour.

Through the peen forming process, residual compressive stress acts to elastically stretch the peened side as shown in Figure 1. The surface will bend or "arc" towards the peened side. The resulting curvature will force the lower surface into a compressive state. Typically an aircraft wingskin has a large surface area and thin cross sectional thickness. Therefore, significant forces are generated from the shot peening residual stress over this large surface area. The thin cross section is able to be manipulated into desired contours when the peen forming is properly engineered and controlled.

A properly engineered peen forming procedure will compensate for varying curvature requirements, varying wingskin thickness, cutouts, reinforcements and pre-existing distortion.

Peen forming offers the following advantages:

- No forming dies are required.
- Process is performed at room temperature.
- Wingskin design changes are easily accomplished by altering the peen forming procedure. There is no expensive modification of dies required.
- All forming is accomplished using residual compressive stress. Peen formed parts exhibit increased resistance to flexural bending fatigue and stress corrosion cracking as a result.
- Peen formed skins exhibit compressive stress on the top and bottom surfaces.

The majority of aircraft in production with aerodynamically formed aluminum alloy wingskins employ the peen forming process.

Metal Improvement Company has developed computer modeling techniques that allow feasibility studies of particular designs. The program takes three-dimensional engineering data and, based on the degree of compound curvature, calculates and illustrates the degree of peen forming required. It also exports numerical data to define the peening that is required to obtain the curvatures. A significant advantage of these techniques is that Metal Improvement Company can assist aircraft wing designers in the early stages of design. These techniques insure that the desired aerodynamic curvatures are met with economically beneficial manufacturing processes (Figure 2).