



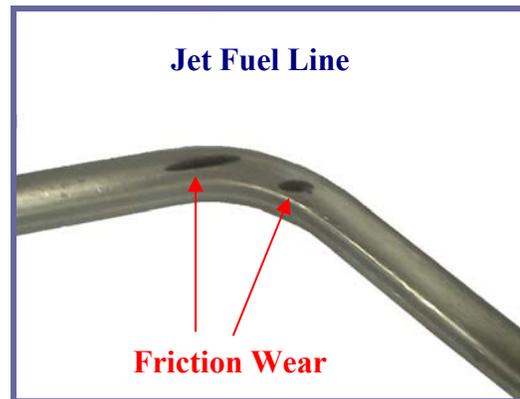
## Gouges and Dents



### Inspection Problems

Critical components in aircraft and space vehicles can be damaged by foreign objects during repair processes or by unexpected wear during normal operation. Any material removed from a surface by a scratch or a gouge or any deformity of a surface, such as a dent, may compromise the safety of the vehicle.

Scratches and gouges on tubes, pipes and other surfaces must be measured to determine how much material has been removed, and thus, how much of the original surface or wall is remaining. Depth micrometers and other mechanical devices cannot provide meaningful measurements because of the contour of the surfaces and the small features that have to be measured.

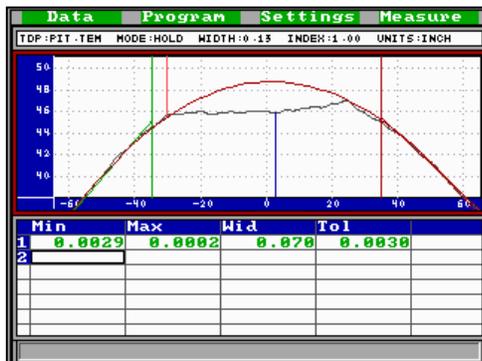


### Requirements

**Measurements** - The depth and width of any visible wear or gouge must be measured to determine if the part is still qualified for flight. Thresholds for the amount of material that can be missing are in the thousandths of an inch, so the measurement instrument must achieve this resolution.

**Instrument** - The inspection may need to be performed on the aircraft if the part cannot be removed, therefore, the instrument must be portable. Operators need to be alerted to out-of-spec conditions and measurements need to be documented.

### LaserGauge® Solution



LaserGauge System - The size of the feature being measured will determine the sensor field-of-view needed. For very small gouges and dents, the HS400 sensor with a 0.150" field-of-view will provide the greatest resolution. A dent or larger gouge may require an HS300 sensor with a FOV from 0.5" to 3.5", depending on the size of the feature and the resolution required. An LG1102 controller should be used to provide the graphical feedback necessary for the operator to position the laser stripe and view the profile as the measurements are being taken.

**Measurements** - The LaserGauge algorithm automatically

calculates the depth and width of the feature relative to a line-fit of the adjacent surfaces. Adjacent surfaces can be flat or curved. Material that has been pushed up above the original surface can also be measured.

## Advantages Realized

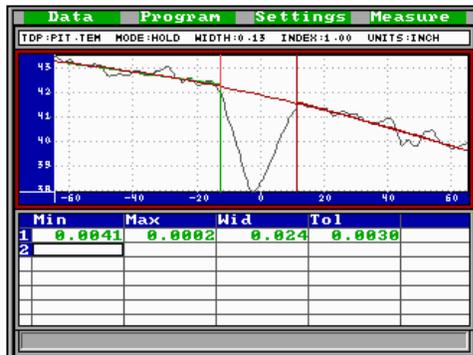
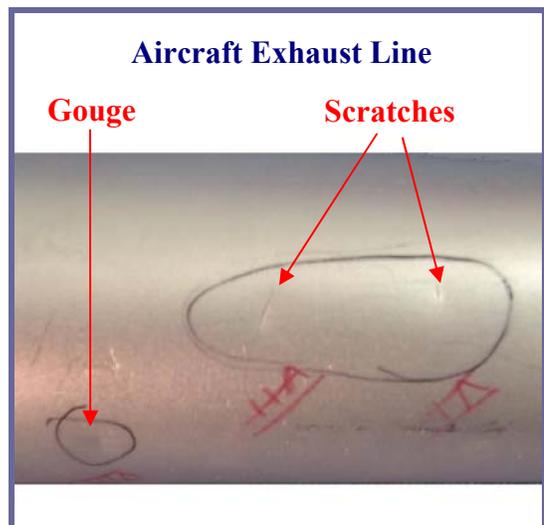
**Documented Results** - Measurements are accurate and repeatable. Measurements that reveal a problem condition are immediately flagged in the data table and can be documented in saved data files.

**Flexible** - Unusual damage can also be measured using on-screen, point and select tools. Saved data files can be retrieved to a PC and used to track process changes and for other analysis.

## Related Applications

**Scratches** - A scratch that is only 0.020 to 0.050 of an inch wide at the surface can present a measurement challenge for mechanical gauges. The tip or stylus of a depth micrometer is often too large to get down into such a narrow scratch.

**LaserGauge System** - An HS400 sensor with a 0.150" field-of-view is used with a portable LG1102 controller to make the measurements. The sensor has a depth resolution of  $\pm 0.0005$ -inches enabling it measure the scratch with the accuracy required. A real-time plot of the scratch is displayed as the operator positions the stripe over the location of interest.



**Measurements** - The depth (Min) of a scratch is measured from its deepest point relative to a line-fit of the two adjacent surfaces. Material pushed out of the scratch and creating a surface point above the line-fit is also measured (Max).

Edges of the scratch are determined using an edge tolerance provided by the operator and the width is measured between the two edges. Reflectivity problems may occur with scratches narrower than 0.020".

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