

**PROBLEM:** With the increased adoption of composite materials and innovative coatings in aircraft construction, the need to map damage found during maintenance onto CAD models has become essential. Historical approaches require extensive training and/or the use of expensive specialized equipment.

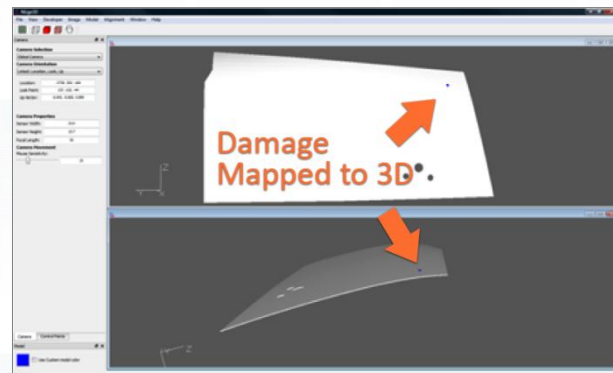
### WHAT NLIGN PROVIDES:

Nlign provides a solution to 3-D damage localization that is faster and simpler than other approaches. This solution uses photogrammetric techniques to map damage onto a CAD model from a digital picture of the part.

The process begins by the inspector marking the damage on the aircraft with a pen or other tool. The user then takes a picture of the damage and surrounding area. Once brought into Etegent's Nlign tool, this picture is aligned to a model of the structure using photogrammetric techniques. Pen annotations can also be extracted from the photograph and mapped onto the 3-D part.

At this point Nlign "takes over":

- **No Setup Required:** There is no calibration or setup process. The only information needed is a CAD model and a photograph of the damaged part.
- **Easy to Use:** The user performing the acquisition only needs to know how to operate a camera.
- **Flexibility:** Since the photographs contain the information needed to locate the damage, the alignment and analysis work can be done either locally or at another facility to which the images are transferred.
- **Localized Alignment:** Since alignments can be performed on a localized portion of the CAD model, issues such as the orientation of control surfaces are not a problem.
- **Accurate:** Sub-millimeter accuracy over a meter-squared area has been achieved for some structures.
- **FEA Export:** The damaged regions can be exported to an FEA package for detailed analysis.
- **No Specialized Hardware:** Other than a PC, the only hardware requirement is a consumer grade digital camera.
- **Fast:** The alignment process



These images show the damage to the mapping process. First, a photograph is taken of the damage. Next, the photograph is aligned with a CAD model. Finally, the damage in the photograph is mapped onto the CAD model

**SOLUTION:** Etegent's Nlign software tools, utilizing proven photogrammetric techniques, provides an accurate, low cost means of mapping damage found during maintenance onto a CAD model of the structure being maintained.

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an **NLIGN** CASE STUDY