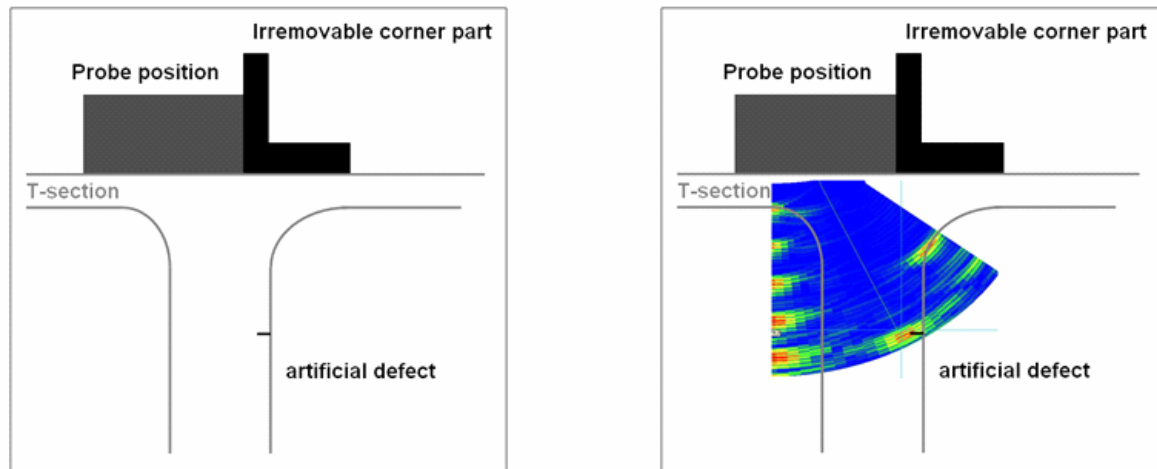


Stiffener inspection using a linear phased array (1/2)

Crack detection in T-section stiffeners is a recurrent problem for aircraft manufacturers. In most cases, access to the stiffener is not as easy as in the case described in the article titled “Analysis capabilities” for which the complete top surface is accessible. In the most common T-section configuration, there is a corner piece that cannot be removed for the inspection that restricts access and prevents the NDT inspector from using a simple procedure with a conventional probe (see figure below). Without the corner part, the inspection could be performed with good accuracy using normally incident pressure waves.



Left: T-section stiffener. Expected defects are located inside the stiffener. The corner piece prevents inspection using only normally incident waves. Right: Sectorial scan superimposed on a cross section showing the stiffener geometry. The sectorial scan allows cracks lying beneath the corner piece to be detected.

Stiffener inspection using a linear phased array (2/2)

However, with the corner piece, pressure waves at normal incidence cannot sample every zone of the stiffener, and the shadow zone (or silent zone) is too large to be acceptable. The inspection strategy must therefore be adapted to detect defects that lie underneath the corner piece. One solution is to use a linear phased-array probe. By performing a sectorial scan and using delay laws to steer the acoustic beam, the full width of the part can be inspected and the formerly silent zone is eliminated. As illustrated in the figure, cracks lying underneath the corner part can be detected using this procedure. In this figure, the inspector can observe the multiple reflections of the thin part (occurring at normal incidence, on the left side of the sectorial scan), as well as other structural reflections (at high steering angles, right side of the sectorial scan).



On-site inspection of T-section stiffeners, using M2M phased-array unit. Image courtesy of Dassault Aviation.