Ladies and gentlemen, today I am here to talk about the revolutionary technology of cold expansion in aircraft structures. Cold expansion technology, developed by Boeing in the early 1970s, utilizes residual stress caused by plastic deformation to enhance the fatigue life of aircraft components [2]. This process involves generating compressive residual stress to mitigate stress concentration at fastener holes, thereby delaying fatigue crack initiation and propagation [6].

One of the key aspects of cold expansion technology is the investigation of residual stress fields. Various measurement methods, such as strain gage, hole-drilling, and X-ray diffraction, have been employed to study the residual stress distribution around expanded holes [6]. Additionally, finite element simulation models have been developed to predict residual stress distributions near hole walls, providing valuable insights into the effectiveness of cold expansion in enhancing fatigue resistance [7].

As we delve deeper into the research on cold expansion technology, it becomes evident that the working temperature plays a crucial role in the performance of cold-expanded holes. Elevated temperatures, such as those experienced during

supersonic flight, can impact the residual stresses generated by cold expansion and potentially affect fatigue life [15].

In conclusion, cold expansion technology stands as a key anti-fatigue manufacturing method in the aviation industry, offering significant improvements in the fatigue lives of various materials. Through experimental investigations, finite element simulations, and ongoing research efforts, we continue to enhance our understanding of the mechanisms behind cold expansion and its application in modern aircraft structures [9].