The following is a summary of two lectures to be presented by Richard Whitcomb at the special course on subsonic/transonic aerodynamic interference for aircraft to be held at the von Karman Institute for Fluid Dynamics on May 2-6, 1983. All results presented were taken from publications which are now free of U.S. security or For Early Domestic Dissemination (FEDD) restrictions.

The first lecture entitled "Transonic Airfoil Development" consists of three parts, in which consideration is given to the current state of development of transonic or supercritical airfoils designed for fully turbulent boundary layers on the surfaces, previous research on subcritical airfoils designed to achieve laminar boundary layers on all or parts of the surfaces, and current research on supercritical airfoils designed to achieve laminar boundary layers. In the first part the use of available two dimensional computer codes in the development of supercritical airfoils and the general trends in the design of such airfoils with turbulent boundary layers are discussed. The second part provides the necessary background on laminar boundary layer phenomena. The last part, which constitutes the major portion of the lecture, covers research by NASA on supercritical airfoils utilizing both decreasing pressure gradients and surface suction for stabilizing the laminar boundary layer. An investigation of the former has been recently conducted in flight using gloves on the wing panels of the U.S. Air Force F111 TACT airplane, research on the later is currently being conducted in a transonic wind tunnel which has been modified to greatly reduce the stream turbulence and noise levels in the test section.

The second lecture entitled "Transonic Empirical Configuration Design Process" describes some of the experimental research pertaining to transonic configuration development conducted by the Transonic Aerodynamics Branch of the NASA Langley Research Center. Discussions are presented of the following: use of florescent oil films for the study of surface boundary layer flows; the severe effect of wind tunnel wall interference on the measured configuration drag rise near the speed of sound as determined by a comparison between wind tunnel and free air results; the development of a near sonic transport configuration incorporating a supercritical wing and an indented fuselage, designed on the basis of the area rule with a modification to account for the presence of local supersonic flow above the wing; a device for improving the transonic pitch up of swept wings with very little added drag at the cruise condition; a means for reducing the large transonic aerodynamic interference between the wing, fuselage, nacelle and pylon for a fuselage mounted nacelle having the inlet above the wing; and methods for reducing the transonic interference between flows over a winglet and the wing.