FINAL YEAR PROJECT REPORT
DIPLOMA MECHANICAL ENGINEERING
1999

FACULTY OF MECHANICAL ENGINEERING
UNIVERSITI TEKNOLOGI MARA (UiTM)
SHAH ALAM

TOPIC
FORTRAN PROGRAM UTILIZING PANEL METHOD ON ARBITRARY LIFTING AIRFOIL IN TWO-DIMENSIONAL INCOMPRESSIBLE FLOW TO OBTAIN Cl, Cd & Cm

PREPARED BY
ABDUL RAHMAN BIN ABDULLAH
(96299655)

ABSTRACT

The surfaces that support an aircraft by means of dynamic reaction on the air are called **wings**. Regardless of the type of lifting surface, its **aerodynamic characteristics** of the wing section will strongly affected by the shape of the **wing section** (called **airfoil**).

The wing characteristics may be predicted from the known aerodynamic characteristics of the wing section. A considerable body of aerodynamic theory has been developed whereby it is possible to calculate some of the important characteristics of wing sections, one being the use of **PANEL METHOD** and with the aide of computers.

By the beginning of the 20th century, methods of **hydrodynamics** had been successfully applied to airfoils so as to allow the prediction of **lifting characteristics** for airfoil shapes, mathematically. These special shapes did not represent the optimum in airfoil performance, and experimental methods (that is the wind tunnel testing) guided by theory were used to determine the characteristics of **arbitrary shaped airfoils**. Eventually, the numerical technique of panel method has come into widespread use since 1970s.

Panel Method computer codes, is used for the purpose of estimating aerodynamic characteristics of **two-dimensional airfoil sections** in **ideal flows of negligible compressibility and viscosity effects**, with a primary intention as a preliminary evaluation tool used to obtain quick estimations of configuration aerodynamics. It is not the intent to replace wind tunnel or more rigorous analytical results, but rather to provide an efficient means of estimating vehicle aerodynamic characteristics and preliminary design stages.

Thus, base on these preliminary design estimation, this project will assimillate the **Utilization of Panel Method Using Fortran** (a reliable and convenience way to represent linear equations and other listings through computer programs) to predict the aerodynamic sectional airfoil coefficients namely **Cl (lift), Cd (drag) and Cm (moment)** so as further analysis of aerodynamic characteristics can be done with the results obtained. **NACA 0009 Symmetrical Airfoil** and **NACA 23018 Cambered Airfoil** configuration is used as a comparable results with the one obtained from Abbot and Von Doenhoff Airfoil Data.

Hopefully with this effort, those whose interest is Computational Aerodynamics, particularly with the use of Panel Method, will gain tremendously. To appreciate the **PROGRAM PANEL** is to really understand the gist of Panel Method. Enjoy reading.

CONTENTS **PAGES**