

REPORT

25.10.02 목 과제

CHEONGJU UNIVERSITY



청주대학교

과 목 명 : 전산유체해석실습

지도교수 : 임동균

학 과 : 무인항공기학과

학 번 : 2021010599

이 름 : 박원빈

제 출 일 : 2025년10월3일

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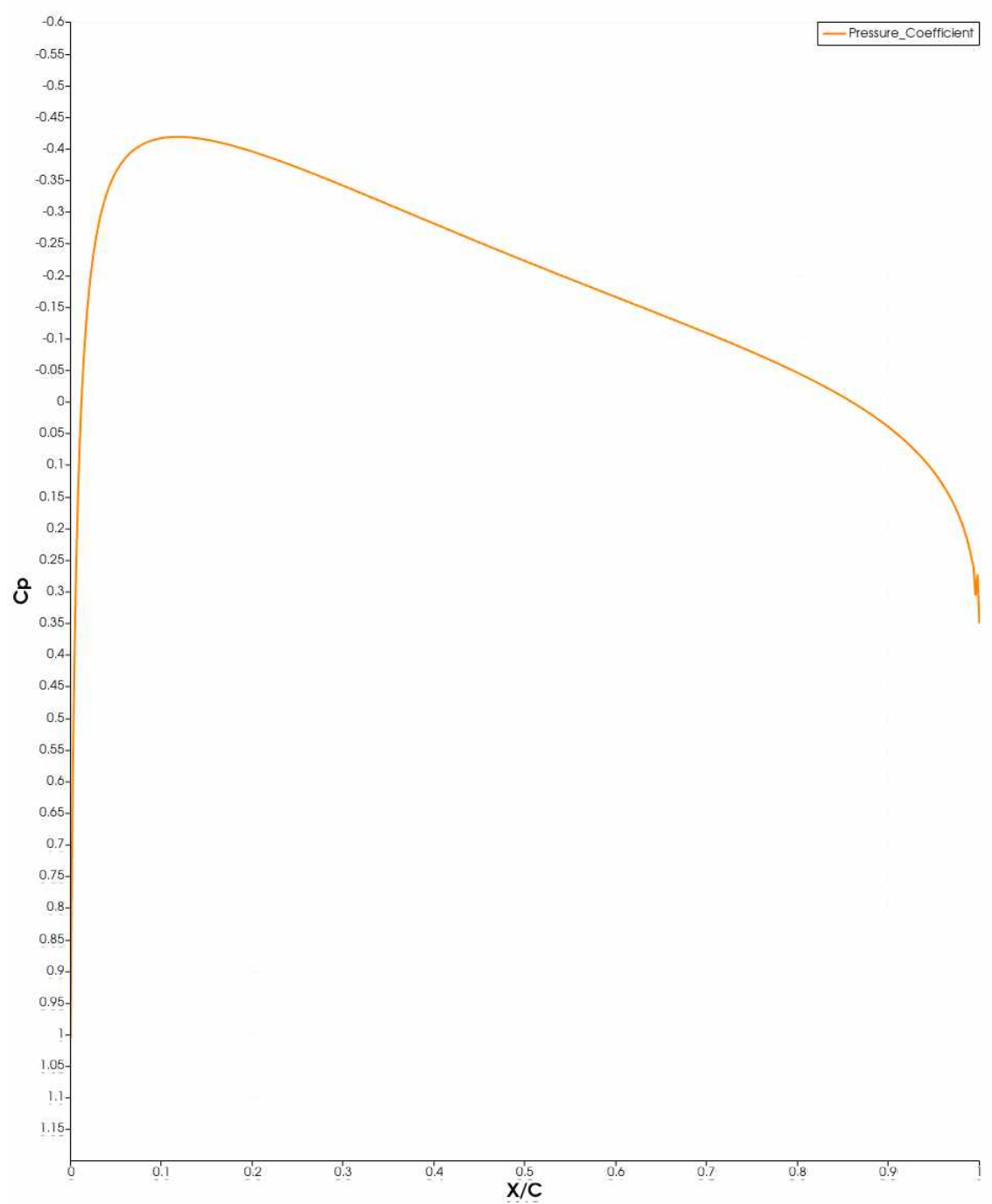
% ----- DIRECT, ADJOINT, AND LINEARIZED PROBLEM DEFINITION -----%
%
% Physical governing equations (EULER, NAVIER_STOKES,
%                               WAVE_EQUATION, HEAT_EQUATION, FEM_ELASTICITY,
%                               POISSON_EQUATION, RANS)
SOLVER= RANS
%
% Specify turbulence model (NONE, SA, SA_NEG, SST)
KIND_TURB_MODEL= SA
%
% Mathematical problem (DIRECT, CONTINUOUS_ADJOINT)
MATH_PROBLEM= DIRECT
%
% Restart solution (NO, YES)
RESTART_SOL= NO

% ----- COMPRESSIBLE FREE-STREAM DEFINITION -----%
%
% Mach number (non-dimensional, based on the free-stream values)
MACH_NUMBER= 0.150
%
% Angle of attack (degrees, only for compressible flows)
AOA= 0
%
% Side-slip angle (degrees, only for compressible flows)
SIDESLIP_ANGLE= 0.0
%
% Init option to choose between Reynolds (default) or thermodynamics quantities
% for initializing the solution (REYNOLDS, TD_CONDITIONS)
INIT_OPTION= REYNOLDS
%
% Free-stream option to choose between density and temperature (default) for
% initializing the solution (TEMPERATURE_FS, DENSITY_FS)
FREESTREAM_OPTION= TEMPERATURE_FS
%
% Free-stream temperature (288.15 K by default)
FREESTREAM_TEMPERATURE= 288.15
%
% Reynolds number (non-dimensional, based on the free-stream values)
REYNOLDS_NUMBER= 6.0E6
%
% Reynolds length (1 m by default)
REYNOLDS_LENGTH= 1.0

```

-RANS 방정식을 풀도록 지정

-마하수 0.15, 받음각 0°, 레이놀즈수 6.0×10^6 , 시위선 1.0m



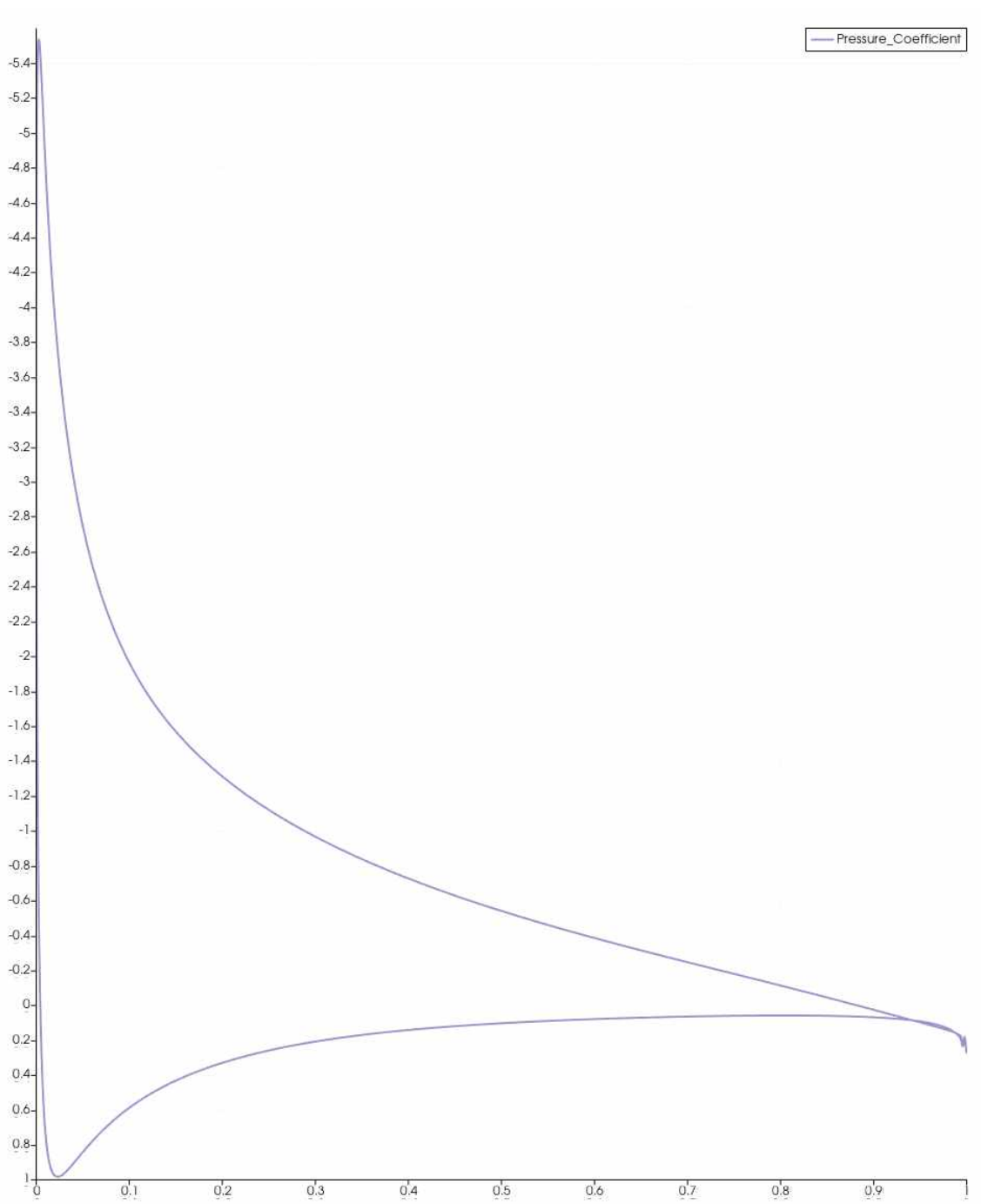
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% ----- DIRECT, ADJOINT, AND LINEARIZED PROBLEM DEFINITION -----%
%
% Physical governing equations (EULER, NAVIER_STOKES,
%                               WAVE_EQUATION, HEAT_EQUATION, FEM_ELASTICITY,
%                               POISSON_EQUATION, RANS)
SOLVER= RANS
%
% Specify turbulence model (NONE, SA, SA_NEG, SST)
KIND_TURB_MODEL= SA
%
% Mathematical problem (DIRECT, CONTINUOUS_ADJOINT)
MATH_PROBLEM= DIRECT
%
% Restart solution (NO, YES)
RESTART_SOL= NO

% ----- COMPRESSIBLE FREE-STREAM DEFINITION -----%
%
% Mach number (non-dimensional, based on the free-stream values)
MACH_NUMBER= 0.150
%
% Angle of attack (degrees, only for compressible flows)
AOA= 10
%
% Side-slip angle (degrees, only for compressible flows)
SIDESLIP_ANGLE= 0.0
%
% Init option to choose between Reynolds (default) or thermodynamics quantities
% for initializing the solution (REYNOLDS, TD_CONDITIONS)
INIT_OPTION= REYNOLDS
%
% Free-stream option to choose between density and temperature (default) for
% initializing the solution (TEMPERATURE_FS, DENSITY_FS)
FREESTREAM_OPTION= TEMPERATURE_FS
%
% Free-stream temperature (288.15 K by default)
FREESTREAM_TEMPERATURE= 288.15
%
% Reynolds number (non-dimensional, based on the free-stream values)
REYNOLDS_NUMBER= 6.0E6
%
% Reynolds length (1 m by default)
REYNOLDS_LENGTH= 1.0

```

-받음각 10°, 나머지 조건은 0°일 때와 동일



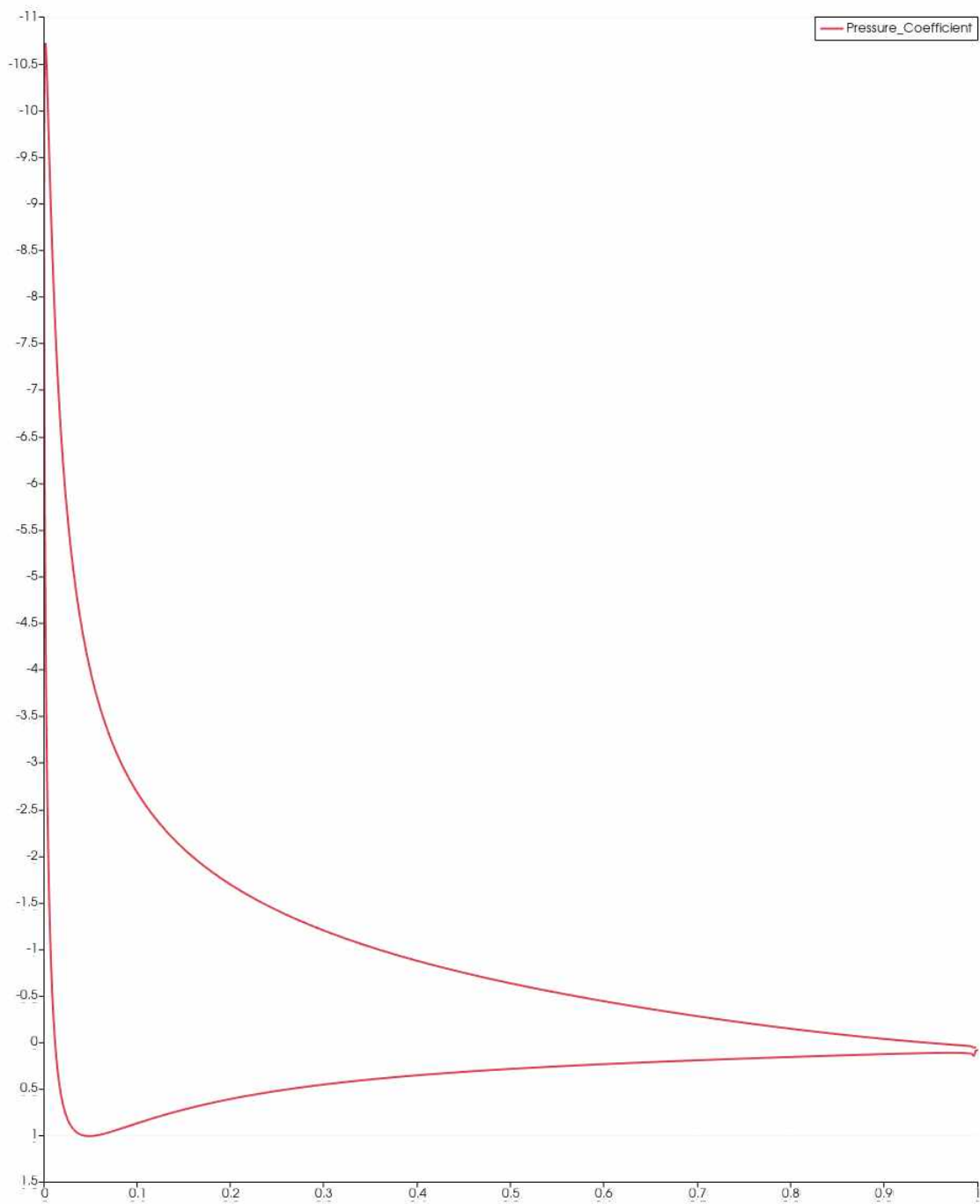
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% ----- DIRECT, ADJOINT, AND LINEARIZED PROBLEM DEFINITION -----%
%
% Physical governing equations (EULER, NAVIER_STOKES,
%                               WAVE_EQUATION, HEAT_EQUATION, FEM_ELASTICITY,
%                               POISSON_EQUATION, RANS)
SOLVER= RANS
%
% Specify turbulence model (NONE, SA, SA_NEG, SST)
KIND_TURB_MODEL= SA
%
% Mathematical problem (DIRECT, CONTINUOUS_ADJOINT)
MATH_PROBLEM= DIRECT
%
% Restart solution (NO, YES)
RESTART_SOL= NO

% ----- COMPRESSIBLE FREE-STREAM DEFINITION -----%
%
% Mach number (non-dimensional, based on the free-stream values)
MACH_NUMBER= 0.150
%
% Angle of attack (degrees, only for compressible flows)
AOA= 15
%
% Side-slip angle (degrees, only for compressible flows)
SIDESLIP_ANGLE= 0.0
%
% Init option to choose between Reynolds (default) or thermodynamics quantities
% for initializing the solution (REYNOLDS, TD_CONDITIONS)
INIT_OPTION= REYNOLDS
%
% Free-stream option to choose between density and temperature (default) for
% initializing the solution (TEMPERATURE_FS, DENSITY_FS)
FREESTREAM_OPTION= TEMPERATURE_FS
%
% Free-stream temperature (288.15 K by default)
FREESTREAM_TEMPERATURE= 288.15
%
% Reynolds number (non-dimensional, based on the free-stream values)
REYNOLDS_NUMBER= 6.0E6
%
% Reynolds length (1 m by default)
REYNOLDS_LENGTH= 1.0

```

-받음각 15°, 나머지 조건은 위와 동일



받음각 (α)	0°	10°	15°
특징	대칭 분포	상·하부 압력 뚜렷하게 분리	상·하부 압력 최대 분리
C_L	≈ 0	높은 양력 발생	C_{Lmax} 근접
날개 윗면 최저 C_p	≈ -0.45	≈ -5	≈ -11
C_p 분포변화	-받음각이 0°일 때는 상하 분포가 대칭적이라 양력이 거의 없다 -10°에서는 윗면 압력이 크게 낮아지고 아랫면 압력이 높아져 C_L 이 크게 증가. -15°에서는 윗면 압력이 매우 낮아지지만 뒷전 유동이 불안정해져 박리가 발생하고 C_L 이 감소하면서 실속 징후가 나타남.		