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COLLECTED DATA FOR TESTS ON A NACA 23012A AEROFOIL

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Herein is presented the collected data for tests in which a NACA 23012A aerofoil was subjected to a variety of displacements in pitch about the quarter-chord location at low Reynolds numbers.

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NACA 23012A

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NOMENCLATURE

c	chord
C_m	pitching-moment coefficient
C_n	normal force coefficient
C_p	pressure coefficient
C_t	"thrust" force coefficient
D.P.	dynamic pressure ($\rho V^2/2$)
k	reduced frequency ($\omega c/2V$)
r	reduced pitch-rate $(c/2V)d\alpha/dt$
Re	Reynolds number
V	velocity
x/c	chordwise dimension
α	angle of attack
ω	rotational velocity

1 INTRODUCTION

The phenomenon of dynamic stall, the onset of which is largely controlled by the behaviour of the viscous boundary layer on the aerofoil surface, plays an important role in the successful design of the helicopter rotor. During high speed forward flight conditions, the blades on the retreating side of the rotor disc encounter a reduced dynamic pressure, and hence rotor trim requirements dictate a high aerofoil lift coefficient. These high lift coefficients are generated through large angles of incidence, often exceeding the maximum static stall value and so take advantage of the dynamic effects on the stalling process. Aerofoil dynamic stall is imprecisely understood and is currently the subject of extensive experimental and theoretical investigation by, amongst others, **Beddoes**[1]. As has been shown by **Harris and Pruyn**[2], attempts to predict rotor performance without a mathematical model of retreating-blade stall have met with little success. Furthermore, the modelling is complicated by the highly three-dimensional flowfield of the rotor. It is clear, however, that, in order to formulate modelling techniques for use in rotor airload calculations, a basic understanding of the unsteady stall process must be established.

An experimental investigation of retreating-blade stall, together with a boundary-layer analysis on a model rotor, by **McCroskey et al**[3,4] pointed to the modelling of blade dynamic stall by an oscillating aerofoil in the nominally two-dimensional flow environment of a wind tunnel. Many such experiments of aerofoils oscillating through stall have since been performed, and data have been gathered for both the analysis of the fluid mechanics of the dynamic stall phenomenon itself and for use in mathematical model development.

As part of this investigation, in recent years, in the dynamic stall facility at the University of Glasgow[5,6,7], two-dimensional data have been acquired from experiments on a number of aerofoils under a variety of motion types. These aerofoils can be divided into two groups: the first is a family of cambered aerofoils generated from the NACA 23012 section and intended for the examination on helicopter blades of the transition from trailing-edge to leading-edge stall and the mechanism of reattachment; the second is a series of symmetrical sections for use on large-scale vertical-axis wind turbines. This report presents the collected data from tests performed on a model of a NACA 23012A aerofoil in steady and unsteady conditions. This aerofoil, which belongs to the first of these groups was designed by **Niven and Galbraith**[8] by modifying the NACA 23012 aerofoil section downstream of the quarter-chord location in order to create a region of reflex camber at the trailing edge. The coordinates for the aerofoil section are listed in **Table 1**, and a brief descripton of the experimental apparatus and techniques is presented below.

2 DESCRIPTION OF TEST FACILITY

2.1 Aerofoil and Wind Tunnel

The general arrangement of the aerofoil in the wind tunnel was as shown in **Figure 1**. The aerofoil, of chord length 0.55m and span 1.61m, was constructed of fibre glass mounted on an aluminium spar and filled with an epoxy resin foam. The hand-finished surface was very smooth, and the profile accurate to better than 0.1mm. The instrumented model was fitted vertically into the University of Glasgow's "Handley Page" wind tunnel.

The "Handley Page" low-speed wind tunnel is an atmospheric-pressure closed-return type with a 1.61x2.13 octagonal working section (**Figure 2**) in which a wind velocity of $61ms^{-1}$ can be attained. The model was pivoted about its quarter-chord axis on two tubular steel shafts connected to the main support via two self-aligning bearings. A single thrust bearing on the top support beam took all the weight. The dynamic and aerodynamic loadings from the aerofoil were reacted to the tunnel framework by two transversely mounted beams.

2.2 Pitch Drive Mechanism

2.2.1 Actuator

Angular movement of the model was obtained using a linear hydraulic actuator and crank mechanism. The actuator was mounted horizontally below the tunnel working section on the supporting structure, with the crank rigidly connected to the tubular part of the spar by a welded sleeve and keyway. The acuator was a UNIDYNE 907/1 type with a normal dynamc thrust of 6.1KN operated from a supply pressure of 7.0MNm^{-2}. A MOOG 76 series 450 servo valve was used via a UNIDYNE servo controller unit to control the movement of the actuator. A suitable feedback signal for the controller was provided by a precision linear angular displacement transducer geared to the main spar of the model.

2.2.2 Command Signal

The model's angle of attack was incremented by the actuator controller. The input signal during the static tests was provided under software control by the data acquisition unit's own digital-to-analogue converter. This was possible because, during the sampling, the angle of attack was fixed and sufficient time was available between sampling to set the model at the required angle of attack. The two activities were separate and were performed sequentially.

Such was not the case during the unsteady tests, however, where sampling and control of the model's motion were required simultaneously. Therefore, during constant-pitch-rate "ramp" experiments, the input signal was provided by a separate function generator, comprised of an PET microcomputer and an 8-bit digital-to-analogue converter. A ramp signal was obtained by simply incrementing the PET's output lines sequentially from 00000000 to 11111111, while the desired delay between increments was generated by software using a memory location as a counter. The input signal during oscillatory experiments was provided by an IEEE-controlled synthesised function generator, the amplitude and frequency of which was set via the MINC microcomputer at the start of each test condition.

2.3 Instrumentation and Data Logging

2.3.1 Pressure Transducers

To provide the chordwise pressure distribution at mid-span, thirty ultra-miniature silicon strain-gauge pressure transducers (ENTRAN EPI-080-5 and KULITE LSQ-57) were installed just below the surface of the centre section of the model. The transducers were of sealed-gauge type with one side of the pressure-sensitive diaphragm sealed to a reference pressure during manufacture. Each transducer was fitted with a temperature compensation module, which minimised the change in zero-offset and sensitivity with temperature. The locations of the pressure transducers in the model are illustrated in **Figure 3**.

The low voltage outputs from the thirty presure transducers were suitably amplified and conditioned by a bank of differential amplifiers. The conditioned signals were passed to a "sample and hold" unit[5,9] to overcome the time-skew problem arising from the sequential conversion of the anlogue signals into digital form.

2.3.2 Dynamic Pressure

The dynamic pressure in the wind tunnel working section was determined by a pitot-static probe mounted on the tunnel side wall approximately one chord length upstream of the aerofoil's leading edge. The probe was connected to a FURNESS FC012 micromanometer, which provided an analogue signal suitable for the data acquisition unit's analogue-to-digital converter. This dynamic pressure was recorded as the sample-and-hold unit was triggered to sample the output from the pressure transducers.

2.3.3 Incidence

The instantaneous angle of attack of the aerofoil was determined by an angular displacement transducer geared to the model's main spar. The signal voltage from the transducer was fed into an amplifier/splitter to produce three signals for the following purposes:

i) connection of the multiplexer for recording the aerofoil's angle of attack;

ii) connection of the Schmitt trigger for initiation of data sampling when a preset incidence (voltage) was attained;

iii) a feedback signal to the hydraulic actuator controller.

2.3.4 Acquisition Unit

The actual data acquisition unit was a DEC MINC-11 microcomputer, configured with an LSI-11/32 16-bit microprocessor and laboratory modules which included:

i) an analogue-to-digital converter module, with a 16-channel multiplexer incorporated. The converter was a 12-bit successive approximation type with a conversion time of of 30μs, but the multiplexer's settling time and the need to transfer the data from the analogue-to-digital converter into system memory increased the conversion time to 44μs;

ii) a multiplexer module, of 16 single-ended channels, which increased the number of channels that could be sampled to 32;

iii) a real-time clock module, with two Schmitt triggers. This was used as a time-base generator to accurately set the sampling frequency. For ramp experiments, the sampling frequency was determined at run time from the pitch rate and the requirement that 128 sample sweeps should be obtained when the incidence was increasing and the same number when the aerofoil was sitting at its final incidence. However this specification was qualified by the fact that data were required to be recorded at the final incidence for no longer than 4 seconds and that the maximum sampling frequency which could be attained was 550Hz. One of the Shmitt triggers was used to initiate data sampling, by setting its reference voltage to a value corresponding to the angular displacement transducer's output for the required starting angle of attack. For oscillatory tests, the sampling frequency was determined from the frequency of oscillation and the requirement that 128 sample sweeps should be obtained during each cycle;

iv) a digital-to-analogue converter module which housed four independent 12-bit digital to analogue converters. This was used to provide the command signal for the hydraulic actuator during static tests.

The path of data flow and system layout is shown diagrammatically in **Figure 4**. The main control programs for the tests were written in FORTRAN IV, as described by **Murray-Smith and Galbraith**[10]. The programs prompt the user for specific run information before calling a specialised subroutine written in MACRO-11 assembly language to receive and store the digitised data. The timing and control of the analogue-to-digital converter and associated circuitry was performed by the processor's hardware, but channel selection and data management were achieved under software control.

3 TEST SERIES AND PROCEDURE

3.1 Static Experiment

A number of experiments were performed under steady conditions. Once the wind velocity had reached the required value, the aerofoil was rotated about its quarter-chord axis until it was positioned at the incidence at which the first set of data were to be recorded. Usually, this was approximately -2°. The model's angle of attack was then increased in steps of approximately 0.5°. After each increment in incidence, the flow was allowed to stabilise for a few seconds before each transducer's output was sampled 100 times and the mean value for each was stored. After 64 sweeps of data had been recorded, the model was returned to its starting position. Data sampling was maintained at the same rate on the return arc in order to record any delay in the reattachment of flow.

3.2 Ramp Experiment

During a ramp test the aerofoil was rotated about its quarter-chord axis over a preset arc at a constant pitch-rate. Five cycles of 256 data sweeps were recorded during each experiment. Between each ramp, the model sat at the finishing angle for five seconds, moved smoothly back to the starting angle in five seconds and sat at this position for another five seconds. Experiments were performed both when the pitch-rate was positive ("ramp up") and when it was negative ("ramp down").

3.3 Sinusoidal Experiment

For this experiment, the model was rotated about its quarter-chord axis so that its angle of attack varied sinusoidally with time. The amplitude and frequency were controlled by the function generator. During each oscillatory cycle 128 data sweeps were recorded and logged, with data being sampled during ten cycles.

3.4 Procedure

Before each individual set of tests, the tunnel was shut down and the air flow allowed to cease before the transducer offsets were logged. Immediately after these values were recorded, the appropriate data acquisition routine was initiated whilst the tunnel was brought up to speed and thence data gathered as per the software prompts. The tunnel was then shut down, offsets logged again and further tests were performed in the manner described above.

3.5 Data Presentation

All data collected by the data acquisition routines were stored in unformatted form on magnetic tape. A library of programs (coded in FORTRAN 77) is available for the reduction, presentation and analysis of the data on a DEC MICROVAX 3400. By applying offsets, gains and calibrations, the data reduction programs convert the cycles of raw data into averaged or unaveraged non-dimensional pressure coefficients. As described by **Leitch and Galbraith**[11], these data are stored on the University of Glasgow's aerofoil database. The airloads are determined by suitably integrating the pressure coefficient values.

4 RESULTS AND DISCUSSION

4.1 Tunnel Performance

Assessment of the quality of the data can only be made with a clear insight of the tunnel effects. Unfortunately the tunnel performance was such that, for the time scales of the model motion, it was not possible to hold the dynamic pressure in the working section constant whilst altering the blockage due to the pitching of the aerofoil. During the static tests (i.e. **k**=0.0 and **r**=0.0), this variation was as illustrated in **Figure 5**, where it can be seen that there was approximately a 30% reduction in dynamic pressure as the angle of attack was increased from 0° to 30°. As illustrated in **Figures 6** and **7**, this reduction in dynamic pressure decreased as reduced frequency increased.

Figure 8 reveals that, during ramps, there was a drastic reduction and subsequent unsteadiness in the dynamic pressure during a test. The model was pitched to an incidence of 40° so that uniform ramp conditions existed at stall. Once the aerofoil had stalled, however, all significant data had already been collected and the corresponding dynamic pressure reduction was only in the region of 10%. The subsequent data are of little relevance to the current work and is presented merely for completeness.

4.2 Averaging of the Data

The main data in this report are the average of a number of cycles. Individual cycles are presented in **Figures 9** and **10** where it may be seen that, whilst minor random differences do exist from cycle to cycle, the salient features are highlighted by the averaging process. In addition, the sweep at which any event occurred did not vary. Therefore the given data may be considered as typical of aerofoil performance during any given individual cycle. This is particularly relevant when considering the detailed flow phenomena of separation and reattachment.

4.3 Test Data

The test data are grouped for each motion type with compact details of the specific tests listed in **Tables 2** to **5**.

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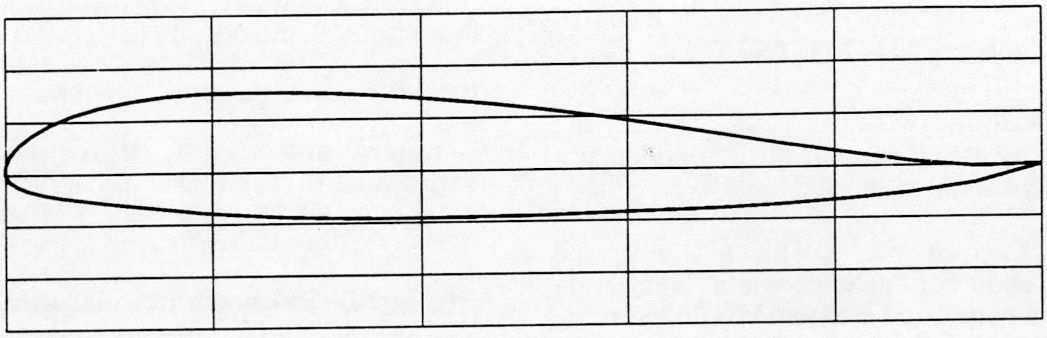
TABLE 1 : NACA 23012A AEROFOIL PROFILE AND COORDINATES



Coordinates in %Chord

Upper Surface		Lower Surface	
Station	Ordinate	Station	Ordinate
0.000	0.000	0.000	0.000
-0.044	0.802	0.436	-0.681
0.337	1.694	1.229	-1.226
1.166	2.657	2.354	-1.658
2.454	3.651	3.791	-2.008
4.207	4.626	5.529	-2.308
6.413	5.523	7.564	-2.588
9.048	6.286	9.910	-2.874
12.069	6.876	12.588	-3.180
15.421	7.276	15.631	-3.508
19.042	7.503	19.077	-3.838
22.902	7.603	22.925	-4.123
27.060	7.597	27.083	-4.333
31.507	7.479	31.530	-4.471
36.224	7.241	36.247	-4.540
41.195	6.872	41.216	-4.547
46.399	6.365	46.418	-4.498
51.816	5.725	51.831	-4.401
57.424	4.964	57.436	-4.261
63.202	4.103	63.209	-4.077
69.125	3.169	69.128	-3.843
75.169	2.202	75.169	-3.544
81.310	1.257	81.306	-3.147
87.521	0.422	87.515	-2.587
93.773	-0.125	93.768	-1.705
100.031	0.051	100.027	-0.050

TABLE 2 : DETAILS OF STATIC TESTS

TABLE 2.1 : SUMMARY OF STATIC TESTS (nominal)

Reynolds Number	1.5×10^6
Angle of Attack	-2° to 30°

TABLE 2.2 : LIST OF STATIC TESTS (actual)

Run Number	Start (°)	Sweep (°)	Reynolds No. x 10^{-6}
00101	-2	32	1.51

TABLE 3 : DETAILS OF RAMP UP TESTS

TABLE 3.1 : SUMMARY OF RAMP UP TESTS (nominal)

Starting Incidence	-1°						
Finishing Incidence	40°						
Pitch Rate (°s^{-1})	3.0	4.5	6.0	7.5	15.0	30.0	45.0
	60.0	75.0	90.0	100.0	115.0	130.0	145.0
	160.0	175.0	190.0	200.0	230.0	245.0	260.0
	275.0	290.0	300.0	315.0	330.0	345.0	360.0
Reynolds Number	1.5x10^6						

(all permutations)

TABLE 3.2 : LIST OF RAMP UP TESTS (actual)

Run Number	Start (°)	Arc (°)	Pitch Rate (°s^{-1})	Reduced Pitch Rate	Reynolds No. x 10^{-6}
20031	-1	41	2.9	0.0004	1.50
20041	-1	41	4.4	0.0006	1.50
20051	-1	41	6.0	0.0007	1.50
20061	-1	41	7.4	0.0009	1.51
20071	-1	41	14.9	0.0018	1.53
20081	-1	41	30.0	0.0037	1.51
20091	-1	41	45.0	0.0055	1.53
20101	-1	41	60.0	0.0075	1.51
20111	-1	41	75.3	0.0092	1.53
20121	-1	41	89.9	0.0111	1.51
20131	-1	41	102.5	0.0125	1.53
20141	-1	41	115.1	0.0142	1.51
20151	-1	41	129.6	0.0158	1.53
20161	-1	41	146.4	0.0181	1.51
20171	-1	41	159.6	0.0195	1.53
20181	-1	41	173.6	0.0215	1.51
20191	-1	40	189.5	0.0232	1.53
20201	-1	40	199.8	0.0244	1.53
20221	-1	41	229.1	0.0282	1.52
20231	-1	41	242.6	0.0296	1.48
20241	-1	40	258.5	0.0311	1.48
20251	-1	41	263.6	0.0319	1.48
20261	-1	40	276.8	0.0335	1.47
20271	-1	41	286.6	0.0346	1.48
20281	-1	41	298.5	0.0358	1.49
20291	-1	40	315.9	0.0385	1.46
20301	-1	41	324.9	0.0181	0.81
20311	-1	41	337.2	0.0411	1.47

TABLE 4 : DETAILS OF RAMP DOWN TESTS

TABLE 4.1 : SUMMARY OF RAMP DOWN TESTS (nominal)

Starting Incidence	40°				
Finishing Incidence	-1°				
Pitch Rate ($^o s^{-1}$)	-5.0	-15.0	-30.0	-45.0	-60.0
	-75.0	-90.0	-150.0	-250.0	-350.0
Reynolds Number	1.5×10^6				

(all permutations)

TABLE 4.2 : LIST OF RAMP DOWN TESTS (actual)

Run Number	Start (°)	Arc (°)	Pitch Rate ($^o s^{-1}$)	Reduced Pitch Rate	Reynolds No. x 10^{-6}
30321	40	-41	-325.2	-0.0403	1.47
30331	40	-41	-233.9	-0.0285	1.49
30341	40	-41	-148.6	-0.0185	1.46
30351	40	-41	-84.1	-0.0105	1.46
30361	40	-41	-71.1	-0.0088	1.48
30371	40	-41	-57.6	-0.0072	1.46
30381	40	-41	-43.5	-0.0054	1.48
30392	40	-41	-29.1	-0.0036	1.47
30402	40	-41	-14.6	-0.0018	1.47
30411	40	-41	-4.5	-0.0006	1.45

TABLE 5 : DETAILS OF SINUSOIDAL TESTS

TABLE 5.1 : SUMMARY OF OSCILLATIONS ABOUT 10^o (nominal)

Mean Incidence	10^o							
Amplitude	4^o		6^o		8^o		10^o	
Reduced Frequency	0.010	0.025	0.050	0.075	0.100	0.125	0.150	0.175
Reynolds Number	1.5x10^6							

(all permutations)

TABLE 5.2 : SUMMARY OF OSCILLATIONS OF AMPLITUDE 10^o (nominal)

Mean Incidence	4^o		6^o		8^o	15^o		20^o
Amplitude	10^o							
Reduced Frequency	0.010	0.025	0.050	0.075	0.100	0.125	0.150	0.175
Reynolds Number	1.5x10^6							

(all permutations)

TABLE 5.3 : SUMMARY OF OSCILLATIONS OF AMPLITUDE 8^o (nominal)

Mean Angle	4^o	6^o	8^o	10^o	12^o	17^o
Amplitude	8^o					
Reduced Frequency	0.100					
Reynolds Number	1.5x10^6					

(all permutations)

TABLE 5.4 : LIST OF OSCILLATORY TESTS (actual)

Run Number	Mean (°)	Amp'ude (°)	Reduced Frequency	Reynolds No. x 10^{-6}
10011	10	4	0.011	1.42
10021	10	4	0.025	1.48
10031	10	4	0.051	1.48
10041	10	4	0.080	1.44
10051	10	4	0.104	1.49
10061	10	4	0.128	1.51
10071	10	4	0.155	1.50
10081	10	4	0.180	1.51
10111	10	6	0.025	1.49
10121	10	6	0.052	1.50
10131	10	6	0.078	1.50
10141	10	6	0.103	1.51
10151	10	6	0.130	1.49
10161	10	6	0.156	1.49
10171	10	6	0.181	1.49
10191	10	8	0.010	1.49
10201	10	8	0.026	1.49
10211	10	8	0.052	1.49
10221	10	8	0.077	1.50
10231	10	8	0.103	1.50
10241	10	8	0.128	1.51
10251	10	8	0.157	1.48
10261	10	8	0.182	1.49
10291	10	10	0.026	1.50
10301	10	10	0.051	1.50
10311	10	10	0.077	1.49
10331	10	10	0.128	1.51
10341	10	10	0.155	1.48
10351	10	10	0.181	1.49
10361	4	10	0.010	1.49
10371	4	10	0.026	1.48
10381	4	10	0.049	1.43
10391	4	10	0.076	1.51
10401	4	10	0.103	1.49
10411	4	10	0.128	1.50
10421	4	10	0.155	1.49
10431	4	10	0.181	1.49
10451	6	10	0.026	1.48
10461	6	10	0.052	1.47
10471	6	10	0.077	1.48
10481	6	10	0.103	1.48
10491	6	10	0.128	1.46
10501	6	10	0.155	1.48
10511	6	10	0.180	1.49
10521	8	10	0.010	1.50
10531	8	10	0.026	1.46
10561	8	10	0.104	1.47
10571	8	10	0.129	1.49
10581	8	10	0.157	1.46
10591	8	10	0.183	1.46

TABLE 5.4 : LIST OF OSCILLATORY TESTS (continued)

Run Number	Mean (°)	Amp'ude (°)	Reduced Frequency	Reynolds No. x 10^{-6}
10601	15	10	0.010	1.47
10611	15	10	0.026	1.46
10621	15	10	0.052	1.47
10631	15	10	0.078	1.48
10641	15	10	0.105	1.46
10651	15	10	0.130	1.48
10661	15	10	0.157	1.46
10671	15	10	0.181	1.47
10681	20	10	0.010	1.46
10691	20	10	0.026	1.46
10701	20	10	0.052	1.46
10711	20	10	0.078	1.47
10721	20	10	0.105	1.46
10731	20	10	0.130	1.47
10741	20	10	0.157	1.46
10751	20	10	0.181	1.47
10761	10	10	0.010	1.48
10771	10	10	0.026	1.50
10781	10	10	0.052	1.48
10791	10	10	0.078	1.49
10801	10	10	0.104	1.49
10811	10	10	0.131	1.48
10821	10	10	0.157	1.48
10831	10	10	0.182	1.49
10841	20	10	0.022	1.47
10851	20	10	0.032	1.48
10861	20	10	0.043	1.47
10871	20	10	0.054	1.48
10881	4	8	0.104	1.51
10891	6	8	0.105	1.50
10901	8	8	0.105	1.50
10911	10	8	0.102	1.54
10921	12	8	0.103	1.53
10931	17	8	0.103	1.53

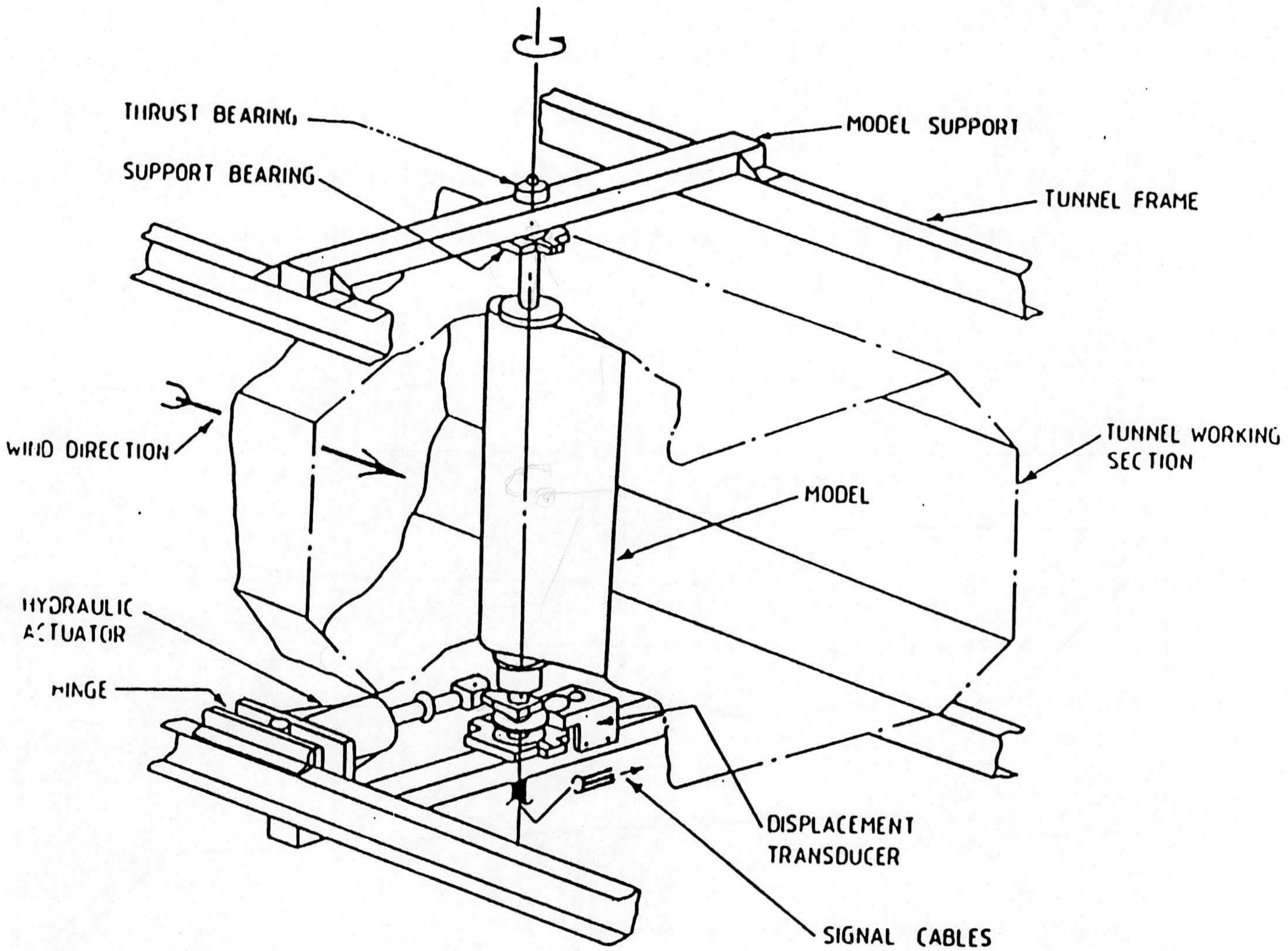


FIGURE 1 : GLASGOW UNIVERSITY'S DYNAMIC STALL RIG

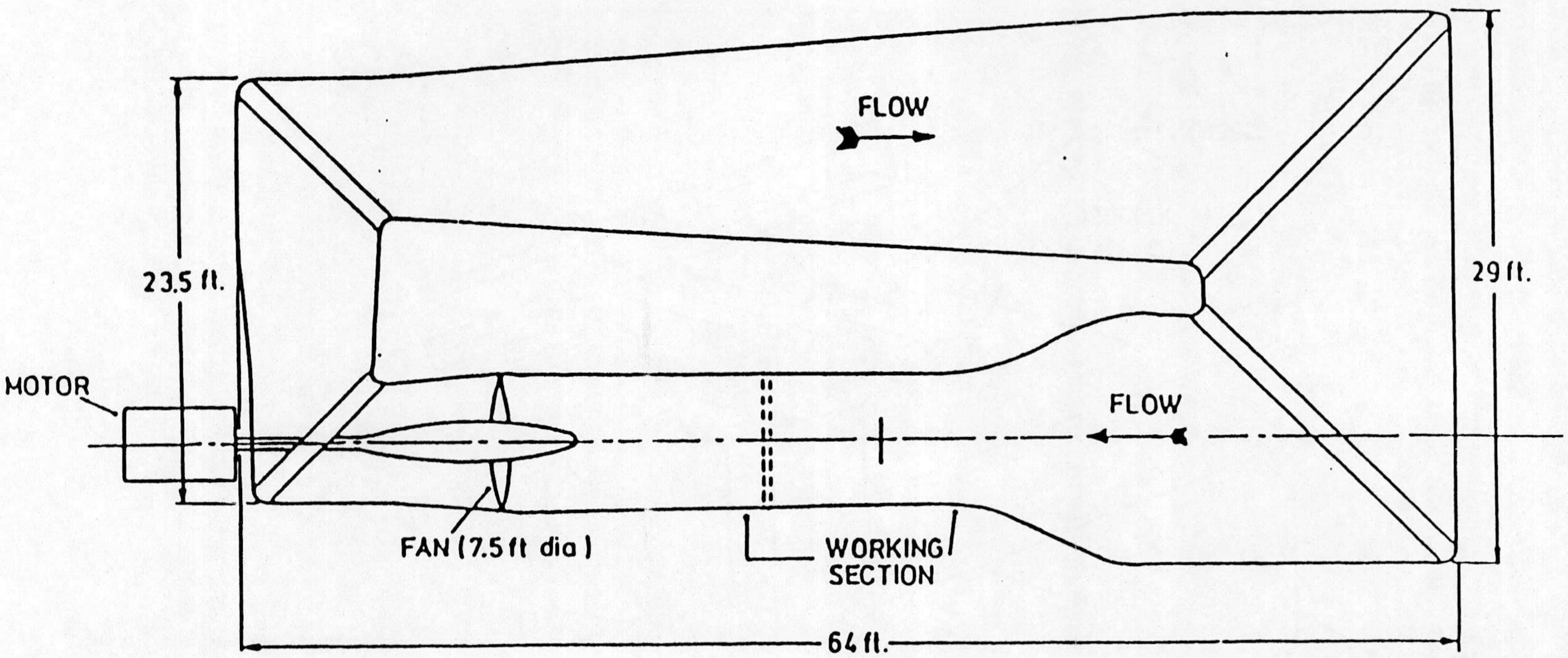
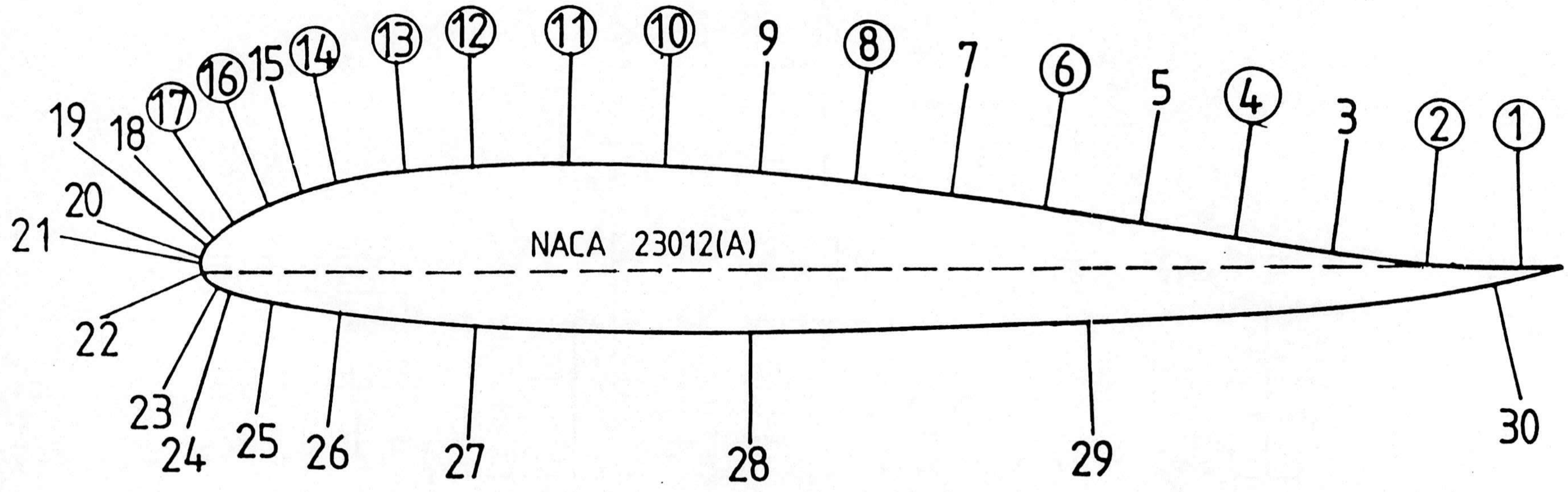


FIGURE 2 : PLAN VIEW OF THE GLASGOW UNIVERSITY "HANDLEY PAGE" 7ft X 5ft 3in WIND TUNNEL



TRANSDUCER LOCATIONS			NACA 23012(A)		
No.	x/c	No.	x/c	No.	x/c
1	0.97	11	0.27	21	0.00
2	0.90	12	0.20	22	0.00
3	0.83	13	0.15	23	0.01
4	0.76	14	0.10	24	0.02
5	0.69	15	0.075	25	0.05
6	0.62	16	0.05	26	0.10
7	0.55	17	0.025	27	0.20
8	0.48	18	0.01	28	0.40
9	0.41	19	0.005	29	0.65
10	0.34	20	0.0005	30	0.95

○ Hot-Film Location

FIGURE 3 : PRESSURE TRANSDUCER LOCATIONS FOR THE NACA 23012A.

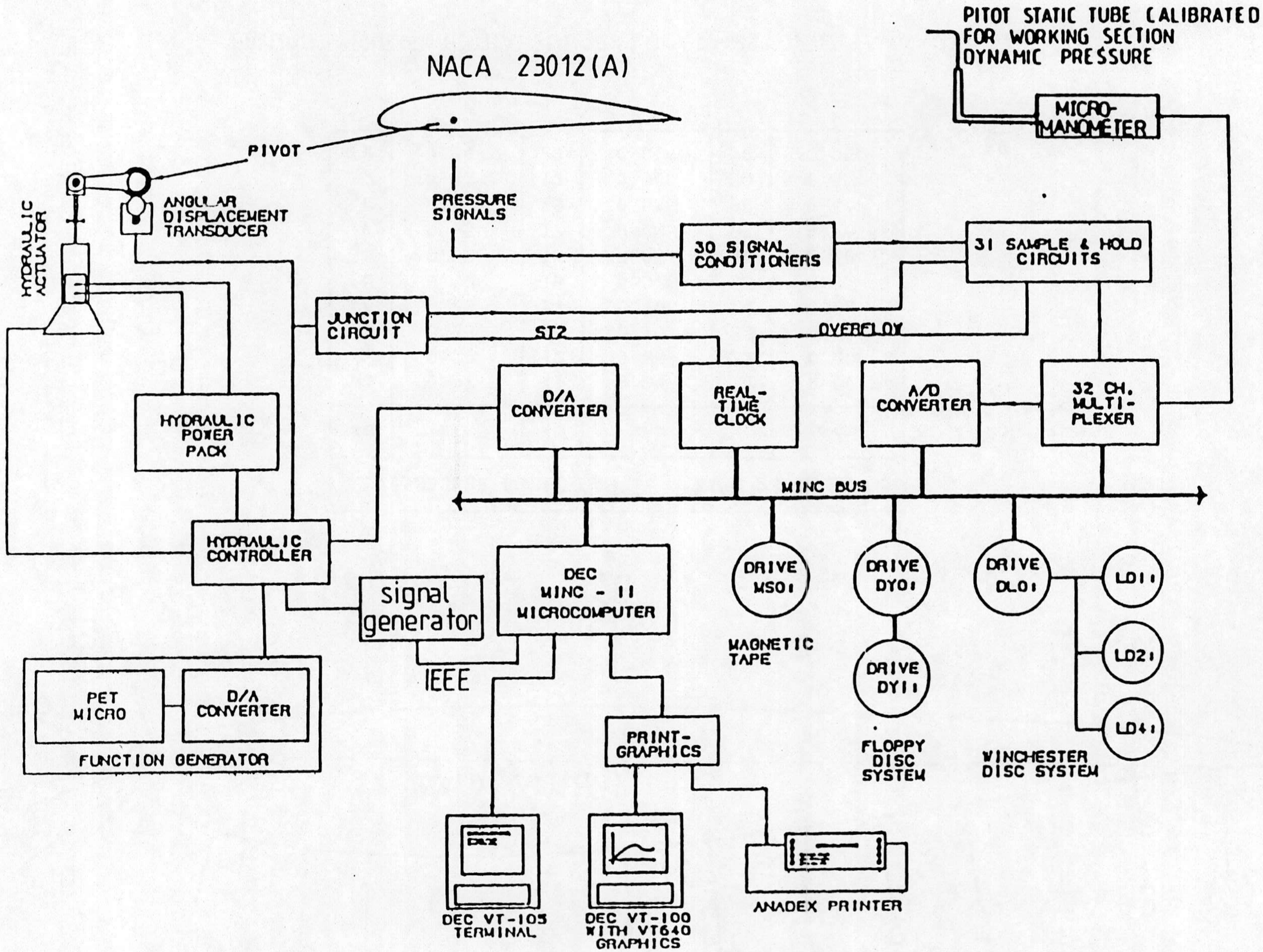


FIGURE 4 : SYSTEMATIC ARRANGEMENT OF DATA ACQUISITION AND CONTROL SYSTEM.

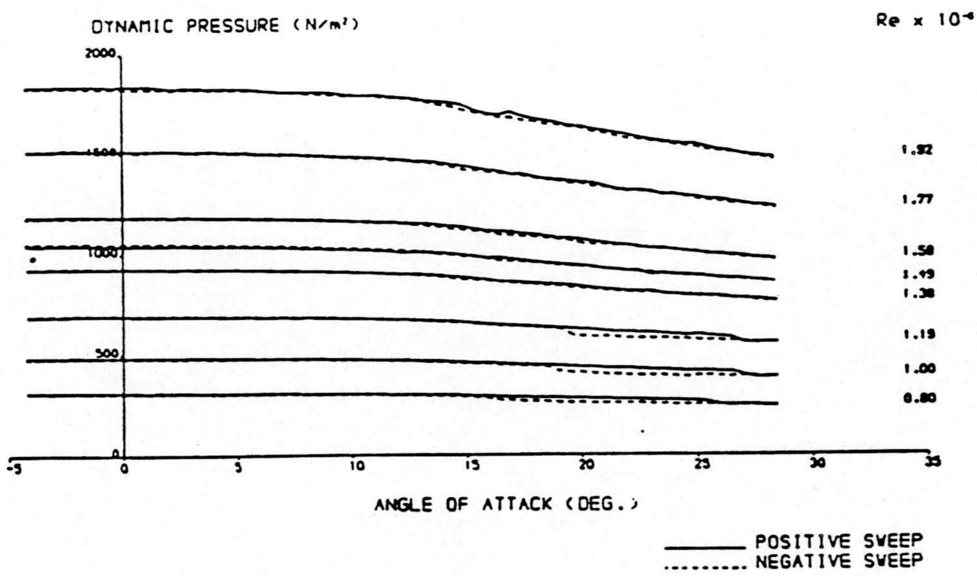


FIGURE 5 : REDUCTION OF DYNAMIC PRESSURE WITH INCREASING ANGLE OF ATTACK.

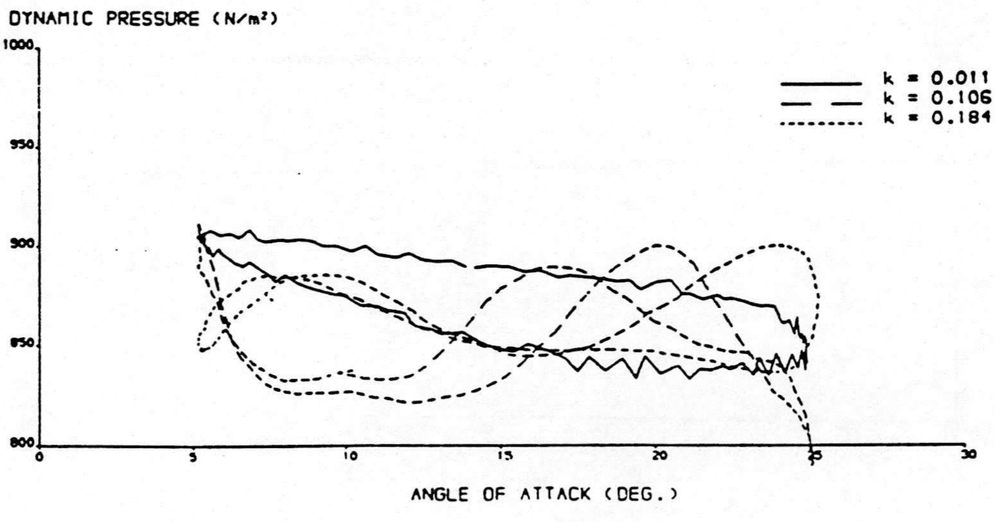


FIGURE 6 : VARIATION OF DYNAMIC PRESSURE DURING OSCILLATORY TESTS.

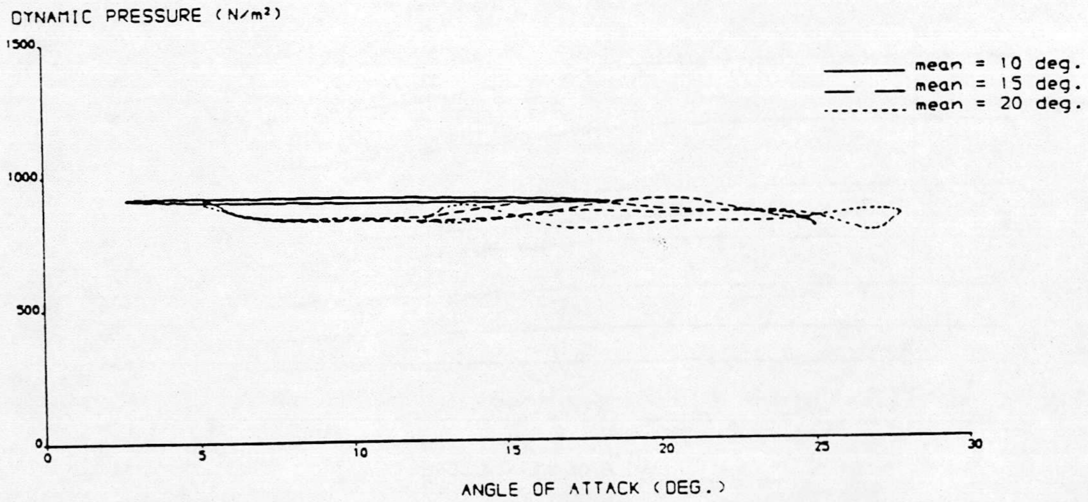


FIGURE 7 : VARIATION OF DYNAMIC PRESSURE FOR VARIOUS MEAN ANGLES OF ATTACK AT A REDUCED FREQUENCY OF 0.10.

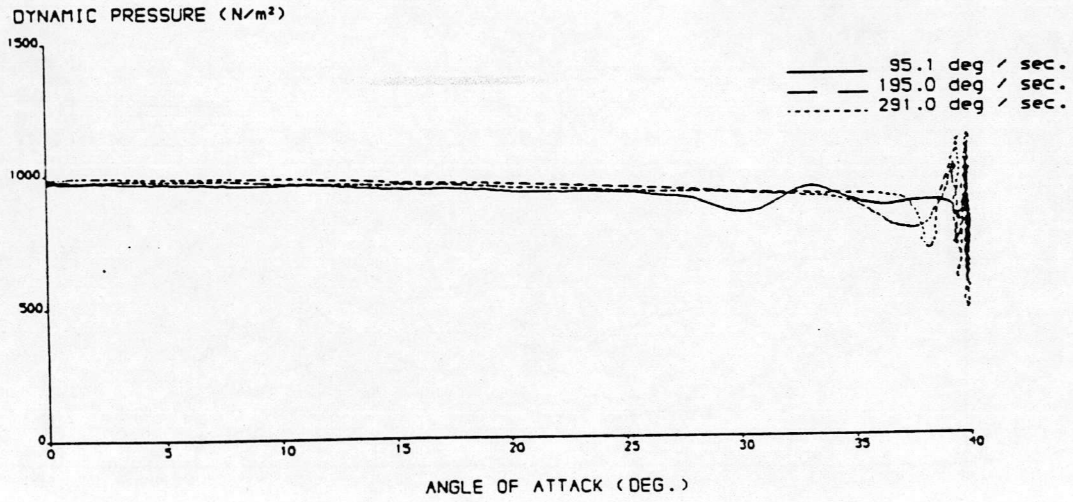


FIGURE 8 : VARIATION OF DYNAMIC PRESSURE FOR VARIOUS PITCH RATES DURING RAMP TESTS.

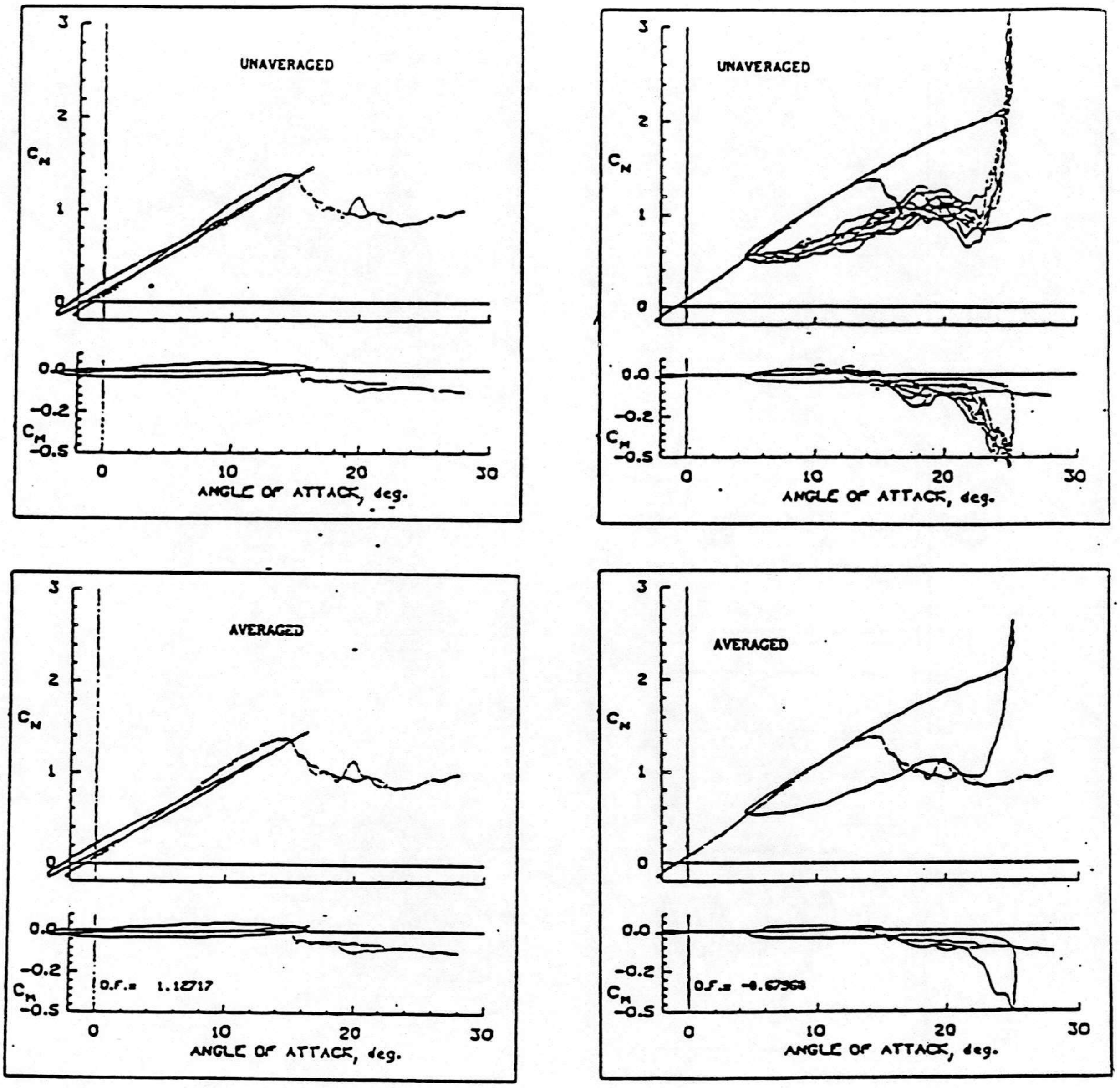


FIGURE 9: EFFECT OF AVERAGING ON THE NORMAL FORCE AND PITCHING MOMENT FOR OSCILLATORY TESTS.

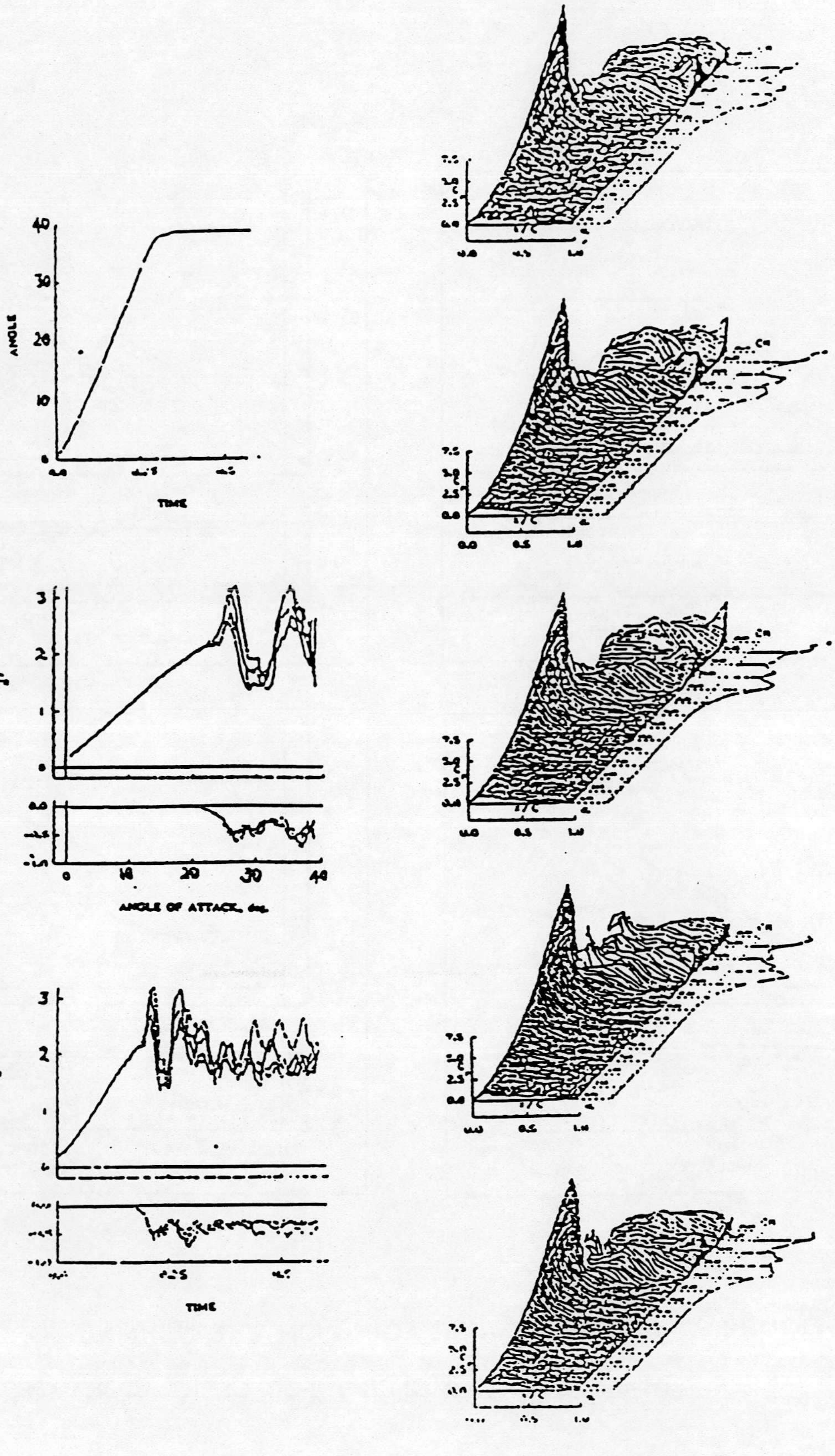


FIGURE 10: TYPICAL UNAVERAGED DATA FOR RAMP TESTS.

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UNIVERSITY OF GLASGOW

DEPARTMENT OF AEROSPACE ENGINEERING

PRESSURE DATA FROM

STATIC EXPERIMENTS

DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 101

REYNOLDS NUMBER = 1511935.

DYNAMIC PRESSURE = 996.12 Nm^{-2}

NUMBER OF CYCLES = 1

MOTION TYPE: STATIC

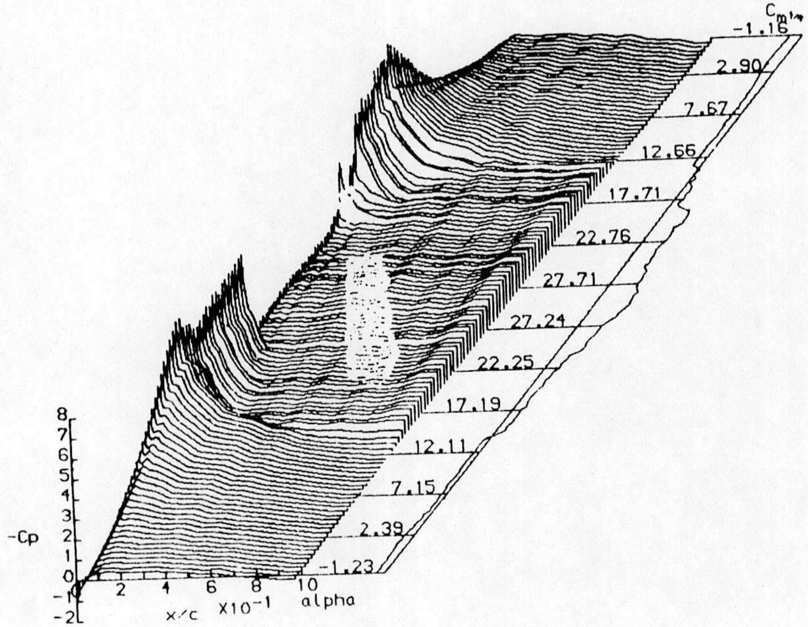
DATE OF TEST: 4/3/86

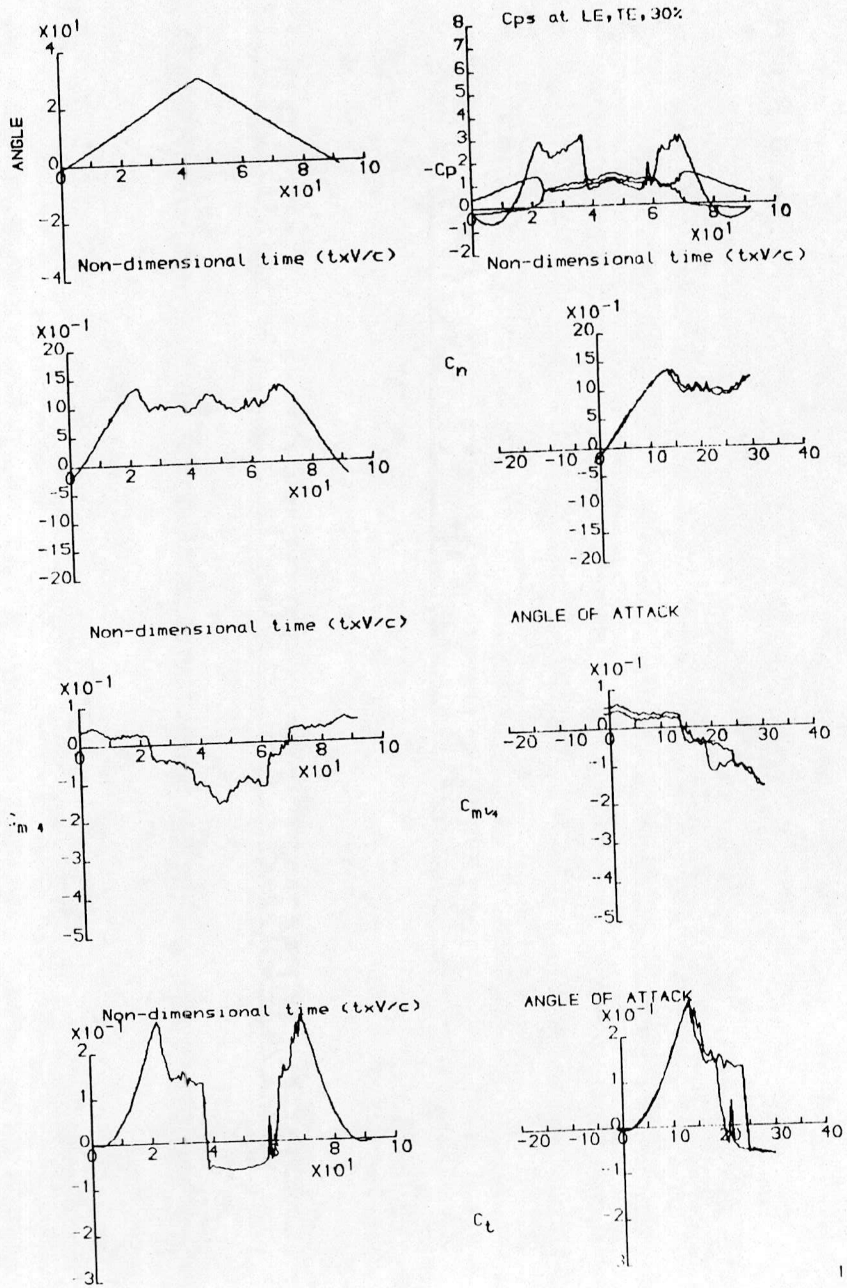
MACH NUMBER = 0.114

AIR TEMPERATURE = 29.0°C

SAMPLING FREQUENCY = 100.00 Hz.

AVERAGED DATA OF 1 CYCLES





G.U. Aero Report 9220

UNIVERSITY OF GLASGOW

DEPARTMENT OF AEROSPACE ENGINEERING

PRESSURE DATA FROM

RAMP UP EXPERIMENTS

DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 20031

REYNOLDS NUMBER = 1503912.

DYNAMIC PRESSURE = 965.29 Nm^{-2}

NUMBER OF CYCLES = 5

MOTION TYPE: RAMP UP

START ANGLE = -1.00°

RAMP ARC = 41.000°

AVERAGED DATA OF 5 CYCLES

DATE OF TEST: 25/2/86

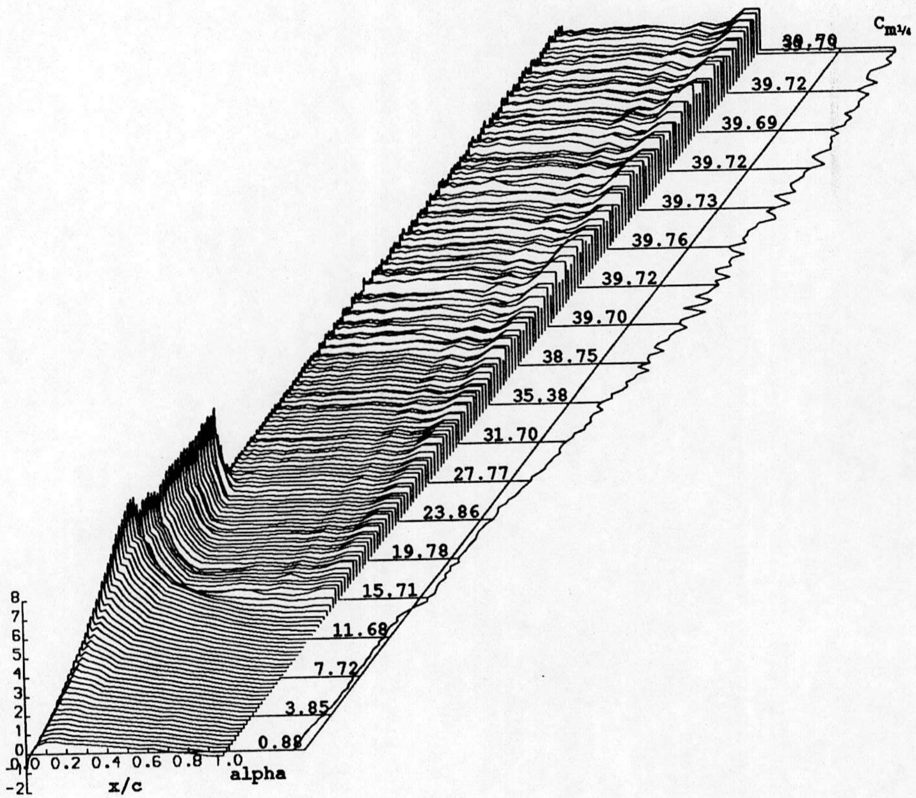
MACH NUMBER = 0.110

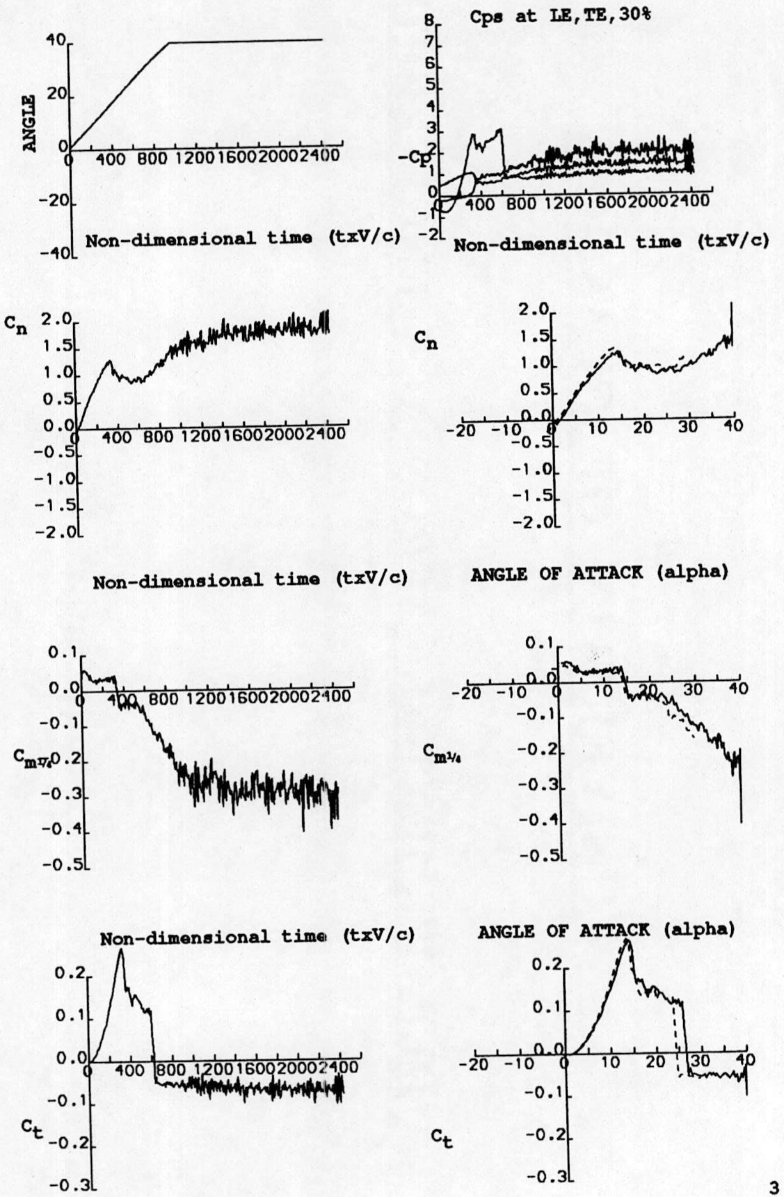
AIR TEMPERATURE = 30.0°C

SAMPLING FREQUENCY = 7.33 Hz.

REDUCED PITCH RATE = 0.00040

LINEAR PITCH RATE = 2.91°S^{-1}





DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 20041

REYNOLDS NUMBER = 1497228.

DYNAMIC PRESSURE = 956.72 Nm^{-2}

NUMBER OF CYCLES = 5

MOTION TYPE: RAMP UP

START ANGLE = -1.00°

RAMP ARC = 41.000°

AVERAGED DATA OF 5 CYCLES

DATE OF TEST: 25/2/86

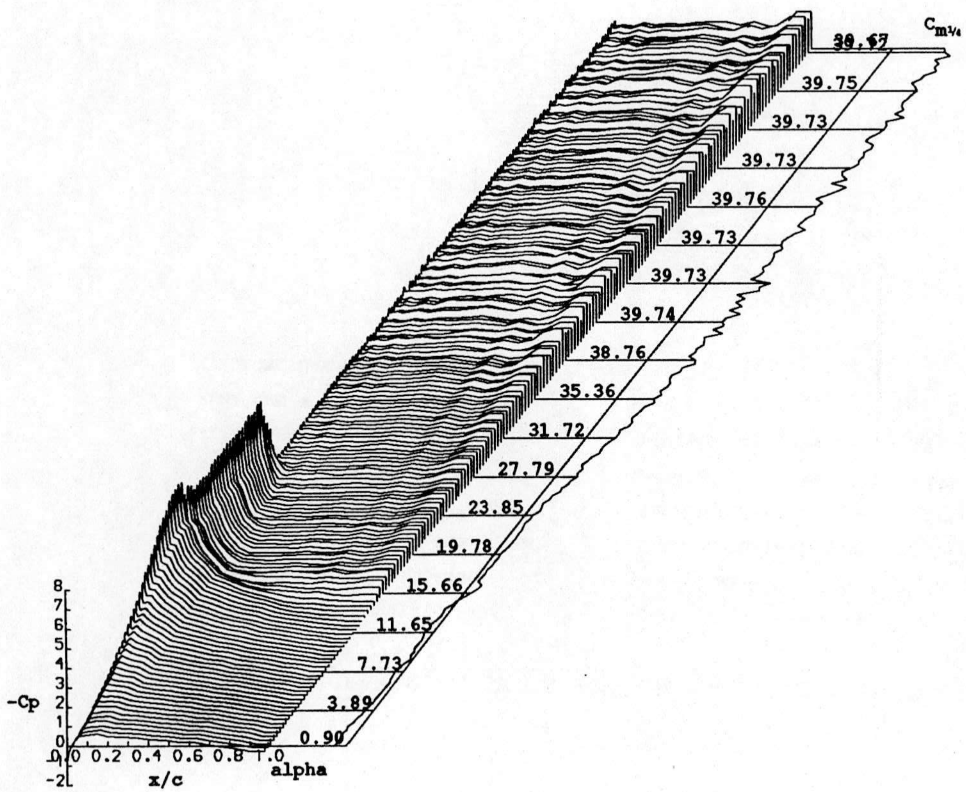
MACH NUMBER = 0.110

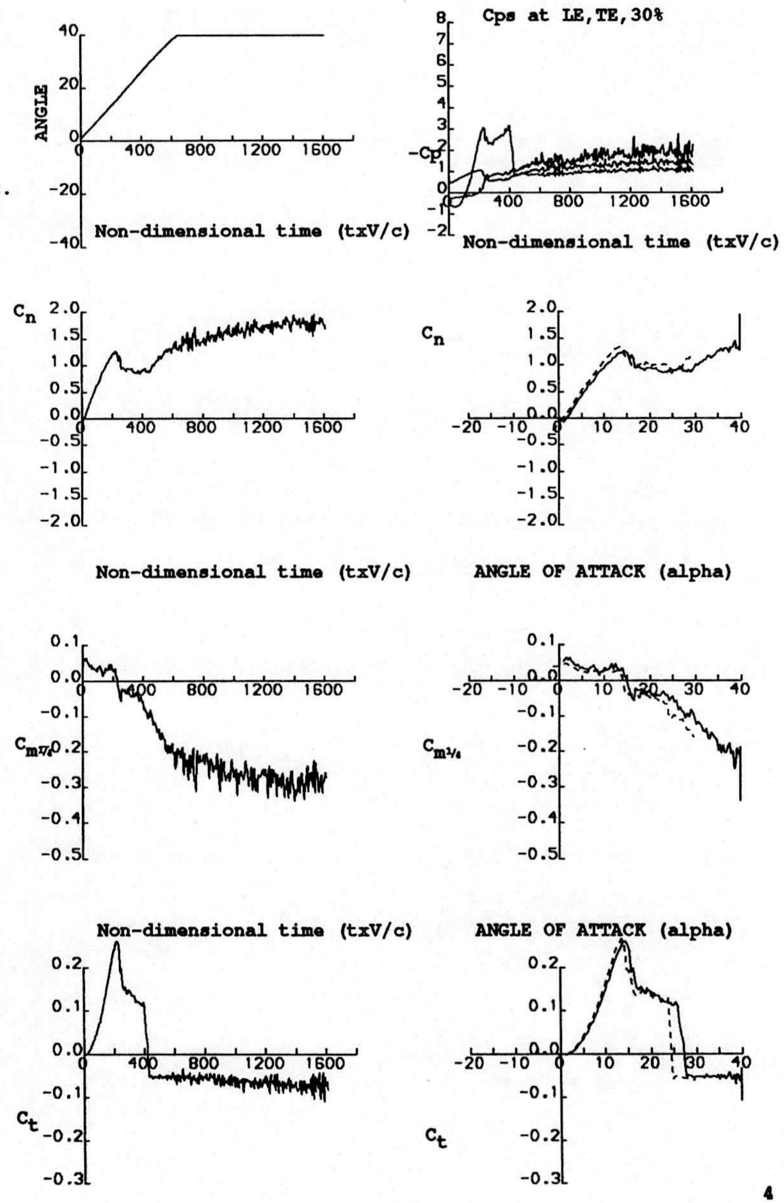
AIR TEMPERATURE = 30.0°C

SAMPLING FREQUENCY = 11.01 Hz.

REDUCED PITCH RATE = 0.00060

LINEAR PITCH RATE = 4.39°S^{-1}

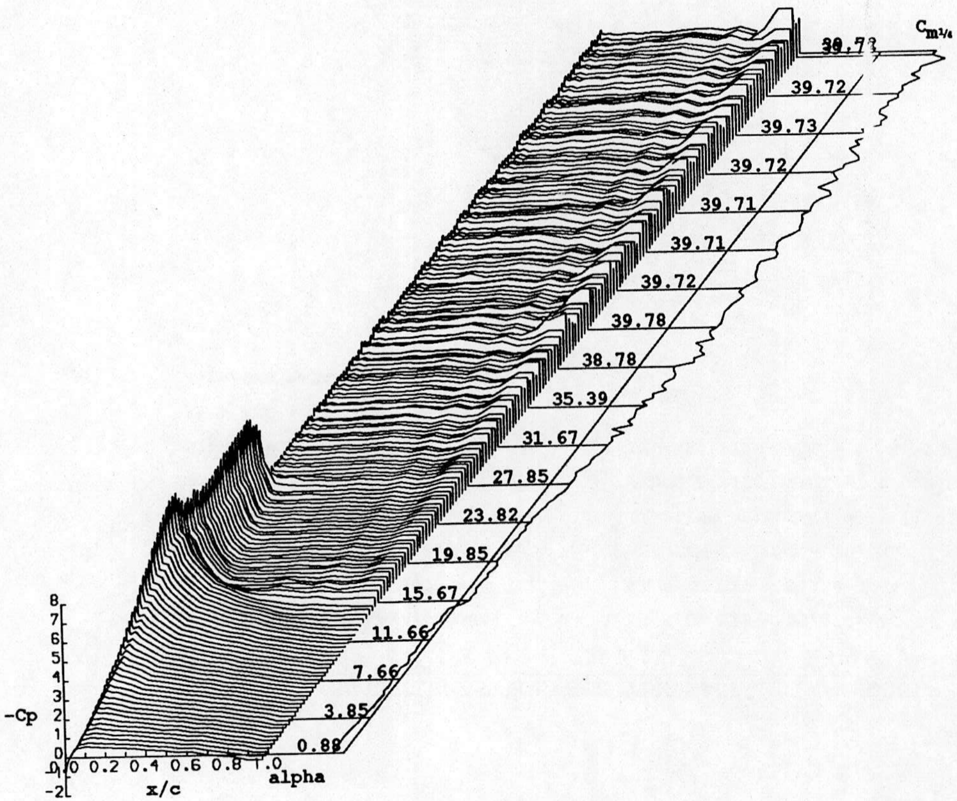


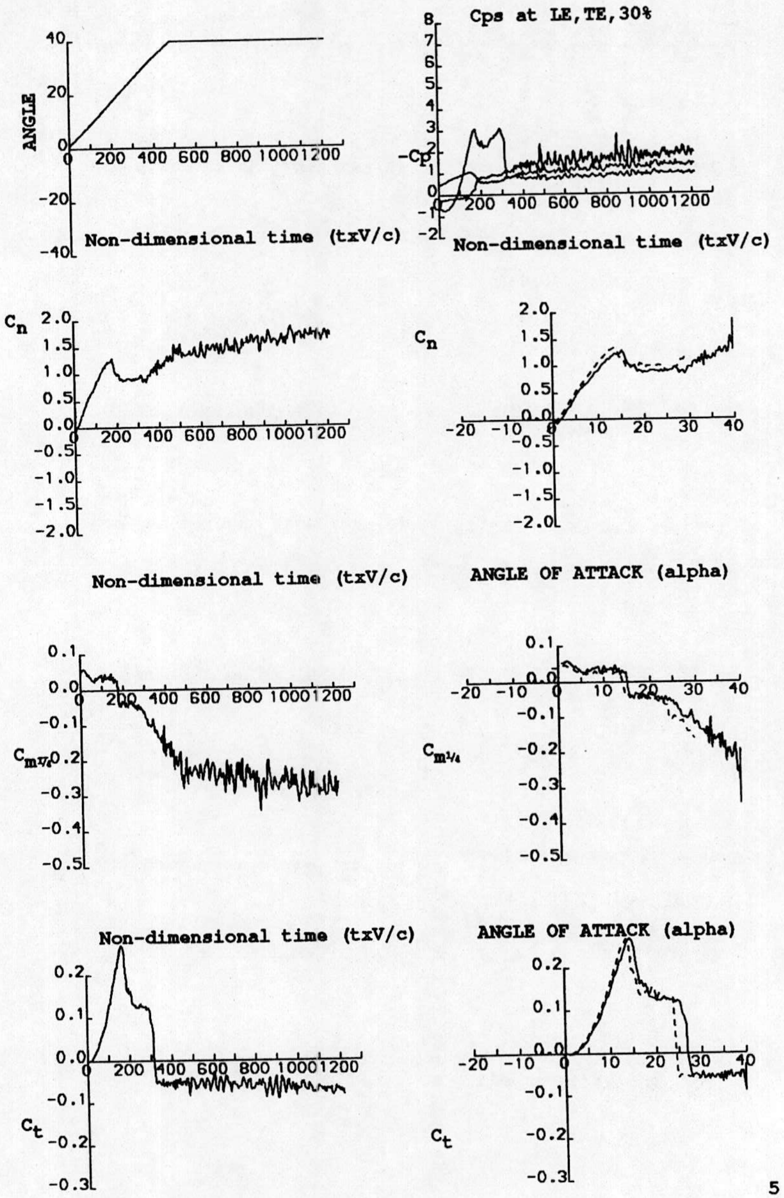


DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 20051
REYNOLDS NUMBER = 1504456.
DYNAMIC PRESSURE = 965.98 Nm^{-2}
NUMBER OF CYCLES = 5
MOTION TYPE: RAMP UP
START ANGLE = -1.00°
RAMP ARC = 41.000°
AVERAGED DATA OF 5 CYCLES

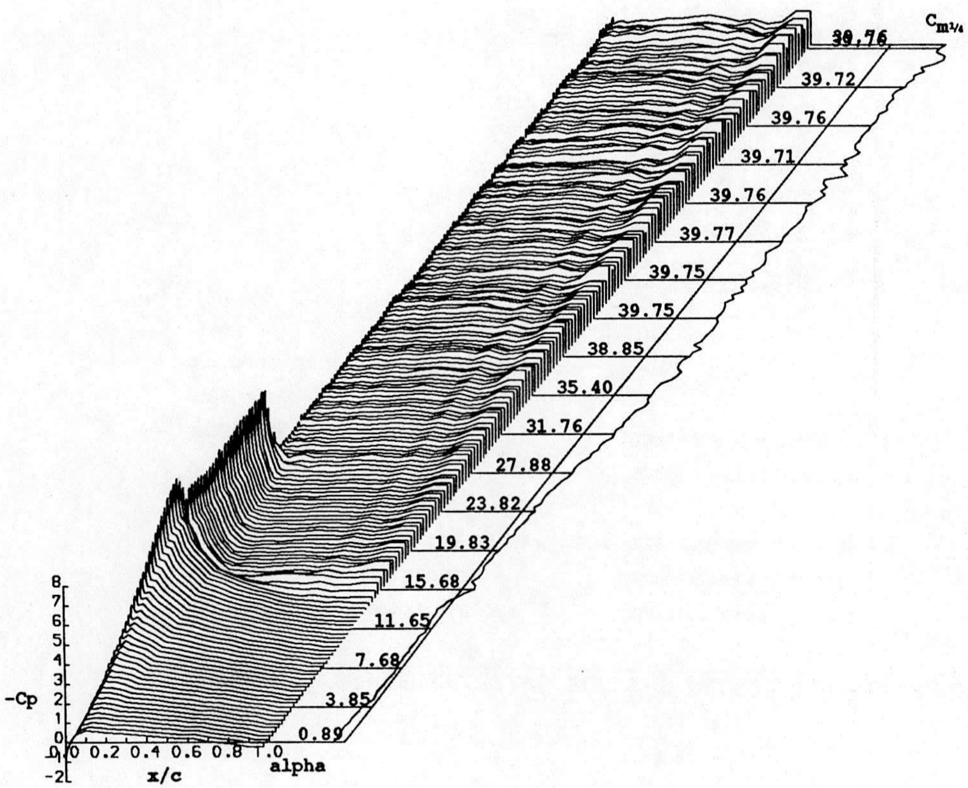
DATE OF TEST: 25/2/86
MACH NUMBER = 0.110
AIR TEMPERATURE = 30.0°C
SAMPLING FREQUENCY = 14.66 Hz.
REDUCED PITCH RATE = 0.00070
LINEAR PITCH RATE = 5.97°S^{-1}

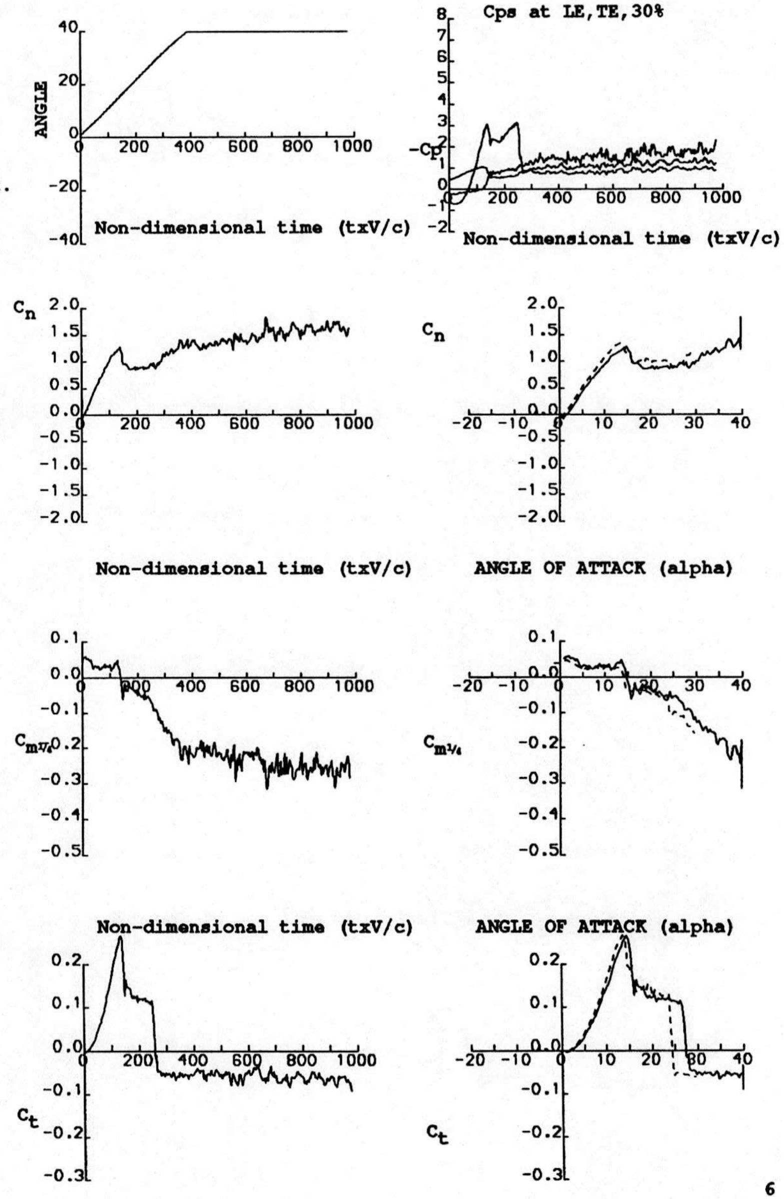




DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 20061	DATE OF TEST: 25/2/86
REYNOLDS NUMBER = 1512838.	MACH NUMBER = 0.111
DYNAMIC PRESSURE = 976.78 Nm^{-2}	AIR TEMPERATURE = 30.0°C
NUMBER OF CYCLES = 5	SAMPLING FREQUENCY = 18.34 Hz.
MOTION TYPE: RAMP UP	REDUCED PITCH RATE = 0.00090
START ANGLE = -1.00°	LINEAR PITCH RATE = 7.41°S^{-1}
RAMP ARC = 41.000°	
AVERAGED DATA OF 5 CYCLES	

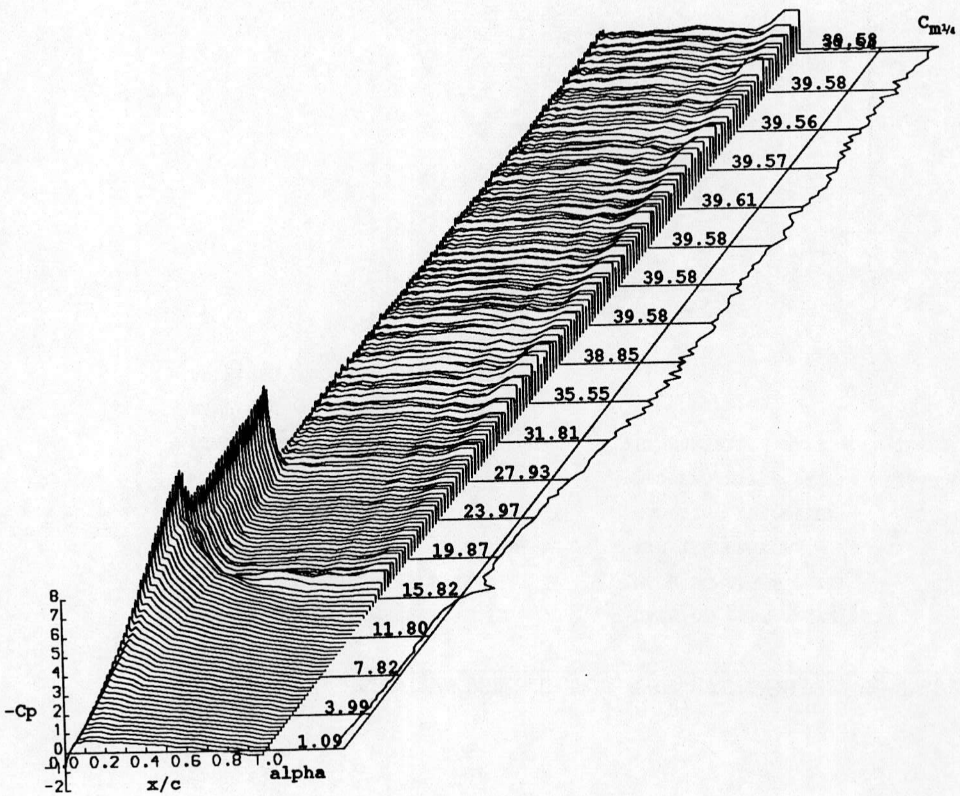


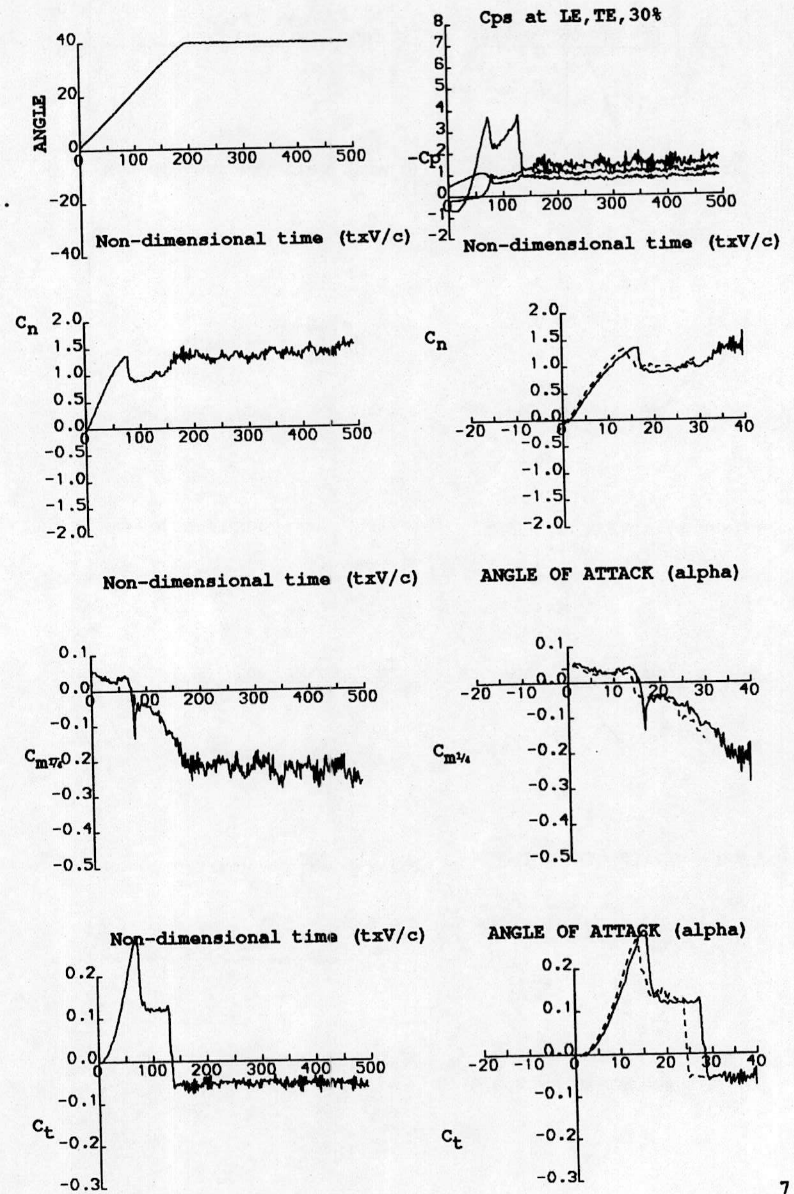


DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 20071
REYNOLDS NUMBER = 1526537.
DYNAMIC PRESSURE = 994.55 Nm^{-2}
NUMBER OF CYCLES = 5
MOTION TYPE: RAMP UP
START ANGLE = -1.00°
RAMP ARC = 41.000°
AVERAGED DATA OF 5 CYCLES

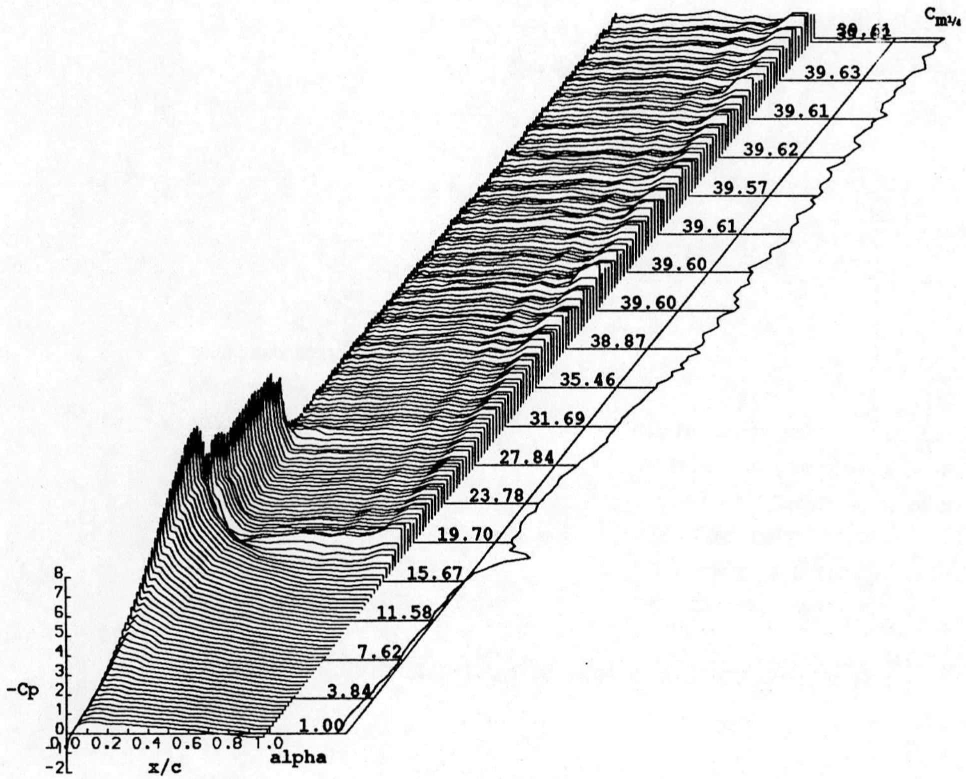
DATE OF TEST: 28/2/86
MACH NUMBER = 0.112
AIR TEMPERATURE = 30.0°C
SAMPLING FREQUENCY = 36.67 Hz.
REDUCED PITCH RATE = 0.00180
LINEAR PITCH RATE = 14.87°S^{-1}

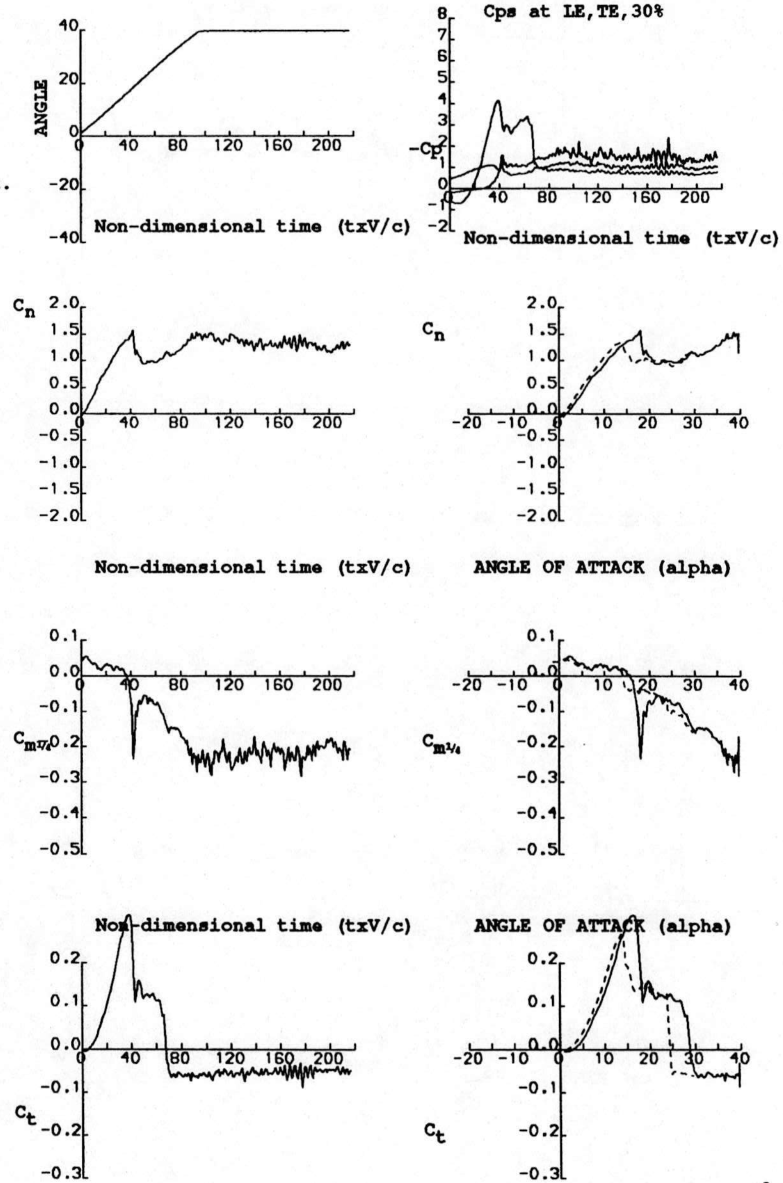




DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 20081	DATE OF TEST: 28/2/86
REYNOLDS NUMBER = 1509525.	MACH NUMBER = 0.111
DYNAMIC PRESSURE = 972.50 Nm^{-2}	AIR TEMPERATURE = 30.0°C
NUMBER OF CYCLES = 5	SAMPLING FREQUENCY = 73.38 Hz.
MOTION TYPE: RAMP UP	REDUCED PITCH RATE = 0.00370
START ANGLE = -1.00°	LINEAR PITCH RATE = 30.01°S^{-1}
RAMP ARC = 41.000°	
AVERAGED DATA OF 5 CYCLES	

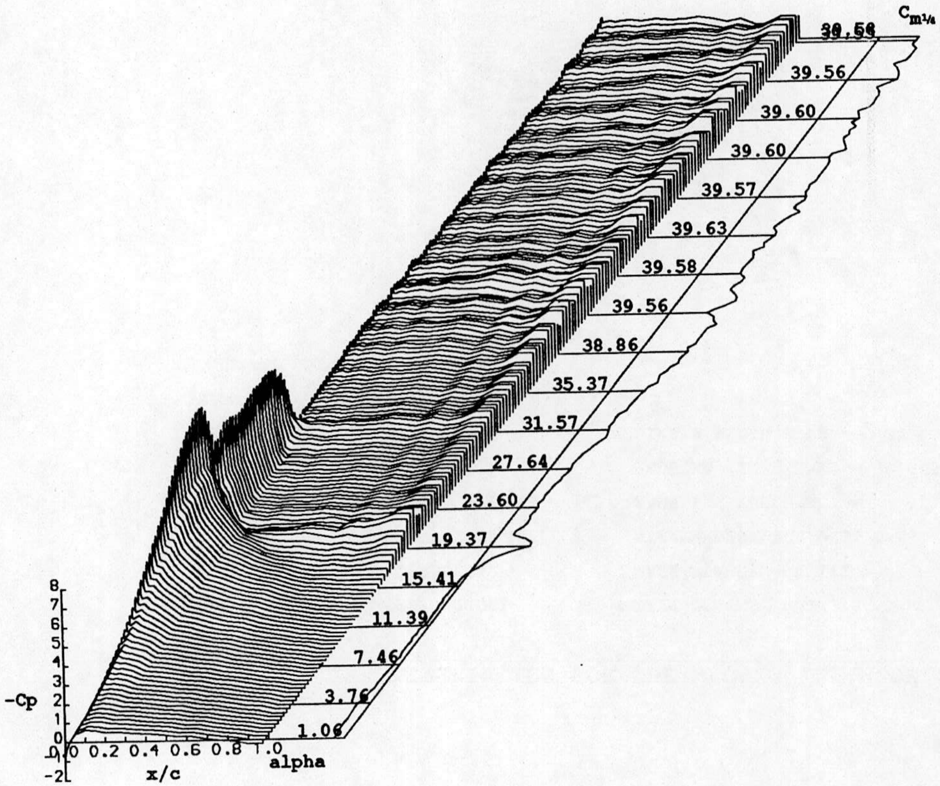


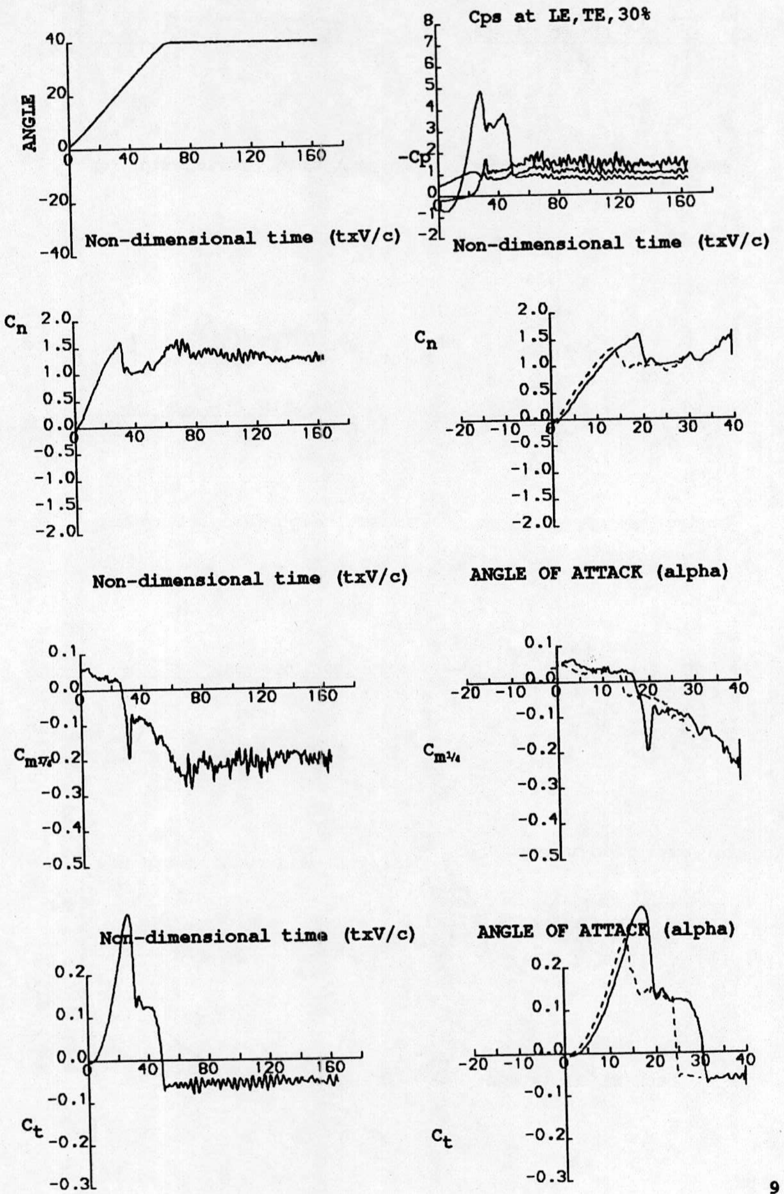


DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 20091
REYNOLDS NUMBER = 1525950.
DYNAMIC PRESSURE = 993.78 Nm^{-2}
NUMBER OF CYCLES = 5
MOTION TYPE: RAMP UP
START ANGLE = -1.00°
RAMP ARC = 41.000°
AVERAGED DATA OF 5 CYCLES

DATE OF TEST: 28/2/86
MACH NUMBER = 0.112
AIR TEMPERATURE = 30.0°C
SAMPLING FREQUENCY = 110.05 Hz.
REDUCED PITCH RATE = 0.00550
LINEAR PITCH RATE = 44.99°S^{-1}

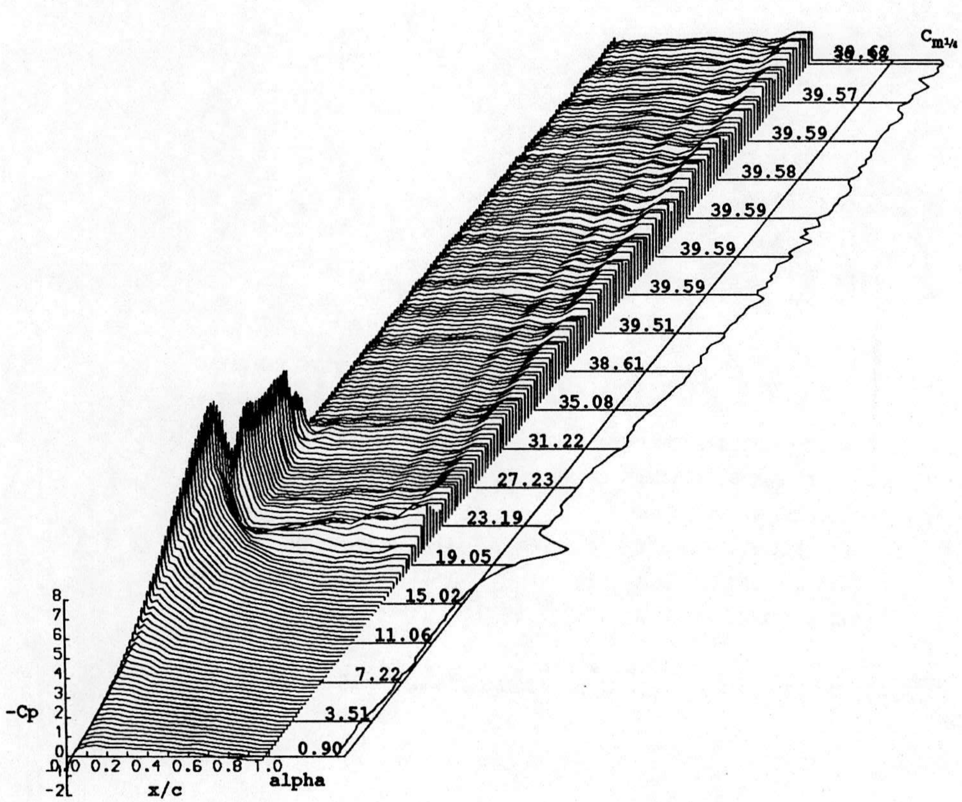


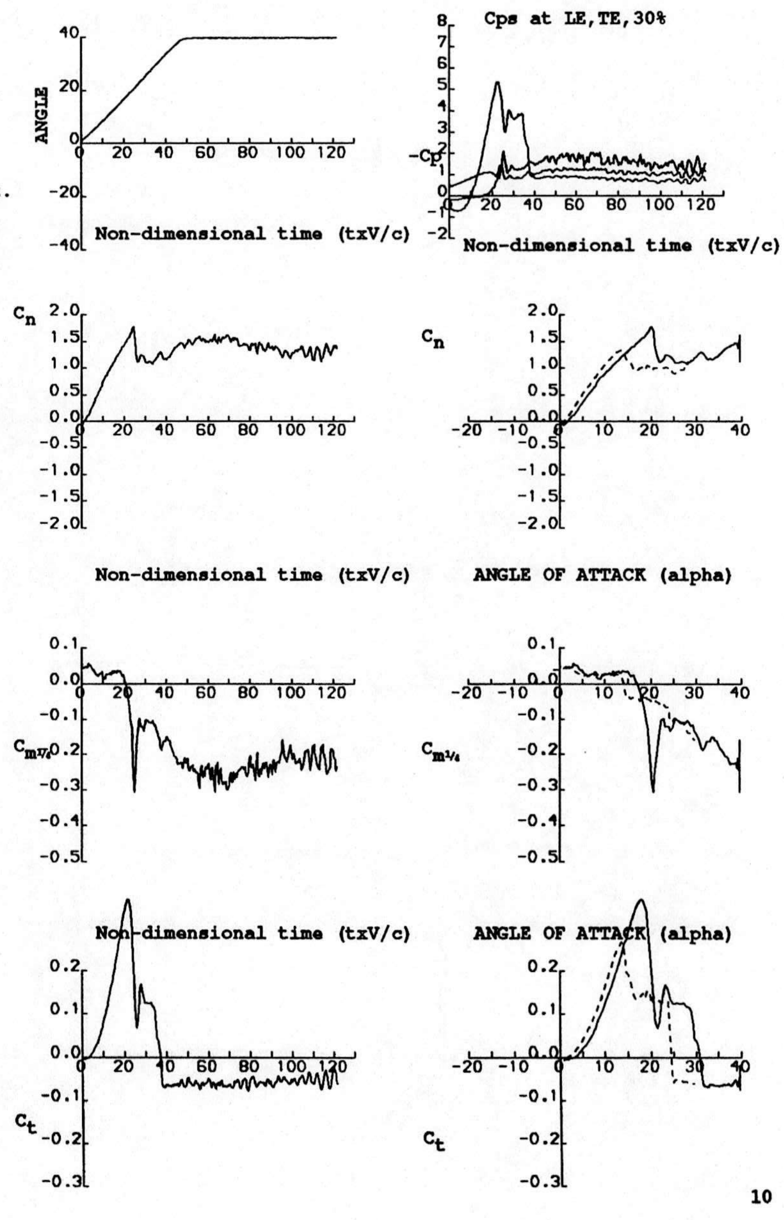


DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 20101
REYNOLDS NUMBER = 1509174.
DYNAMIC PRESSURE = 972.05 Nm^{-2}
NUMBER OF CYCLES = 5
MOTION TYPE: RAMP UP
START ANGLE = -1.00°
RAMP ARC = 41.000°
AVERAGED DATA OF 5 CYCLES

DATE OF TEST: 28/2/86
MACH NUMBER = 0.111
AIR TEMPERATURE = 30.0°C
SAMPLING FREQUENCY = 146.76 Hz.
REDUCED PITCH RATE = 0.00750
LINEAR PITCH RATE = 60.01°s^{-1}

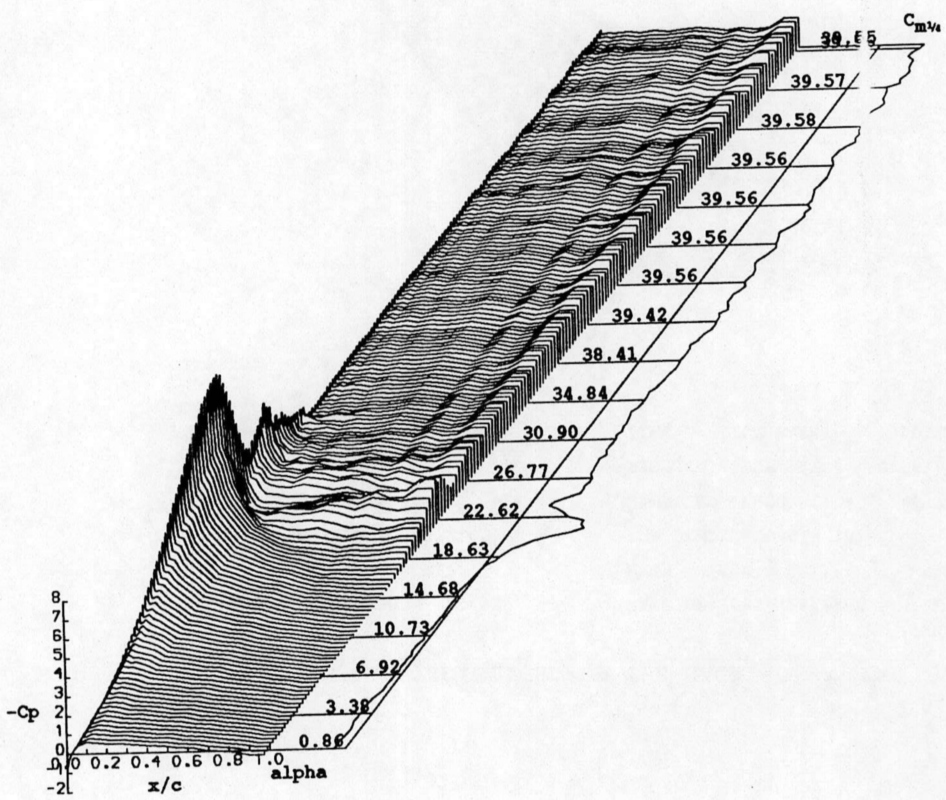


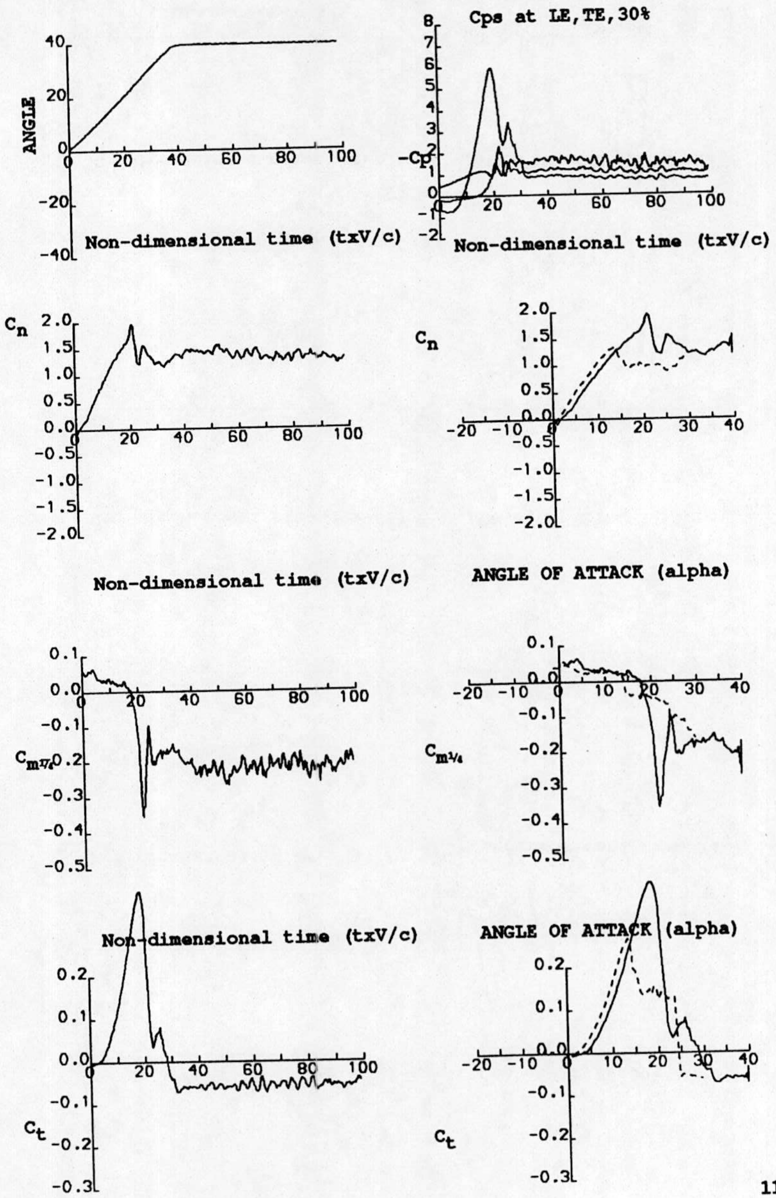


DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 20111
REYNOLDS NUMBER = 1525870.
DYNAMIC PRESSURE = 993.68 Nm^{-2}
NUMBER OF CYCLES = 5
MOTION TYPE: RAMP UP
START ANGLE = -1.00°
RAMP ARC = 41.000°
AVERAGED DATA OF 5 CYCLES

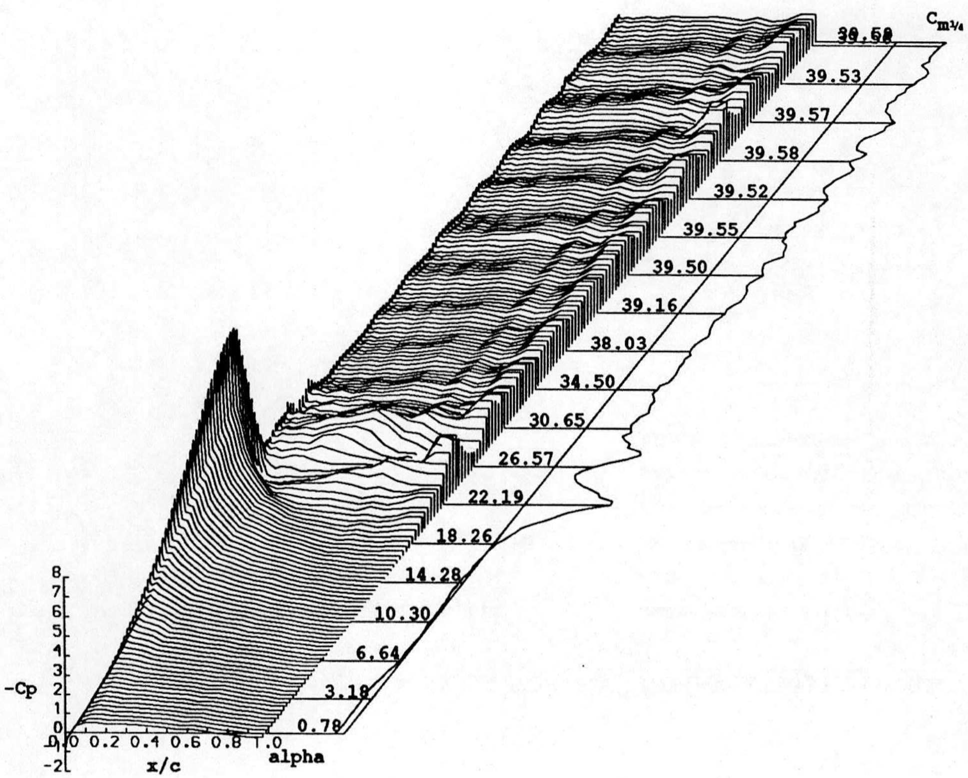
DATE OF TEST: 28/2/86
MACH NUMBER = 0.112
AIR TEMPERATURE = 30.0°C
SAMPLING FREQUENCY = 183.35 Hz.
REDUCED PITCH RATE = 0.00920
LINEAR PITCH RATE = 75.29°S^{-1}

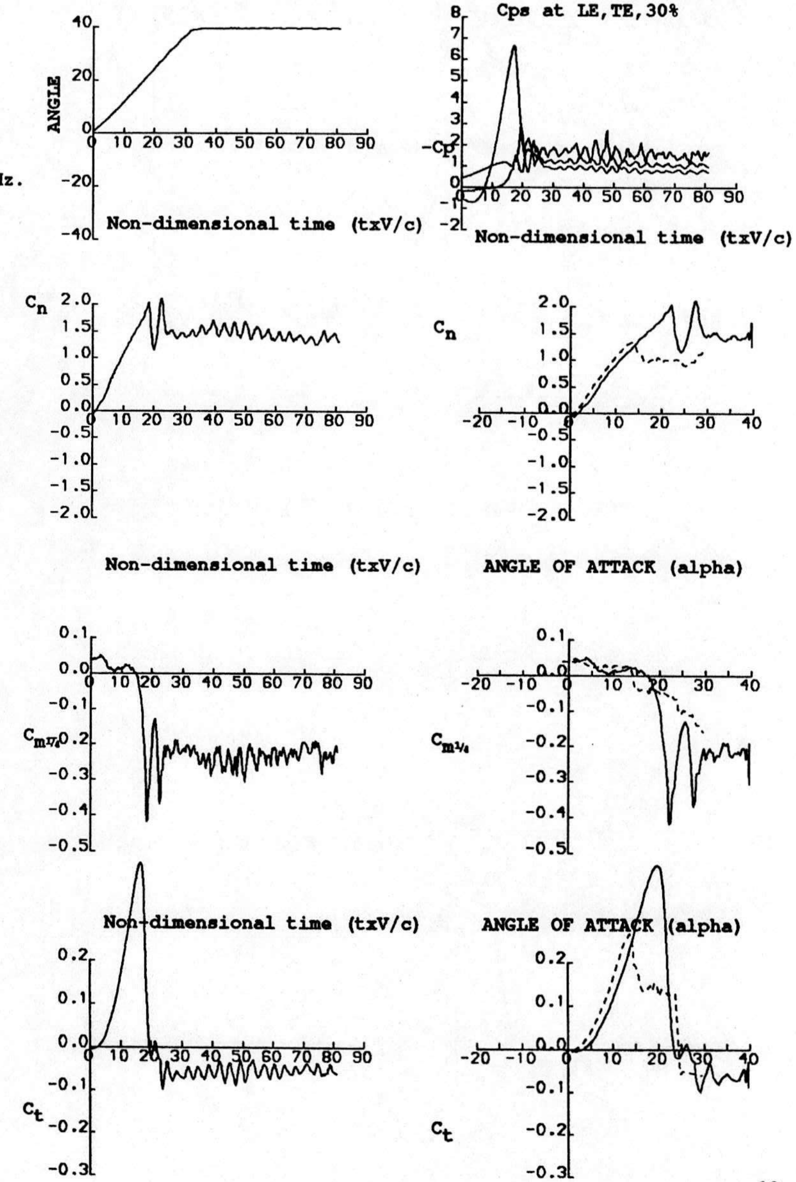




DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

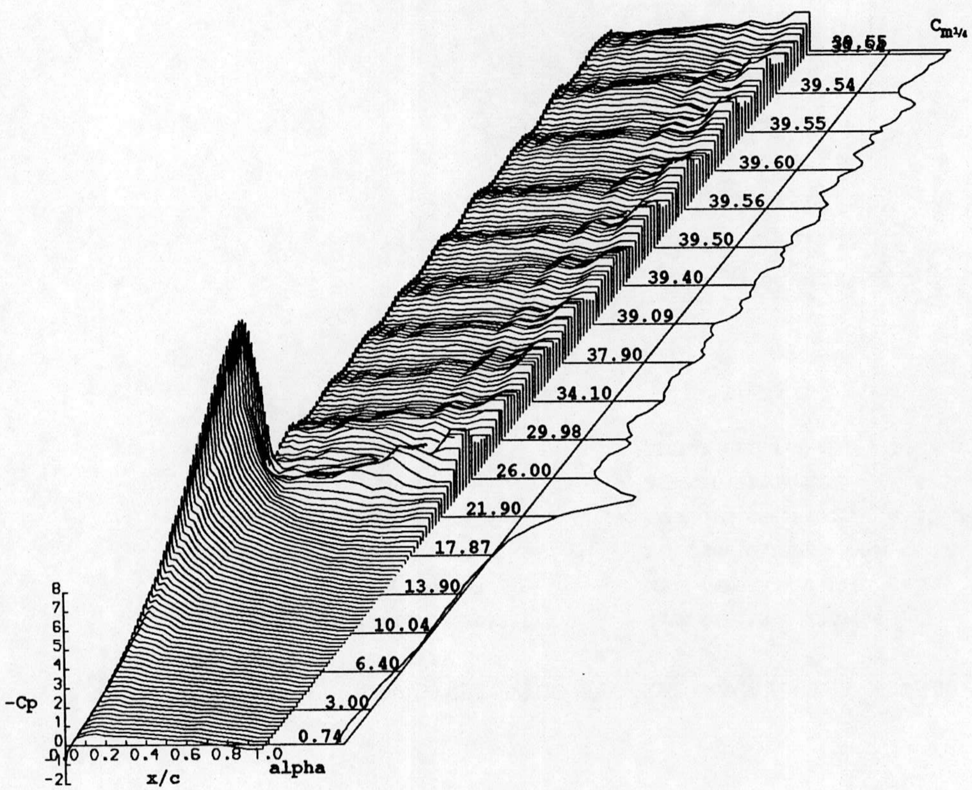
RUN REFERENCE NUMBER: 20121	DATE OF TEST: 28/2/86
REYNOLDS NUMBER = 1508647.	MACH NUMBER = 0.111
DYNAMIC PRESSURE = 971.37 Nm^{-2}	AIR TEMPERATURE = 30.0°C
NUMBER OF CYCLES = 5	SAMPLING FREQUENCY = 220.12 Hz.
MOTION TYPE: RAMP UP	REDUCED PITCH RATE = 0.01114
START ANGLE = -1.00°	LINEAR PITCH RATE = 89.95°S^{-1}
RAMP ARC = 41.000°	
AVERAGED DATA OF 5 CYCLES	

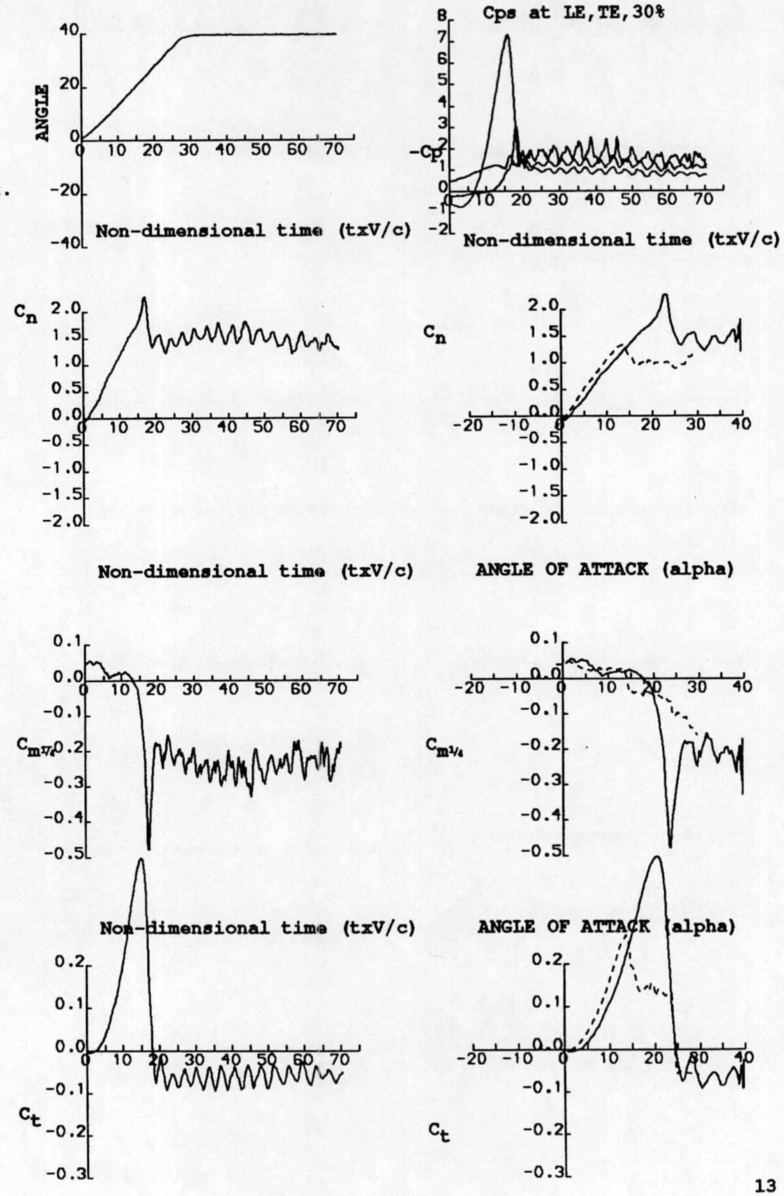




DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 20131	DATE OF TEST: 28/2/86
REYNOLDS NUMBER = 1528010.	MACH NUMBER = 0.112
DYNAMIC PRESSURE = 996.47 Nm^{-2}	AIR TEMPERATURE = 30.0°C
NUMBER OF CYCLES = 5	SAMPLING FREQUENCY = 256.81 Hz.
MOTION TYPE: RAMP UP	REDUCED PITCH RATE = 0.01250
START ANGLE = -1.00°	LINEAR PITCH RATE = 102.53°S^{-1}
RAMP ARC = 41.000°	
AVERAGED DATA OF 5 CYCLES	





DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 20141

REYNOLDS NUMBER = 1513561.

DYNAMIC PRESSURE = 977.71 Nm^{-2}

NUMBER OF CYCLES = 5

MOTION TYPE: RAMP UP

START ANGLE = -1.00°

RAMP ARC = 41.000°

AVERAGED DATA OF 5 CYCLES

DATE OF TEST: 28/2/86

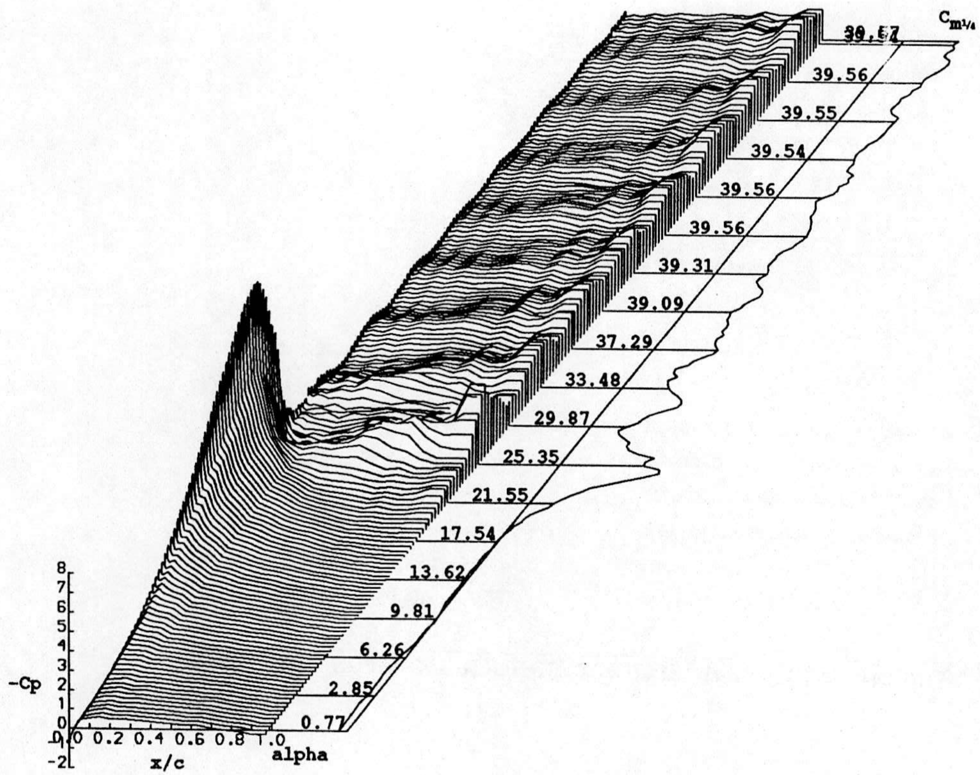
MACH NUMBER = 0.111

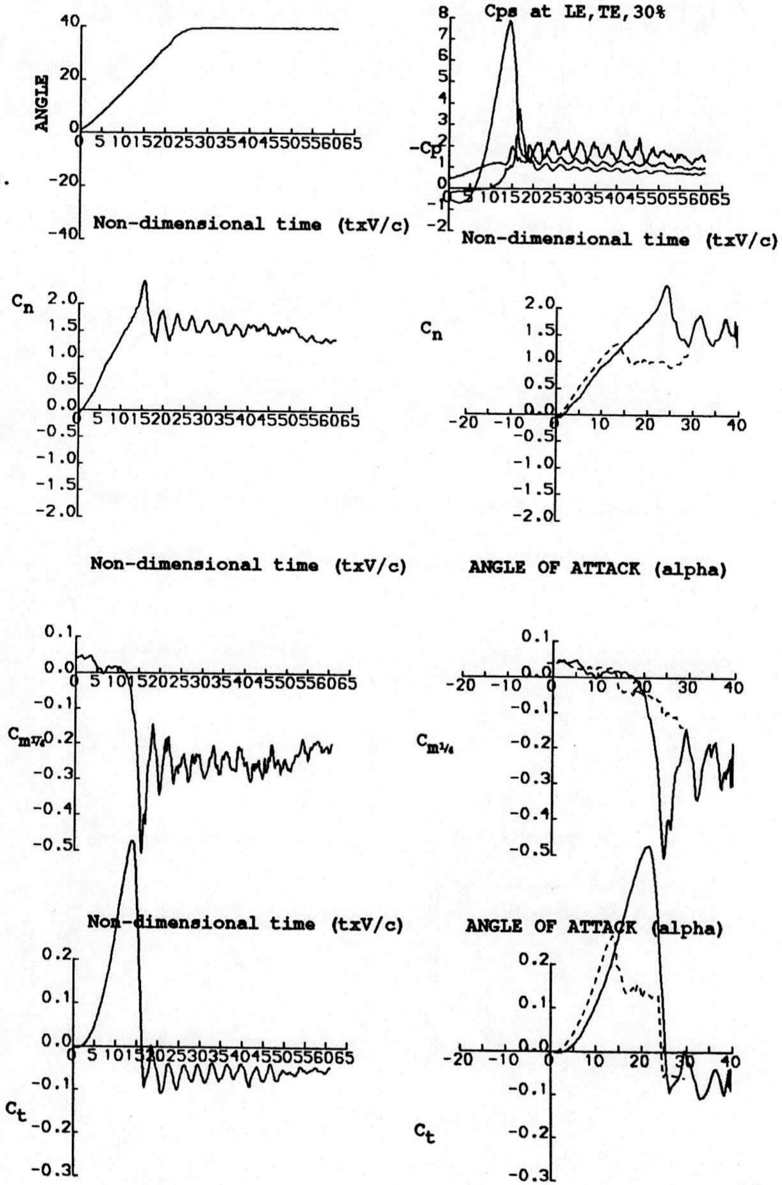
AIR TEMPERATURE = 30.0°C

SAMPLING FREQUENCY = 293.51 Hz.

REDUCED PITCH RATE = 0.01420

LINEAR PITCH RATE = 115.12°S^{-1}





DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 20151

REYNOLDS NUMBER = 1534555.

DYNAMIC PRESSURE = 1005.02 Nm^{-2}

NUMBER OF CYCLES = 5

MOTION TYPE: RAMP UP

START ANGLE = -1.00°

RAMP ARC = 41.000°

AVERAGED DATA OF 5 CYCLES

DATE OF TEST: 28/2/86

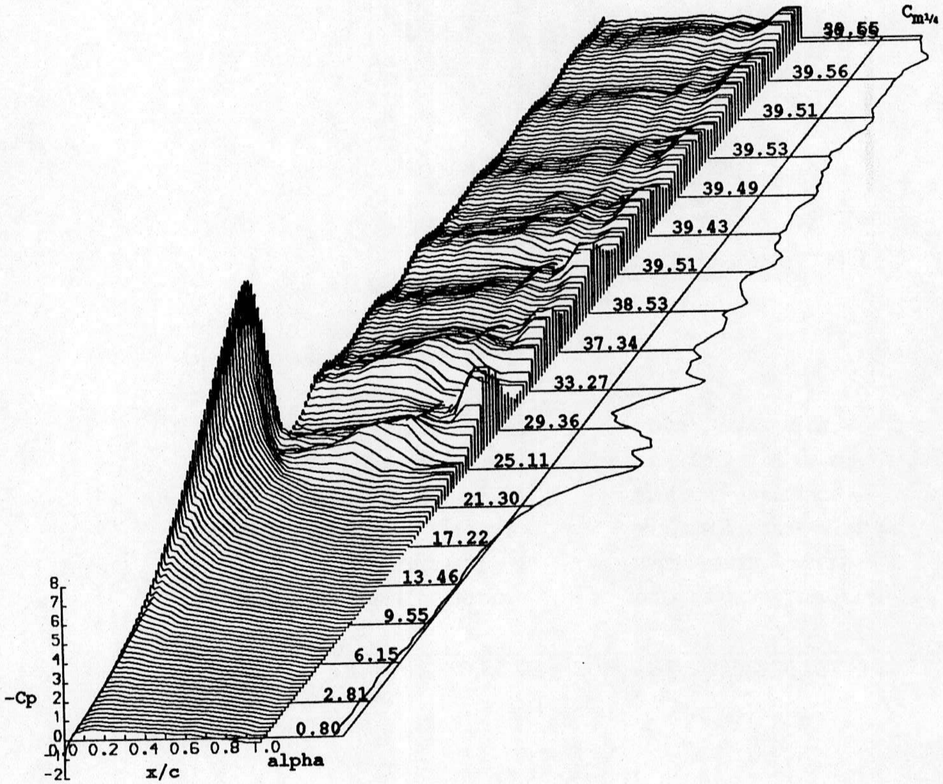
MACH NUMBER = 0.113

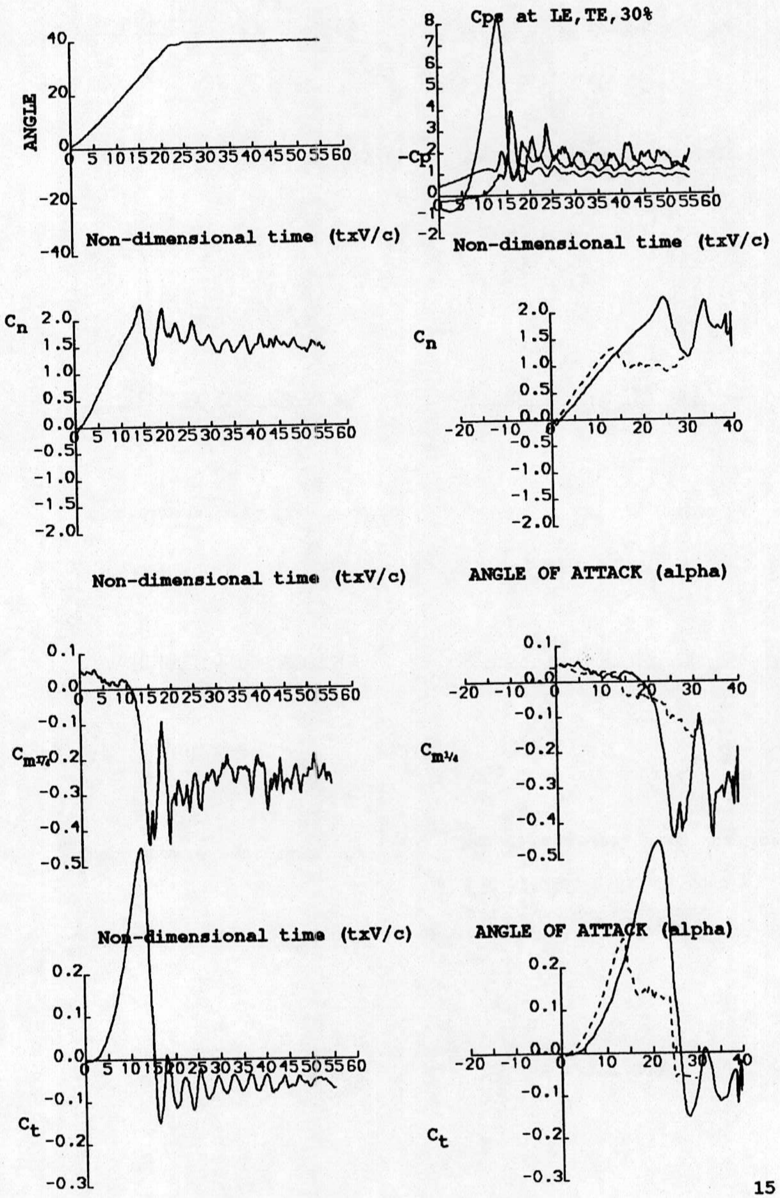
AIR TEMPERATURE = 30.0°C

SAMPLING FREQUENCY = 330.25 Hz.

REDUCED PITCH RATE = 0.01580

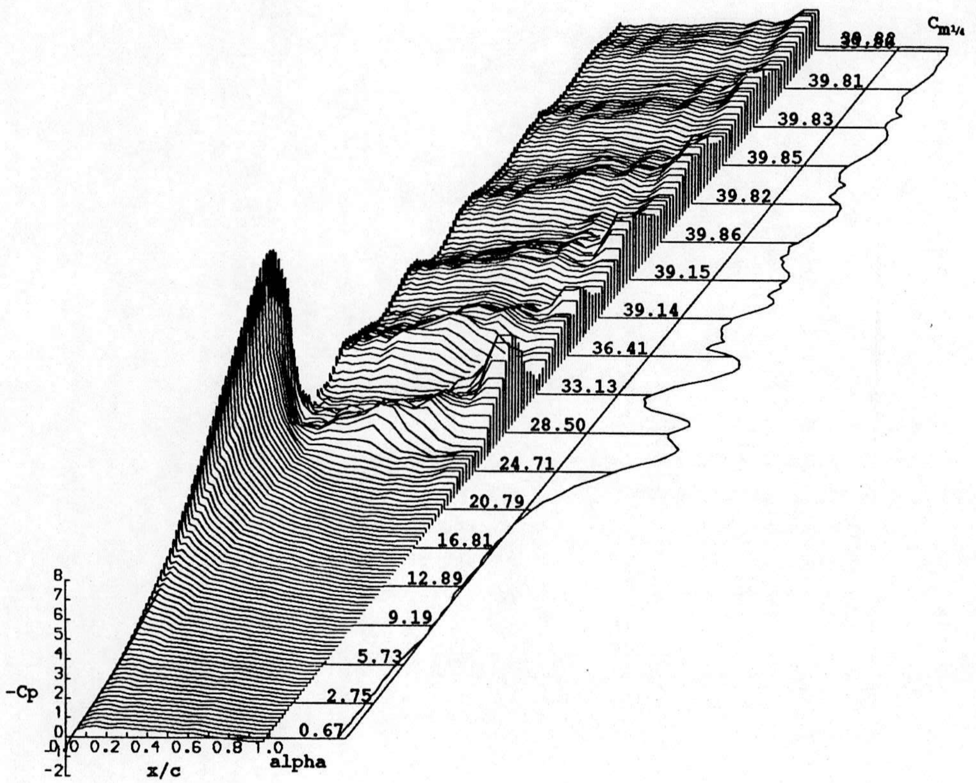
LINEAR PITCH RATE = 129.59°S^{-1}

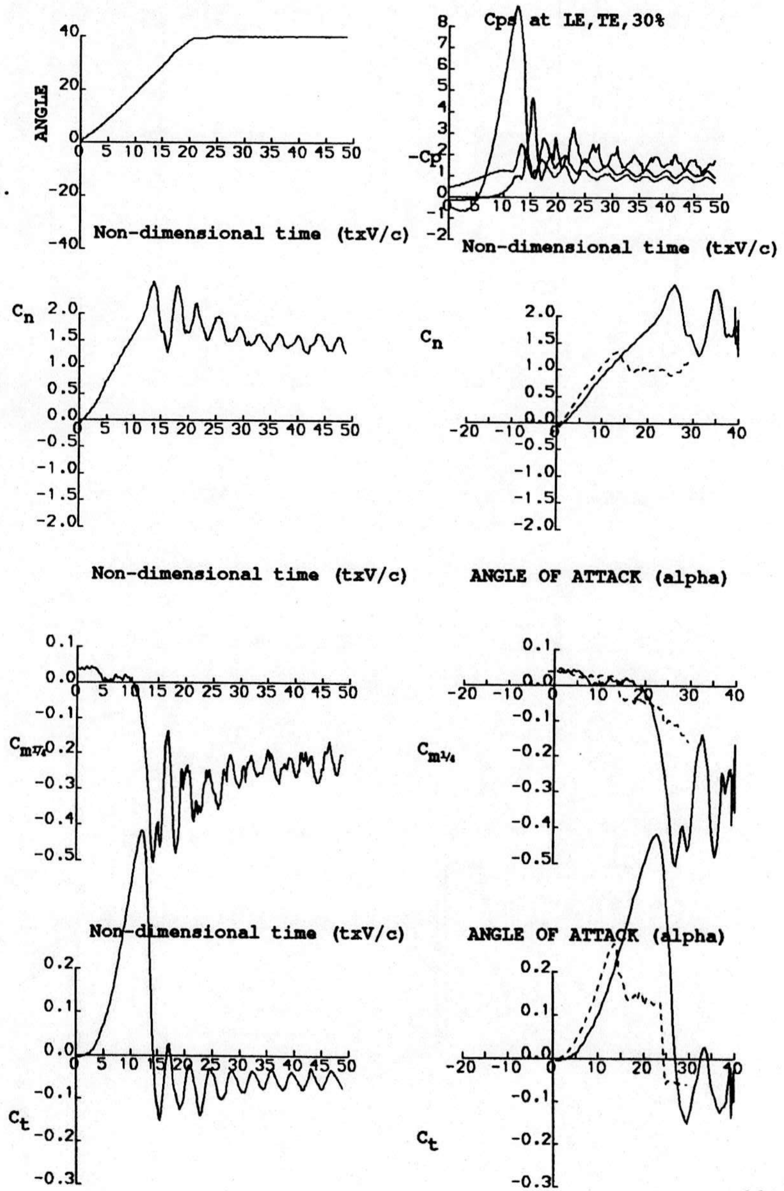




DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 20161	DATE OF TEST: 28/2/86
REYNOLDS NUMBER = 1514126.	MACH NUMBER = 0.111
DYNAMIC PRESSURE = 978.44 Nm^{-2}	AIR TEMPERATURE = 30.0°C
NUMBER OF CYCLES = 5	SAMPLING FREQUENCY = 366.84 Hz.
MOTION TYPE: RAMP UP	REDUCED PITCH RATE = 0.01810
START ANGLE = -1.00°	LINEAR PITCH RATE = 146.43°s^{-1}
RAMP ARC = 41.000°	
AVERAGED DATA OF 5 CYCLES	

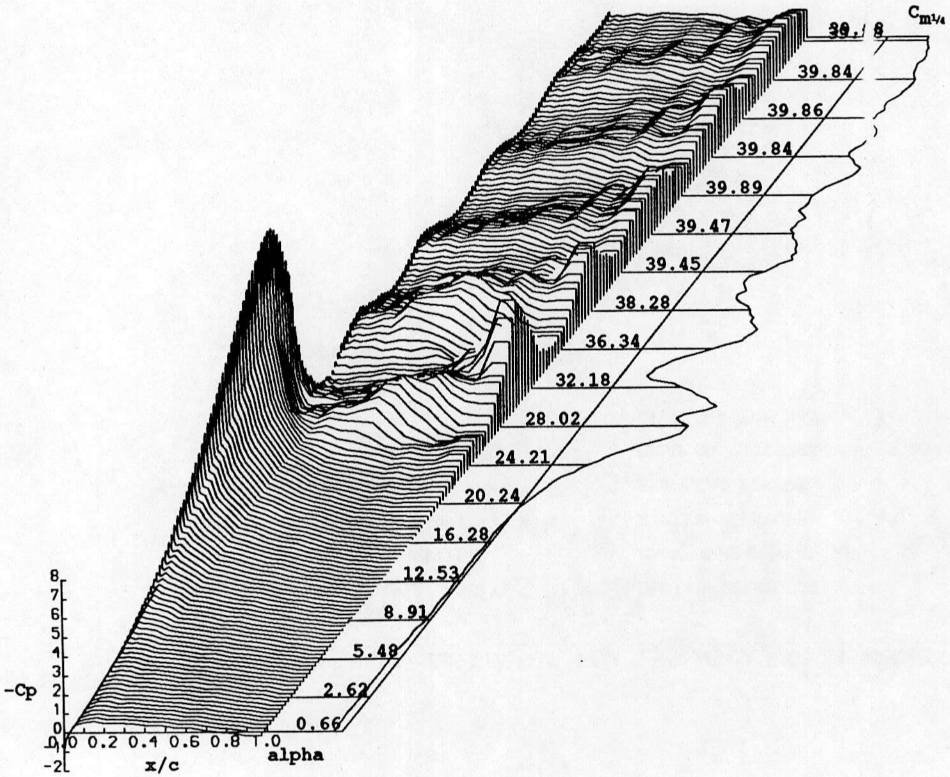


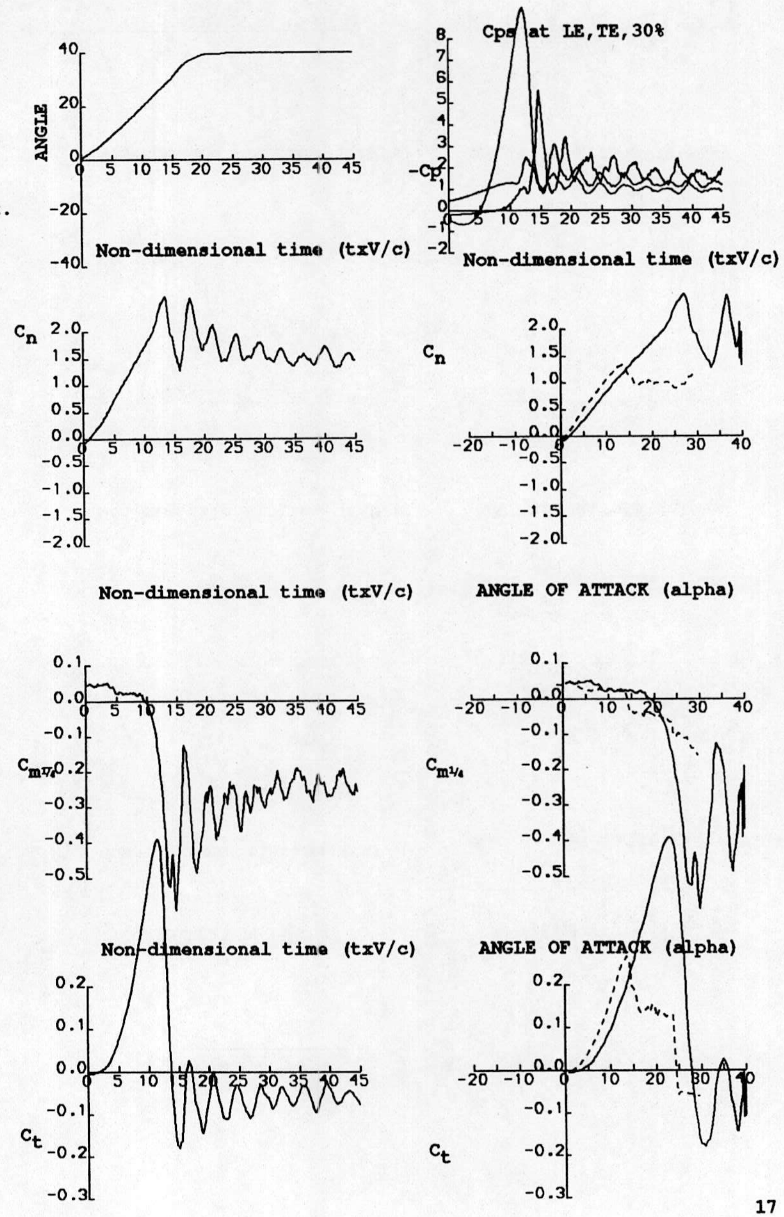


DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 20171
REYNOLDS NUMBER = 1531268.
DYNAMIC PRESSURE = 1000.72 Nm^{-2}
NUMBER OF CYCLES = 5
MOTION TYPE: RAMP UP
START ANGLE = -1.00°
RAMP ARC = 41.000°
AVERAGED DATA OF 5 CYCLES

DATE OF TEST: 28/2/86
MACH NUMBER = 0.112
AIR TEMPERATURE = 30.0°C
SAMPLING FREQUENCY = 403.55 Hz.
REDUCED PITCH RATE = 0.01950
LINEAR PITCH RATE = 159.64°S^{-1}

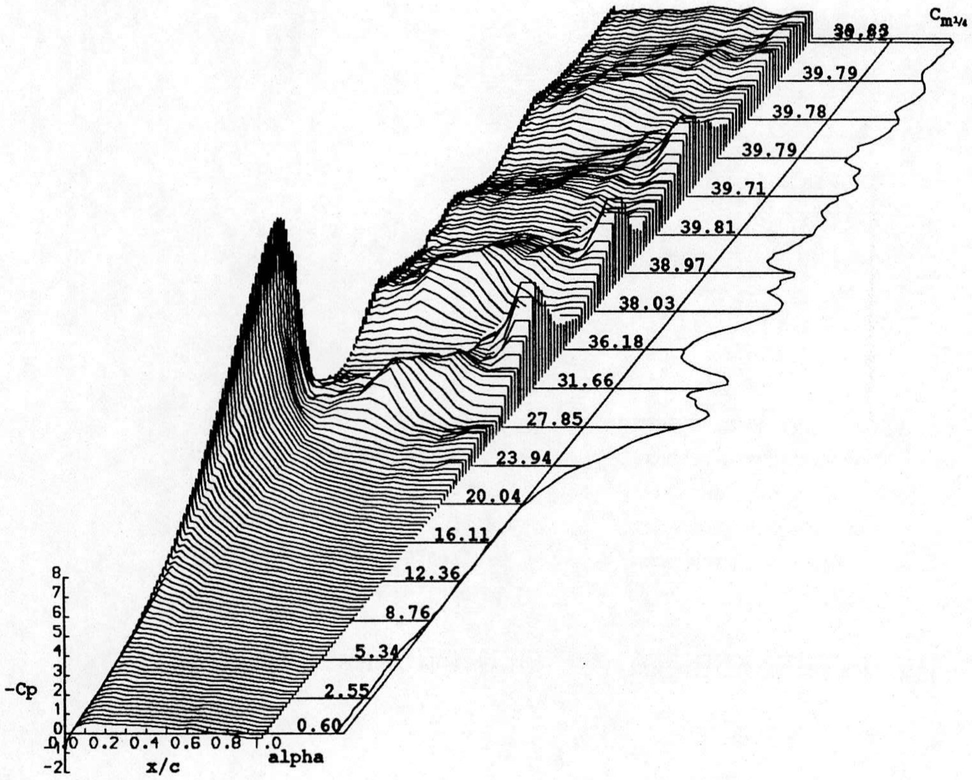


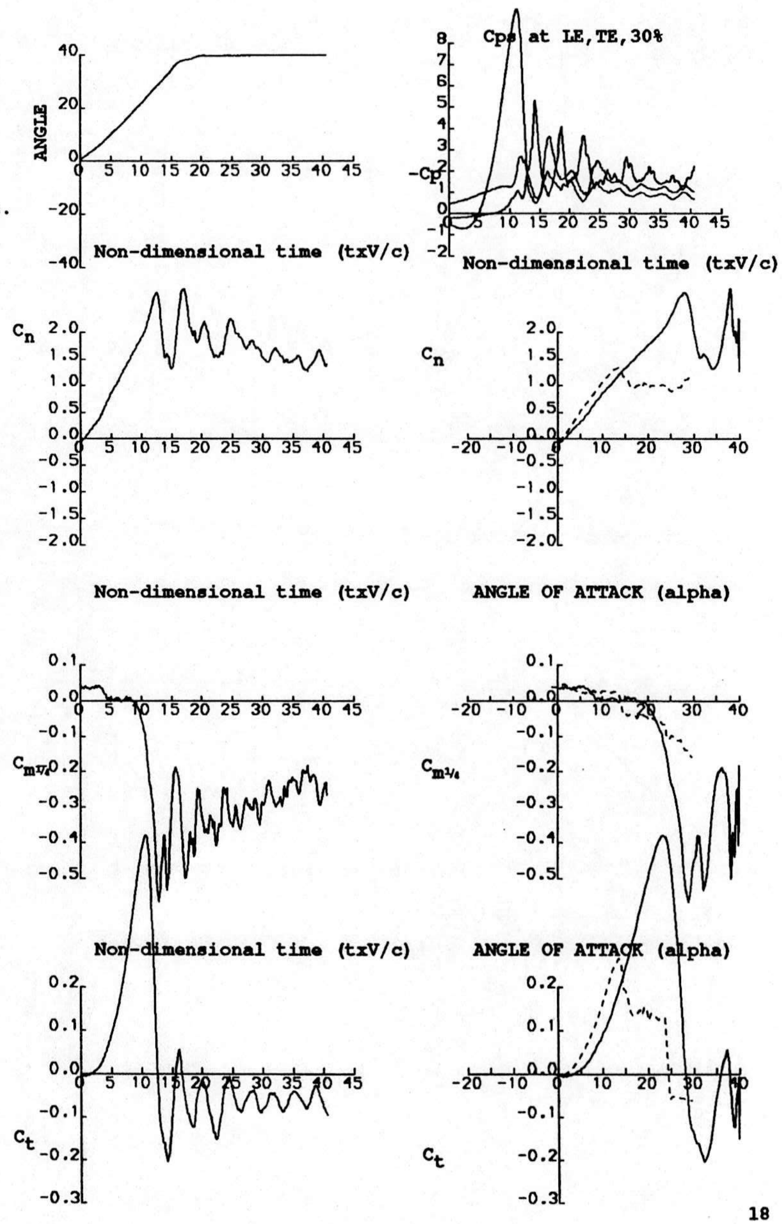


DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 20181
REYNOLDS NUMBER = 1509865.
DYNAMIC PRESSURE = 972.94 Nm^{-2}
NUMBER OF CYCLES = 5
MOTION TYPE: RAMP UP
START ANGLE = -1.00°
RAMP ARC = 41.000°
AVERAGED DATA OF 5 CYCLES

DATE OF TEST: 28/2/86
MACH NUMBER = 0.111
AIR TEMPERATURE = 30.0°C
SAMPLING FREQUENCY = 440.33 Hz.
REDUCED PITCH RATE = 0.02150
LINEAR PITCH RATE = 173.63°S^{-1}





DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 20191

REYNOLDS NUMBER = 1528971.

DYNAMIC PRESSURE = 997.72 Nm^{-2}

NUMBER OF CYCLES = 5

MOTION TYPE: RAMP UP

START ANGLE = -1.00°

RAMP ARC = 41.000°

AVERAGED DATA OF 5 CYCLES

DATE OF TEST: 28/2/86

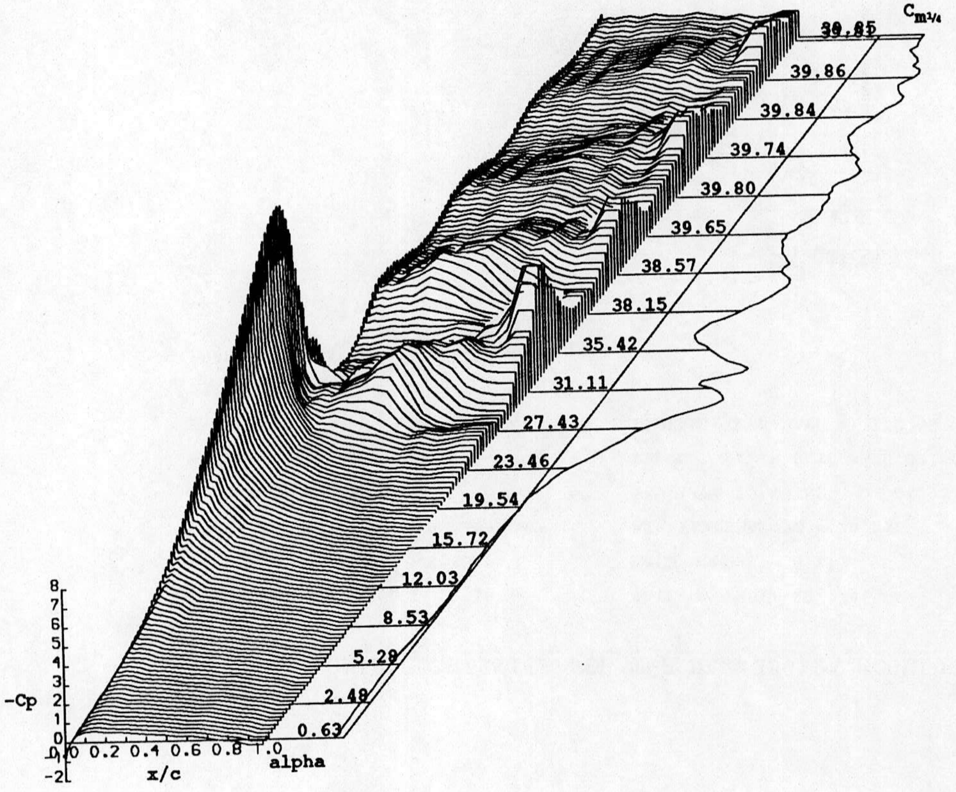
MACH NUMBER = 0.112

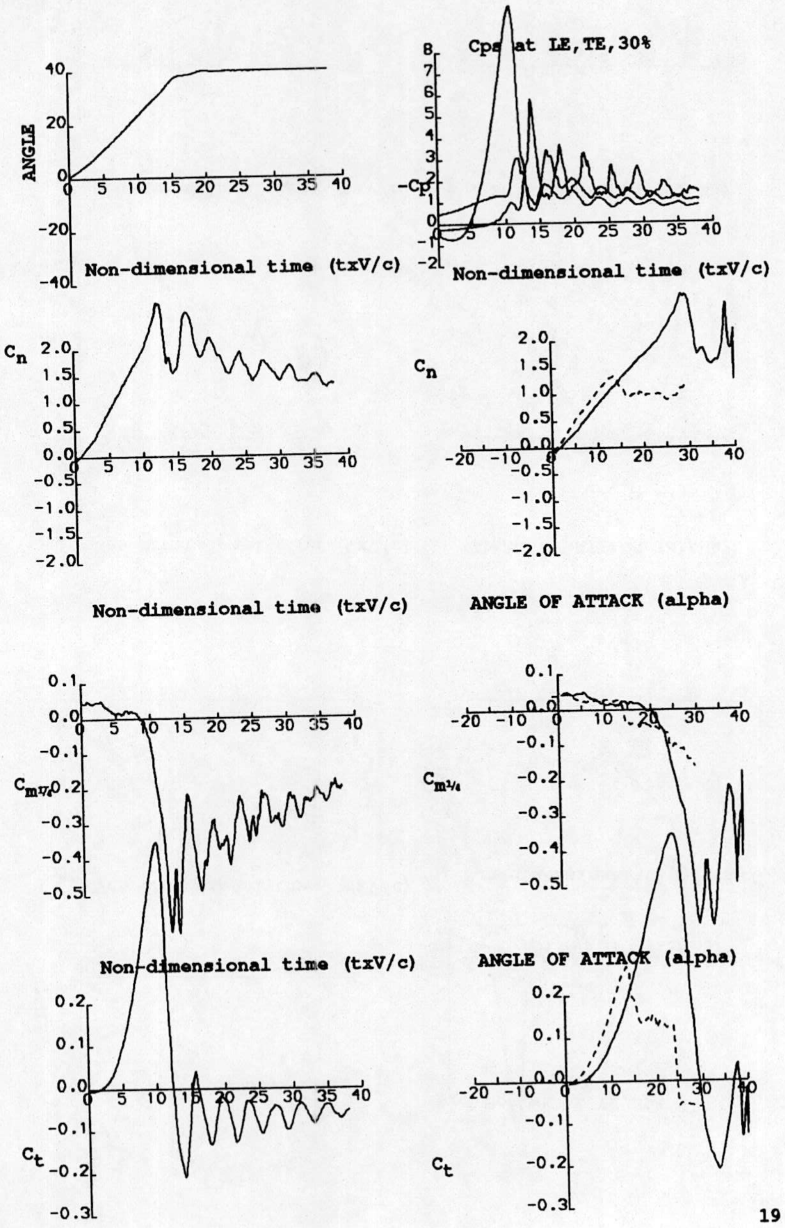
AIR TEMPERATURE = 30.0°C

SAMPLING FREQUENCY = 476.87 Hz.

REDUCED PITCH RATE = 0.02320

LINEAR PITCH RATE = 189.52°s^{-1}





DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 20201

REYNOLDS NUMBER = 1531150.

DYNAMIC PRESSURE = 1000.57 Nm^{-2}

NUMBER OF CYCLES = 5

MOTION TYPE: RAMP UP

START ANGLE = -1.00°

RAMP ARC = 41.000°

AVERAGED DATA OF 5 CYCLES

DATE OF TEST: 28/2/86

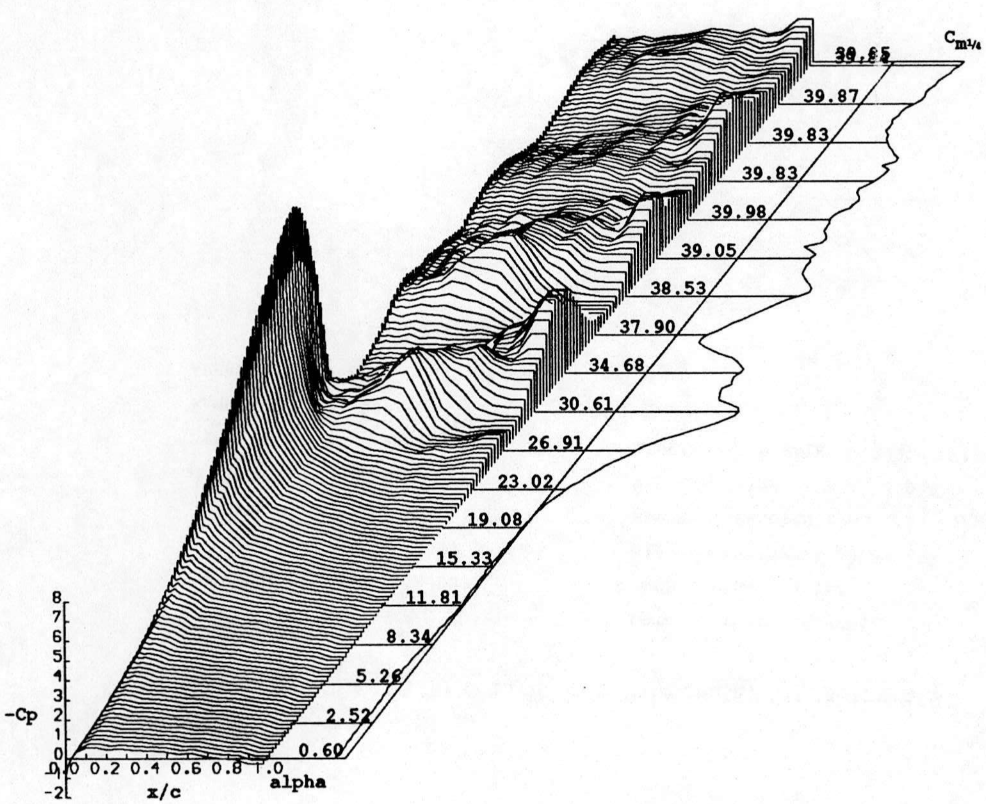
MACH NUMBER = 0.112

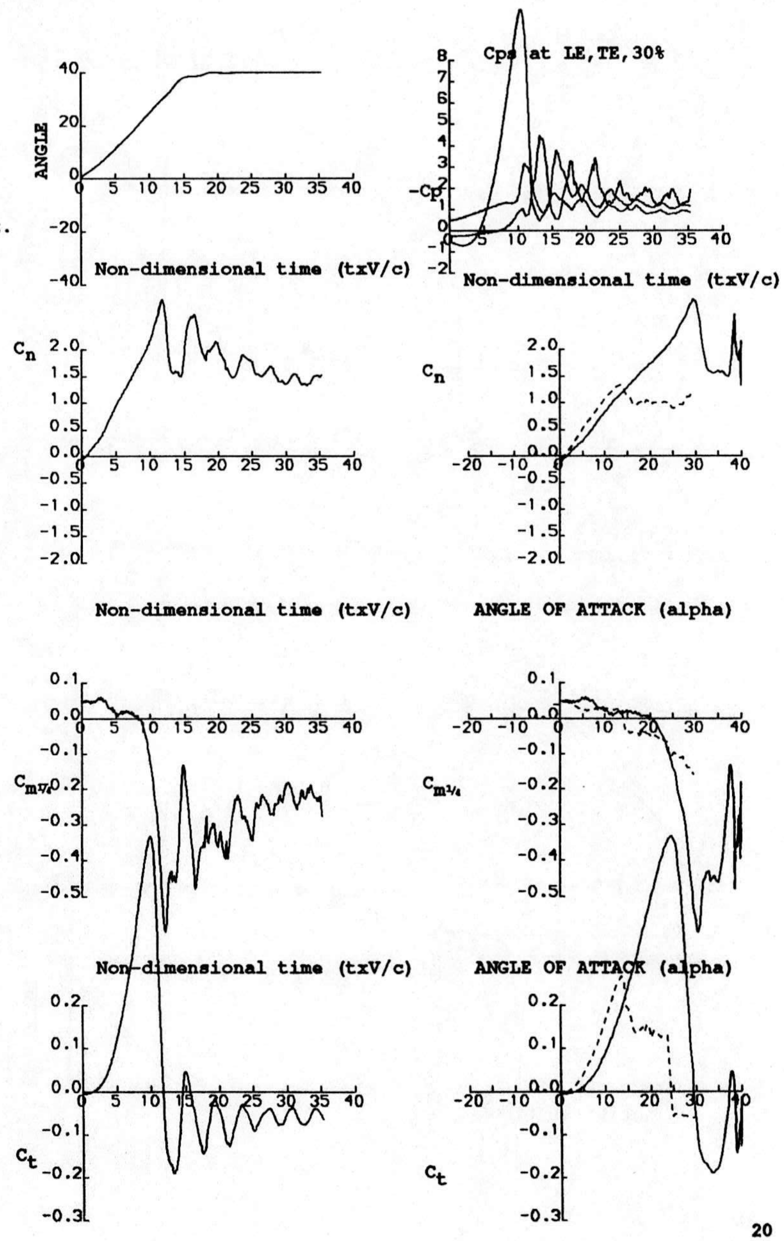
AIR TEMPERATURE = 30.0°C

SAMPLING FREQUENCY = 513.61 Hz.

REDUCED PITCH RATE = 0.02440

LINEAR PITCH RATE = 199.78°S^{-1}





DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 20221

REYNOLDS NUMBER = 1520903.

DYNAMIC PRESSURE = 987.22 Nm^{-2}

NUMBER OF CYCLES = 5

MOTION TYPE: RAMP UP

START ANGLE = -1.00°

RAMP ARC = 41.000°

AVERAGED DATA OF 5 CYCLES

DATE OF TEST: 28/2/86

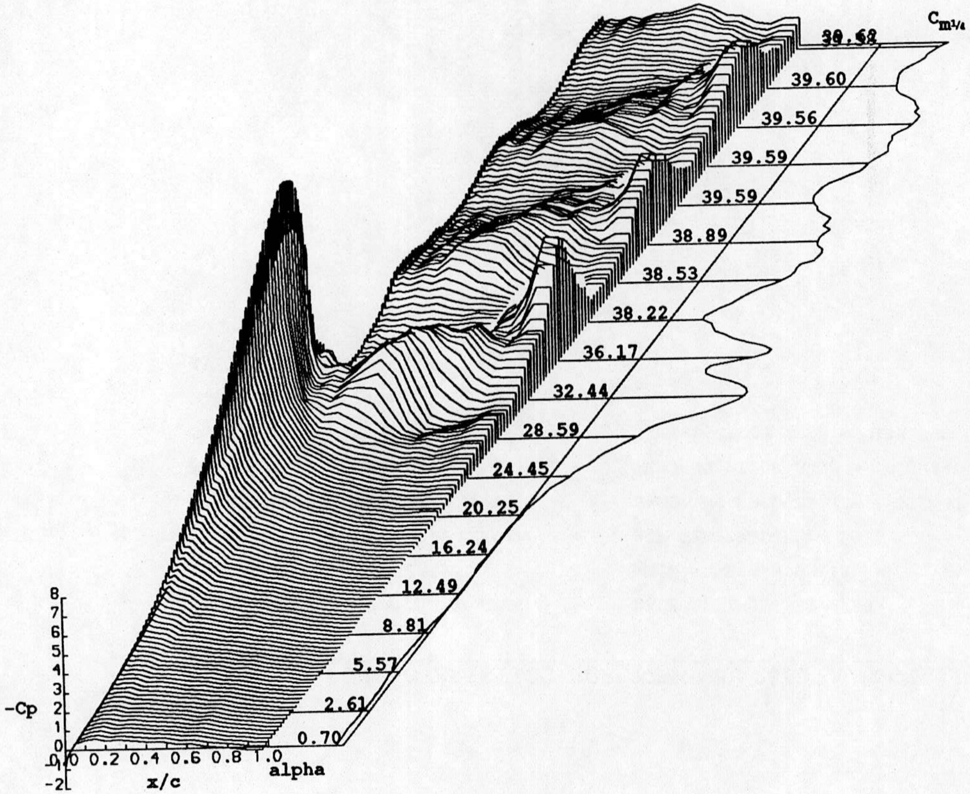
MACH NUMBER = 0.112

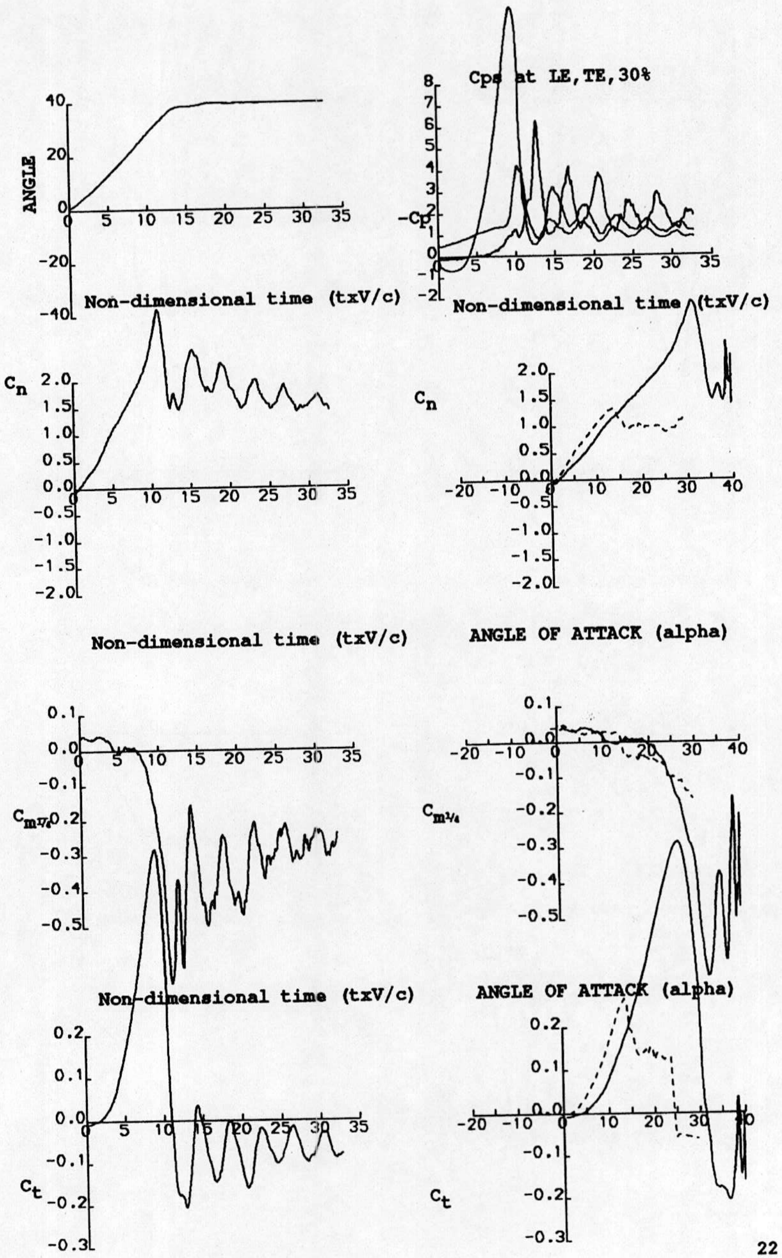
AIR TEMPERATURE = 30.0°C

SAMPLING FREQUENCY = 550.05 Hz.

REDUCED PITCH RATE = 0.02820

LINEAR PITCH RATE = 229.07°S^{-1}

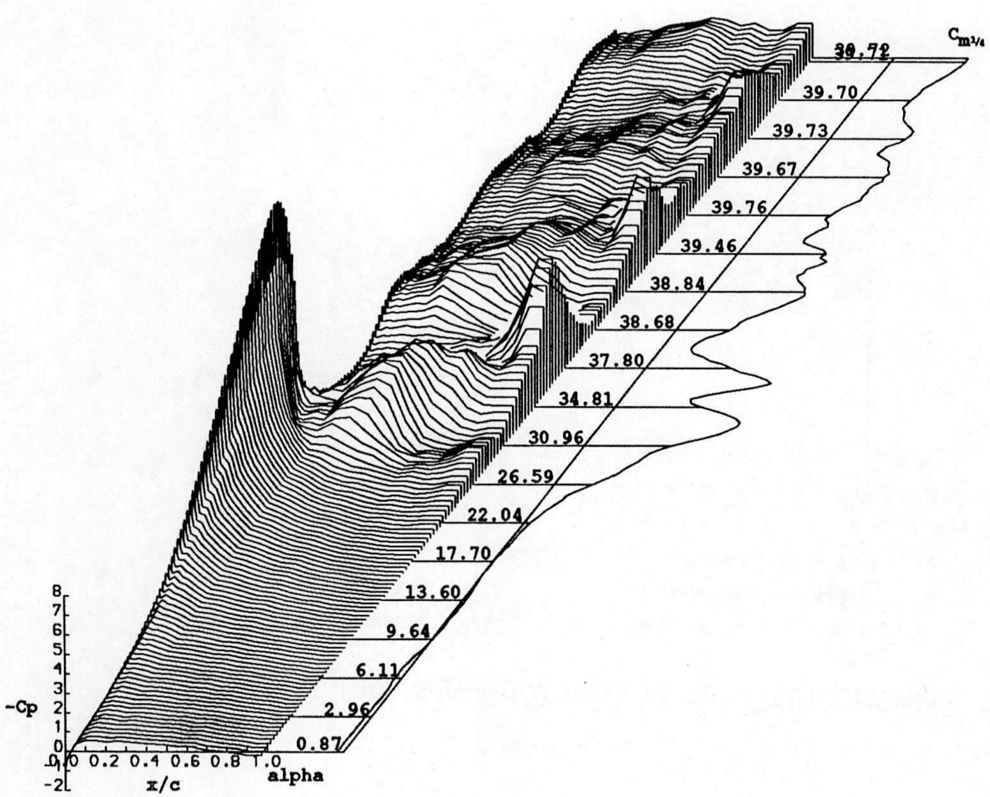


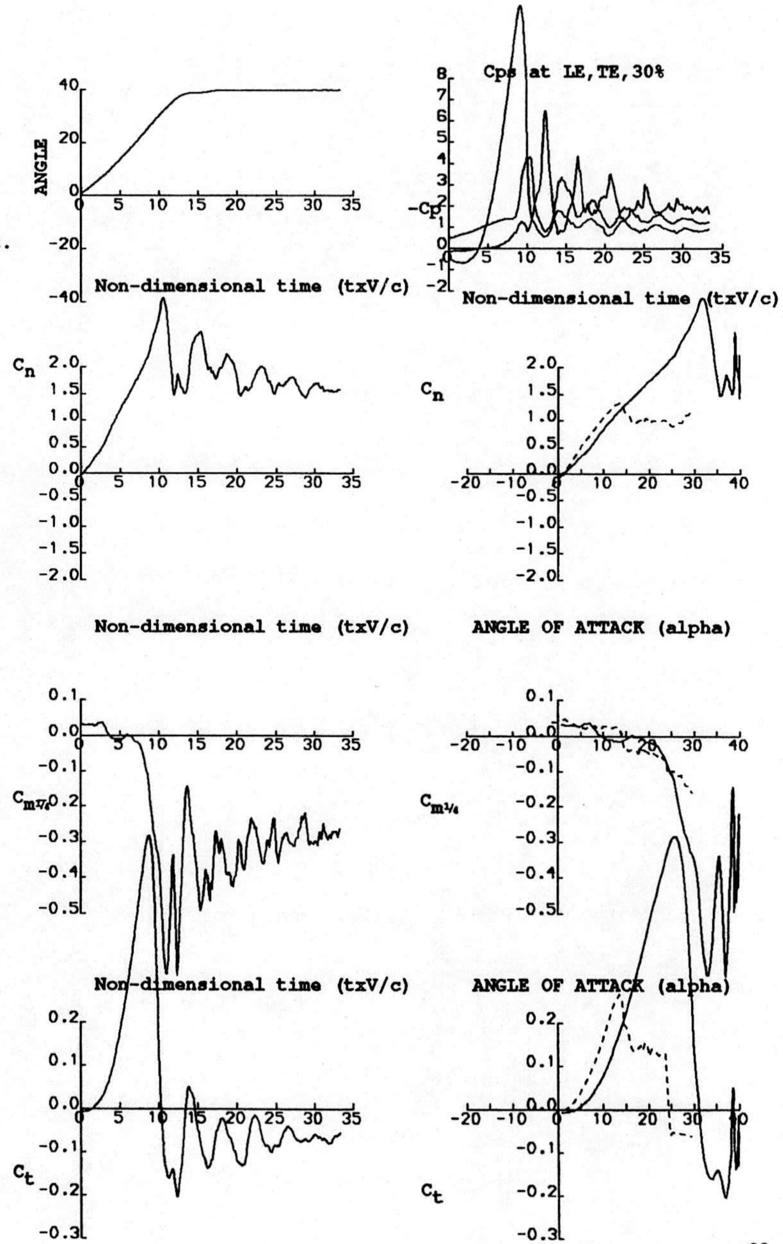


DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 20231
REYNOLDS NUMBER = 1479256.
DYNAMIC PRESSURE = 978.37 Nm^{-2}
NUMBER OF CYCLES = 5
MOTION TYPE: RAMP UP
START ANGLE = -1.00°
RAMP ARC = 41.000°
AVERAGED DATA OF 5 CYCLES

DATE OF TEST: 4/3/86
MACH NUMBER = 0.114
AIR TEMPERATURE = 30.0°C
SAMPLING FREQUENCY = 550.05 Hz.
REDUCED PITCH RATE = 0.02960
LINEAR PITCH RATE = 242.61°S^{-1}





DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 20241

REYNOLDS NUMBER = 1482482.

DYNAMIC PRESSURE = 982.64 Nm^{-2}

NUMBER OF CYCLES = 5

MOTION TYPE: RAMP UP

START ANGLE = -1.00°

RAMP ARC = 41.000°

AVERAGED DATA OF 5 CYCLES

DATE OF TEST: 4/3/86

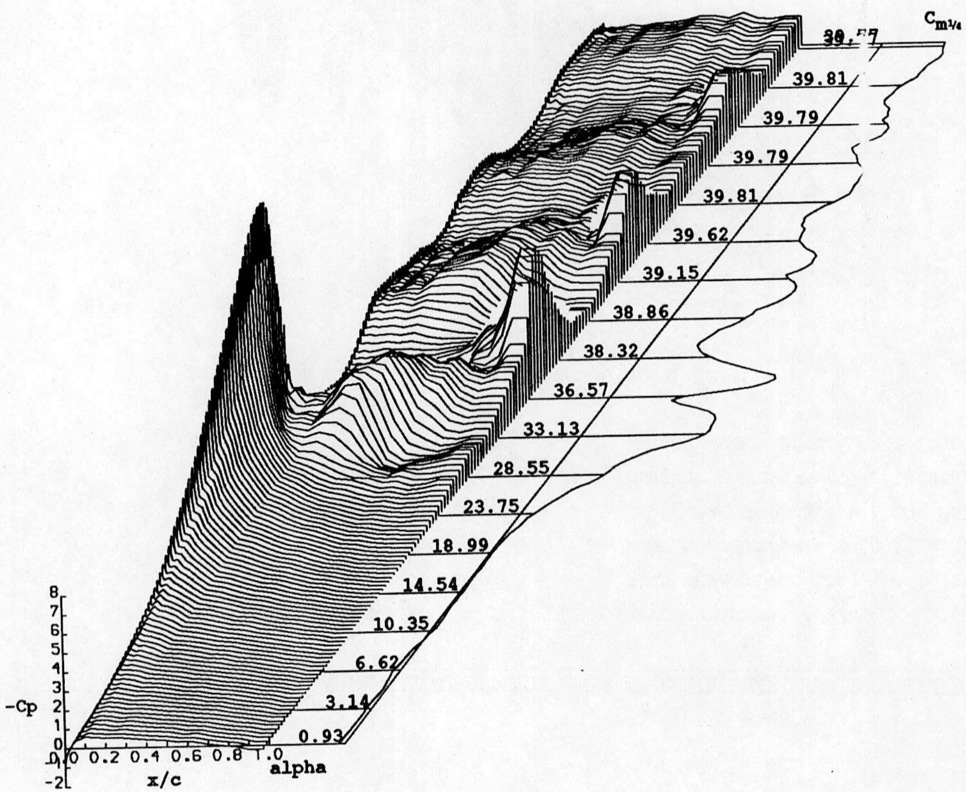
MACH NUMBER = 0.114

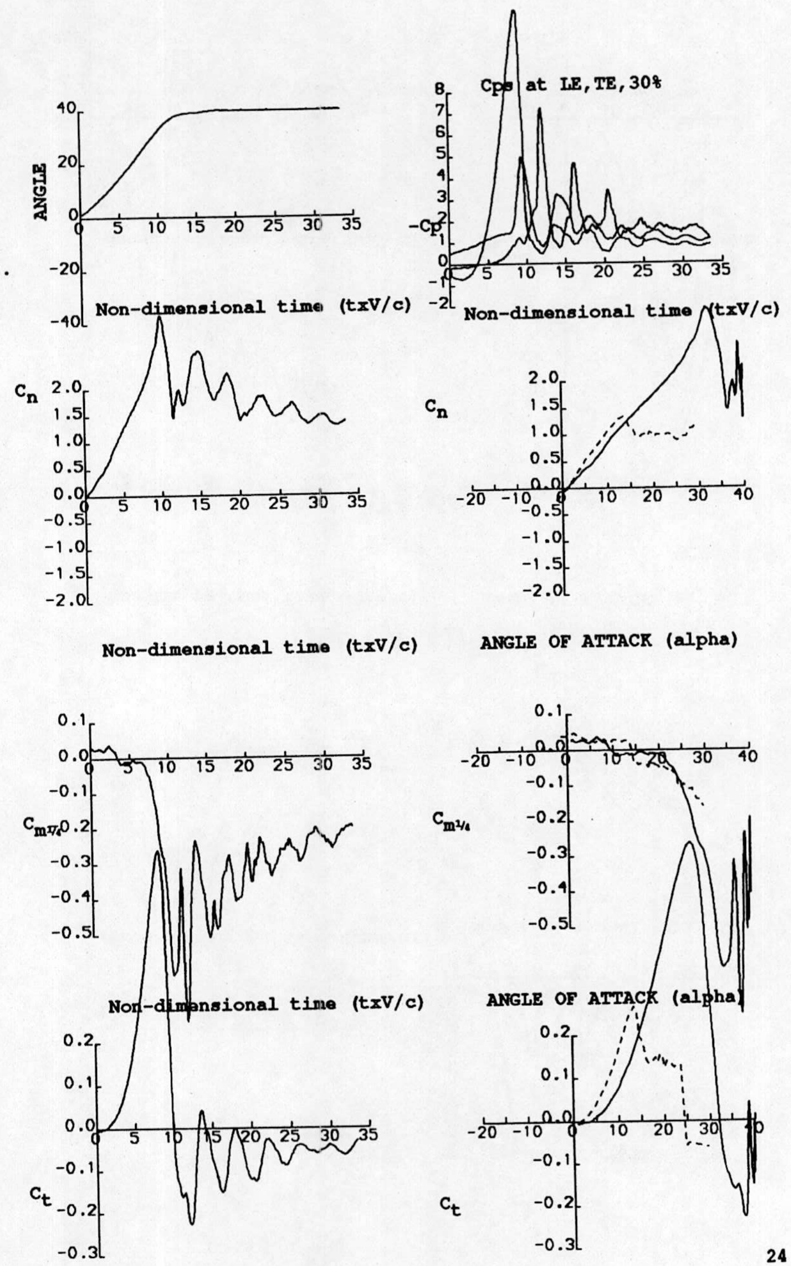
AIR TEMPERATURE = 30.0°C

SAMPLING FREQUENCY = 550.05 Hz.

REDUCED PITCH RATE = 0.03110

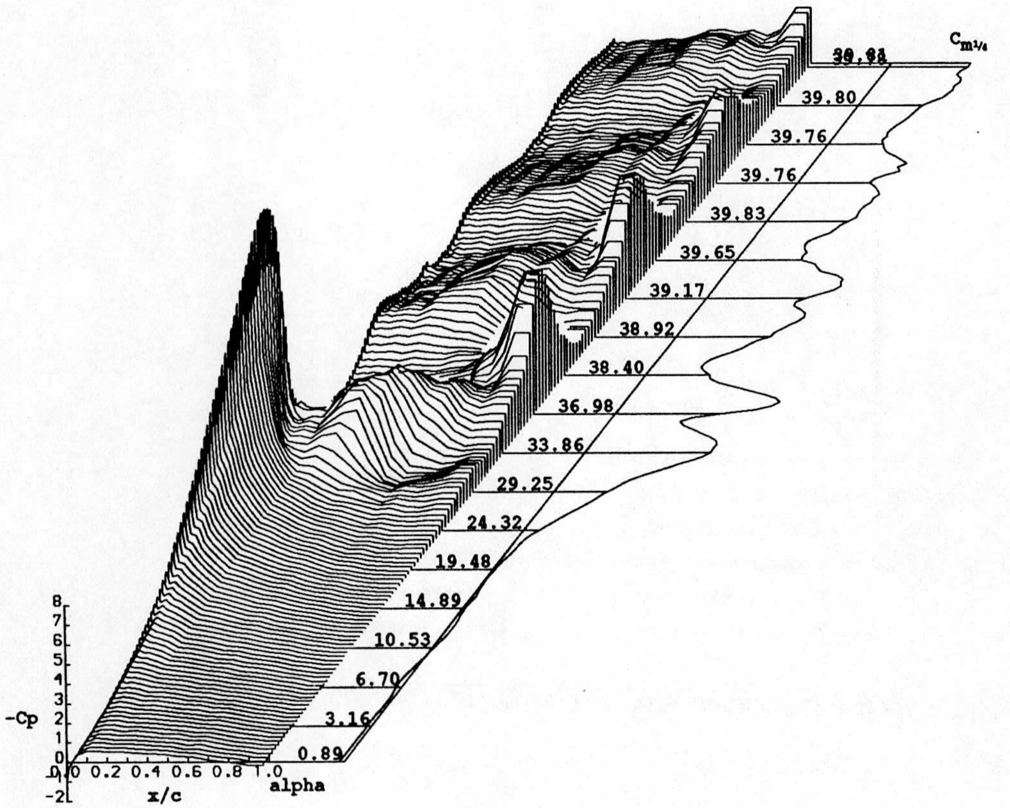
LINEAR PITCH RATE = 258.52°S^{-1}

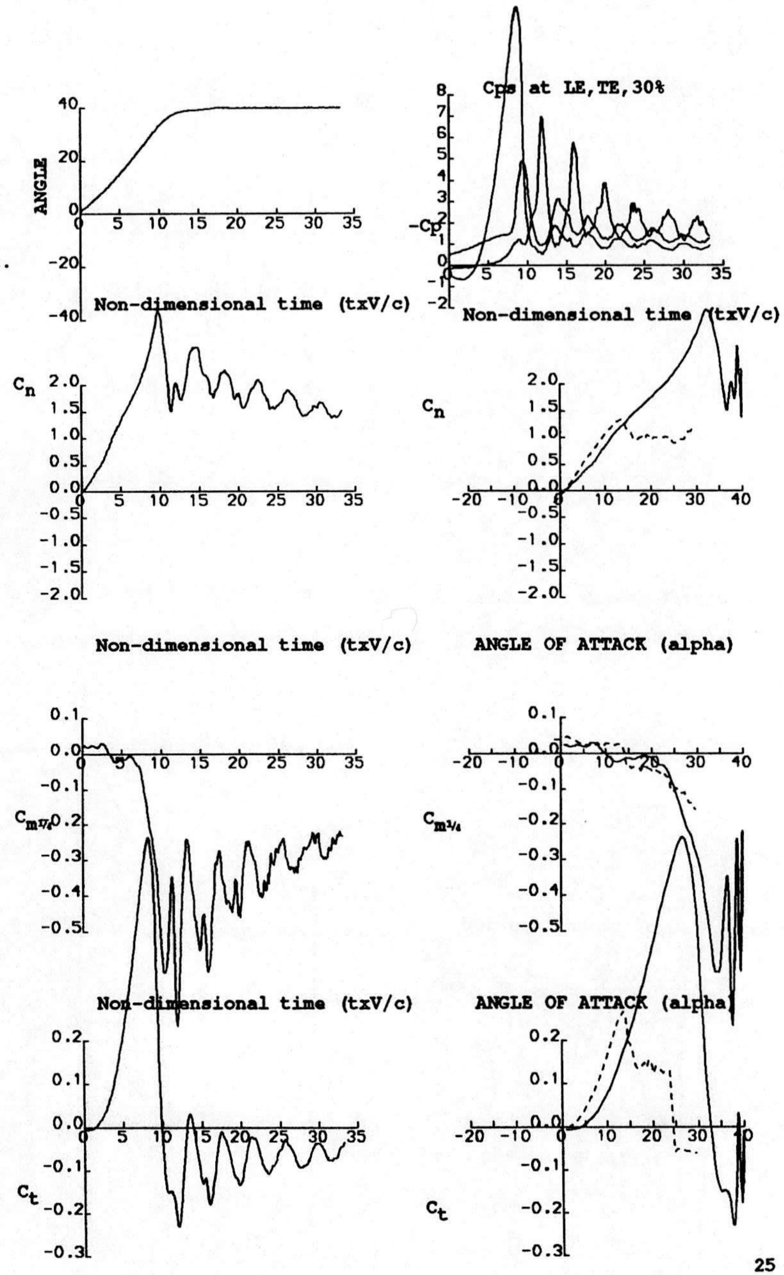




DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

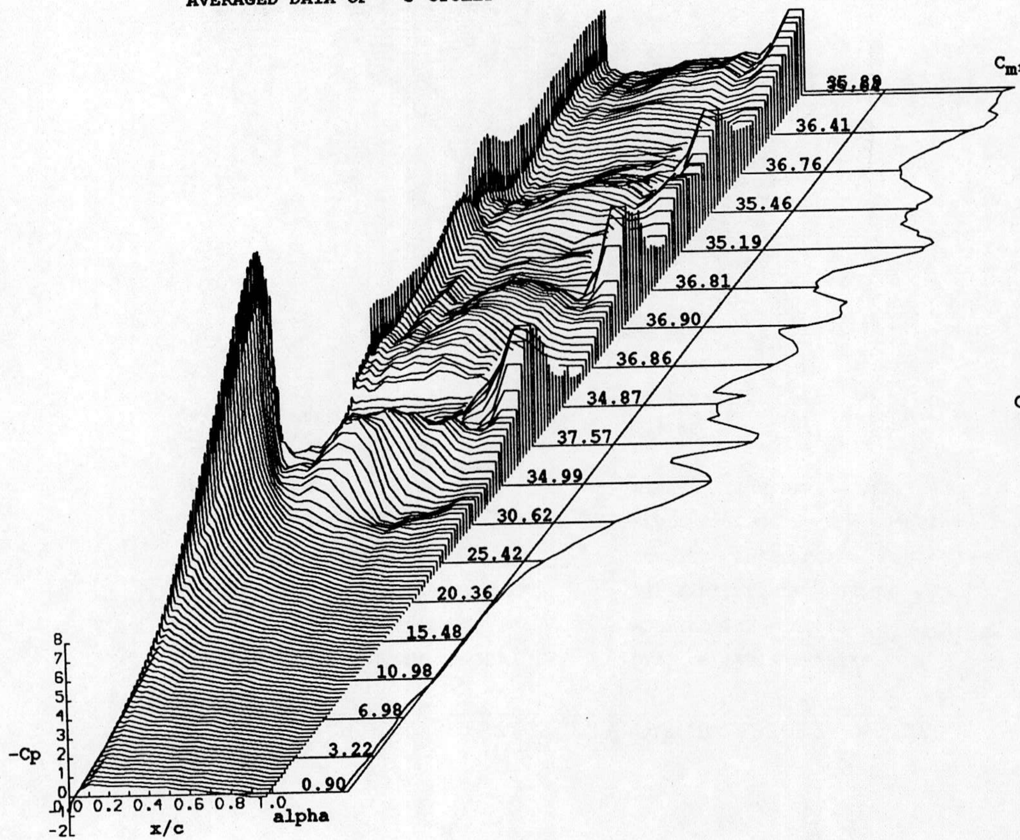
RUN REFERENCE NUMBER: 20251	DATE OF TEST: 4/3/86
REYNOLDS NUMBER = 1475689.	MACH NUMBER = 0.113
DYNAMIC PRESSURE = 973.65 Nm^{-2}	AIR TEMPERATURE = 30.0°C
NUMBER OF CYCLES = 5	SAMPLING FREQUENCY = 550.05 Hz.
MOTION TYPE: RAMP UP	REDUCED PITCH RATE = 0.03190
START ANGLE = -1.00°	LINEAR PITCH RATE = 263.63°S^{-1}
RAMP ARC = 41.000°	
AVERAGED DATA OF 5 CYCLES	

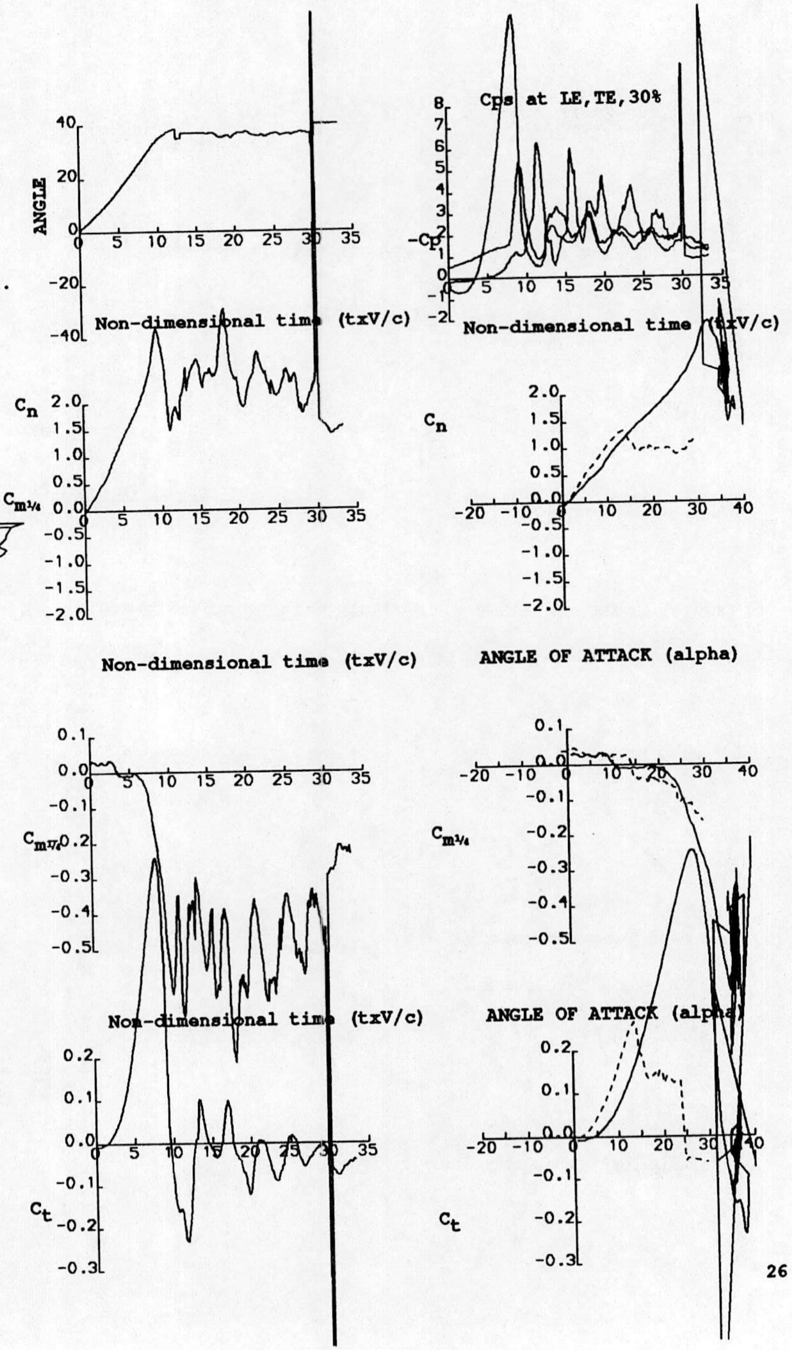




DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

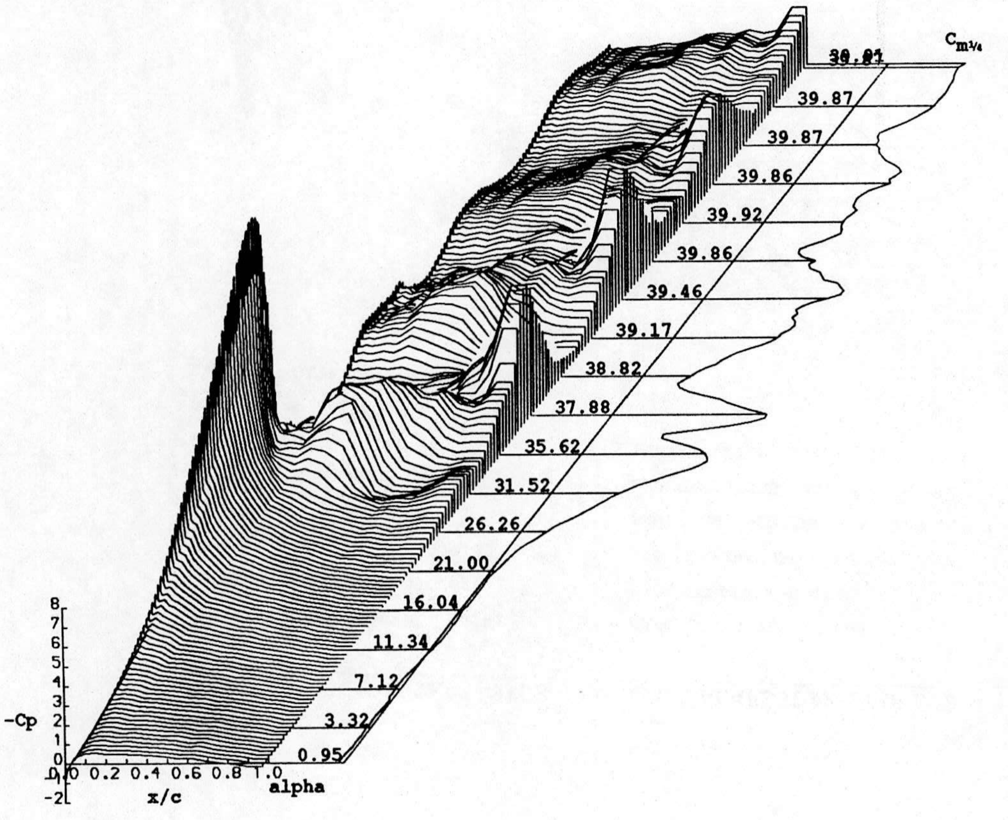
RUN REFERENCE NUMBER: 20261	DATE OF TEST: 4/3/86
REYNOLDS NUMBER = 1474562.	MACH NUMBER = 0.113
DYNAMIC PRESSURE = 972.17 Nm^{-2}	AIR TEMPERATURE = 30.0°C
NUMBER OF CYCLES = 5	SAMPLING FREQUENCY = 550.05 Hz.
MOTION TYPE: RAMP UP	REDUCED PITCH RATE = 0.03350
START ANGLE = -1.00°	LINEAR PITCH RATE = 276.83°S^{-1}
RAMP ARC = 41.000°	
AVERAGED DATA OF 5 CYCLES	

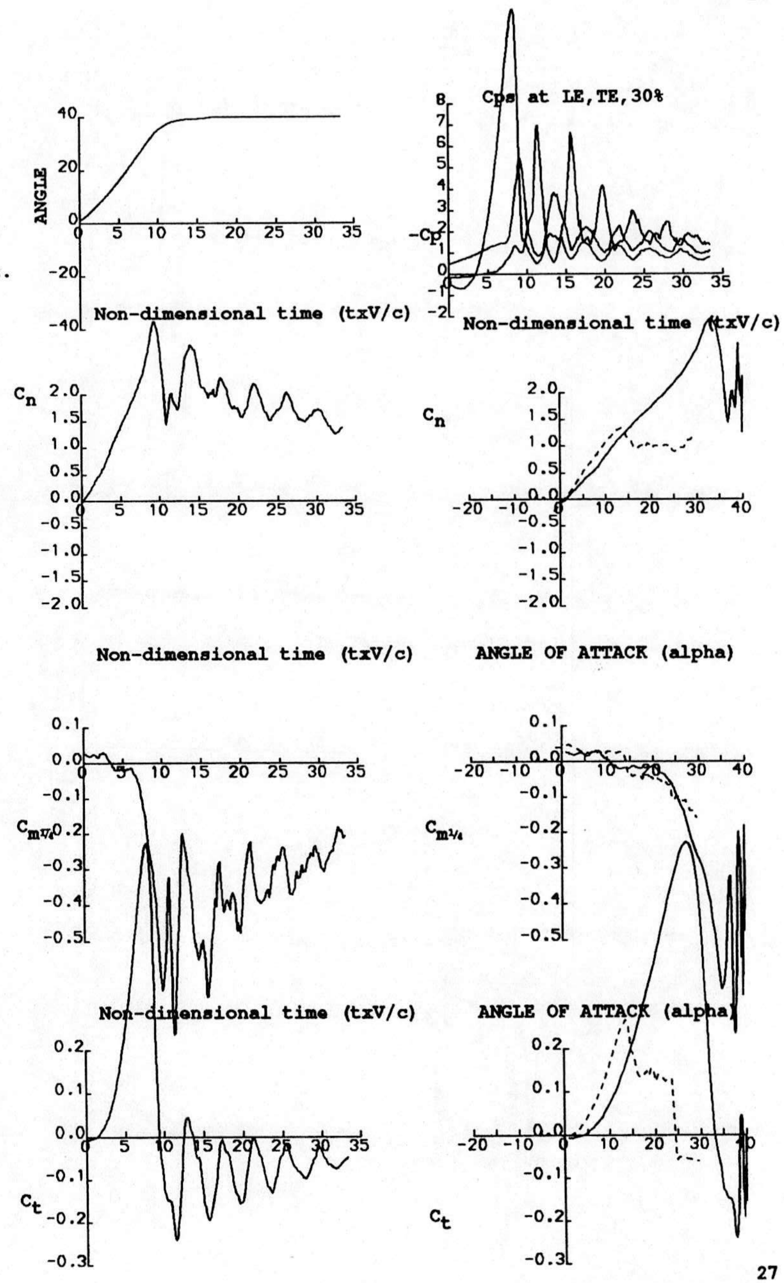




DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 20271	DATE OF TEST: 4/3/86
REYNOLDS NUMBER = 1478949.	MACH NUMBER = 0.114
DYNAMIC PRESSURE = 977.96 Nm^{-2}	AIR TEMPERATURE = 30.0°C
NUMBER OF CYCLES = 5	SAMPLING FREQUENCY = 550.05 Hz.
MOTION TYPE: RAMP UP	REDUCED PITCH RATE = 0.03460
START ANGLE = -1.00°	LINEAR PITCH RATE = 286.60°S^{-1}
RAMP ARC = 41.000°	
AVERAGED DATA OF 5 CYCLES	

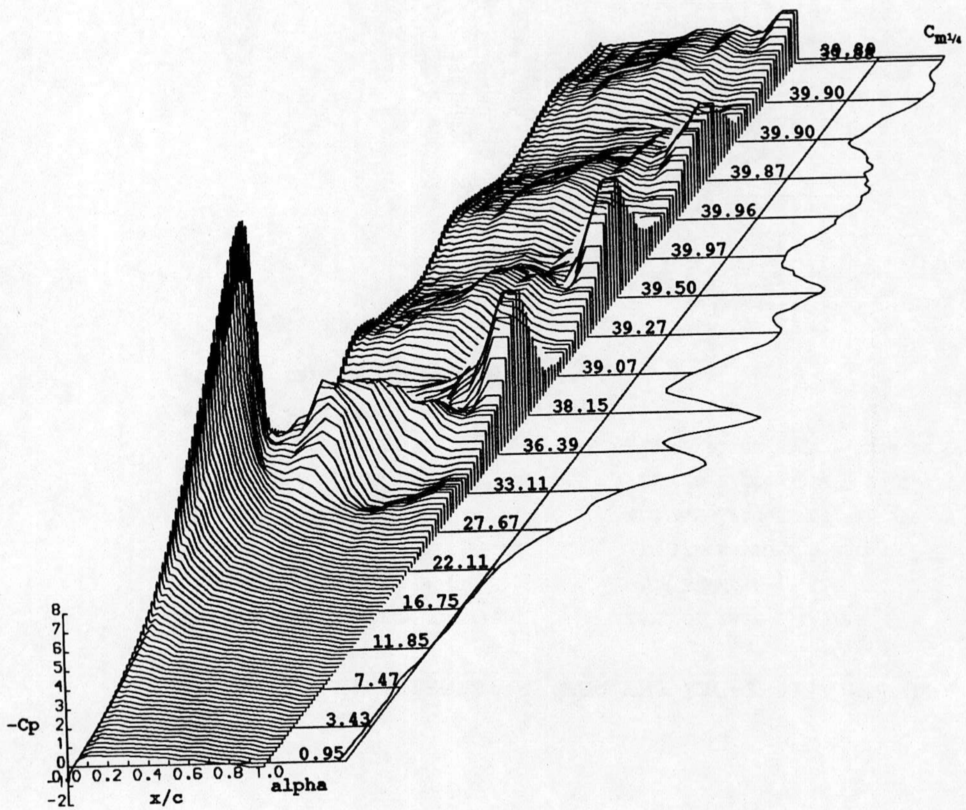


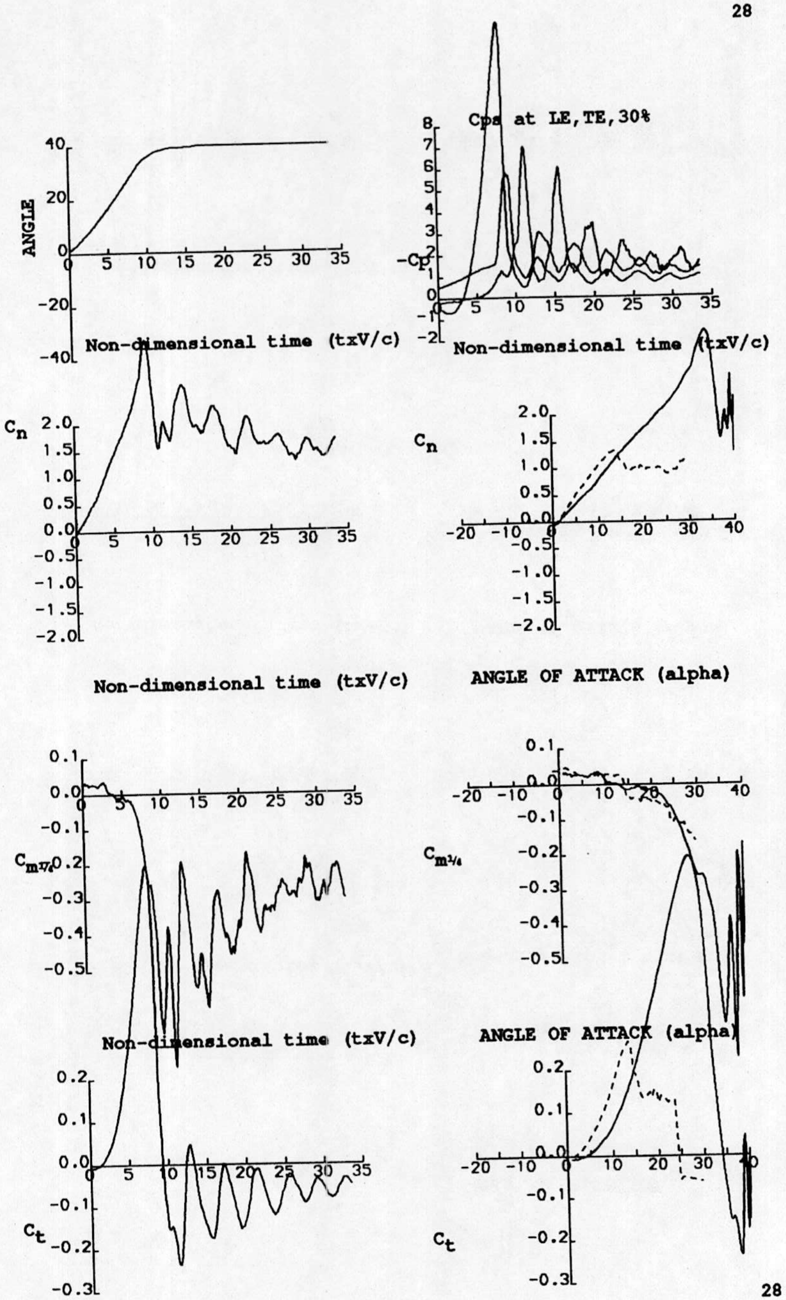


DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 20281
REYNOLDS NUMBER = 1486762.
DYNAMIC PRESSURE = 988.32 Nm^{-2}
NUMBER OF CYCLES = 5
MOTION TYPE: RAMP UP
START ANGLE = -1.00°
RAMP ARC = 41.000°
AVERAGED DATA OF 5 CYCLES

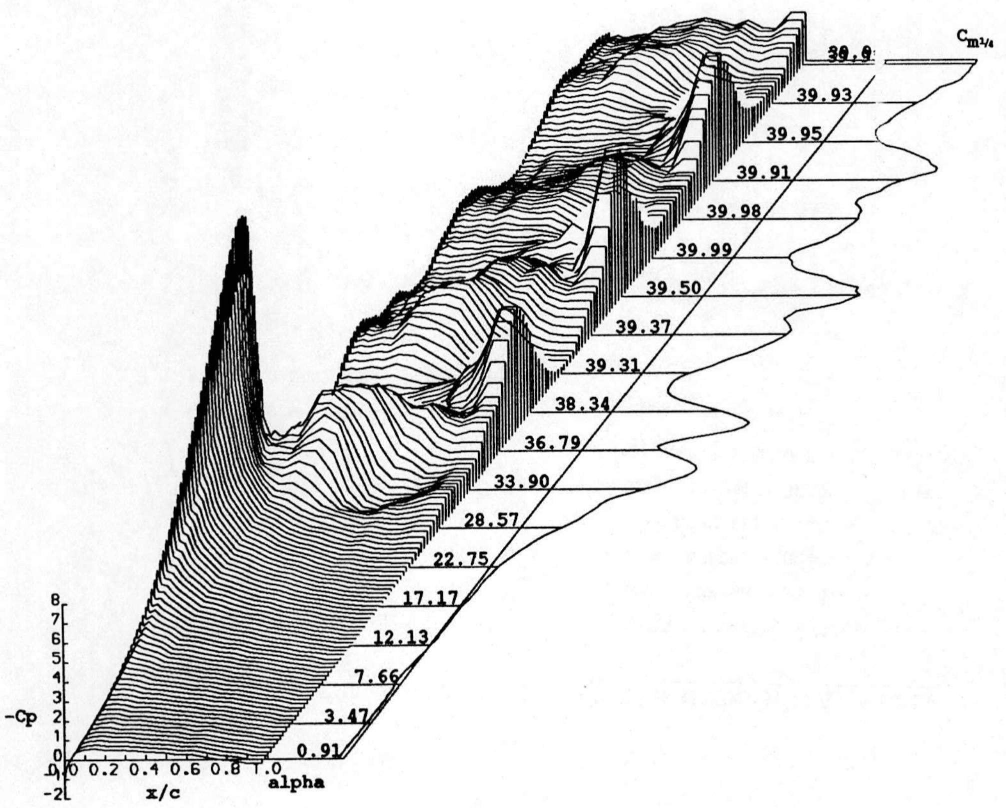
DATE OF TEST: 4/3/86
MACH NUMBER = 0.114
AIR TEMPERATURE = 30.0°C
SAMPLING FREQUENCY = 550.05 Hz.
REDUCED PITCH RATE = 0.03580
LINEAR PITCH RATE = 298.51°S^{-1}

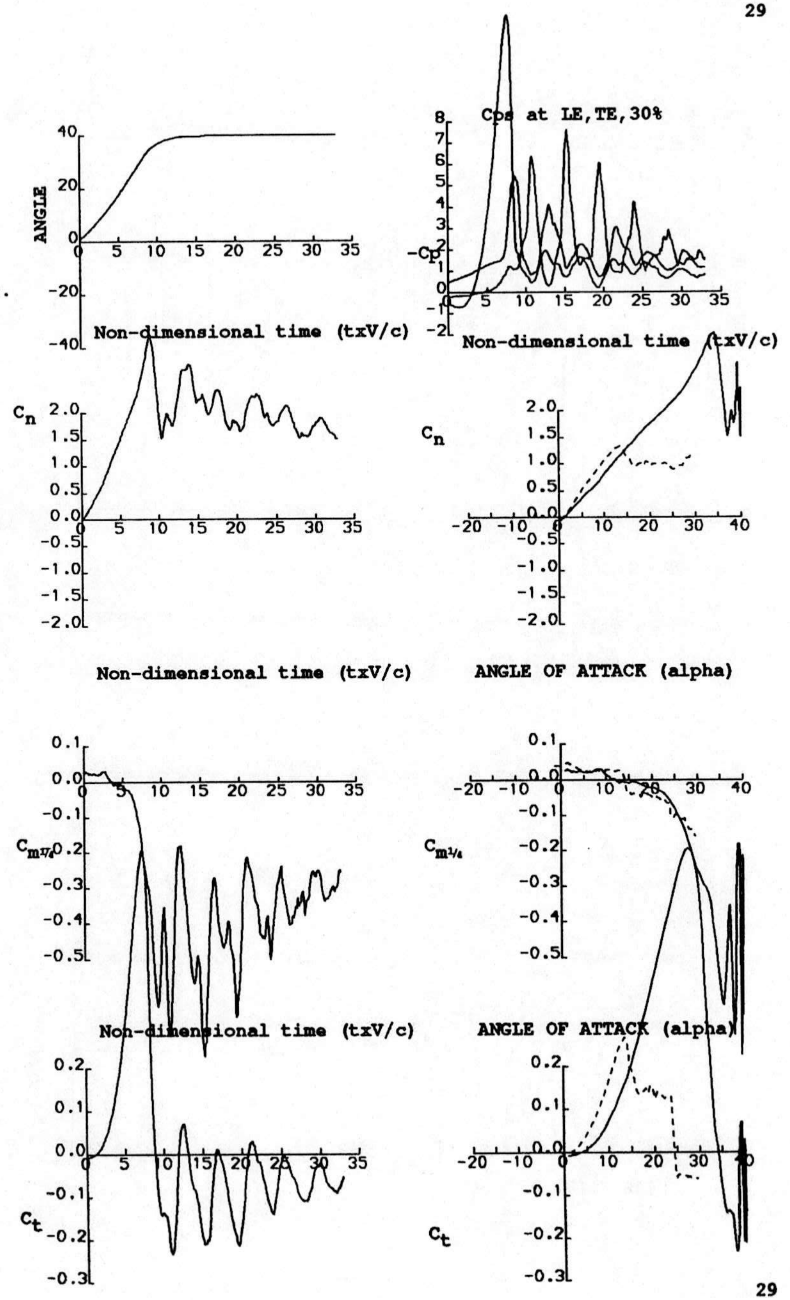




DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 20291	DATE OF TEST: 4/3/86
REYNOLDS NUMBER = 1462327.	MACH NUMBER = 0.112
DYNAMIC PRESSURE = 956.10 Nm^{-2}	AIR TEMPERATURE = 30.0°C
NUMBER OF CYCLES = 5	SAMPLING FREQUENCY = 550.05 Hz.
MOTION TYPE: RAMP UP	REDUCED PITCH RATE = 0.03850
START ANGLE = -1.00°	LINEAR PITCH RATE = 315.94°S^{-1}
RAMP ARC = 41.000°	
AVERAGED DATA OF 5 CYCLES	

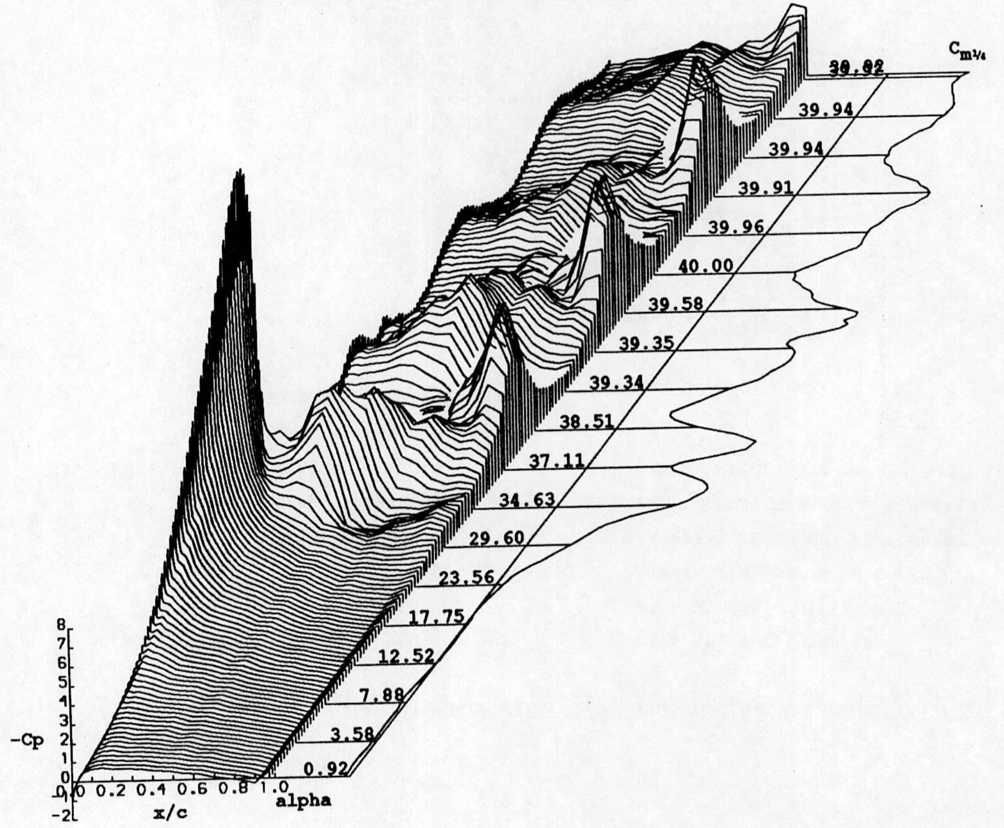


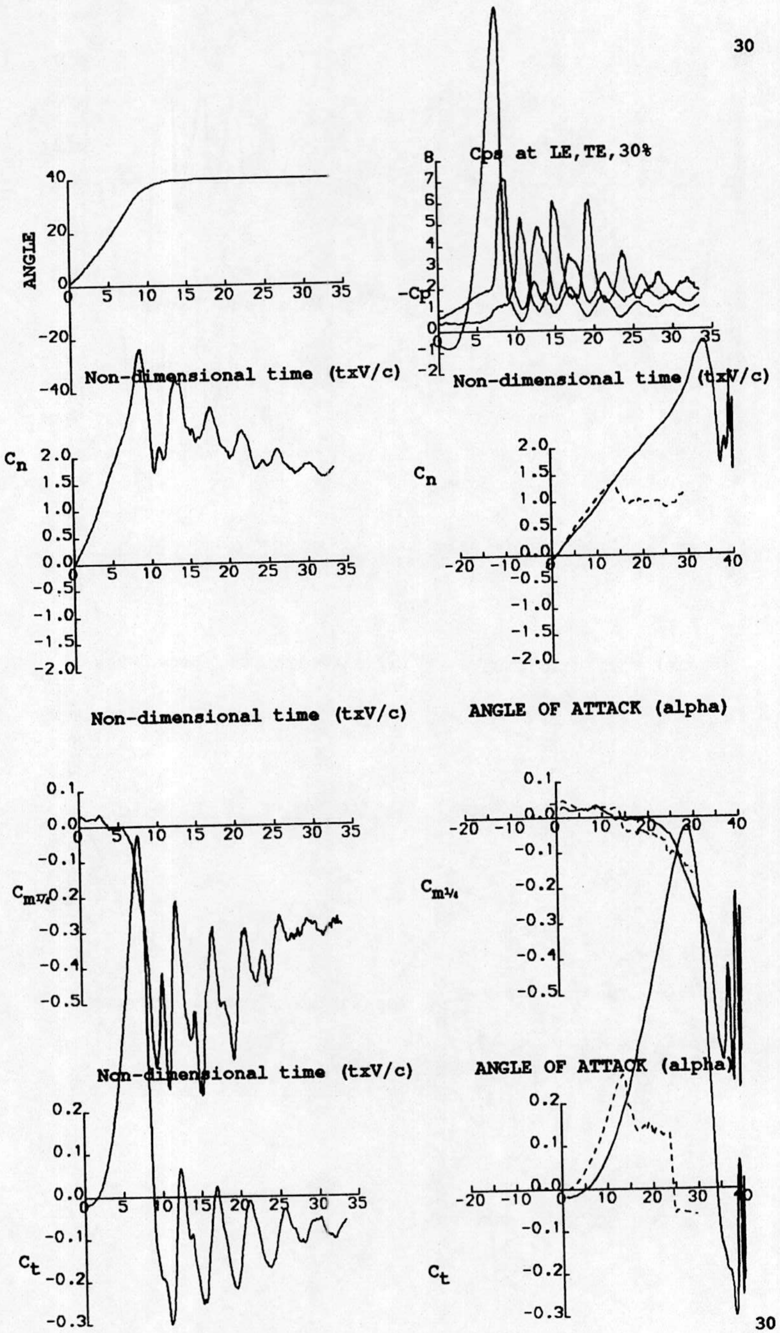


DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 20301
REYNOLDS NUMBER = 806544.
DYNAMIC PRESSURE = 977.58 Nm^{-2}
NUMBER OF CYCLES = 5
MOTION TYPE: RAMP UP
START ANGLE = -1.00°
RAMP ARC = 41.000°
AVERAGED DATA OF 5 CYCLES

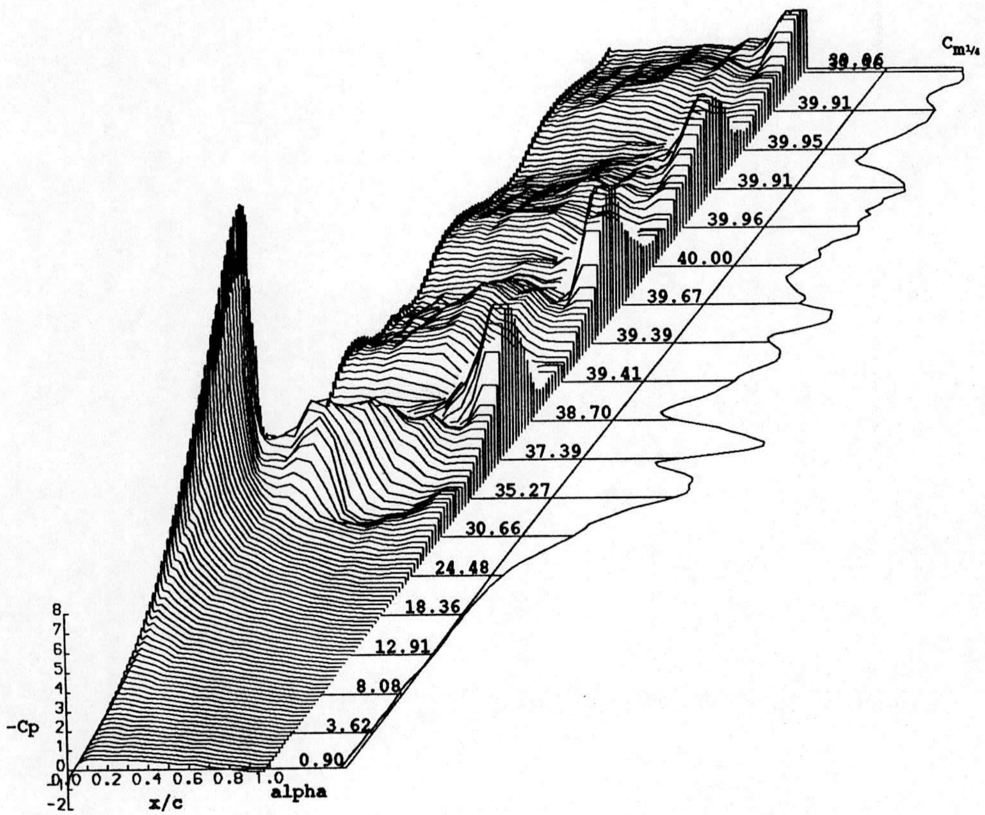
DATE OF TEST: 4/3/86
MACH NUMBER = 0.114
AIR TEMPERATURE = 30.0°C
SAMPLING FREQUENCY = 550.05 Hz.
REDUCED PITCH RATE = 0.01811
LINEAR PITCH RATE = 324.90°S^{-1}

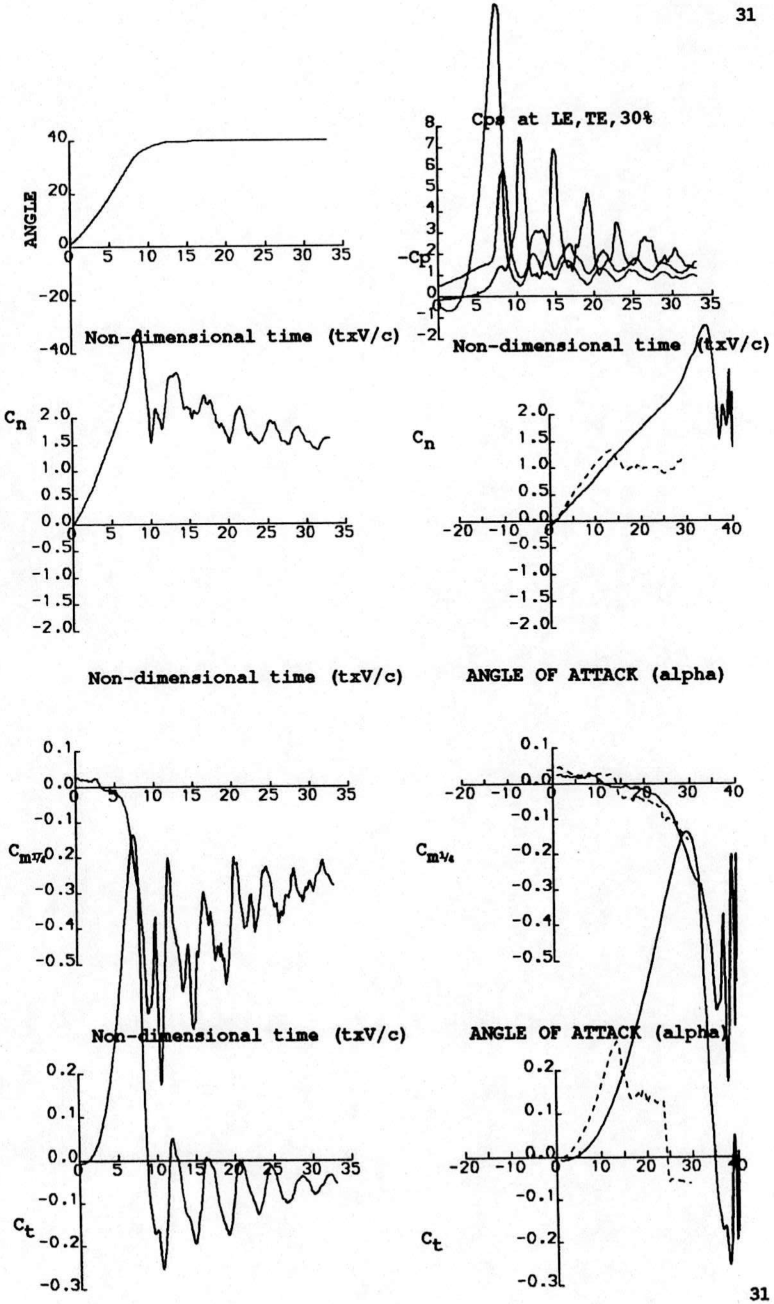




DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 20311	DATE OF TEST: 4/3/86
REYNOLDS NUMBER = 1465533.	MACH NUMBER = 0.113
DYNAMIC PRESSURE = 960.30 Nm^{-2}	AIR TEMPERATURE = 30.0°C
NUMBER OF CYCLES = 5	SAMPLING FREQUENCY = 550.05 Hz.
MOTION TYPE: RAMP UP	REDUCED PITCH RATE = 0.04110
START ANGLE = -1.00°	LINEAR PITCH RATE = 337.21°S^{-1}
RAMP ARC = 41.000°	
AVERAGED DATA OF 5 CYCLES	





G.U. Aero Report 9220

UNIVERSITY OF GLASGOW

DEPARTMENT OF AEROSPACE ENGINEERING

PRESSURE DATA FROM

RAMP DOWN EXPERIMENTS

DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 30321

REYNOLDS NUMBER = 1468062.

DYNAMIC PRESSURE = 944.34 Nm^{-2}

NUMBER OF CYCLES = 5

MOTION TYPE: RAMP DOWN

START ANGLE = 40.00°

RAMP ARC = -41.000°

AVERAGED DATA OF 5 CYCLES

DATE OF TEST: 17/3/86

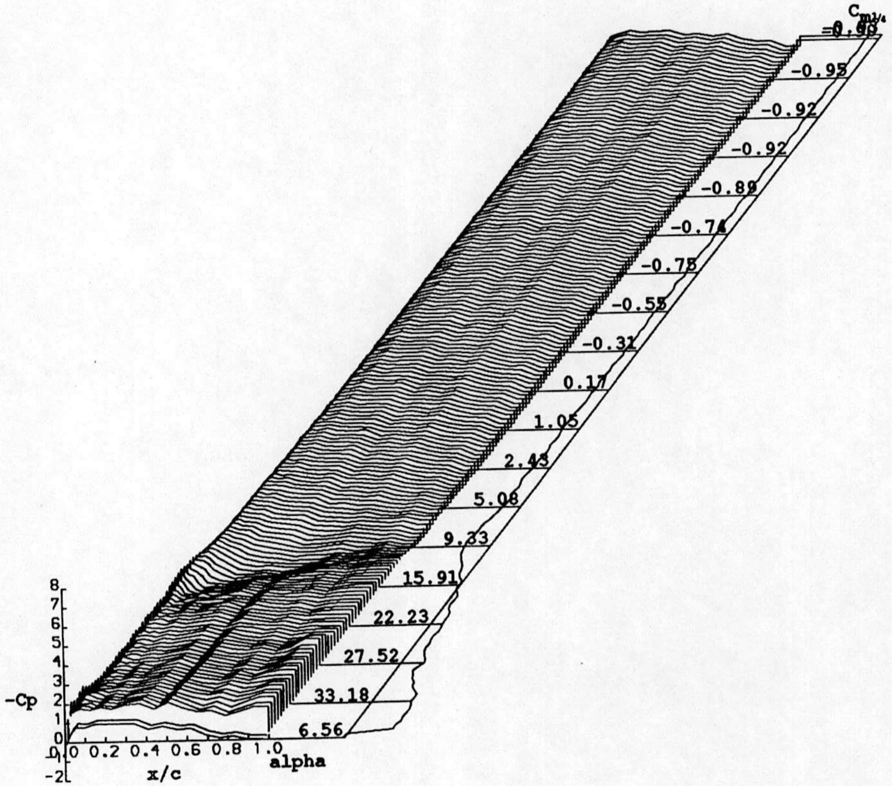
MACH NUMBER = 0.111

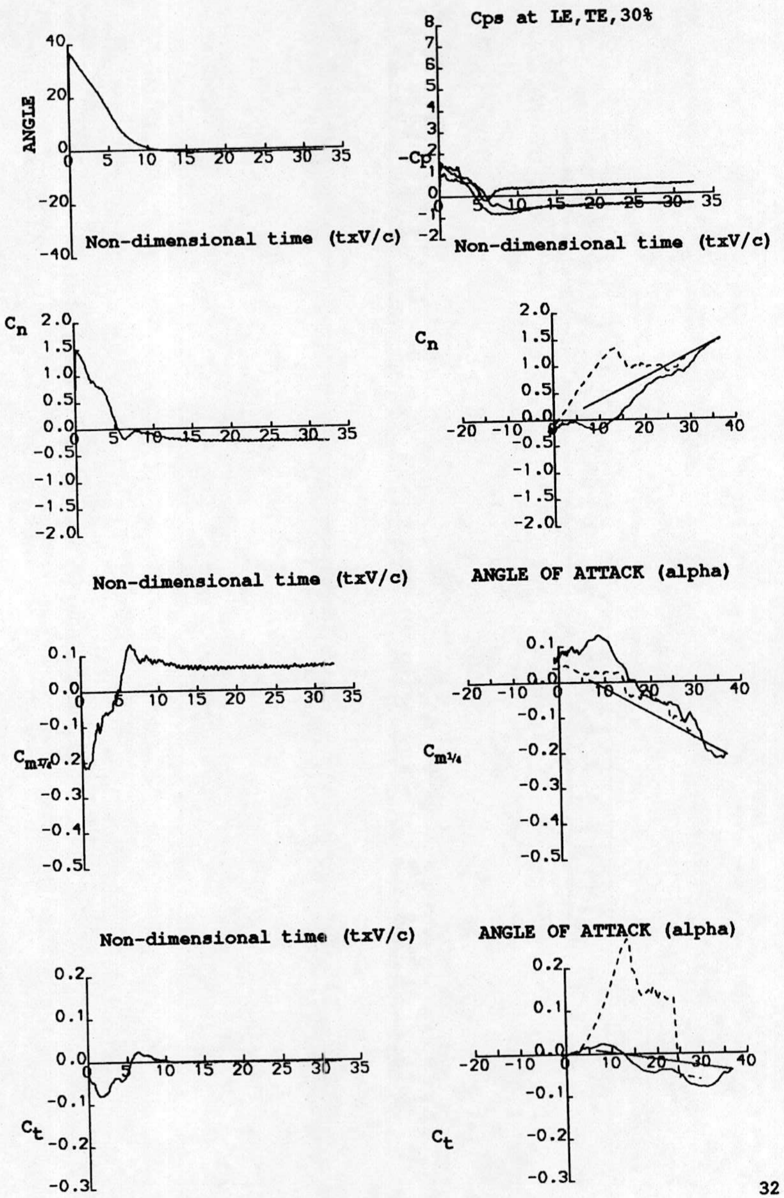
AIR TEMPERATURE = 30.0°C

SAMPLING FREQUENCY = 550.05 Hz.

REDUCED PITCH RATE = -0.04033

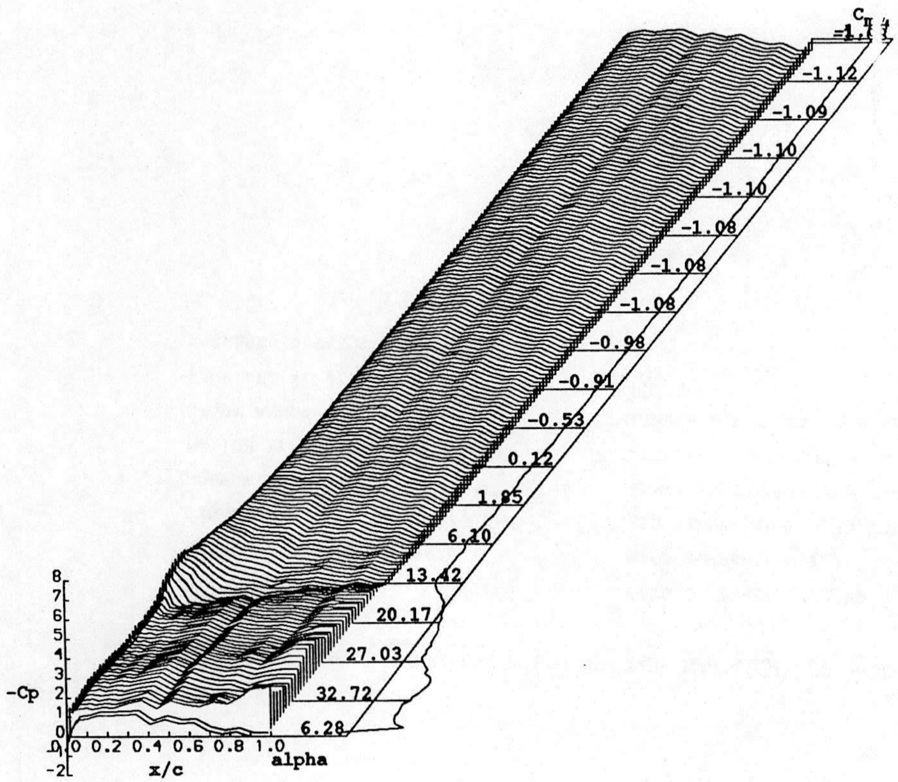
LINEAR PITCH RATE = -325.18°s^{-1}

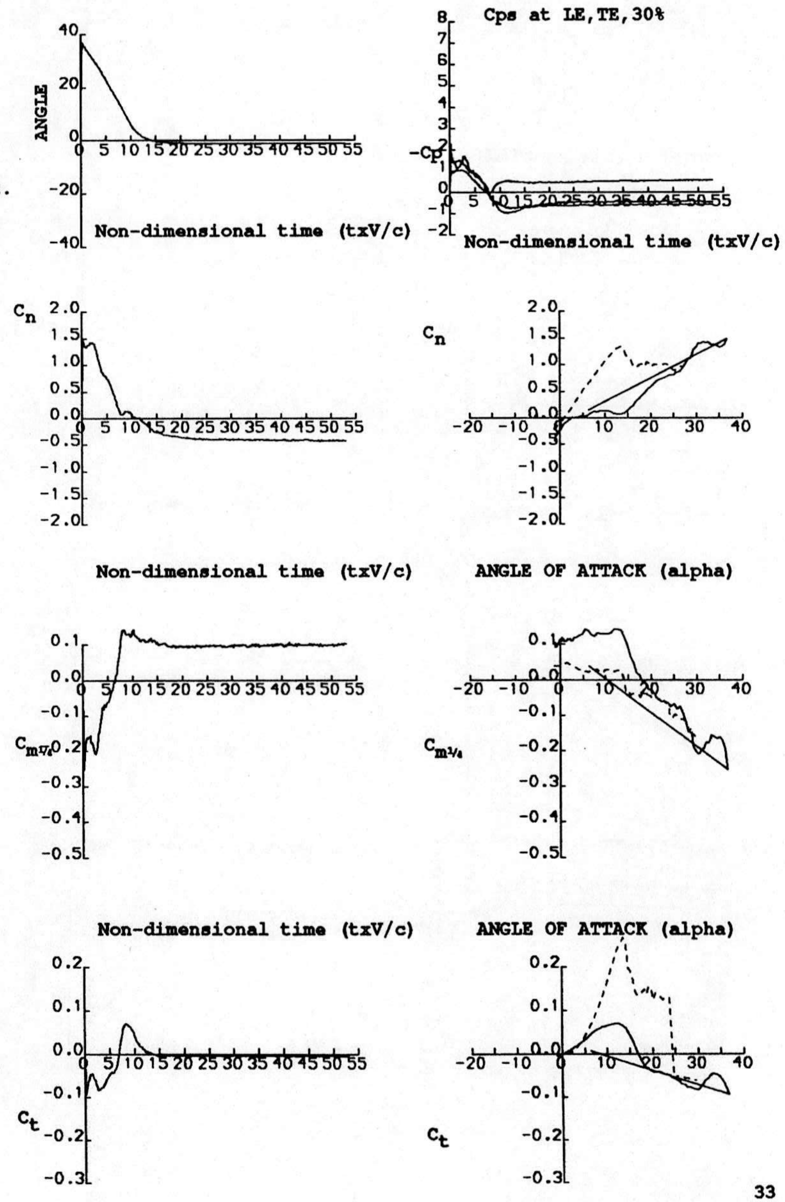




DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 30331	DATE OF TEST: 17/3/86
REYNOLDS NUMBER = 1494932.	MACH NUMBER = 0.113
DYNAMIC PRESSURE = 979.23 Nm^{-2}	AIR TEMPERATURE = 30.0°C
NUMBER OF CYCLES = 5	SAMPLING FREQUENCY = 342.82 Hz.
MOTION TYPE: RAMP DOWN	REDUCED PITCH RATE = -0.02849
START ANGLE = 40.00°	LINEAR PITCH RATE = -233.91°S^{-1}
RAMP ARC = -41.000°	
AVERAGED DATA OF 5 CYCLES	

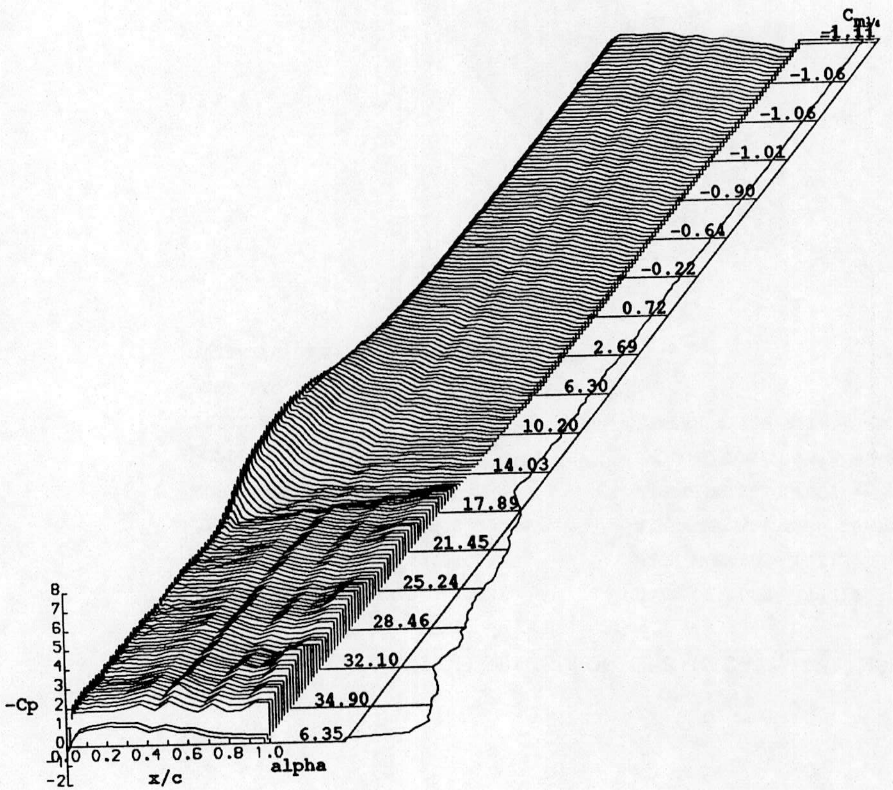


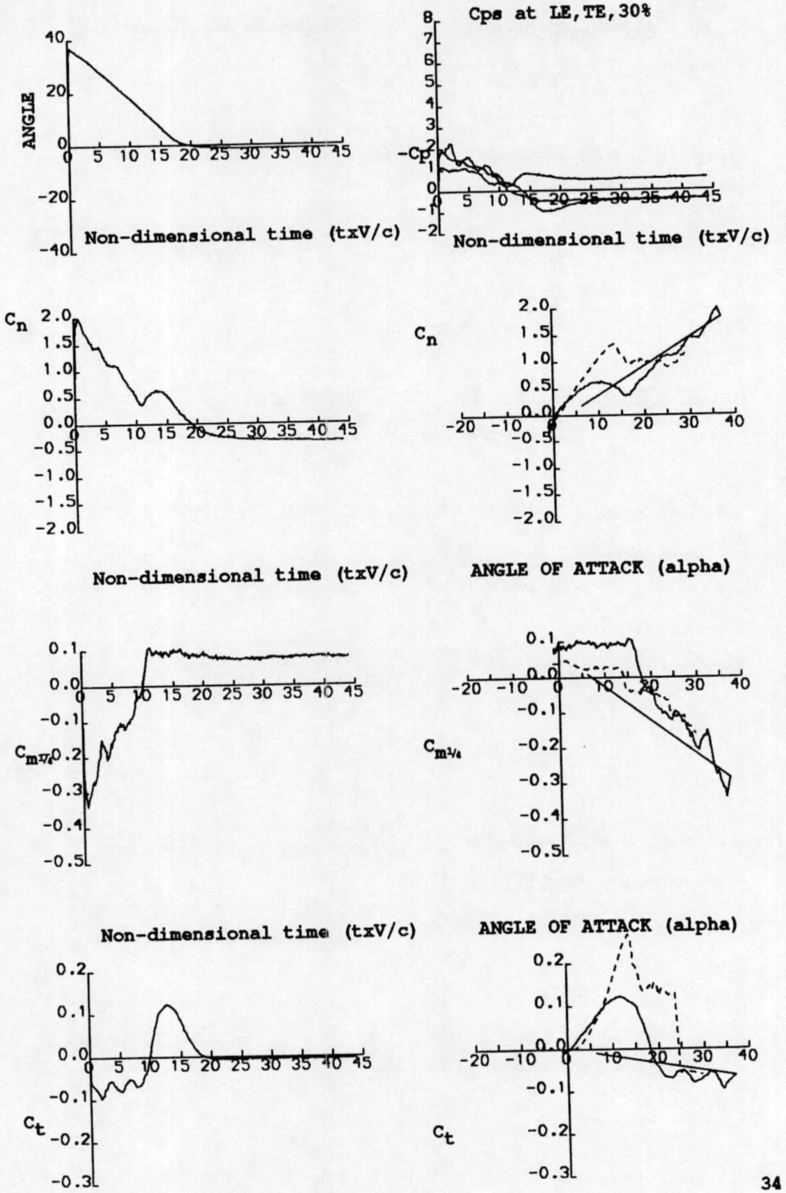


DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 30341
REYNOLDS NUMBER = 1460208.
DYNAMIC PRESSURE = 934.26 Nm^{-2}
NUMBER OF CYCLES = 5
MOTION TYPE: RAMP DOWN
START ANGLE = 40.00°
RAMP ARC = -41.000°
AVERAGED DATA OF 5 CYCLES

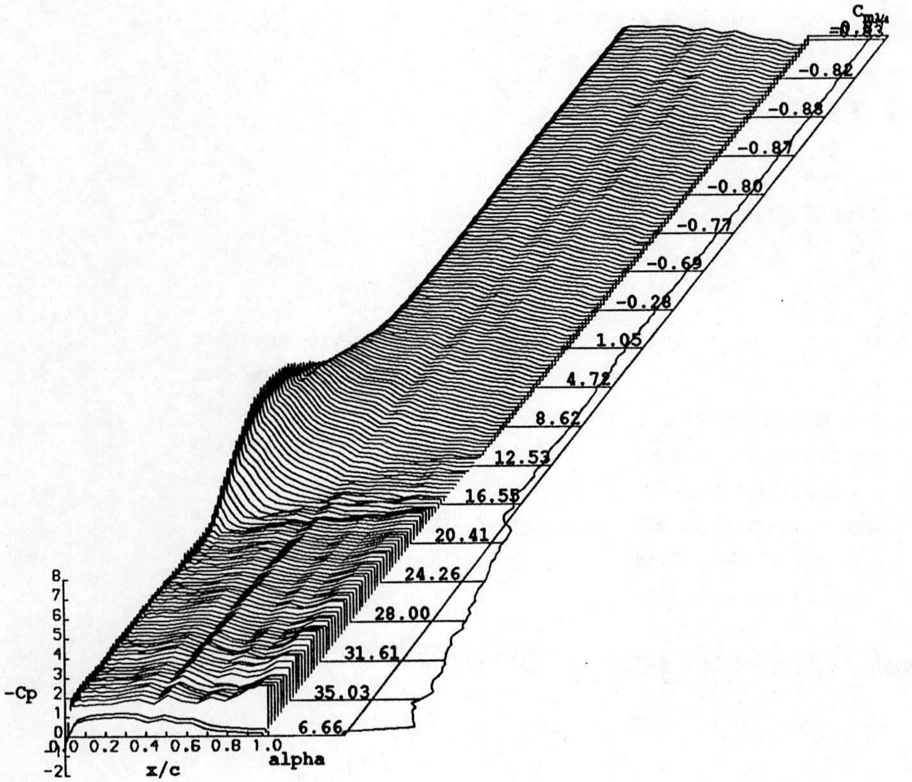
DATE OF TEST: 17/3/86
MACH NUMBER = 0.110
AIR TEMPERATURE = 30.0°C
SAMPLING FREQUENCY = 403.55 Hz.
REDUCED PITCH RATE = -0.01852
LINEAR PITCH RATE = -148.57°S^{-1}

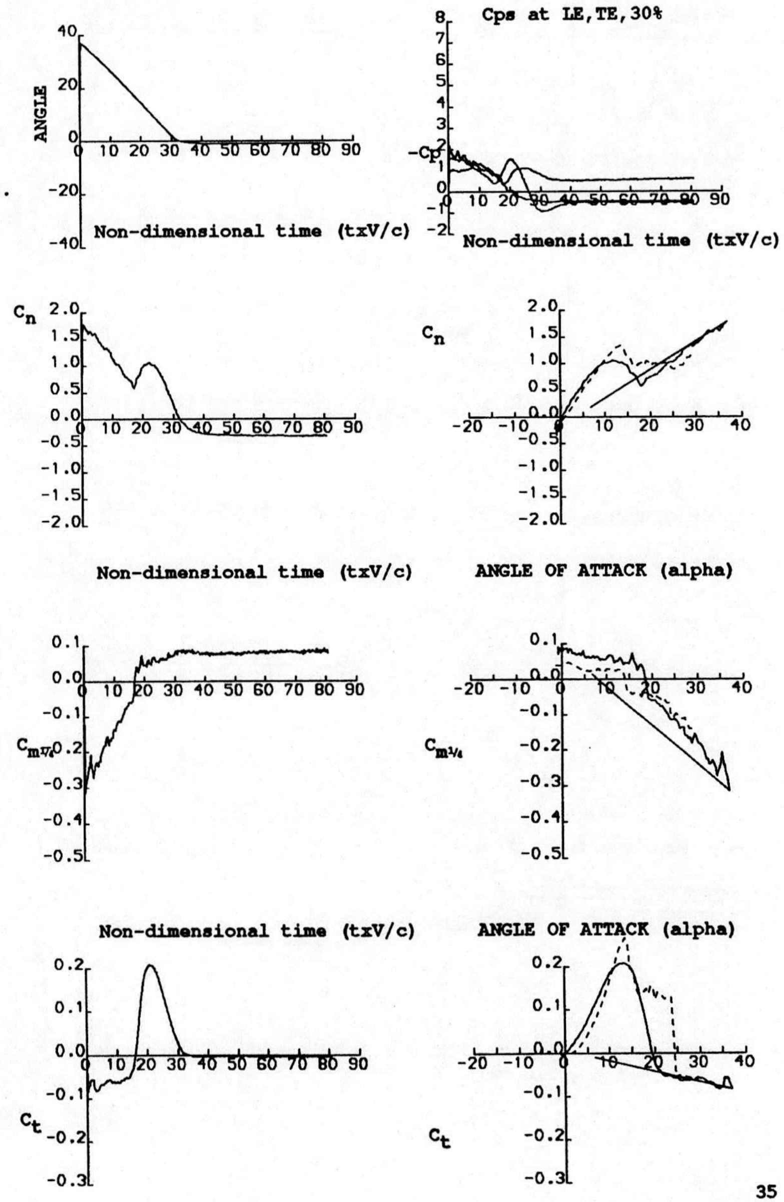




DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 30351	DATE OF TEST: 17/3/86
REYNOLDS NUMBER = 1462540.	MACH NUMBER = 0.110
DYNAMIC PRESSURE = 937.25 Nm^{-2}	AIR TEMPERATURE = 30.0°C
NUMBER OF CYCLES = 5	SAMPLING FREQUENCY = 220.12 Hz.
MOTION TYPE: RAMP DOWN	REDUCED PITCH RATE = -0.01047
START ANGLE = 40.00°	LINEAR PITCH RATE = $-84.13°S^{-1}$
RAMP ARC = -41.000°	
AVERAGED DATA OF 5 CYCLES	

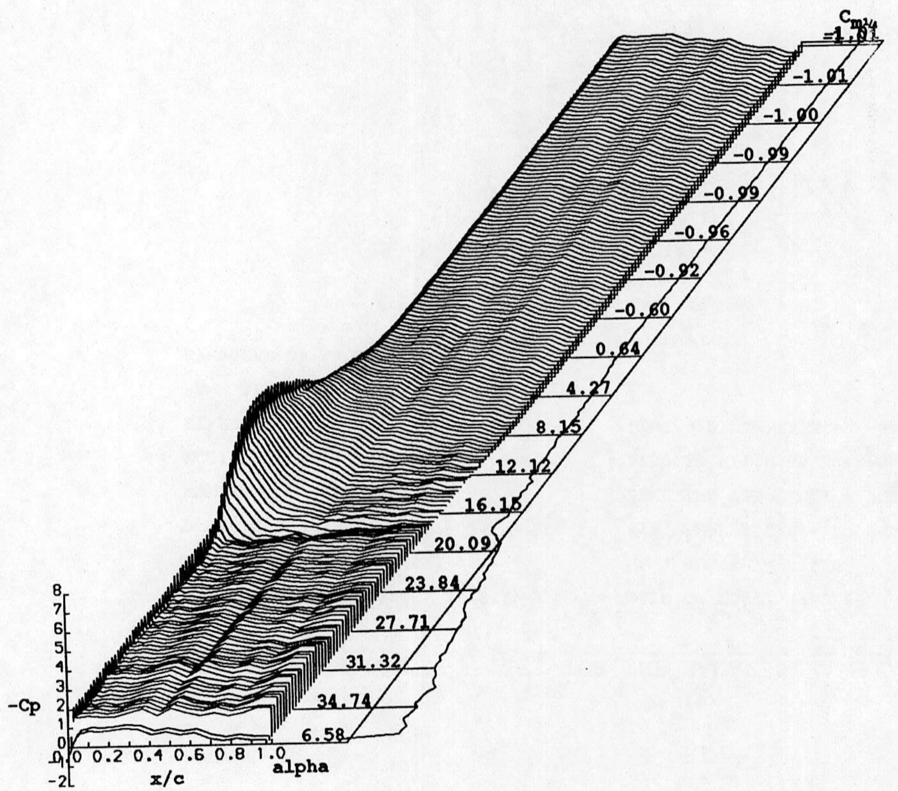


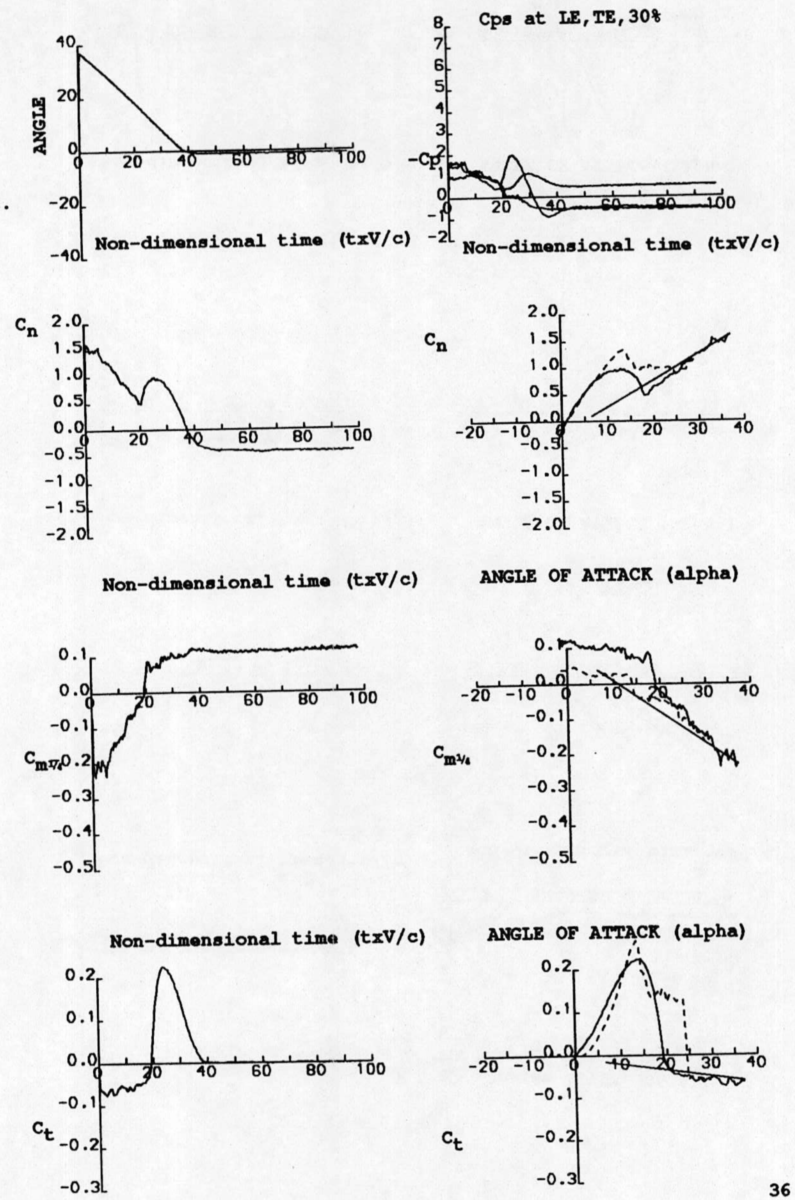


DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 30361
REYNOLDS NUMBER = 1476688.
DYNAMIC PRESSURE = 955.47 Nm^{-2}
NUMBER OF CYCLES = 5
MOTION TYPE: RAMP DOWN
START ANGLE = 40.00°
RAMP ARC = -41.000°
AVERAGED DATA OF 5 CYCLES

DATE OF TEST: 17/3/86
MACH NUMBER = 0.111
AIR TEMPERATURE = 30.0°C
SAMPLING FREQUENCY = 183.35 Hz.
REDUCED PITCH RATE = -0.00877
LINEAR PITCH RATE = -71.15°S^{-1}





DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 30371

REYNOLDS NUMBER = 1458732.

DYNAMIC PRESSURE = 932.38 Nm^{-2}

NUMBER OF CYCLES = 5

MOTION TYPE: RAMP DOWN

START ANGLE = 40.00°

RAMP ARC = -41.000°

AVERAGED DATA OF 5 CYCLES

DATE OF TEST: 17/3/86

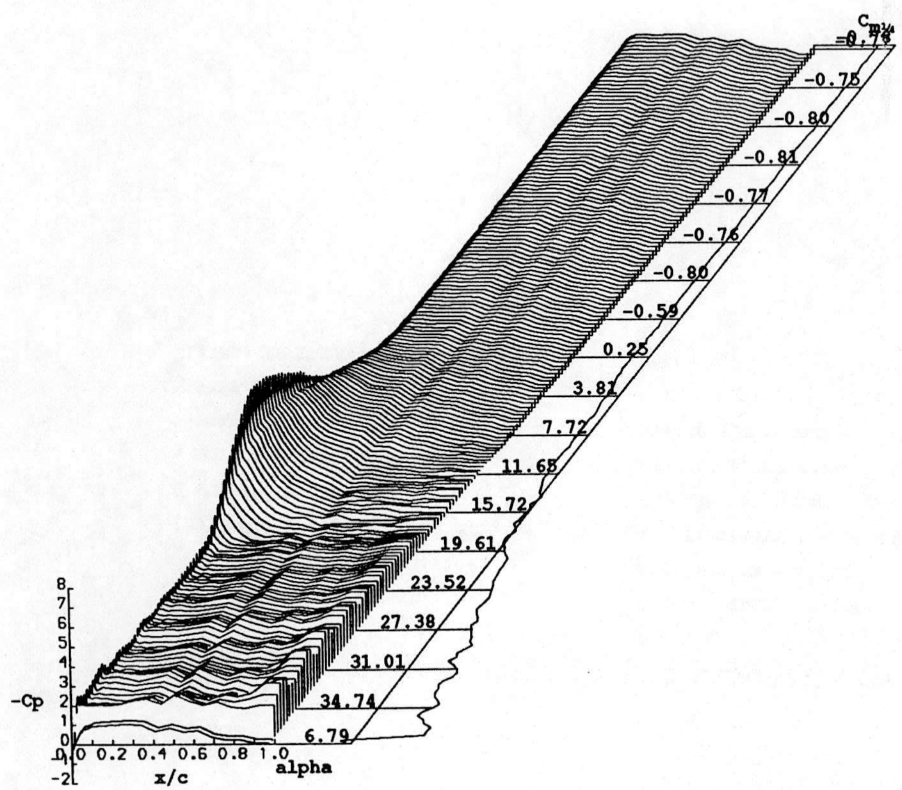
MACH NUMBER = 0.110

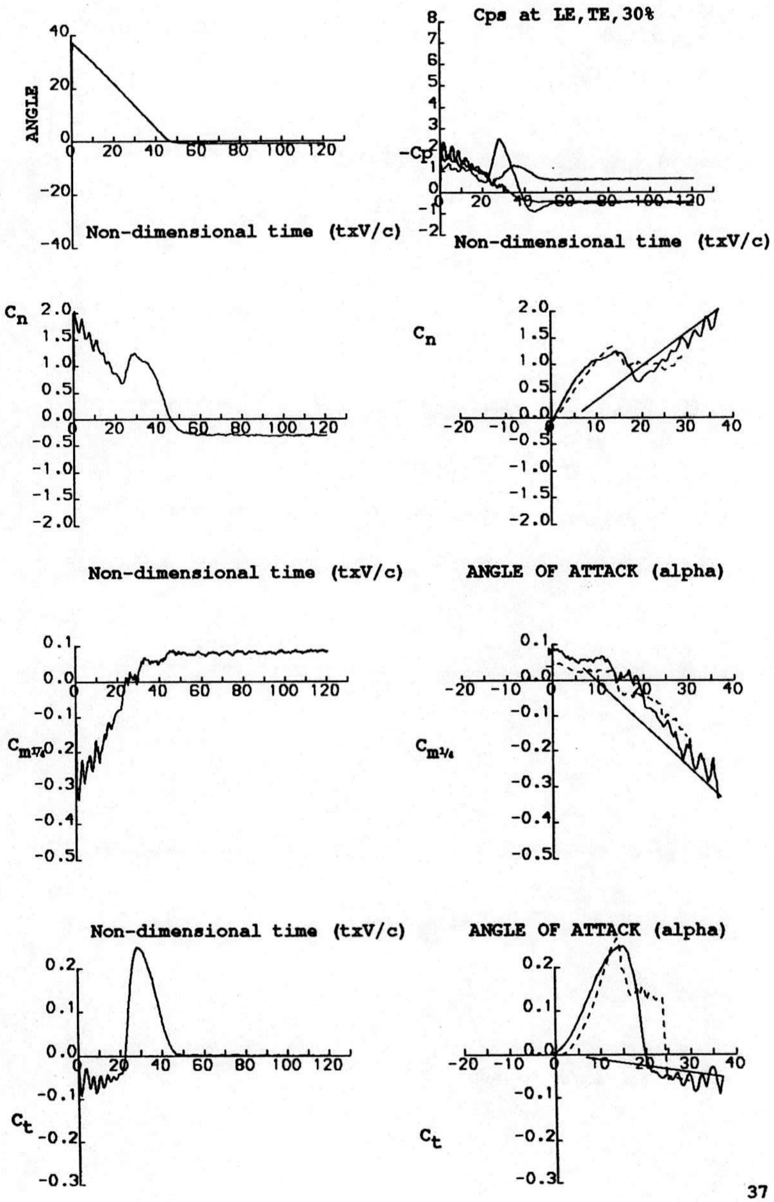
AIR TEMPERATURE = 30.0°C

SAMPLING FREQUENCY = 146.76 Hz.

REDUCED PITCH RATE = -0.00719

LINEAR PITCH RATE = $-57.57°S^{-1}$

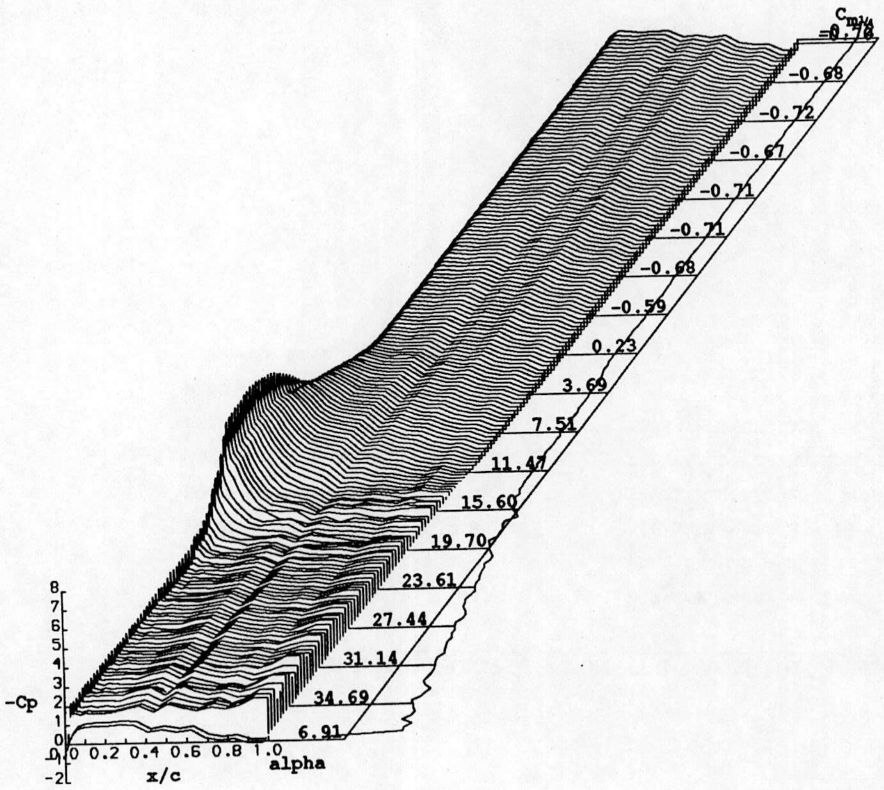


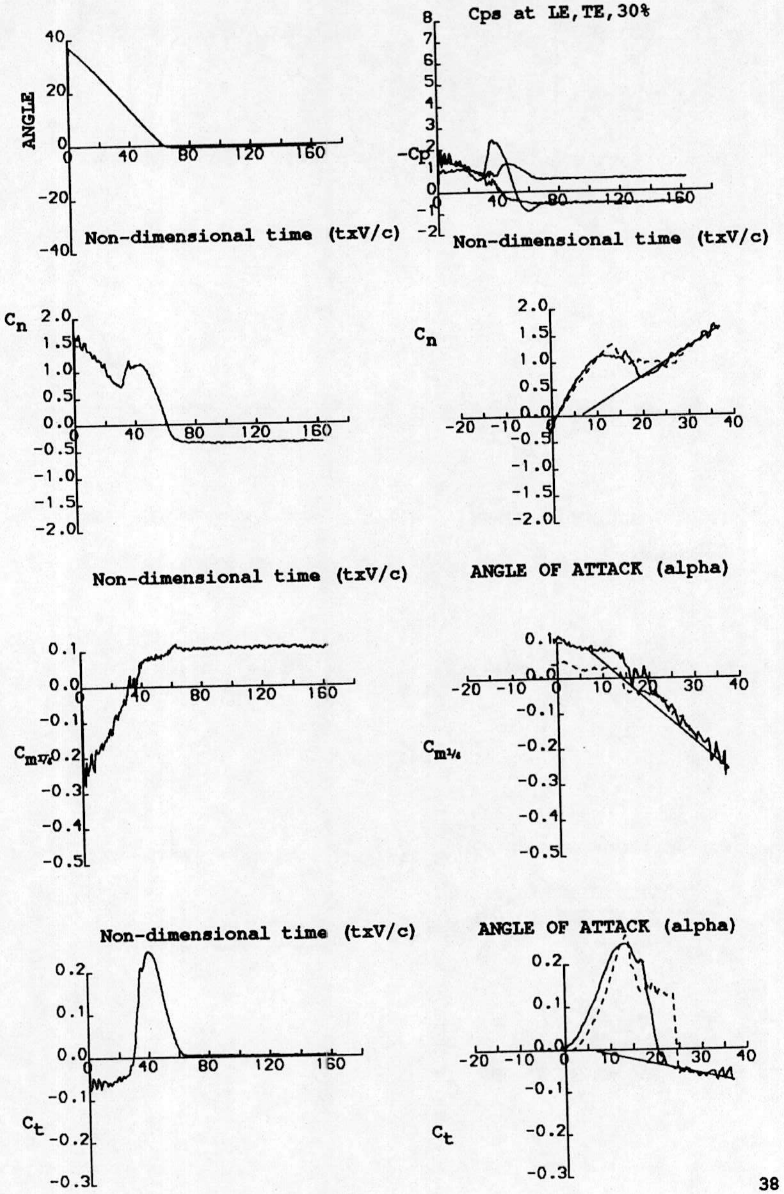


DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 30381
REYNOLDS NUMBER = 1476706.
DYNAMIC PRESSURE = 955.50 Nm^{-2}
NUMBER OF CYCLES = 5
MOTION TYPE: RAMP DOWN
START ANGLE = 40.00°
RAMP ARC = -41.000°
AVERAGED DATA OF 5 CYCLES

DATE OF TEST: 17/3/86
MACH NUMBER = 0.111
AIR TEMPERATURE = 30.0°C
SAMPLING FREQUENCY = 110.05 Hz.
REDUCED PITCH RATE = -0.00536
LINEAR PITCH RATE = -43.47°S^{-1}





DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 30392

REYNOLDS NUMBER = 1465442.

DYNAMIC PRESSURE = 940.97 Nm^{-2}

NUMBER OF CYCLES = 5

MOTION TYPE: RAMP DOWN

START ANGLE = 40.00°

RAMP ARC = -41.000°

AVERAGED DATA OF 5 CYCLES

DATE OF TEST: 17/3/86

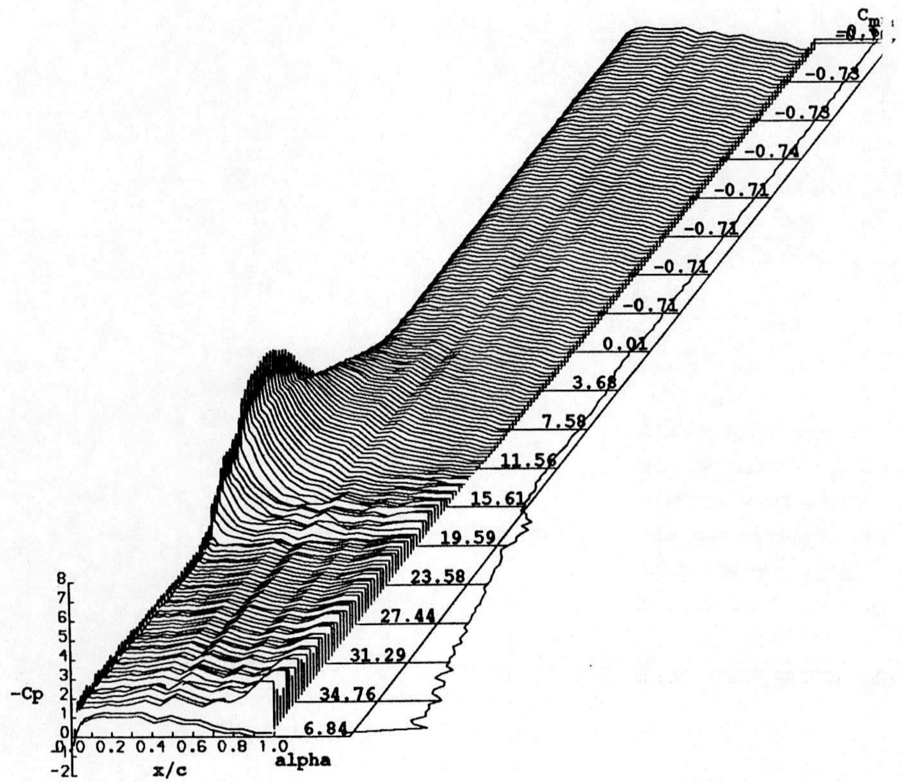
MACH NUMBER = 0.110

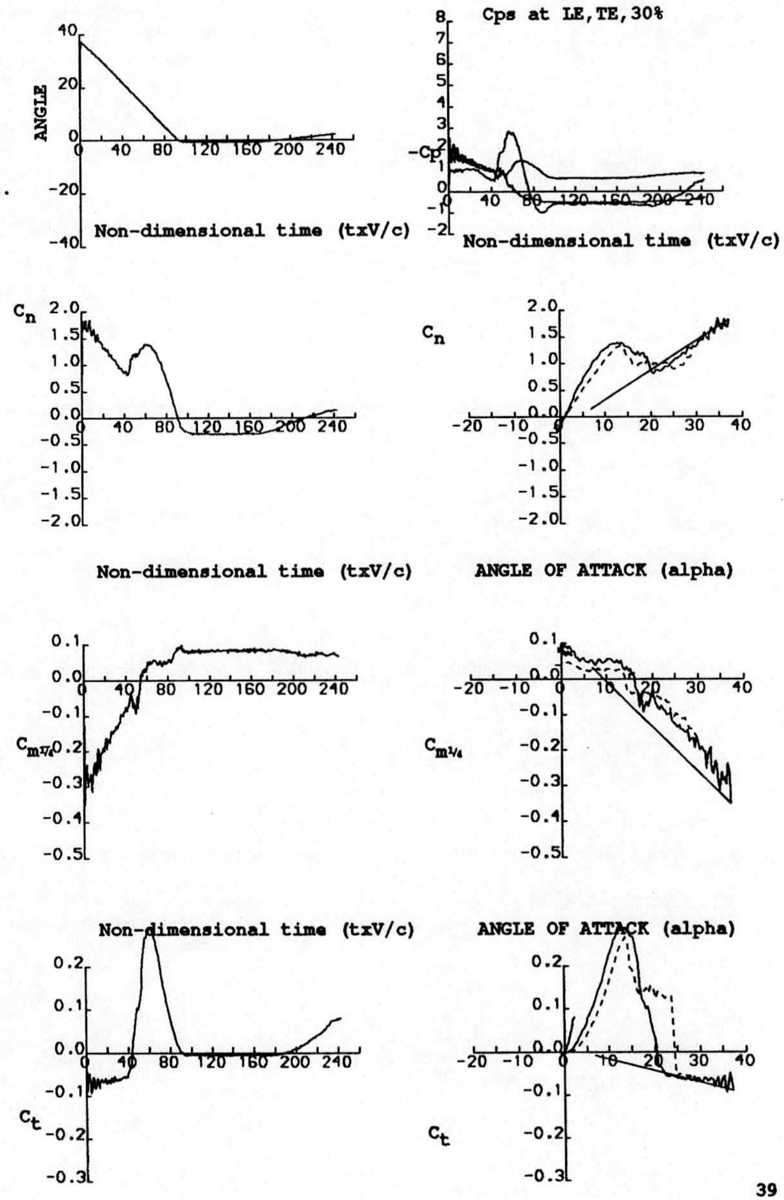
AIR TEMPERATURE = 30.0°C

SAMPLING FREQUENCY = 73.38 Hz.

REDUCED PITCH RATE = -0.00362

LINEAR PITCH RATE = $-29.10°S^{-1}$





DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 30402

REYNOLDS NUMBER = 1465846.

DYNAMIC PRESSURE = 941.49 Nm^{-2}

NUMBER OF CYCLES = 5

MOTION TYPE: RAMP DOWN

START ANGLE = 40.00°

RAMP ARC = -41.000°

AVERAGED DATA OF 5 CYCLES

DATE OF TEST: 17/3/86

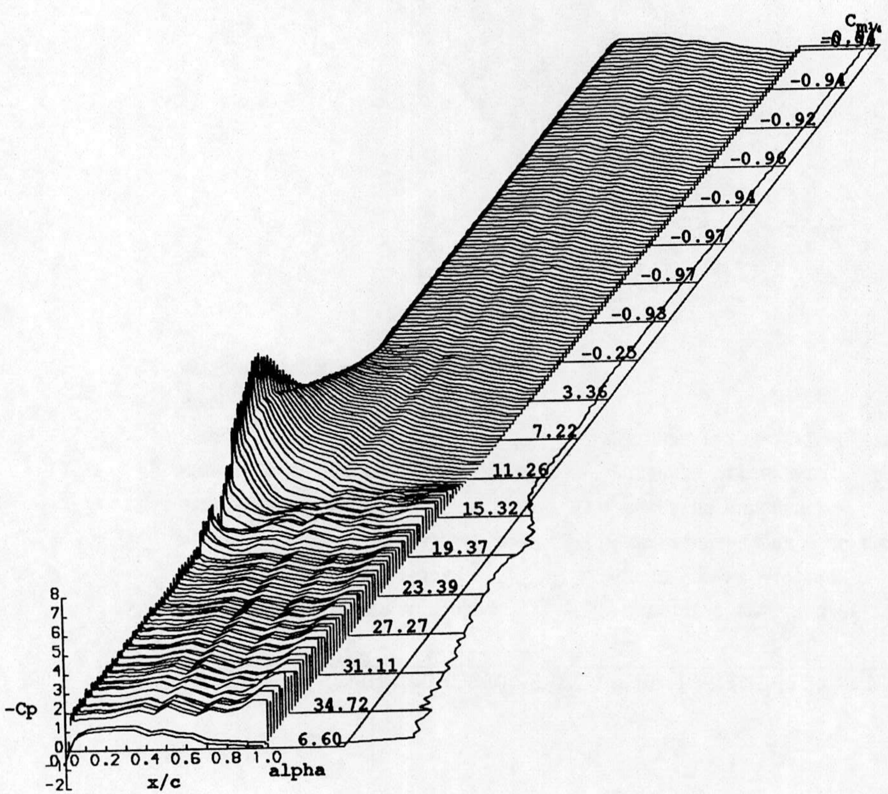
MACH NUMBER = 0.110

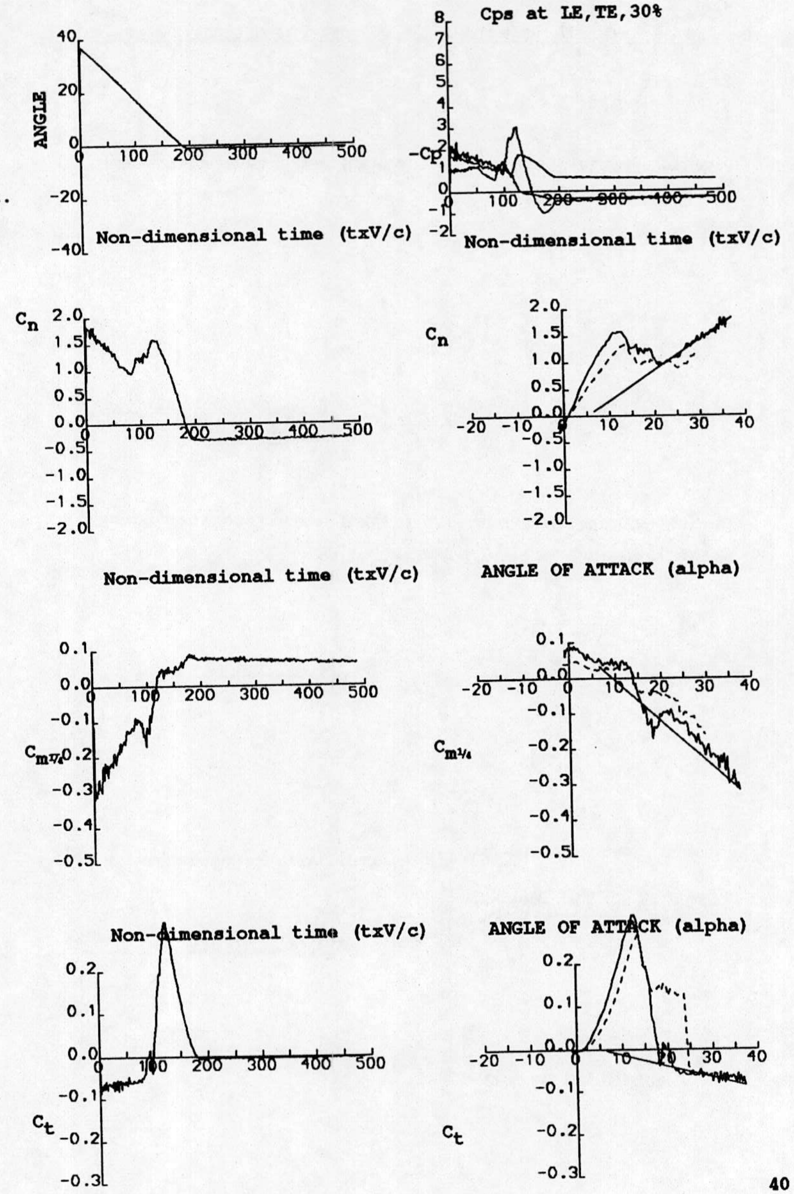
AIR TEMPERATURE = 30.0°C

SAMPLING FREQUENCY = 36.67 Hz.

REDUCED PITCH RATE = -0.00181

LINEAR PITCH RATE = $-14.61°S^{-1}$

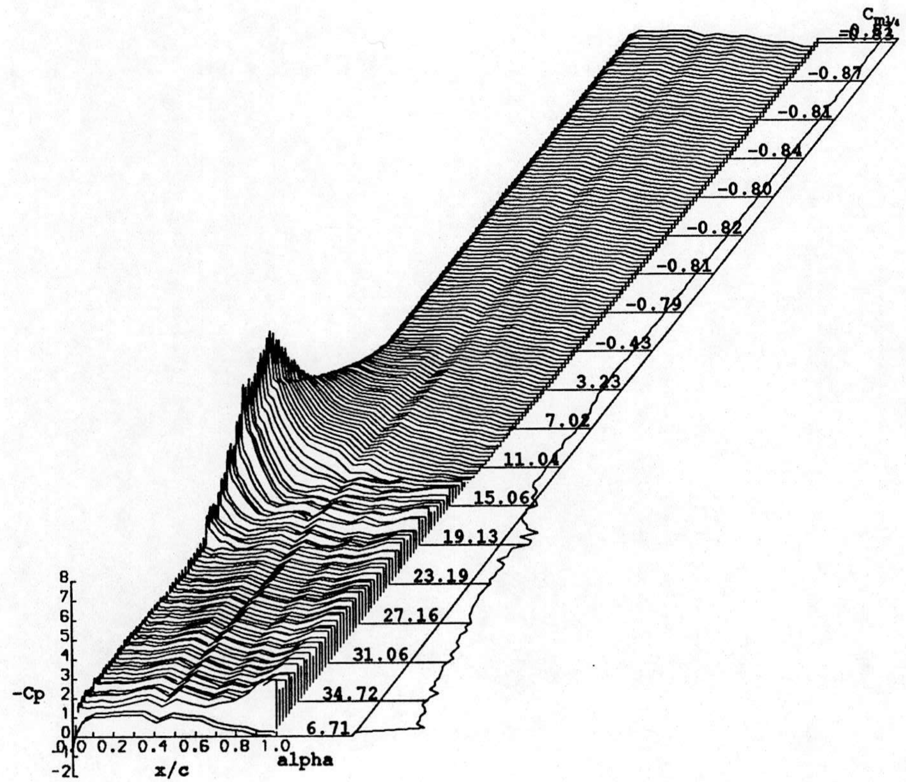


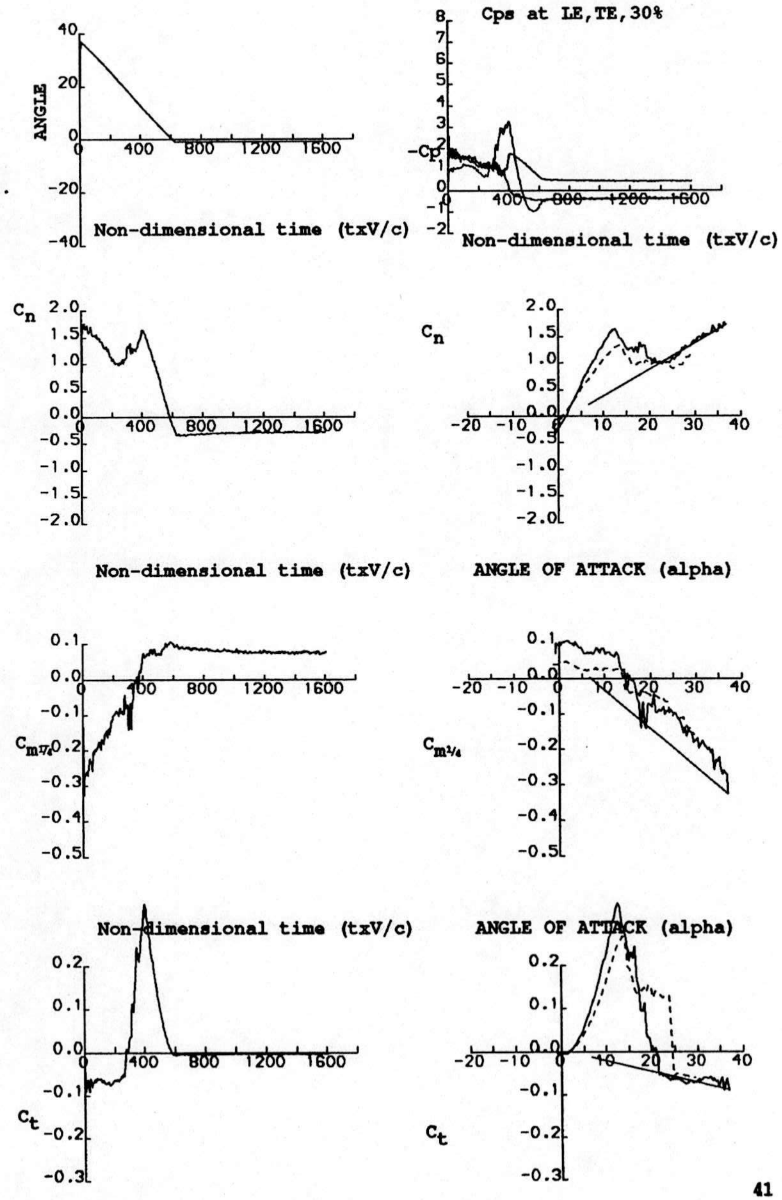


DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 30411
REYNOLDS NUMBER = 1454636.
DYNAMIC PRESSURE = 927.15 Nm^{-2}
NUMBER OF CYCLES = 5
MOTION TYPE: RAMP DOWN
START ANGLE = 40.00°
RAMP ARC = -41.000°
AVERAGED DATA OF 5 CYCLES

DATE OF TEST: 17/3/86
MACH NUMBER = 0.110
AIR TEMPERATURE = 30.0°C
SAMPLING FREQUENCY = 11.01 Hz.
REDUCED PITCH RATE = -0.00056
LINEAR PITCH RATE = $-4.48°S^{-1}$





G.U. Aero Report 9220

UNIVERSITY OF GLASGOW

DEPARTMENT OF AEROSPACE ENGINEERING

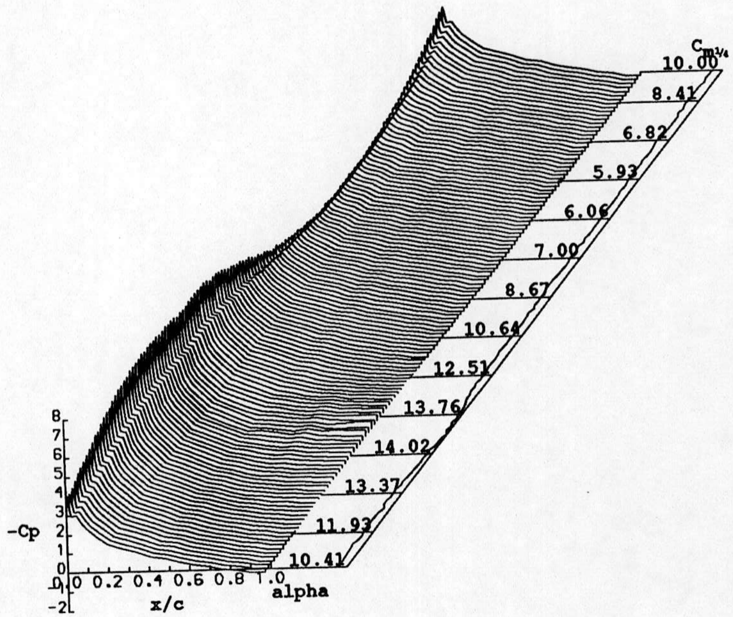
PRESSURE DATA FROM

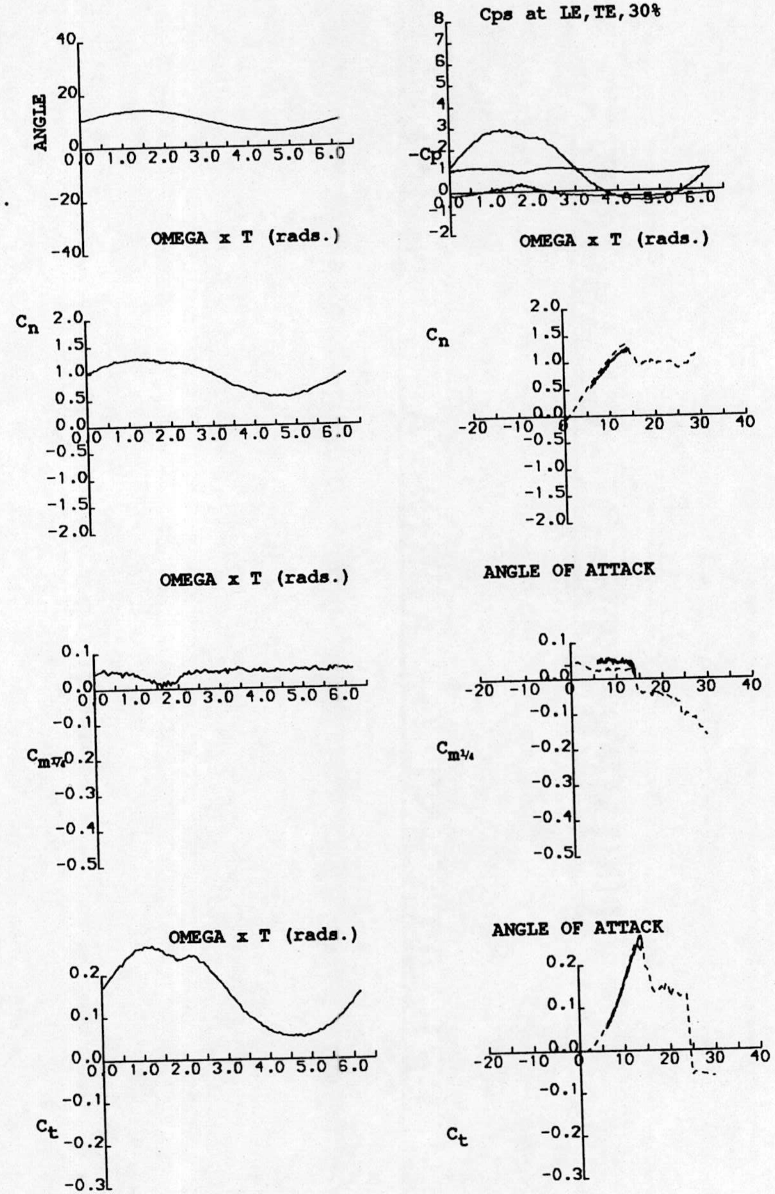
SINUSOIDAL EXPERIMENTS

DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10011
REYNOLDS NUMBER = 1417244.
DYNAMIC PRESSURE = 891.99 Nm^{-2}
NUMBER OF CYCLES = 10
MOTION TYPE: SINUSOIDAL
MEAN ANGLE = 10.00°
OSCILLATION FREQUENCY = 0.233 Hz.
AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 4/3/86
MACH NUMBER = 0.108
AIR TEMPERATURE = 30.0°C
SAMPLING FREQUENCY = 29.82 Hz.
REDUCED FREQUENCY = 0.011
AMPLITUDE = 4.00°





DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10021

REYNOLDS NUMBER = 1483306.

DYNAMIC PRESSURE = 977.08 Nm^{-2}

NUMBER OF CYCLES = 10

MOTION TYPE: SINUSOIDAL

MEAN ANGLE = 10.00°

OSCILLATION FREQUENCY = 0.582 Hz.

AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 4/3/86

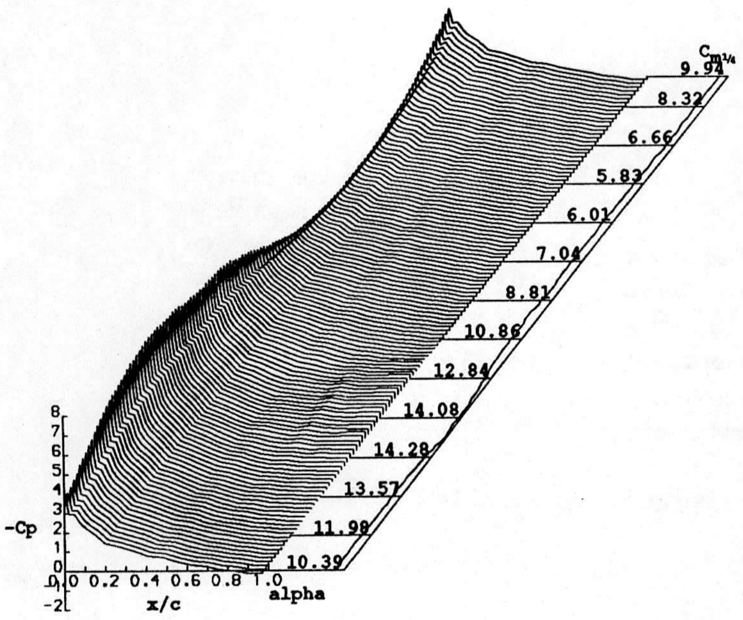
MACH NUMBER = 0.113

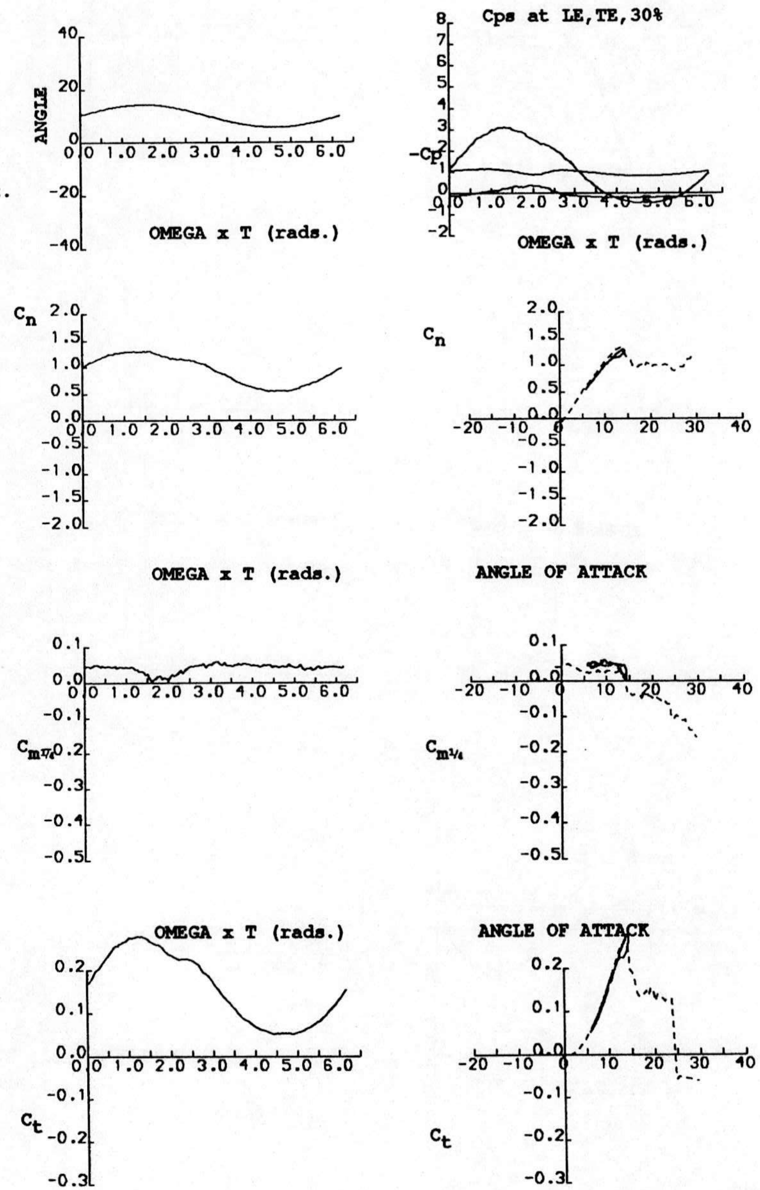
AIR TEMPERATURE = 30.0°C

SAMPLING FREQUENCY = 74.49 Hz.

REDUCED FREQUENCY = 0.025

AMPLITUDE = 4.00°





DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10031

REYNOLDS NUMBER = 1475940.

DYNAMIC PRESSURE = 967.40 Nm^{-2}

NUMBER OF CYCLES = 10

MOTION TYPE: SINUSOIDAL

MEAN ANGLE = 10.00°

OSCILLATION FREQUENCY = 1.165 Hz.

AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 4/3/86

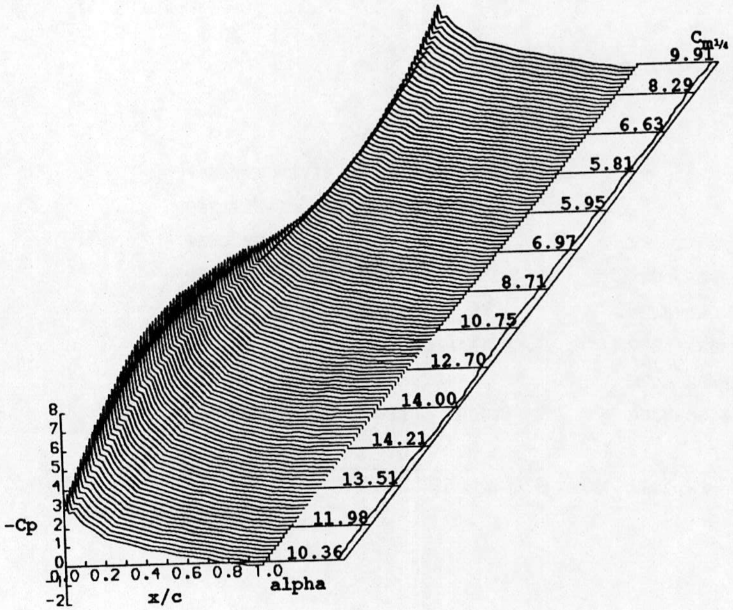
MACH NUMBER = 0.113

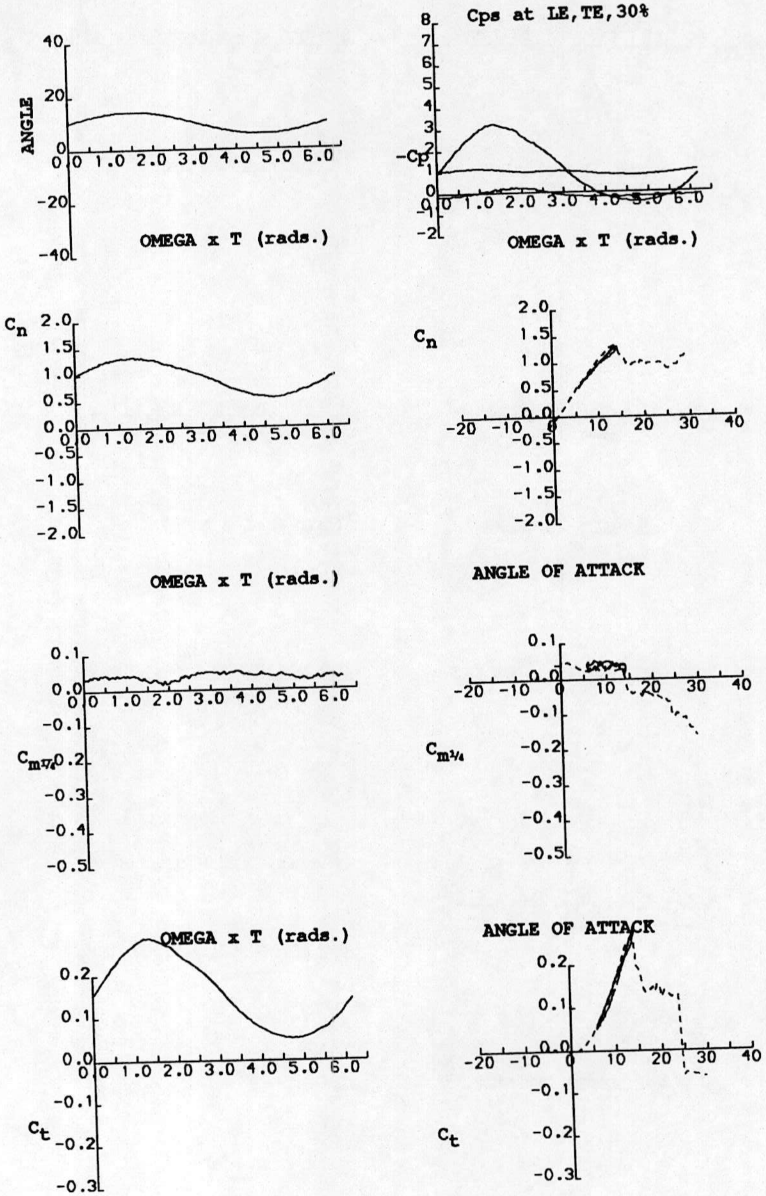
AIR TEMPERATURE = 30.0°C

SAMPLING FREQUENCY = 149.12 Hz.

REDUCED FREQUENCY = 0.051

AMPLITUDE = 4.00°





DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10041

REYNOLDS NUMBER = 1444607.

DYNAMIC PRESSURE = 902.38 Nm^{-2}

NUMBER OF CYCLES = 10

MOTION TYPE: SINUSOIDAL

MEAN ANGLE = 10.00°

OSCILLATION FREQUENCY = 1.747 Hz.

AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 7/3/86

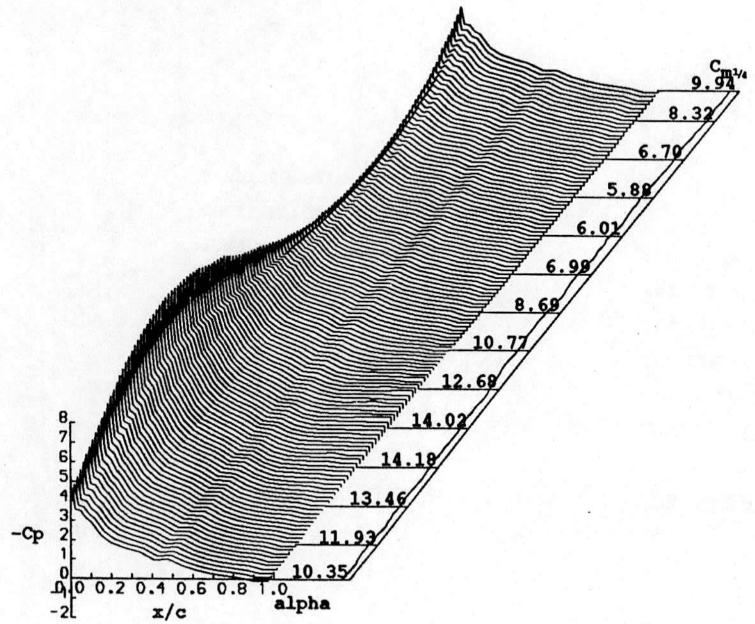
MACH NUMBER = 0.107

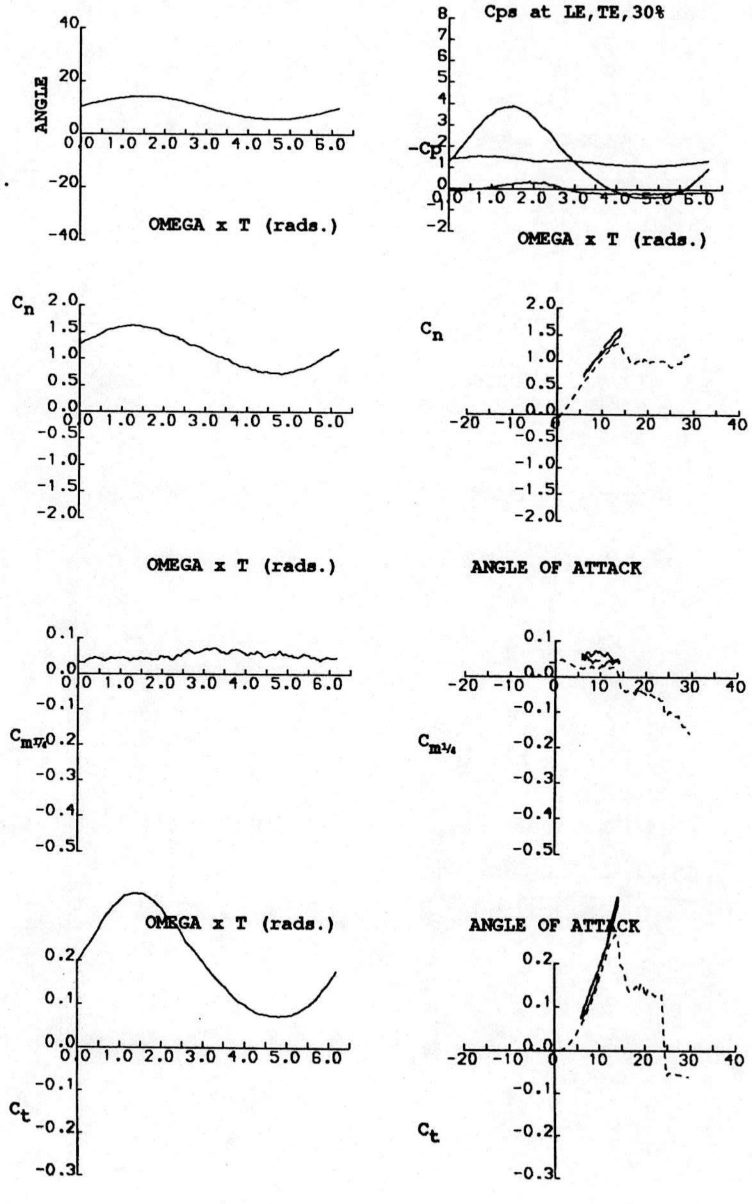
AIR TEMPERATURE = 30.0°C

SAMPLING FREQUENCY = 223.61 Hz.

REDUCED FREQUENCY = 0.080

AMPLITUDE = 4.00°





DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10051

REYNOLDS NUMBER = 1492787.

DYNAMIC PRESSURE = 963.57 Nm^{-2}

NUMBER OF CYCLES = 10

MOTION TYPE: SINUSOIDAL

MEAN ANGLE = 10.00°

OSCILLATION FREQUENCY = 2.330 Hz.

AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 7/3/86

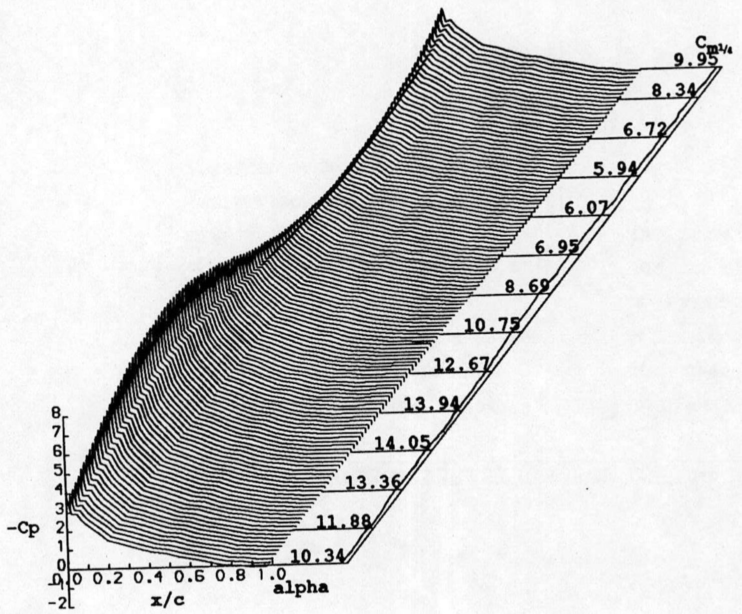
MACH NUMBER = 0.111

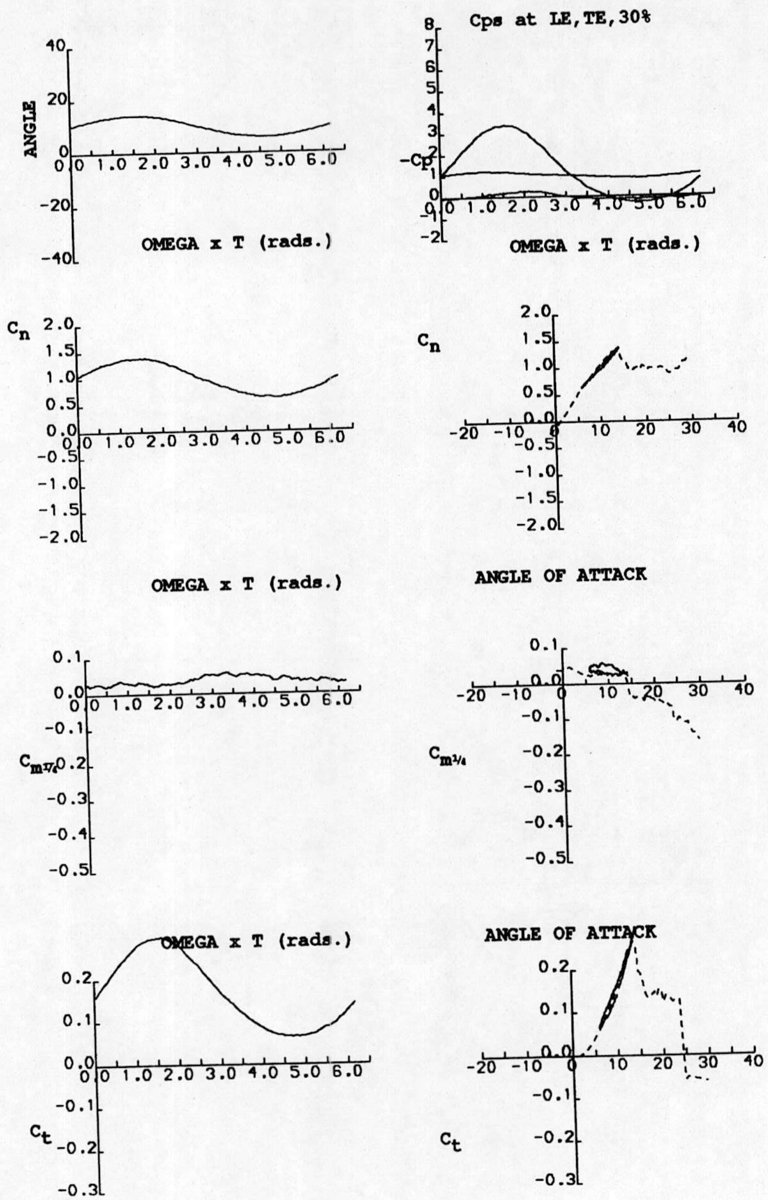
AIR TEMPERATURE = 30.0°C

SAMPLING FREQUENCY = 298.24 Hz.

REDUCED FREQUENCY = 0.104

AMPLITUDE = 4.00°





DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10061

REYNOLDS NUMBER = 1507435.

DYNAMIC PRESSURE = 982.57 Nm^{-2}

NUMBER OF CYCLES = 10

MOTION TYPE: SINUSOIDAL

MEAN ANGLE = 10.00°

OSCILLATION FREQUENCY = 2.912 Hz.

AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 7/3/86

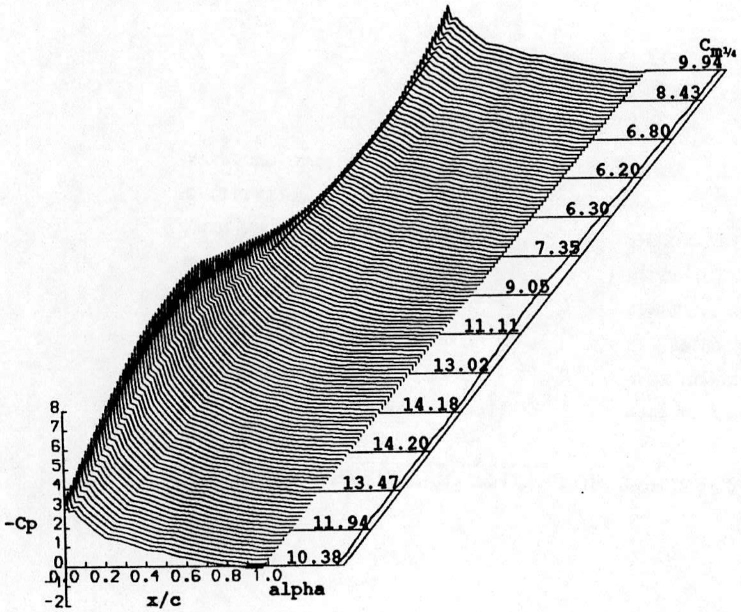
MACH NUMBER = 0.112

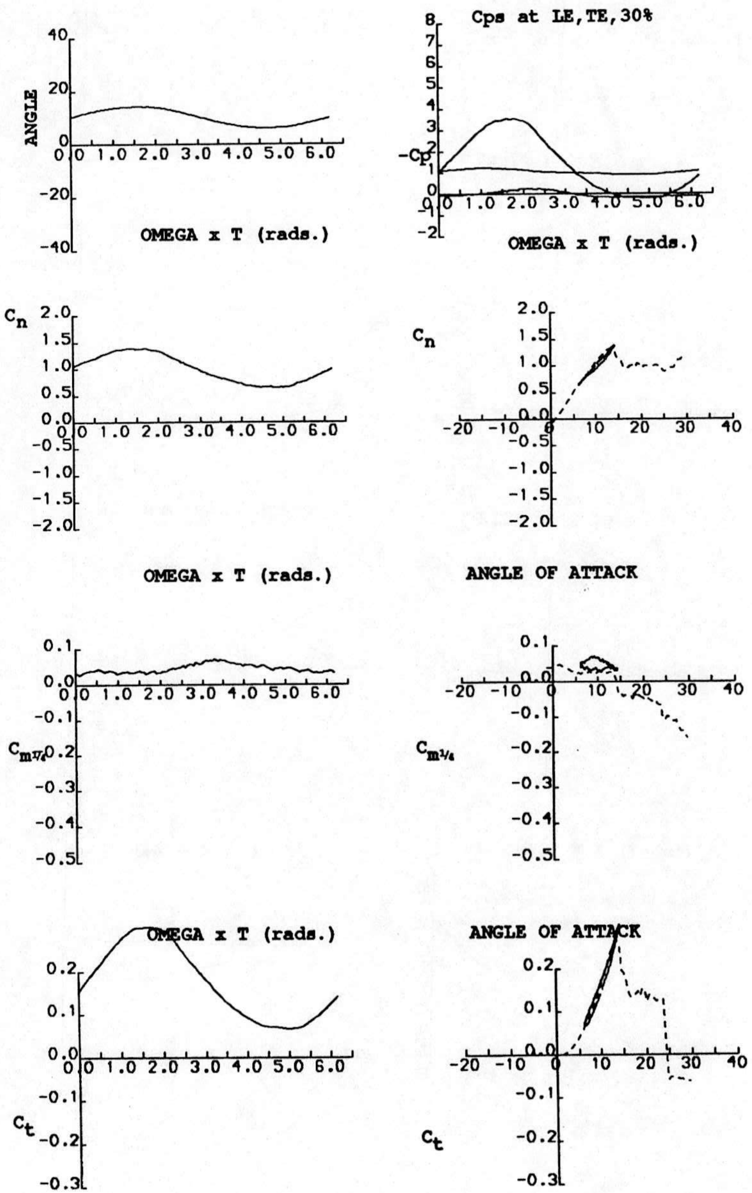
AIR TEMPERATURE = 30.0°C

SAMPLING FREQUENCY = 372.72 Hz.

REDUCED FREQUENCY = 0.128

AMPLITUDE = 4.00°





DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10071

REYNOLDS NUMBER = 1497109.

DYNAMIC PRESSURE = 969.16 Nm^{-2}

NUMBER OF CYCLES = 10

MOTION TYPE: SINUSOIDAL

MEAN ANGLE = 10.00°

OSCILLATION FREQUENCY = 3.496 Hz.

AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 7/3/86

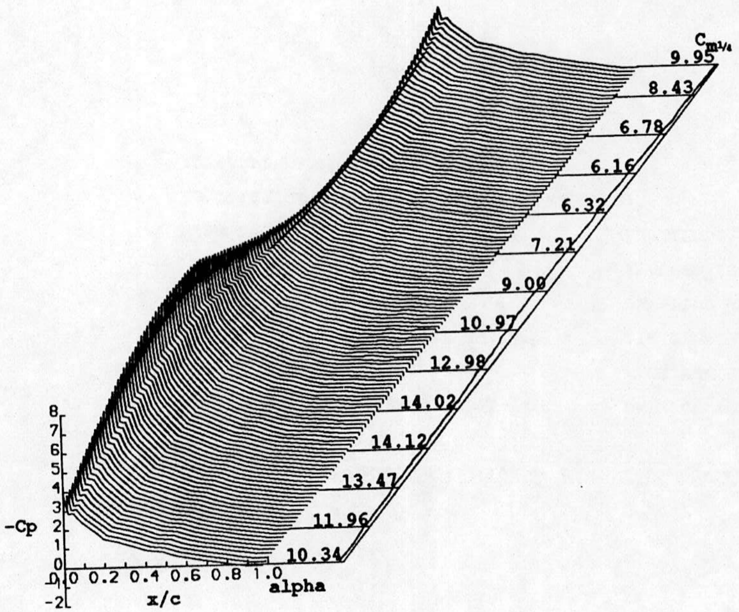
MACH NUMBER = 0.111

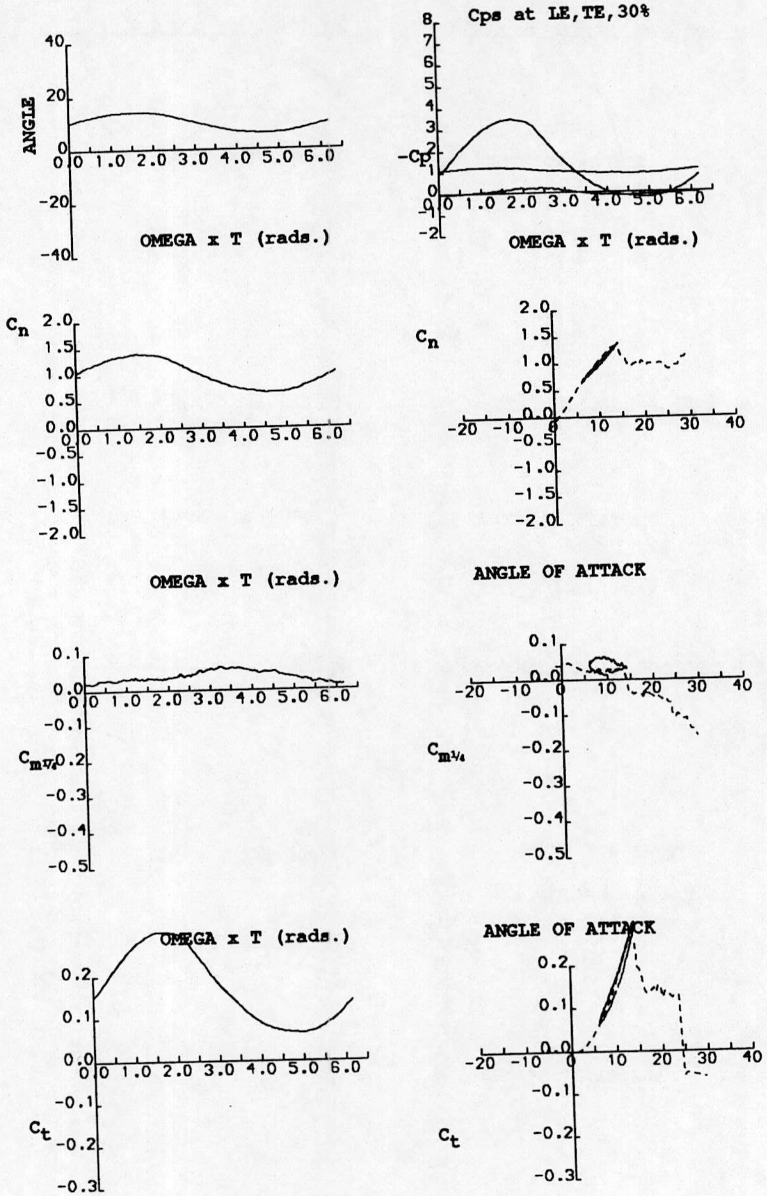
AIR TEMPERATURE = 30.0°C

SAMPLING FREQUENCY = 447.43 Hz.

REDUCED FREQUENCY = 0.155

AMPLITUDE = 4.00°





DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10081

REYNOLDS NUMBER = 1508602.

DYNAMIC PRESSURE = 984.10 Nm^{-2}

NUMBER OF CYCLES = 10

MOTION TYPE: SINUSOIDAL

MEAN ANGLE = 10.00°

OSCILLATION FREQUENCY = 4.078 Hz.

AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 7/3/86

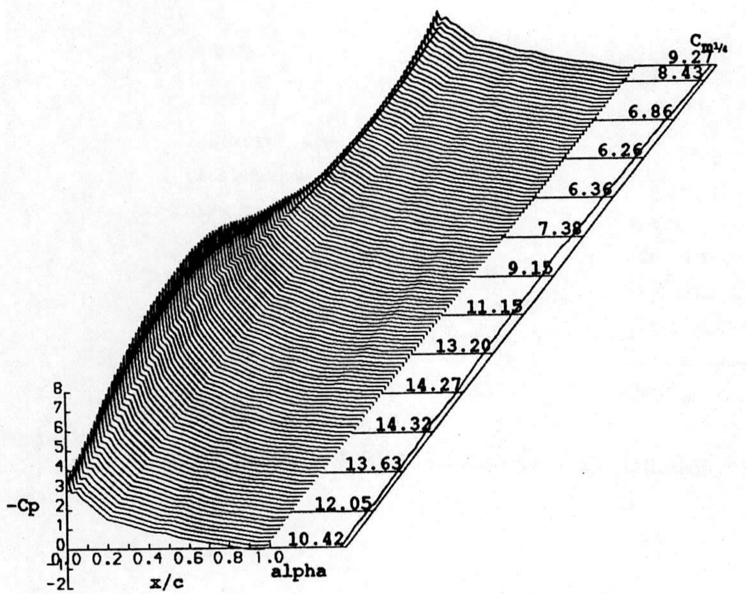
MACH NUMBER = 0.112

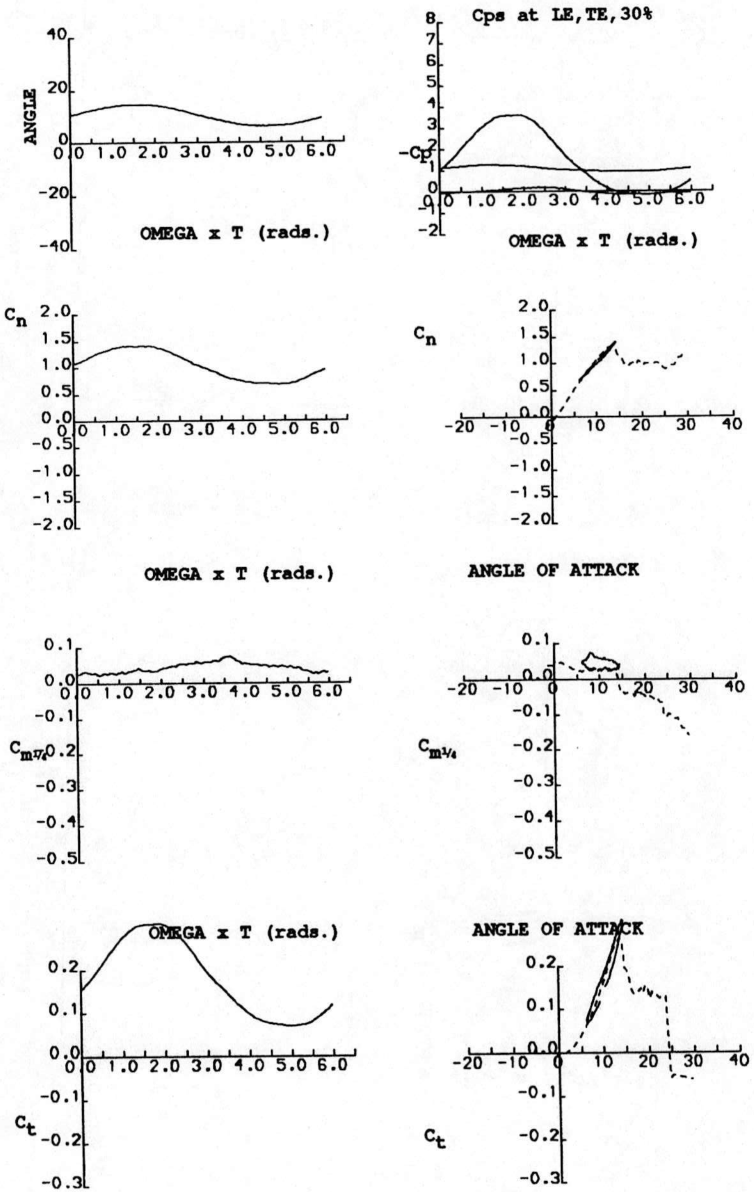
AIR TEMPERATURE = 30.0°C

SAMPLING FREQUENCY = 521.92 Hz.

REDUCED FREQUENCY = 0.180

AMPLITUDE = 4.00°





DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10111

REYNOLDS NUMBER = 1487999.

DYNAMIC PRESSURE = 957.40 Nm^{-2}

NUMBER OF CYCLES = 10

MOTION TYPE: SINUSOIDAL

MEAN ANGLE = 10.00°

OSCILLATION FREQUENCY = 0.582 Hz.

AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 7/3/86

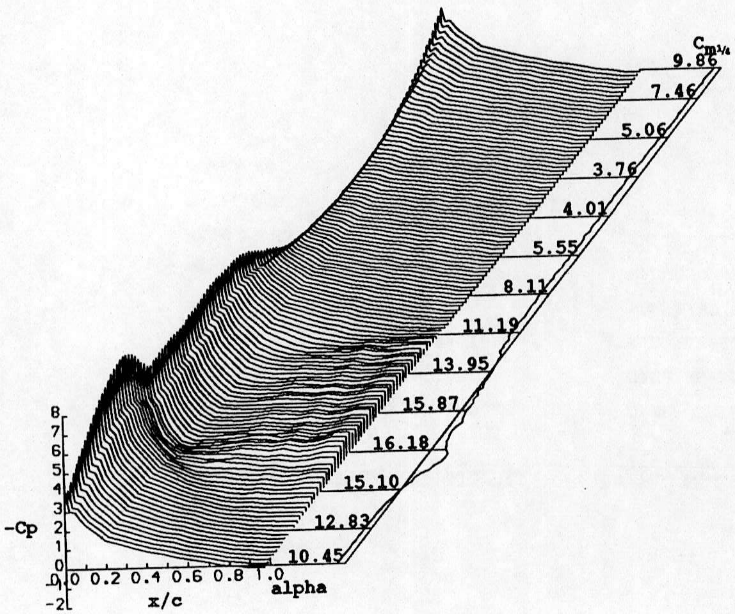
MACH NUMBER = 0.111

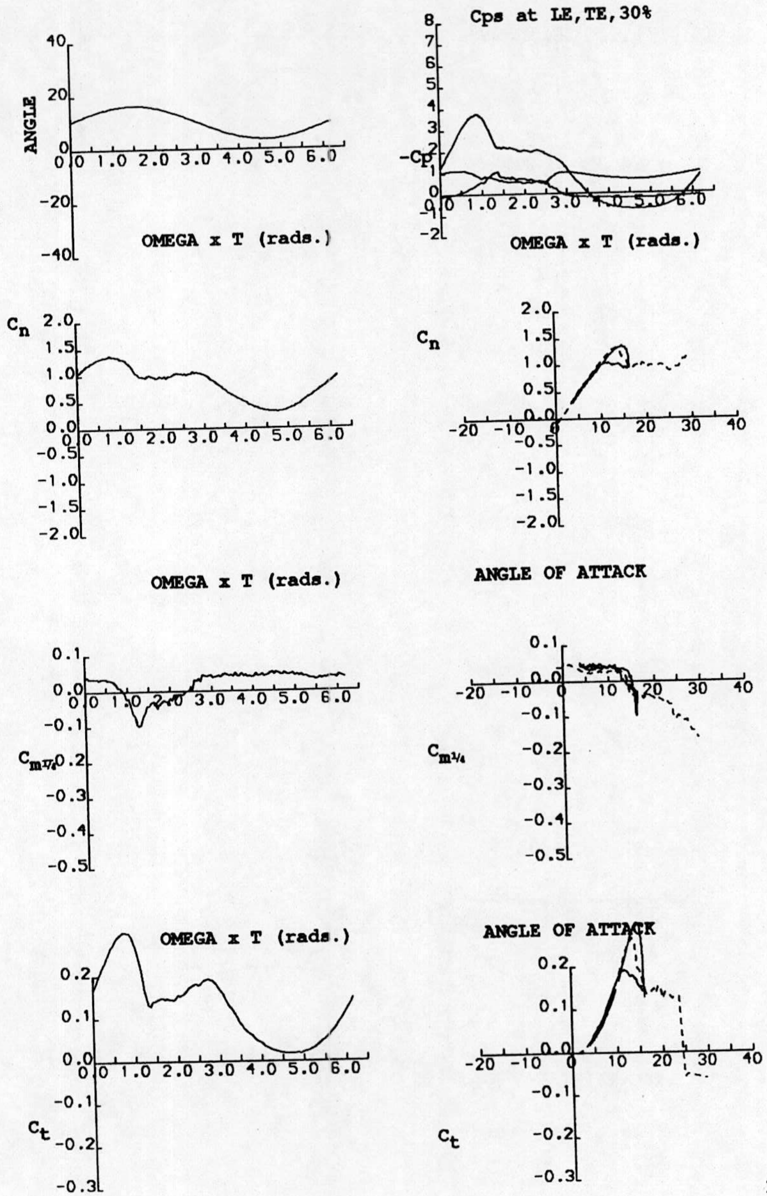
AIR TEMPERATURE = 30.0°C

SAMPLING FREQUENCY = 74.49 Hz.

REDUCED FREQUENCY = 0.026

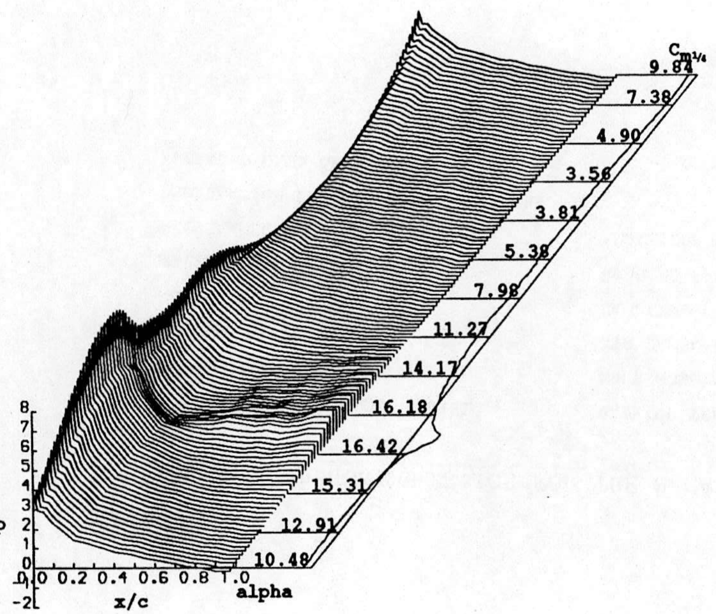
AMPLITUDE = 6.00°

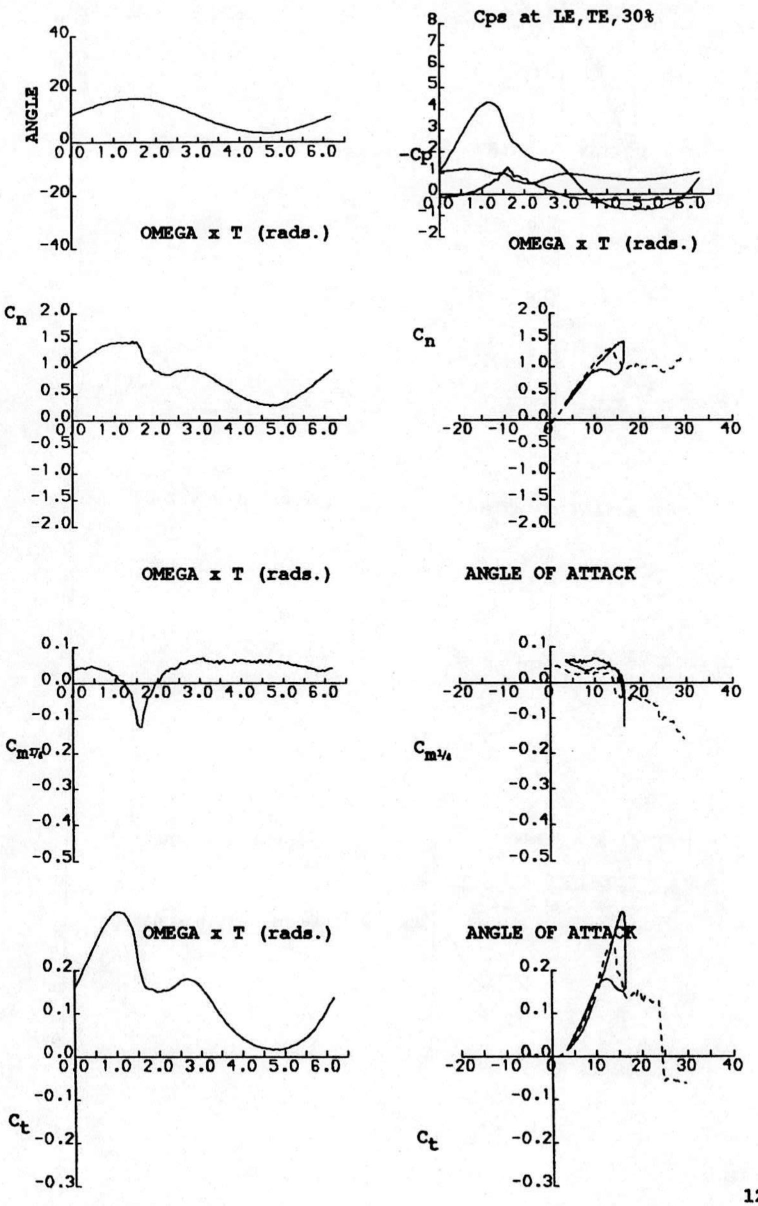




DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10121	DATE OF TEST: 7/3/86
REYNOLDS NUMBER = 1501768.	MACH NUMBER = 0.112
DYNAMIC PRESSURE = 975.20 Nm^{-2}	AIR TEMPERATURE = 30.0°C
NUMBER OF CYCLES = 10	SAMPLING FREQUENCY = 149.12 Hz.
MOTION TYPE: SINUSOIDAL	REDUCED FREQUENCY = 0.052
MEAN ANGLE = 10.00°	AMPLITUDE = 6.00°
OSCILLATION FREQUENCY = 1.165 Hz.	
AVERAGED DATA OF 10 CYCLES	





DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10131

REYNOLDS NUMBER = 1496751.

DYNAMIC PRESSURE = 968.70 Nm^{-2}

NUMBER OF CYCLES = 10

MOTION TYPE: SINUSOIDAL

MEAN ANGLE = 10.00°

OSCILLATION FREQUENCY = 1.747 Hz.

AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 7/3/86

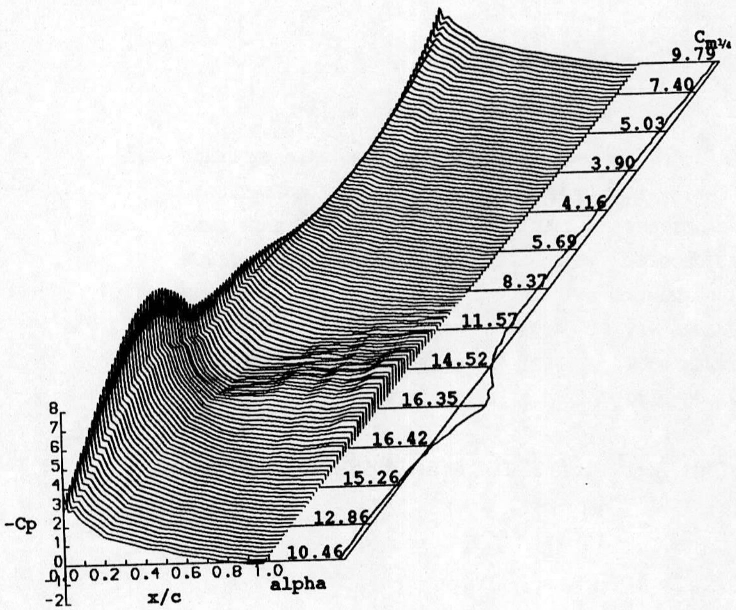
MACH NUMBER = 0.111

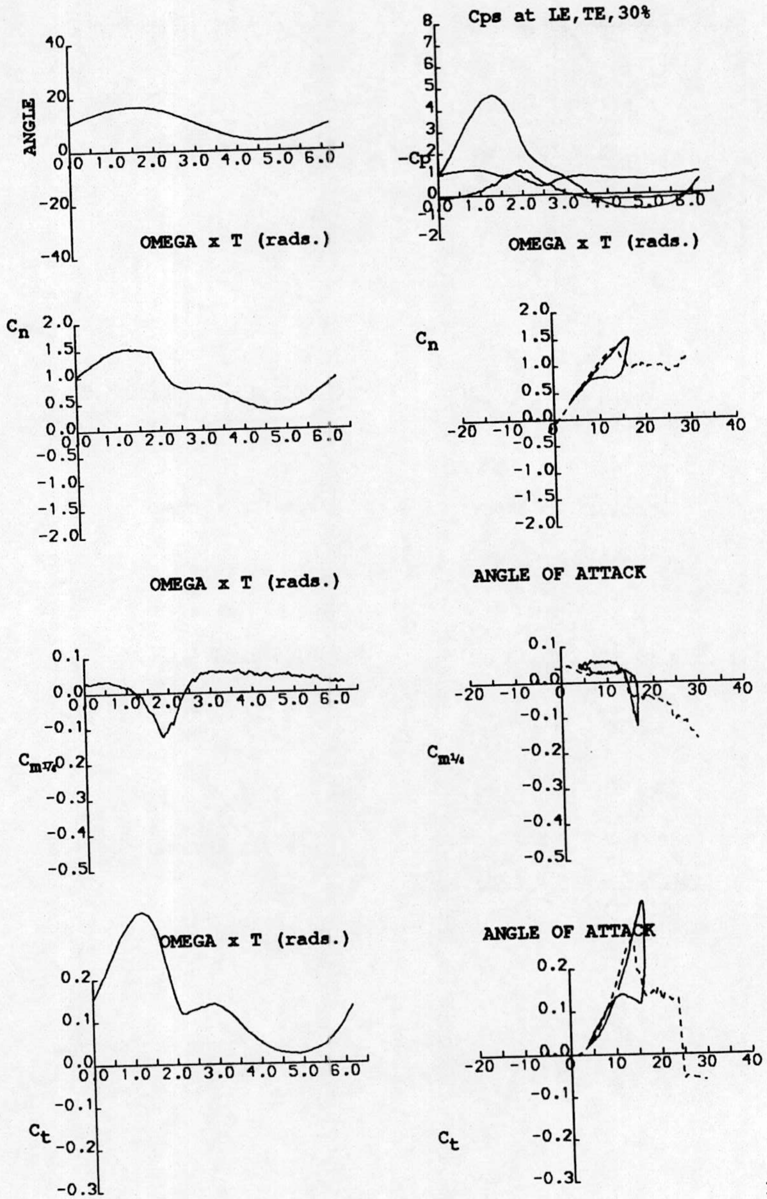
AIR TEMPERATURE = 30.0°C

SAMPLING FREQUENCY = 223.61 Hz.

REDUCED FREQUENCY = 0.078

AMPLITUDE = 6.00°





DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10141

REYNOLDS NUMBER = 1505237.

DYNAMIC PRESSURE = 979.71 Nm^{-2}

NUMBER OF CYCLES = 10

MOTION TYPE: SINUSOIDAL

MEAN ANGLE = 10.00°

OSCILLATION FREQUENCY = 2.330 Hz.

AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 7/3/86

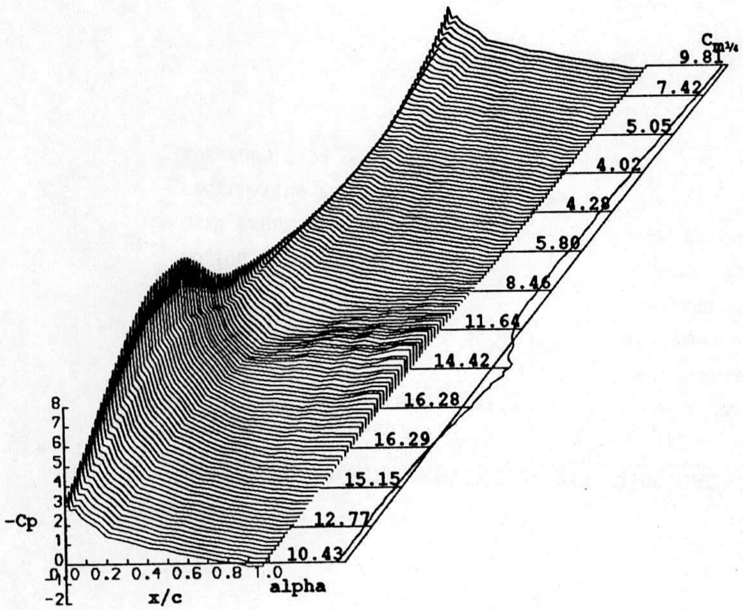
MACH NUMBER = 0.112

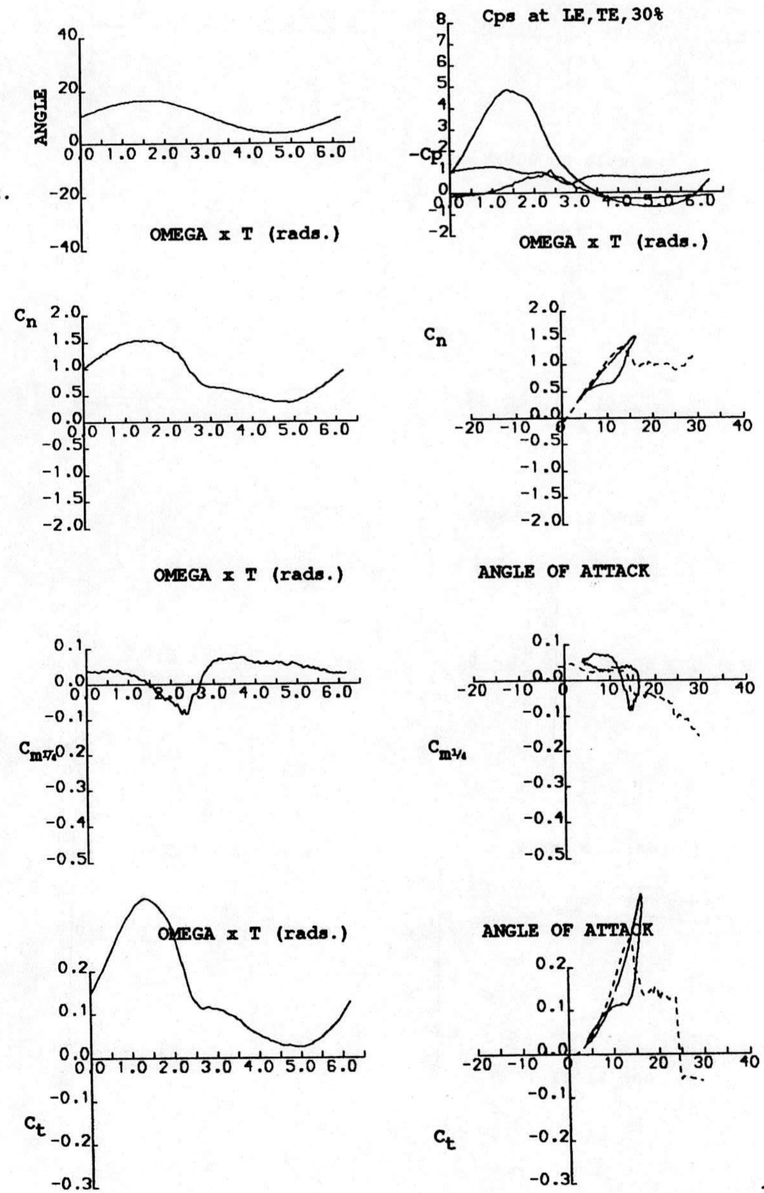
AIR TEMPERATURE = 30.0°C

SAMPLING FREQUENCY = 298.24 Hz.

REDUCED FREQUENCY = 0.103

AMPLITUDE = 6.00°





DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10151

REYNOLDS NUMBER = 1489961.

DYNAMIC PRESSURE = 959.93 Nm^{-2}

NUMBER OF CYCLES = 10

MOTION TYPE: SINUSOIDAL

MEAN ANGLE = 10.00°

OSCILLATION FREQUENCY = 2.912 Hz.

AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 7/3/86

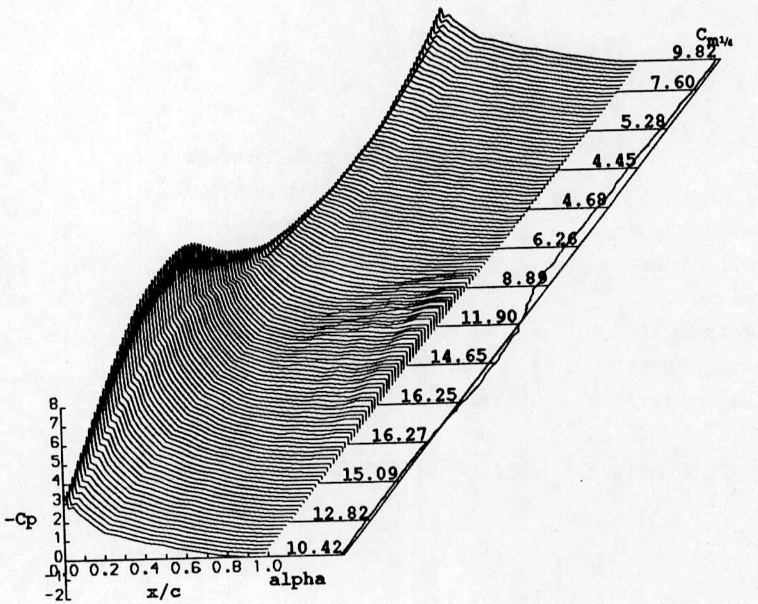
MACH NUMBER = 0.111

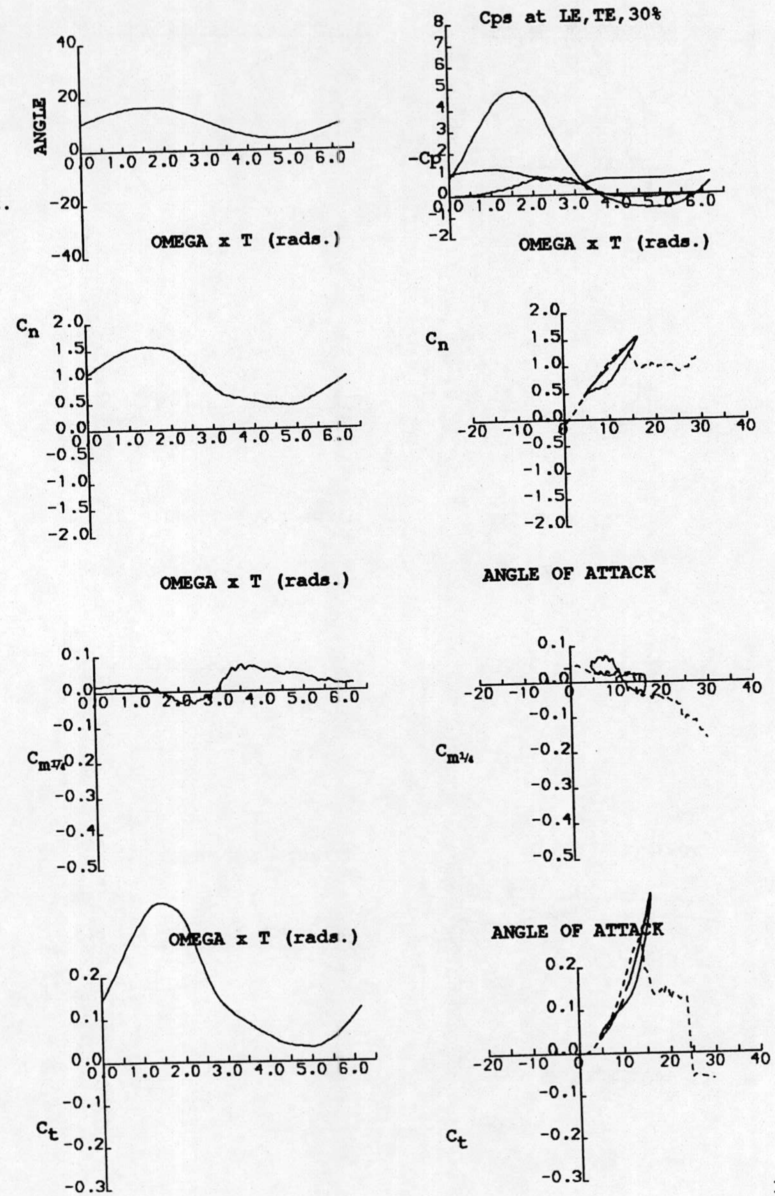
AIR TEMPERATURE = 30.0°C

SAMPLING FREQUENCY = 372.72 Hz.

REDUCED FREQUENCY = 0.130

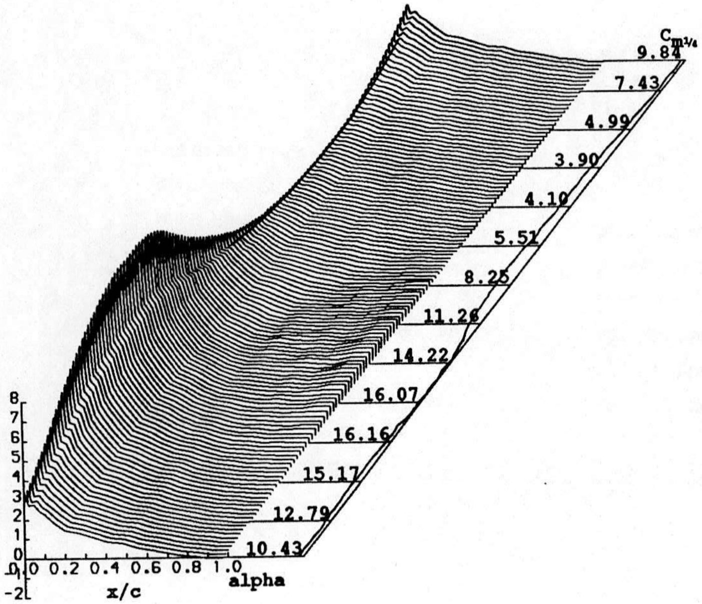
AMPLITUDE = 6.00°

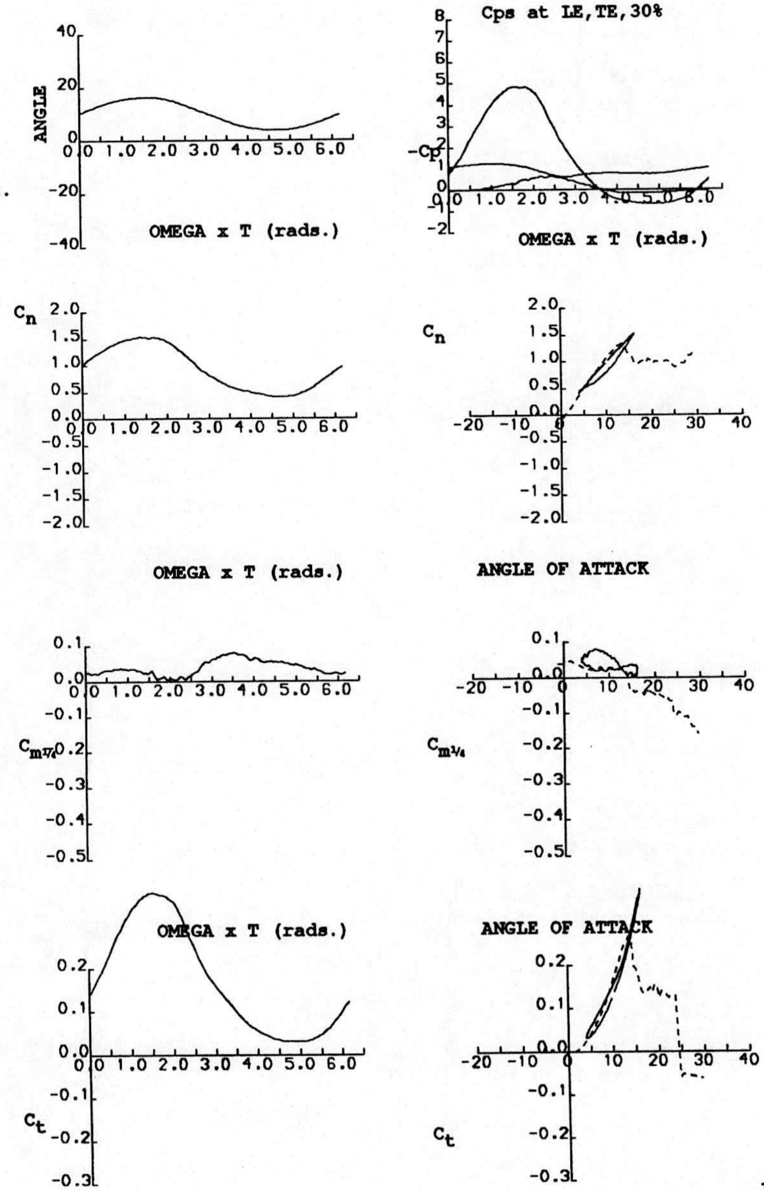




DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10161	DATE OF TEST: 7/3/86
REYNOLDS NUMBER = 1488792.	MACH NUMBER = 0.111
DYNAMIC PRESSURE = 958.42 Nm^{-2}	AIR TEMPERATURE = 30.0°C
NUMBER OF CYCLES = 10	SAMPLING FREQUENCY = 447.43 Hz.
MOTION TYPE: SINUSOIDAL	REDUCED FREQUENCY = 0.156
MEAN ANGLE = 10.00°	AMPLITUDE = 6.00°
OSCILLATION FREQUENCY = 3.496 Hz.	
AVERAGED DATA OF 10 CYCLES	





DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10171

REYNOLDS NUMBER = 1494515.

DYNAMIC PRESSURE = 965.80 Nm^{-2}

NUMBER OF CYCLES = 10

MOTION TYPE: SINUSOIDAL

MEAN ANGLE = 10.00°

OSCILLATION FREQUENCY = 4.078 Hz.

AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 7/3/86

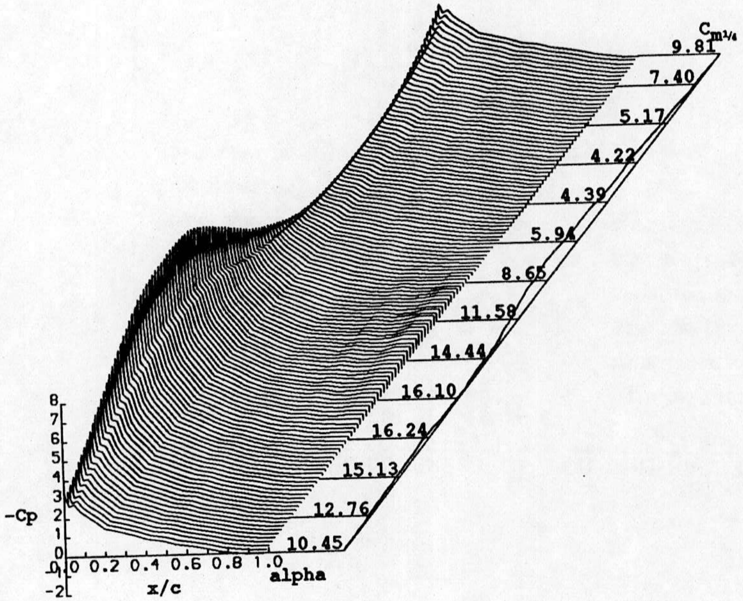
MACH NUMBER = 0.111

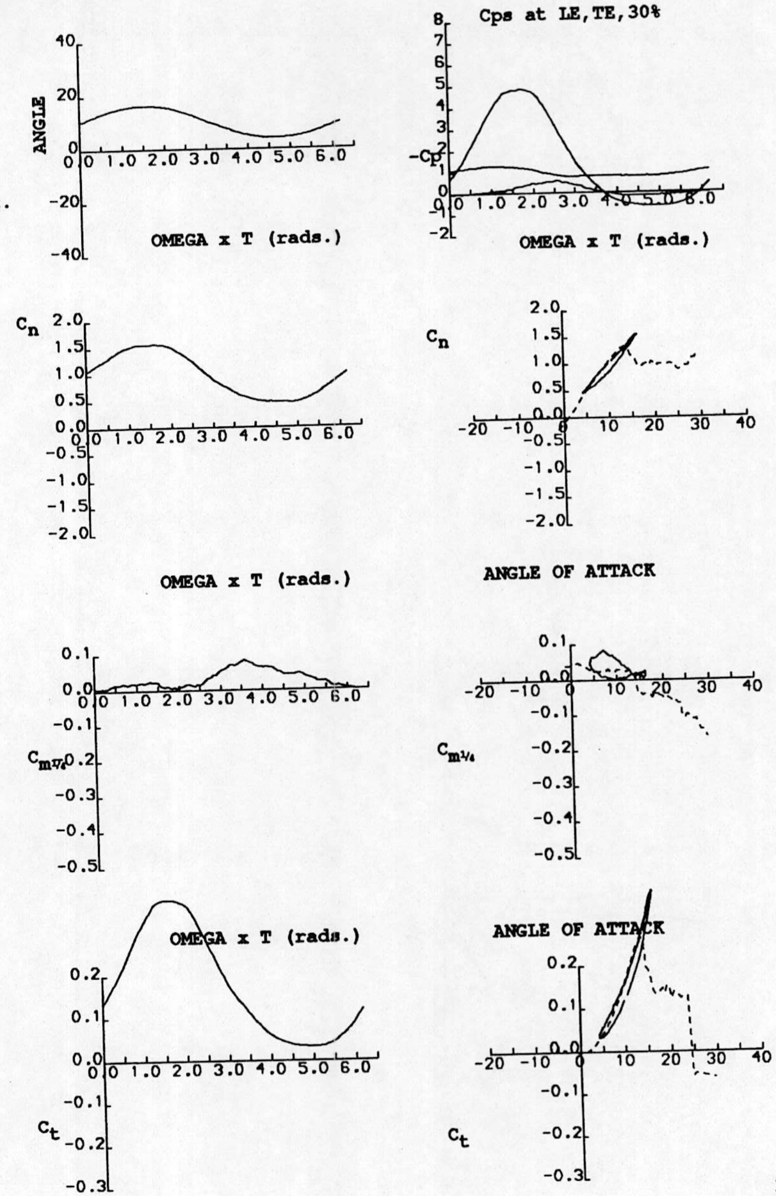
AIR TEMPERATURE = 30.0°C

SAMPLING FREQUENCY = 521.92 Hz.

REDUCED FREQUENCY = 0.181

AMPLITUDE = 6.00°





DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10191

REYNOLDS NUMBER = 1485341.

DYNAMIC PRESSURE = 953.98 Nm^{-2}

NUMBER OF CYCLES = 10

MOTION TYPE: SINUSOIDAL

MEAN ANGLE = 10.00°

OSCILLATION FREQUENCY = 0.233 Hz.

AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 7/3/86

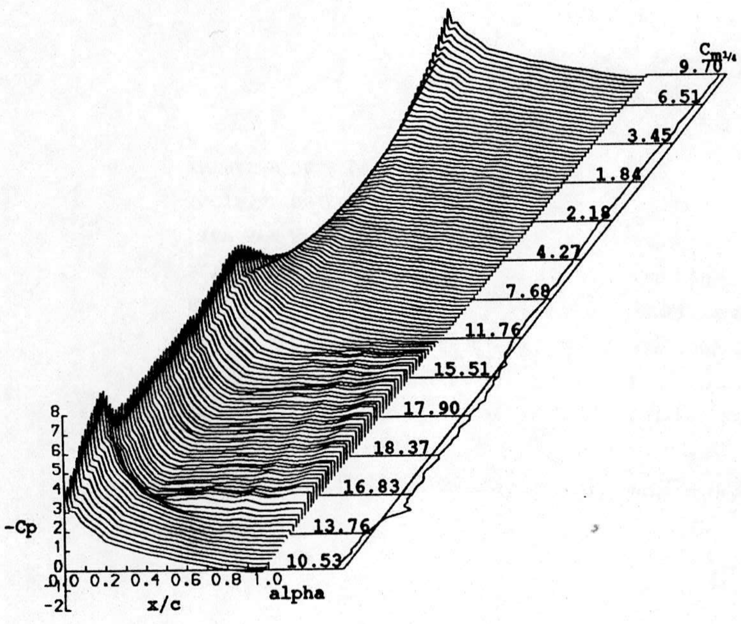
MACH NUMBER = 0.110

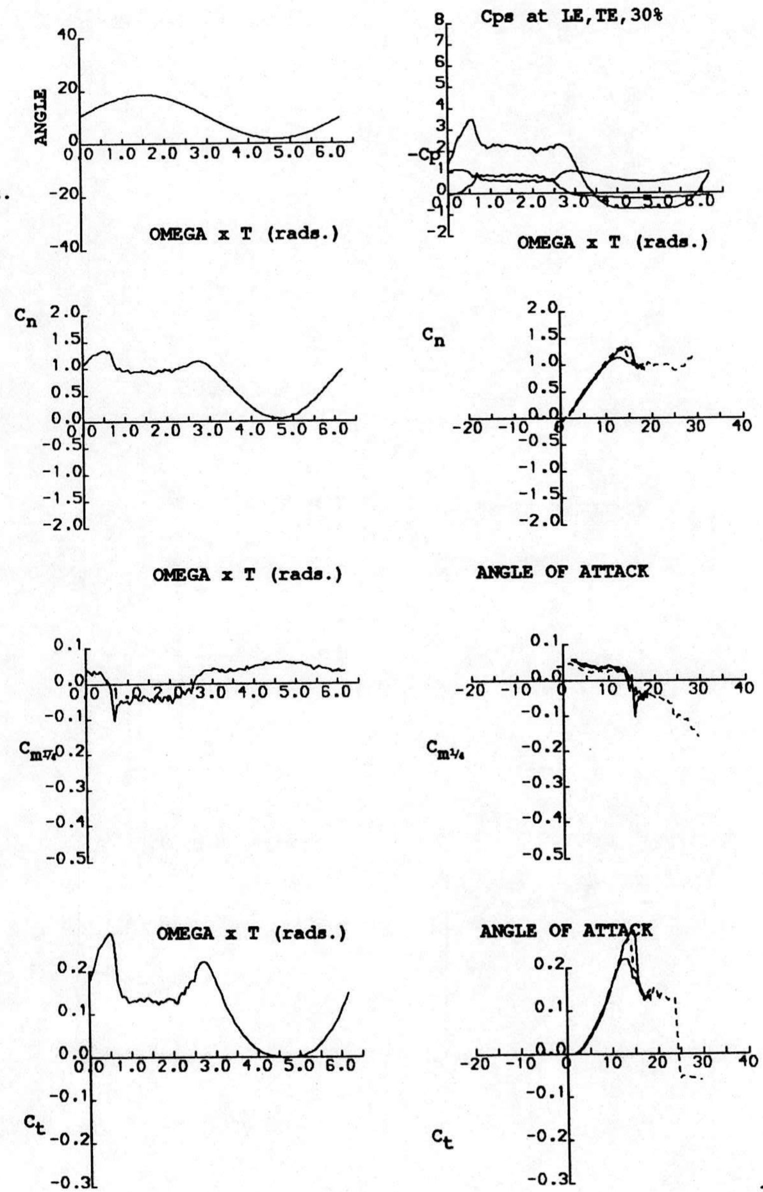
AIR TEMPERATURE = 30.0°C

SAMPLING FREQUENCY = 29.82 Hz.

REDUCED FREQUENCY = 0.010

AMPLITUDE = 8.00°





DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10201

REYNOLDS NUMBER = 1494698.

DYNAMIC PRESSURE = 966.04 Nm^{-2}

NUMBER OF CYCLES = 10

MOTION TYPE: SINUSOIDAL

MEAN ANGLE = 10.00°

OSCILLATION FREQUENCY = 0.582 Hz.

AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 7/3/86

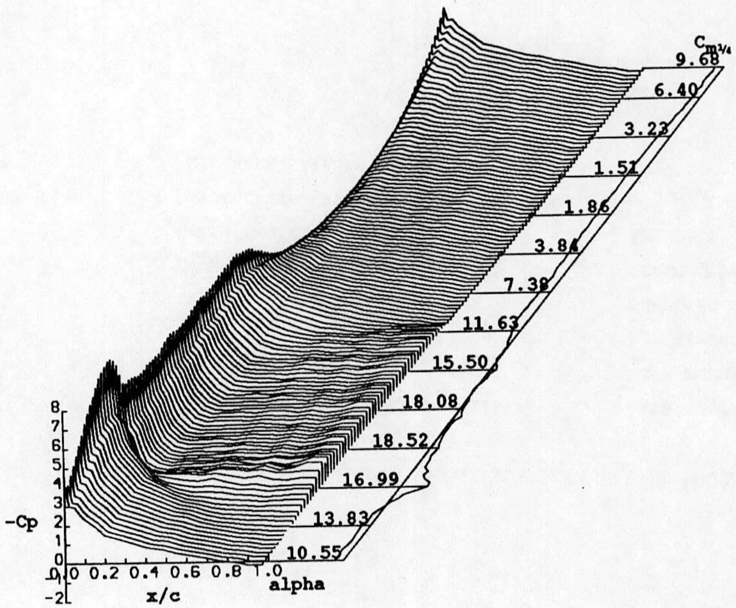
MACH NUMBER = 0.111

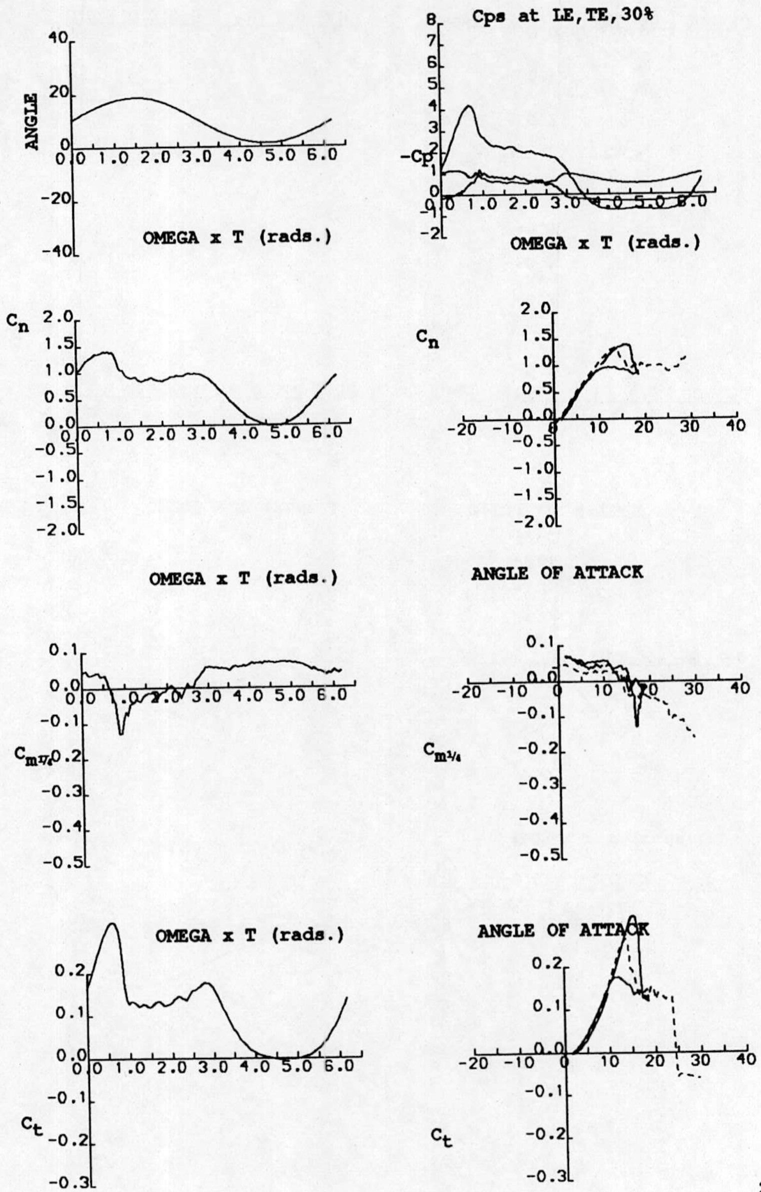
AIR TEMPERATURE = 30.0°C

SAMPLING FREQUENCY = 74.49 Hz.

REDUCED FREQUENCY = 0.026

AMPLITUDE = 8.00°





DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10211

REYNOLDS NUMBER = 1489783.

DYNAMIC PRESSURE = 959.70 Nm^{-2}

NUMBER OF CYCLES = 10

MOTION TYPE: SINUSOIDAL

MEAN ANGLE = 10.00°

OSCILLATION FREQUENCY = 1.165 Hz.

AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 7/3/86

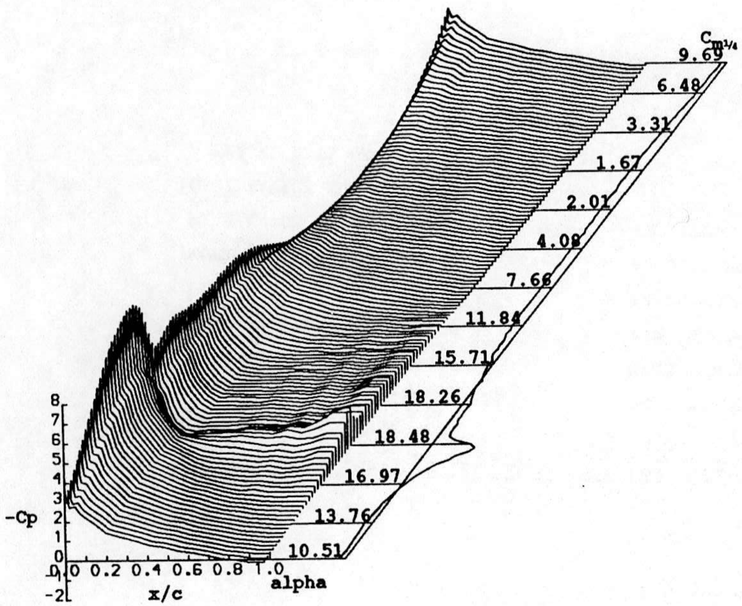
MACH NUMBER = 0.111

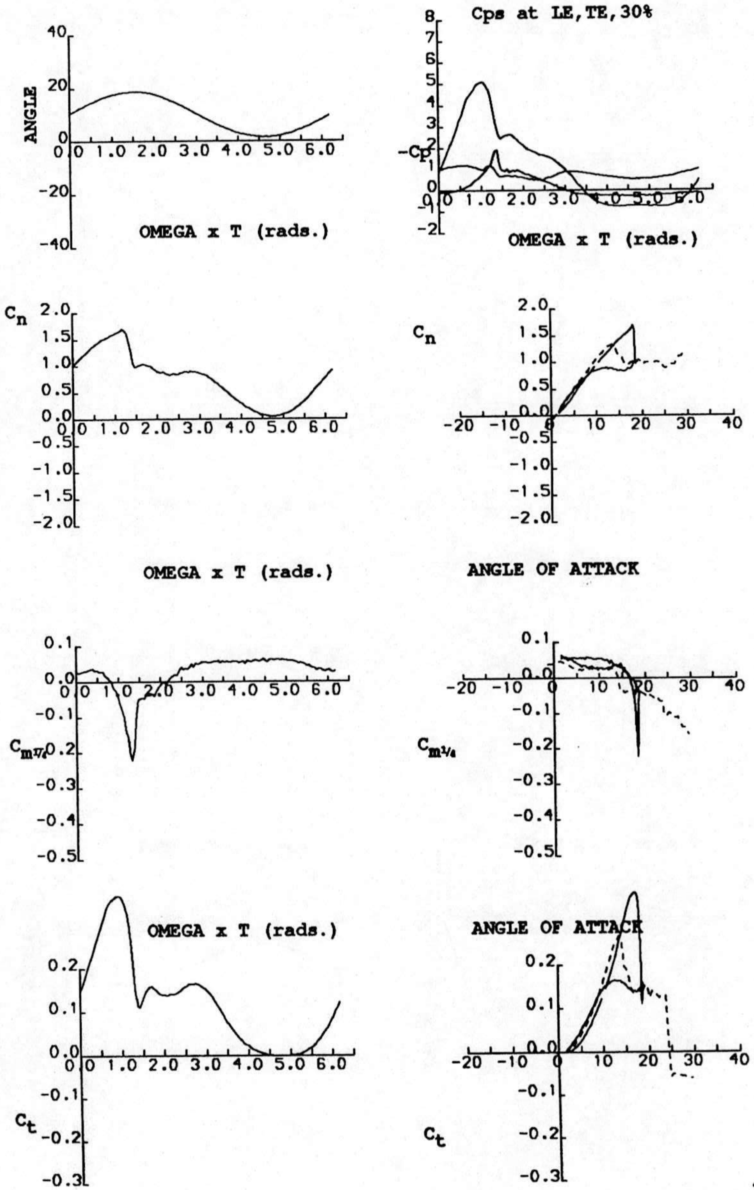
AIR TEMPERATURE = 30.0°C

SAMPLING FREQUENCY = 149.12 Hz.

REDUCED FREQUENCY = 0.052

AMPLITUDE = 8.00°





DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10221

REYNOLDS NUMBER = 1504267.

DYNAMIC PRESSURE = 978.45 Nm^{-2}

NUMBER OF CYCLES = 10

MOTION TYPE: SINUSOIDAL

MEAN ANGLE = 10.00°

OSCILLATION FREQUENCY = 1.747 Hz.

AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 7/3/86

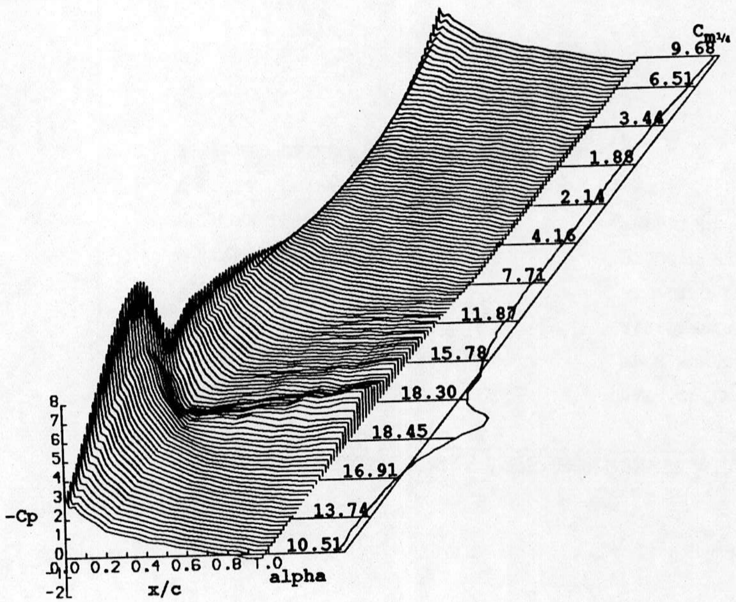
MACH NUMBER = 0.112

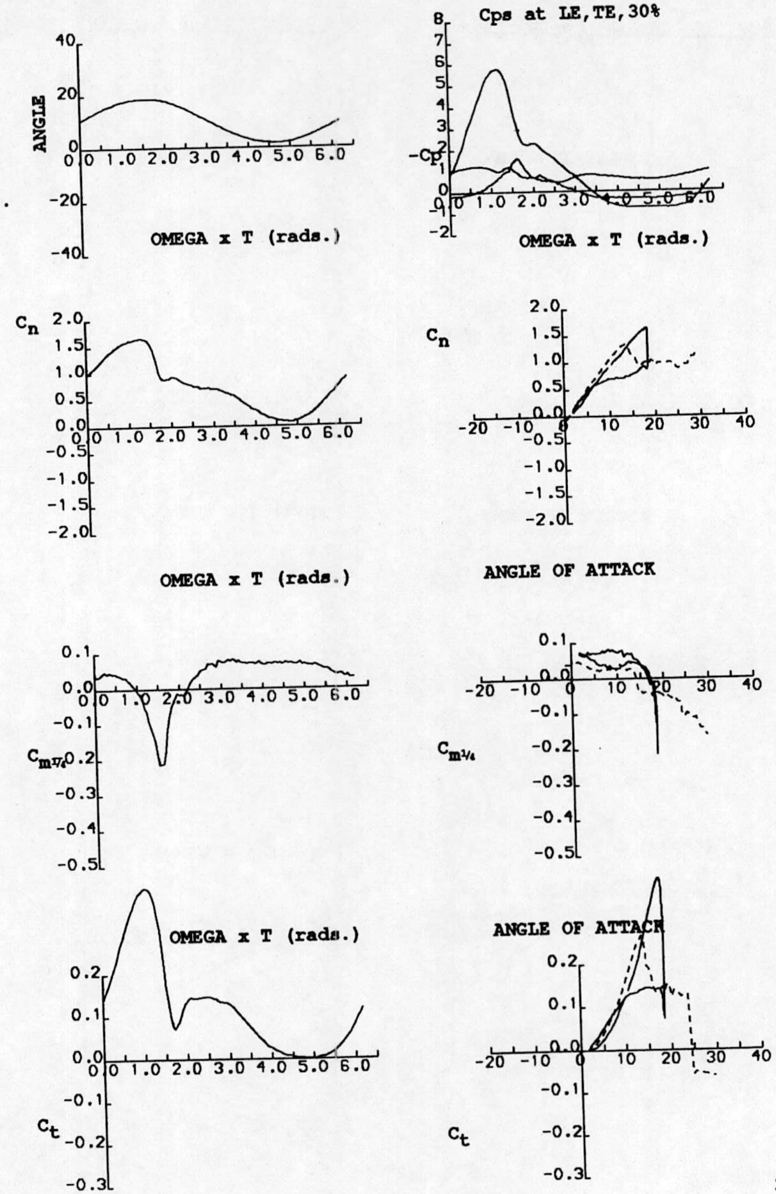
AIR TEMPERATURE = 30.0°C

SAMPLING FREQUENCY = 223.61 Hz.

REDUCED FREQUENCY = 0.077

AMPLITUDE = 8.00°





DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10231

REYNOLDS NUMBER = 1498590.

DYNAMIC PRESSURE = 971.08 Nm^{-2}

NUMBER OF CYCLES = 10

MOTION TYPE: SINUSOIDAL

MEAN ANGLE = 10.00°

OSCILLATION FREQUENCY = 2.330 Hz.

AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 7/3/86

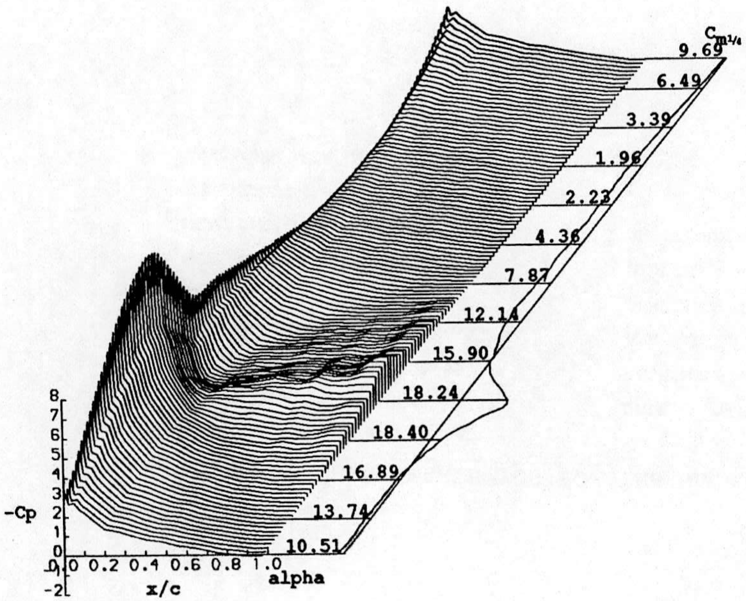
MACH NUMBER = 0.111

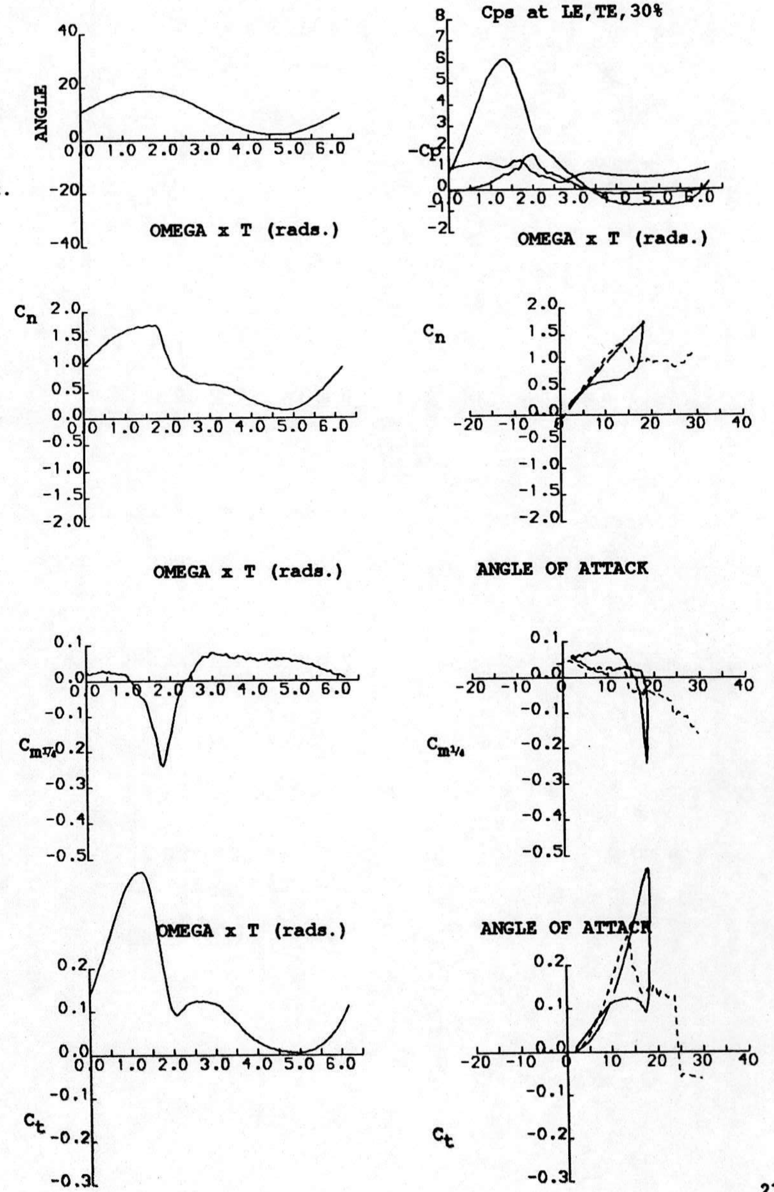
AIR TEMPERATURE = 30.0°C

SAMPLING FREQUENCY = 298.24 Hz.

REDUCED FREQUENCY = 0.103

AMPLITUDE = 8.00°





DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10241

REYNOLDS NUMBER = 1508689.

DYNAMIC PRESSURE = 984.21 Nm^{-2}

NUMBER OF CYCLES = 10

MOTION TYPE: SINUSOIDAL

MEAN ANGLE = 10.00°

OSCILLATION FREQUENCY = 2.912 Hz.

AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 7/3/86

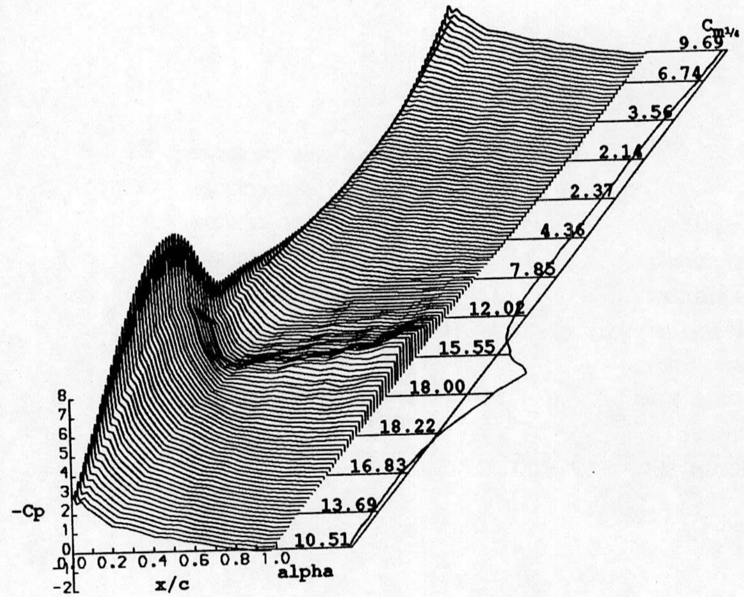
MACH NUMBER = 0.112

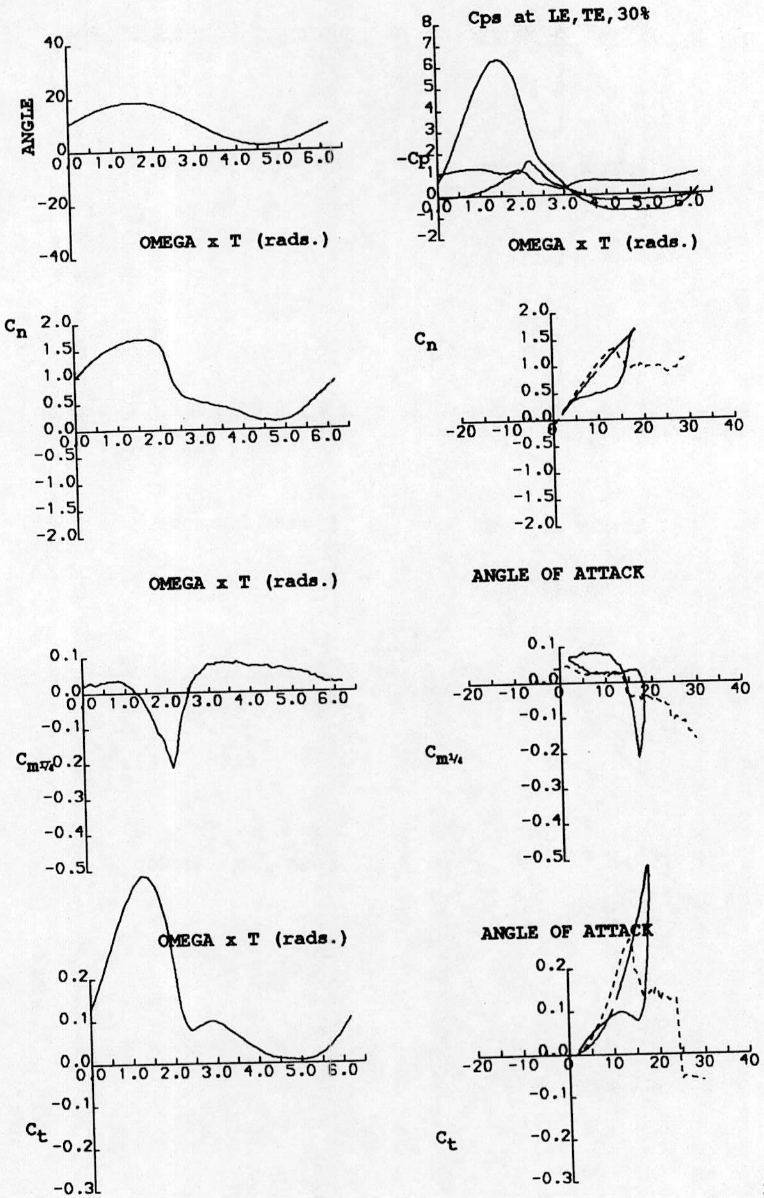
AIR TEMPERATURE = 30.0°C

SAMPLING FREQUENCY = 372.72 Hz.

REDUCED FREQUENCY = 0.128

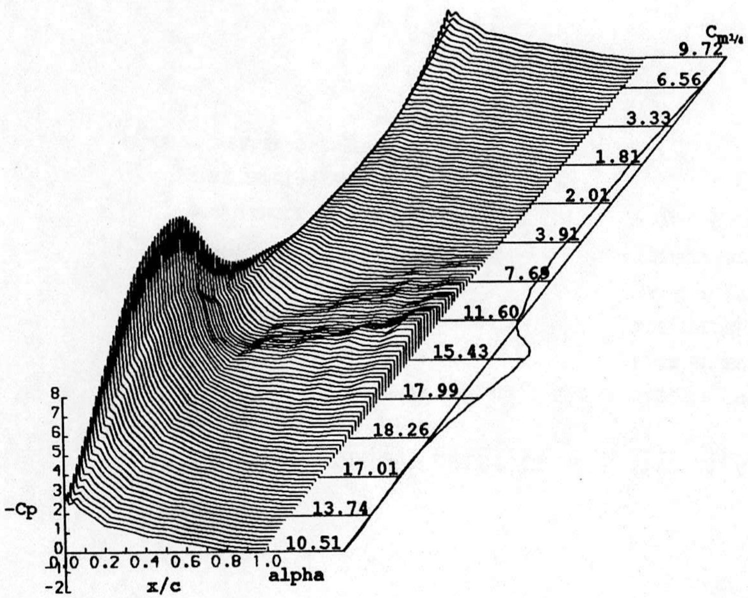
AMPLITUDE = 8.00°

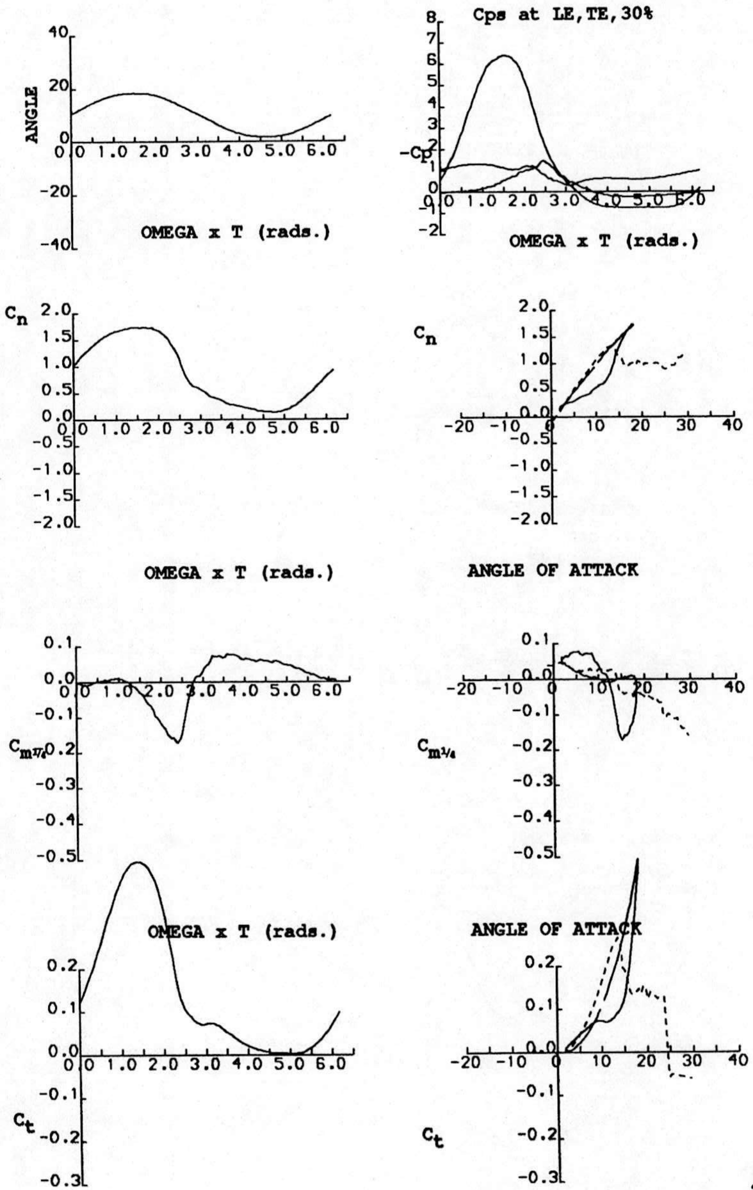




DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10251	DATE OF TEST: 7/3/86
REYNOLDS NUMBER = 1482170.	MACH NUMBER = 0.110
DYNAMIC PRESSURE = 949.91 Nm^{-2}	AIR TEMPERATURE = 30.0°C
NUMBER OF CYCLES = 10	SAMPLING FREQUENCY = 447.43 Hz.
MOTION TYPE: SINUSOIDAL	REDUCED FREQUENCY = 0.157
MEAN ANGLE = 10.00°	AMPLITUDE = 8.00°
OSCILLATION FREQUENCY = 3.496 Hz.	
AVERAGED DATA OF 10 CYCLES	





DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10261

REYNOLDS NUMBER = 1490591.

DYNAMIC PRESSURE = 960.74 Nm^{-2}

NUMBER OF CYCLES = 10

MOTION TYPE: SINUSOIDAL

MEAN ANGLE = 10.00°

OSCILLATION FREQUENCY = 4.078 Hz.

AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 7/3/86

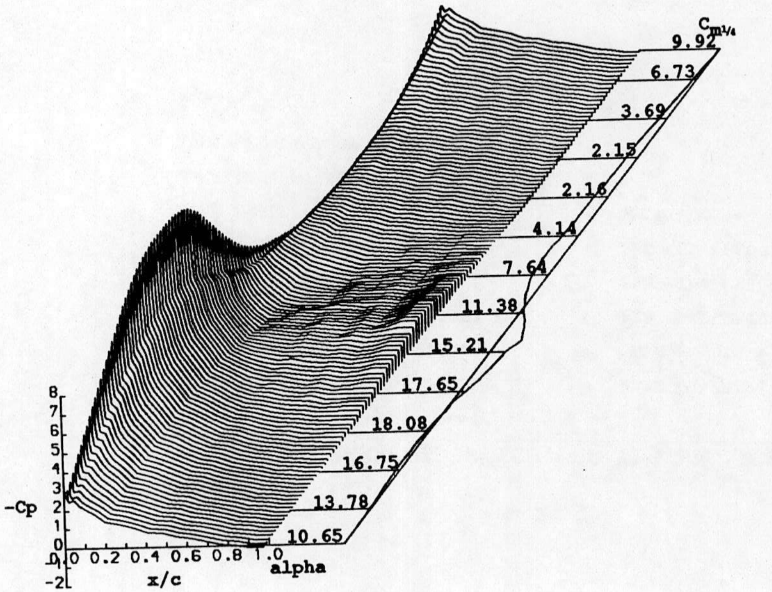
MACH NUMBER = 0.111

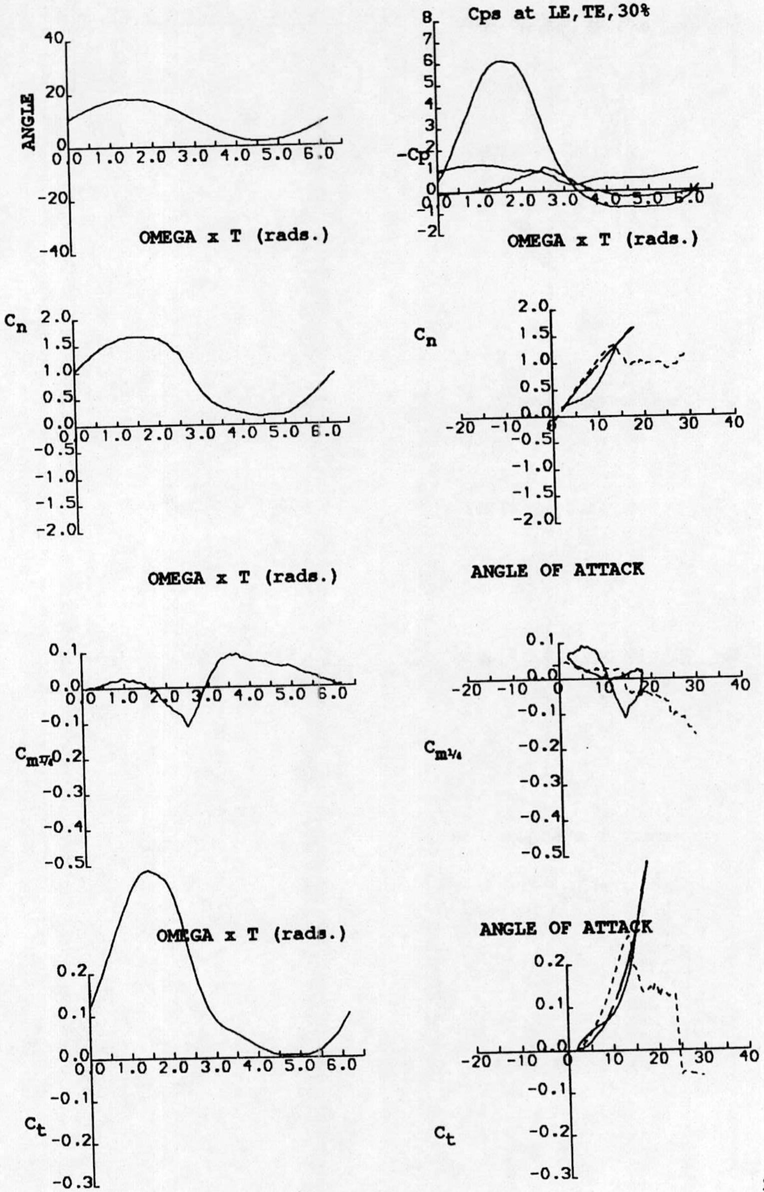
AIR TEMPERATURE = 30.0°C

SAMPLING FREQUENCY = 521.92 Hz.

REDUCED FREQUENCY = 0.182

AMPLITUDE = 8.00°

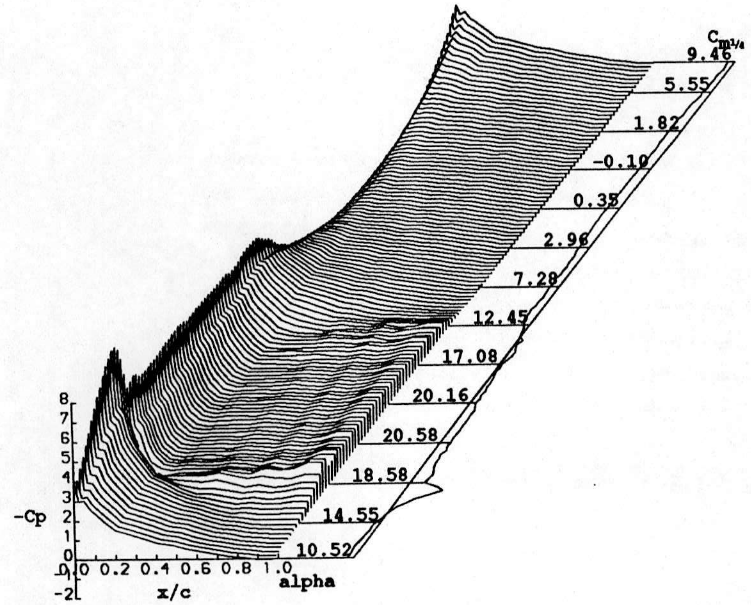


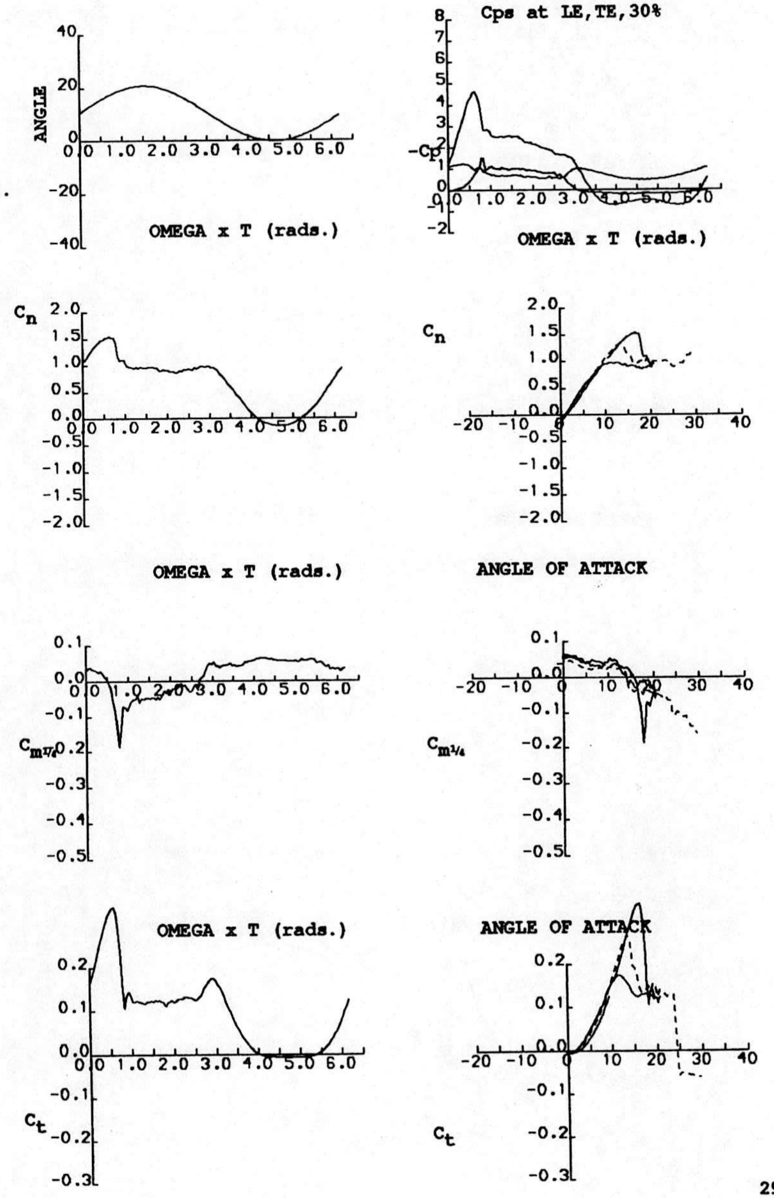


DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10291
REYNOLDS NUMBER = 1498441.
DYNAMIC PRESSURE = 977.31 Nm^{-2}
NUMBER OF CYCLES = 10
MOTION TYPE: SINUSOIDAL
MEAN ANGLE = 10.00°
OSCILLATION FREQUENCY = 0.582 Hz.
AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 7/3/86
MACH NUMBER = 0.112
AIR TEMPERATURE = 30.0°C
SAMPLING FREQUENCY = 74.49 Hz.
REDUCED FREQUENCY = 0.026
AMPLITUDE = 10.00°

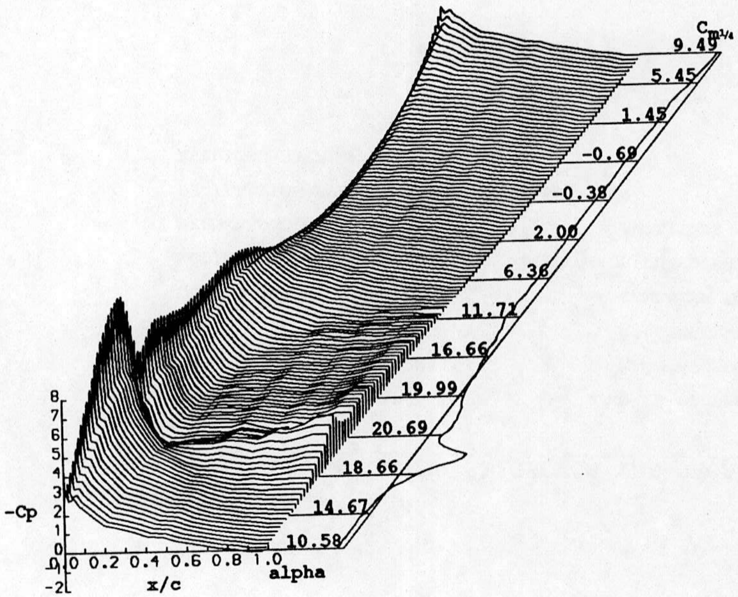


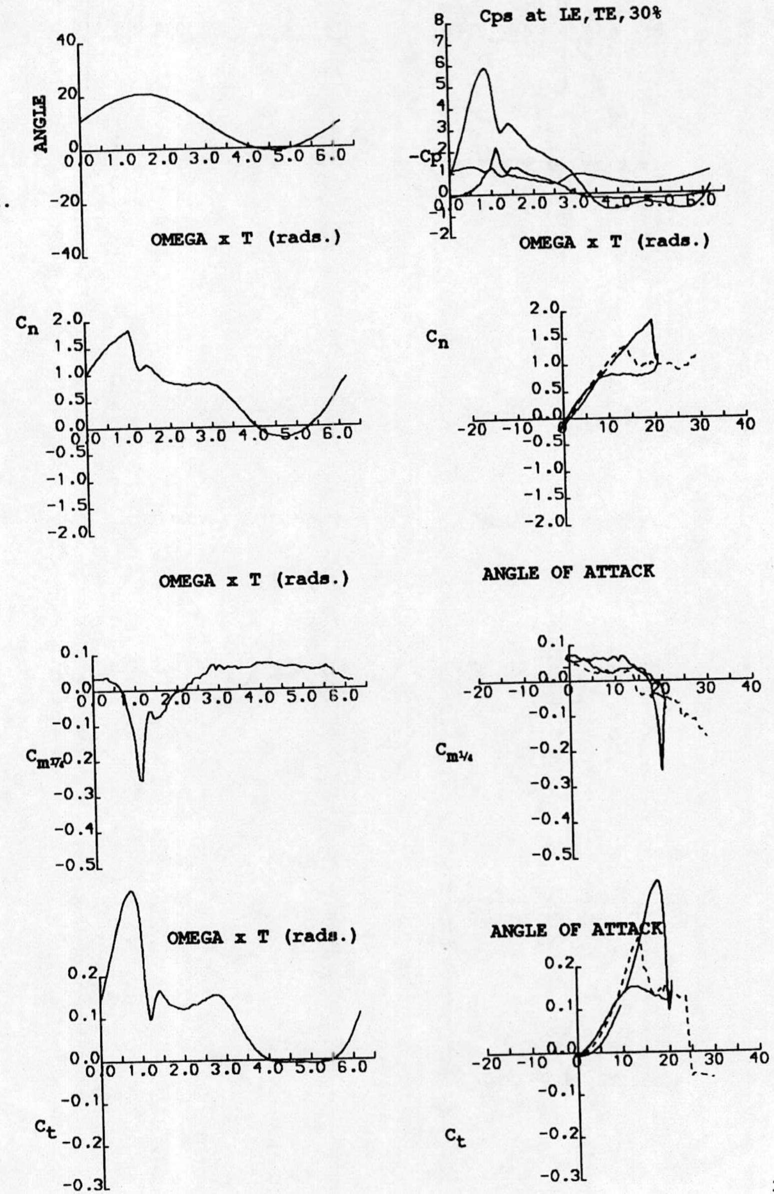


DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10301
REYNOLDS NUMBER = 1501354.
DYNAMIC PRESSURE = 981.12 Nm^{-2}
NUMBER OF CYCLES = 10
MOTION TYPE: SINUSOIDAL
MEAN ANGLE = 10.00°
OSCILLATION FREQUENCY = 1.165 Hz.
AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 7/3/86
MACH NUMBER = 0.112
AIR TEMPERATURE = 30.0°C
SAMPLING FREQUENCY = 149.12 Hz.
REDUCED FREQUENCY = 0.051
AMPLITUDE = 10.00°





DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10311

REYNOLDS NUMBER = 1493929.

DYNAMIC PRESSURE = 971.44 Nm^{-2}

NUMBER OF CYCLES = 10

MOTION TYPE: SINUSOIDAL

MEAN ANGLE = 10.00°

OSCILLATION FREQUENCY = 1.747 Hz.

AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 7/3/86

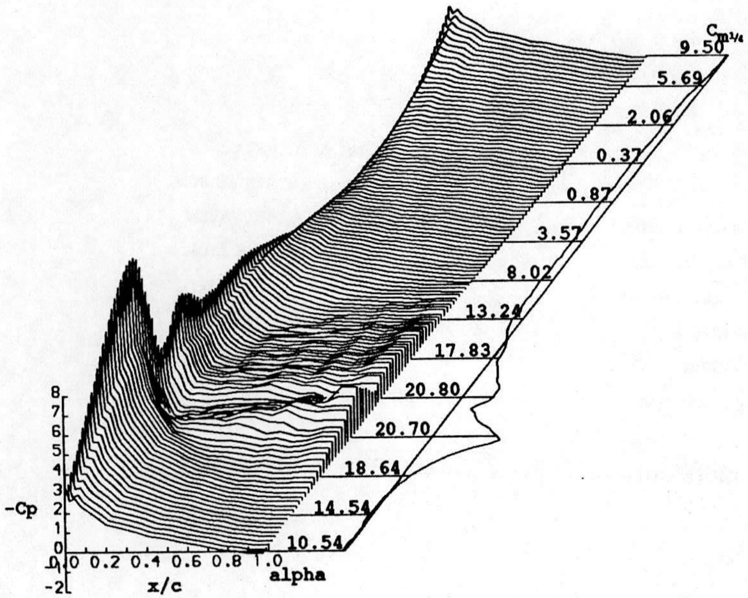
MACH NUMBER = 0.112

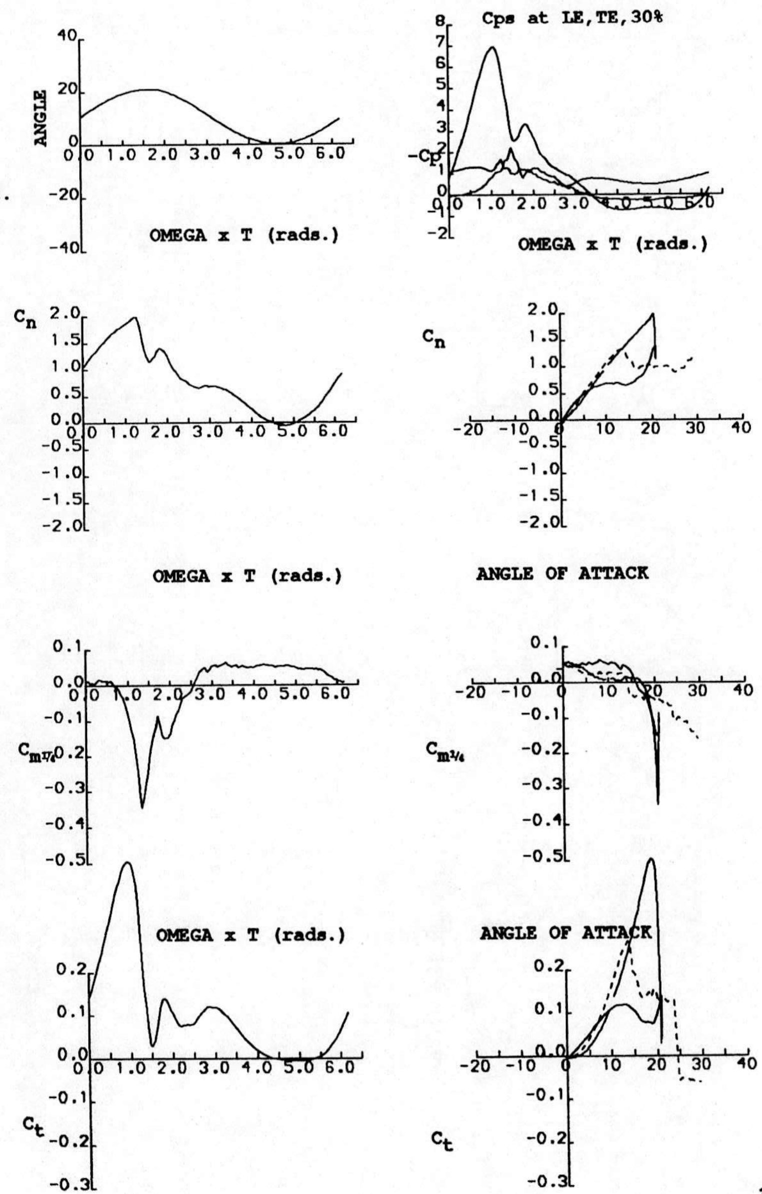
AIR TEMPERATURE = 30.0°C

SAMPLING FREQUENCY = 223.61 Hz.

REDUCED FREQUENCY = 0.077

AMPLITUDE = 10.00°





DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10331

REYNOLDS NUMBER = 1506663.

DYNAMIC PRESSURE = 988.07 Nm^{-2}

NUMBER OF CYCLES = 10

MOTION TYPE: SINUSOIDAL

MEAN ANGLE = 10.00°

OSCILLATION FREQUENCY = 2.912 Hz.

AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 7/3/86

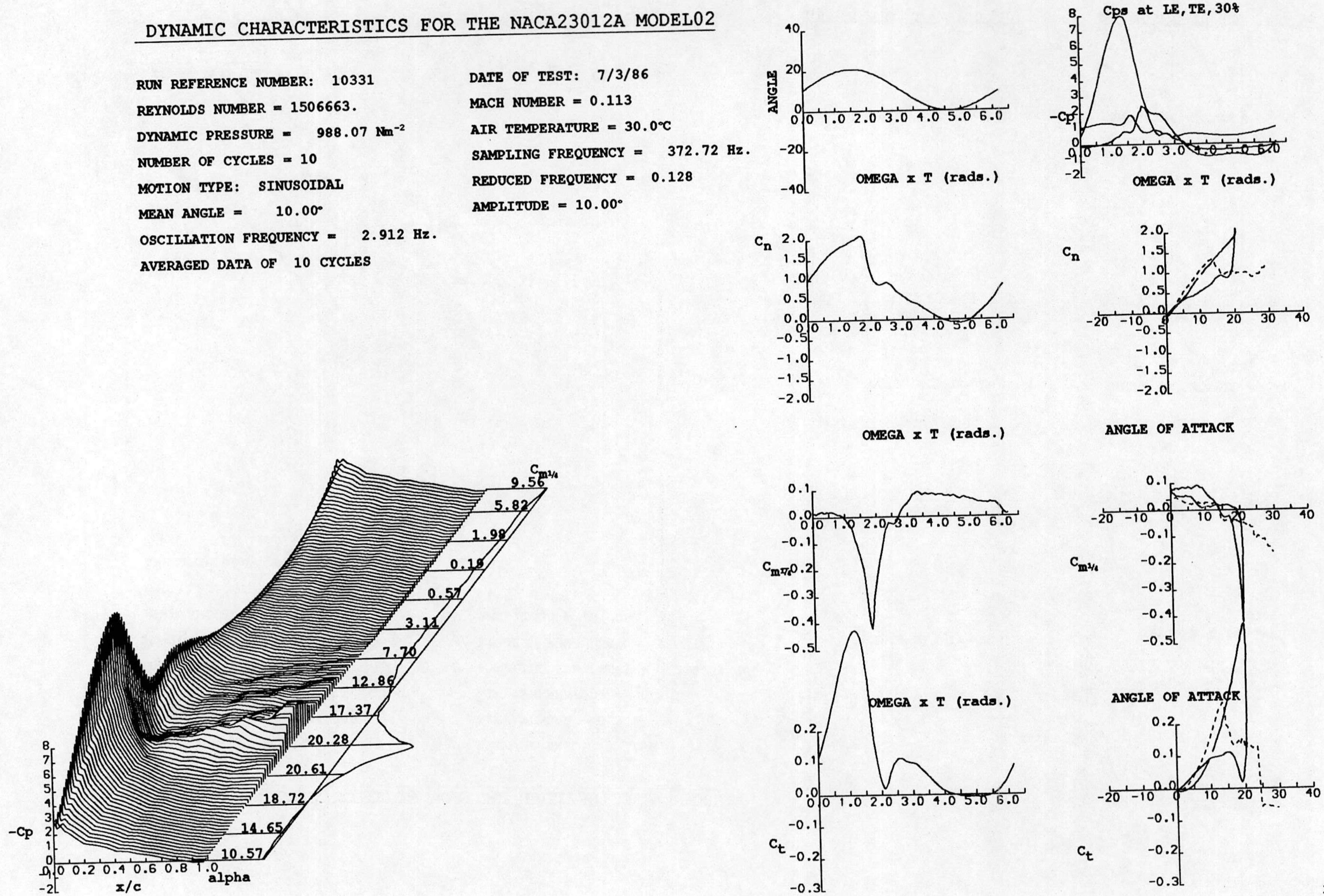
MACH NUMBER = 0.113

AIR TEMPERATURE = 30.0°C

SAMPLING FREQUENCY = 372.72 Hz.

REDUCED FREQUENCY = 0.128

AMPLITUDE = 10.00°



DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10341

REYNOLDS NUMBER = 1483905.

DYNAMIC PRESSURE = 958.44 Nm^{-2}

NUMBER OF CYCLES = 10

MOTION TYPE: SINUSOIDAL

MEAN ANGLE = 10.00°

OSCILLATION FREQUENCY = 3.496 Hz.

AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 7/3/86

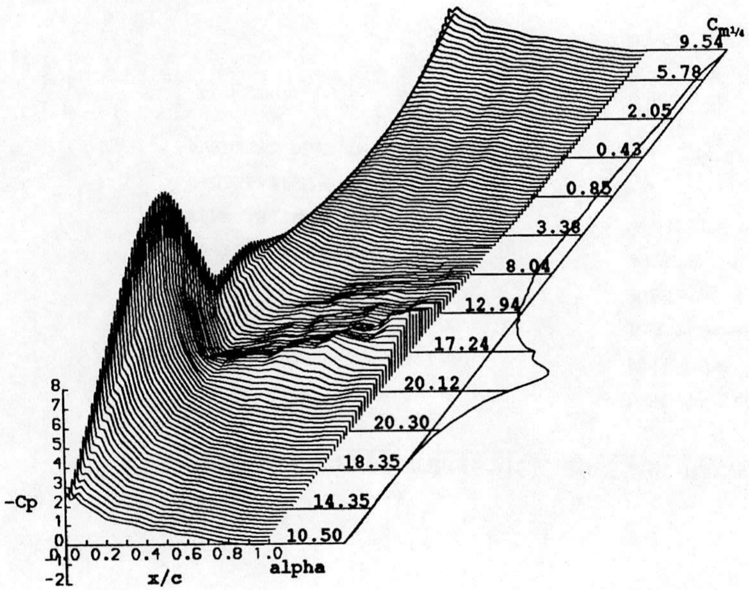
MACH NUMBER = 0.111

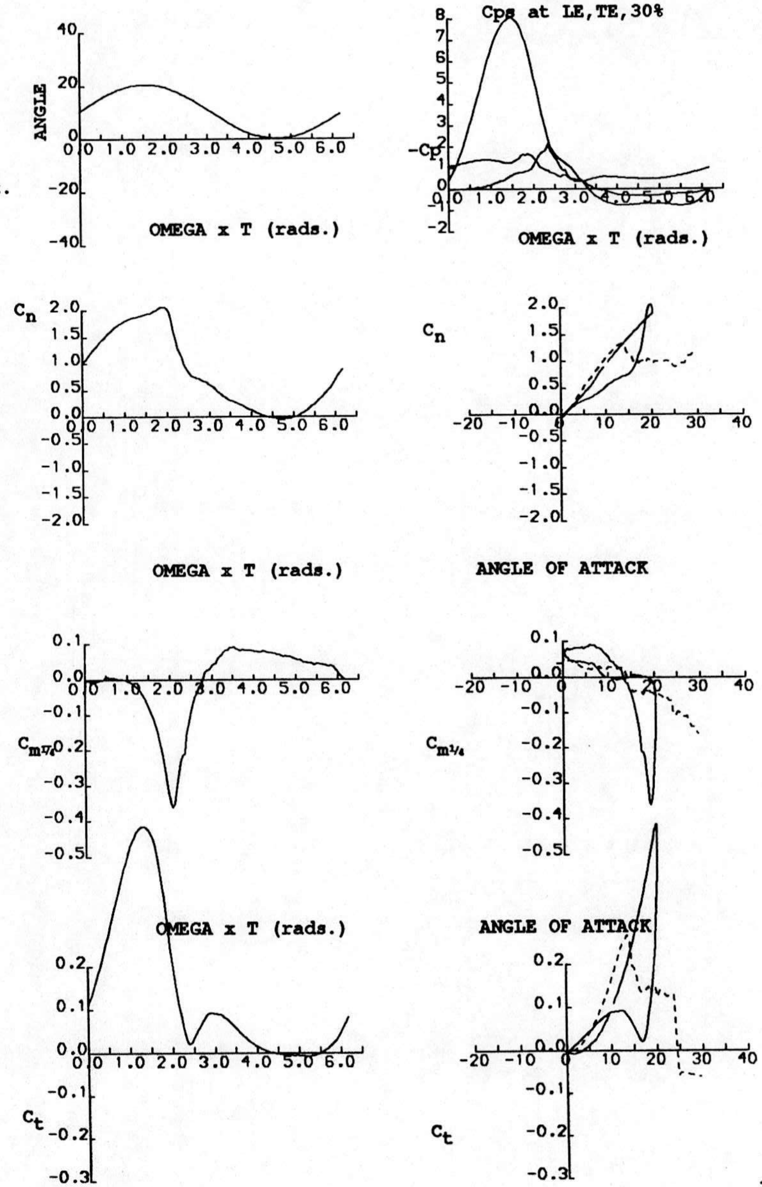
AIR TEMPERATURE = 30.0°C

SAMPLING FREQUENCY = 447.43 Hz.

REDUCED FREQUENCY = 0.155

AMPLITUDE = 10.00°





DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10351

REYNOLDS NUMBER = 1487790.

DYNAMIC PRESSURE = 963.47 Nm^{-2}

NUMBER OF CYCLES = 10

MOTION TYPE: SINUSOIDAL

MEAN ANGLE = 10.00°

OSCILLATION FREQUENCY = 4.078 Hz.

AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 7/3/86

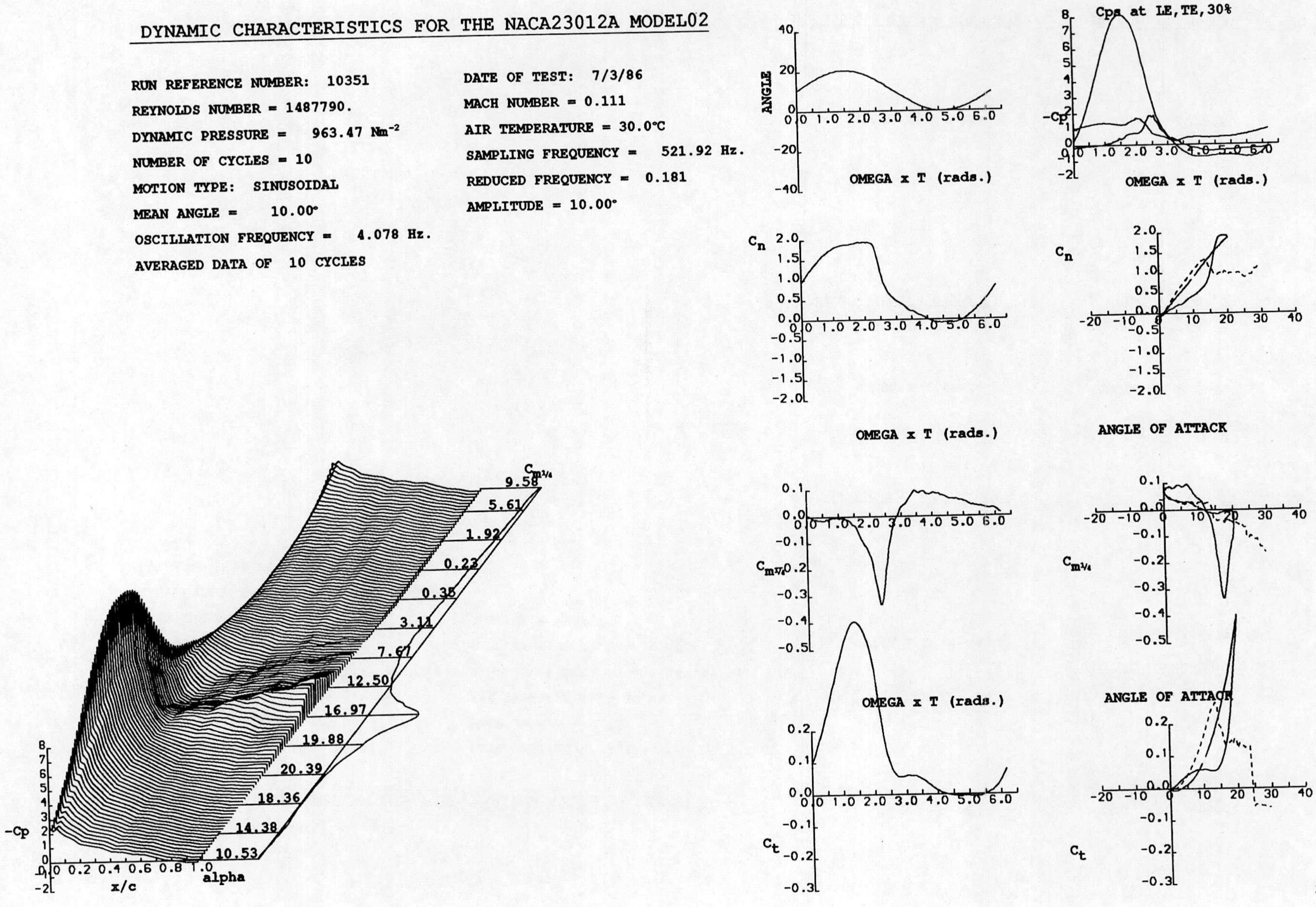
MACH NUMBER = 0.111

AIR TEMPERATURE = 30.0°C

SAMPLING FREQUENCY = 521.92 Hz.

REDUCED FREQUENCY = 0.181

AMPLITUDE = 10.00°



DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10361

REYNOLDS NUMBER = 1491180.

DYNAMIC PRESSURE = 967.86 Nm^{-2}

NUMBER OF CYCLES = 10

MOTION TYPE: SINUSOIDAL

MEAN ANGLE = 4.00°

OSCILLATION FREQUENCY = 0.233 Hz.

AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 7/3/86

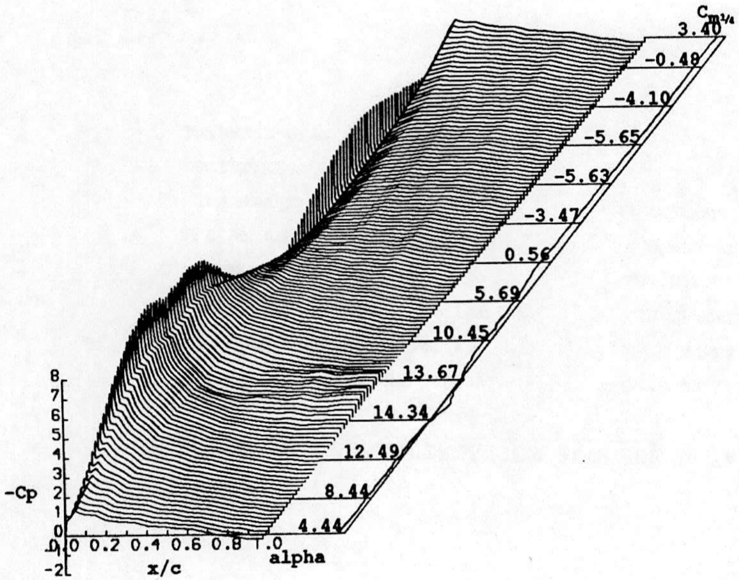
MACH NUMBER = 0.112

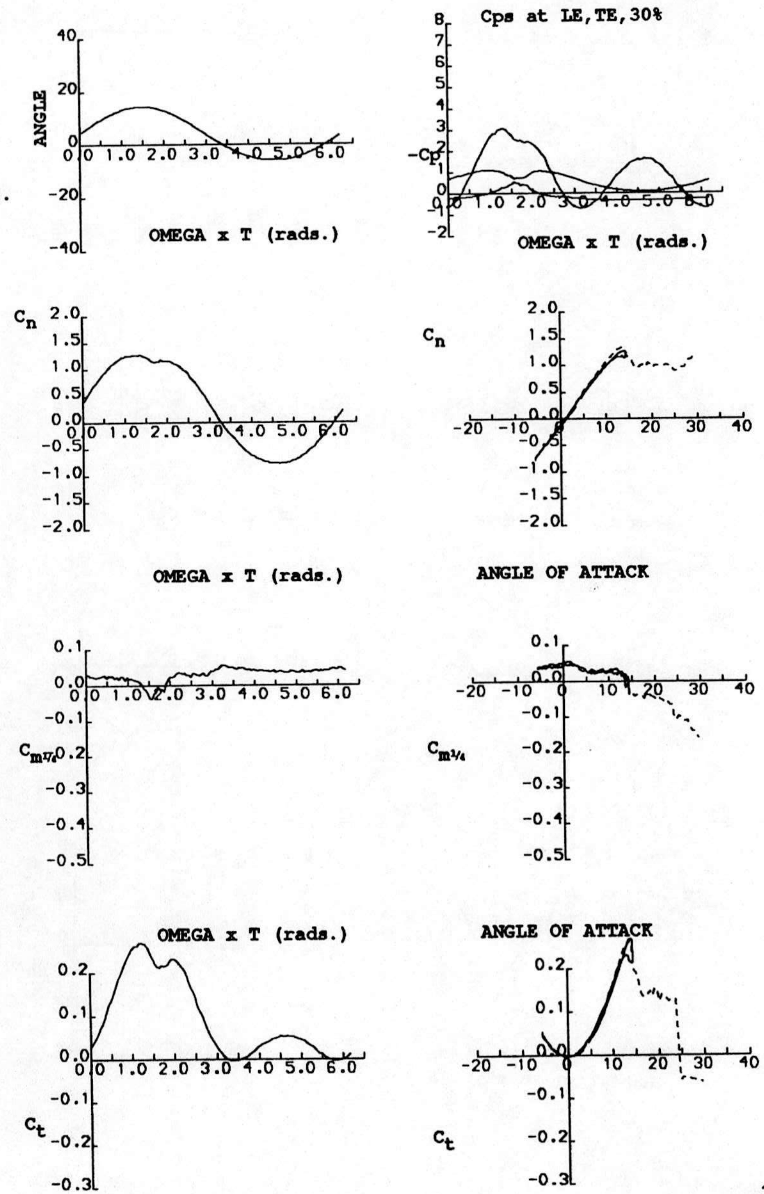
AIR TEMPERATURE = 30.0°C

SAMPLING FREQUENCY = 29.82 Hz.

REDUCED FREQUENCY = 0.010

AMPLITUDE = 10.00°

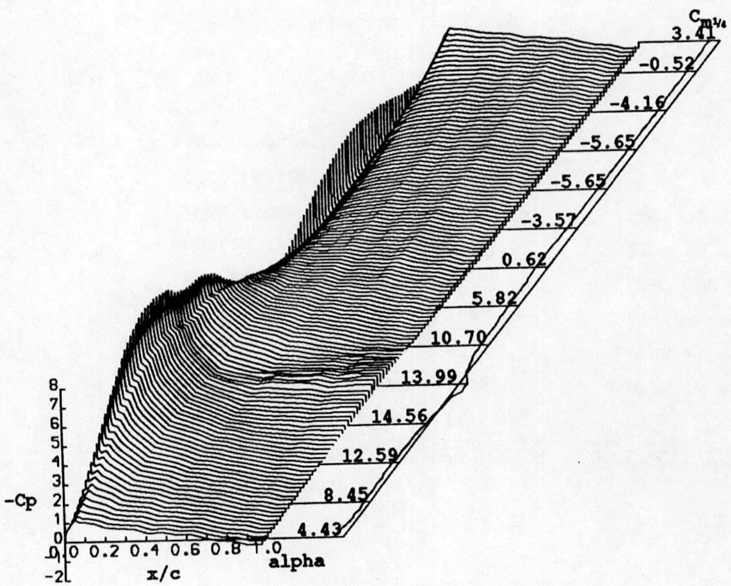


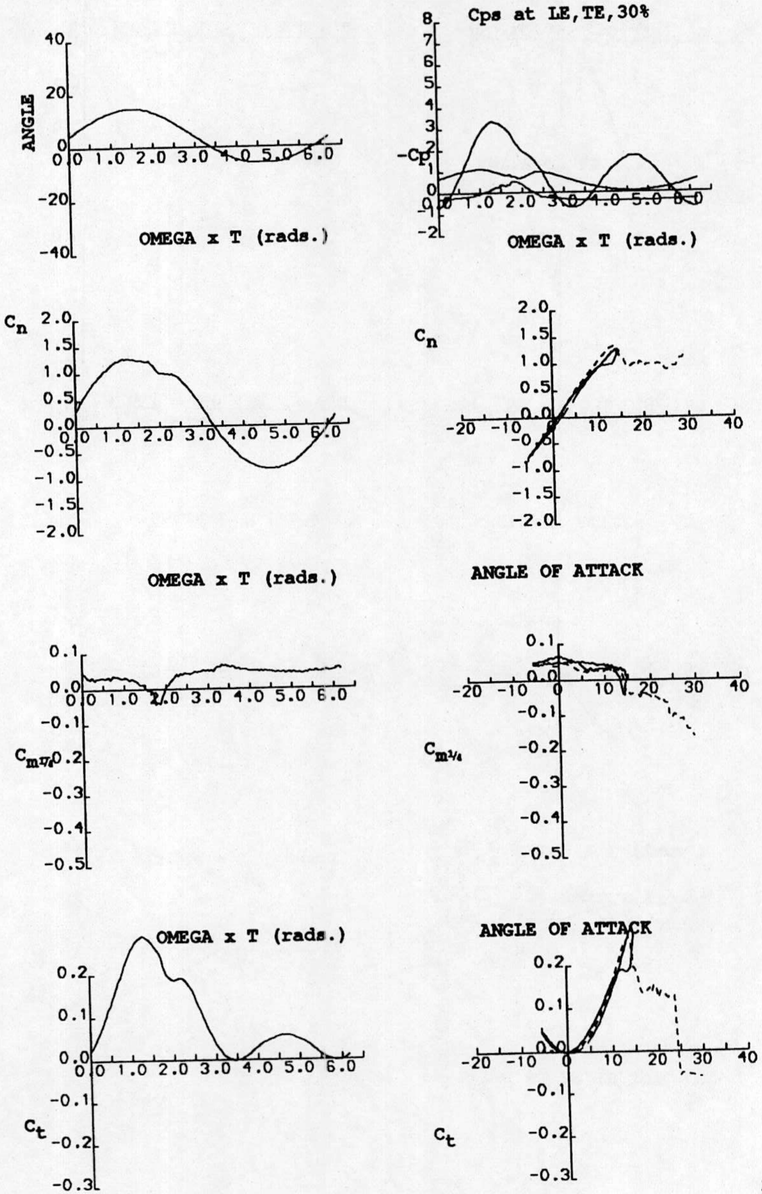


DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10371
REYNOLDS NUMBER = 1479729.
DYNAMIC PRESSURE = 953.06 Nm^{-2}
NUMBER OF CYCLES = 10
MOTION TYPE: SINUSOIDAL
MEAN ANGLE = 4.00°
OSCILLATION FREQUENCY = 0.582 Hz.
AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 7/3/86
MACH NUMBER = 0.111
AIR TEMPERATURE = 30.0°C
SAMPLING FREQUENCY = 74.49 Hz.
REDUCED FREQUENCY = 0.026
AMPLITUDE = 10.00°





DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10381

REYNOLDS NUMBER = 1427378.

DYNAMIC PRESSURE = 974.03 Nm^{-2}

NUMBER OF CYCLES = 10

MOTION TYPE: SINUSOIDAL

MEAN ANGLE = 4.00°

OSCILLATION FREQUENCY = 1.165 Hz.

AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 7/3/86

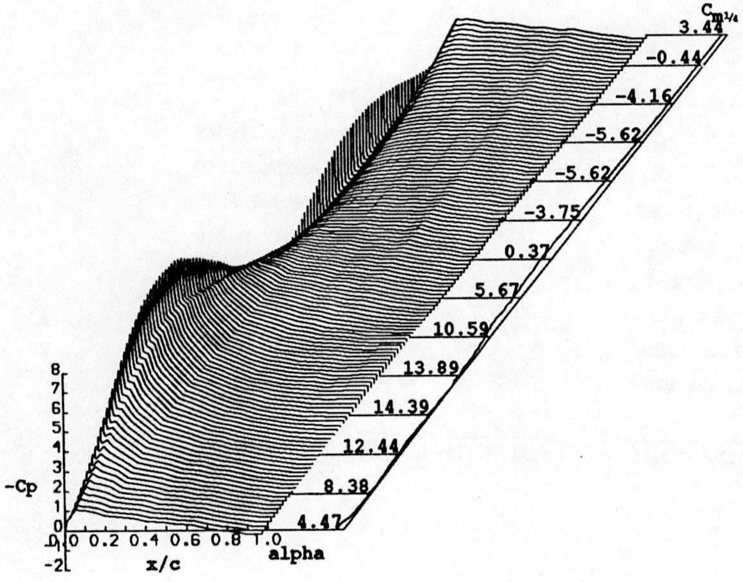
MACH NUMBER = 0.118

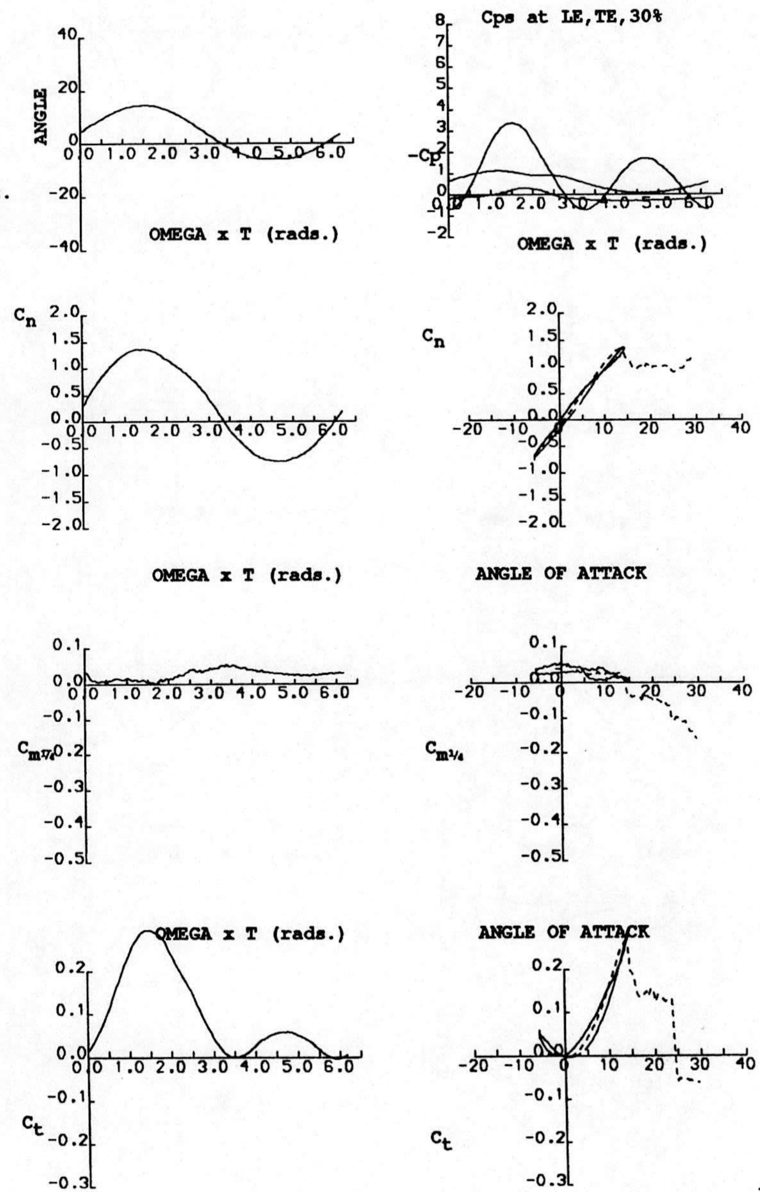
AIR TEMPERATURE = 30.0°C

SAMPLING FREQUENCY = 149.12 Hz.

REDUCED FREQUENCY = 0.049

AMPLITUDE = 10.00°

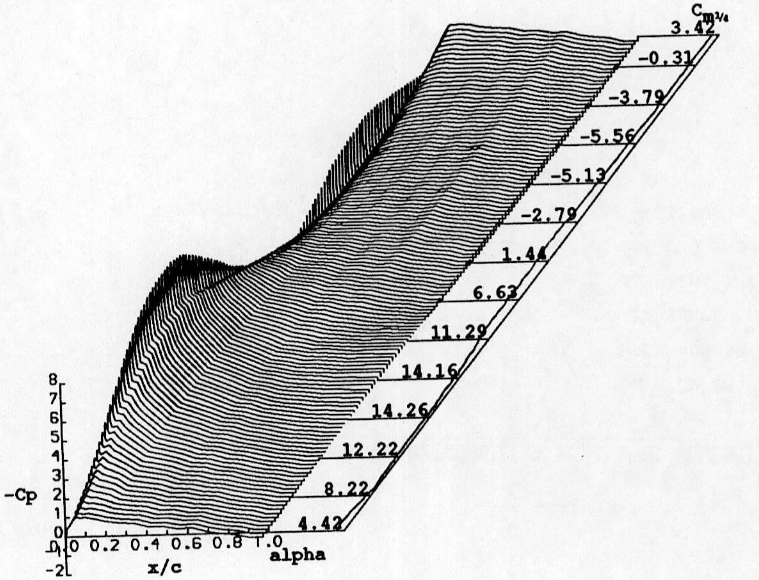


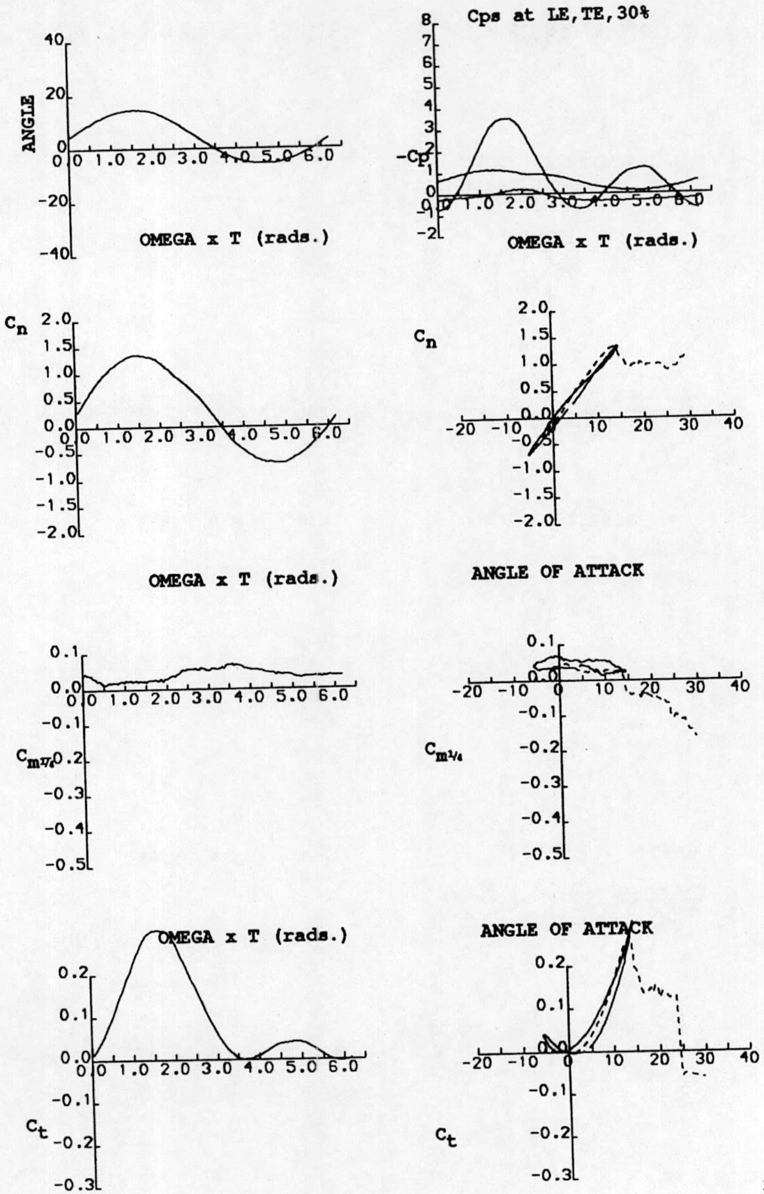


DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10391
REYNOLDS NUMBER = 1508093.
DYNAMIC PRESSURE = 989.94 Nm^{-2}
NUMBER OF CYCLES = 10
MOTION TYPE: SINUSOIDAL
MEAN ANGLE = 4.00°
OSCILLATION FREQUENCY = 1.747 Hz.
AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 7/3/86
MACH NUMBER = 0.113
AIR TEMPERATURE = 30.0°C
SAMPLING FREQUENCY = 223.61 Hz.
REDUCED FREQUENCY = 0.076
AMPLITUDE = 10.00°





DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10401

REYNOLDS NUMBER = 1488829.

DYNAMIC PRESSURE = 964.82 Nm^{-2}

NUMBER OF CYCLES = 10

MOTION TYPE: SINUSOIDAL

MEAN ANGLE = 4.00°

OSCILLATION FREQUENCY = 2.330 Hz.

AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 7/3/86

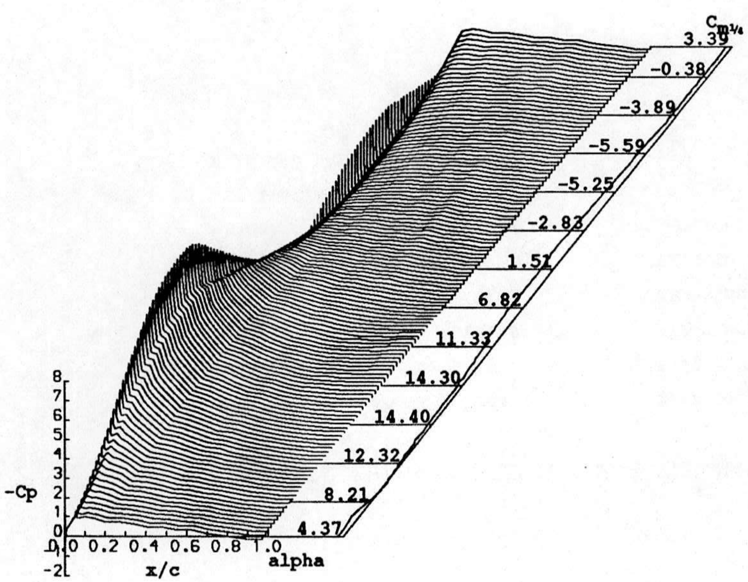
MACH NUMBER = 0.111

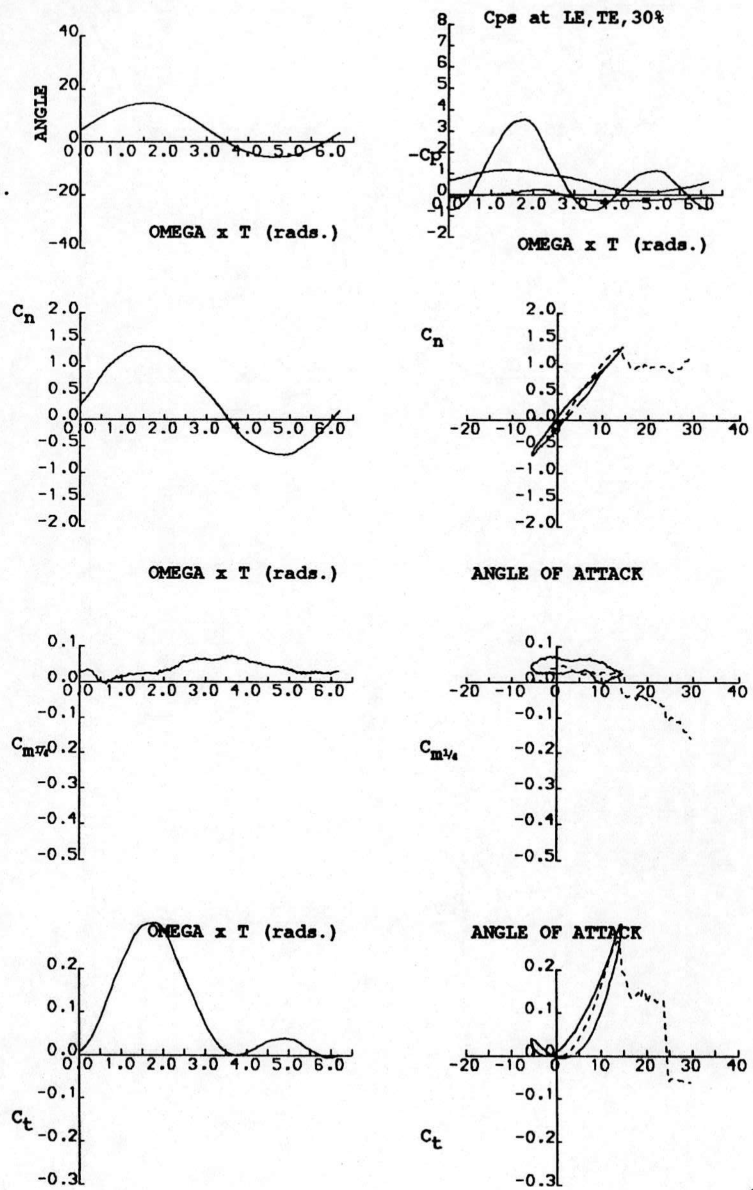
AIR TEMPERATURE = 30.0°C

SAMPLING FREQUENCY = 298.24 Hz.

REDUCED FREQUENCY = 0.103

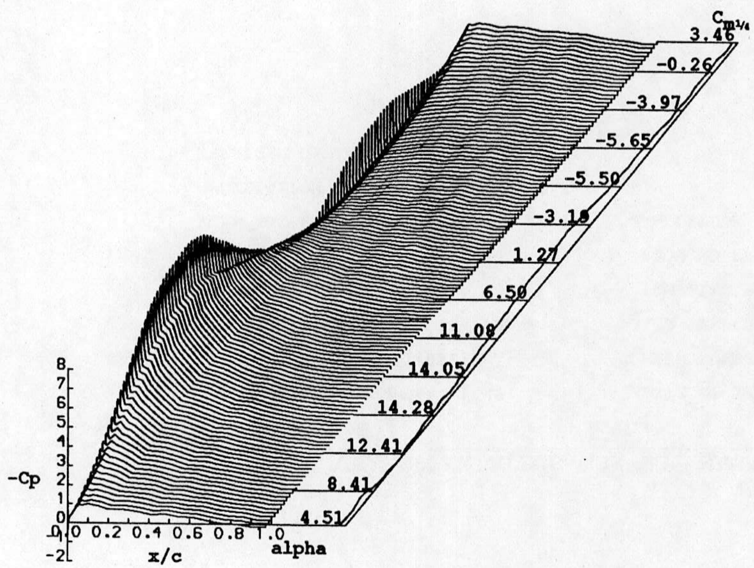
AMPLITUDE = 10.00°

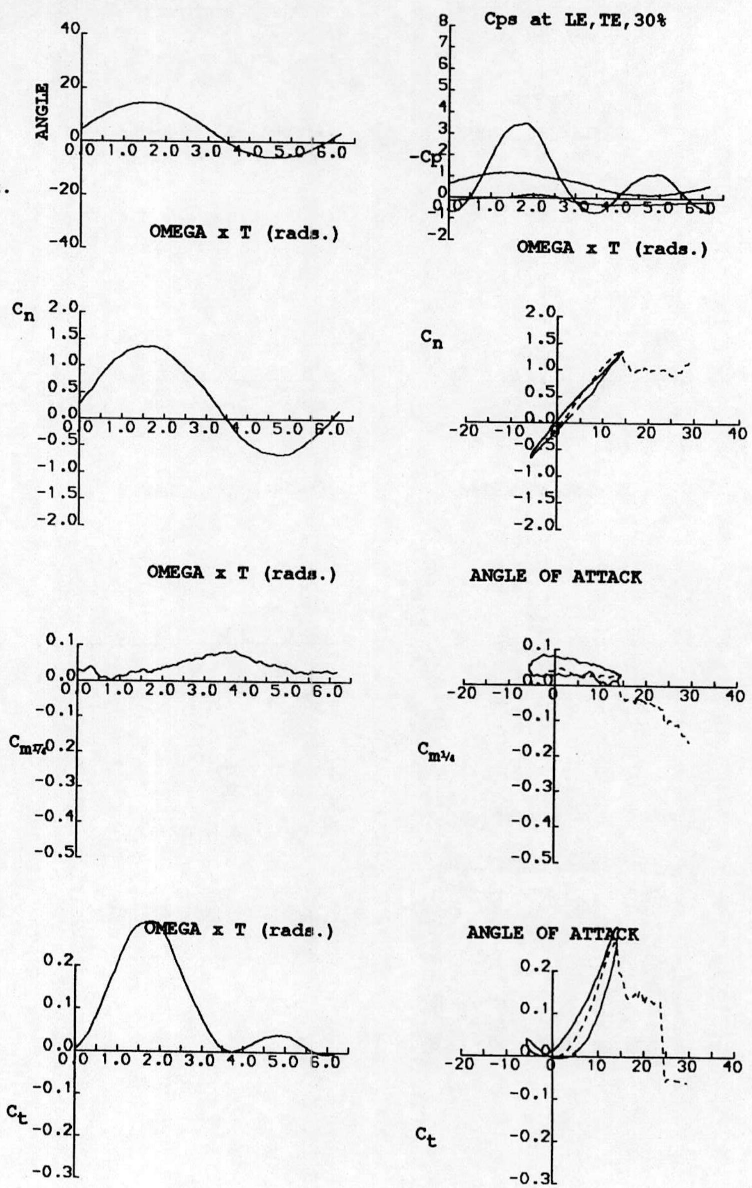




DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

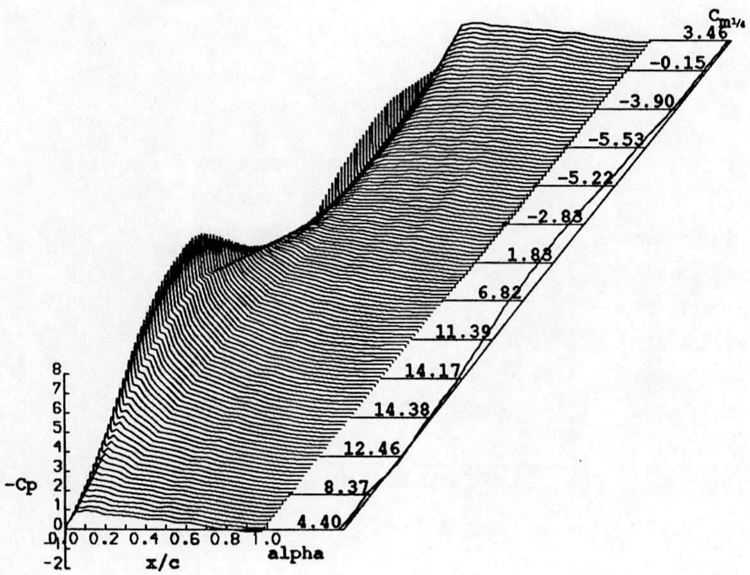
RUN REFERENCE NUMBER: 10411	DATE OF TEST: 7/3/86
REYNOLDS NUMBER = 1503855.	MACH NUMBER = 0.113
DYNAMIC PRESSURE = 984.39 Nm^{-2}	AIR TEMPERATURE = 30.0°C
NUMBER OF CYCLES = 10	SAMPLING FREQUENCY = 372.72 Hz.
MOTION TYPE: SINUSOIDAL	REDUCED FREQUENCY = 0.128
MEAN ANGLE = 4.00°	AMPLITUDE = 10.00°
OSCILLATION FREQUENCY = 2.912 Hz.	
AVERAGED DATA OF 10 CYCLES	

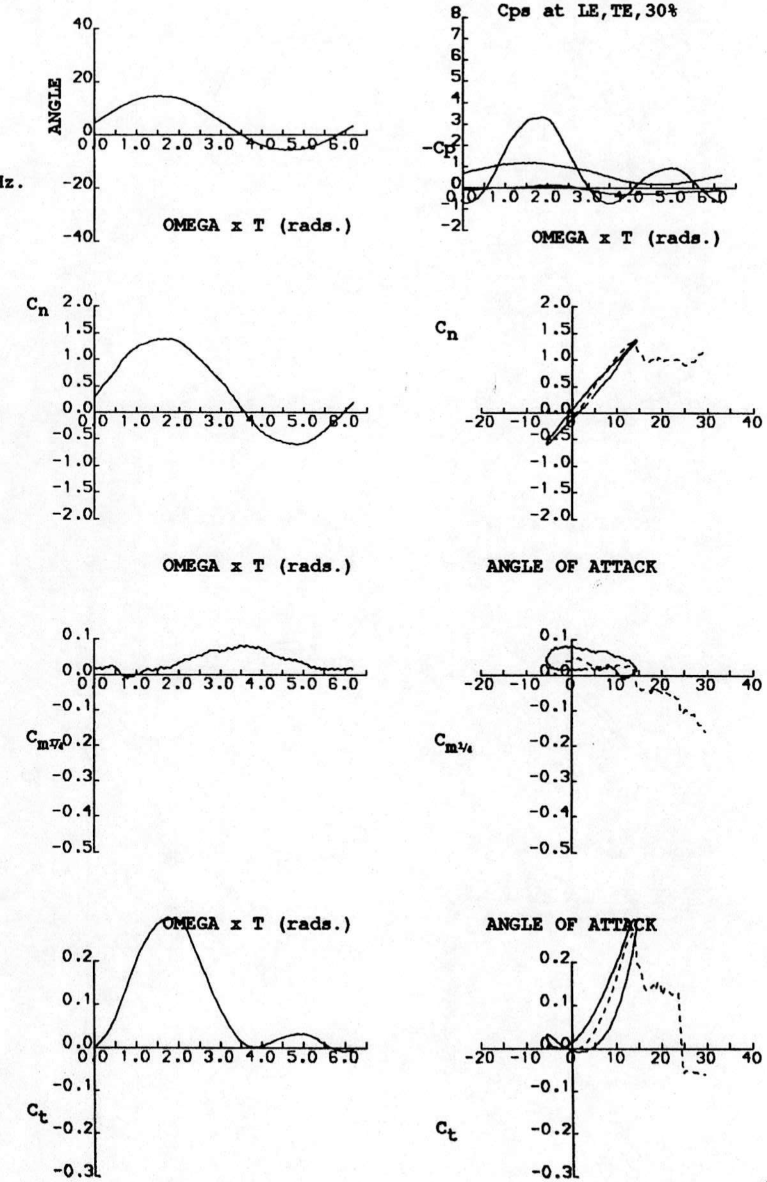




DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10421	DATE OF TEST: 7/3/86
REYNOLDS NUMBER = 1487724.	MACH NUMBER = 0.111
DYNAMIC PRESSURE = 963.38 Nm^{-2}	AIR TEMPERATURE = 30.0°C
NUMBER OF CYCLES = 10	SAMPLING FREQUENCY = 447.43 Hz.
MOTION TYPE: SINUSOIDAL	REDUCED FREQUENCY = 0.155
MEAN ANGLE = 4.00°	AMPLITUDE = 10.00°
OSCILLATION FREQUENCY = 3.496 Hz.	
AVERAGED DATA OF 10 CYCLES	





DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10431

REYNOLDS NUMBER = 1490373.

DYNAMIC PRESSURE = 966.82 Nm^{-2}

NUMBER OF CYCLES = 10

MOTION TYPE: SINUSOIDAL

MEAN ANGLE = 4.00°

OSCILLATION FREQUENCY = 4.078 Hz.

AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 7/3/86

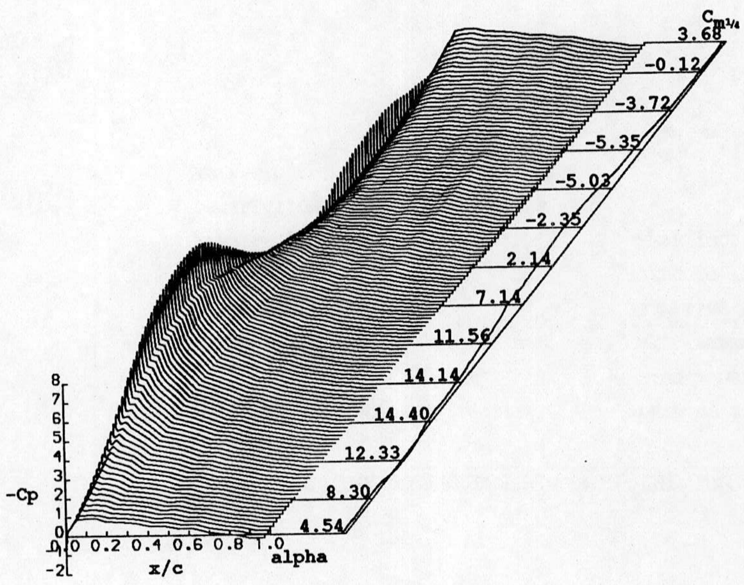
MACH NUMBER = 0.112

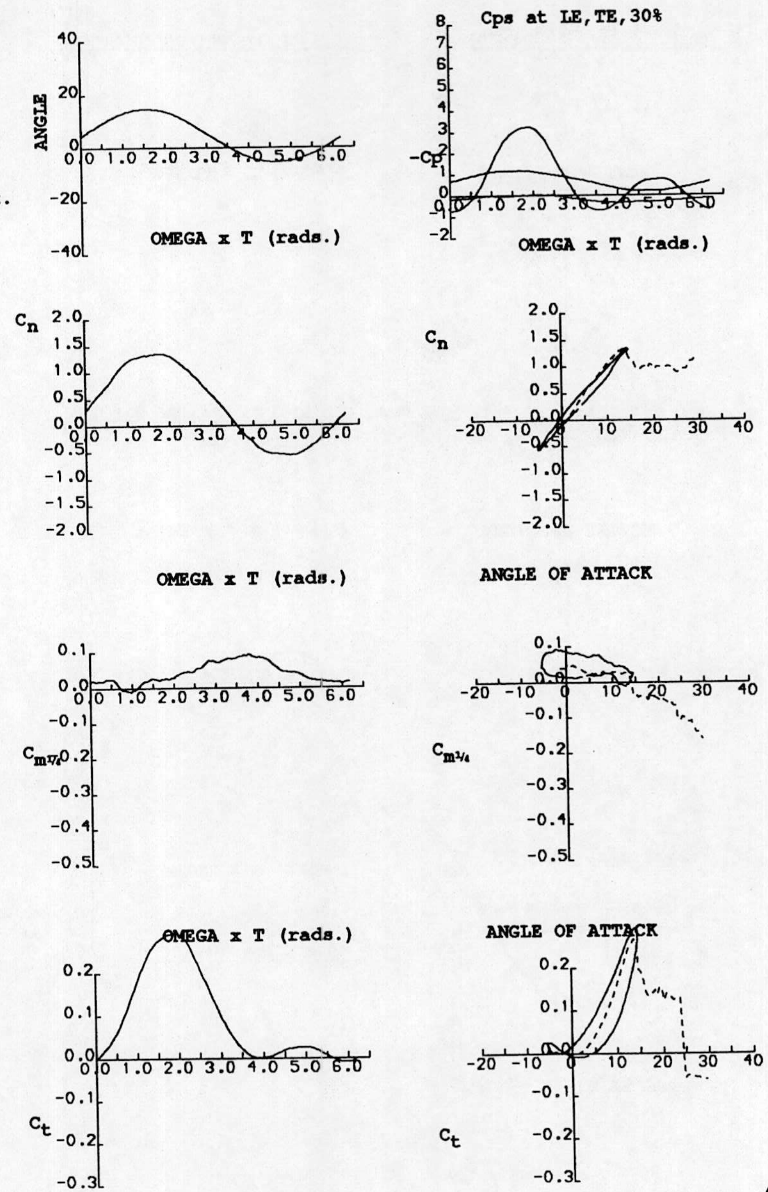
AIR TEMPERATURE = 30.0°C

SAMPLING FREQUENCY = 521.92 Hz.

REDUCED FREQUENCY = 0.181

AMPLITUDE = 10.00°





DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10451

REYNOLDS NUMBER = 1478627.

DYNAMIC PRESSURE = 957.98 Nm^{-2}

NUMBER OF CYCLES = 10

MOTION TYPE: SINUSOIDAL

MEAN ANGLE = 6.00°

OSCILLATION FREQUENCY = 0.582 Hz.

AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 12/3/86

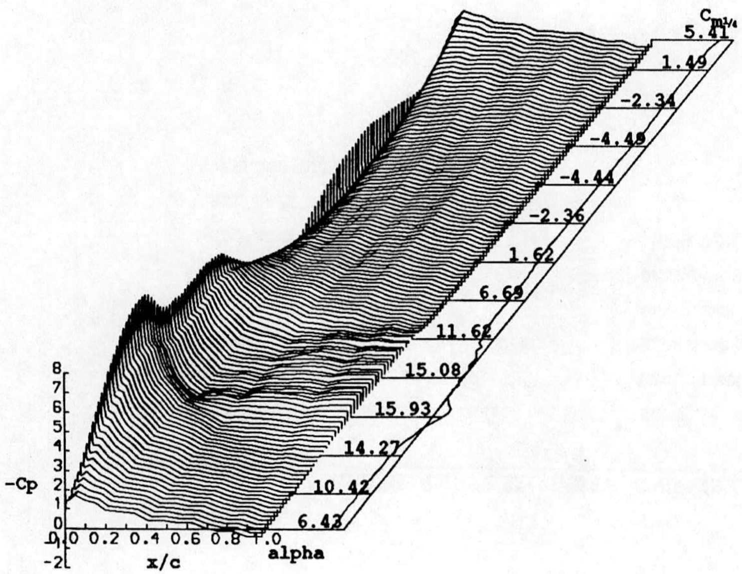
MACH NUMBER = 0.111

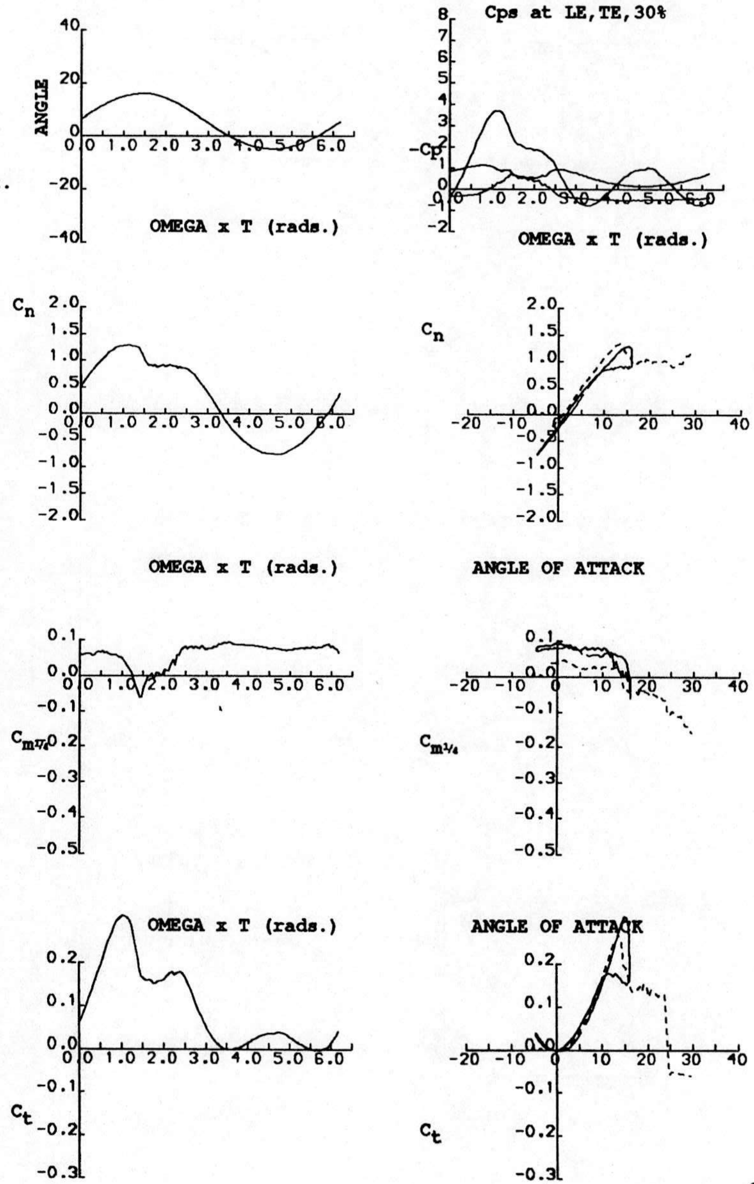
AIR TEMPERATURE = 30.0°C

SAMPLING FREQUENCY = 74.49 Hz.

REDUCED FREQUENCY = 0.026

AMPLITUDE = 10.00°

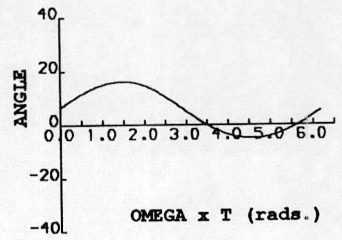


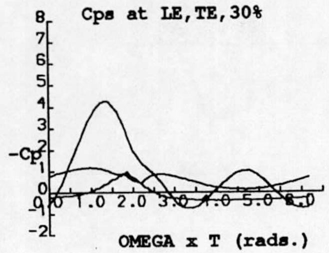


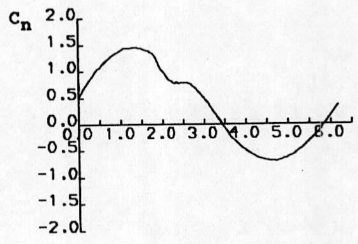
DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

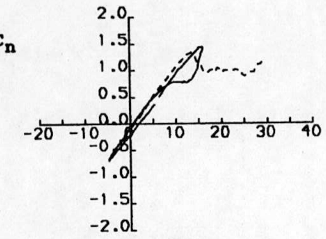
RUN REFERENCE NUMBER: 10461
REYNOLDS NUMBER = 1469549.
DYNAMIC PRESSURE = 946.26 Nm^{-2}
NUMBER OF CYCLES = 10
MOTION TYPE: SINUSOIDAL
MEAN ANGLE = 6.00°
OSCILLATION FREQUENCY = 1.165 Hz.
AVERAGED DATA OF 10 CYCLES

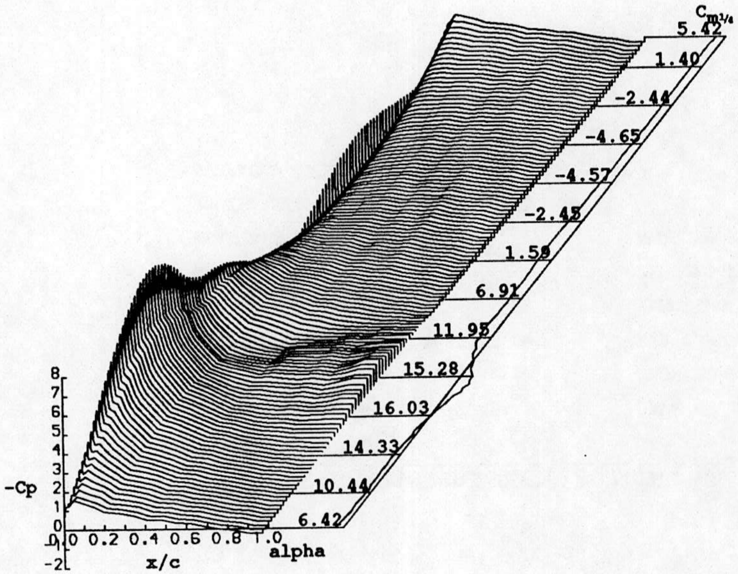
DATE OF TEST: 12/3/86
MACH NUMBER = 0.111
AIR TEMPERATURE = 30.0°C
SAMPLING FREQUENCY = 149.12 Hz.
REDUCED FREQUENCY = 0.052
AMPLITUDE = 10.00°

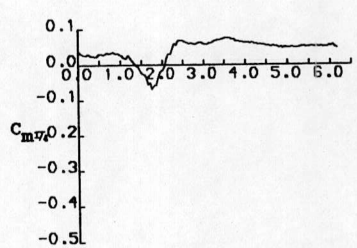


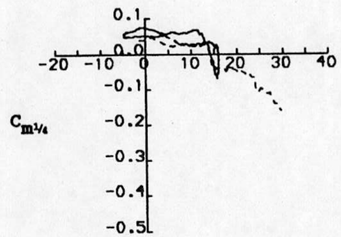


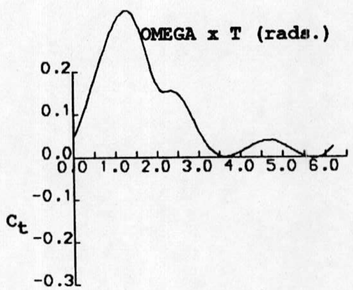


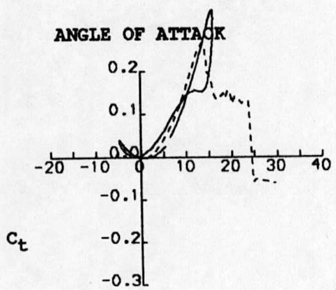








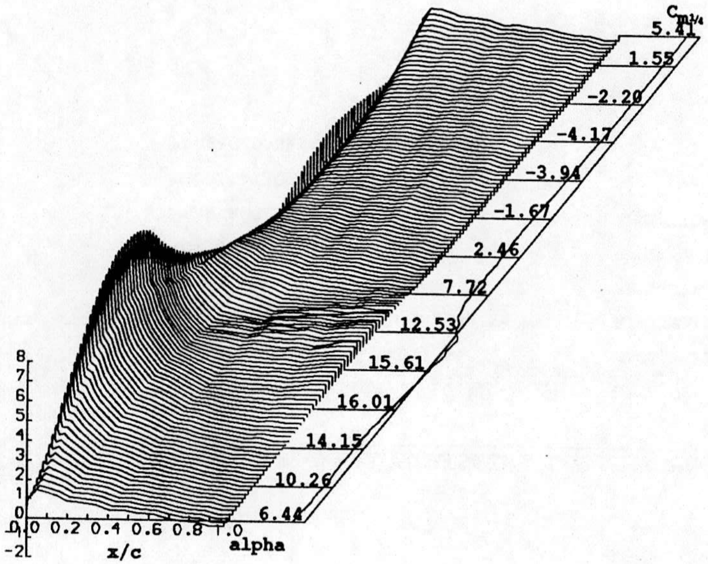


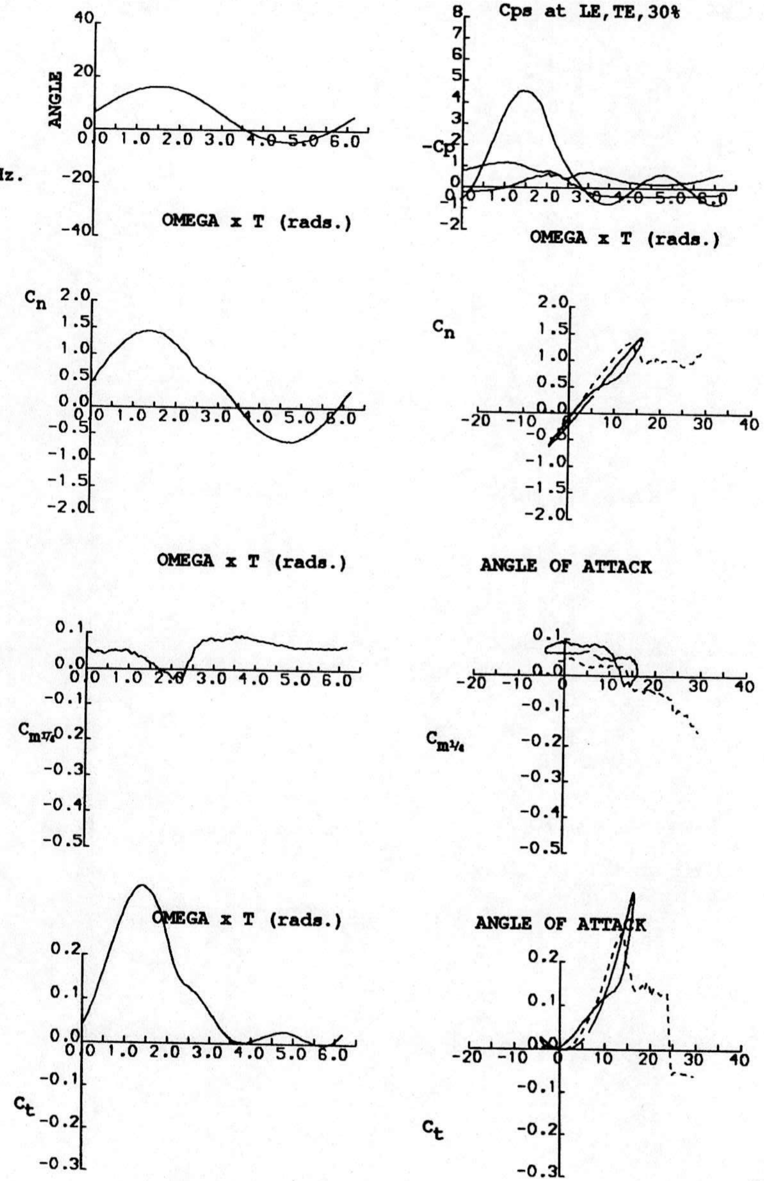


DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10471
REYNOLDS NUMBER = 1483809.
DYNAMIC PRESSURE = 964.71 Nm^{-2}
NUMBER OF CYCLES = 10
MOTION TYPE: SINUSOIDAL
MEAN ANGLE = 6.00°
OSCILLATION FREQUENCY = 1.747 Hz.
AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 12/3/86
MACH NUMBER = 0.112
AIR TEMPERATURE = 30.0°C
SAMPLING FREQUENCY = 223.61 Hz.
REDUCED FREQUENCY = 0.077
AMPLITUDE = 10.00°





DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10481

REYNOLDS NUMBER = 1481786.

DYNAMIC PRESSURE = 962.08 Nm^{-2}

NUMBER OF CYCLES = 10

MOTION TYPE: SINUSOIDAL

MEAN ANGLE = 6.00°

OSCILLATION FREQUENCY = 2.330 Hz.

AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 12/3/86

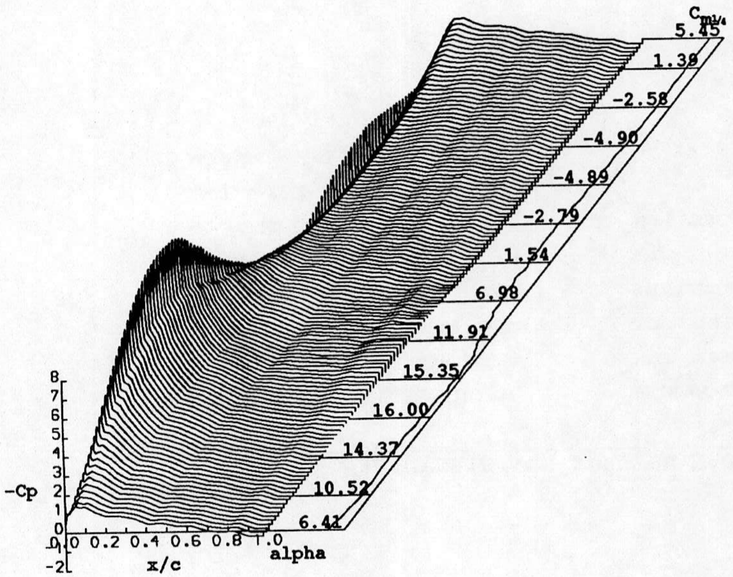
MACH NUMBER = 0.112

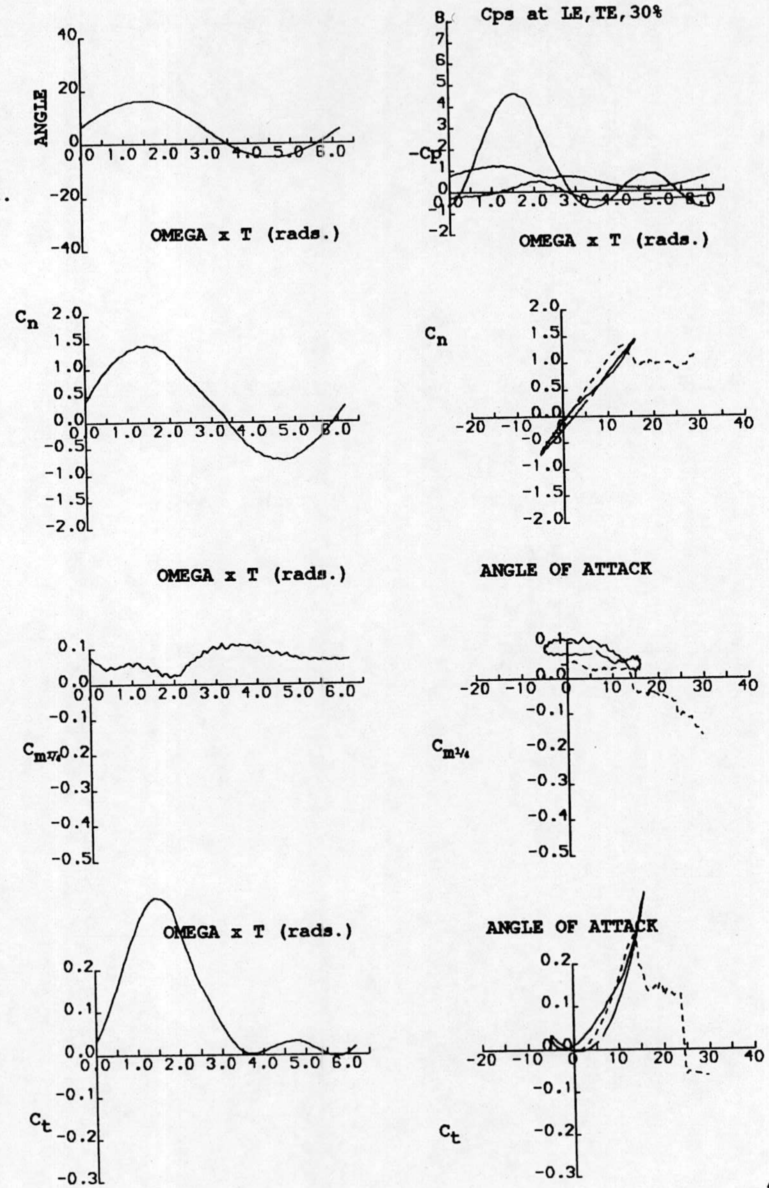
AIR TEMPERATURE = 30.0°C

SAMPLING FREQUENCY = 298.24 Hz.

REDUCED FREQUENCY = 0.103

AMPLITUDE = 10.00°





DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10491

REYNOLDS NUMBER = 1464445.

DYNAMIC PRESSURE = 939.69 Nm^{-2}

NUMBER OF CYCLES = 10

MOTION TYPE: SINUSOIDAL

MEAN ANGLE = 6.00°

OSCILLATION FREQUENCY = 2.912 Hz.

AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 12/3/86

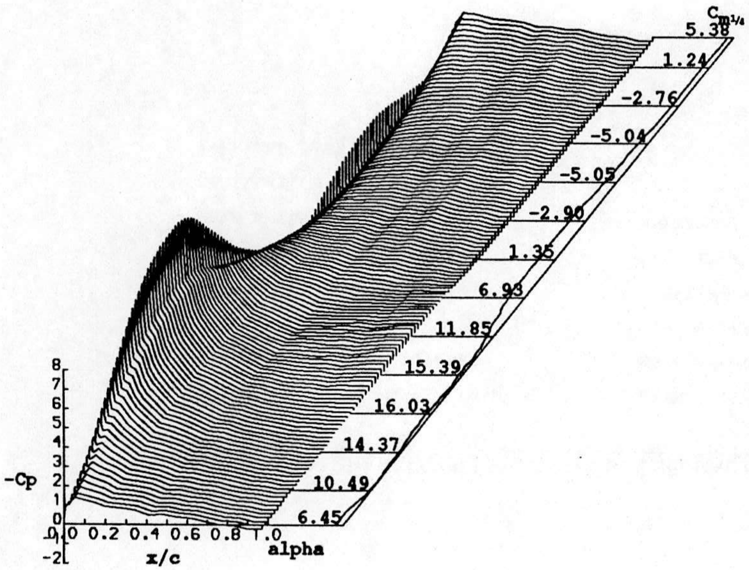
MACH NUMBER = 0.110

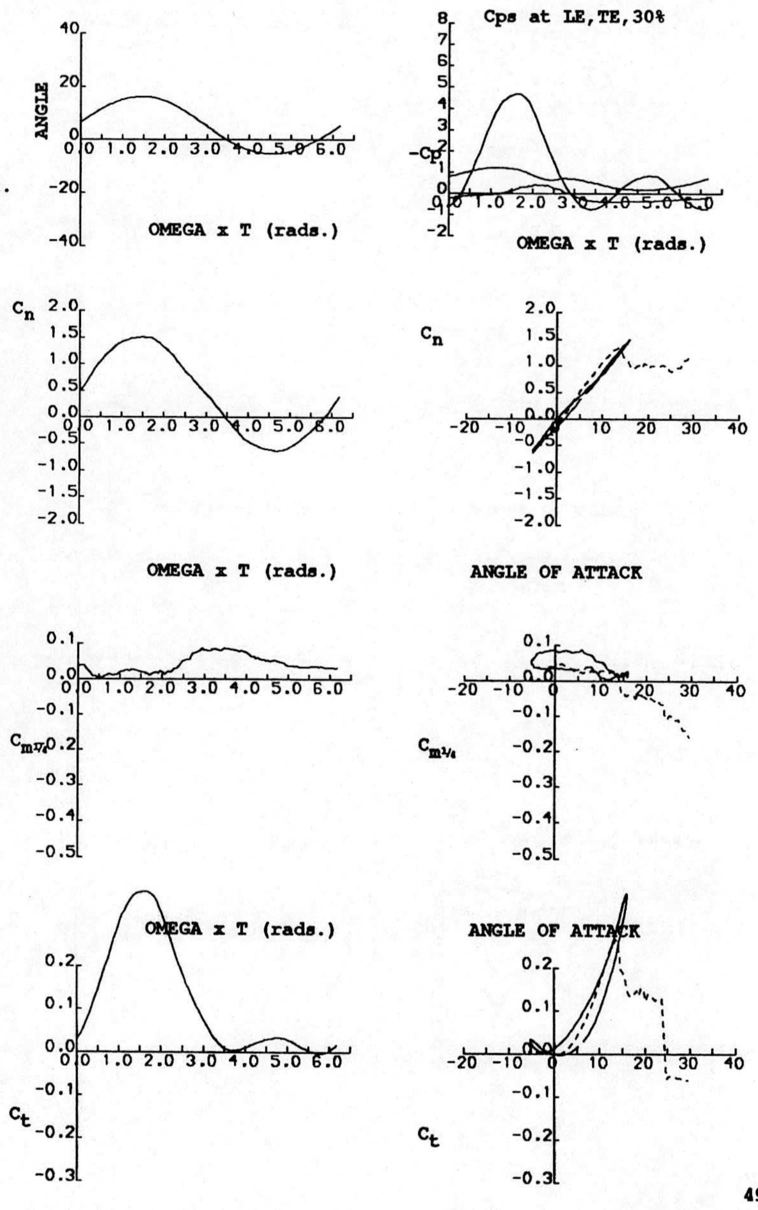
AIR TEMPERATURE = 30.0°C

SAMPLING FREQUENCY = 372.72 Hz.

REDUCED FREQUENCY = 0.130

AMPLITUDE = 10.00°





DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10501

REYNOLDS NUMBER = 1478587.

DYNAMIC PRESSURE = 957.93 Nm^{-2}

NUMBER OF CYCLES = 10

MOTION TYPE: SINUSOIDAL

MEAN ANGLE = 6.00°

OSCILLATION FREQUENCY = 3.496 Hz.

AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 12/3/86

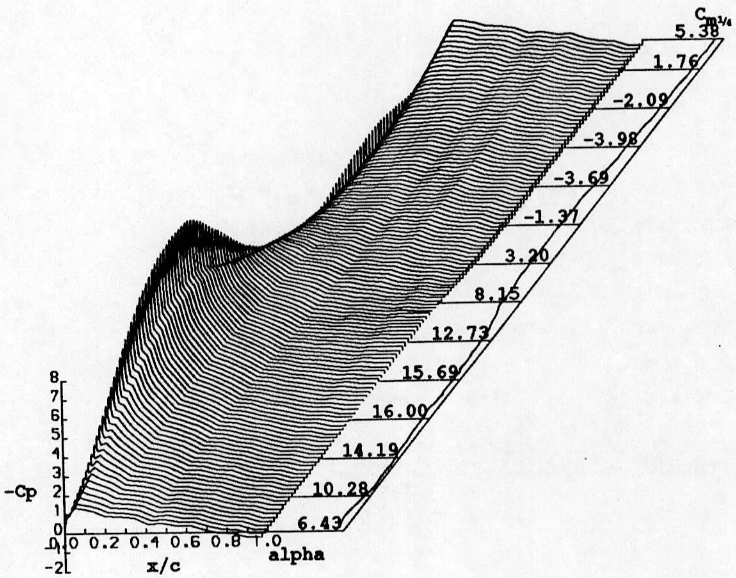
MACH NUMBER = 0.111

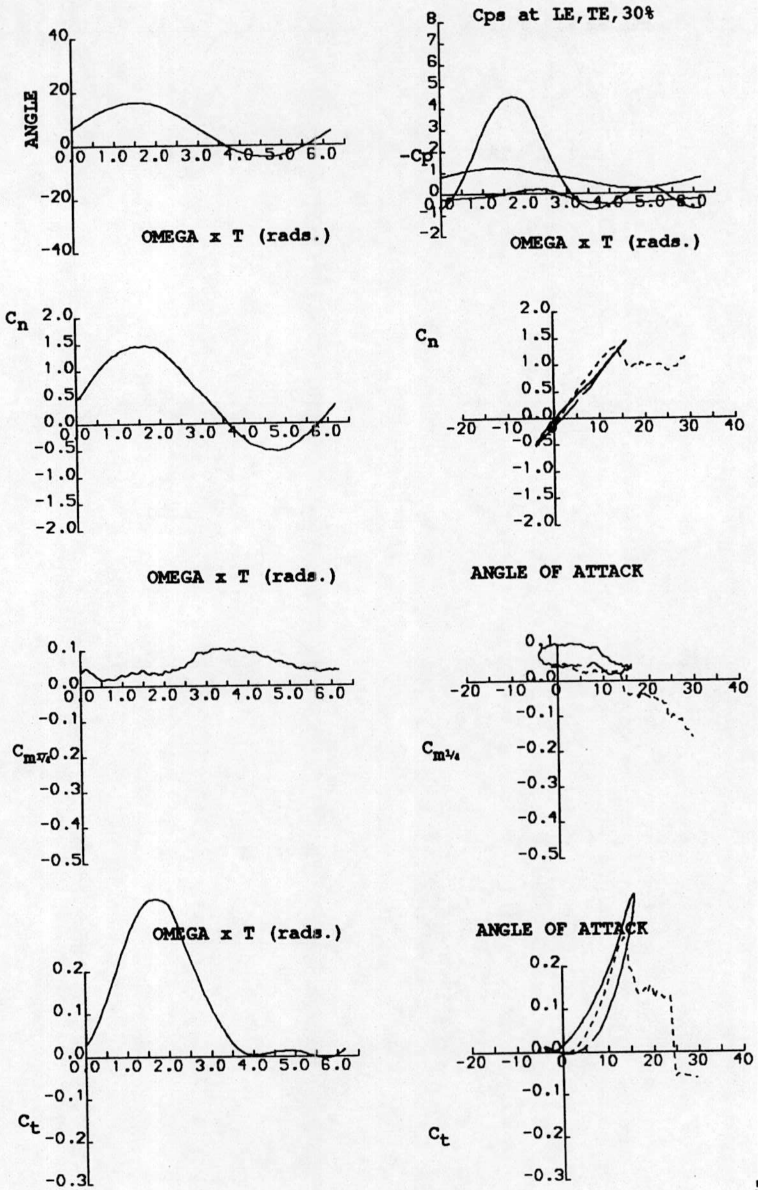
AIR TEMPERATURE = 30.0°C

SAMPLING FREQUENCY = 447.43 Hz.

REDUCED FREQUENCY = 0.155

AMPLITUDE = 10.00°





DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10511

REYNOLDS NUMBER = 1485515.

DYNAMIC PRESSURE = 966.93 Nm^{-2}

NUMBER OF CYCLES = 10

MOTION TYPE: SINUSOIDAL

MEAN ANGLE = 6.00°

OSCILLATION FREQUENCY = 4.078 Hz.

AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 12/3/86

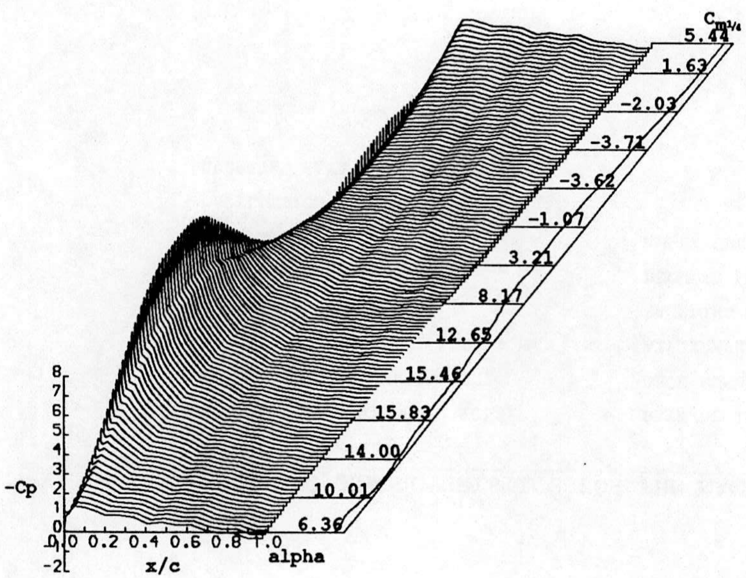
MACH NUMBER = 0.112

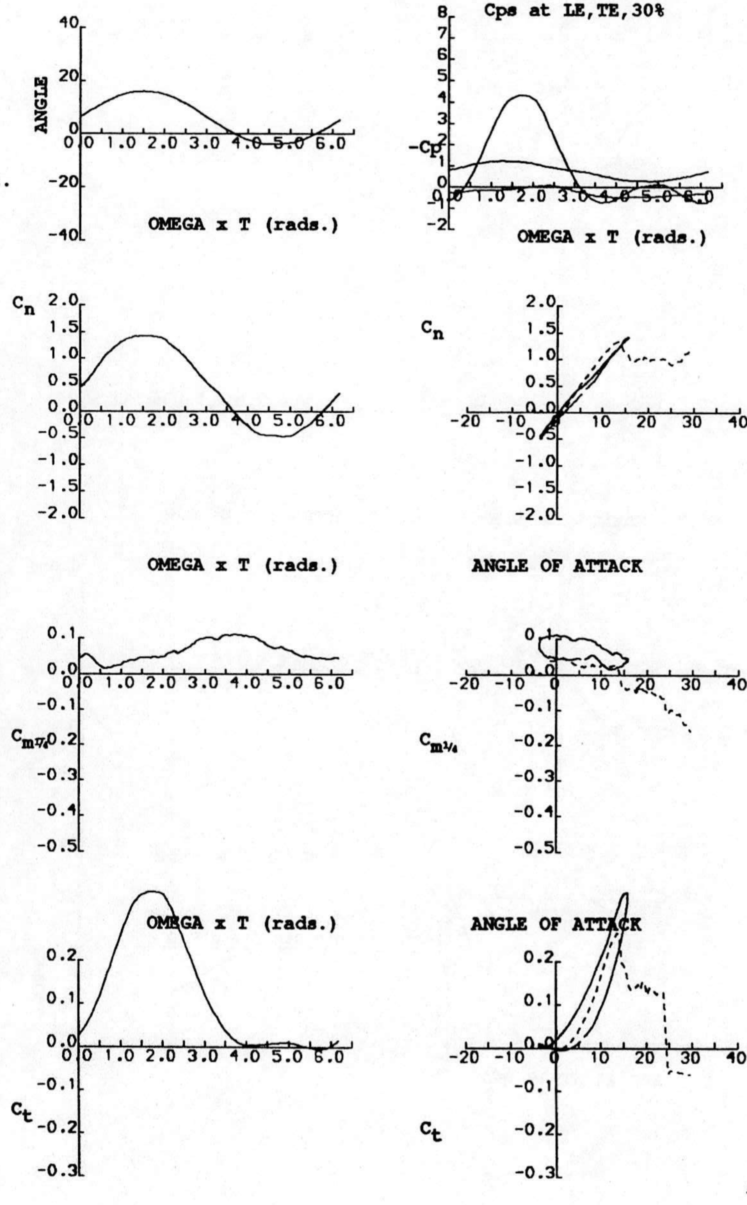
AIR TEMPERATURE = 30.0°C

SAMPLING FREQUENCY = 521.92 Hz.

REDUCED FREQUENCY = 0.180

AMPLITUDE = 10.00°

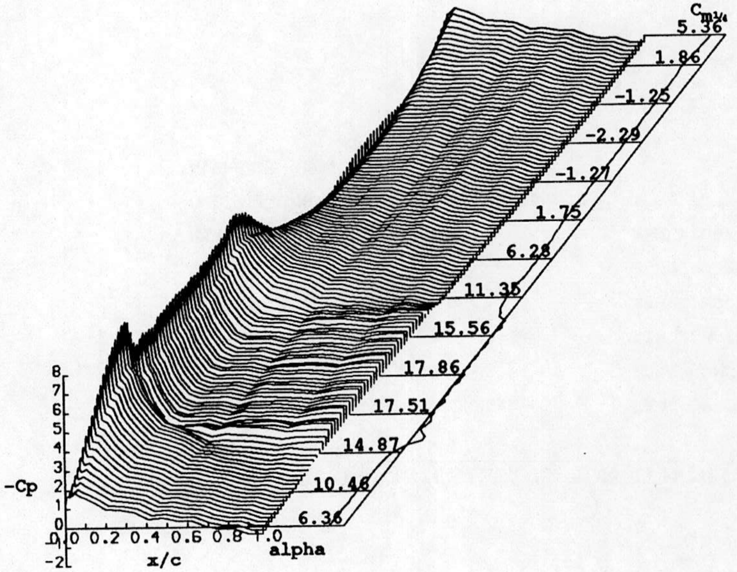


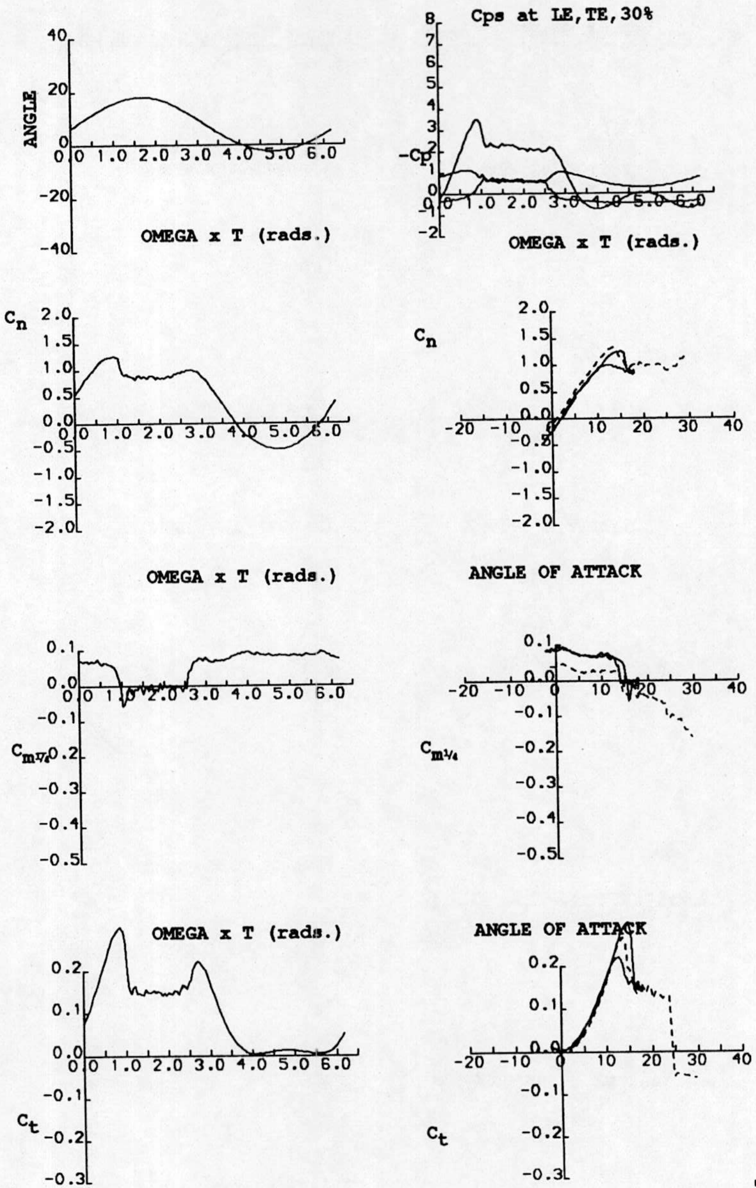


DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10521
REYNOLDS NUMBER = 1498052.
DYNAMIC PRESSURE = 976.81 Nm^{-2}
NUMBER OF CYCLES = 10
MOTION TYPE: SINUSOIDAL
MEAN ANGLE = 8.00°
OSCILLATION FREQUENCY = 0.233 Hz.
AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 12/3/86
MACH NUMBER = 0.112
AIR TEMPERATURE = 30.0°C
SAMPLING FREQUENCY = 29.82 Hz.
REDUCED FREQUENCY = 0.010
AMPLITUDE = 10.00°





DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10531

REYNOLDS NUMBER = 1459022.

DYNAMIC PRESSURE = 932.75 Nm^{-2}

NUMBER OF CYCLES = 10

MOTION TYPE: SINUSOIDAL

MEAN ANGLE = 8.00°

OSCILLATION FREQUENCY = 0.582 Hz.

AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 12/3/86

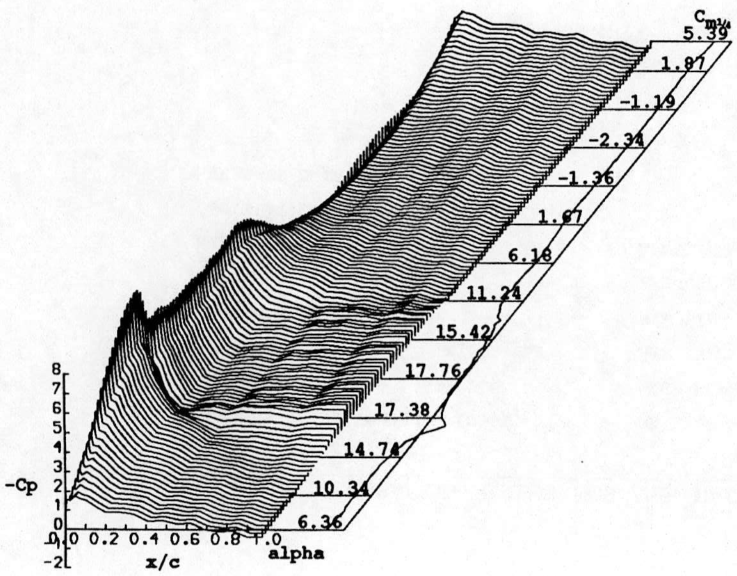
MACH NUMBER = 0.110

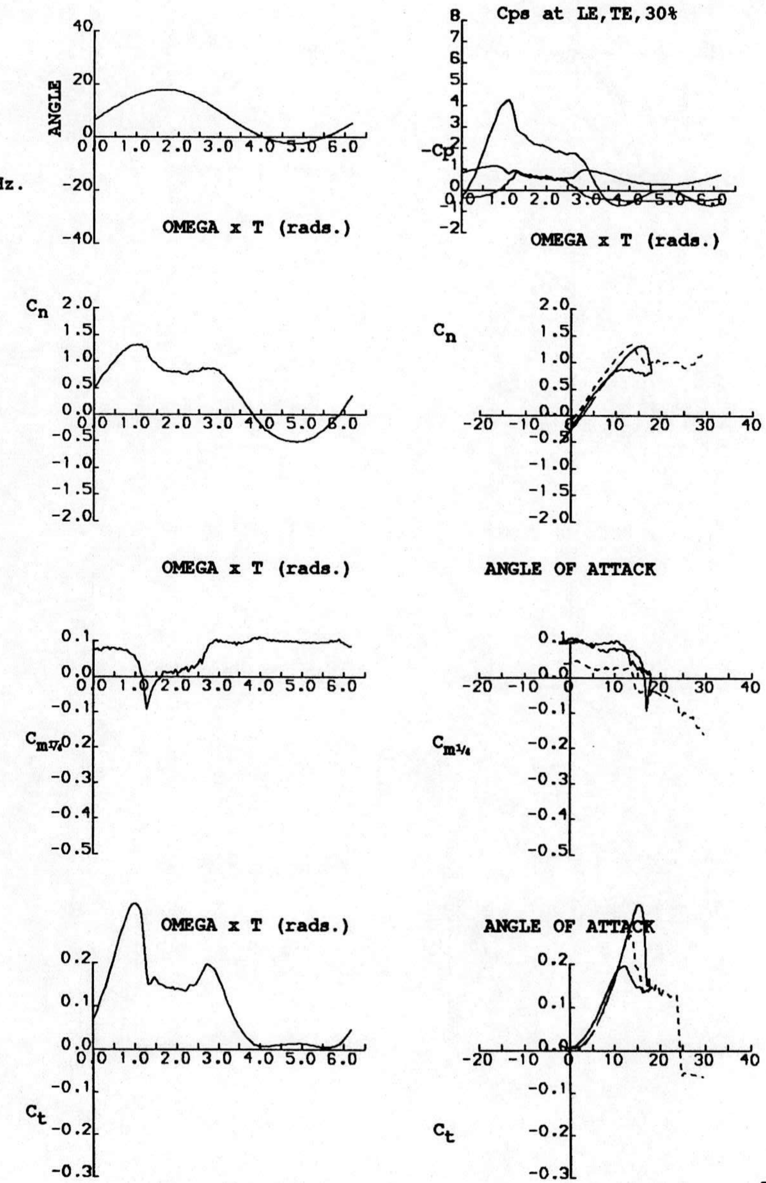
AIR TEMPERATURE = 30.0°C

SAMPLING FREQUENCY = 74.49 Hz.

REDUCED FREQUENCY = 0.026

AMPLITUDE = 10.00°





DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10561

REYNOLDS NUMBER = 1466227.

DYNAMIC PRESSURE = 941.98 Nm^{-2}

NUMBER OF CYCLES = 10

MOTION TYPE: SINUSOIDAL

MEAN ANGLE = 8.00°

OSCILLATION FREQUENCY = 2.330 Hz.

AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 12/3/86

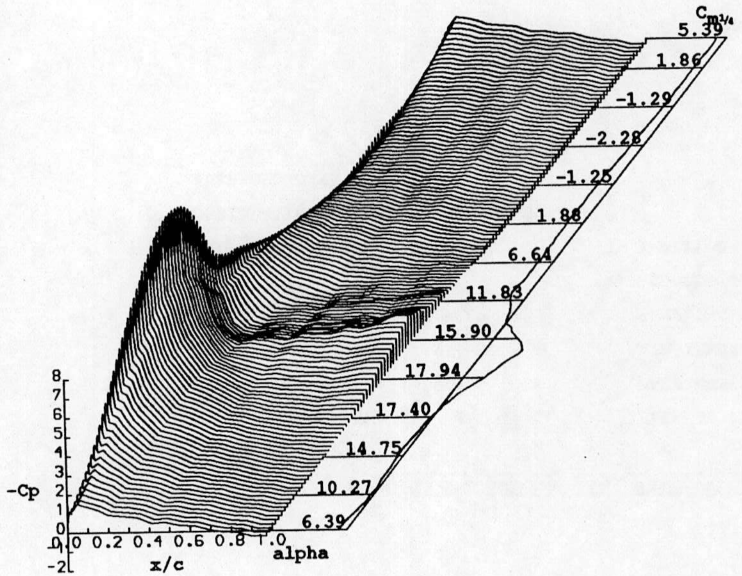
MACH NUMBER = 0.110

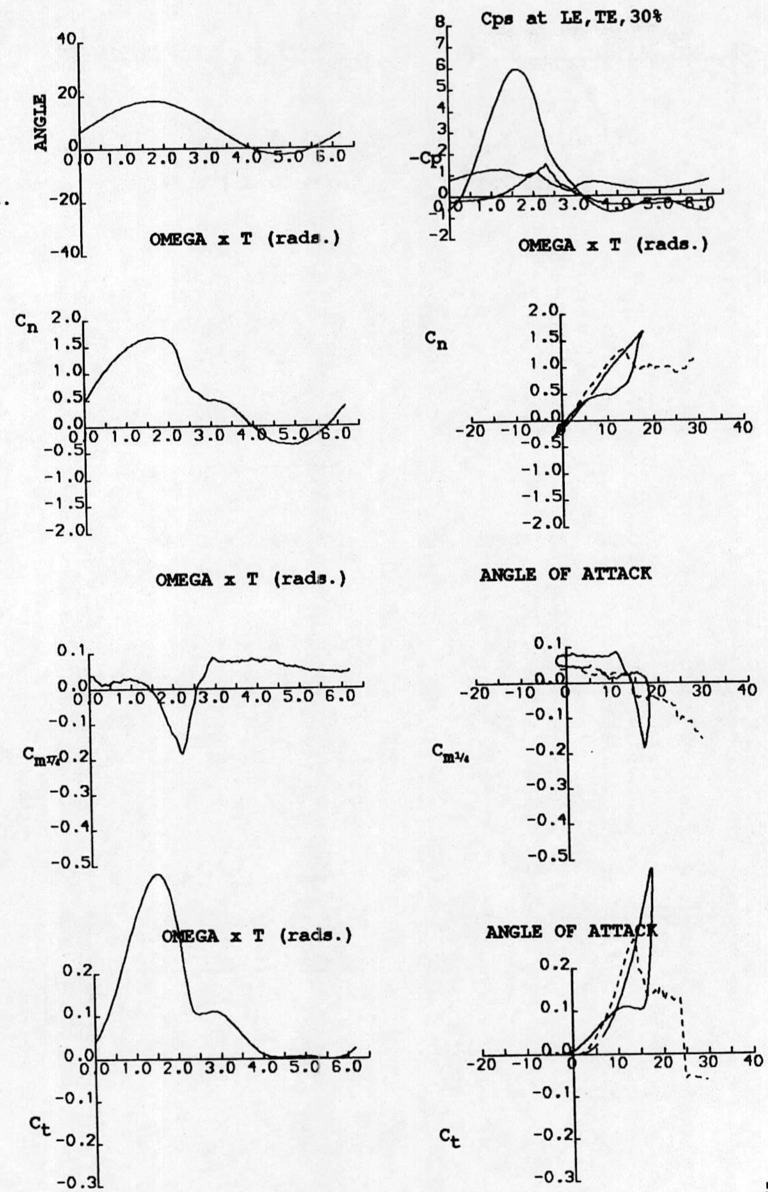
AIR TEMPERATURE = 30.0°C

SAMPLING FREQUENCY = 298.24 Hz.

REDUCED FREQUENCY = 0.104

AMPLITUDE = 10.00°

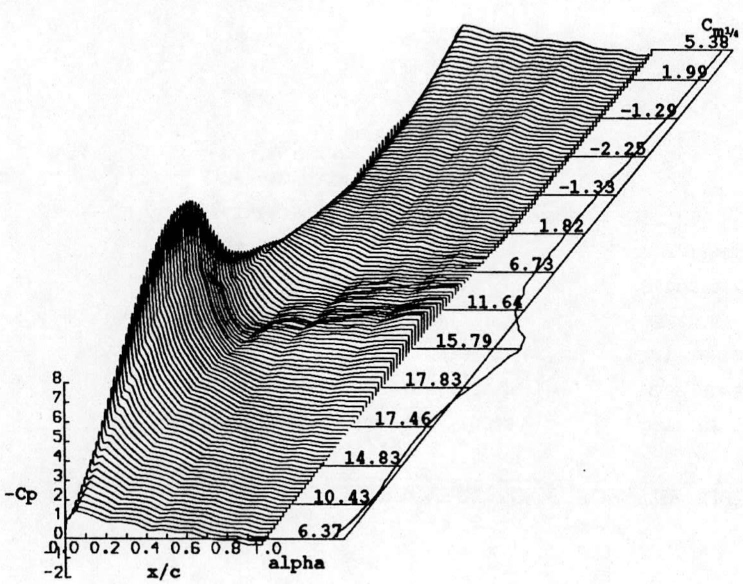


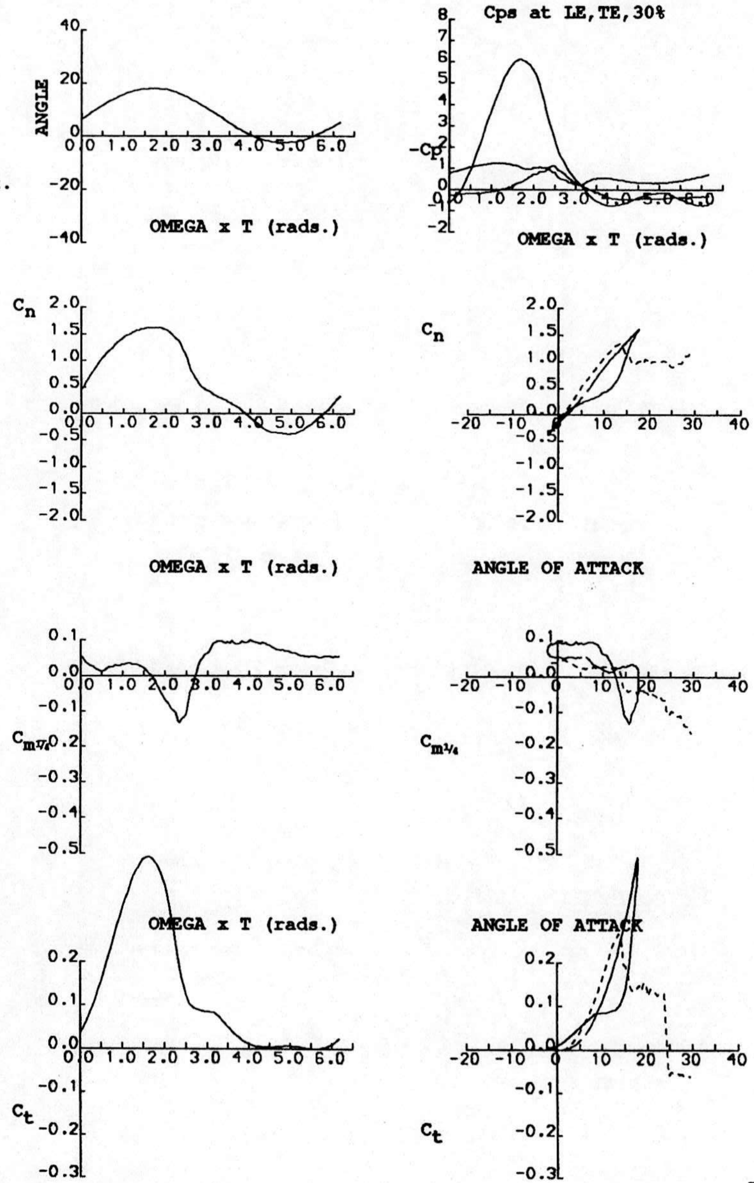


DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10571
REYNOLDS NUMBER = 1485188.
DYNAMIC PRESSURE = 966.50 Nm^{-2}
NUMBER OF CYCLES = 10
MOTION TYPE: SINUSOIDAL
MEAN ANGLE = 8.00°
OSCILLATION FREQUENCY = 2.912 Hz.
AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 12/3/86
MACH NUMBER = 0.112
AIR TEMPERATURE = 30.0°C
SAMPLING FREQUENCY = 372.72 Hz.
REDUCED FREQUENCY = 0.129
AMPLITUDE = 10.00°





DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10581

REYNOLDS NUMBER = 1459663.

DYNAMIC PRESSURE = 933.57 Nm^{-2}

NUMBER OF CYCLES = 10

MOTION TYPE: SINUSOIDAL

MEAN ANGLE = 8.00°

OSCILLATION FREQUENCY = 3.496 Hz.

AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 12/3/86

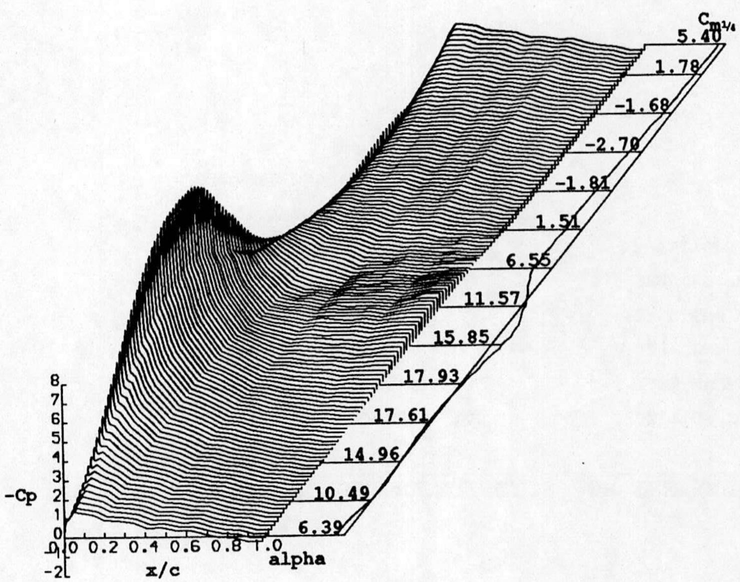
MACH NUMBER = 0.110

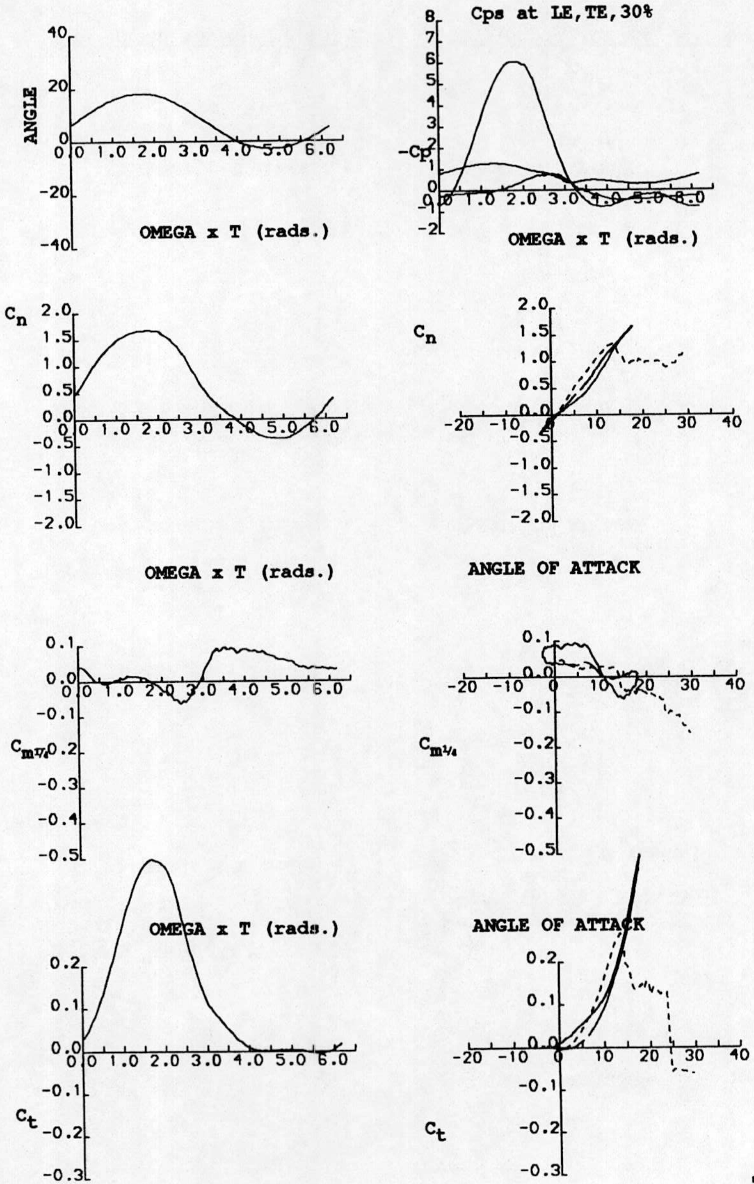
AIR TEMPERATURE = 30.0°C

SAMPLING FREQUENCY = 447.43 Hz.

REDUCED FREQUENCY = 0.157

AMPLITUDE = 10.00°





DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10591

REYNOLDS NUMBER = 1463557.

DYNAMIC PRESSURE = 938.55 Nm^{-2}

NUMBER OF CYCLES = 10

MOTION TYPE: SINUSOIDAL

MEAN ANGLE = 8.00°

OSCILLATION FREQUENCY = 4.078 Hz.

AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 12/3/86

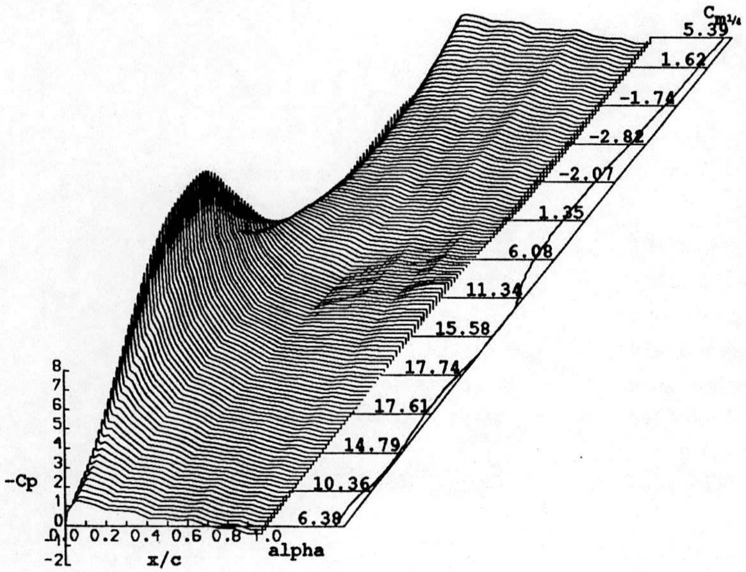
MACH NUMBER = 0.110

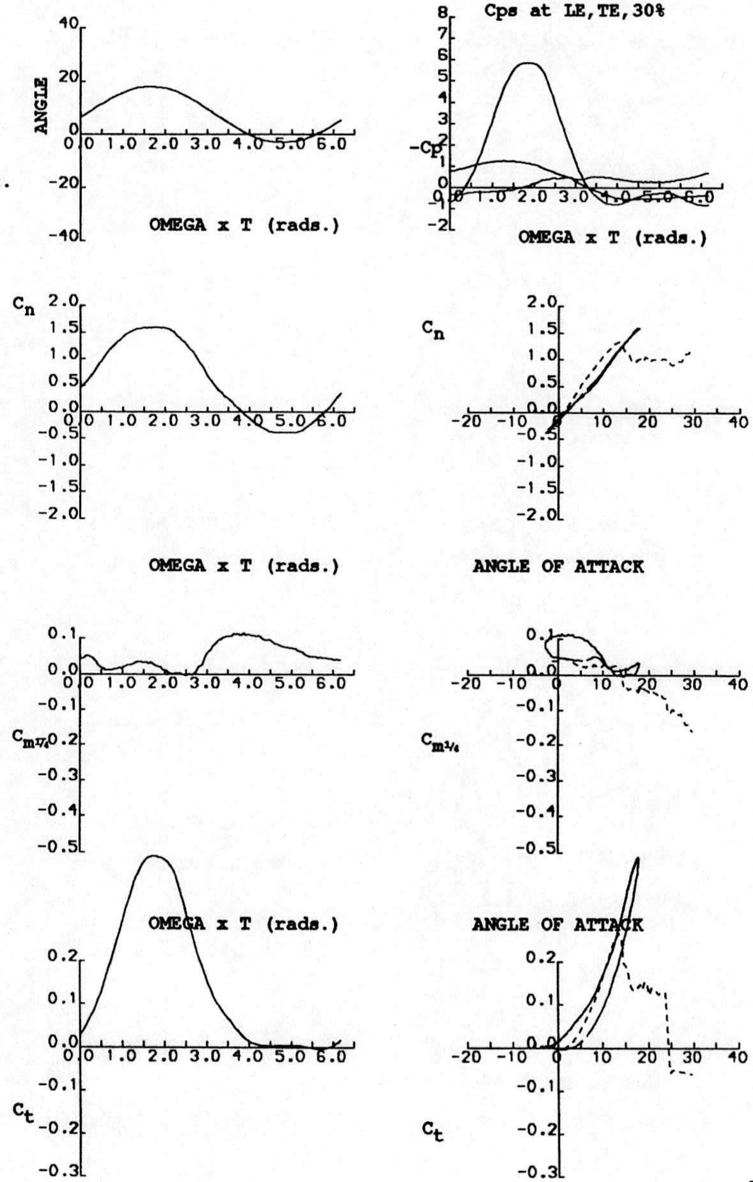
AIR TEMPERATURE = 30.0°C

SAMPLING FREQUENCY = 521.92 Hz.

REDUCED FREQUENCY = 0.183

AMPLITUDE = 10.00°





DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10601

REYNOLDS NUMBER = 1467310.

DYNAMIC PRESSURE = 937.13 Nm^{-2}

NUMBER OF CYCLES = 10

MOTION TYPE: SINUSOIDAL

MEAN ANGLE = 15.00°

OSCILLATION FREQUENCY = 0.233 Hz.

AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 14/3/86

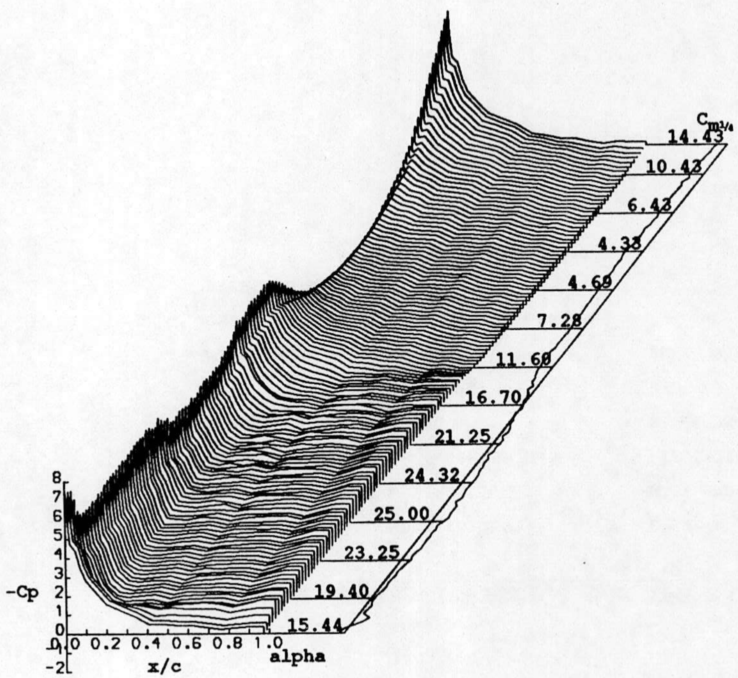
MACH NUMBER = 0.110

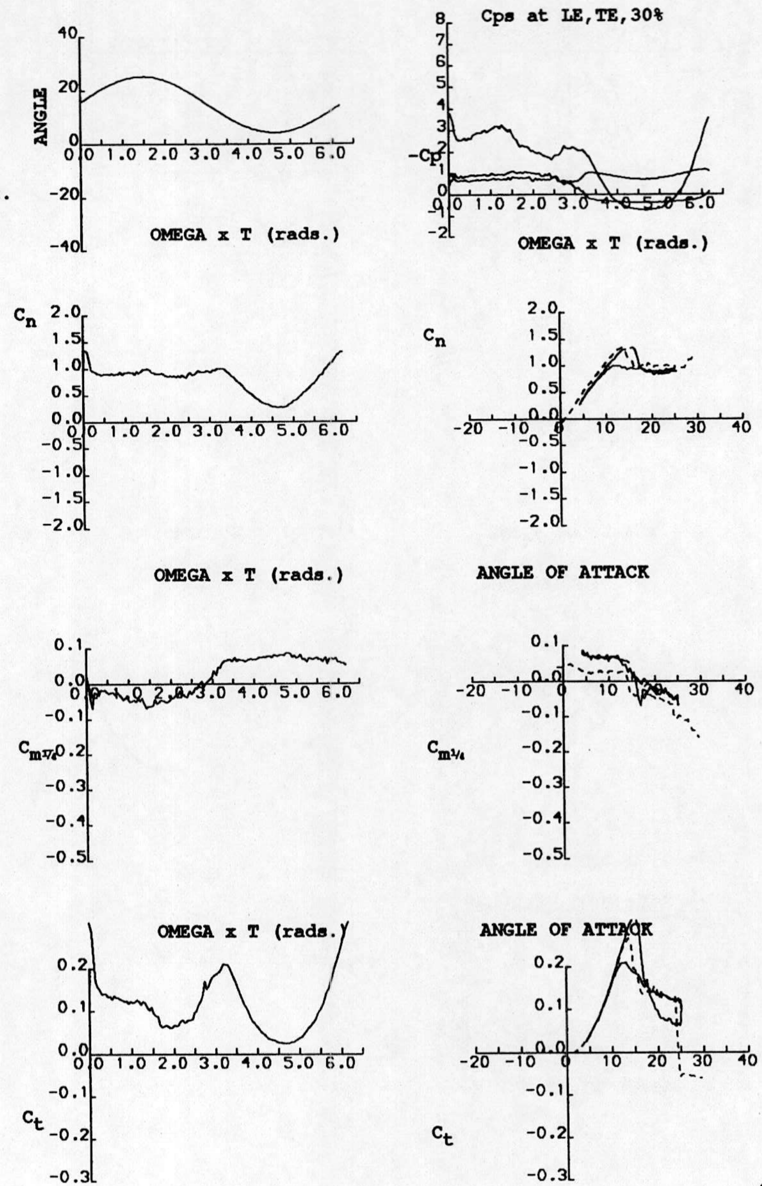
AIR TEMPERATURE = 30.0°C

SAMPLING FREQUENCY = 29.82 Hz.

REDUCED FREQUENCY = 0.010

AMPLITUDE = 10.00°





DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10611

REYNOLDS NUMBER = 1459166.

DYNAMIC PRESSURE = 932.93 Nm^{-2}

NUMBER OF CYCLES = 10

MOTION TYPE: SINUSOIDAL

MEAN ANGLE = 15.00°

OSCILLATION FREQUENCY = 0.582 Hz.

AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 14/3/86

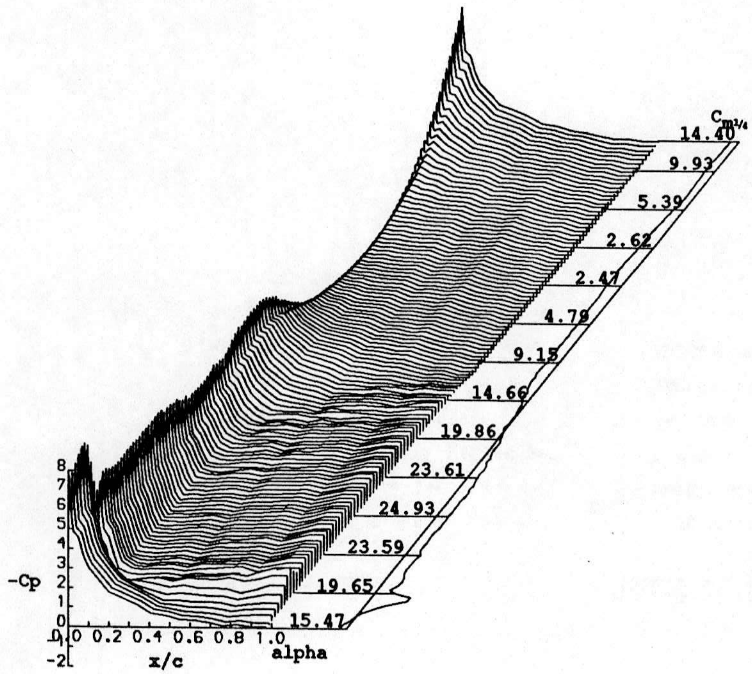
MACH NUMBER = 0.110

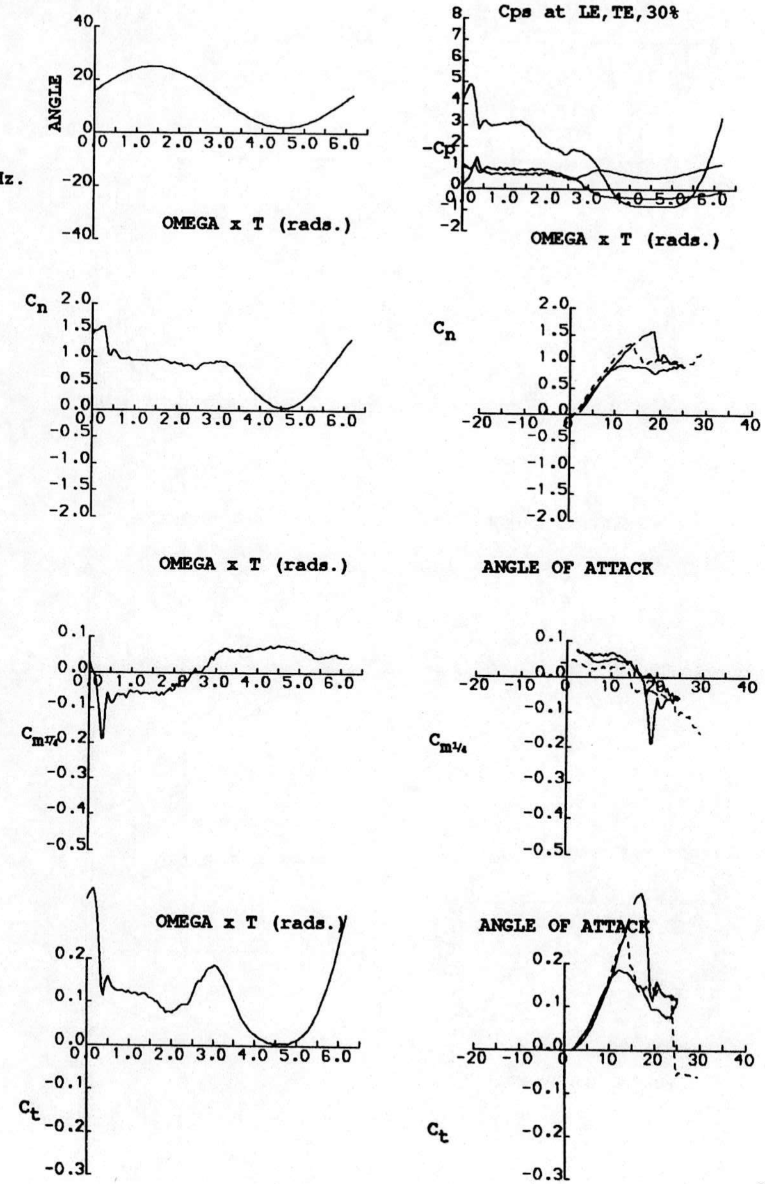
AIR TEMPERATURE = 30.0°C

SAMPLING FREQUENCY = 74.49 Hz.

REDUCED FREQUENCY = 0.026

AMPLITUDE = 10.00°

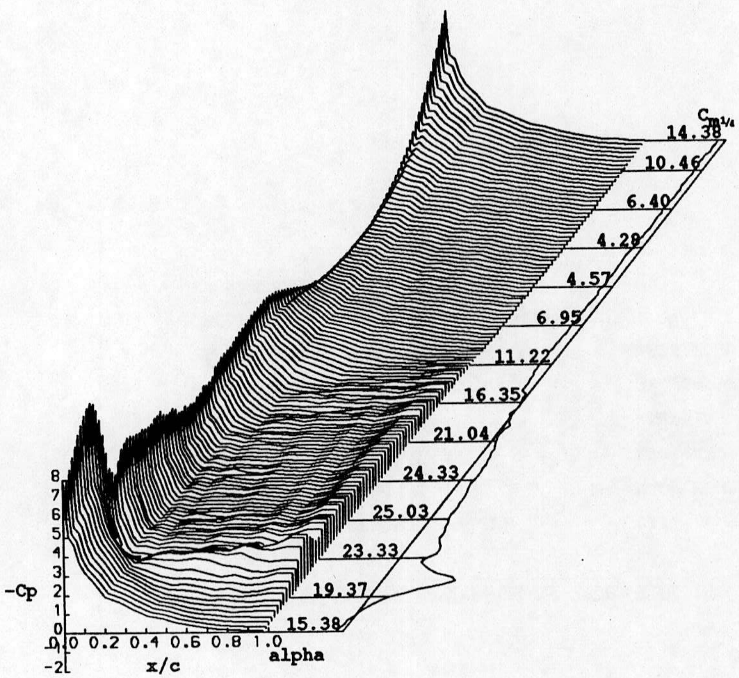


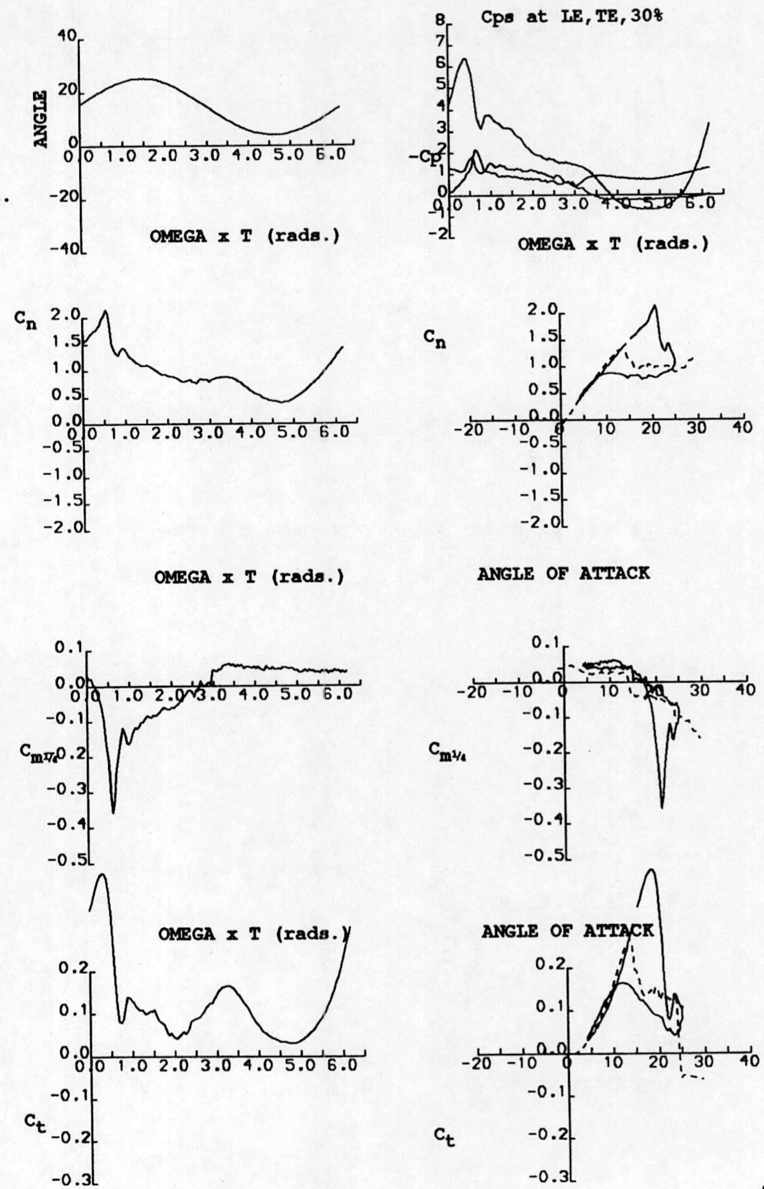


DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10621
REYNOLDS NUMBER = 1465819.
DYNAMIC PRESSURE = 941.46 Nm^{-2}
NUMBER OF CYCLES = 10
MOTION TYPE: SINUSOIDAL
MEAN ANGLE = 15.00°
OSCILLATION FREQUENCY = 1.165 Hz.
AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 14/3/86
MACH NUMBER = 0.110
AIR TEMPERATURE = 30.0°C
SAMPLING FREQUENCY = 149.12 Hz.
REDUCED FREQUENCY = 0.052
AMPLITUDE = 10.00°





DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10631

DATE OF TEST: 14/3/86

REYNOLDS NUMBER = 1483018.

MACH NUMBER = 0.112

DYNAMIC PRESSURE = 963.68 Nm^{-2}

AIR TEMPERATURE = 30.0°C

NUMBER OF CYCLES = 10

SAMPLING FREQUENCY = 223.61 Hz.

MOTION TYPE: SINUSOIDAL

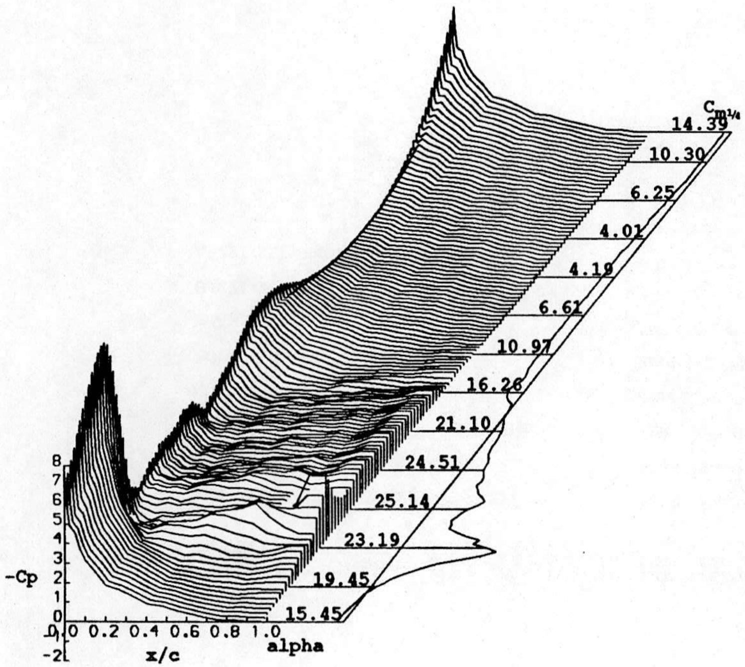
REDUCED FREQUENCY = 0.077

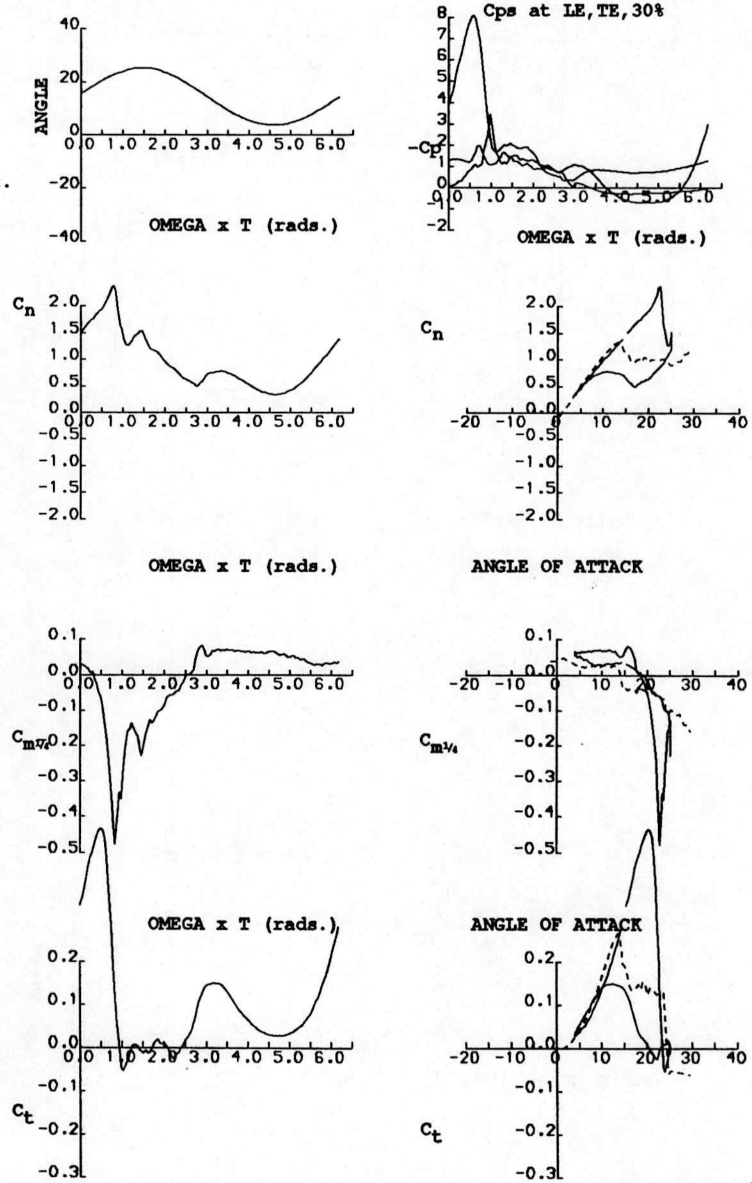
MEAN ANGLE = 15.00°

AMPLITUDE = 10.00°

OSCILLATION FREQUENCY = 1.747 Hz.

AVERAGED DATA OF 10 CYCLES





DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10641

REYNOLDS NUMBER = 1464159.

DYNAMIC PRESSURE = 939.33 Nm^{-2}

NUMBER OF CYCLES = 10

MOTION TYPE: SINUSOIDAL

MEAN ANGLE = 15.00°

OSCILLATION FREQUENCY = 2.330 Hz.

AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 14/3/86

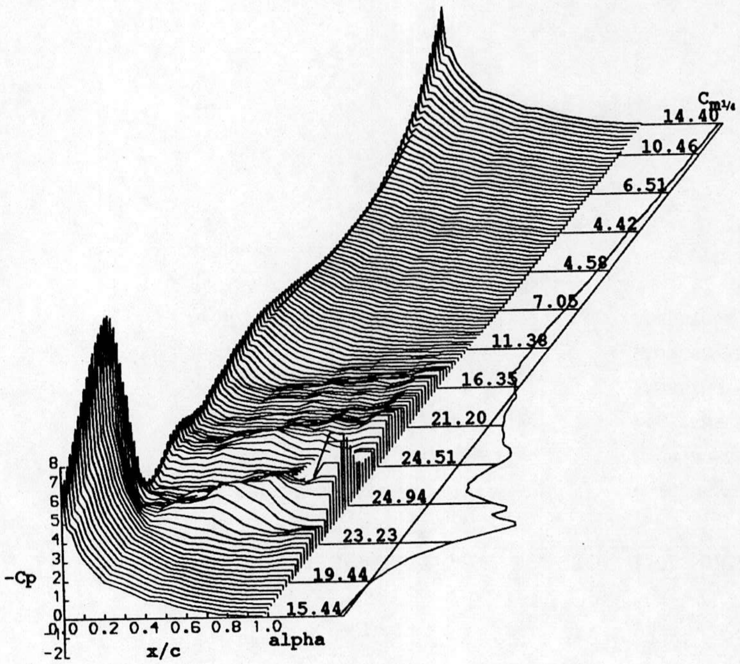
MACH NUMBER = 0.110

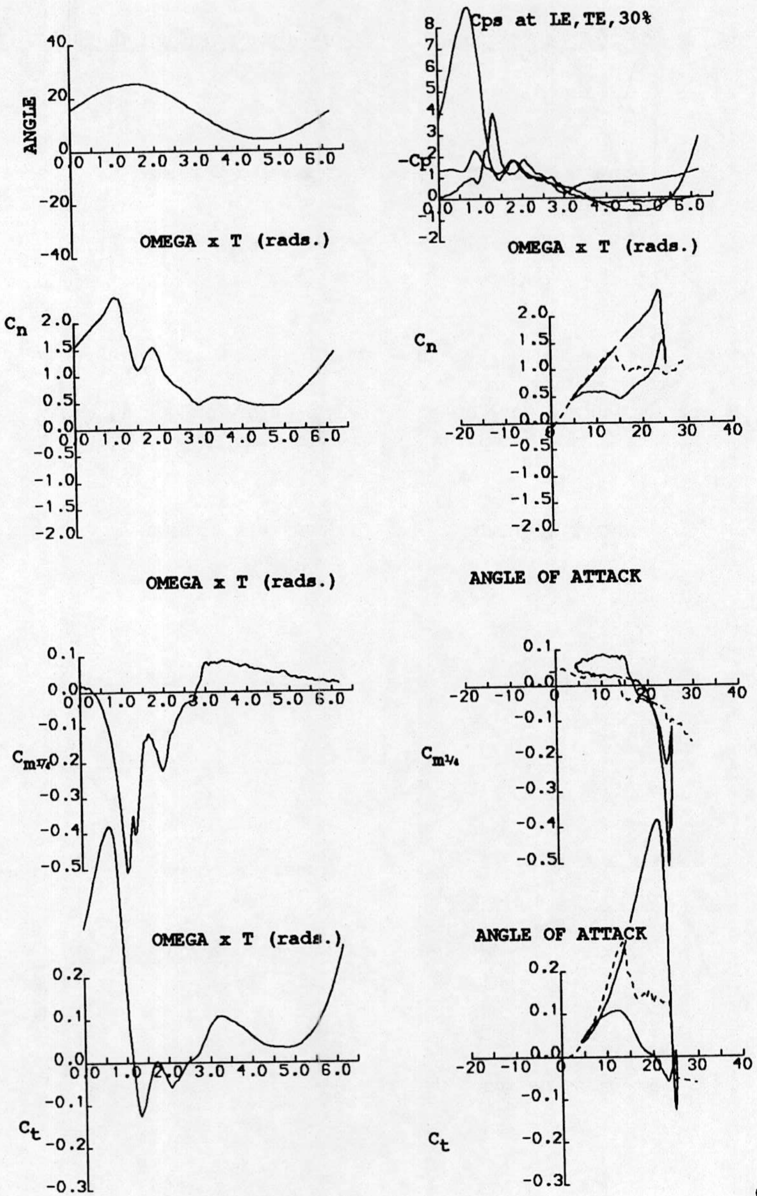
AIR TEMPERATURE = 30.0°C

SAMPLING FREQUENCY = 298.24 Hz.

REDUCED FREQUENCY = 0.104

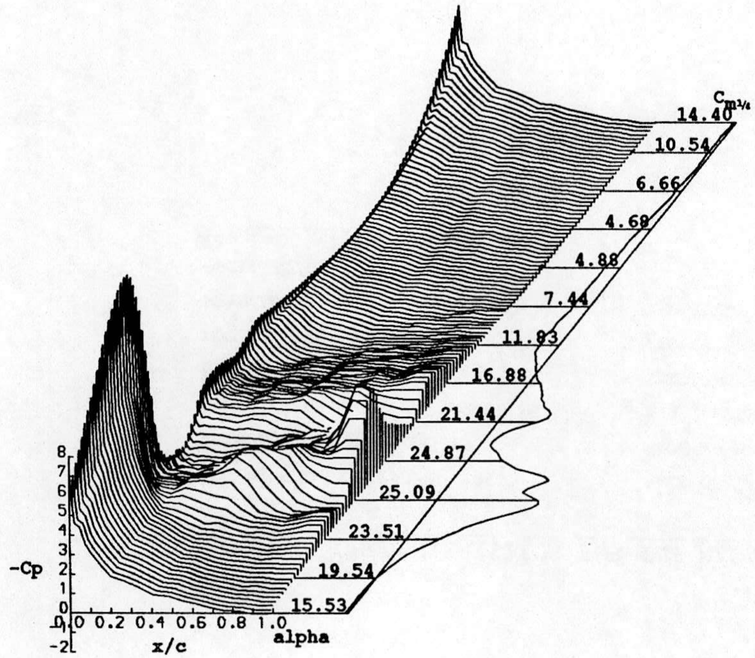
AMPLITUDE = 10.00°

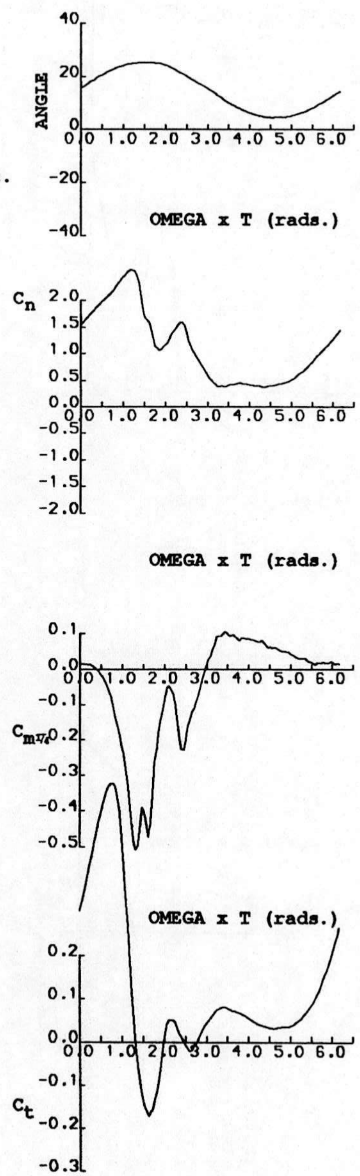


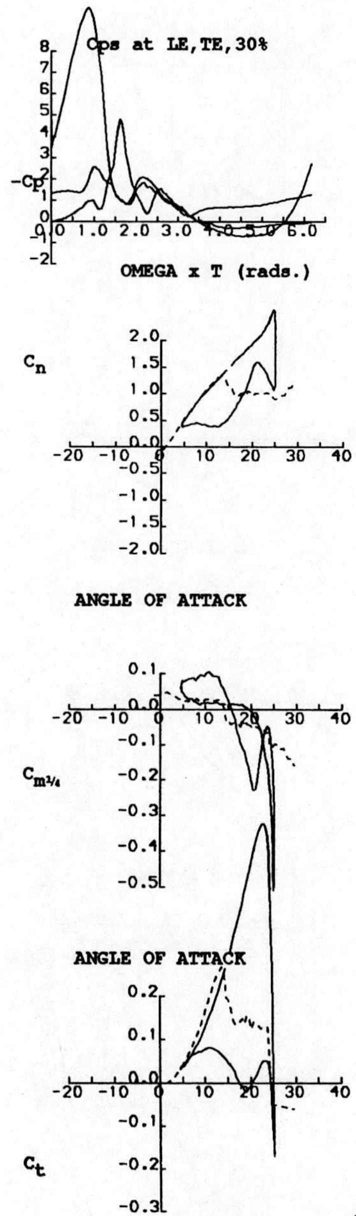


DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10651	DATE OF TEST: 14/3/86
REYNOLDS NUMBER = 1482006.	MACH NUMBER = 0.112
DYNAMIC PRESSURE = 962.37 Nm^{-2}	AIR TEMPERATURE = 30.0°C
NUMBER OF CYCLES = 10	SAMPLING FREQUENCY = 372.72 Hz.
MOTION TYPE: SINUSOIDAL	REDUCED FREQUENCY = 0.129
MEAN ANGLE = 15.00°	AMPLITUDE = 10.00°
OSCILLATION FREQUENCY = 2.912 Hz.	
AVERAGED DATA OF 10 CYCLES	







DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10661

REYNOLDS NUMBER = 1458695.

DYNAMIC PRESSURE = 932.33 Nm^{-2}

NUMBER OF CYCLES = 10

MOTION TYPE: SINUSOIDAL

MEAN ANGLE = 15.00°

OSCILLATION FREQUENCY = 3.496 Hz.

AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 14/3/86

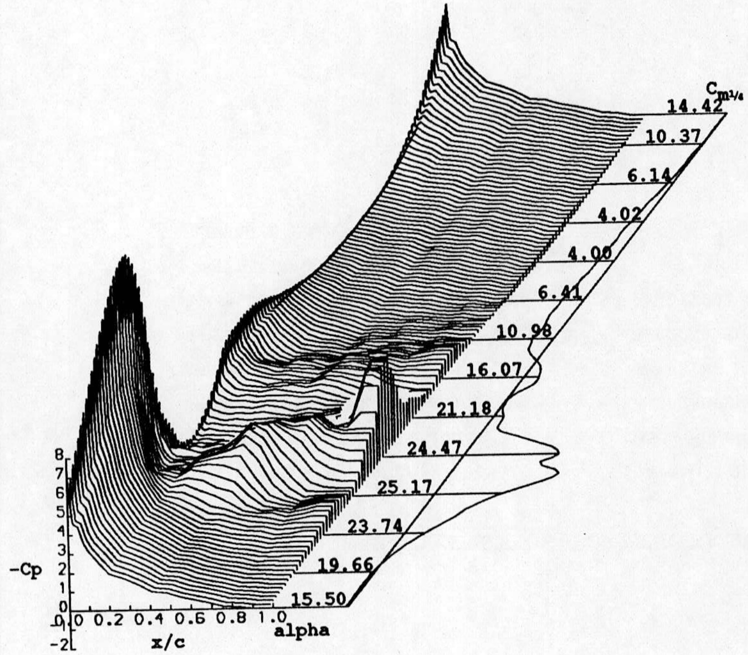
MACH NUMBER = 0.110

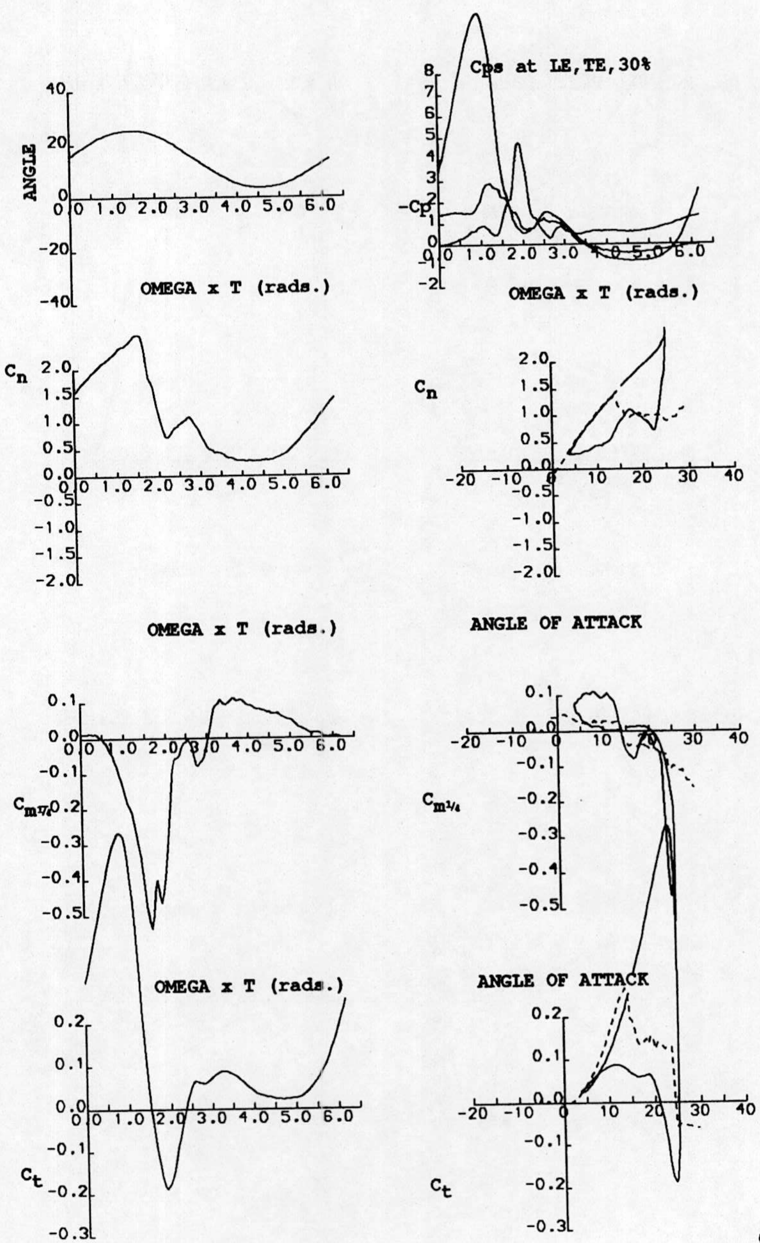
AIR TEMPERATURE = 30.0°C

SAMPLING FREQUENCY = 447.43 Hz.

REDUCED FREQUENCY = 0.157

AMPLITUDE = 10.00°





DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10671

REYNOLDS NUMBER = 1470569.

DYNAMIC PRESSURE = 947.57 Nm^{-2}

NUMBER OF CYCLES = 10

MOTION TYPE: SINUSOIDAL

MEAN ANGLE = 15.00°

OSCILLATION FREQUENCY = 4.078 Hz.

AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 14/3/86

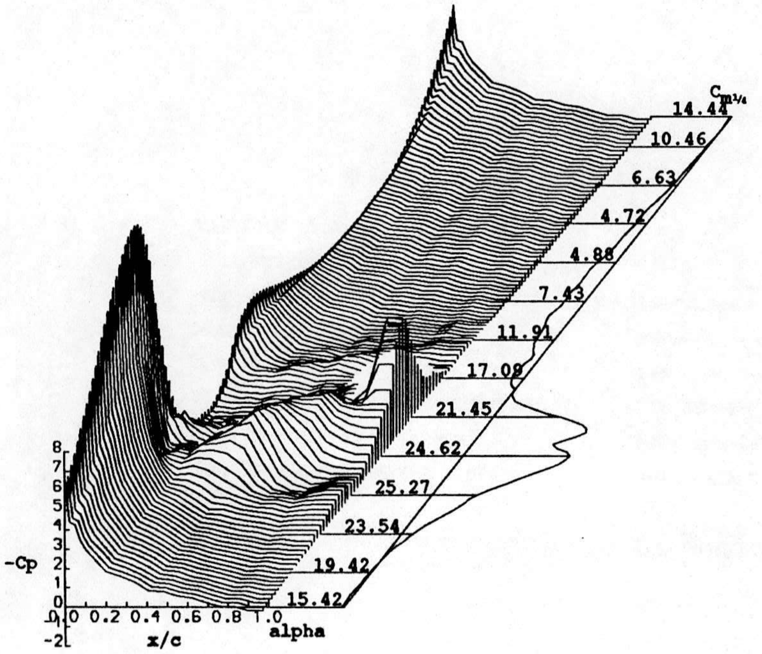
MACH NUMBER = 0.111

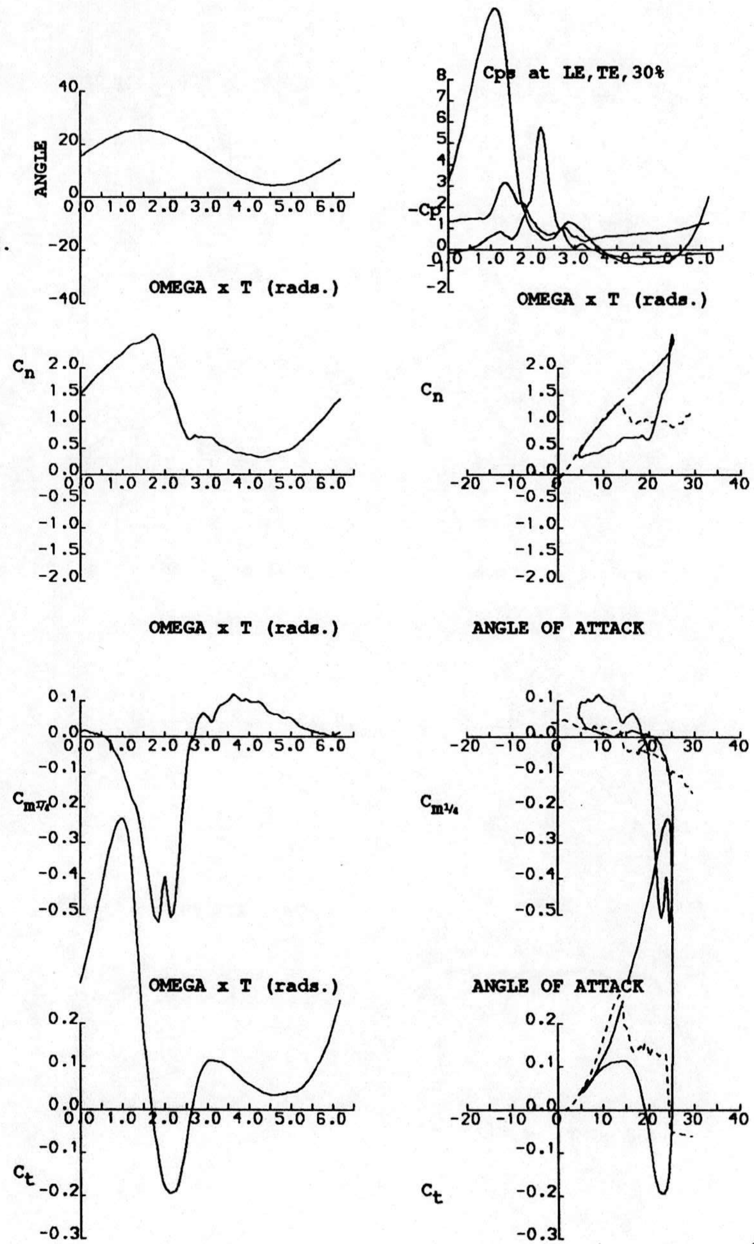
AIR TEMPERATURE = 30.0°C

SAMPLING FREQUENCY = 521.92 Hz.

REDUCED FREQUENCY = 0.182

AMPLITUDE = 10.00°

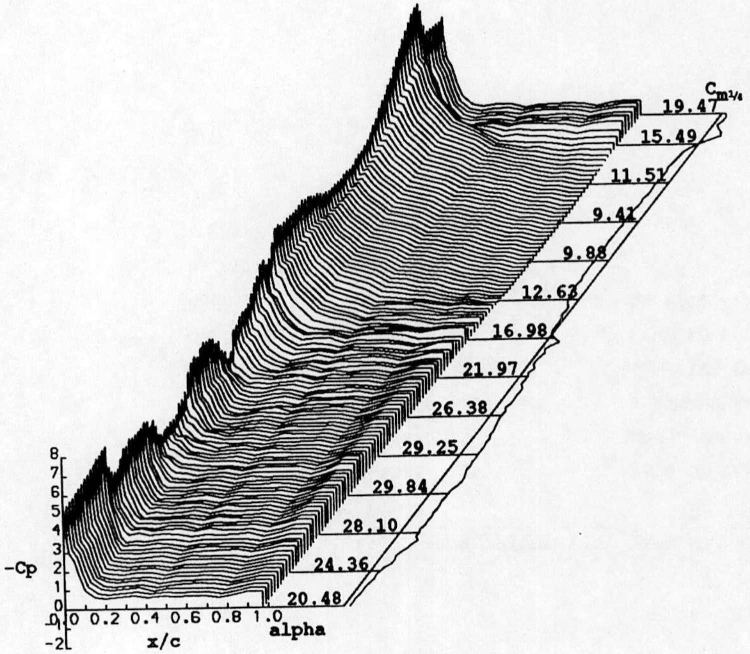


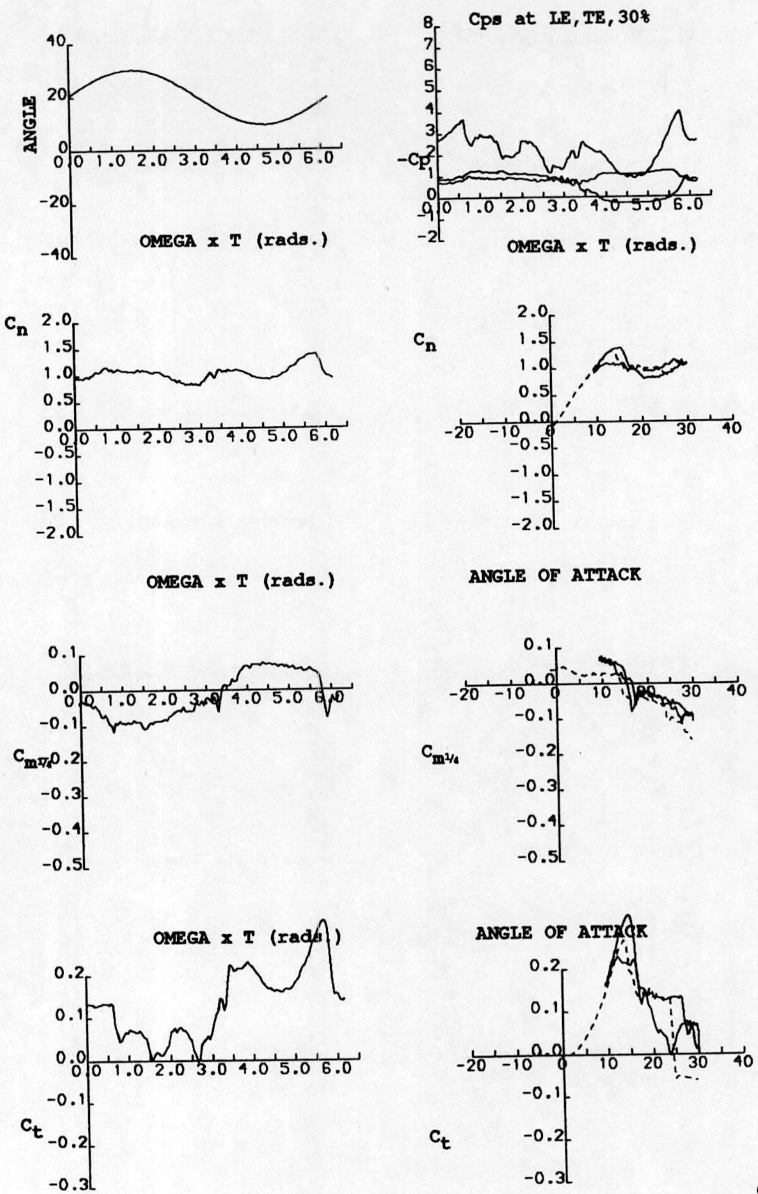


DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10681
REYNOLDS NUMBER = 1459723.
DYNAMIC PRESSURE = 933.64 Nm^{-2}
NUMBER OF CYCLES = 10
MOTION TYPE: SINUSOIDAL
MEAN ANGLE = 20.00°
OSCILLATION FREQUENCY = 0.233 Hz.
AVERAGED DATA OF 10 CYCLES

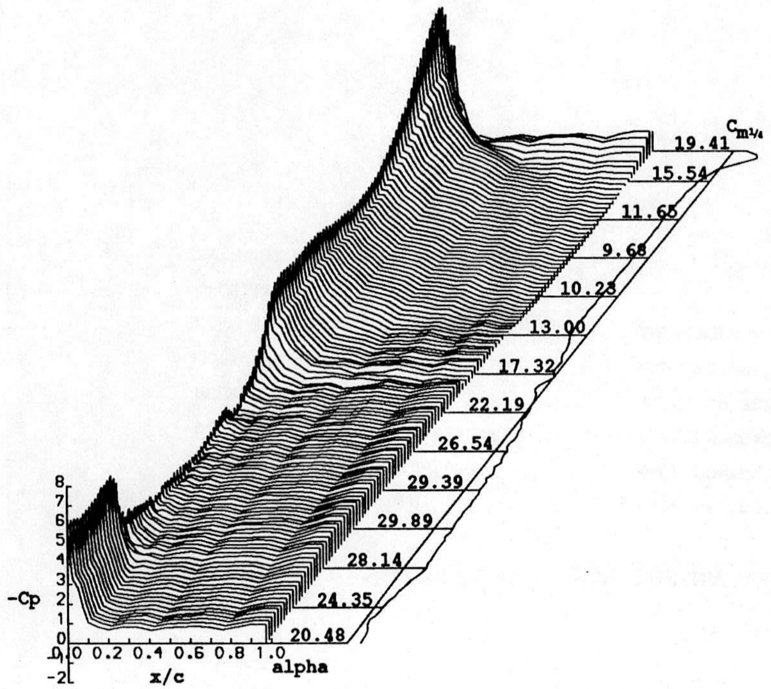
DATE OF TEST: 14/3/86
MACH NUMBER = 0.110
AIR TEMPERATURE = 30.0°C
SAMPLING FREQUENCY = 29.82 Hz.
REDUCED FREQUENCY = 0.010
AMPLITUDE = 10.00°

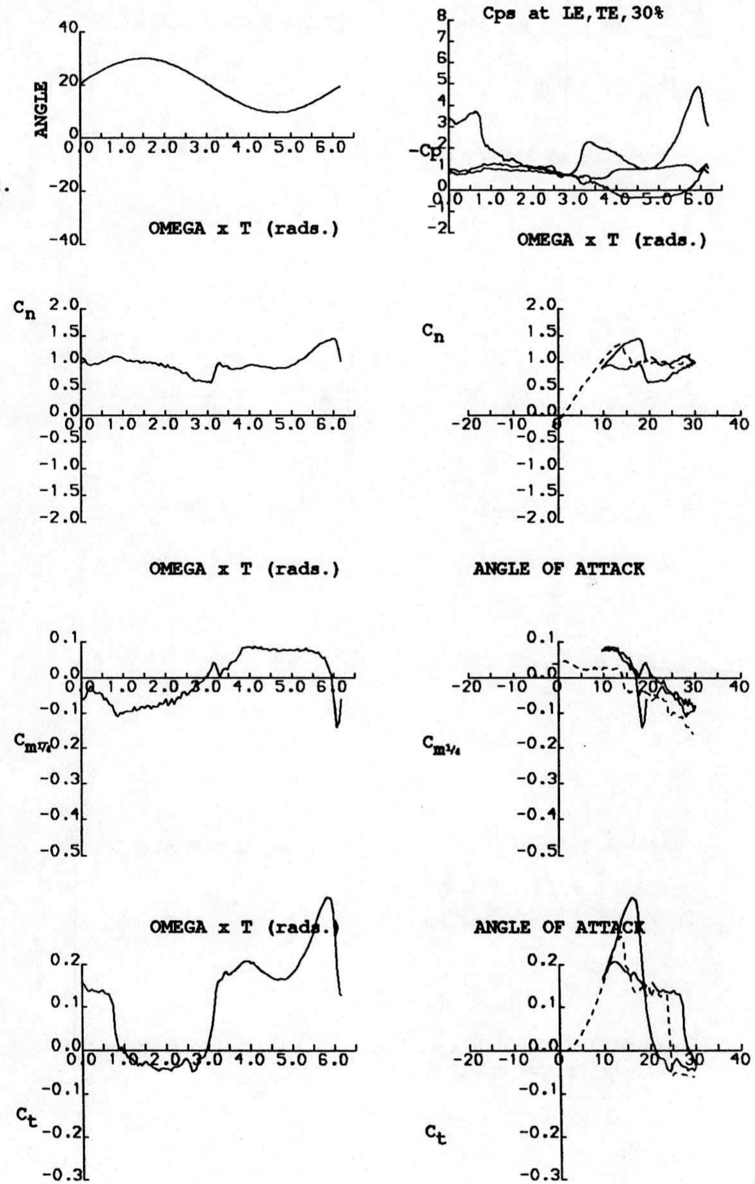




DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10691	DATE OF TEST: 14/3/86
REYNOLDS NUMBER = 1458182.	MACH NUMBER = 0.110
DYNAMIC PRESSURE = 931.67 Nm^{-2}	AIR TEMPERATURE = 30.0°C
NUMBER OF CYCLES = 10	SAMPLING FREQUENCY = 74.49 Hz.
MOTION TYPE: SINUSOIDAL	REDUCED FREQUENCY = 0.026
MEAN ANGLE = 20.00°	AMPLITUDE = 10.00°
OSCILLATION FREQUENCY = 0.582 Hz.	
AVERAGED DATA OF 10 CYCLES	

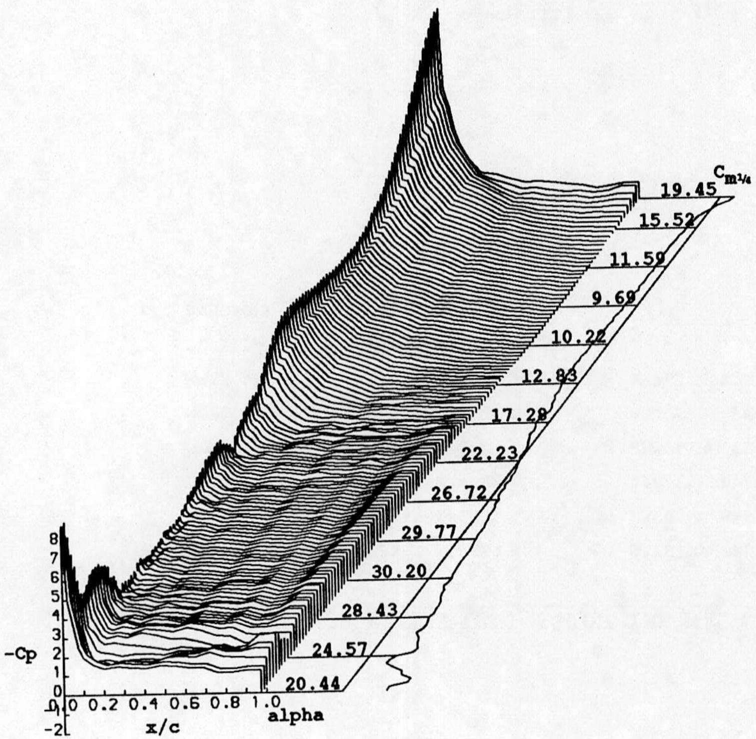


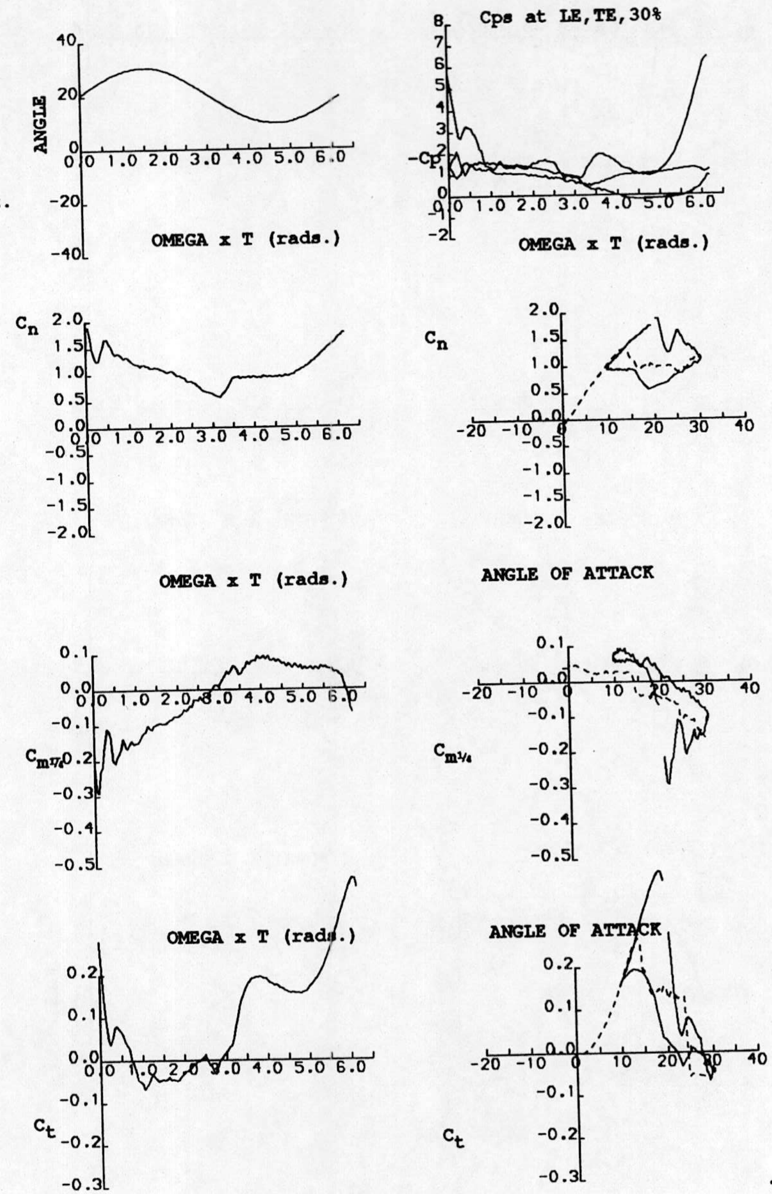


DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10701
REYNOLDS NUMBER = 1461003.
DYNAMIC PRESSURE = 935.28 Nm^{-2}
NUMBER OF CYCLES = 10
MOTION TYPE: SINUSOIDAL
MEAN ANGLE = 20.00°
OSCILLATION FREQUENCY = 1.165 Hz.
AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 14/3/86
MACH NUMBER = 0.110
AIR TEMPERATURE = 30.0°C
SAMPLING FREQUENCY = 149.12 Hz.
REDUCED FREQUENCY = 0.052
AMPLITUDE = 10.00°





DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10711

DATE OF TEST: 14/3/86

REYNOLDS NUMBER = 1468716.

MACH NUMBER = 0.111

DYNAMIC PRESSURE = 945.18 Nm^{-2}

AIR TEMPERATURE = 30.0°C

NUMBER OF CYCLES = 10

SAMPLING FREQUENCY = 223.61 Hz.

MOTION TYPE: SINUSOIDAL

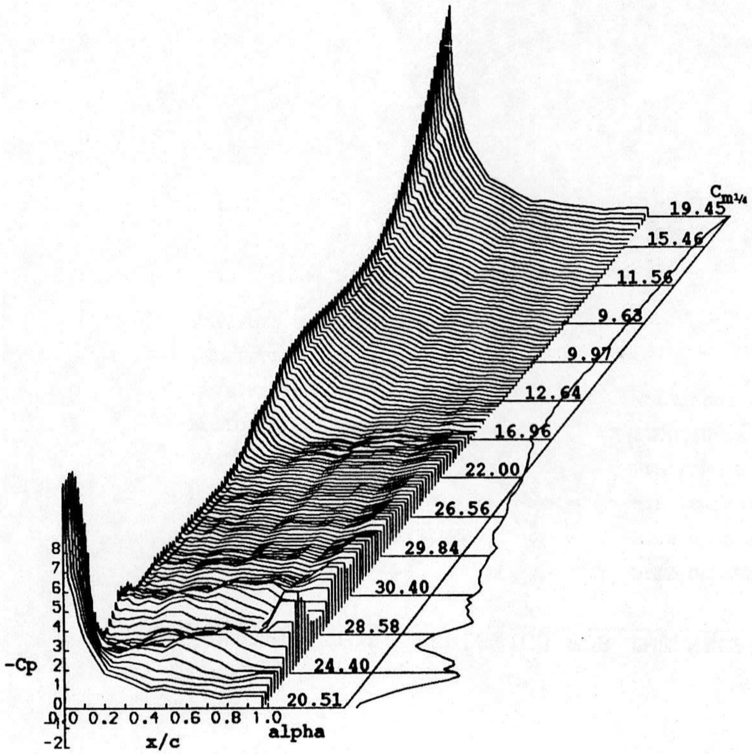
REDUCED FREQUENCY = 0.078

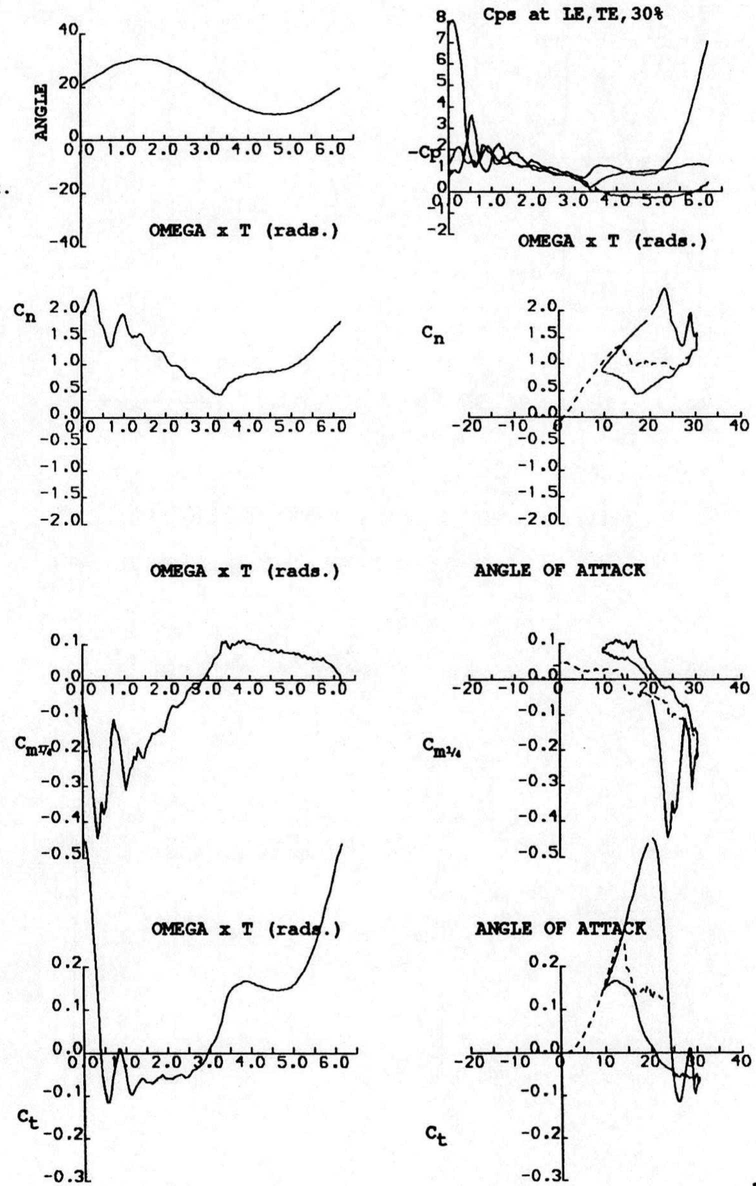
MEAN ANGLE = 20.00°

AMPLITUDE = 10.00°

OSCILLATION FREQUENCY = 1.747 Hz.

AVERAGED DATA OF 10 CYCLES

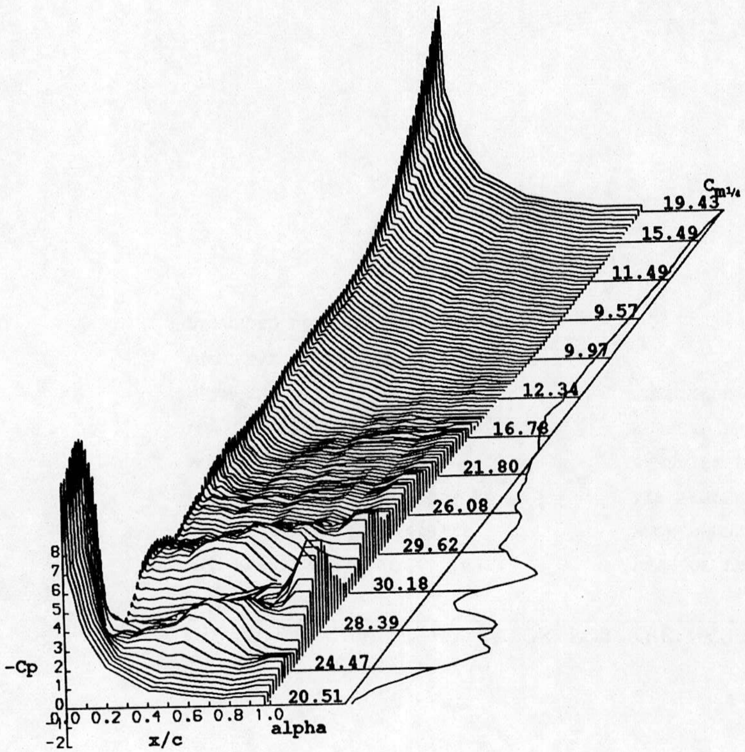


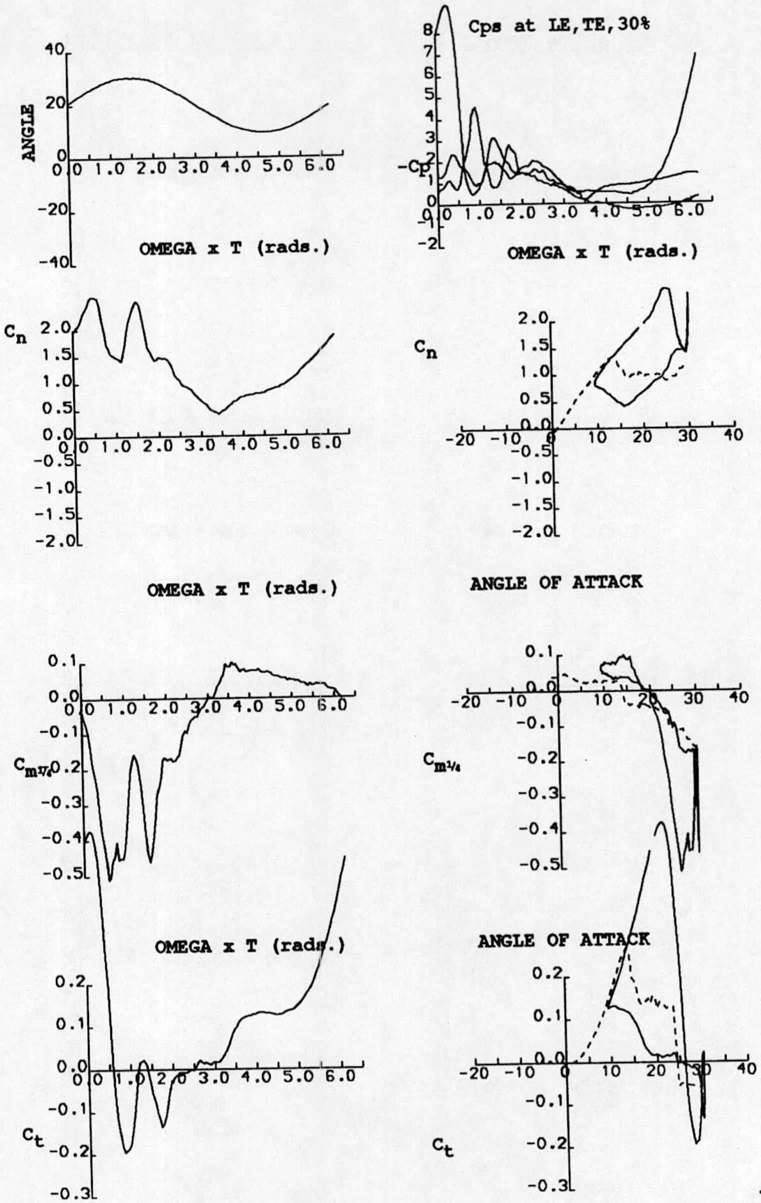


DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10721
REYNOLDS NUMBER = 1461955.
DYNAMIC PRESSURE = 936.50 Nm^{-2}
NUMBER OF CYCLES = 10
MOTION TYPE: SINUSOIDAL
MEAN ANGLE = 20.00°
OSCILLATION FREQUENCY = 2.330 Hz.
AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 14/3/86
MACH NUMBER = 0.110
AIR TEMPERATURE = 30.0°C
SAMPLING FREQUENCY = 298.24 Hz.
REDUCED FREQUENCY = 0.105
AMPLITUDE = 10.00°





DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10731

REYNOLDS NUMBER = 1468983.

DYNAMIC PRESSURE = 945.53 Nm^{-2}

NUMBER OF CYCLES = 10

MOTION TYPE: SINUSOIDAL

MEAN ANGLE = 20.00°

OSCILLATION FREQUENCY = 2.912 Hz.

AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 14/3/86

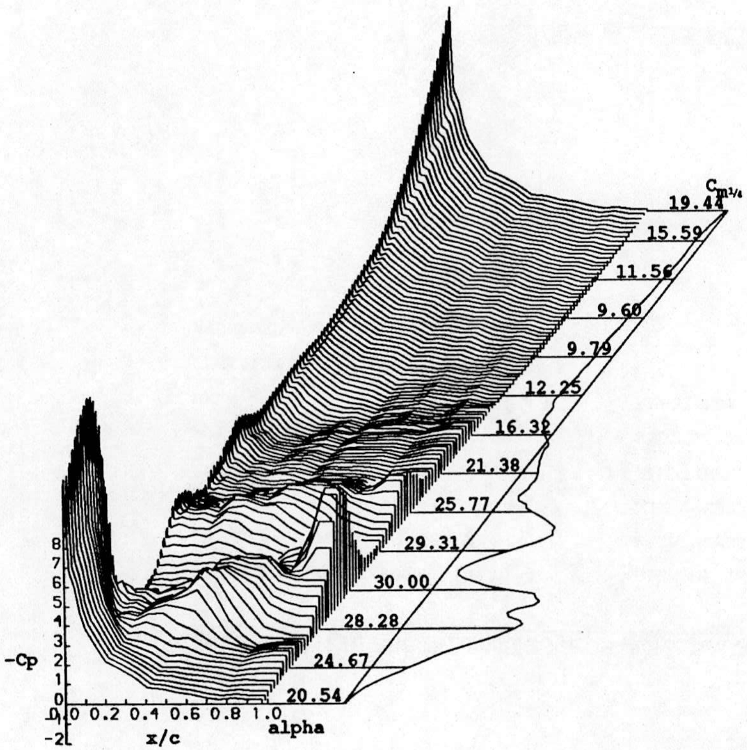
MACH NUMBER = 0.111

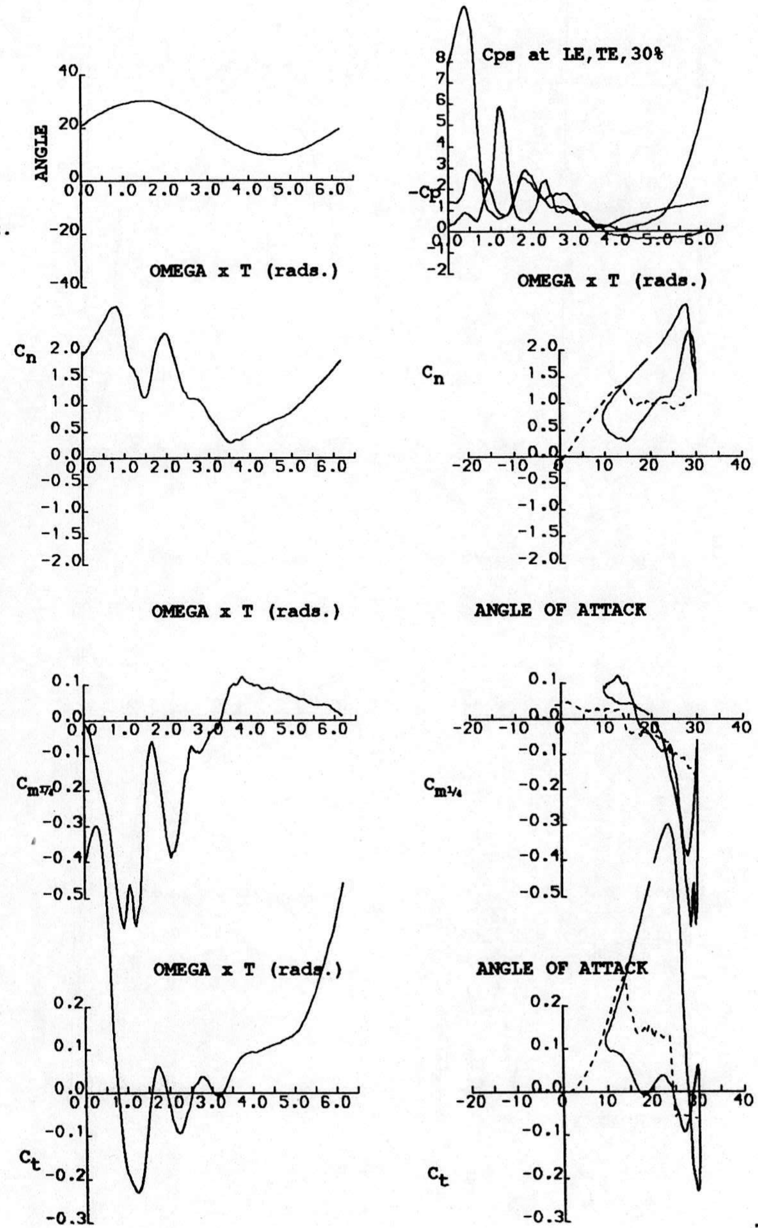
AIR TEMPERATURE = 30.0°C

SAMPLING FREQUENCY = 372.72 Hz.

REDUCED FREQUENCY = 0.130

AMPLITUDE = 10.00°

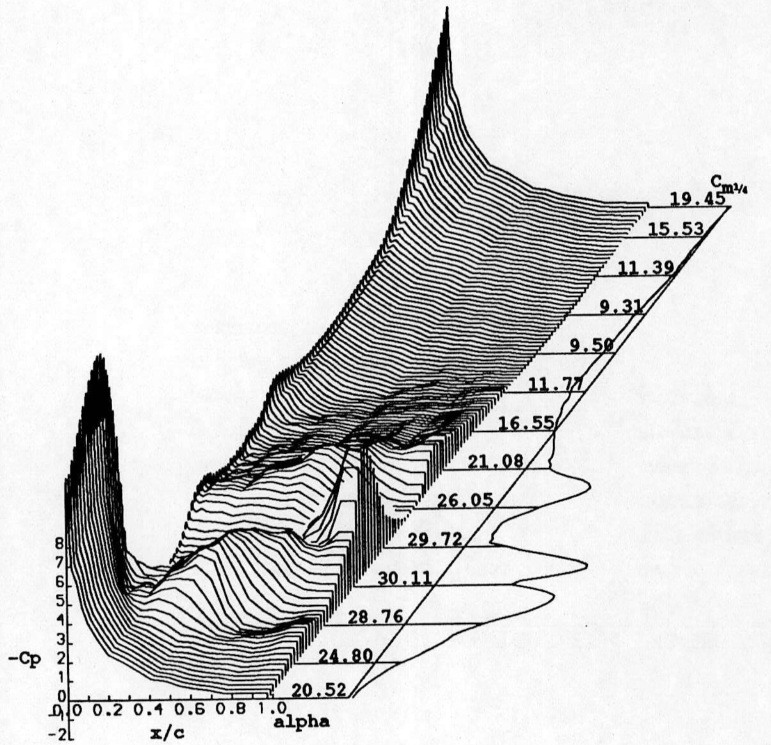


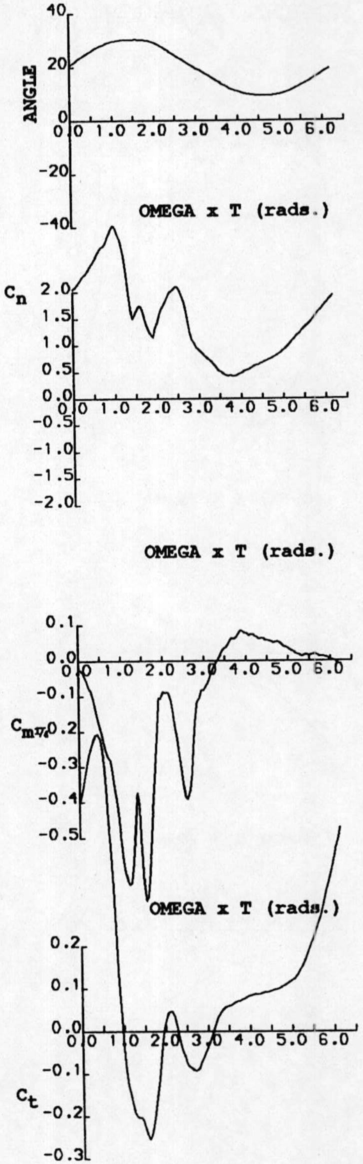


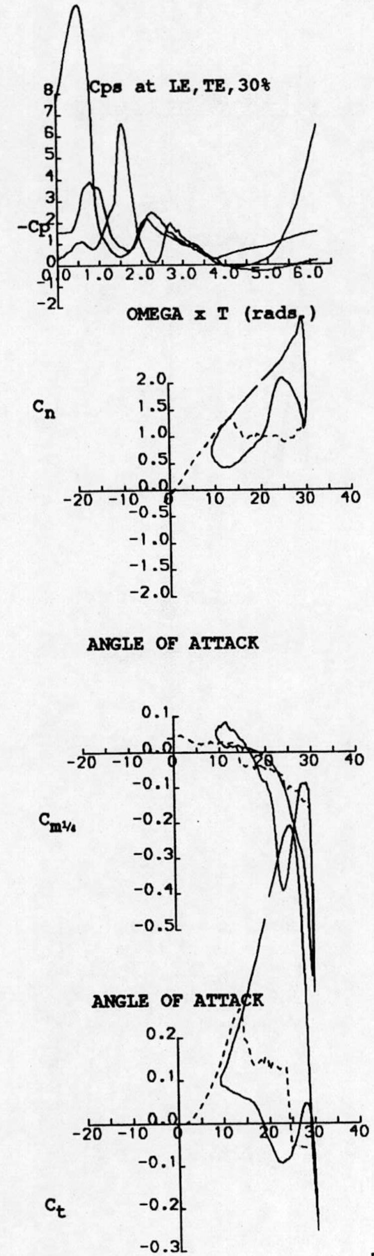
DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10741
REYNOLDS NUMBER = 1458512.
DYNAMIC PRESSURE = 932.10 Nm^{-2}
NUMBER OF CYCLES = 10
MOTION TYPE: SINUSOIDAL
MEAN ANGLE = 20.00°
OSCILLATION FREQUENCY = 3.496 Hz.
AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 14/3/86
MACH NUMBER = 0.110
AIR TEMPERATURE = 30.0°C
SAMPLING FREQUENCY = 447.43 Hz.
REDUCED FREQUENCY = 0.157
AMPLITUDE = 10.00°







DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10751

REYNOLDS NUMBER = 1473877.

DYNAMIC PRESSURE = 951.84 Nm^{-2}

NUMBER OF CYCLES = 10

MOTION TYPE: SINUSOIDAL

MEAN ANGLE = 20.00°

OSCILLATION FREQUENCY = 4.078 Hz.

AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 14/3/86

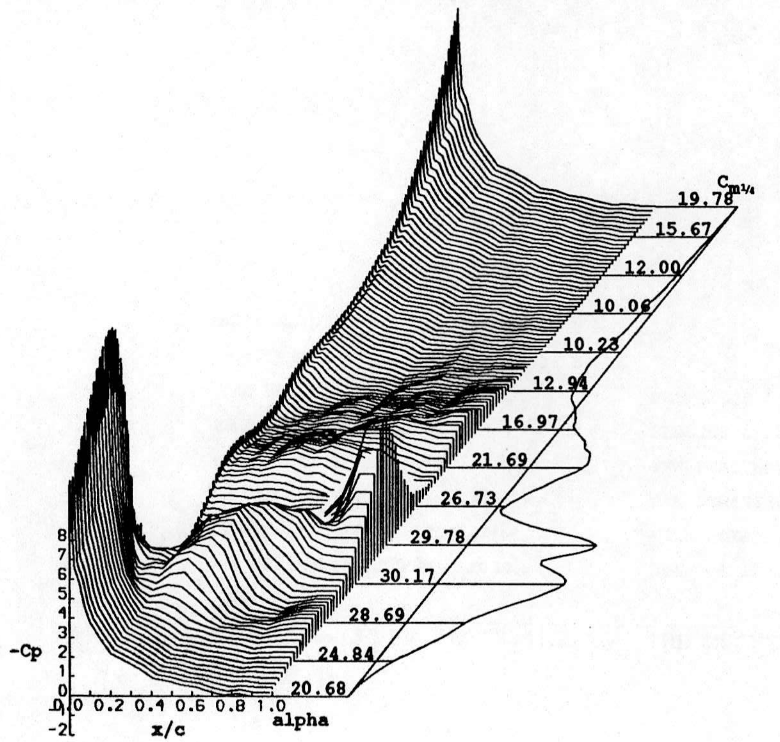
MACH NUMBER = 0.111

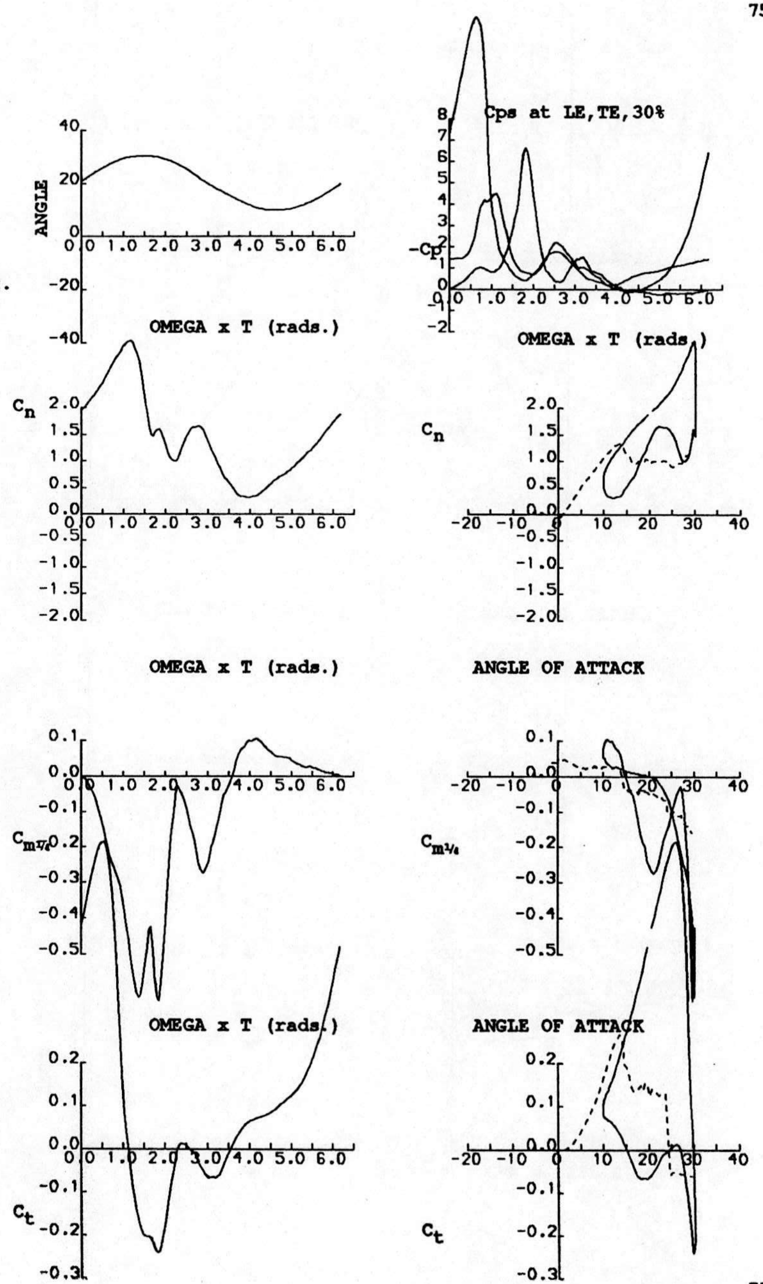
AIR TEMPERATURE = 30.0°C

SAMPLING FREQUENCY = 521.92 Hz.

REDUCED FREQUENCY = 0.181

AMPLITUDE = 10.00°





DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10761

REYNOLDS NUMBER = 1476191.

DYNAMIC PRESSURE = 942.27 Nm^{-2}

NUMBER OF CYCLES = 10

MOTION TYPE: SINUSOIDAL

MEAN ANGLE = 10.00°

OSCILLATION FREQUENCY = 0.233 Hz.

AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 17/3/86

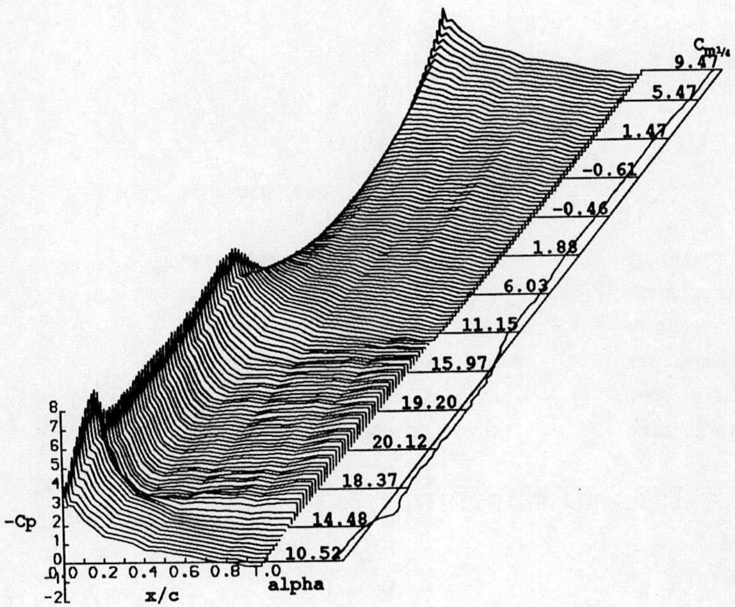
MACH NUMBER = 0.110

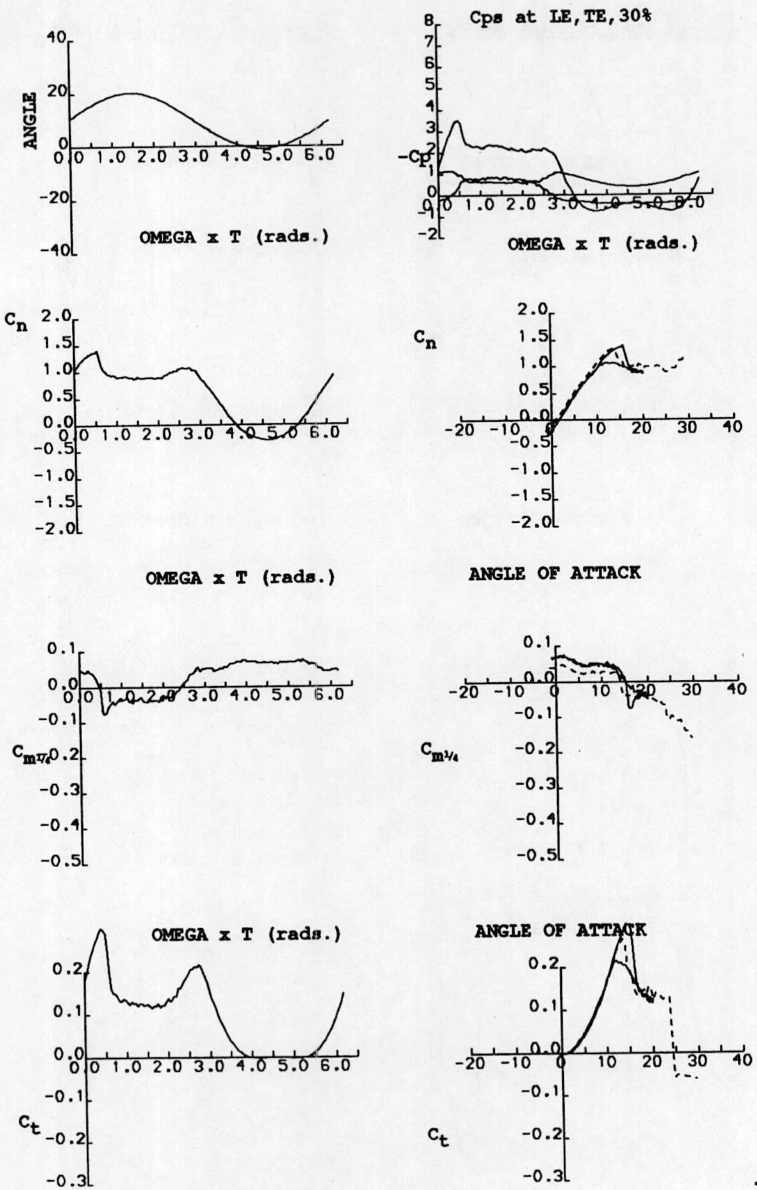
AIR TEMPERATURE = 30.0°C

SAMPLING FREQUENCY = 29.82 Hz.

REDUCED FREQUENCY = 0.010

AMPLITUDE = 10.00°

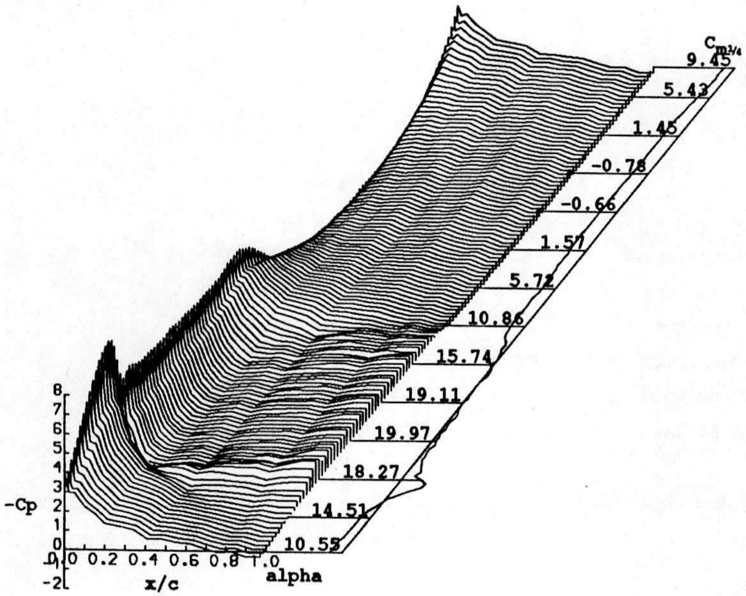


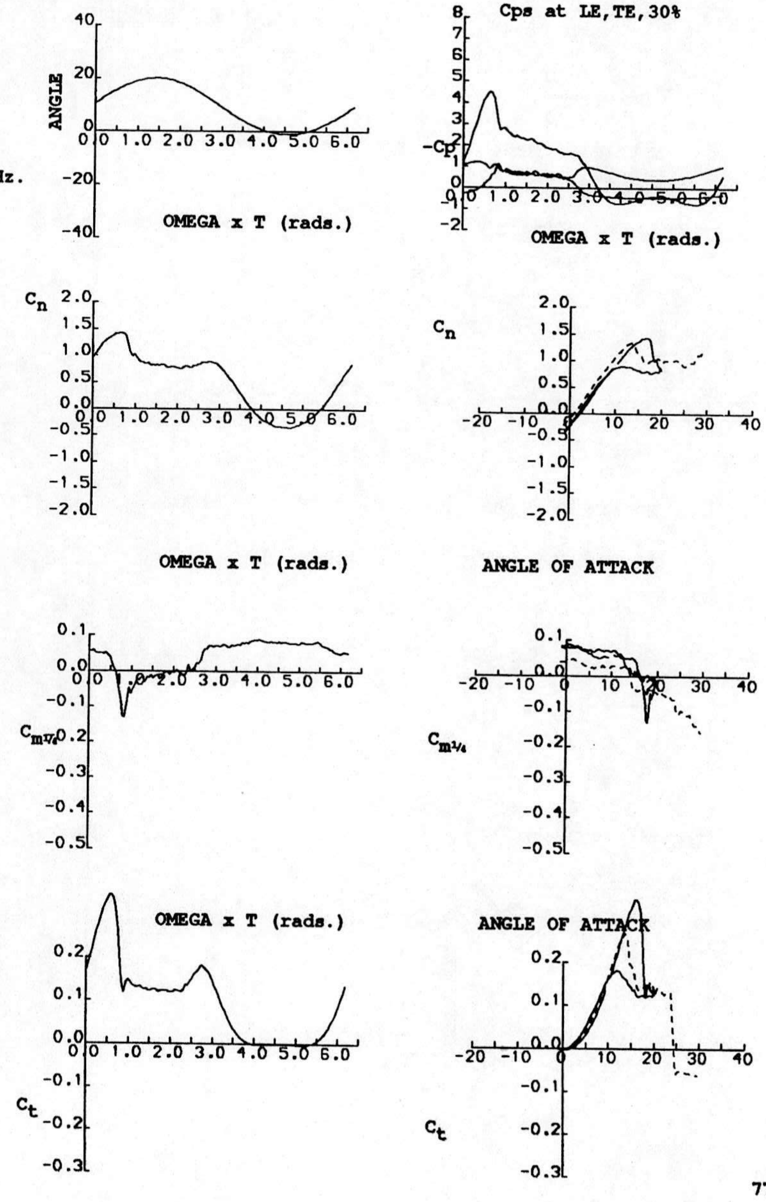


DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10771
REYNOLDS NUMBER = 1501782.
DYNAMIC PRESSURE = 975.22 Nm^{-2}
NUMBER OF CYCLES = 10
MOTION TYPE: SINUSOIDAL
MEAN ANGLE = 10.00°
OSCILLATION FREQUENCY = 0.582 Hz.
AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 17/3/86
MACH NUMBER = 0.112
AIR TEMPERATURE = 30.0°C
SAMPLING FREQUENCY = 74.49 Hz.
REDUCED FREQUENCY = 0.026
AMPLITUDE = 10.00°

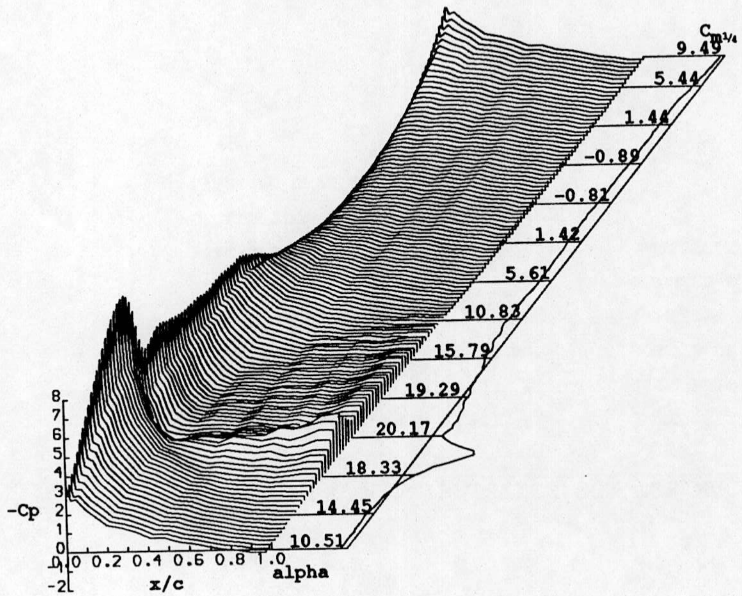


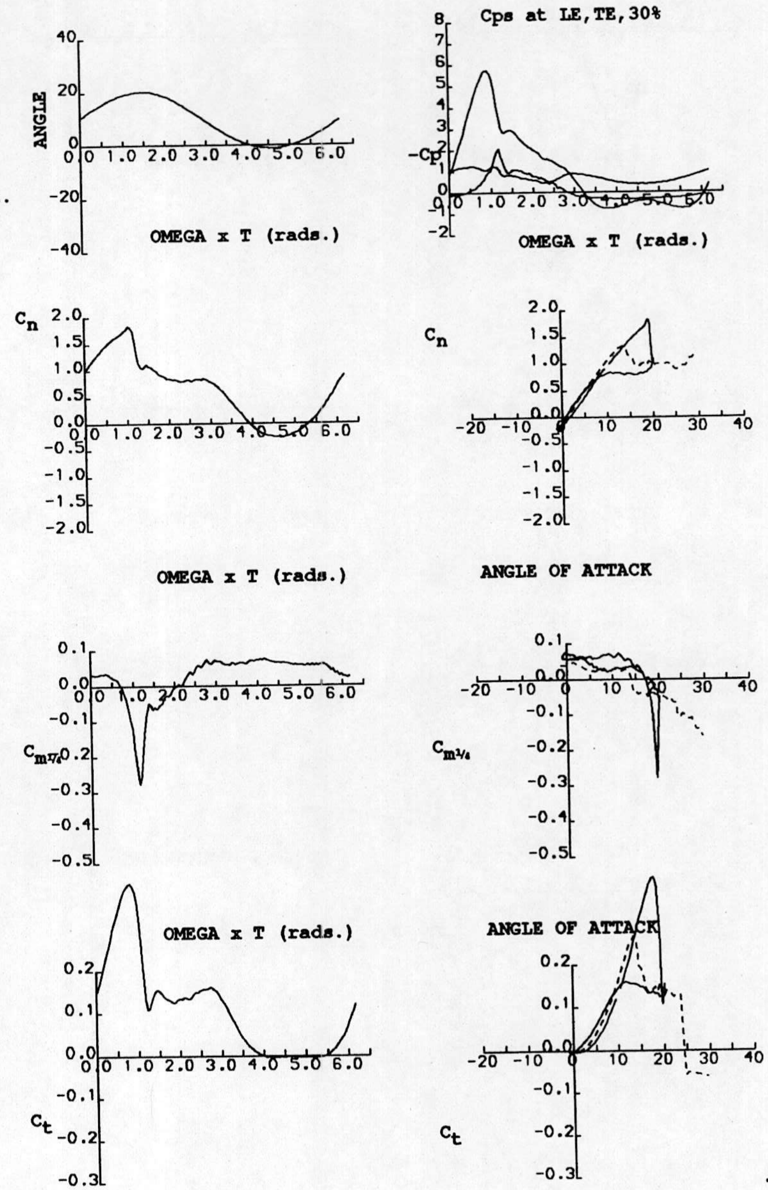


DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10781
REYNOLDS NUMBER = 1479818.
DYNAMIC PRESSURE = 946.90 Nm^{-2}
NUMBER OF CYCLES = 10
MOTION TYPE: SINUSOIDAL
MEAN ANGLE = 10.00°
OSCILLATION FREQUENCY = 1.165 Hz.
AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 17/3/86
MACH NUMBER = 0.110
AIR TEMPERATURE = 30.0°C
SAMPLING FREQUENCY = 149.12 Hz.
REDUCED FREQUENCY = 0.052
AMPLITUDE = 10.00°

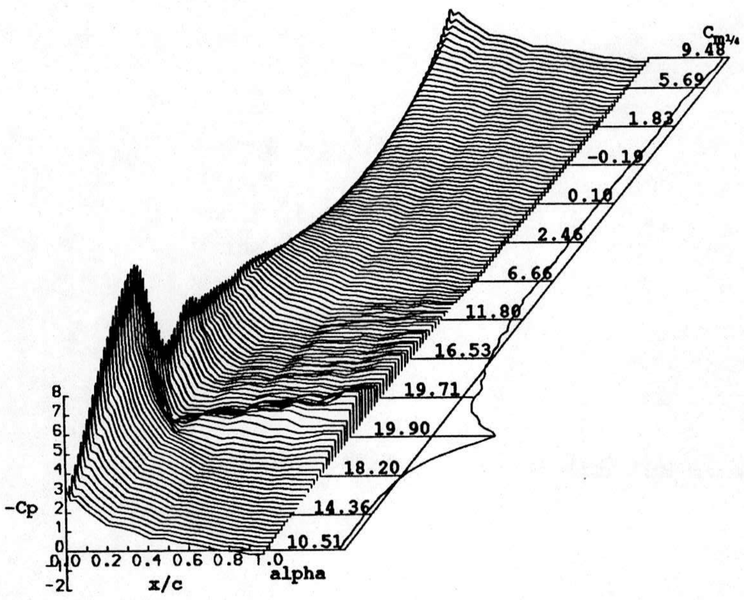


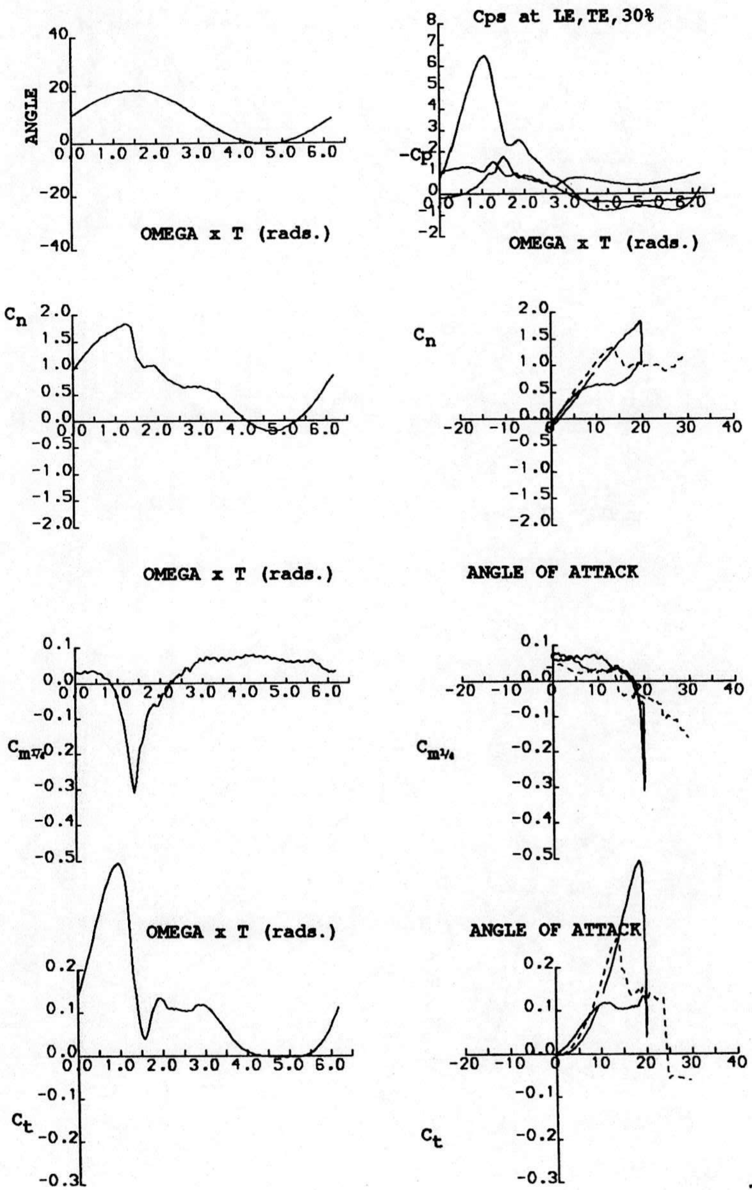


DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10791
REYNOLDS NUMBER = 1491382.
DYNAMIC PRESSURE = 961.76 Nm^{-2}
NUMBER OF CYCLES = 10
MOTION TYPE: SINUSOIDAL
MEAN ANGLE = 10.00°
OSCILLATION FREQUENCY = 1.747 Hz.
AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 17/3/86
MACH NUMBER = 0.111
AIR TEMPERATURE = 30.0°C
SAMPLING FREQUENCY = 223.61 Hz.
REDUCED FREQUENCY = 0.078
AMPLITUDE = 10.00°





DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10801

REYNOLDS NUMBER = 1486036.

DYNAMIC PRESSURE = 954.88 Nm^{-2}

NUMBER OF CYCLES = 10

MOTION TYPE: SINUSOIDAL

MEAN ANGLE = 10.00°

OSCILLATION FREQUENCY = 2.330 Hz.

AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 17/3/86

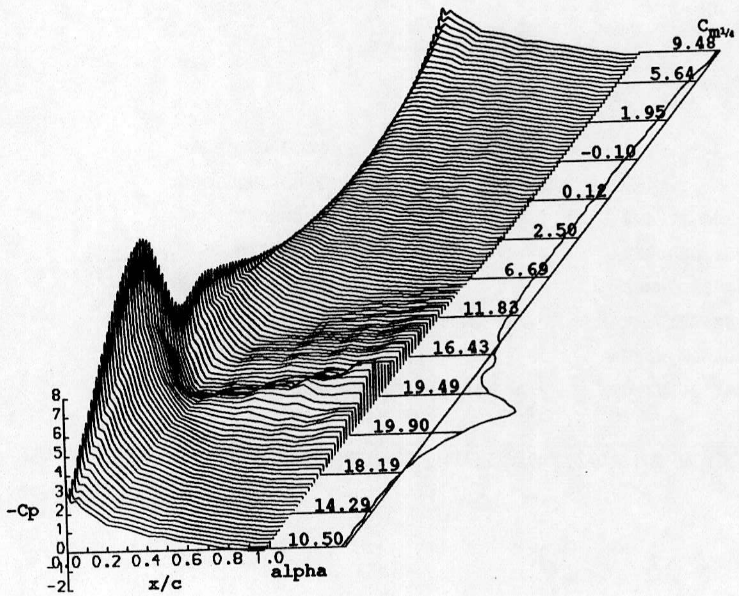
MACH NUMBER = 0.111

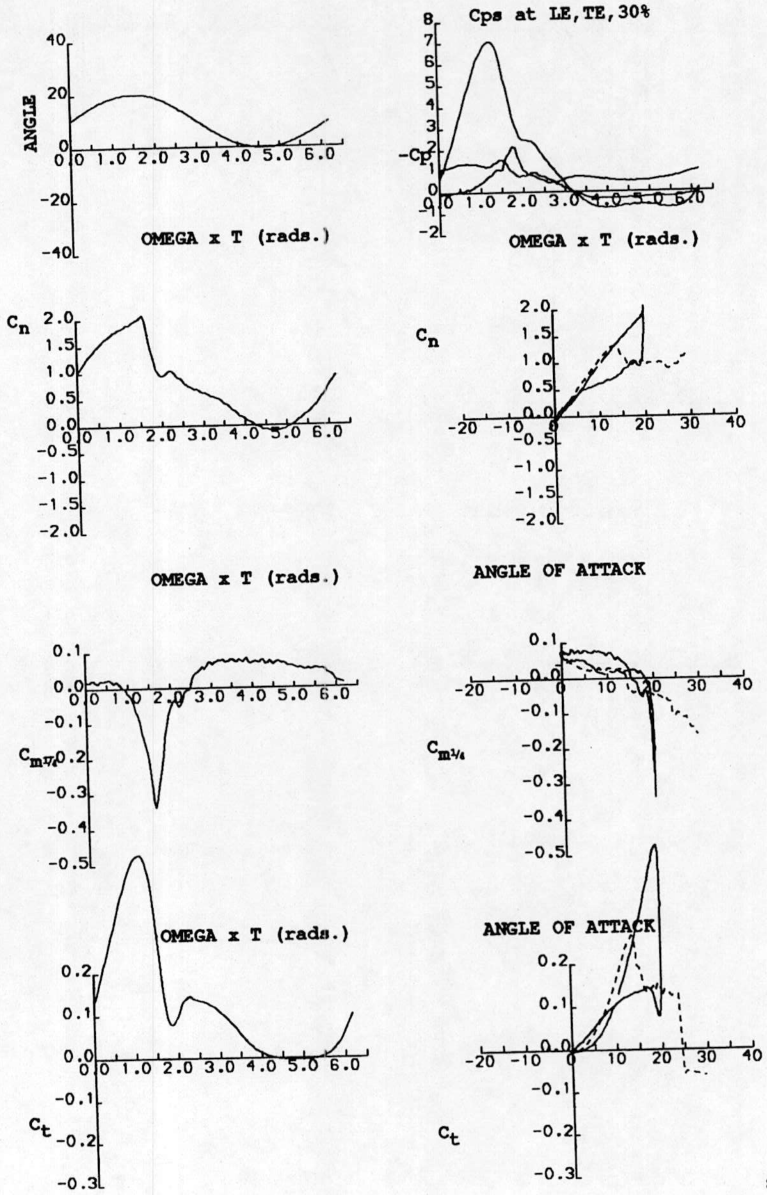
AIR TEMPERATURE = 30.0°C

SAMPLING FREQUENCY = 298.24 Hz.

REDUCED FREQUENCY = 0.104

AMPLITUDE = 10.00°

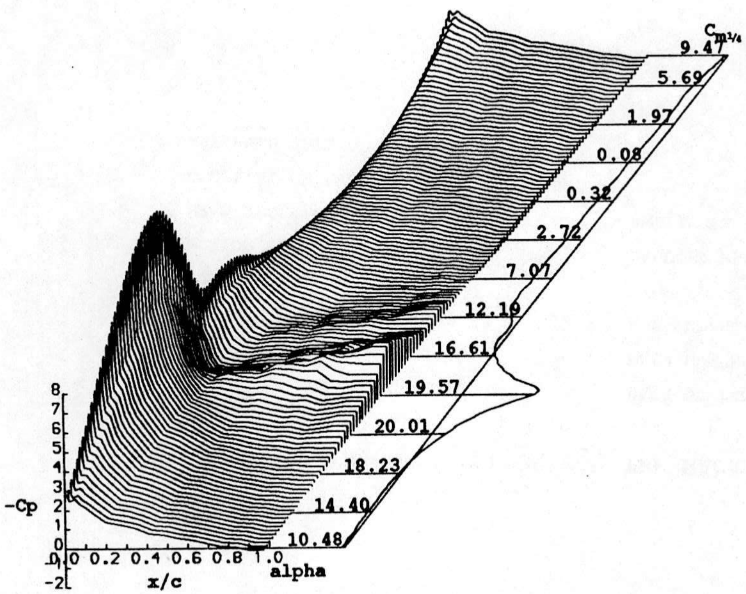


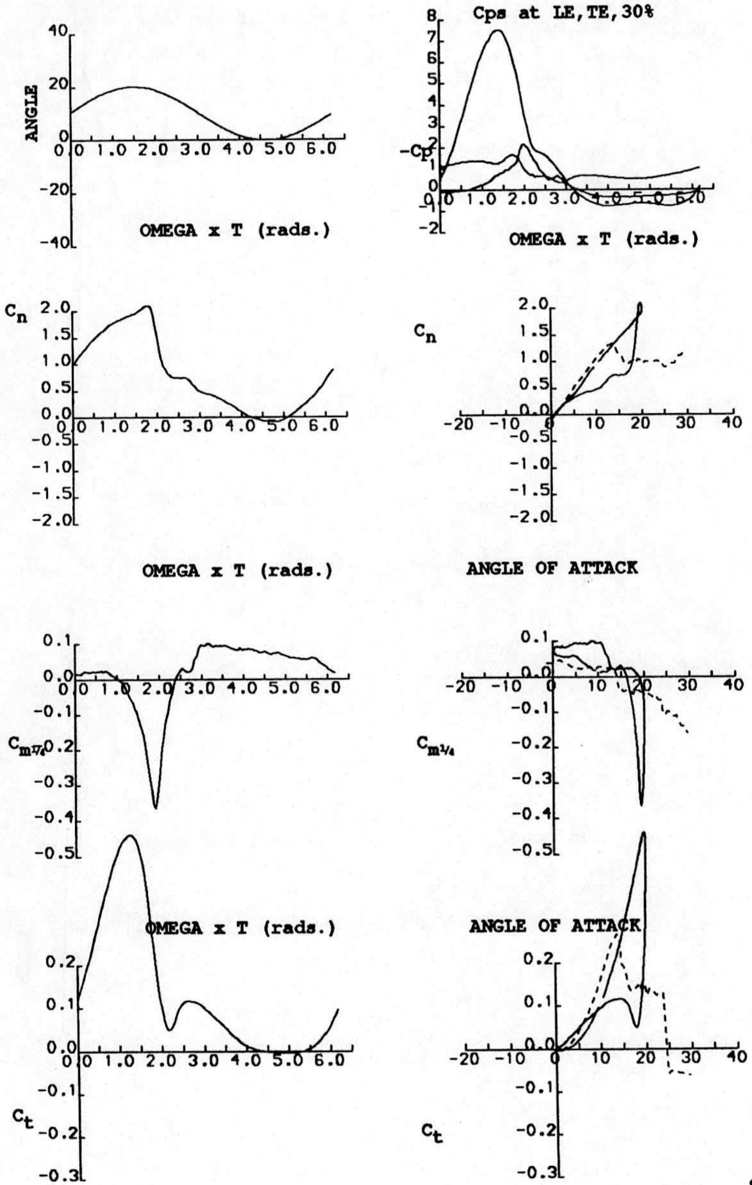


DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10811
REYNOLDS NUMBER = 1482537.
DYNAMIC PRESSURE = 950.38 Nm^{-2}
NUMBER OF CYCLES = 10
MOTION TYPE: SINUSOIDAL
MEAN ANGLE = 10.00°
OSCILLATION FREQUENCY = 2.912 Hz.
AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 17/3/86
MACH NUMBER = 0.110
AIR TEMPERATURE = 30.0°C
SAMPLING FREQUENCY = 372.72 Hz.
REDUCED FREQUENCY = 0.131
AMPLITUDE = 10.00°





DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10821

REYNOLDS NUMBER = 1481940.

DYNAMIC PRESSURE = 949.62 Nm^{-2}

NUMBER OF CYCLES = 10

MOTION TYPE: SINUSOIDAL

MEAN ANGLE = 10.00°

OSCILLATION FREQUENCY = 3.496 Hz.

AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 17/3/86

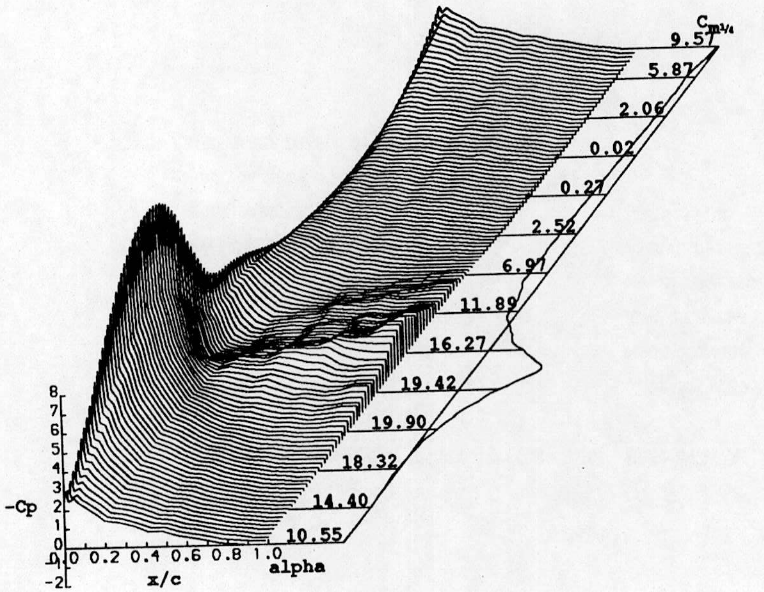
MACH NUMBER = 0.110

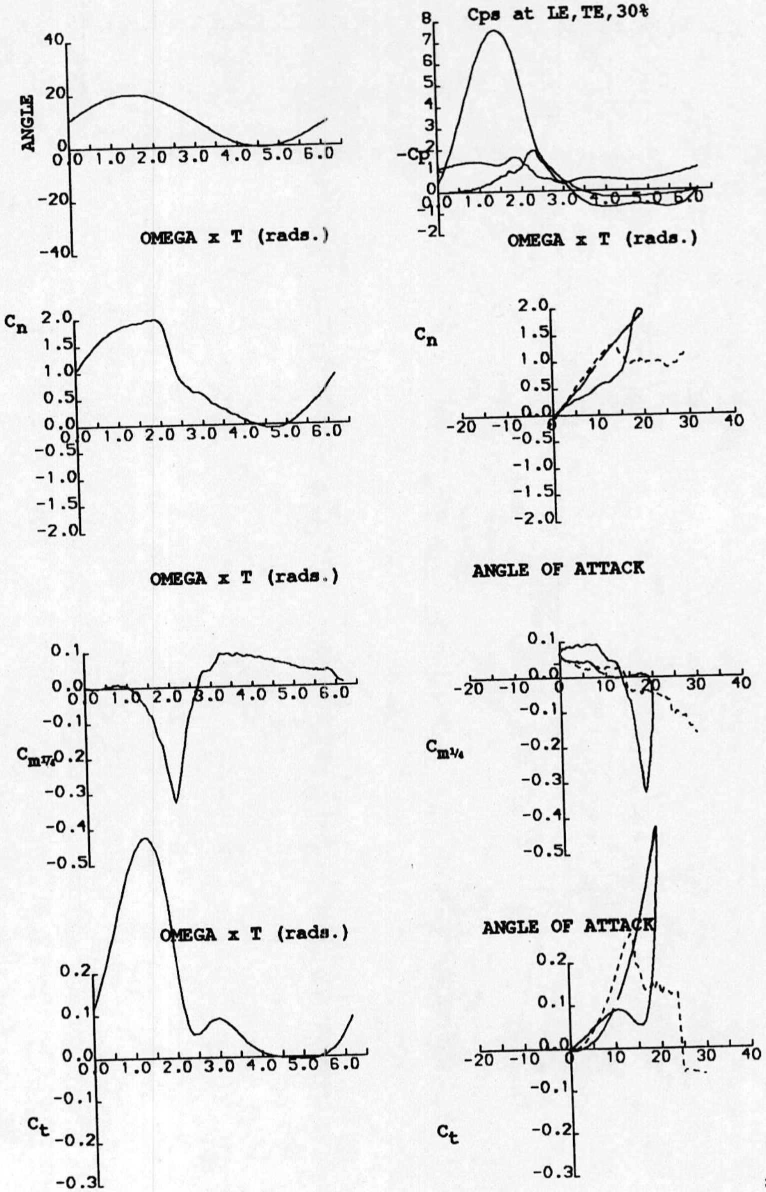
AIR TEMPERATURE = 30.0°C

SAMPLING FREQUENCY = 447.43 Hz.

REDUCED FREQUENCY = 0.157

AMPLITUDE = 10.00°

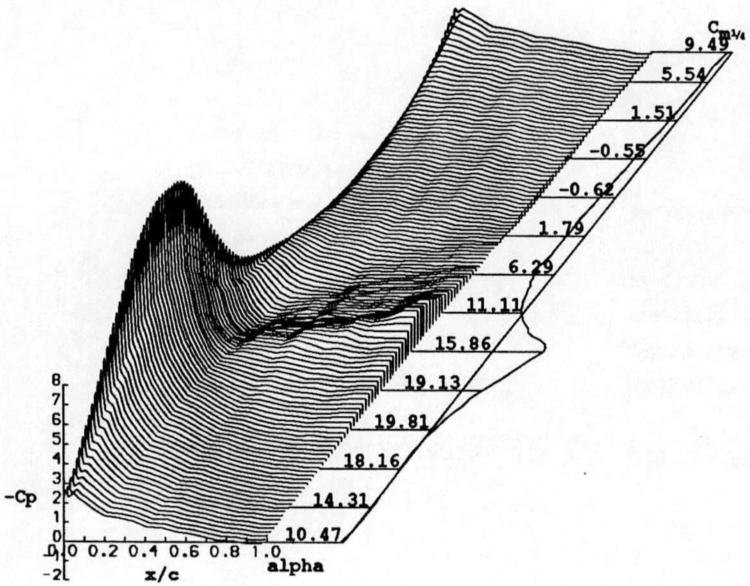


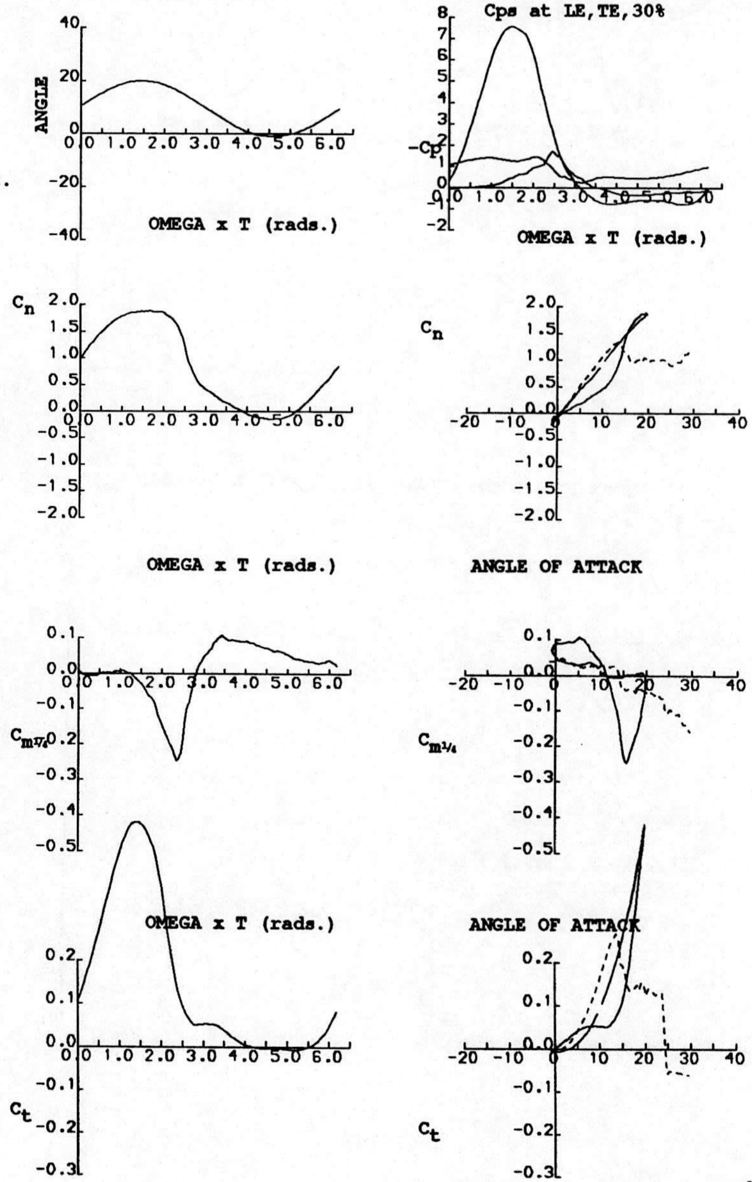


DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10831
REYNOLDS NUMBER = 1488742.
DYNAMIC PRESSURE = 958.36 Nm^{-2}
NUMBER OF CYCLES = 10
MOTION TYPE: SINUSOIDAL
MEAN ANGLE = 10.00°
OSCILLATION FREQUENCY = 4.078 Hz.
AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 17/3/86
MACH NUMBER = 0.111
AIR TEMPERATURE = 30.0°C
SAMPLING FREQUENCY = 521.92 Hz.
REDUCED FREQUENCY = 0.182
AMPLITUDE = 10.00°





DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10841

REYNOLDS NUMBER = 1474930.

DYNAMIC PRESSURE = 940.66 Nm^{-2}

NUMBER OF CYCLES = 10

MOTION TYPE: SINUSOIDAL

MEAN ANGLE = 20.00°

OSCILLATION FREQUENCY = 0.478 Hz.

AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 17/3/86

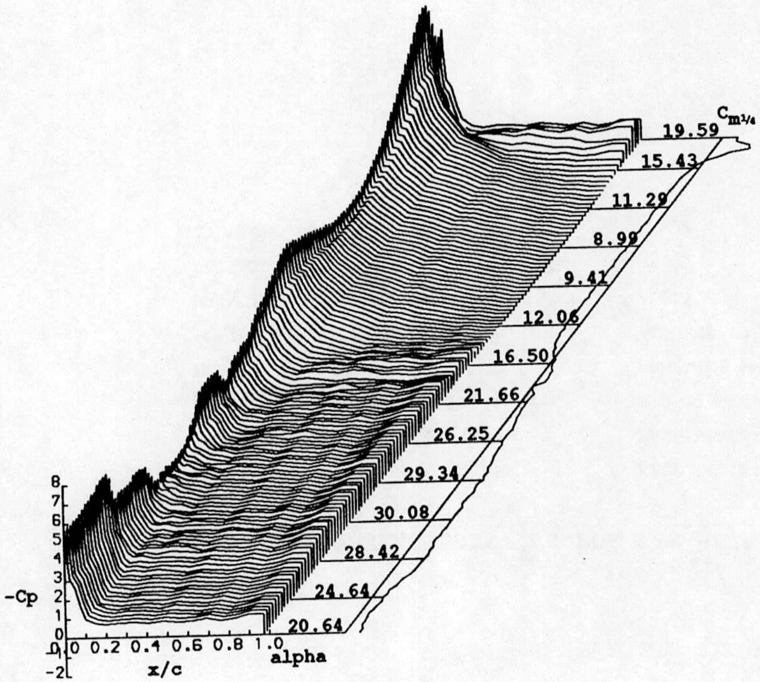
MACH NUMBER = 0.110

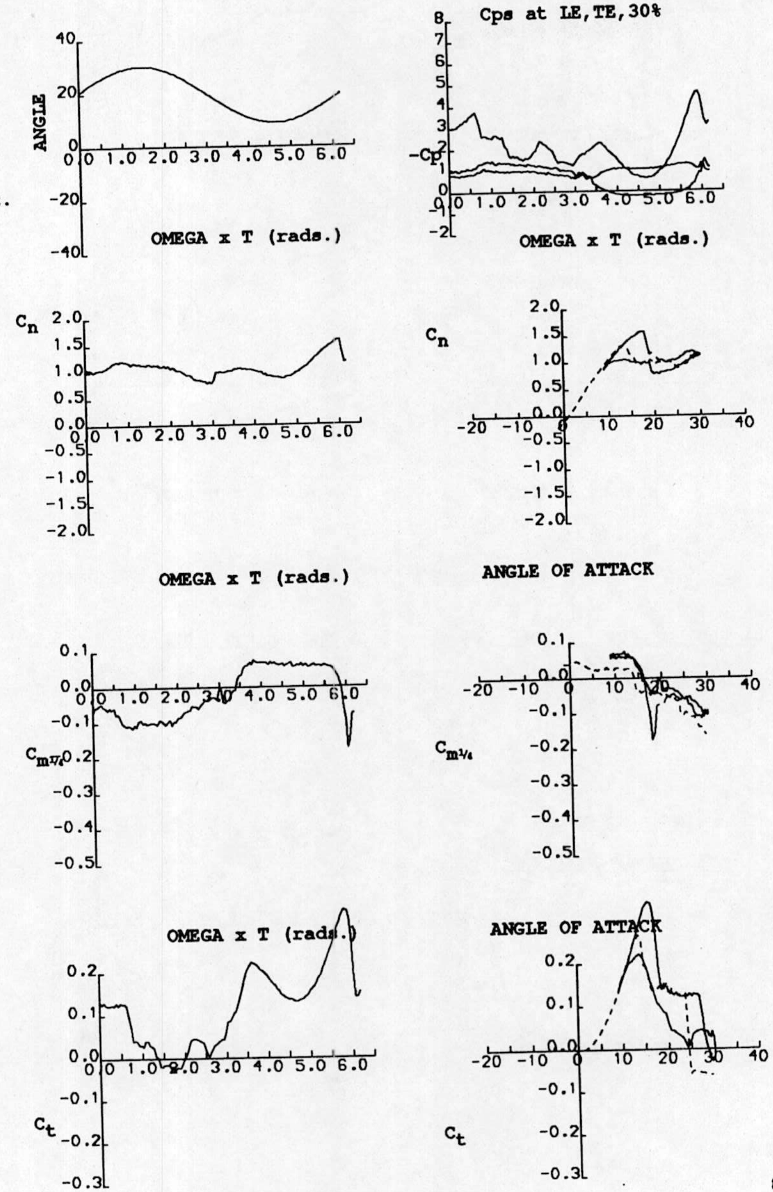
AIR TEMPERATURE = 30.0°C

SAMPLING FREQUENCY = 61.18 Hz.

REDUCED FREQUENCY = 0.022

AMPLITUDE = 10.00°





DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10851

REYNOLDS NUMBER = 1483462.

DYNAMIC PRESSURE = 951.57 Nm^{-2}

NUMBER OF CYCLES = 10

MOTION TYPE: SINUSOIDAL

MEAN ANGLE = 20.00°

OSCILLATION FREQUENCY = 0.716 Hz.

AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 17/3/86

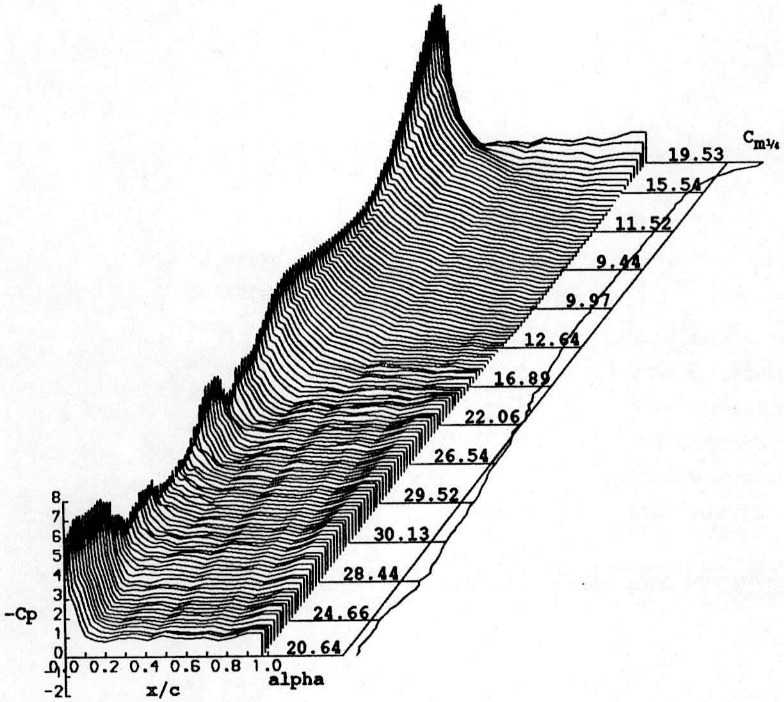
MACH NUMBER = 0.110

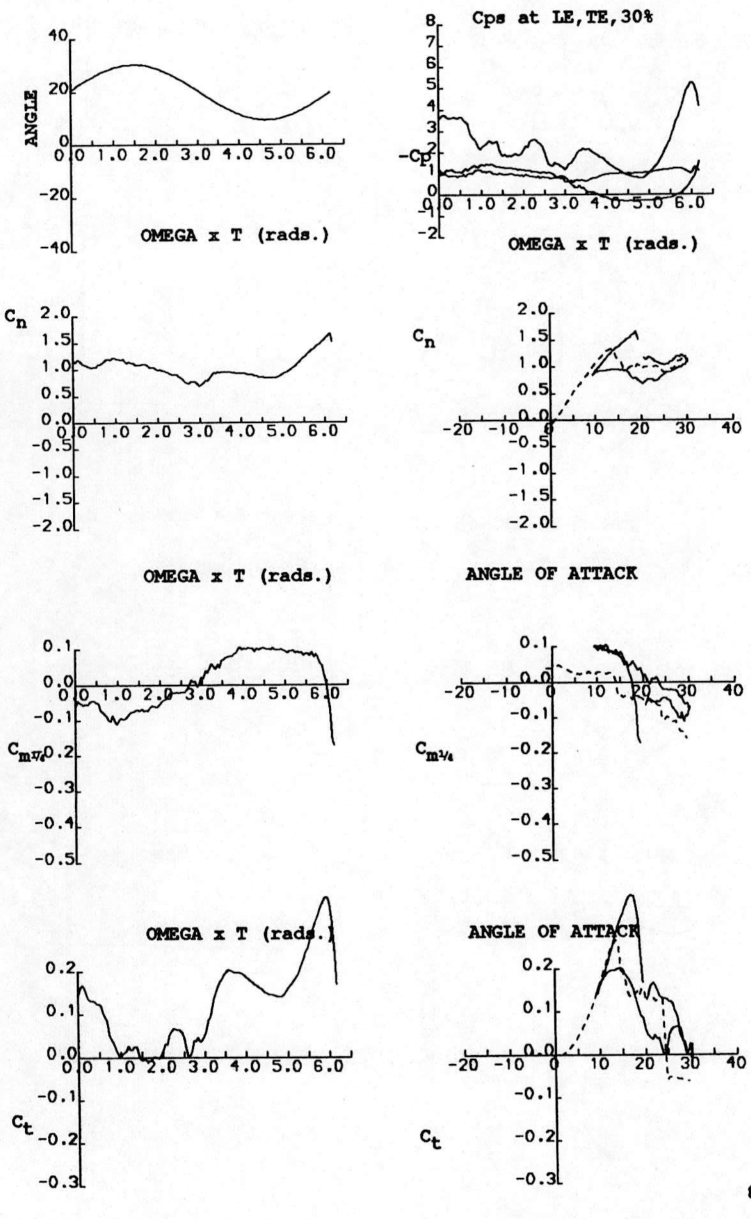
AIR TEMPERATURE = 30.0°C

SAMPLING FREQUENCY = 91.65 Hz.

REDUCED FREQUENCY = 0.032

AMPLITUDE = 10.00°





DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10861

REYNOLDS NUMBER = 1473034.

DYNAMIC PRESSURE = 938.24 Nm^{-2}

NUMBER OF CYCLES = 10

MOTION TYPE: SINUSOIDAL

MEAN ANGLE = 20.00°

OSCILLATION FREQUENCY = 0.955 Hz.

AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 17/3/86

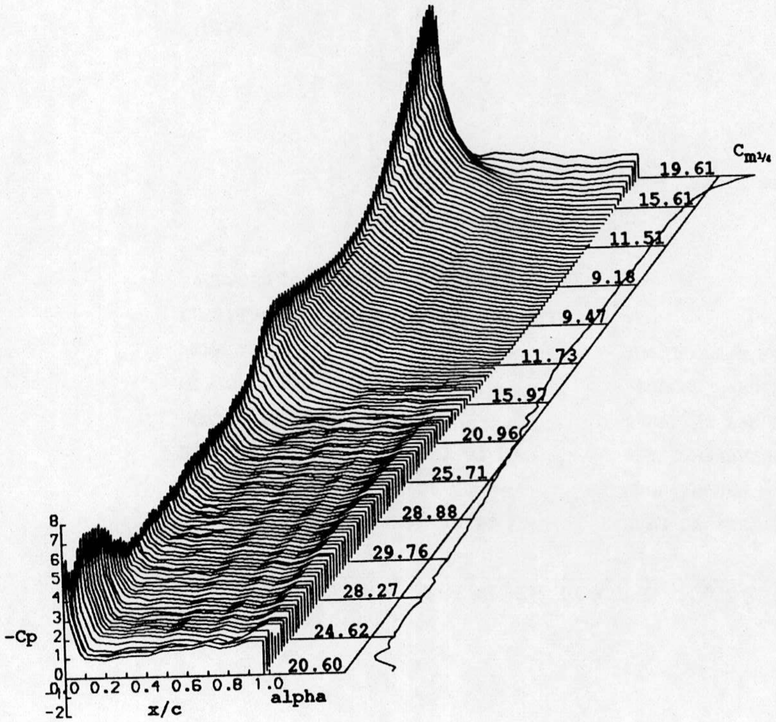
MACH NUMBER = 0.110

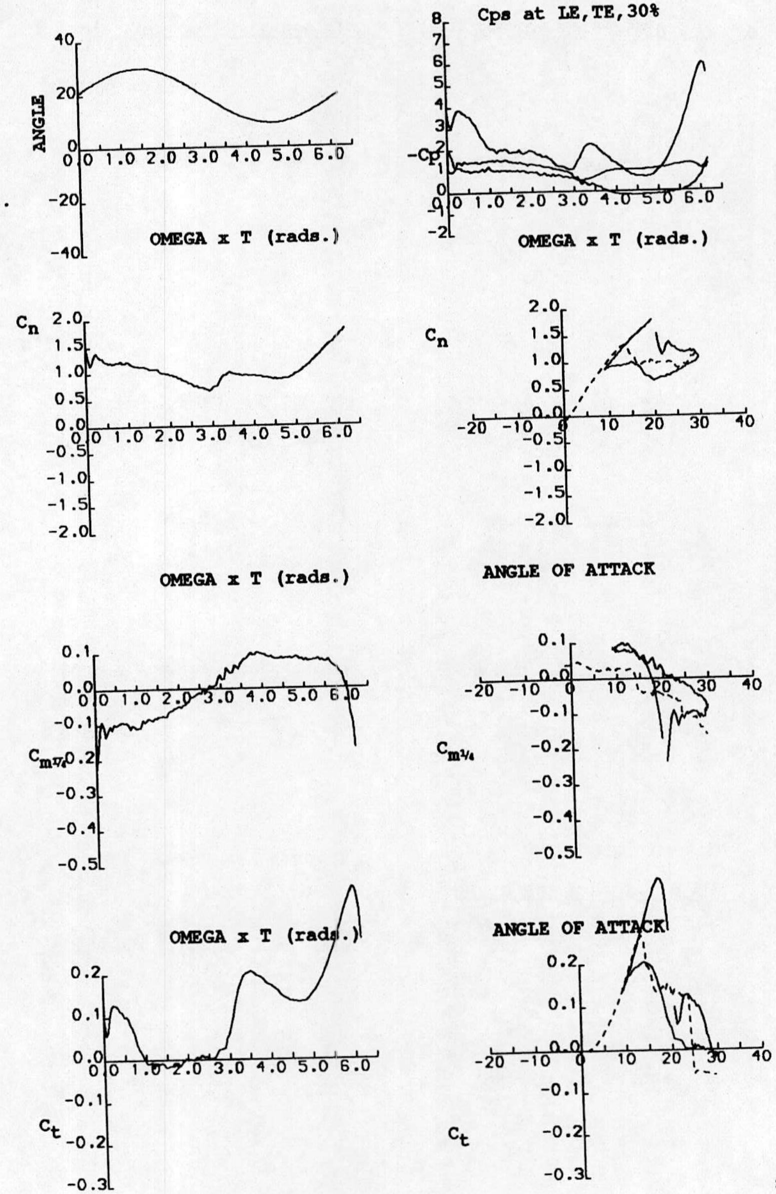
AIR TEMPERATURE = 30.0°C

SAMPLING FREQUENCY = 122.23 Hz.

REDUCED FREQUENCY = 0.043

AMPLITUDE = 10.00°





DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10871

REYNOLDS NUMBER = 1480802.

DYNAMIC PRESSURE = 948.16 Nm^{-2}

NUMBER OF CYCLES = 10

MOTION TYPE: SINUSOIDAL

MEAN ANGLE = 20.00°

OSCILLATION FREQUENCY = 1.198 Hz.

AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 17/3/86

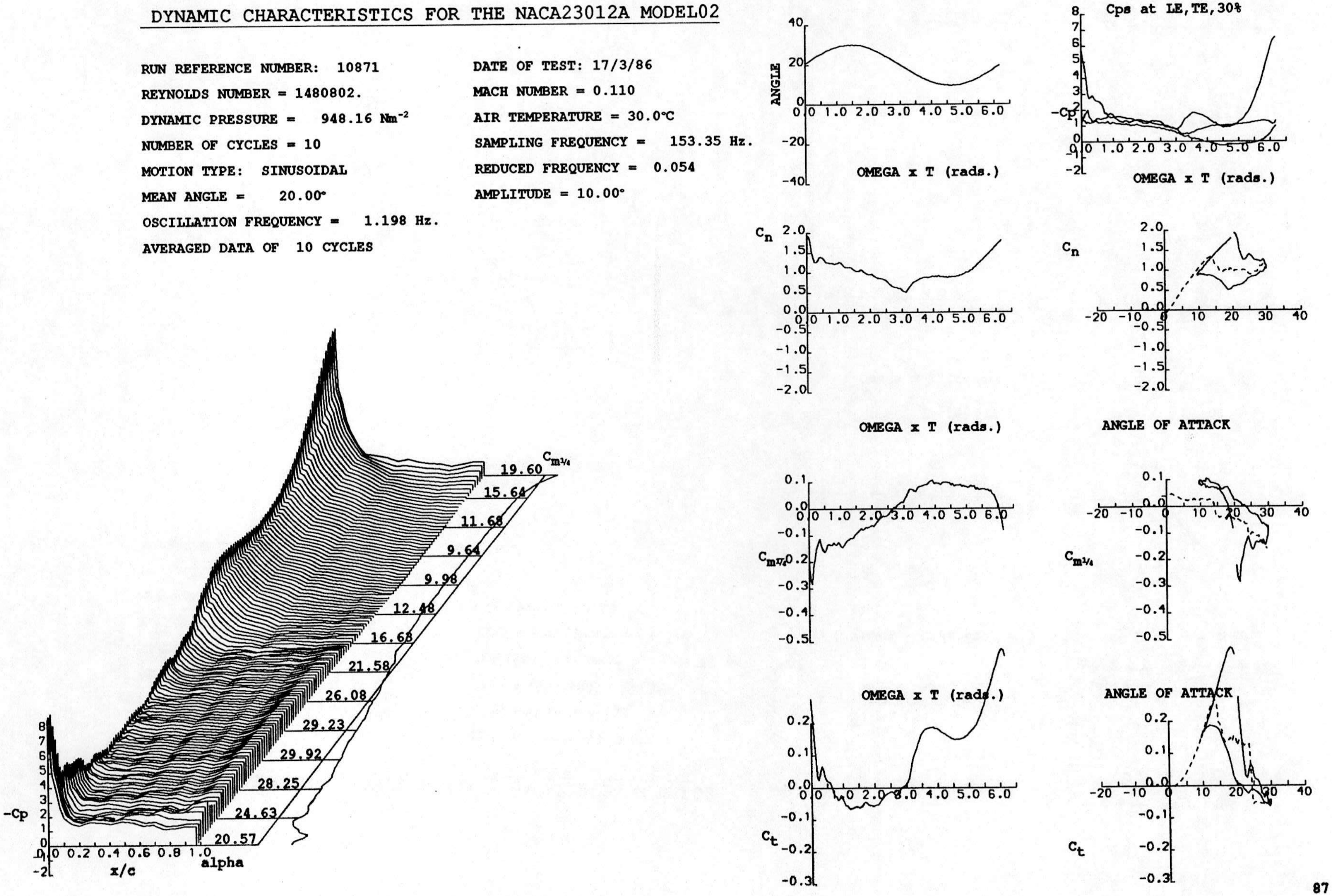
MACH NUMBER = 0.110

AIR TEMPERATURE = 30.0°C

SAMPLING FREQUENCY = 153.35 Hz.

REDUCED FREQUENCY = 0.054

AMPLITUDE = 10.00°



DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10881

REYNOLDS NUMBER = 1507681.

DYNAMIC PRESSURE = 961.35 Nm^{-2}

NUMBER OF CYCLES = 10

MOTION TYPE: SINUSOIDAL

MEAN ANGLE = 4.00°

OSCILLATION FREQUENCY = 2.330 Hz.

AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 24/7/85

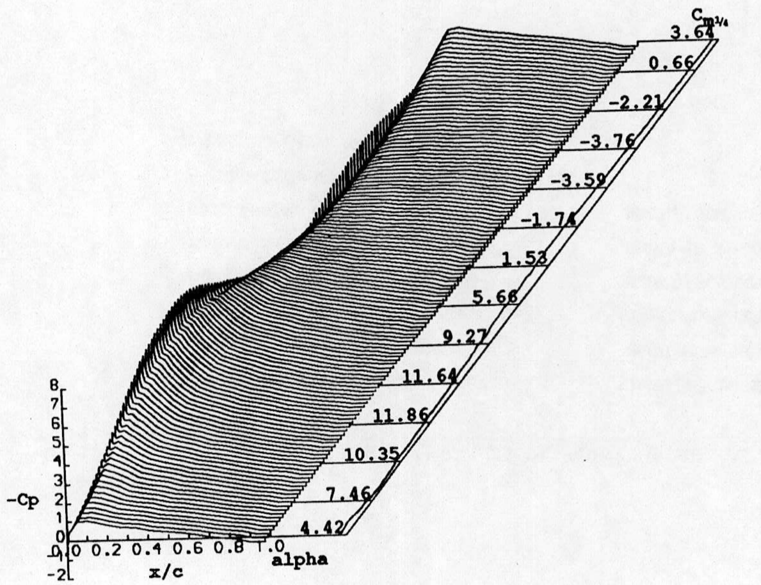
MACH NUMBER = 0.112

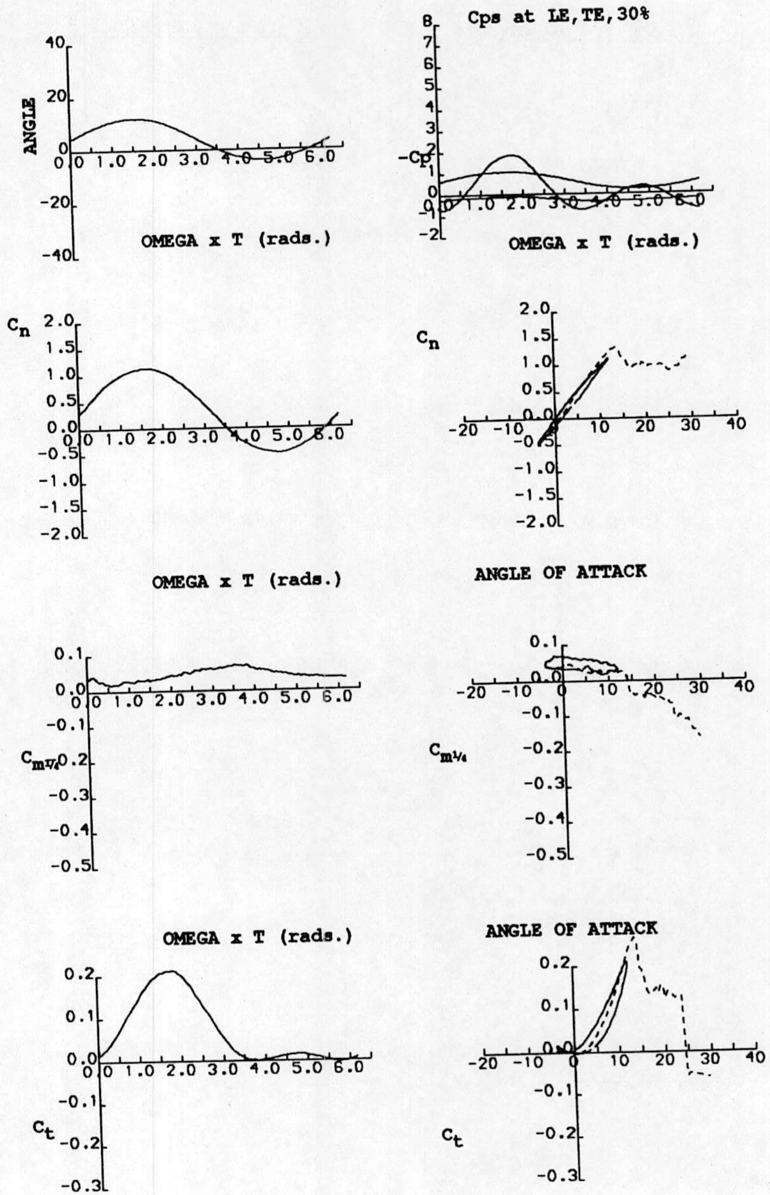
AIR TEMPERATURE = 26.0°C

SAMPLING FREQUENCY = 298.24 Hz.

REDUCED FREQUENCY = 0.104

AMPLITUDE = 8.00°

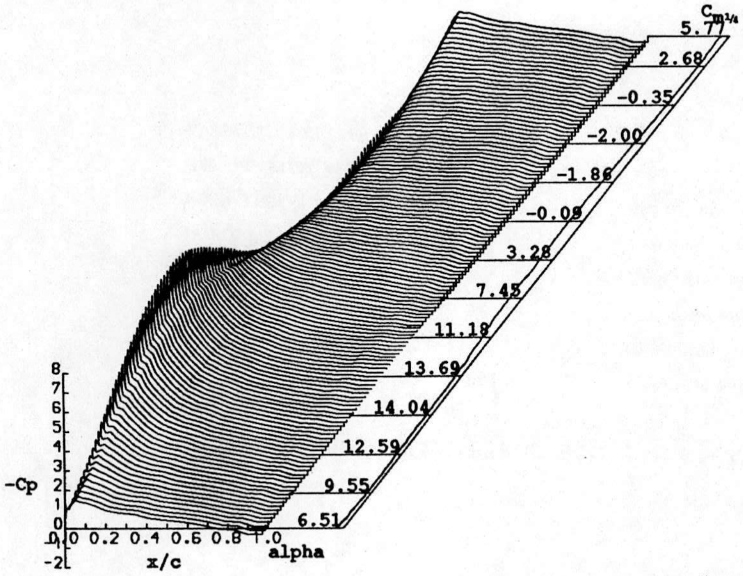


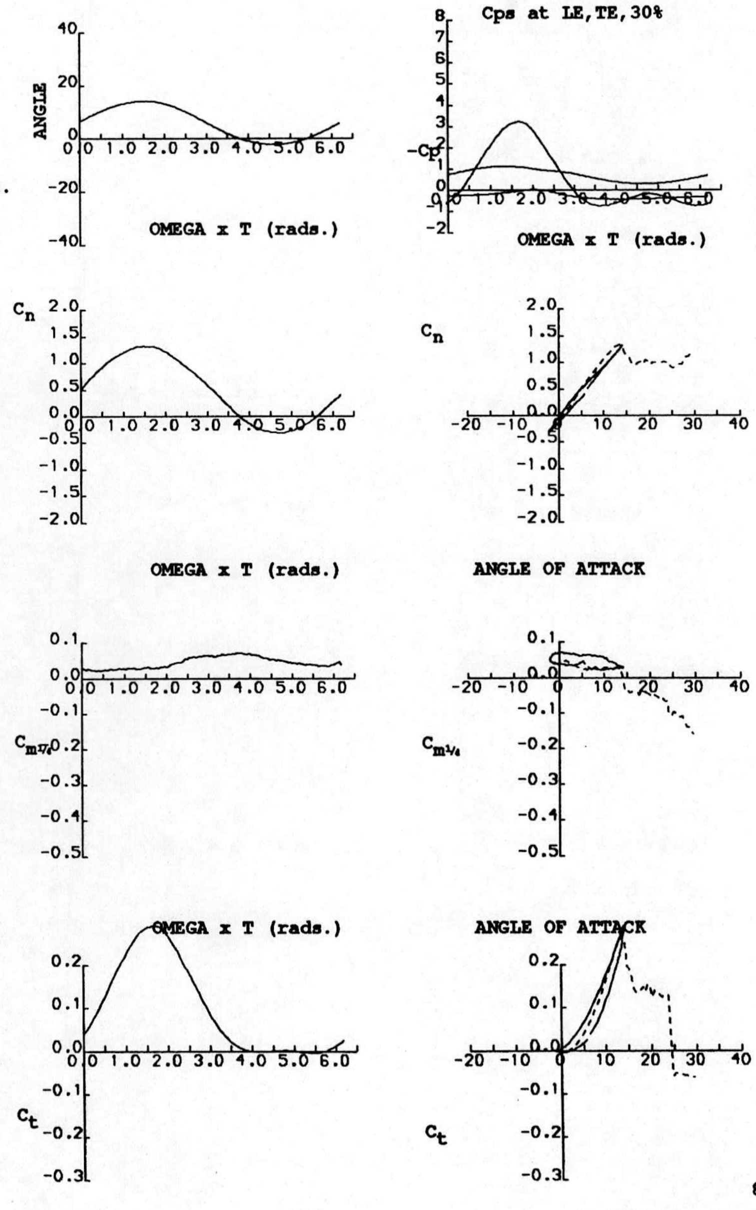


DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10891
REYNOLDS NUMBER = 1499009.
DYNAMIC PRESSURE = 950.32 Nm^{-2}
NUMBER OF CYCLES = 10
MOTION TYPE: SINUSOIDAL
MEAN ANGLE = 6.00°
OSCILLATION FREQUENCY = 2.330 Hz.
AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 24/7/85
MACH NUMBER = 0.111
AIR TEMPERATURE = 26.0°C
SAMPLING FREQUENCY = 298.24 Hz.
REDUCED FREQUENCY = 0.105
AMPLITUDE = 8.00°





DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10901

REYNOLDS NUMBER = 1495997.

DYNAMIC PRESSURE = 946.50 Nm^{-2}

NUMBER OF CYCLES = 10

MOTION TYPE: SINUSOIDAL

MEAN ANGLE = 8.00°

OSCILLATION FREQUENCY = 2.330 Hz.

AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 24/7/85

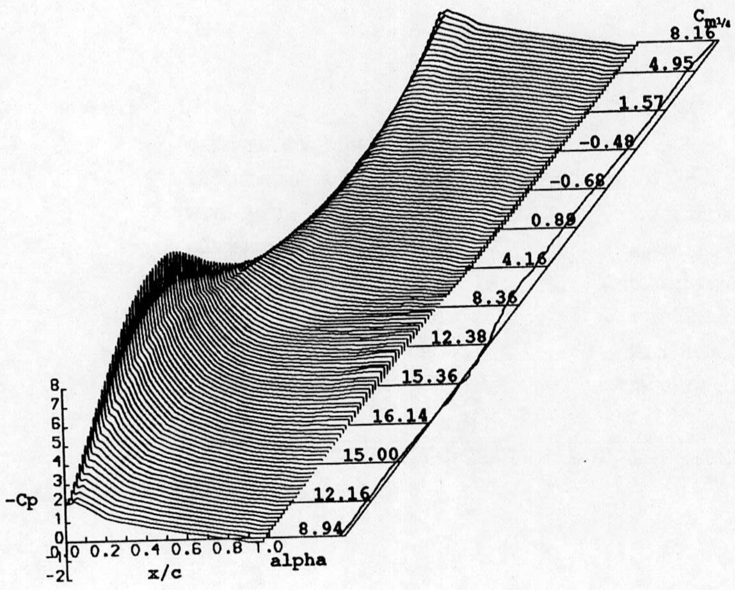
MACH NUMBER = 0.111

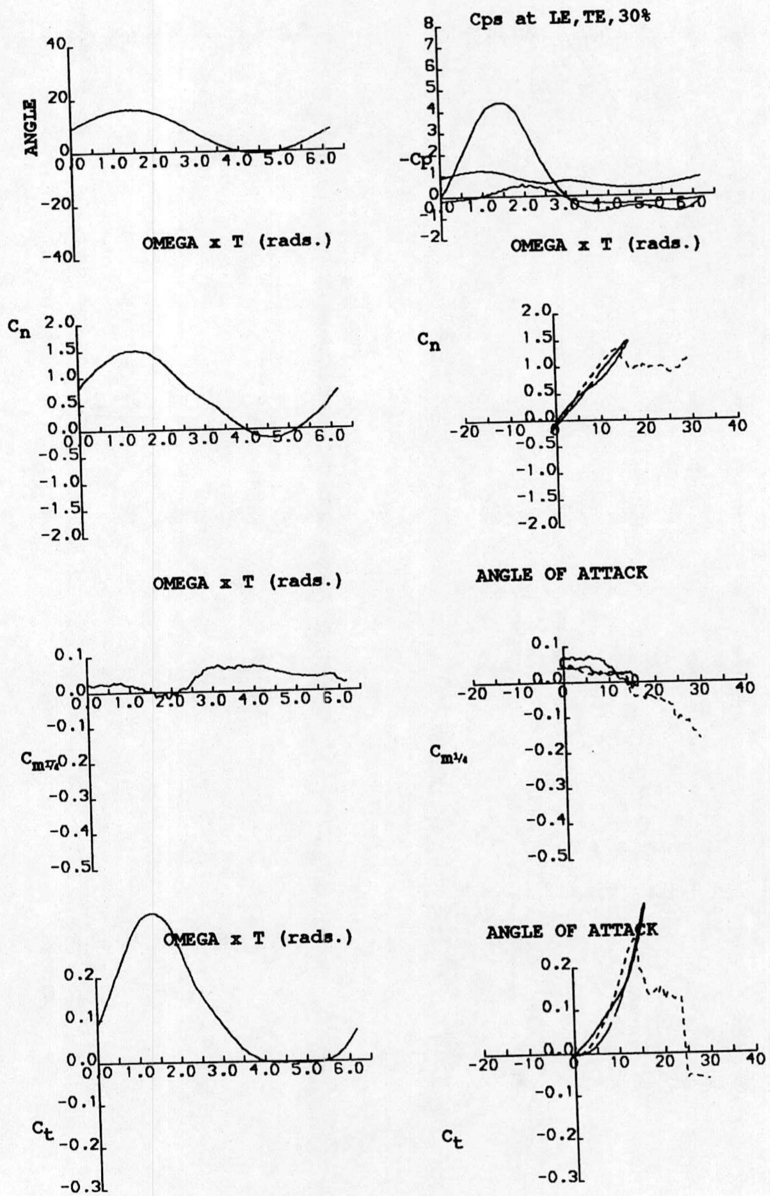
AIR TEMPERATURE = 26.0°C

SAMPLING FREQUENCY = 298.24 Hz.

REDUCED FREQUENCY = 0.105

AMPLITUDE = 8.00°





DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10911

REYNOLDS NUMBER = 1542815.

DYNAMIC PRESSURE = 1006.67 Nm^{-2}

NUMBER OF CYCLES = 10

MOTION TYPE: SINUSOIDAL

MEAN ANGLE = 10.00°

OSCILLATION FREQUENCY = 2.330 Hz.

AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 24/7/85

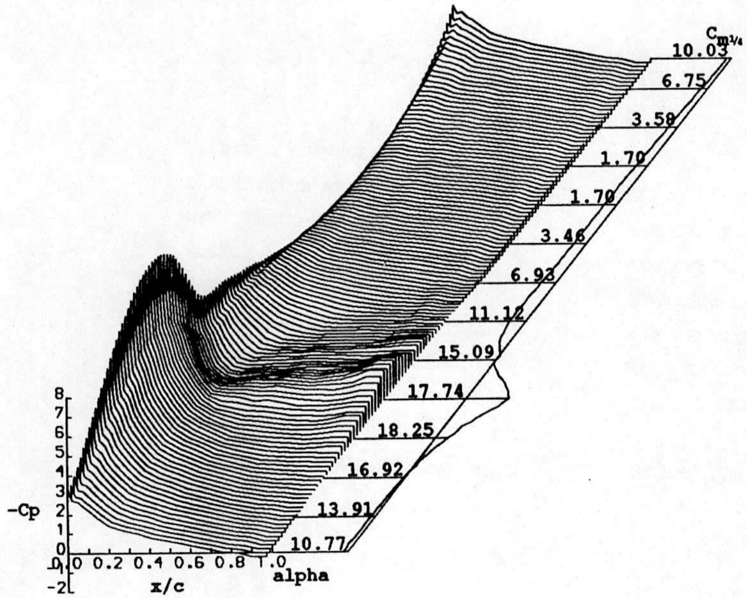
MACH NUMBER = 0.114

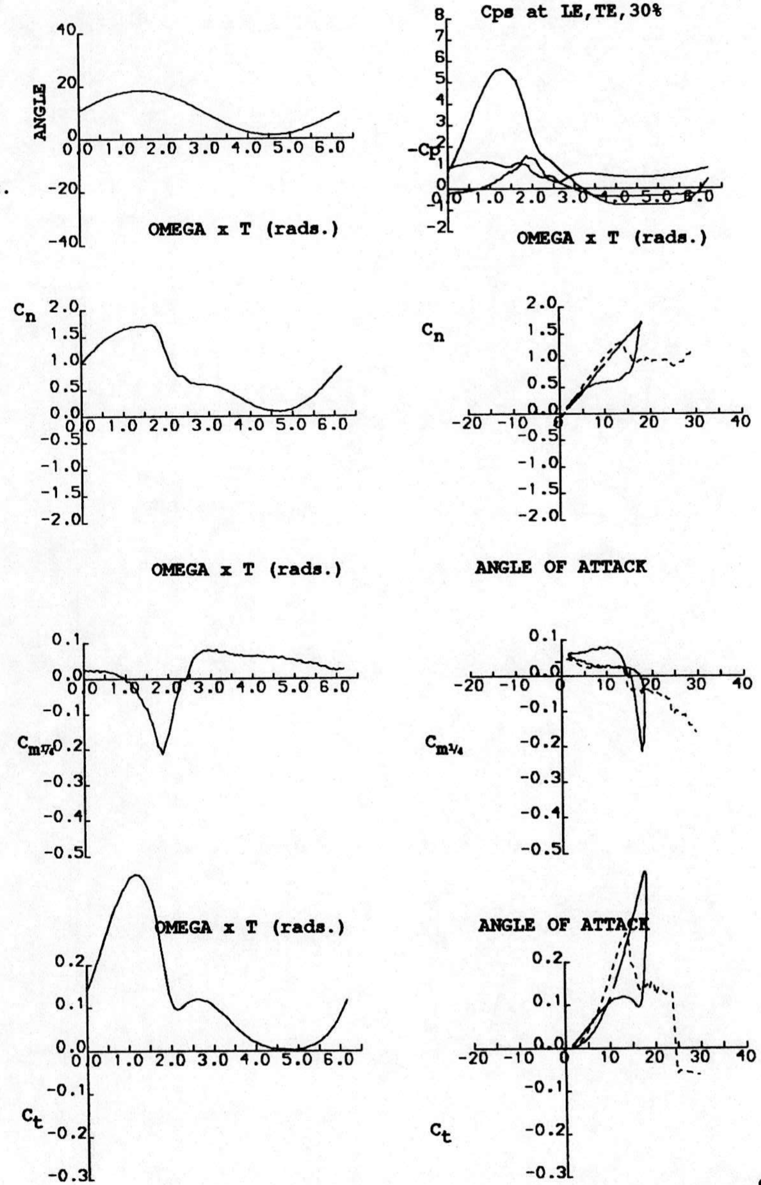
AIR TEMPERATURE = 26.0°C

SAMPLING FREQUENCY = 298.24 Hz.

REDUCED FREQUENCY = 0.102

AMPLITUDE = 8.00°





DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10921

REYNOLDS NUMBER = 1527392.

DYNAMIC PRESSURE = 986.65 Nm^{-2}

NUMBER OF CYCLES = 10

MOTION TYPE: SINUSOIDAL

MEAN ANGLE = 12.00°

OSCILLATION FREQUENCY = 2.330 Hz.

AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 24/7/85

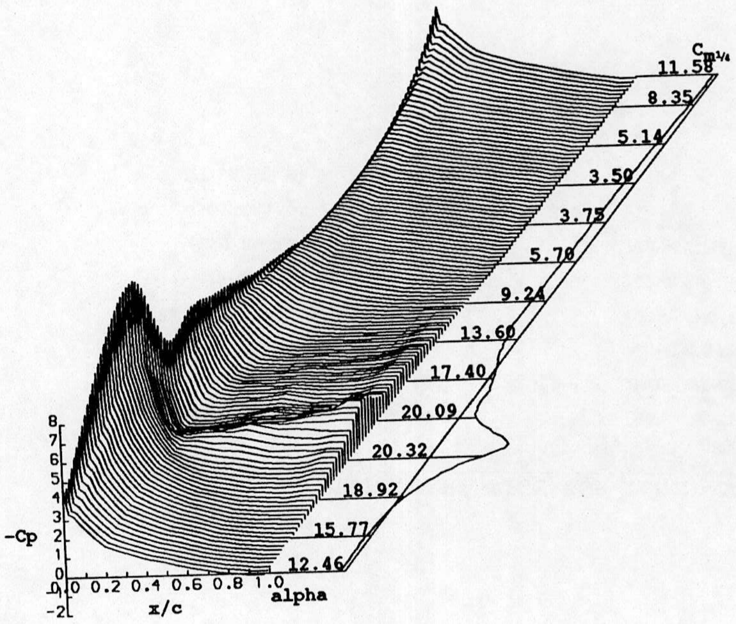
MACH NUMBER = 0.113

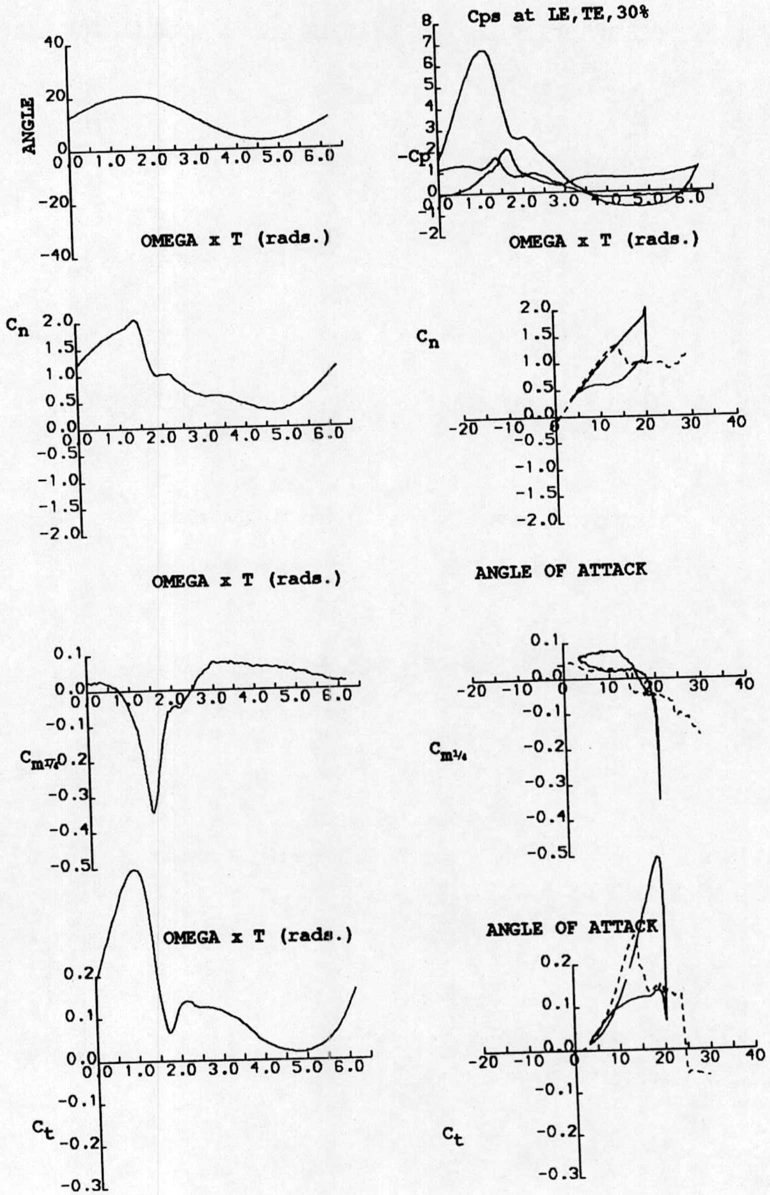
AIR TEMPERATURE = 26.0°C

SAMPLING FREQUENCY = 298.24 Hz.

REDUCED FREQUENCY = 0.103

AMPLITUDE = 8.00°





DYNAMIC CHARACTERISTICS FOR THE NACA23012A MODEL02

RUN REFERENCE NUMBER: 10931

REYNOLDS NUMBER = 1526854.

DYNAMIC PRESSURE = 985.95 Nm^{-2}

NUMBER OF CYCLES = 10

MOTION TYPE: SINUSOIDAL

MEAN ANGLE = 17.00°

OSCILLATION FREQUENCY = 2.330 Hz.

AVERAGED DATA OF 10 CYCLES

DATE OF TEST: 24/7/85

MACH NUMBER = 0.113

AIR TEMPERATURE = 26.0°C

SAMPLING FREQUENCY = 298.24 Hz.

REDUCED FREQUENCY = 0.103

AMPLITUDE = 8.00°