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ALCM Preflight-Test Thrust Uncertainty Analysis

B. D. Couch, W. O. Boals, and B. M. Bishop
ARO, Inc.

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Uncertainty analyses of the F107 engine in-flight net thrust data acquisition systems and data reduction equations were conducted for both the AGM-86B (Boeing) and the AGM-109 (General Dynamics) Air-Launched Cruise Missile (ALCM) systems in preparation for the competitive flyoff between these two missile systems. An analytical model was developed to integrate the uncertainty estimates of the engine and missile inlet performance, the flight

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missile instrumentation and telemetering systems, and the flight data recording and reduction systems. This model was also used to calculate uncertainty estimates for each of several different net thrust equations which were used as a guide to select the primary and backup thrust calculation methods for the subsequent ALCM competitive flyoff and to predict the error limits of the measured flight data.

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PREFACE

The work reported herein was conducted by the Arnold Engineering Development Center (AEDC), Air Force Systems Command (AFSC) at the request of the Directorate of Analysis and Evaluation (DOA), AEDC, for the Joint Cruise Missiles Project Office (JCMPO), Washington, D.C. The results of the research were obtained by ARO, Inc., AEDC Group (a Sverdrup Corporation Company), operating contractor for the AEDC, AFSC, Arnold Air Force Station, Tennessee, under ARO Project Number E43Y-87A. The AEDC project manager was Mr. D. Bradley. The manuscript was submitted for publication on December 30, 1980.

B. D. Couch is currently employed by Williams Research Corporation. W. O. Boals is employed by Sverdrup Technology, Inc., AEDC Group, and B. M. Bishop is employed by Sverdrup Technology, Inc., Technology Group.

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1.0 INTRODUCTION

The AGM-86B and the AGM-109 Air-Launched Cruise Missile (ALCM) weapons systems were the competitors in a flight test program to determine which of the systems would enter final production for the U.S. Air Force. The AGM-86B is manufactured by The Boeing Company (TBC), and the AGM-109 is built by the General Dynamics Corporation (GDC). Both of the ALCM systems are powered by F107 engines manufactured by the Williams Research Corporation (WRC). The F107-WR-101 engine is used in the AGM-86B, and the F107-WR-102 engine is used in the AGM-109.

The competitive flight tests were to be conducted at the Air Force Flight Test Center (AFFTC) using the Center's data acquisition and data reduction systems. The F107 engines were calibrated at the Naval Air Propulsion Center (NAPC), and the missile inlets were calibrated at the Arnold Engineering Development Center (AEDC). Since several techniques were proposed for calculating inflight net thrust during the competitive flight test program, pretest thrust uncertainties of the different thrust during the competitive flight test program, pretest thrust uncertainties of the different thrust calculation methods were estimated to provide the information required for selection of the primary and backup inflight thrust calculation techniques for each missile system. These estimates also quantify the thrust data error that can be expected. The methodology for the uncertainty analyses was based on Ref. 1.

2.0 DISCUSSION

Engine inflight net thrust was determined during flight performance evaluation tests of the AGM-86B and the AGM-109 ALCM systems using calculation procedures which were dependent upon measurements obtained with the missile and engine flight test measurement systems and upon separate ground test calibrations of the engines and the missile inlet air induction systems. Each flight engine was calibrated at the NAPC to determine engine airflow and gross thrust as functions of measured engine parameters. The flight instrumentation used to obtain the engine parameters during the engine calibration is listed in Table 1; the instrumentation station locations and the scope of the overall measurement systems are shown in Figs. 1 and 2. respectively.

Preflight-test missile inlet pressure recovery calibration data were obtained for each ALCM system from full-scale missile wind tunnel tests conducted in the AEDC's Propulsion Wind Tunnel (16T) (Refs. 2 and 3).

2.1 ALCM DATA ACQUISITION, TRANSMISSION, PROCESSING, AND REDUCTION

The missile data acquisition/transmission system converts the sensor signals to a pulse code modulated format and telemeters the data to ground and airborne stations (Fig. 2). Each missile data system has two Pulse Code Modulations (PCM), one used primarily for engine data and the other primarily for guidance and air frame data.

Data processing and reduction responsibilities were shared by the missile contractors and the AFFTC. Information concerning the measurement system probable errors was obtained from the missile systems contractors (Refs. 4 and 5) and the AFFTC. The flow of information required to accomplish the inflight net thrust analysis is illustrated in Fig. 3. The responsibility of the AEDC was to assimilate the measurement systems error information and to process this information using the methodology of Ref. 1 to estimate the measurement systems uncertainties.

2.2 MEASUREMENT UNCERTAINTIES

2.2.1 Methodology

The measurement uncertainty methodology utilized herein is outlined in Ref. 1, wherein measurement errors are the differences between the measurements and the true value defined by the National Bureau of Standards (NBS). Uncertainty (U) is the maximum error which might reasonably be expected. The uncertainty includes two types of measurement errors (i.e., fixed and random errors). The component of the uncertainty estimate that represents random error is called precision. Precision is derived from the standard deviation of repeated measurements as shown in Fig. 4. The fixed error component of the uncertainty estimate is called bias. Bias error levels are generally derived by engineering judgement and provide an upper limit of the fixed error. Bias is categorized into five classes: (1) large known biases, (2) small known biases, (3) large unknown biases, and small unknown biases which may have (4) unknown sign (±) or (5) known sign. Some bias errors can be eliminated through calibrations, proper installation techniques, and environmental control. The remaining errors representative of controlled processes were analyzed. Errors incurred from improper installation, equipment failure, telemetry dropouts, etc., were not considered.

The method for combining elemental measurement errors is to first determine the bias limit (B) and precision index (S) from the root-sum-squared (RSS) values of the elemental biases (b) and precisions (s), and then to apply the uncertainty formula (Ref. 1) to the combined bias limits and precision indices as illustrated in Fig. 5.

In the uncertainty formula

$$U = \pm (B_{meas} + t_{95}\, S_{meas})$$

the bias limit, B, represents an upper limit, and the precision index, S, is weighted by t_{95}, which is the 95th percentile point of the two-tailed Student's "t" distribution. (The t value is a function of the number of degrees of freedom used in calculating S. The number of degrees of freedom is the size of the sample, and when the number of samples is 30 and above, $t_{95} = 2$. Using the uncertainty formula to combine the fixed and random errors provides an uncertainty estimate that defines an interval about the measurement which encompasses the true value. A graphic example of this is shown in Fig. 6. To obtain the measurement uncertainty of a system one must accomplish the following tasks:

1. Determine the elemental bias and precision errors for the calibration, measuring, data acquisition, and data reduction processes.

2. Combine elemental bias and precision errors into system total bias and total precision error components.

3. Combine system bias and precision into an uncertainty estimate.

2.2.2 Procedural Example

Elemental error information of the AGM-86B and AGM-109 measurement systems (including data transmission and data reduction systems) was obtained from the respective ALCM contractors and AFFTC and analyzed at the AEDC. Block diagrams were made of each measurement system, and the elemental error sources were listed. A typical block diagram of the exhaust gas temperature measurement system is shown in Fig. 7. The system elemental errors shown for the EGT measurement are defined as follows:

b_1 = bias error of the thermocouple wire from the manufacturers' chemical composition tolerances = ±0.75 percent, full scale.

s_1 = precision error of the thermocouple wire = 0 percent.

b_2 = bias error of the signal conditioner from 0.1-percent nonlinearity, 0.1-percent power supply variations, and 0.3-percent cold junction temperature coefficient = ±0.33 percent, full scale.

s_2 = precision error of the signal conditioner from nonrepeatability of redundant calibrations = ±0.25 percent, full scale.

b_3 = bias error of pulse code modulation (PCM) system from manufacturers' specification tolerances = ±0.25 percent, full scale.

s_3 = precision error of PCM system from manufacturers' specification tolerances = ±0.08 percent, full scale.

b_4 = bias error of digital telemetry receiver recording onto magnetic tape = 0 percent.

s_4 = precision error of digital telemetry receiver recording onto magnetic tape = 0 percent.

b_5 = bias error of digital preprocessor system recording onto magnetic tape = 0 percent.

s_5 = precision error of digital preprocessor system recording onto magnetic tape = 0 percent.

b_6 = bias error of digital tape conversion to engineering units from linear approximation of calibration curve = ±0.75 percent, full scale.

s_6 = precision error of digital tape conversion to engineering units = 0 percent.

The telemetered and on-ground data processing errors (b_4. b_5, s_4, s_5) are assumed negligible because the data are transmitted in a digital format and the word size of the data processing equipment is greater than the transmitted data word size. Bias errors b_1, b_2, and b_6 cancel out because the same sensors and signal conditioners were used during the engine calibration as are being used during the flight test. Therefore, these three bias errors were not included in the system uncertainty estimate.

A measurement system uncertainty estimate is determined using the uncertainty formula (Ref. 1) and the individual bias limits and precision indices as previously outlined.

The above methodology was applied to each measurement system required for in-flight net thrust determination for both the AGM-86B and AGM-109 ALCM systems. The resultant measurement system uncertainties are presented in Table 2.

2.3 ENGINE CALIBRATIONS

The engines were calibrated at the NAPC for engine airflow and gross thrust at the simulated flight conditions shown in Table 3. The engine calibrations consisted of obtaining steady-state data at discrete power settings at each flight condition and correlating engine performance data from facility-measured and engine-measured parameters.

A data uncertainty analysis was provided by the NAPC for each engine calibrated at that facility. These analyses were based on the Ref. 1 methodology and included uncertainty estimates of engine corrected airflow, WAC, and each of the five calculated gross thrust calibration parameters, i.e., FGP, CV8M, CV8E, CV8A, and FGC.

At the time of this study, the only NAPC engine calibration data and uncertainty estimates available were from the first two -101 flight engine calibration tests (S/N's 330 and 331). Therefore, these estimates were also used for the -102 engine. The NAPC-provided engine calibration data uncertainty estimates are presented in graphical form in Fig. 8.

2.4 MISSILE INLET CALIBRATIONS

Prior to the ALCM competitive flight test program, full-scale model tests were conducted at the AEDC (Refs. 2 and 3) to assess both the AGM-86B and AGM-109 inlet performance. These tests indicate that the inlet ram recovery was predominantly a function of corrected inlet airflow for both ALCM systems. For ram recovery (ETAR), the uncertainty estimate based on measurement uncertainty estimates from Refs. 2 and 3 and the error propagation methodology outlined in Ref. 1 was calculated to be

$$U_{ETAR} = \pm 0.15 \text{ percent}$$

This value was used in the flight test uncertainty analysis for both ALCM systems.

2.5 FLIGHT TEST DATA UNCERTAINTIES

2.5.1 Error Propagation Methodology

Engine net thrust cannot be measured directly during flight. More basic parameters such as rotor speeds, fuel flow, temperatures, and pressures are directly measured, and through correlation with engine and inlet calibration data obtained in an altitude test facility, in-flight net thrust is derived. Errors which exist in the measured parameters during flight are propagated through the governing net thrust equations.

A schematic representation of the error propagation technique is presented in Fig. 9. The primary components in the analysis are the influence coefficient (IC) computer program and the flight test engine performance (EP) computer program.

The IC program is a standard AEDC computer program for error propagation utilizing the procedures and guidelines outlined in Ref. 1. The IC program handles a maximum of 40 independent and 30 dependent variables.

The IC program is operated in two modes. One mode (influence mode) is used to obtain influence coefficients indicating the level of dependence of the calculated parameter on the independent parameters used in its calculation. This information is used as an analysis tool to estimate the partial derivative of the dependent variables by determining the effect of a one-percent change in each independent variable on the selected dependent variable. The influence coefficient matrices at the five flight conditions investigated are presented in Appendixes B and C for the AGM-86B and AGM-109 thrust calculations, respectively. The second mode (error mode) is used to determine the estimated errors (uncertainty) in the calculated parameter from estimated errors of the independent parameters.

Errors in the independent parameters are accepted by the IC program in the form of symmetrical bias (B) and precision (S) errors. The IC program uses separate Taylor's series expansions to operate on the bias and precision errors to propagate the errors into the final calculated (dependent) parameter.

For this investigation, the estimated errors in measured flight parameters and engine calibration results were propagated into estimates of uncertainty of net thrust at five specific flight conditions for both ALCM systems. The propagation of bias and precision errors of parameters $x_1, x_2, \ldots, x_n$ in a calculated parameter y, i.e.,

$$y = f(x_1, x_2, \ldots x_n)$$

approximated by a Taylor's series expansion (Ref. 1) is

$$B_y = \pm\left\{\left[(\partial y/\partial x_1)\left(B_{x_1}\right)\right]^2 + \left[(\partial y/\partial x_2)\left(B_{x_2}\right)\right]^2 + \ldots \left[(\partial y/\partial x_n)\left(B_{x_n}\right)\right]^2\right\}^{1/2}$$

and

$$S_y = \pm\left\{\left[(\partial y/\partial x_1)\left(S_{x_1}\right)\right]^2 + \left[(\partial y/\partial x_2)\, S_{x_2}\right]^2 + \ldots \left[(\partial y/\partial x_n)\left(S_{x_n}\right)\right]^2\right\}^{1/2}$$

where the partial derivatives $\partial y/\partial x_i$ are referred to as the uncertainty influence coefficients (estimated by exercising the IC program in the influence coefficient mode) and the products $[(\partial y/\partial x_i)(BX_i)]$ and $[(\partial y/\partial x_i)(Sx_i)]$ are the error contributions of the system components to the bias and precision errors of y, respectively (i.e., elemental bias and precision errors). The total uncertainty in net thrust (or other selected dependent parameter) is then calculated as

$$U = \pm(B_y + t_{95}S_y)$$

where $t_{95} = 2$ because the degrees of freedom for this analysis are greater than 30 (Ref. 1).

Both modes of the IC program require a specific set of equations for each ALCM system which mathematically describes the relationships between the dependent and the independent parameters. These specific equations are provided within the EP program. The EP program is used to generate the base data set for each flight condition investigated and serves as the engine model during error propagation.

The information required by the IC and EP programs for error propagation is shown in Fig. 9. The EP program requires engine and inlet calibration test results and engine characteristic constants to supplement the basic engine performance equations. The equations used in the EP program are based on flight test equations (Refs. 6 and 7). The EP program also requires nominal values for measured engine parameters at each flight condition; these are obtained from the engine math model. The IC program, when operated in the error mode, requires estimates not only of the bias and precision errors of measured flight parameters, but also of engine and inlet calibration data.

Although the engine and inlet calibration data errors consisted of the combined bias and precision errors obtained in the ground test facility, these combined errors are treated as fixed bias errors (precision error equal to zero) for inputs into the flight test uncertainty analysis. Thus the bias error of the calibration data in the flight test analyses is equivalent to the total error of the ground test data; i.e.,

$$\left(B_{x_i}\right)_{\text{Flight Test}} = \left(U_{x_i}\right)_{\text{Ground Test}} = \left(B_{x_i} + t_{95}S_{x_i}\right)_{\text{Ground Test}}$$

where x_i is a calibration parameter.

2.5.2 Computer Program Inputs

Flight Conditions

The flight conditions at which uncertainties in engine net thrust were investigated are listed in Table 4 for both ALCM systems. Flight condition one was chosen to provide comparisons between the two systems while conditions two through five were chosen by the respective contractors. All flight conditions chosen are representative of conditions expected during a typical flight test mission.

Engine Math Models

Nominal values of some of the input parameters supplied to the EP program were determined for all flight conditions from the engine math models supplied by the engine manufacturer (WRC). Math models designated No. CD 22951-2 and No. CD 23700-2 (Refs. 8 and 9) were utilized for the AGM-86B and the AGM-109 systems, respectively. The math model parameters used as inputs to the EP program are listed in Table 5.

Engine Characteristic Constants

Calculations of engine performance parameters by the EP program require nominal values for certain engine characteristic constants such as combustion efficiency and turbine efficiency. A listing of the required constants and the values used is presented in Table 6.

Estimated Bias and Precision Elemental Errors

Errors in measured flight parameters and engine calibration data were estimated as described in the sections on measurement uncertainties and engine calibration. These errors are presented in Table 2 and Fig. 8 and were input to the IC program during operation in the error mode.

Engine/Inlet Calibration Results

The engine and inlet calibration results used in the EP program to calculate in-flight engine performance are presented in Table 7. The results were supplied in the form of polynomial equations; for example, corrected engine airflow (WAC) was supplied as a quadratic equation in terms of the corrected fan speed (N1C).

2.5.3 Computer Program Outputs

The computer outputs for both ALCM systems consisted of baseline data. influence coefficients, bias error, precision error, and total uncertainty estimates for each thrust calculation method (as well as free-stream velocity and engine airflow) at each flight condition.

3.0 RESULTS

The primary results of the uncertainty analysis of in-flight net thrust are presented in Tables 8 and 9 for both the AGM-86B and the AGM-109 ALCM's. Included in Tables 8 and 9 are estimates of net thrust uncertainty for each of the five proposed thrust calculation methods, i.e., FGP, CV8M, CV8E, CV8A, and FGC, at each selected flight condition (Table 4). The bias error and precision error components as well as the total uncertainty estimates of net thrust are presented. Uncertainty estimates of free-stream velocity and engine airflow are also presented in Tables 8 and 9.

3.1 AGM-86B ALCM

For the AGM-86B, the total uncertainty estimates (Table 8) using the FGP, CV8M, and FGC methods were consistently lower than those using the CV8E and CV8A methods. The total uncertainty estimates using the FGP, CV8M and FGC methods were within ±0.3 percent agreement for all AGM-86B flight conditions, whereas the CV8E and CV8A methods deviated an additional +1.5 percent. The ranges of total uncertainty estimates using all five calculation methods for each of the flight conditions were as follows:

AGM-86B Flight Condition, Altitude, ft/Mach No.	Range of U (All Methods), ± percent
1,000/0.65	5.4 to 6.6
500/0.50	5.0 to 6.3
500/0.65	3.8 to 4.6
8,000/0.55	6.4 to 8.0
8,000/0.65	4.9 to 5.6

The total uncertainty estimate of in-flight thrust, as discussed above, can be interpreted as the uncertainty of a calculated net thrust value for a single data point as measured and processed with flight test measurement and data systems. However, these data are generally obtained at near steady-state conditions over a period of several (approximately 100) seconds, and the approximately 200 single data points taken during the most stable segment (30 to 40 sec) are averaged to obtain one performance evaluation data point. Since approximately 200 single data points are averaged, the in-flight thrust precision error will be reduced by the factor $1/\sqrt{200}$. Therefore, the estimated precision error of a performance evaluation data point is greatly reduced and, in fact, becomes negligible relative to the estimated bias error.

For the AGM-86B ALCM, the estimated bias errors of in-flight net thrust (Table 8), which can be assumed to approximate the total uncertainty for a flight data point, have the following ranges for the different flight conditions:

AGM-86B Flight Condition, Altitude, ft/Mach No.	Range of B, ± percent
1,000/0.65	4.6 to 6.0
500/0.50	4.2 to 5.8
500/0.65	3.0 to 4.2
8,000/0.55	5.0 to 7.4
8,000/0.65	4.0 to 5.1

On the basis of estimated bias errors only, net thrust calculation by the FGP, CV8M, and FGC methods again consistently provides lower uncertainty estimates than the CV8E and CV8A methods.

Free-stream velocity total uncertainty estimates varied from ±0.8 percent at 1,000 ft/Mach 0.65 and 500 ft/Mach 0.5 to ±1.4 percent at 8,000 ft/Mach 0.55. Bias error estimates for the same conditions varied from ±0.6 percent to ±1.1 percent, respectively.

Engine airflow total uncertainty estimates varied from ±1.7 percent at 500 ft/Mach 0.65 to ±2.6 percent at 8,000 ft/Mach 0.55. Bias error estimates for the same conditions varied from ±1.5 percent to ±2.4 percent, respectively.

In addition to providing relative uncertainty information for selection of the primary and backup methods for calculating net thrust, this analysis indicates the major contributors to these uncertainties. The error contributions to the AGM-86B uncertainty estimates of engine airflow and engine net thrust as calculated by the FGP, CV8M, and FGC methods for the 1,000 ft/Mach 0.65 condition are presented in Tables 10 and 11. The major contributors to in-flight engine airflow and net thrust uncertainties are the engine calibration data uncertainties. For in-flight engine airflow the bias error of the airflow calibration coefficient (CWAC) is -1.5 percent (approximately three times as large as the next largest contributor) compared to a total airflow uncertainty estimate of ±2.0 percent. The elemental bias error of the gross thrust parameter calibration coefficient (CFGP) is +3.7 percent compared to the total net thrust uncertainty of ±5.7 percent. Similar errors are noted for net thrust calculation by the CV8M and FGC methods. The influence of the engine airflow error contribution to net thrust uncertainty should also be noted. For example, for net thrust calculation by the FGP method, the bias error of the airflow calibration coefficient is 1.8 percent. It is evident also from Tables 10 and 11 that other significant contributors to airflow and net thrust bias error estimates are the free-stream temperature, TO, static pressure, PSO, and differential pressure, DELPO. The major contributors to the precision error estimates are the exhaust nozzle total pressures P6 and P16.

3.2 AGM-109 ALCM

The primary results of the uncertainty analysis for the AGM-109 ALCM are presented in Table 9. As was noted for the AGM-86B, the total uncertainty estimates provided by the FGP, CV8M, and FGC net thrust calculation methods were consistently lower than estimates provided by the CV8E and CV8A methods. However, for the AGM-109, the estimates based on the FGC method were consistently lower than the FGP and CV8M methods. The net thrust total uncertainty estimates from the five thrust calculation procedures at each selected AGM-109 flight condition (Table 4) were as follows:

AGM-109 Flight Condition, Altitude, ft/Mach No.	Range of U (All Methods), ± percent
1,000/0.65 (PLA = 0.6)	5.6 to 7.0
1,000/0.65)PLA = 1.5)	4.7 to 5.9
1,000/0.75	3.7 to 4.9
8,000/0.65	5.8 to 6.9
8,000/0.75	4.8 to 5.9

The estimated bias errors of AGM-109 in-flight net thrust (Table 9), which, as with the AGM-86B, can be assumed to approximate the total uncertainty for a flight data point, have the following ranges for the different flight conditions:

AGM-109 Flight Condition, Altitude, ft/Mach No.	Range of B, ± percent
1,000/0.65 (PLA = 0.6)	4.6 to 6.1
1,000/0.65 (PLA = 1.5)	3.8 to 5.2
1,000/0.75	3.0 to 4.3
8,000/0.65	4.8 to 6.0
8,000/0.75	4.0 to 5.2

On the basis of estimated bias errors only, net thrust calculations by the FGP, CV8M, and FGC methods are again seen to provide consistently lower uncertainty estimates than the CV8E and CV8A methods, with the FGC method consistently providing the lowest estimates.

Free-stream velocity total uncertainty estimates varied from ±0.6 percent at 1,000 ft/Mach 0.75 to ±0.9 percent at 8,000 ft/Mach 0.65. Bias error estimates ranged from ±0.5 percent to ±0.8 percent.

Engine airflow total uncertainty estimates varied from ±1.5 percent at 1,000 ft/Mach 0.75 to ±2.2 percent at 8,000 ft/Mach 0.75. Bias error estimates ranged from ±1.3 percent to ±1.9 percent.

Error contributions to the AGM-109 uncertainty estimates of engine airflow and engine net thrust as calculated by the FGP, CV8M, and FGC methods for the 1,000 ft/Mach 0.65 (PLA = 0.6) flight condition are presented in Tables 12 and 13. As was the case with the AGM-86B, the major contributors to the AGM-109 in-flight engine airflow and net thrust uncertainties are the engine calibration data uncertainties. For in-flight engine airflow, the bias error of the airflow calibration coefficient (CWAC) is -1.4 percent compared to a total airflow uncertainty of ±1.9 percent. The elemental bias error of the gross thrust parameter calibration coefficient is +3.7 percent compared to the total net thrust uncertainty estimate of ±6.0 percent. Similar errors are noted for the CV8M and FGC net thrust calculation methods. The AGM-109 engine airflow calibration bias error has, as for the AGM-86B, a significant effect on net thrust. For example, for the FGP thrust calculation method, the airflow calibration coefficient bias error is +2.1 percent. Other major contributors to airflow and net thrust bias error estimates are the free-stream total temperature, TO, and differential pressure, DELPO, exhaust nozzle exit static pressure, PS8NE, and exhaust nozzle total pressures, P6 and P16. The major contributors to the precision error estimates are the high-pressure rotor speed, N2, engine fuel flow, and the exhaust nozzle total pressures, P6 and P16.

3.3 AGM-86B/AGM-109 UNCERTAINTY ANALYSIS COMPARISON

A common flight condition (1,000 ft/Mach 0.65) for each of the ALCM systems was arbitrarily selected to provide a direct comparison of uncertainty estimates of engine net thrust, free-stream velocity, and engine airflow. This comparison is presented in Table 14. The uncertainty estimates for free-stream velocity and engine airflow for the two ALCM systems are within 0.1 percentage point agreement. For net thrust uncertainty, the AGM-86B estimates are 0.3 to 0.4 percentage points lower than the corresponding AGM-109 estimates for each thrust calculation method except the FGC method, where the AGM-109 method is 0.2 percentage points lower. The lowest estimated net thrust uncertainty for the AGM-86B for this flight condition was provided by the CV8M method (±5.4 percent); the lowest for the AGM-109 was provided by the FGC method (±5.6 percent).

4.0 CONCLUSIONS AND RECOMMENDATIONS

Several conclusions concerning the preflight-test estimates of ALCM in-flight net thrust uncertainties were reached as a result of this study. These conclusions were instrumental in the pre-flight-test selection of the primary and backup thrust calculation methods to be used during the competitive flight test program. Some of the conclusions are presented below along with recommendations for follow-on analyses.

CONCLUSIONS

1. The results of this study supported each of the ALCM systems contractors' pretest choices of primary thrust calculation method (i.e., CV8M for the AGM-86B and FGC for the AGM-109).

2. The FGP thrust calculation was selected as the principal backup method for each ALCM contractor and was programmed into the AFFTC flight test data reduction programs.

3. The inflight engine airflow and net thrust uncertainties are predominantly comprised of bias-type errors. The major cause of the large bias errors is the engine airflow and gross thrust calibration data uncertainties. The engine airflow calibration uncertainty estimate also has a substantial influence on the net thrust calculations.

4. Only bias errors of engine instrumentation used in the calculation of net thrust which are common to both the calibration test and flight test can be neglected.

5. Based on the common flight conditions for the AGM-86B and the AGM-109, the total uncertainty estimates of free-stream velocity, engine airflow, and net thrust (using each contractor's primary method) agreed within 0.2 percentage points. Therefore, although the magnitudes of the uncertainty estimates for engine airflow (on the order of ±2 percent) and net thrust (on the order of ±5 percent) may be considered large, the uncertainty levels of the two systems are comparable. Also, the major contributions to these uncertainty estimates (the engine calibration uncertainties) are common to both the AGM-86B and the AGM-109 systems since all engine calibration tests were conducted at the NAPC. Although the absolute inflight engine airflow and net thrust

uncertainties may be large for each system, the relative uncertainty between the two systems is much smaller. Therefore, on the basis of this uncertainty analysis, comparison of AGM-86B and AGM-109 flight test performance evaluation data should be valid.

RECOMMENDATIONS

1. A post-flight-test net thrust uncertainty analysis should be conducted on the basis of flight test results.

2. Since the major contributors to the net thrust uncertainty estimates are the engine calibration uncertainties, emphasis should be placed on obtaining the highest possible degree of accuracy in all future engine calibrations.

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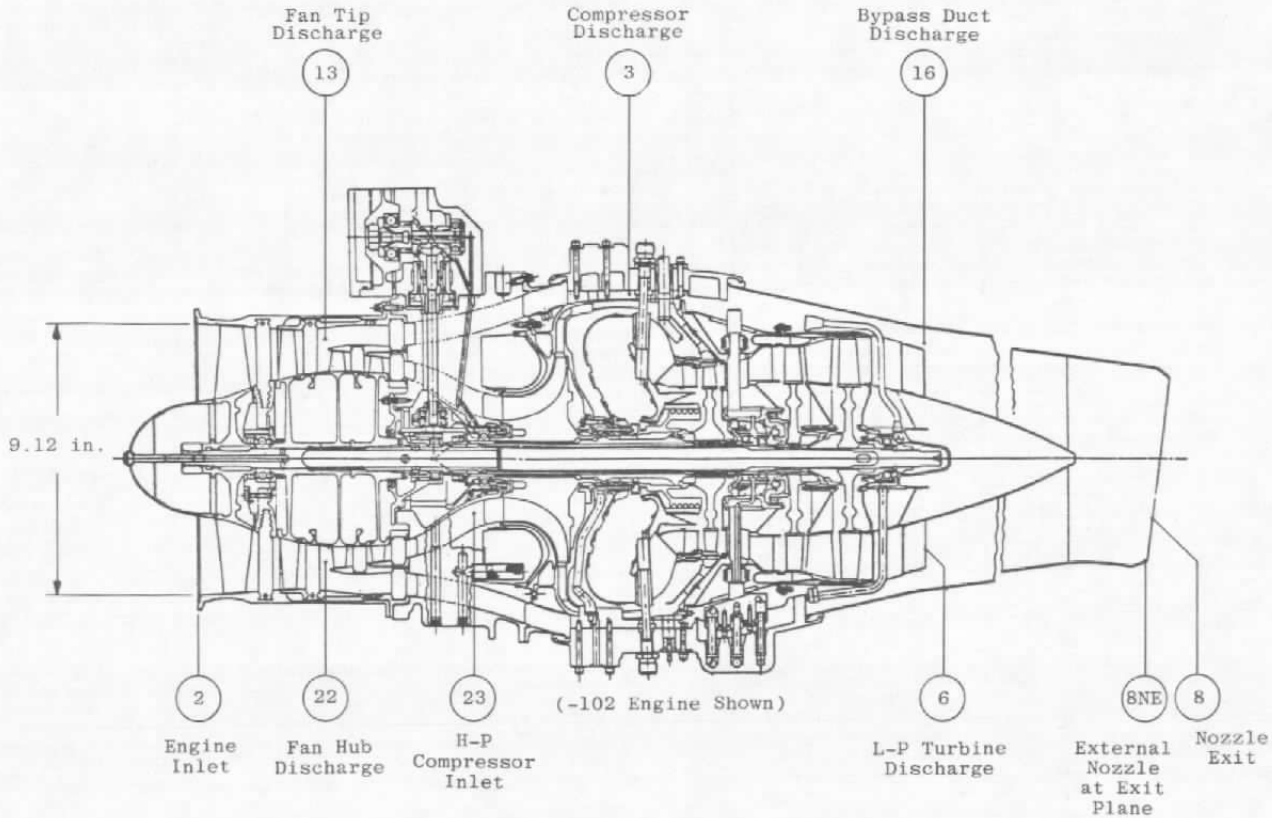


Figure 1. F107 engine instrumentation station locations.

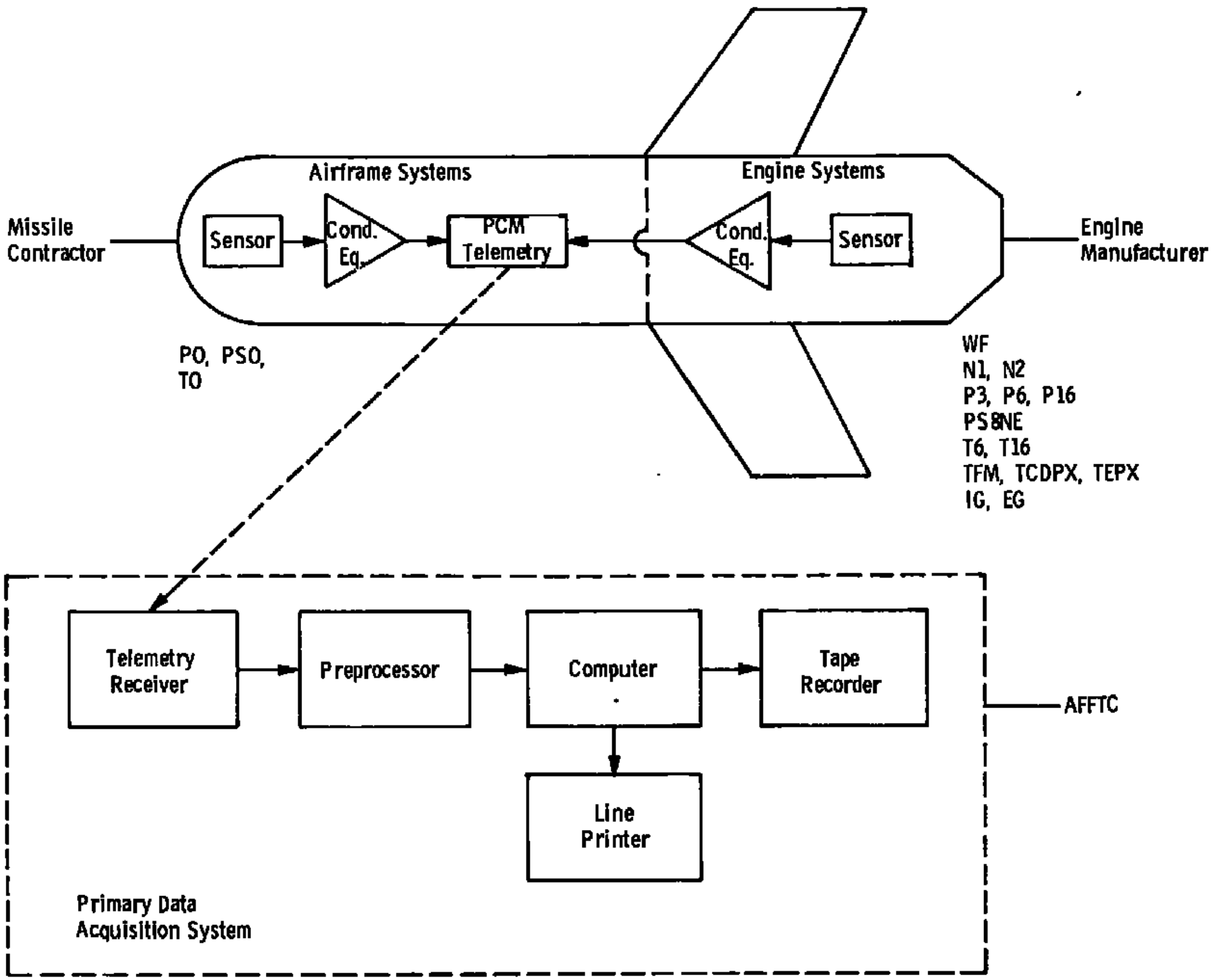


Figure 2. Scope of measurement system.

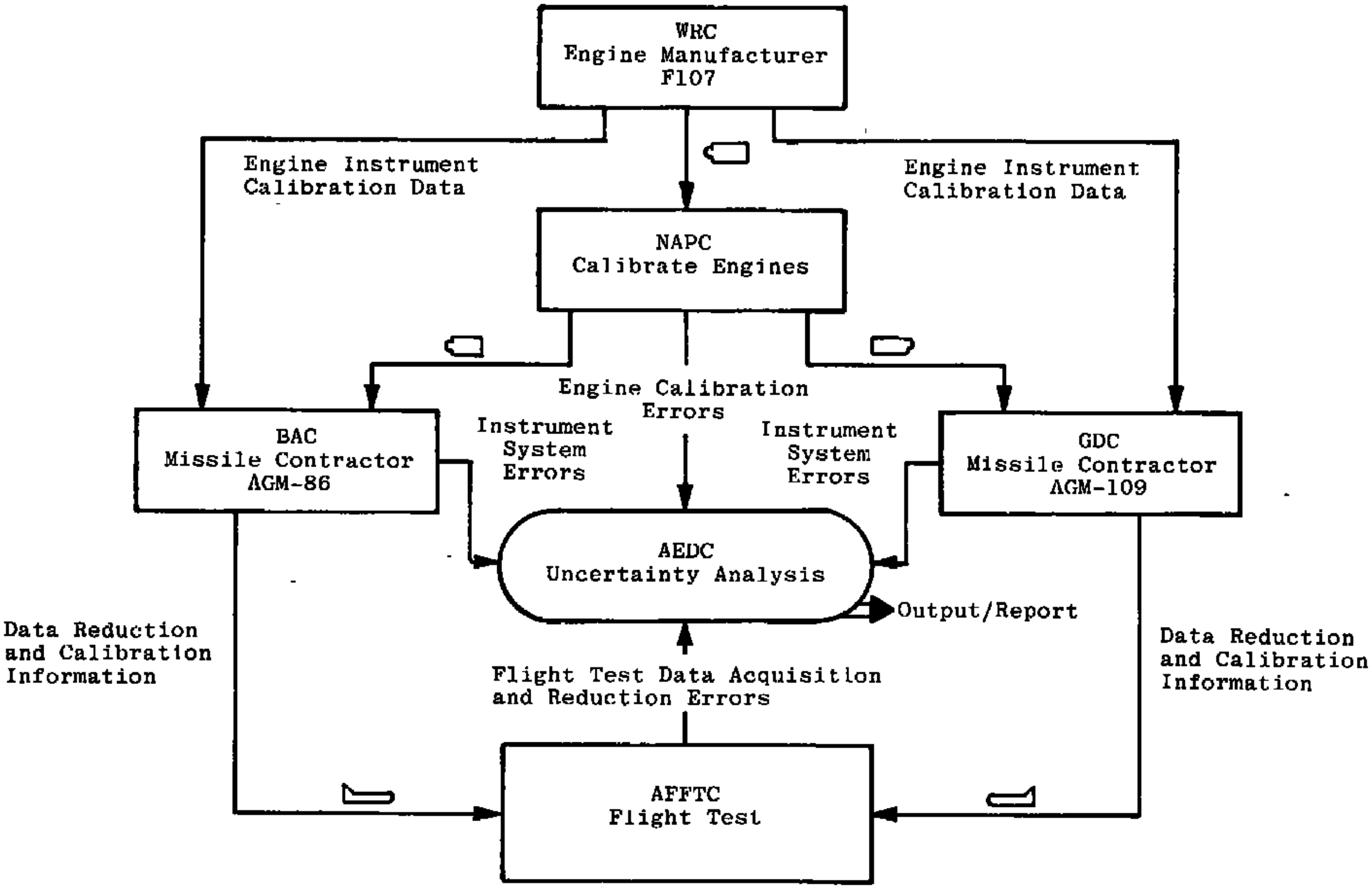


Figure 3. In-flight thrust uncertainty analysis.

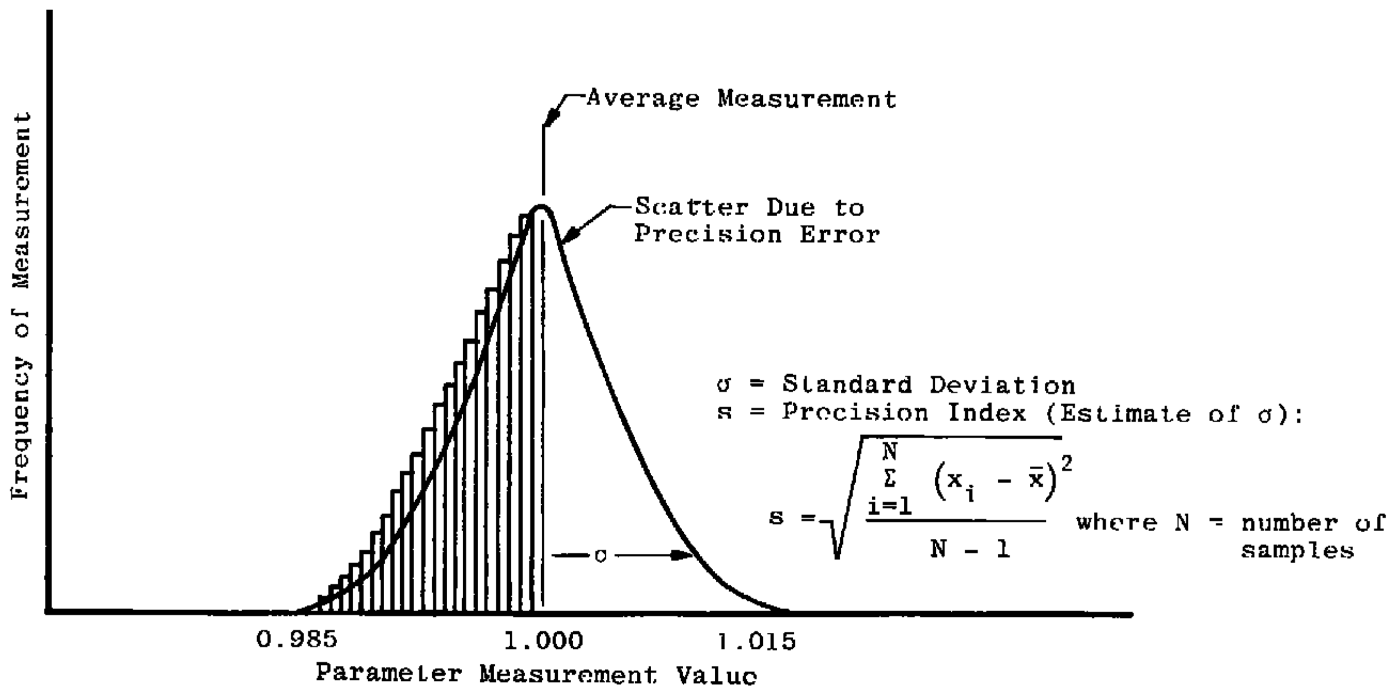


Figure 4. Precision error.

Calibration

b_{11} through b_{i1}

s_{11} through s_{i1}

$$B_{CAL} = \pm \sqrt{b_{11}^2 + \text{---}\ b_{i1}^2}$$

$$S_{CAL} = \pm \sqrt{s_{11}^2 + \text{---}\ s_{i1}^2}$$

Data Acquisition

b_{12} through b_{i2}

s_{12} through s_{i2}

$$B_{DATA\ AC} = \pm \sqrt{b_{12}^2 + \text{---}\ b_{i2}^2}$$

$$S_{DATA\ AC} = \pm \sqrt{s_{12}^2 + \text{---}\ s_{i2}^2}$$

Data Reduction

b_{13} through b_{i3}

s_{13} through s_{i3}

$$B_{DR} = \pm \sqrt{b_{13}^2 + \text{---}\ b_{i3}^2}$$

$$S_{DR} = \pm \sqrt{s_{13}^2 + \text{---}\ s_{i3}^2}$$

$$B_{meas} = \pm \sqrt{B_{CAL}^2 + B_{DATA\ AC}^2 + B_{DR}^2}$$

$$S_{meas} = \pm \sqrt{S_{CAL}^2 + S_{DATA\ AC}^2 + S_{DR}^2}$$

UNCERTAINTY FORMULA

$$U = \pm(B_{meas} + t_{95}\, S_{meas})$$

where t_{95} is the 95th percentile of the two-tailed Student's "t" distribution.

Figure 5. Elemental error treatment.

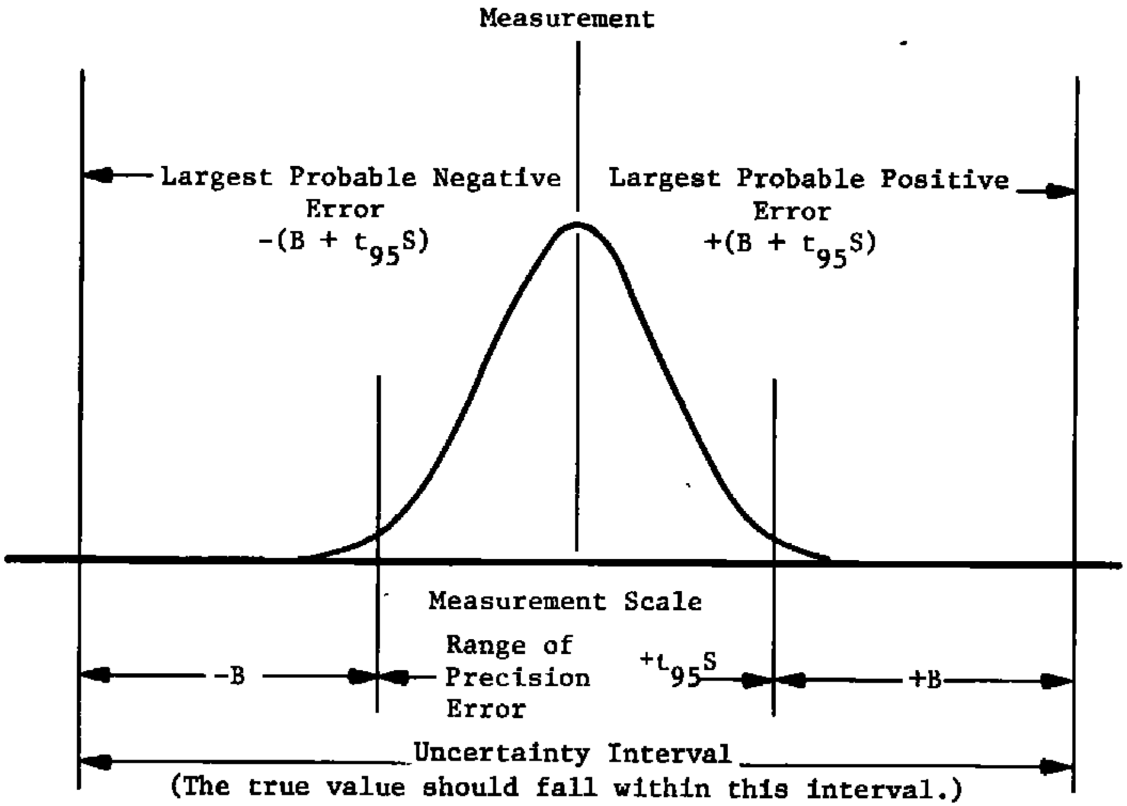


Figure 6. Measurement uncertainty interval.

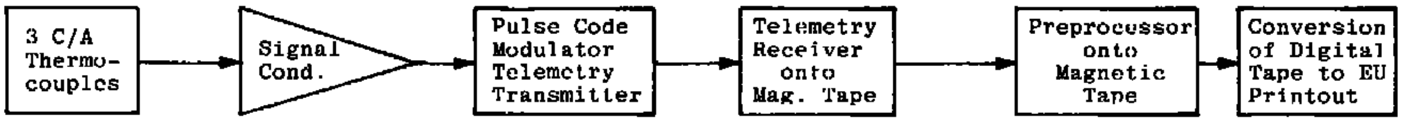
T6 Engine Exhaust Gas Temperature

Range -100 to 1900 °F

$B = \pm 4.75^\circ F$

$S = \pm 4.9^\circ F$

$U = \pm 14.6^\circ F$



$b_1 = 14.25^\circ F$	$b_2 = 6.27^\circ F$	$b_3 = 4.75^\circ F$	$b_4 = 0$	$b_5 = 0$	$b_6 = 14.25^\circ F$
$s_1 = 0$	$s_2 = 4.75^\circ F$	$s_3 = 1.52^\circ F$	$s_4 = 0$	$s_5 = 0$	$s_6 = 0$

$$B = \sqrt{\cancel{b_1^2} + \cancel{b_2^2} + b_3^2 + b_4^2 + b_5^2 + \cancel{b_6^2}}$$

$$B = \sqrt{(4.75)^2 + (0)^2 + (0)^2}$$

$$B = 4.75^\circ F$$

$$S = \sqrt{s_1^2 + s_2^2 + s_3^2 + s_4^2 + s_5^2 + s_6^2}$$

$$S = \sqrt{(0)^2 + (4.75)^2 + (1.75)^2 + (0)^2 + (0)^2 + (0)^2}$$

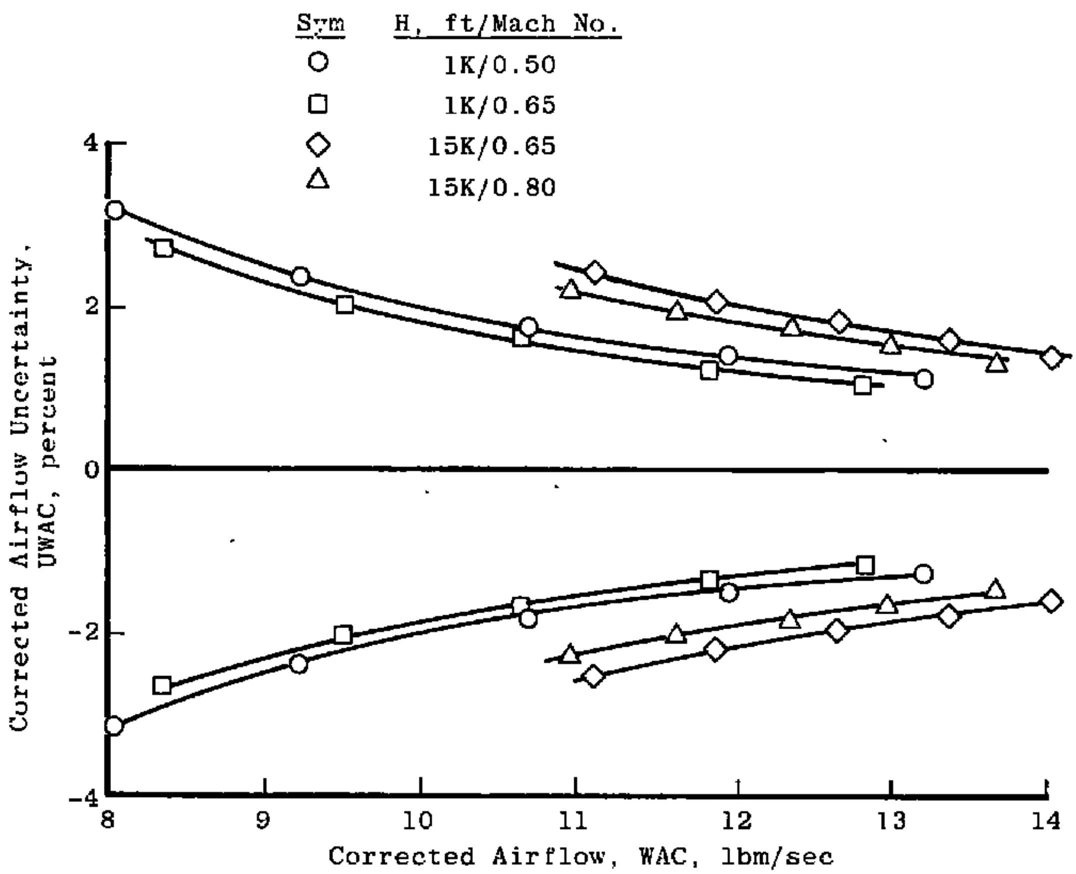
$$S = 4.9^\circ F$$

$$U = \pm(B + t_{95}\ S)$$

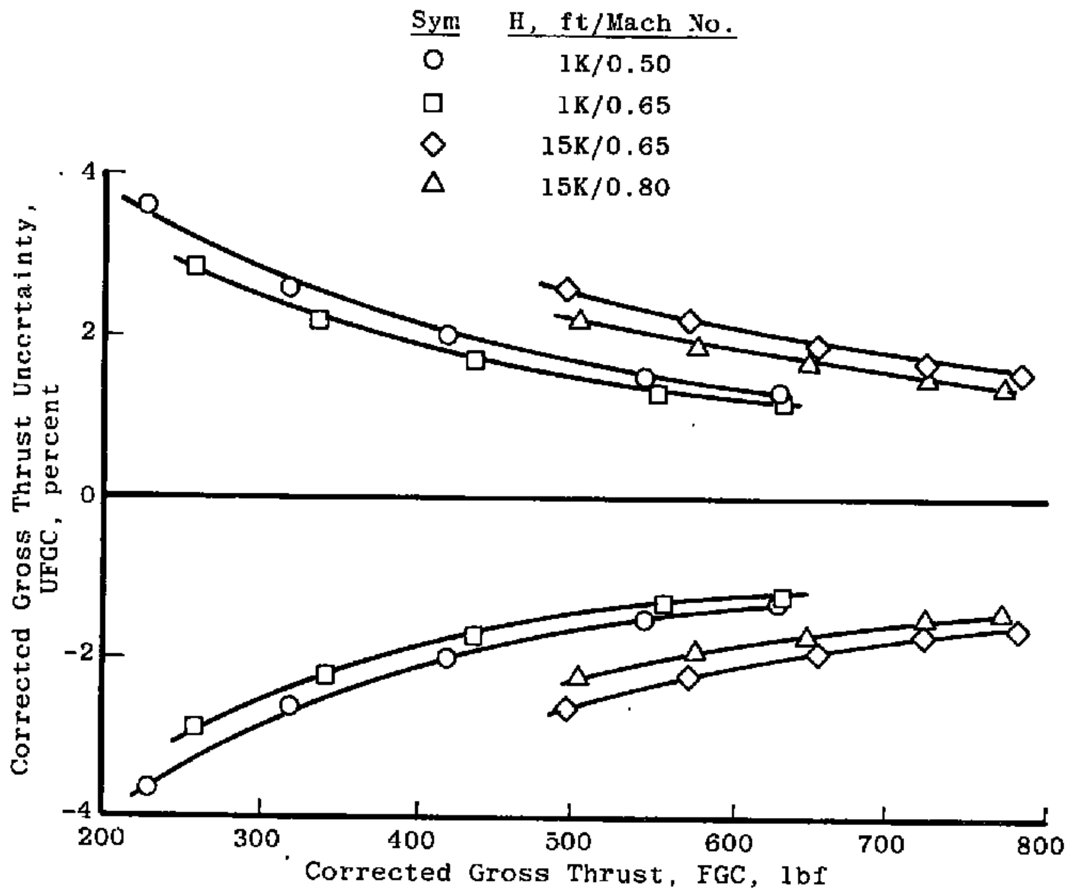
$$U = \pm(4.75 + 2\ |4.9|)$$

$$U = \pm 14.6^\circ F$$

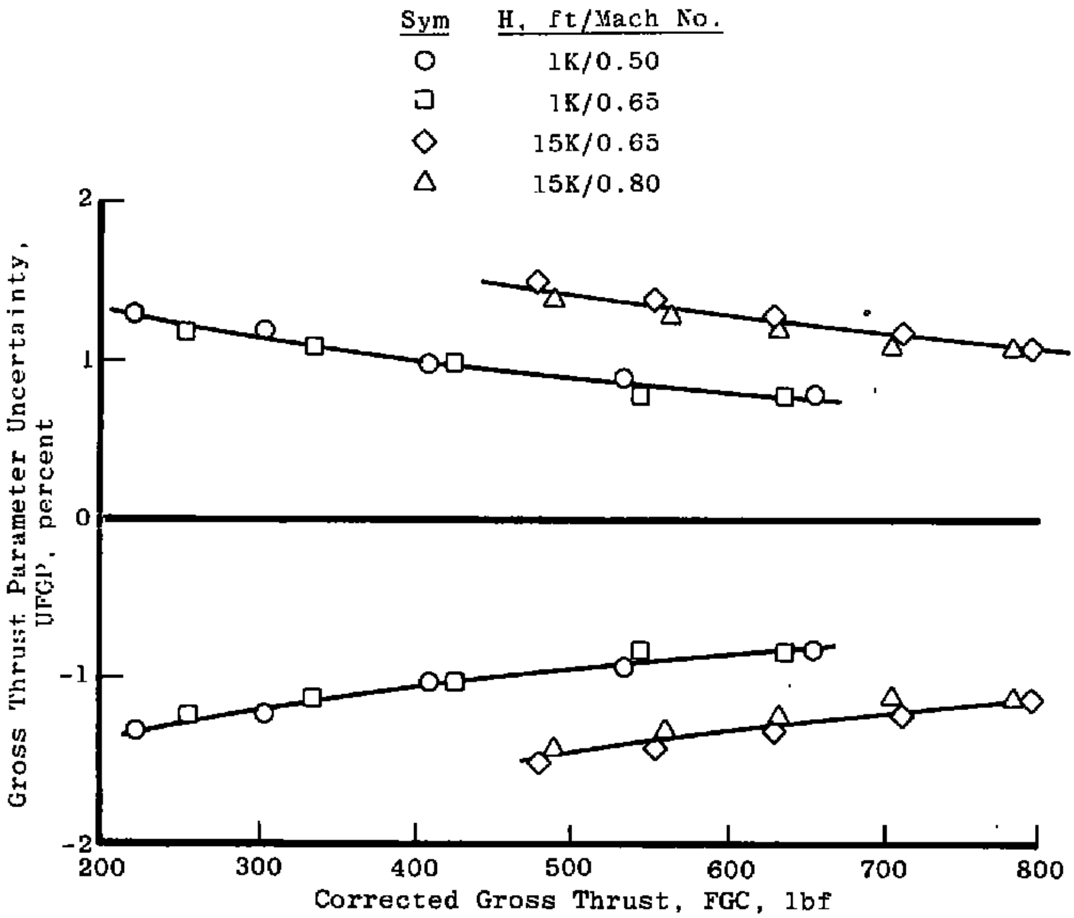
Figure 7. Engine exhaust gas temperature measurement system.



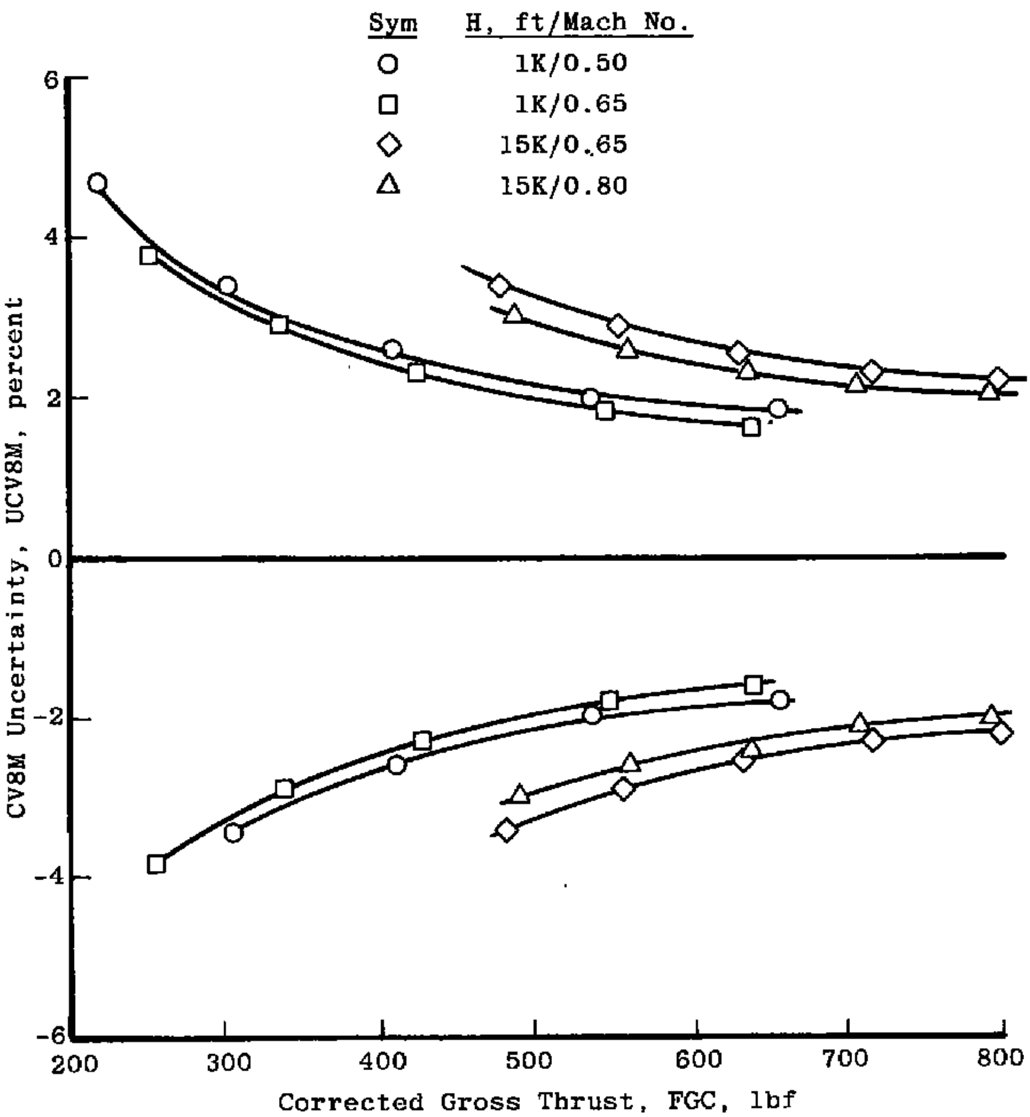
a. Corrected airflow uncertainty
Figure 8. Engine calibration uncertainties.



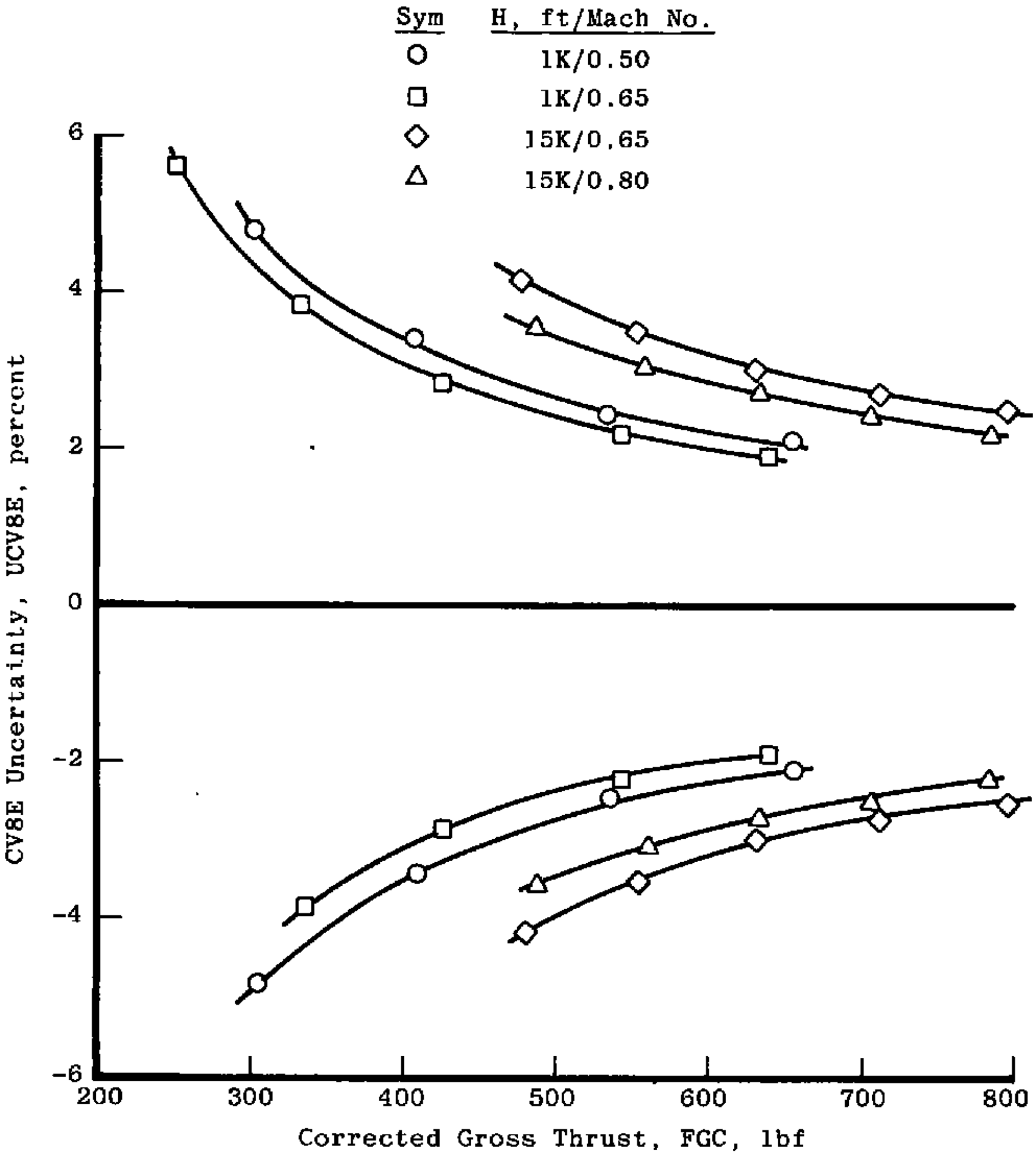
b. Corrected gross thrust uncertainty
Figure 8. Continued.



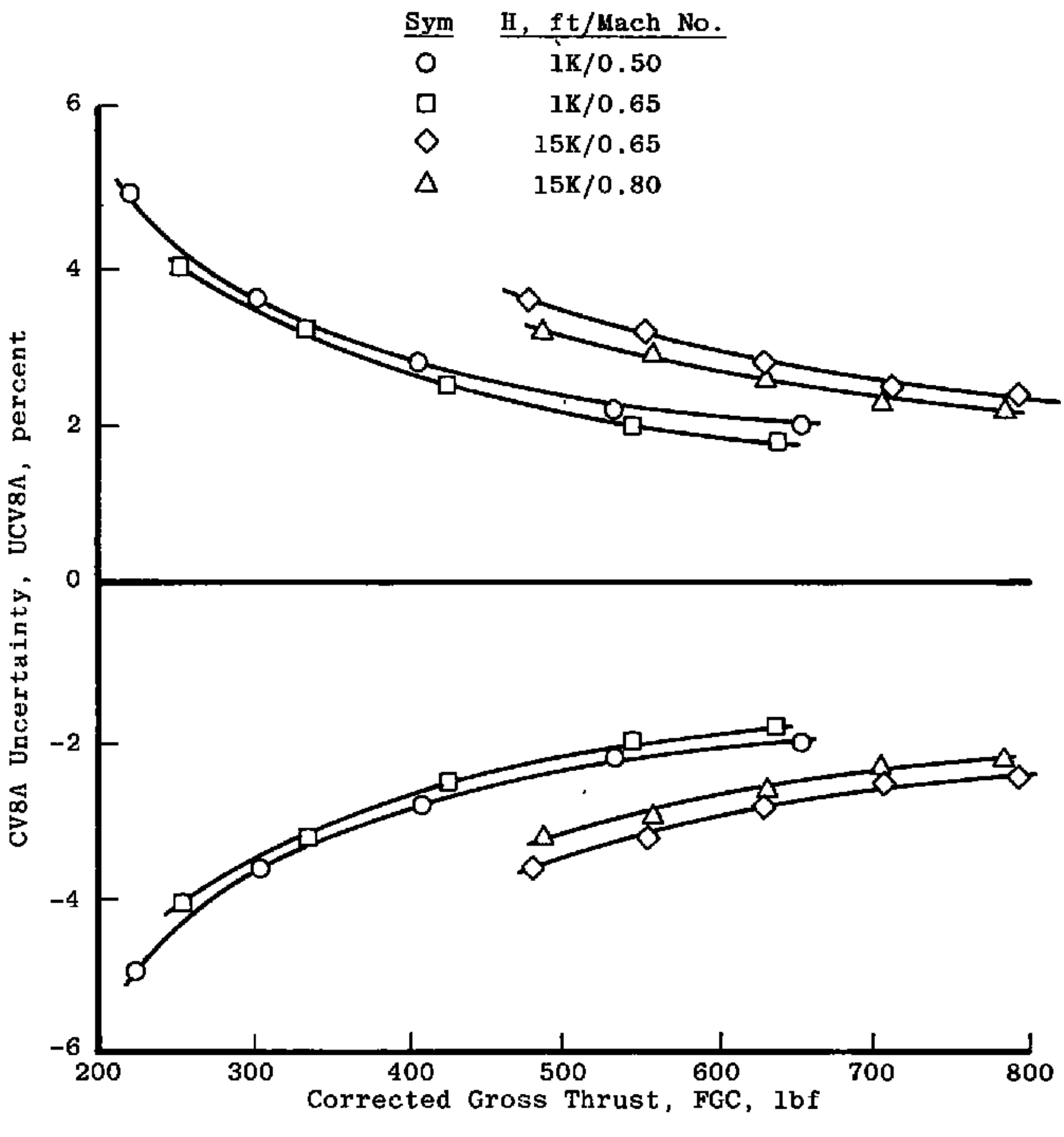
c. Gross thrust parameter uncertainty
Figure 8. Continued.



d. Velocity coefficient (mass-weighted, dual-stream) uncertainty
Figure 8. Continued.



e. Velocity coefficient (mass-weighted, single-stream) uncertainty
Figure 8. Continued.



f. Velocity coefficient (area-weighted, single-stream) uncertainty
Figure 8. Concluded.

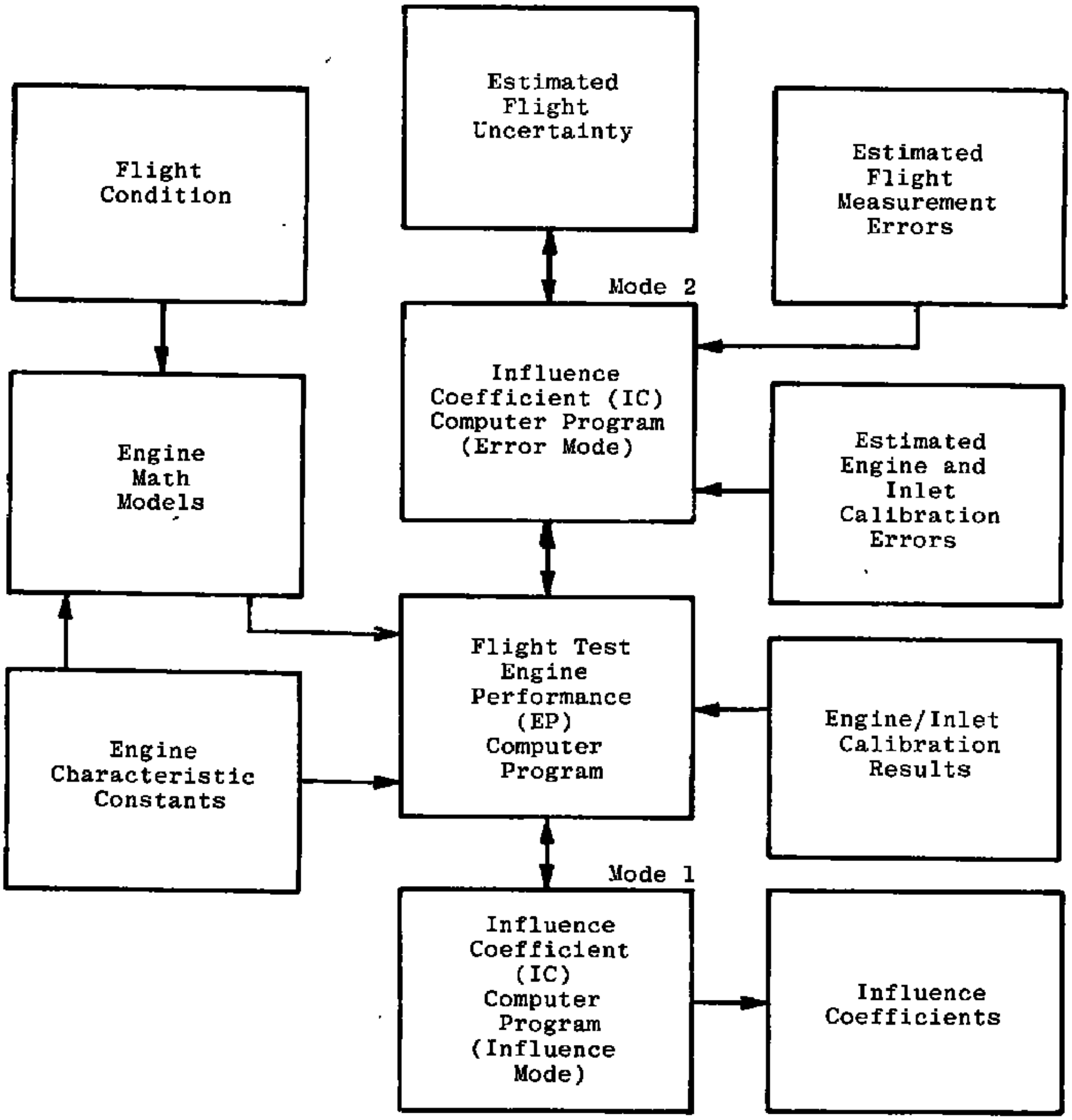


Figure 9. Data uncertainty analysis flow chart.

Table 1. Engine Instrumentation
a. AGM-86B Development Test Instrumentation Kit (DTIK) Instrumentation

Nomenclature	Number of Sensors	Parameter
P16[1]	2	Bypass duct discharge pressure
P3[1]	1	Compressor discharge pressure
P6[1]	3	LP turbine discharge pressure
T16[2]	2	Bypass duct discharge temperature
T6[3]	3	LP turbine discharge temperature
TCDPX[2]	1	Temperature of the compressor discharge pressure transducer
TFM[2]	1	Fuel temperature at the engine flowmeter
TTEPX[2]	1	Temperature of the LP turbine exhaust pressure transducer
WFE[4]	1	Engine fuel flowmeter
N1[4]	1	LP rotor speed
N2[4]	1	HP rotor speed

[1]These engine-mounted transducers produce a frequency output signal at the DTIK harness connector.

[2]These externally excited resistance temperature devices produce an output signal at the DTIK harness connector.

[3]These three thermocouple signals are conditioned with an engine-mounted thermocouple amplifier which averages the signals and produces two 0- to 5-volt output signals (a full range and an expanded range) at the DTIK harness connector.

[4]These frequency output signals are amplified through an engine-mounted signal conditioner which produces frequency output signals at the DTIK harness connector.

Table 1. Continued
b. AGM-109 DTIK Instrumentation

Nomenclature	Number of Sensors	Parameter
P3(1)	1	Compressor discharge pressure
T6(2)	3	LP turbine discharge temperature
TFM(3)	1	Fuel temperature at the engine flowmeter
TCDPX(3)	1	Temperature of the compressor discharge pressure transducer
WFE(4)	1	Engine fuel flowmeter
N1 (4)	1	LP rotor speed
N2 (4)	1	HP rotor speed

(1) These engine-mounted transducers produce a millivolt output signal at the DTIK harness connector.

(2) These three thermocouple signals are conditioned with an engine-mounted thermocouple amplifier which averages the signals and produces two 0- to 5-volt output signals (a full range and an expanded range) at the DTIK harness connector.

(3) These externally excited resistance temperature devices produce an output signal at the DTIK harness connector.

(4) These frequency output signals are amplified through an engine-mounted signal conditioner which produces frequency output signals at the DTIK harness connector.

Table 1. Concluded
c. AGM-109 Performance Instrumentation

Nomenclature	Number of Sensors	Parameter
P16[(1)]	8	Bypass duct discharge pressure
P6[(1)]	12	Turbine discharge pressure
PS8NE[(1)]	4	External nozzle exit static pressure
TCDPX[(2)]	1	Temperature of the compressor discharge pressure transducer

(1) These pressures were manifolded (one for each P16, P6, PS8NE) to a GDC-furnished differential pressure transducer.

(2) This externally-excited resistance temperature device (flight-type) produced an output signal at the harness connector.

Table 2. Flight Measurement Systems Estimated Measurement Uncertainties
a. AGM-86b

Parameter	Precision Index, S, ±	Bias, B, ±	Degrees of Freedom	Uncertainty, U, ±	Measuring System Range	Remarks
Low-pressure Rotor Speed, N1, rpm	5.7	3.0	31	14.0	17 to 37,000	Speed errors mainly due to resolution of PCM assessed to be: ±1 ct = 3σ precision error.
High-pressure Rotor Speed, N2, rpm	31.3	3.2	31	66.0	94 to 64,000	
Fuel Flow, WF, gpm	0.005	0.003	31	0.013	0.125 to 1.25	
Bypass Duct Discharge Pressure, P16, psia	0.047	0.010	31	0.100	0 to 36	
LP Turbine Discharge Pressure, P6, psia	0.047	0.010	31	0.100	0 to 36	Fuel temperature and transducer case temperature measurement errors are included in the flow and pressure measurement uncertainties.
Compressor Discharge Pressure, P3, psia	0.39	0.09	31	0.87	0 to 300	
Exhaust Gas Temperature, T6, °F	4.9	4.75	31	14.6	-100 to 1,900	
	3.1	3.0	31	9.2	700 to 1,200	
Bypass Duct Discharge Temperature, T16, °F	1.07	3.2	31	5.3	-65 to 400	
Inlet Air Total Temperature, T2, °F	0.35	2.67	31	3.4	-100 to 220	Probe position error included for T2, PSI, and DELPO.
Inlet Static Pressure, PSI, psf	1.8	15.4	31	19.0	0 to 2,000	
Inlet Total minus Static Pressure, DELPO psf	1.0	8.4	31	10.4	0 to 1,000	

Table 2. Concluded
b. AGM-109

Parameter	Precision Index, S, ±	Bias, B, ±	Degrees of Freedom	Uncertainty, U, ±	Measuring System Range	Remarks
Low-pressure Rotor Speed, N1, rpm	22.7	7.0	31	52.0	68 to 37,000	Speed errors mainly due to resolution of PCM assessed to be: ±1 ct = 3σ precision error.
High-pressure Rotor Speed, N2, rpm	29.0	8.9	31	67.0	89 to 64,000	
Fuel Flow, WF, gpm	0.0045	0.001	31	0.01	0.125 to 1.25	Fuel temperature and pressure transducer case temperature measurement errors are included in the flow and pressure measurement uncertainties.
Bypass Duct Discharge Pressure, P16, psia	0.045	0.11	31	0.20	0 to 40	
LP Turbine Discharge Pressure, P6, psia	0.045	0.11	31	0.20	0 to 40	
Nozzle Exit Static Pressure, PS8NE, psia	0.0018	0.11	31	0.11	0 to 15	Static pressure measurement error included to obtain absolute pressure level for P16, P6, and PS8NE.
Compressor Discharge Pressure, P3, psia	0.51	2.1	31	3.1	0 to 300	
Exhaust Gas Temperature, T6, °F	4.7	1.9	31	11.3	-100 to 1,900	
Engine Inlet Air Temperature, T2, °F	0.1	1.9	31	2.1	-323 to 215	
Inlet Cavity Static Pressure, PSI, psf	1.8	12.2	31	15.9	302 to 2,304	
Inlet Total minus Static Pressure, DELPO, psf	0.72	7.6	31	9.1	0 to 1,440	Probe position error included for TO, PSI, and DELPO.

Table 3. Simulated Flight Conditions for NAPC Engine Calibrations

Altitude, ft	Mach Number
1,000	0.50
1,000	0.65
15,000	0.65
15,000	0.80

Table 4. Flight Conditions Investigated for Preflight Uncertainty Estimates

Flight Condition Designation	Vehicle System	Altitude, H, ft	Mach Number, MO	Ambient Temperature, TSO, °R	Power Lever Angle, PLA, volts	Bleed, WBL, Percent of Bypass Flow
1	AGM-86B	1,000	0.65	545	0.5	0.6
2	↓	500	0.50	547	0.37	0.6
3	↓	500	0.65	547	3.04	0.6
4	↓	8,000	0.55	520	-0.50	0.6
5	↓	8,000	0.65	520	1.96	0.6
1	AGM-109	1,000	0.65	545	0.5	0.6
2	↓	1,000	0.65	545	1.5	0
3	↓	1,000	0.75	545	3.5	0
4	↓	8,000	0.65	520	1.0	0
5	↓	8,000	0.75	520	2.65	0

NOTE: Power extraction for both systems at all flight conditions was 4.0 hp (HPX).

Table 5. EP Program Input Parameters from Math Models

Math Model Inputs	Source	
H	Flight Condition	
MO	Flight Condition	
PLA	Flight Condition	
WBL	Flight Condition	
HPX	Flight Condition	
LHV	Engine Specification	
Math Model Outputs (Inputs to Flight Calculation Program)		
PSO	P3	WBL
DELPO	P6	WF
TO	P16	N1
	T6	N2
	T16	

Table 6. Engine Characteristic Constants

Symbol	Value	Description
ETAB	0.99	Combustion Efficiency
ETAT	0.860	Turbine Efficiency
BLOSS	1.030	Burner Loss Ratio (P3/P4)
MFP4	1.679	High-pressure Turbine Flow Parameter
A6	27.24 in.^{2}	Turbine Discharge Area at Mixing Plane
A16	17.60 in.^{2}	Bypass Duct Area at Mixing Plane
A8	32.08 in.^{2}	Engine Exhaust Nozzle Exit Area
CDPQ1	-0.05114	
CDPQ2	0.005621 lbf/lbm ft^2 g	Constants in PO-PSO Correction Equation (CDPQ1, CDPQ2, CDPQ3)
CDPQ3	6.200 x 10^{-5} ft^2/lbf	
XNZ	1.0 g	Acceleration factor
GWT	2,100 lbm	Vehicle gross weight
XKTR	0.92	Temperature recovery factor

Table 7. EP Program Inputs from Engine and Inlet Calibration Data*

Vehicle System	Calibrated Engine or Inlet Parameters, Z	Correlation Parameters, X,Y	A0	A1	A2	B1	B2
AGM-86B	WAC	N1C	-1.185	$4.666x10^{-4}$	$-2.593x10^{-10}$	-	-
↓	ETAR	WAC	0.9876	$2.551x10^{-3}$	$-1.525x10^{-4}$	-	-
	FGP	N2C	6.442	$-2.463x10^{-4}$	$2.883x10^{-9}$	-	-
	CV8M	NPR	0.9758	$-3.095x10^{-4}$	$1.385x10^{-3}$	-	-
	CV8E	NPR	0.9426	$2.720x10^{-3}$	$1.687x10^{-2}$	-	-
	CV8A	NPR,RPR	0.8072	$2.573x10^{-2}$	$2.575x10^{-3}$	1.393	$-8.336x10^{-2}$
AGM-109	WAC	N1C	-1.185	$4.666x10^{-4}$	$-2.593x10^{-10}$	-	-
↓	ETAR	WAC	0.8536	$2.924x10^{-2}$	$-1.675x10^{-3}$	-	-
	FGP	N2C	6.442	$-2.463x10^{-4}$	2.883x10-9	-	-
	CV8M	NPR	0.9758	$-3.095x10^{-4}$	$1.385x10^{-3}$	-	-
	CV8E	NPR	0.9426	$2.720x10^{-3}$	$1.687x10^{-2}$	-	-
	CV8A	NPR,RPR	0.8072	$2.573x10^{-2}$	$2.575x10^{-3}$	1.393	$-8.336x10^{-2}$
	FGC	NPR,RPR	-998.0	812.7	-91.82	711.6	-420.4

*General Form: $Z = A_0 + A_1X + A_2X^2 + B_1Y + B_2Y^2$

Table 8. AGM-86B In-Flight Engine Parameter Uncertainty Estimates
a. 1,000 ft/Mach No. 0.65

Parameter* Designation	Precision Index, S		Bias, B	Uncertainty, U
	Percent of Reading	Degrees of Freedom	Percent of Reading	±(B + t_{95} S), percent
VO	0.08	>30	0.66	0.81
WA	0.10	↓	1.75	1.94
FN(1)	0.57	↓	4.59	5.73
FN(2)	0.26	↓	4.85	5.36
FN(3)	0.26	↓	6.03	6.55
FN(4)	0.30	↓	5.63	6.23
FN(5)	0.61	↓	4.55	5.76

*FN(1) = FGP Method
FN(2) = CV8M Method
FN(3) = CV8E Method
FN(4) = CV8A Method
FN(5) = FGC Method

Table 8. Continued
b. 500 ft/Mach No. 0.5

Parameter* Designation	Precision Index, S		Bias, B	Uncertainty, U
	Percent of Reading	Degrees of Freedom	Percent of Reading	$\pm(B + t_{95}\,S)$, percent
VO	0.13	>30	1.06	1.31
WA	0.11		1.94	2.15
FN(1)	0.53		4.19	5.25
FN(2)	0.25		4.49	4.99
FN(3)	0.25		5.80	6.30
FN(4)	0.28		5.09	5.65
FN(5)	0.53		4.20	5.27

*FN(1) = FGP Method
FN(2) = CV8M Method
FN(3) = CV8E Method
FN(4) = CV8A Method
FN(5) = FGC Method

Table 8. Continued
c. 500 ft/Mach No. 0.65

Parameter* Designation	Precision Index, S		Bias, B	Uncertainty, U
	Percent of Reading	Degrees of Freedom	Percent of Reading	±(B + t_{95} S), percent
VO	0.08	>30	0.63	0.78
WA	0.10	↓	1.52	1.71
FN(1)	0.49	↓	3.41	4.38
FN(2)	0.19	↓	3.52	3.89
FN(3)	0.19	↓	4.20	4.59
FN(4)	0.22	↓	3.94	4.39
FN(5)	0.37	↓	3.01	3.76

*FN(1) = FGP Method
FN(2) = CV8M Method
FN(3) = CV8E Method
FN(4) = CV8A Method
FN(5) = FGC Method

Table 8. Continued
d. 8,000 ft/Mach No. 0.55

Parameter* Designation	Precision Index, S		Bias, B	Uncertainty, U
	Percent of Reading	Degrees of Freedom	Percent of Reading	$\pm(B + t_{95}\ S)$, percent
VO	0.14	>30	1.12	1.39
WA	0.12	↓	2.39	2.64
FN(1)	0.56	↓	5.25	6.37
FN(2)	0.30	↓	6.01	6.62
FN(3)	0.30	↓	7.39	7.99
FN(4)	0.33	↓	6.70	7.36
FN(5)	0.69	↓	5.12	6.51

*FN(1) = FGP Method
FN(2) = CV8M Method
FN(3) = CV8E Method
FN(4) = CV8A Method
FN(5) = FGC Method

Table 8. Concluded
e. 8,000 ft/Mach No. 0.65

Parameter* Designation	Precision Index, S		Bias, B	Uncertainty, U
	Percent of Reading	Degrees of Freedom	Percent of Reading	$\pm(B + t_{95}\ S)$, percent
VO	0.10	>30	0.81	1.01
WA	0.12	↓	1.93	2.17
FN(1)	0.50	↓	4.16	5.15
FN(2)	0.22	↓	4.44	4.88
FN(3)	0.22	↓	5.11	5.55
FN(4)	0.26	↓	4.94	5.45
FN(5)	0.47	↓	4.00	4.94

*FN(1) = FGP Method
FN(2) = CV8M Method
FN(3) = CV8E Method
FN(4) = CV8A Method
FN(5) = FGC Method

Table 9. AGM-109 In-Flight Engine Parameter Uncertainty Estimates
a. 1,000 ft/Mach No. 0.65

Parameter* Designation	Precision Index, S		Bias, B	Uncertainty, U
	Percent of Reading	Degrees of Freedom	Percent of Reading	$(B + t_{95} S)$, percent
VO	0.06	>30	0.62	0.75
WA	0.11	↓	1.66	1.89
FN(1)	0.52	↓	4.94	5.98
FN(2)	0.53	↓	4.97	6.04
FN(3)	0.41	↓	6.13	6.95
FN(4)	0.37	↓	5.73	6.48
FN(5)	0.54	↓	4.57	5.65

*FN(1) = FGP Method
FN(2) = CV8M Method
FN(3) = CV8E Method
FN(4) = CV8A Method
FN(5) = FGC Method

Table 9. Continued
b. 1,000 ft/Mach No. 0.65

Parameter* Designation	Precision Index, S		Bias, B	Uncertainty, U
	Percent of Reading	Degrees of Freedom	Percent of Reading	$\pm(B + t_{95}\ S)$, percent
VO	0.06	>30	0.62	0.75
WA	0.11		1.57	1.79
FN(1)	0.47		4.37	5.32
FN(2)	0.47		4.27	5.22
FN(3)	0.36		5.18	5.90
FN(4)	0.33		4.86	5.52
FN(5)	0.44		3.85	4.73

*FN(1) = FGP Method
FN(2) = CV8M Method
FN(3) = CV8E Method
FN(4) = CV8A Method
FN(5) = FGC Method

Table 9. Continued
c. 1,000 ft/Mach No. 0.75

Parameter* Designation	Precision Index, S		Bias, B	Uncertainty, U
	Percent of Reading	Degrees of Freedom	Percent of Reading	$\pm(B + t_{95} S)$, percent
VO	0.05	>30	0.51	0.62
WA	0.10	↓	1.30	1.50
FN(1)	0.44	↓	3.84	4.71
FN(2)	0.39	↓	4.04	4.83
FN(3)	0.29	↓	4.20	4.78
FN(4)	0.28	↓	4.29	4.86
FN(5)	0.34	↓	3.01	3.69

*FN(1) = FGP Method
FN(2) = CV8M Method
FN(3) = CV8E Method
FN(4) = CV8A Method
FN(5) = FGC Method

Table 9. Continued
d. 8,000 ft/Mach No. 0.65

Parameter* Designation	Precision Index, S		Bias, B	Uncertainty, U
	Percent of Reading	Degrees of Freedom	Percent of Reading	$\pm(B + t_{95}\ S)$, percent
VO	0.08	>30	0.77	0.92
WA	0.13	↓	1.82	2.07
FN(1)	0.46	↓	4.80	5.73
FN(2)	0.46	↓	5.14	6.26
FN(3)	0.43	↓	6.01	6.87
FN(4)	0.38	↓	5.93	6.70
FN(5)	0.50	↓	4.80	5.79

*FN(1) = FGP Method
FN(2) = CV8M Method
FN(3) = CV8E Method
FN(4) = CV8A Method
FN(5) = FGC Method

Table 9. Concluded
e. 8,000 ft/Mach No. 0.75

Parameter* Designation	Precision Index, S		Bias, B	Uncertainty, U
	Percent of Reading	Degrees of Freedom	Percent of Reading	$\pm(B + t_{95}\ S)$, percent
VO	0.06	>30	0.60	0.74
WA	0.12	↓	1.93	2.17
FN(1)	0.45	↓	4.66	5.56
FN(2)	0.50	↓	4.28	5.27
FN(3)	0.37	↓	5.18	5.91
FN(4)	0.34	↓	5.11	5.79
FN(5)	0.40	↓	3.98	4.77

*FN(1) = FGP Method
FN(2) = CV8M Method
FN(3) = CV8E Method
FN(4) = CV8A Method
FN(5) = FGC Method

Table 10. AGM-86B System Contributions to the Uncertainty of Engine Airflow

Flight Condition: 1000 ft/0.65 M/0.5 VDC		
Parameter $[x_i]$	Bias $\left[\frac{\partial WA}{\partial x_i} \times Bx_i\right]$	Precision $\left[\frac{\partial WA}{\partial x_i} \times Sx_i\right]$
CWAC	-1.54	-
PSO	0.56	0.07
TO	-0.47	-0.06
DELPO	0.32	0.03
CETAR	0.15	-
N1	0.01	0.02
	*Total Bias (B), ±1.75 Percent	**Total Precision, (S) ±0.10 Percent

Total Uncertainty ±(B + 2S) = ±1.95 percent

$$^{*}B = \pm \sqrt{\sum_{i=1}^{N} \left[\frac{\partial WA}{\partial x_i} \times Bx_i\right]^2}$$

$$^{**}S = \pm \sqrt{\sum_{i=1}^{N} \left[\frac{\partial WA}{\partial x_i} \times Sx_i\right]^2}$$

where WA = engine airflow

Table 11. AGM-86B System Contributions to the Uncertainty of Engine Net Thrust
a. Gross Thrust Parameter Method [FN(1)]

Flight Condition: 1000 ft/0.65 M/0.5 VDC		
Parameter $[x_i]$	Bias $\left[\frac{\partial FN(1)}{\partial x_i} \times Bx_i\right]$	Precision $\left[\frac{\partial FN(1)}{\partial x_i} \times Sx_i\right]$
CFGP	3.70	-
TO	-1.89	-0.25
CWAC	1.78	-
PSO	0.60	0.07
CETAR	0.41	-
DELPO	0.27	-0.03
N2	0.05	-0.03
N1	-0.01	0.51
	Total Bias (B), ±4.59 Percent	Total Precision, (S) ±0.57 Percent

Total Uncertainty ±(B + 2S) = ±5.73 percent

Table 11. Continued
b. CV8M Method [FN(2)]

Flight Condition: 1000 ft/0.65 M/0.5 VDC		
Parameter $[x_i]$	Bias $\left[\frac{\partial FN(2)}{\partial x_i} \times Bx_i\right]$	Precision $\left[\frac{\partial FN(2)}{\partial x_i} \times Sx_i\right]$
CCV8M	4.66	-
CWAC	-1.06	-
TO	-0.57	-0.08
PSO	-0.40	-0.05
DELPO	-0.39	-0.04
T16	0.23	0.08
CETAR	0.10	0.09
T6	$<\lvert 0.10\rvert$	-
P6	$<\lvert 0.10\rvert$	0.16
P16	$<\lvert 0.10\rvert$	0.11
P3	$<\lvert 0.10\rvert$	0.07
N1	$<\lvert 0.10\rvert$	$<\lvert 0.02\rvert$
WF	-	$<\lvert 0.02\rvert$
	Total Bias (B), $\pm$4.85 Percent	Total Precision (S), $\pm$0.26 Percent

Total Uncertainty $\pm$(B + 2S) = $\pm$5.36 percent

Table 11. Concluded
c. Corrected Gross Thrust Method [FN(5)]

Flight Condition: 1000 ft/0.65 M/0.5 VDC		
Parameter $[x_i]$	Bias $\left[\frac{\partial FN(5)}{\partial x_i} \times Bx_i\right]$	Precision $\left[\frac{\partial FN(5)}{\partial x_i} \times Sx_i\right]$
TO	0.27	0.04
PSO	-1.84	-0.22
DELPO	-1.14	-0.12
CWAC	1.74	-
N1	-0.01	-0.03
CETAR	-0.24	-
P6	0.10	0.47
P16	0.06	0.29
CFGC	-3.58	
	Total Bias (B), ±4.55 Percent	Total Precision (S), ±0.61 Percent

Total Uncertainty±(B + 2S) = ±5.76 percent

Table 12. AGM-109 System Contributions to the Uncertainty of Engine Airflow

Flight Condition: 1000 ft/0.65 M/0.5 VDC		
Parameter $[x_i]$	Bias $\left[\frac{\partial WA}{\partial x_i} \times Bx_i\right]$	Precision $\left[\frac{\partial WA}{\partial x_i} \times Sx_i\right]$
CWAC	-1.45	-
TO	-0.58	-0.03
PSO	0.45	0.07
DELPO	0.28	0.03
CETAR	0.15	-
N1	0.03	0.08
	Total Bias (B), ±1.66 Percent	Total Precision (S), ±0.11 Percent

Total Uncertainty ±(B + 2S) = ±1.89 percent

Table 13. AGM-109 System Contributions to the Uncertainty of Engine Net Thrust
a. Gross Thrust Parameter Method [FN(1)]

Flight Condition: 1000 ft/0.65 M/0.5 VDC		
Parameter $[x_i]$	Bias $\left[\frac{\partial FN(1)}{\partial x_i} \times Bx_i\right]$	Precision $\left[\frac{\partial FN(1)}{\partial x_i} \times Sx_i\right]$
CFGP	3.74	-
TO	-2.39	-0.13
CWAC	2.07	-
PSO	0.47	0.07
CETAR	0.42	-
DELPO	0.24	0.02
N2	0.15	0.48
N1	-0.04	-0.12
	Total Bias (B), ±4.94 Percent	Total Precision (S), ±0.52 Percent

Total Uncertainty ±(B + 2S) = ±5.98 percent

Table 13. Continued
b. CV8M Method [FN(2)]

Flight Condition: 1000 ft/0.65 M/0.5 VDC		
Parameter $[x_i]$	Bias $\left[\frac{\partial FN(2)}{\partial x_i} \times Bx_i\right]$	Precision $\left[\frac{\partial FN(2)}{\partial x_i} \times Sx_i\right]$
CCV8M	4.68	-
PS8NE	-1.19	<|0.02|
CWAC	-0.81	-
PSO	0.54	0.08
DELPO	0.41	-0.04
P6	0.35	0.14
P16	0.26	0.11
P3	0.22	0.05
TO	0.18	<|0.02|
CETAR	<|0.10|	-
T6	<|0.10|	-0.11
N1	<|0.10|	0.05
WF	-	0.48
	Total Bias (B), ±4.97 Percent	Total Precision (S), ±0.53 Percent

Total Uncertainty±(B + 2S) = ±6.04 percent

Table 13. Concluded
c. Corrected Gross Thrust Method [FN (5)]

Flight Condition: 1000 ft/0.65 M/0.5 VDC		
Parameter $[x_i]$	Bias $\left[\frac{\partial FN(5)}{\partial x_i} \times Bx_i\right]$	Precision $\left[\frac{\partial FN(5)}{\partial x_i} \times Sx_i\right]$
CFGC	-3.62	-
CWAC	1.62	-
PS8NE	-1.53	-0.03
P6	1.09	0.44
DELPO	0.96	-0.09
P16	0.67	0.28
PSO	0.35	-0.05
TO	0.33	0.17
ETAR	-0.21	-
N1	-0.03	-0.09
	Total Bias (B), ±4.57 Percent	Total Precision (S), ±0.54 Percent

Total Uncertainty ±(B + 2S) = ±5.65 percent

Table 14. Comparison of AGM-86B and AGM-109 Uncertainty Estimates

Calculation Method	AGM-86B	AGM-109
FN(1)		
B, percent	4.6	4.9
S, percent	0.6	0.5
U, percent	5.8	6.0
FN(2)		
B, percent	4.8	5.0
S, percent	0.3	0.5
U, percent	5.4	6.0
FN(3)		
B, percent	6.0	6.1
S, percent	0.3	0.4
U, percent	6.6	7.0
FN(4)		
B, percent	5.6	5.7
S, percent	0.3	0.4
U, percent	6.2	6.5
FN(5)		
B, percent	4.6	4.6
S, percent	0.6	0.5
U, percent	5.8	5.6
VO		
B, percent	0.7	0.6
S, percent	0.1	0.1
U, percent	0.9	0.8
WA		
B, percent	1.8	1.7
S, percent	0.1	0.1
U, percent	2.0	1.9

FN(1) = FGP Method FN(2) = CV8M Method
FN(3) = CV8E Method FN(4) = CV8A Method
FN(5) = FGC Method

APPENDIX A
GENERAL ENGINE PERFORMANCE EQUATIONS

Engine net thrust is calculated in flight by the equation

$$FN = FG - (WA)(VO)/gc$$

Engine airflow is dependent upon engine calibration data as follows:

$$WA = (WAC)\left(\frac{P2}{14.696}\right)\left(\sqrt{\frac{518.67}{T2}}\right)$$

where the corrected airflow, WAC, is obtained from engine calibration data as a function of corrected low-pressure rotor (fan) speed, N1C; i.e.,

$$WAC = f(N1C)$$

Free-stream velocity, VO, is calculated from the measured free-stream total temperature, TO, static pressure, PS, and differential pressure, DELPO, where DELPO = PO - PSO. Functionally,

$$VO = f(PSO, DELPO, TO)$$

Five different calculation procedures were proposed for the calculation of engine gross thrust; each of these methods is dependent upon engine calibration data as described below.

Method 1 – Gross thrust parameter (FGP):

$$FGP = \left\{FG/\left[(A8)(PAMB)\right] + 1\right\} \quad (1/RPR)$$

where PAMB = PSO for the AGM-86B, PAMB = PS8NE for the AGM-109, and RPR is the inlet ram pressure ratio (RPR = P2/PAMB).

The gross thrust parameter is obtained from the engine calibration data as a function of corrected high-pressure rotor speed, N2C; i.e.,

$$FGP = f(N2C)$$

Method 2 – Mass-weighted, dual-stream (no mixing) nozzle velocity coefficient (CV8M):

$$CV8M = FG/MV8MI$$

where MV8MI is the ideal nozzle exit momentum calculated from flight test instrumentation measurements and engine airflow. CV8M is obtained from the engine calibration data as a function of the mass-weighted nozzle pressure ratio, RPRM; i.e.,

$$CV8M = f(NPRM)$$

Method 3 – Mass-weighted, single-stream (total mixing) nozzle velocity coefficient (CV8E):

$$CV8E = FG/MV8EI$$

where MV8EI is the ideal nozzle exit momentum which is calculated from flight test instrumentation measurements and engine airflow, and CV8E is obtained from engine calibration data as a function of the mass-weighted nozzle pressure ratio, NPRM; i.e.,

$$CV8E = f(NPRM)$$

Method 4 – Area-weighted, single-stream (total mixing) nozzle velocity coefficient (CV8A):

$$CV8A = FG/MV8AI$$

where MV8AI is the ideal nozzle exit momentum which is calculated from flight test instrumentation measurements and engine airflow, and CV8A is obtained from engine calibration data as a function of the area-weighted nozzle pressure ratio, NPRA, and inlet ram pressure ratio, RPR; i.e.,

$$CV8A = f(NPRA, RPR)$$

Method 5 – Corrected gross thrust (FGC):

$$FGC = (FG)\ (14.696/P2)$$

where FGC is obtained from engine calibration data as a function of the area-weighted nozzle pressure ratio, NPRA, and ram pressure ratio, RPR; i.e.,

$$FGC = f\ (NPRA, RPR)$$

Engine inlet total temperature, T2, is assumed equivalent to the in-flight measured freestream total temperature, TO; i.e.,

$$T2 = TO$$

Engine inlet total pressure, P2, is calculated in flight as a function of the measured free-stream properties, TO, PSO, DELPO, and an inlet ram recovery, ETAR, obtained from previously conducted air vehicle wind tunnel tests; i.e.,

$$P2 = f(TO, PSO, DELPO, ETAR)$$

APPENDIX B
INFLUENCE COEFFICIENTS FOR THE AGM-86B THRUST CALCULATIONS

The influence coefficient printout presents the percent change in the dependent parameter for a 1-percent increase in the independent parameter. Note that a negative sign indicates a decrease in the dependent parameter for a 1-percent increase in the independent parameter. The net thrust (FN) and gross thrust (FG) calculations by the various methods are identified by suffixes as follows:

Suffix	Calculation Method
I	FGP Method
M	CV8M Method
E	CV8E Method
A	CV8A Method

DATE 7- 9-79 PROJECT NUMBER,
ARO, INC.
AEDC DIVISION
A SVERDRUP CORPORATION COMPANY
ENGINE TEST FACILITY
ARNOLD AIR FORCE STATION, TENN

TEST CELL.
TEST ARTICLE. AGM86-B
TEST ARTICLE S/N.

TEST DATE. 0- 0- 0 0 HRS
COMP DATE. 7- 9-79 1019 HRS
COMP RUN. OFF LINE
PROGRAM.

TEST. 0001 DATA POINT. 101101
TEST 001 (Flt Cond 1: 1,000 ft/Mach 0.65)

INFLUENCE COEFFICIENT

INDEP	ITNO	PER	VO 251	WA 257	FN1 326	FNM 327	FNE 328	FNA 329	FG1 265	FGM 268	FGE 290	FGA 314
TTO	201	1.0100	0.4988	-1.0331	-4.1576	-1.2677	-1.2714	-1.5887	-2.2412	-0.6819	-0.8842	-1.0304
PSO	202	1.0100	-0.4153	0.7531	0.7956	-0.5330	-0.5230	-0.3971	0.5514	-0.0734	-0.0693	-0.0077
PTODSO	203	1.0100	0.4164	0.2469	0.2056	-0.3001	-0.2977	-0.2929	0.4486	0.2108	0.2113	0.2165
CHAC1	204	1.0100	0.0000	-0.1103	0.1274	-0.0760	-0.0765	-0.1098	0.0015	-0.0942	-0.0944	-0.1101
CHAC2	205	1.0100	0.0000	1.1185	-1.2931	0.7706	0.7751	1.1134	-0.0158	0.9549	0.9568	1.1161
CHAC3	206	1.0100	0.0000	-0.0160	0.0185	-0.0110	-0.0111	-0.0159	0.0002	-0.0137	-0.0137	-0.0160
XN1	207	1.0100	0.0000	1.0863	-1.2558	0.7484	0.7528	1.0813	-0.0153	0.9274	0.9293	1.0840
CETAR1	208	1.0100	0.0000	0.9901	2.7093	0.6821	0.6862	0.7251	1.7987	0.8453	0.8470	0.8661
CETAR2	209	1.0100	0.0000	0.0273	0.0746	0.0188	0.0189	0.0201	0.0495	0.0233	0.0233	0.0239
CETAR3	210	1.0100	0.0000	-0.0174	-0.0476	-0.0120	-0.0121	-0.0128	-0.0316	-0.0148	-0.0149	-0.0153
A8	211	1.0100	0.0000	0.0000	2.1261	0.0000	0.0000	0.0000	1.0000	0.0000	0.0000	0.0000
CFGP1	212	1.0100	0.0000	0.0000	14.8150	0.0000	0.0000	0.0000	6.9682	0.0000	0.0000	0.0000
CFGP2	213	1.0100	0.0000	0.0000	-31.6404	0.0000	0.0000	0.0000	-14.8820	0.0000	0.0000	0.0000
CFGP3	214	1.0100	0.0000	0.0000	20.6879	0.0000	0.0000	0.0000	9.7305	0.0000	0.0000	0.0000
XN2	215	1.0100	0.0000	0.0000	9.9421	0.0000	0.0000	0.0000	4.6763	0.0000	0.0000	0.0000
CCV8M1	216	1.0100	0.0000	0.0000	0.0000	2.1164	0.0000	0.0000	0.0000	0.9953	0.0000	0.0000
CCV8M2	217	1.0100	0.0000	0.0000	0.0000	-0.0013	0.0000	0.0000	0.0000	-0.0006	0.0000	0.0000
CCV8M3	218	1.0100	0.0000	0.0000	0.0000	0.0113	0.0000	0.0000	0.0000	0.0053	0.0000	0.0000
P6	219	1.0100	0.0000	0.0000	0.0000	0.8596	0.6618	1.0024	0.0000	0.4043	0.3117	0.4690
P16	220	1.0100	0.0000	0.0000	0.0000	0.6703	0.8666	0.6645	0.0000	0.3153	0.4081	0.3109
WBL	221	1.0100	0.0000	0.0000	0.0000	-0.0061	-0.0061	-0.0072	0.0000	-0.0029	-0.0029	-0.0033
T6	222	1.0100	0.0000	0.0000	0.0000	0.4154	0.5624	0.8367	0.0000	0.1954	0.2649	0.3915
T16	223	1.0100	0.0000	0.0000	0.0000	0.5096	0.3821	0.2435	0.0000	0.2397	0.1800	0.1139
ETAT	224	1.0100	0.0000	0.0000	0.0000	-0.0639	-0.0622	0.0000	0.0000	-0.0301	-0.0293	0.0000
P3	225	1.0100	0.0000	0.0000	0.0000	0.2750	0.2672	0.0000	0.0000	0.1293	0.1258	0.0000
BLOSS	226	1.0100	0.0000	0.0000	0.0000	-0.2726	-0.2655	0.0000	0.0000	-0.1282	-0.1250	0.0000
MFF4	227	1.0100	0.0000	0.0000	0.0000	0.3040	0.2953	0.0000	0.0000	0.1430	0.1391	0.0000
WF	228	1.0100	0.0000	0.0000	0.0000	0.0131	0.0168	0.0137	0.0000	0.0062	0.0079	0.0064
CCV8E1	229	1.0100	0.0000	0.0000	0.0000	0.0000	2.0976	0.0000	0.0000	0.0000	0.9679	0.0000
CCV8E2	230	1.0100	0.0000	0.0000	0.0000	0.0000	0.0117	0.0000	0.0000	0.0000	0.0055	0.0000
CCV8E3	231	1.0100	0.0000	0.0000	0.0000	0.0000	0.0141	0.0000	0.0000	0.0000	0.0066	0.0000
CCV8A1	232	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	1.9084	0.0000	0.0000	0.0000	0.8929
CCV8A2	233	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	0.1162	0.0000	0.0000	0.0000	0.0543
CCV8A3	234	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	0.0222	0.0000	0.0000	0.0000	0.0104
CCV8A4	235	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	0.4364	0.0000	0.0000	0.0000	0.2042
CCV8A5	236	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	-0.3457	0.0000	0.0000	0.0000	-0.1618
A6	237	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	0.1362	0.0000	0.0000	0.0000	0.0637
A16	238	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	-0.1367	0.0000	0.0000	0.0000	-0.0639

DATE 7- 9-79 PROJECT NUMBER,
ARO, INC.
AEDC DIVISION
A SVERDRUP CORPORATION COMPANY
ENGINE TEST FACILITY
ARNOLD AIR FORCE STATION, TENN

TEST DATE, 0- 0- 0 0 HRS TEST, 0001 DATA POINT, 102101
TEST CELL, COMP DATE, 7- 9-79 1020 HRS
TEST ARTICLE, AGM86-B COMP RUN, OFF LINE TEST 001
TEST ARTICLE S/N, PROGRAM, (Flt Cond 2: 500 ft/Mach 0.50)

INFLUENCE COEFFICIENT

INDEP	ITNO	PER	VO 251	WA 257	FN1 326	FNH 327	FNE 328	FNA 329	FG1 265	FGP 268	FGE 290	FGA 314
TT0	201	1.0100	0.4988	-1.0313	-3.8971	-1.1289	-1.1348	-1.4047	-2.4387	-0.8720	-0.8754	-1.0283
PS0	202	1.0100	-0.4455	0.8431	0.9275	-0.4926	-0.4821	-0.3615	0.6958	-0.1074	-0.1017	-0.0335
PTODS0	203	1.0100	0.4471	0.1569	0.0736	-0.2301	-0.2290	-0.2087	0.3042	0.1326	0.1331	0.1445
CWAC1	204	1.0100	0.0000	-0.1080	0.0859	-0.0785	-0.0791	-0.1074	0.0018	-0.0913	-0.0916	-0.1077
CWAC2	205	1.0100	0.0000	1.1155	-0.8890	0.8108	0.8165	1.1103	-0.0188	0.9432	0.9463	1.1126
CWAC3	206	1.0100	0.0000	-0.0163	0.0130	-0.0118	-0.0119	-0.0162	0.0003	-0.0138	-0.0138	-0.0162
XN1	207	1.0100	0.0000	1.0828	-0.8629	0.7870	0.7925	1.0778	-0.0182	0.9155	0.9186	1.0799
CETAR1	208	1.0100	0.0000	0.9903	2.6337	0.7198	0.7249	0.8492	1.9202	0.8373	0.8401	0.9105
CETAR2	209	1.0100	0.0000	0.0278	0.0740	0.0202	0.0204	0.0240	0.0540	0.0235	0.0236	0.0257
CETAR3	210	1.0100	0.0000	-0.0181	-0.0482	-0.0132	-0.0133	-0.0156	-0.0351	-0.0153	-0.0154	-0.0167
A8	211	1.0100	0.0000	0.0000	1.7672	0.0000	0.0000	0.0000	1.0000	0.0000	0.0000	0.0000
CFGP1	212	1.0100	0.0000	0.0000	12.6797	-0.0000	0.0000	0.0000	7.1751	0.0000	0.0000	0.0000
CFGP2	213	1.0100	0.0000	0.0000	-27.3107	0.0000	0.0000	0.0000	-15.4541	0.0000	0.0000	0.0000
CFGP3	214	1.0100	0.0000	0.0000	18.0572	0.0000	0.0000	0.0000	10.2181	0.0000	0.0000	0.0000
XN2	215	1.0100	0.0000	0.0000	8.9848	0.0000	0.0000	0.0000	5.0842	0.0000	0.0000	0.0000
CCV8N1	216	1.0100	0.0000	0.0000	0.0000	1.7614	0.0000	0.0000	0.0000	0.9961	0.0000	0.0000
CCV8N2	217	1.0100	0.0000	0.0000	0.0000	-0.0010	0.0000	0.0000	0.0000	-0.0006	0.0000	0.0000
CCV8N3	218	1.0100	0.0000	0.0000	0.0000	0.0080	0.0000	0.0000	0.0000	0.0045	0.0000	0.0000
P6	219	1.0100	0.0000	0.0000	0.0000	0.8251	0.6453	0.9366	0.0000	0.4666	0.3650	0.5299
P16	220	1.0100	0.0000	0.0000	0.0000	0.6272	0.8072	0.6100	0.0000	0.3547	0.4566	0.3452
WBL	221	1.0100	0.0000	0.0000	0.0000	-0.0049	-0.0049	-0.0057	0.0000	-0.0027	-0.0028	-0.0032
T6	222	1.0100	0.0000	0.0000	0.0000	0.3482	0.4714	0.6928	0.0000	0.1969	0.2666	0.3920
T16	223	1.0100	0.0000	0.0000	0.0000	0.4136	0.3070	0.1990	0.0000	0.2339	0.1736	0.1126
ETAT	224	1.0100	0.0000	0.0000	0.0000	-0.0564	-0.0546	0.0000	0.0000	-0.0319	-0.0309	0.0000
P3	225	1.0100	0.0000	0.0000	0.0000	0.2415	0.2334	0.0000	0.0000	0.1366	0.1320	0.0000
BLOSS	226	1.0100	0.0000	0.0000	0.0000	-0.2393	-0.2319	0.0000	0.0000	-0.1353	-0.1312	0.0000
MFP4	227	1.0100	0.0000	0.0000	0.0000	0.2670	0.2580	0.0000	0.0000	0.1510	0.1459	0.0000
WF	228	1.0100	0.0000	0.0000	0.0000	0.0110	0.0141	0.0115	0.0000	0.0062	0.0080	0.0065
CCV8E1	229	1.0100	0.0000	0.0000	0.0000	0.0000	1.7488	0.0000	0.0000	0.0000	0.9892	0.0000
CCV8E2	230	1.0100	0.0000	0.0000	0.0000	0.0000	0.0090	0.0000	0.0000	0.0000	0.0051	0.0000
CCV8E3	231	1.0100	0.0000	0.0000	0.0000	0.0000	0.0100	0.0000	0.0000	0.0000	0.0057	0.0000
CCV8A1	232	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	1.5695	0.0000	0.0000	0.0000	0.8880
CCV8A2	233	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	0.0885	0.0000	0.0000	0.0000	0.0501
CCV8A3	234	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	0.0157	0.0000	0.0000	0.0000	0.0089
CCV8A4	235	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	0.3205	0.0000	0.0000	0.0000	0.1813
CCV8A5	236	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	-0.2268	0.0000	0.0000	0.0000	-0.1283
A6	237	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	0.1179	0.0000	0.0000	0.0000	0.0667
A16	238	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	-0.1184	0.0000	0.0000	0.0000	-0.0670

DATE 7- 9-79 PROJECT NUMBER.
ARO, INC.
AEDC DIVISION
A SVERDRUP CORPORATION COMPANY
ENGINE TEST FACILITY
ARNOLD AIR FORCE STATION, TENN

TEST CELL. TEST DATE. 0- 0- 0 0 HRS TEST. 0001 DATA POINT. 103101
TEST ARTICLE. AGM86-B COMP DATE. 7- 9-79 1020 HRS
TEST ARTICLE S/N. COMP RUN. OFF LINE TEST 001 (Flt Cond 3: 500 ft/Mach 0.65)
PROGRAM.

INFLUENCE COEFFICIENT

INDEP	ITNO	PER	VO 251	WA 257	FN1 326	FNM 327	FNE 328	FNA 329	FG1 265	FGM 268	FGE 290	FGA 314
TIO	201	1.0100	0.4988	-1.0245	-3.7001	-1.1111	-1.1234	-1.4506	-2.2178	-0.8398	-0.8467	-1.0203
P80	202	1.0100	-0.4153	0.7530	0.8182	-0.2488	-0.2503	-0.0909	0.5920	0.0239	0.0228	0.1061
PIOD80	203	1.0100	0.4164	0.2470	0.1827	-0.2031	-0.1992	-0.1771	0.4080	0.2024	0.2040	0.2166
CWAC1	204	1.0100	0.0000	-0.0992	0.0910	-0.0656	-0.0668	-0.0985	0.0021	-0.0813	-0.0819	-0.0988
CWAC2	205	1.0100	0.0000	1.1036	-1.0138	0.7301	0.7433	1.0969	-0.0234	0.9047	0.9116	1.1000
CWAC3	206	1.0100	0.0000	-0.0174	0.0159	-0.0115	-0.0117	-0.0172	0.0004	-0.0142	-0.0143	-0.0173
XM1	207	1.0100	0.0000	1.0688	-0.9818	0.7070	0.7199	1.0622	-0.0227	0.8761	0.8828	1.0653
CETAR1	208	1.0100	0.0000	0.9911	2.2054	0.6556	0.6676	0.7579	1.6374	0.8125	0.8186	0.8670
CETAR2	209	1.0100	0.0000	0.0302	0.0672	0.0200	0.0204	0.0233	0.0499	0.0248	0.0250	0.0265
CETAR3	210	1.0100	0.0000	-0.0213	-0.0475	-0.0141	-0.0144	-0.0164	-0.0352	-0.0175	-0.0176	-0.0187
A8	211	1.0100	0.0000	0.0000	1.8788	0.0000	0.0000	0.0000	1.0000	0.0000	0.0000	0.0000
CFGP1	212	1.0100	0.0000	0.0000	10.4925	0.0000	0.0000	0.0000	5.5846	0.0000	0.0000	0.0000
CFGP2	213	1.0100	0.0000	0.0000	-23.7926	0.0000	0.0000	0.0000	-12.3979	0.0000	0.0000	0.0000
CFGP3	214	1.0100	0.0000	0.0000	15.9041	0.0000	0.0000	0.0000	8.4652	0.0000	0.0000	0.0000
XM2	215	1.0100	0.0000	0.0000	8.6746	0.0000	0.0000	0.0000	4.6172	0.0000	0.0000	0.0000
CCV8M1	216	1.0100	0.0000	0.0000	0.0000	1.8664	0.0000	0.0000	0.0000	0.9939	0.0000	0.0000
CCV8M2	217	1.0100	0.0000	0.0000	0.0000	-0.0013	0.0000	0.0000	0.0000	-0.0007	0.0000	0.0000
CCV8M3	218	1.0100	0.0000	0.0000	0.0000	0.0127	0.0000	0.0000	0.0000	0.0068	0.0000	0.0000
P6	219	1.0100	0.0000	0.0000	0.0000	0.6684	0.5454	0.7622	0.0000	0.3559	0.2907	0.4056
P16	220	1.0100	0.0000	0.0000	0.0000	0.4621	0.5983	0.4865	0.0000	0.2461	0.3190	0.2589
WBL	221	1.0100	0.0000	0.0000	0.0000	-0.0048	-0.0049	-0.0059	0.0000	-0.0026	-0.0026	-0.0031
T6	222	1.0100	0.0000	0.0000	0.0000	0.3825	0.5133	0.7440	0.0000	0.2037	0.2736	0.3960
T16	223	1.0100	0.0000	0.0000	0.0000	0.4087	0.3010	0.2088	0.0000	0.2176	0.1605	0.1111
ETAT	224	1.0100	0.0000	0.0000	0.0000	-0.0707	-0.0672	0.0000	0.0000	-0.0376	-0.0358	0.0000
P3	225	1.0100	0.0000	0.0000	0.0000	0.2984	0.2832	0.0000	0.0000	0.1589	0.1510	0.0000
BLOSS	226	1.0100	0.0000	0.0000	0.0000	-0.2957	-0.2813	0.0000	0.0000	-0.1575	-0.1500	0.0000
WFP4	227	1.0100	0.0000	0.0000	0.0000	0.3292	0.3124	0.0000	0.0000	0.1753	0.1665	0.0000
WF	228	1.0100	0.0000	0.0000	0.0000	0.0142	0.0181	0.0149	0.0000	0.0075	0.0096	0.0079
CCV8E1	229	1.0100	0.0000	0.0000	0.0000	0.0000	1.8484	0.0000	0.0000	0.0000	0.9853	0.0000
CCV8E2	230	1.0100	0.0000	0.0000	0.0000	0.0000	0.0117	0.0000	0.0000	0.0000	0.0062	0.0000
CCV8E3	231	1.0100	0.0000	0.0000	0.0000	0.0000	0.0159	0.0000	0.0000	0.0000	0.0085	0.0000
CCV8A1	232	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	1.6597	0.0000	0.0000	0.0000	0.8833
CCV8A2	233	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	0.1152	0.0000	0.0000	0.0000	0.0613
CCV8A3	234	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	0.0251	0.0000	0.0000	0.0000	0.0134
CCV8A4	235	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	0.3791	0.0000	0.0000	0.0000	0.2018
CCV8A5	236	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	-0.3001	0.0000	0.0000	0.0000	-0.1597
A6	237	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	0.1414	0.0000	0.0000	0.0000	0.0752
A16	238	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	-0.1418	0.0000	0.0000	0.0000	-0.0755

DATE 7- 9-79 PROJECT NUMBER.
ARO, INC.
AEDC DIVISION
A SVERDRUP CORPORATION COMPANY
ENGINE TEST FACILITY
ARNOLD AIR FORCE STATION, TENN

TEST DATE. 0- 0- 0 0 HRS TEST. 0001 DATA POINT. 104101
TEST CELL. COMP DATE. 7- 9-79 1020 HRS
TEST ARTICLE. AGM86-B COMP RUN. OFF LINE TEST 001 (Flt Cond 4: 8,000 ft/Mach 0.55)
TEST ARTICLE S/N. PROGRAM.

INFLUENCE COEFFICIENT

INDEP	ITNO	PER	VO 251	WA 257	FN1 326	FNM 327	FNE 328	FNA 329	FG1 265	FGM 268	FGE 290	FGA 314
TT0	201	1.0100	0.4988	-1.0309	-3.9619	-1.1587	-1.1646	-1.4496	-2.3783	-0.8716	-0.8749	-1.0282
P60	202	1.0100	-0.4360	0.8143	0.8892	-0.4694	-0.4604	-0.3350	0.6514	-0.0794	-0.0747	-0.0072
P10DS0	203	1.0100	0.4374	0.1857	0.1119	-0.2438	-0.2425	-0.2217	0.3486	0.1570	0.1575	0.1688
CWAC1	204	1.0100	0.0000	-0.1073	0.0956	-0.0765	-0.0771	-0.1069	0.0016	-0.0907	-0.0910	-0.1071
CWAC2	205	1.0100	0.0000	1.1146	-0.9935	0.7946	0.8004	1.1102	-0.0187	0.9425	0.9455	1.1122
CWAC3	206	1.0100	0.0000	-0.0164	0.0146	-0.0117	-0.0117	-0.0163	0.0003	-0.0138	-0.0139	-0.0163
XN1	207	1.0100	0.0000	1.0818	-0.9642	0.7712	0.7769	1.0775	-0.0182	0.9147	0.9177	1.0795
CETAR1	208	1.0100	0.0000	0.9903	2.6070	0.7060	0.7112	0.8200	1.8595	0.8373	0.8401	0.8987
CETAR2	209	1.0100	0.0000	0.0280	0.0737	0.0200	0.0201	0.0233	0.0526	0.0237	0.0238	0.0255
CETAR3	210	1.0100	0.0000	-0.0183	-0.0483	-0.0131	-0.0132	-0.0153	-0.0344	-0.0155	-0.0155	-0.0167
A8	211	1.0100	0.0000	0.0000	1.6601	0.0000	0.0000	0.0000	1.0000	0.0000	0.0000	0.0000
CFGP1	212	1.0100	0.0000	0.0000	12.9022	0.0000	0.0000	0.0000	6.9363	0.0000	0.0000	0.0000
CFGP2	213	1.0100	0.0000	0.0000	-27.8573	0.0000	0.0000	0.0000	-14.9763	0.0000	0.0000	0.0000
CFGP3	214	1.0100	0.0000	0.0000	18.4477	0.0000	0.0000	0.0000	9.9176	0.0000	0.0000	0.0000
XN2	215	1.0100	0.0000	0.0000	9.2225	0.0000	0.0000	0.0000	4.9581	0.0000	0.0000	0.0000
CCV8M1	216	1.0100	0.0000	0.0000	0.0000	1.8506	0.0000	0.0000	0.0000	0.9957	0.0000	0.0000
CCV8M2	217	1.0100	0.0000	0.0000	0.0000	-0.0011	0.0000	0.0000	0.0000	-0.0006	0.0000	0.0000
CCV8M3	218	1.0100	0.0000	0.0000	0.0000	0.0090	0.0000	0.0000	0.0000	0.0049	0.0000	0.0000
P6	219	1.0100	0.0000	0.0000	0.0000	0.8146	0.6367	0.9282	0.0000	0.4383	0.3427	0.4995
P16	220	1.0100	0.0000	0.0000	0.0000	0.6173	0.7965	0.6067	0.0000	0.3321	0.4287	0.3265
WBL	221	1.0100	0.0000	0.0000	0.0000	-0.0052	-0.0052	-0.0061	0.0000	-0.0028	-0.0028	-0.0033
T6	222	1.0100	0.0000	0.0000	0.0000	0.3666	0.4946	0.7287	0.0000	0.1973	0.2662	0.3921
T16	223	1.0100	0.0000	0.0000	0.0000	0.4343	0.3264	0.2092	0.0000	0.2337	0.1757	0.1126
ETAT	224	1.0100	0.0000	0.0000	0.0000	-0.0602	-0.0583	0.0000	0.0000	-0.0324	-0.0314	0.0000
P3	225	1.0100	0.0000	0.0000	0.0000	0.2543	0.2460	0.0000	0.0000	0.1368	0.1324	0.0000
WLOSS	226	1.0100	0.0000	0.0000	0.0000	-0.2520	-0.2444	0.0000	0.0000	-0.1356	-0.1316	0.0000
WFP4	227	1.0100	0.0000	0.0000	0.0000	0.2812	0.2721	0.0000	0.0000	0.1513	0.1464	0.0000
WF	228	1.0100	0.0000	0.0000	0.0000	0.0111	0.0142	0.0116	0.0000	0.0060	0.0076	0.0063
CCV8E1	229	1.0100	0.0000	0.0000	0.0000	0.0000	1.8368	0.0000	0.0000	0.0000	0.9886	0.0000
CCV8E2	230	1.0100	0.0000	0.0000	0.0000	0.0000	0.0098	0.0000	0.0000	0.0000	0.0053	0.0000
CCV8E3	231	1.0100	0.0000	0.0000	0.0000	0.0000	0.0113	0.0000	0.0000	0.0000	0.0061	0.0000
CCV8A1	232	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	1.6508	0.0000	0.0000	0.0000	0.8883
CCV8A2	233	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	0.0965	0.0000	0.0000	0.0000	0.0519
CCV8A3	234	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	0.0177	0.0000	0.0000	0.0000	0.0095
CCV8A4	235	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	0.3490	0.0000	0.0000	0.0000	0.1878
CCV8A5	236	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	-0.2557	0.0000	0.0000	0.0000	-0.1376
A6	237	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	0.1241	0.0000	0.0000	0.0000	0.0668
A16	238	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	-0.1245	0.0000	0.0000	0.0000	-0.0670

DATE 7- 9-79 PROJECT NUMBER.
ARO, INC.
AEDC DIVISION
A SVERDRUP CORPORATION COMPANY
ENGINE TEST FACILITY
ARNOLD AIR FORCE STATION, TENN

TEST CELL.	TEST DATE. 0- 0- 0 0 HRS	TEST, 0001	DATA POINT, 105101
TEST ARTICLE. AGM86-B	COMP DATE. 7- 9-79 1021 HRS		
TEST ARTICLE S/N.	COMP RUN, OFF LINE	TEST 001	(Flt Cond 5: 8,000 ft/Mach 0.65)
	PROGRAM.		

INFLUENCE COEFFICIENT

INDEP	ITNO	PER	VO 251	WA 257	FN1 326	FNM 327	FNE 328	FNA 329	FG1 265	FGM 268	FGE 290	FGA 314
TTO	201	1.0100	0.4988	-1.0235	-3.6715	-1.0989	-1.1117	-1.4399	-2.2209	-0.8363	-0.8434	-1.0197
PSO	202	1.0100	-0.4153	0.7530	0.6199	-0.2250	-0.2273	-0.0662	0.5958	0.0333	0.0318	0.1189
PTODSO	203	1.0100	0.4164	0.2470	0.1810	-0.1949	-0.1912	-0.1674	0.4042	0.2018	0.2034	0.2167
CWAC1	204	1.0100	0.0000	-0.0980	0.0880	-0.0647	-0.0659	-0.0974	0.0021	-0.0801	-0.0807	-0.0977
CWAC2	205	1.0100	0.0000	1.1020	-0.9906	0.7275	0.7410	1.0960	-0.0243	0.9004	0.9075	1.0988
CWAC3	206	1.0100	0.0000	-0.0175	0.0157	-0.0116	-0.0118	-0.0174	0.0004	-0.0143	-0.0144	-0.0175
XN1	207	1.0100	0.0000	1.0668	-0.9589	0.7043	0.7174	1.0610	-0.0235	0.8716	0.8785	1.0637
CETAR1	208	1.0100	0.0000	0.9913	2.1638	0.6544	0.6666	0.7615	1.6224	0.8099	0.8163	0.6676
CETAR2	209	1.0100	0.0000	0.0306	0.0667	0.0202	0.0206	0.0236	0.0500	0.0250	0.0252	0.0268
CETAR3	210	1.0100	0.0000	-0.0218	-0.0476	-0.0144	-0.0147	-0.0169	-0.0357	-0.0176	-0.0180	-0.0192
A8	211	1.0100	0.0000	0.0000	1.8579	0.0000	0.0000	0.0000	1.0000	0.0000	0.0000	0.0000
CFGP1	212	1.0100	0.0000	0.0000	10.1286	0.0000	0.0000	0.0000	5.4517	0.0000	0.0000	0.0000
CFGP2	213	1.0100	0.0000	0.0000	-22.6086	0.0000	0.0000	0.0000	-12.1691	0.0000	0.0000	0.0000
CFGP3	214	1.0100	0.0000	0.0000	15.5208	0.0000	0.0000	0.0000	8.3541	0.0000	0.0000	0.0000
XN2	215	1.0100	0.0000	0.0000	8.5882	0.0000	0.0000	0.0000	4.6226	0.0000	0.0000	0.0000
CCV8M1	216	1.0100	0.0000	0.0000	0.0000	1.8457	0.0000	0.0000	0.0000	0.9938	0.0000	0.0000
CCV8M2	217	1.0100	0.0000	0.0000	0.0000	-0.0013	0.0000	0.0000	0.0000	-0.0007	0.0000	0.0000
CCV8M3	218	1.0100	0.0000	0.0000	0.0000	0.0129	0.0000	0.0000	0.0000	0.0069	0.0000	0.0000
P6	219	1.0100	0.0000	0.0000	0.0000	0.6524	0.5352	0.7427	0.0000	0.3513	0.2884	0.3998
P16	220	1.0100	0.0000	0.0000	0.0000	0.4456	0.5772	0.4726	0.0000	0.2399	0.3110	0.2544
WBL	221	1.0100	0.0000	0.0000	0.0000	-0.0047	-0.0048	-0.0057	0.0000	-0.0025	-0.0026	-0.0031
T6	222	1.0100	0.0000	0.0000	0.0000	0.3800	0.5077	0.7361	0.0000	0.2046	0.2736	0.3962
T16	223	1.0100	0.0000	0.0000	0.0000	0.4002	0.2952	0.2056	0.0000	0.2154	0.1590	0.1107
ETAT	224	1.0100	0.0000	0.0000	0.0000	-0.0721	-0.0685	0.0000	0.0000	-0.0388	-0.0369	0.0000
P3	225	1.0100	0.0000	0.0000	0.0000	0.2285	0.2171	0.0000	0.0000	0.1230	0.1170	0.0000
BLOSS	226	1.0100	0.0000	0.0000	0.0000	-0.2973	-0.2829	0.0000	0.0000	-0.1600	-0.1524	0.0000
MFP4	227	1.0100	0.0000	0.0000	0.0000	0.2613	0.2482	0.0000	0.0000	0.1407	0.1337	0.0000
WF	228	1.0100	0.0000	0.0000	0.0000	0.0135	0.0171	0.0142	0.0000	0.0072	0.0092	0.0076
CCV8E1	229	1.0100	0.0000	0.0000	0.0000	0.0000	1.8281	0.0000	0.0000	0.0000	0.9850	0.0000
CCV8E2	230	1.0100	0.0000	0.0000	0.0000	0.0000	0.0117	0.0000	0.0000	0.0000	0.0063	0.0000
CCV8E3	231	1.0100	0.0000	0.0000	0.0000	0.0000	0.0161	0.0000	0.0000	0.0000	0.0087	0.0000
CCV8A1	232	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	1.6389	0.0000	0.0000	0.0000	[illegible]
CCV8A2	233	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	0.1154	0.0000	0.0000	0.0000	[illegible]
CCV8A3	234	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	0.0255	0.0000	0.0000	0.0000	[illegible]
CCV8A4	235	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	0.3743	0.0000	0.0000	0.0000	[illegible]
CCV8A5	236	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	-0.2963	0.0000	0.0000	0.0000	[illegible]
A6	237	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	0.1415	0.0000	0.0000	0.0000	[illegible]
A16	238	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	-0.1420	0.0000	0.0000	0.0000	[illegible]

APPENDIX C
INFLUENCE COEFFICIENTS FOR THE AGM-109 THRUST CALCULATIONS

The influence coefficient printout presents the percent change in the dependent parameter for a 1-percent increase in the independent parameter. Note that a negative sign indicates a decrease in the dependent parameter for a 1-percent increase in the independent parameter. The net thrust (FG) and gross thrust (FG) calculations by the various methods are identified by suffixes as follows:

Suffix	Calculation Method
I	FGP Method
M	CV8M Method
E	CV8E Method
A	CV8A Method
C	FGC Method

DATE 7- 9-79 PROJECT NUMBER,
ARO, INC.,
AEDC DIVISION
A SVERDRUP CORPORATION COMPANY
ENGINE TEST FACILITY
ARNOLD AIR FORCE STATION, TENN.

TEST CELL,
TEST ARTICLE, AGM-109
TEST ARTICLE S/N,

TEST DATE, 0- 0- 0 0 HRS
COMP DATE, 7- 9-79 1022 HRS
COMP RUN, OFF LINE
PROGRAM,

TEST, 0001 DATA POINT, 201201
TEST 001 (Flt Cond 1: 1,000 ft/Mach 0.65)

INFLUENCE COEFFICIENT

INDEP	ITNO	PER	VO	WA	FN1	FNM	FNE	FNA	FNC	FG1	FGM	FGE
			251	257	326	327	328	329	330	265	268	290
CDPQ1	194	1.0100	-0.0293	-0.0000	0.0026	0.0333	0.0331	0.0334	0.0333	-0.0144	0.0000	0.0000
CDPQ2	195	1.0100	-0.0099	0.0000	0.0009	0.0112	0.0111	0.0112	0.0112	-0.0048	0.0000	0.0000
CDPQ3	196	1.0100	0.0244	-0.0000	-0.0021	-0.0277	-0.0276	-0.0278	-0.0277	0.0120	-0.0000	-0.0000
XN2	197	1.0100	-0.0099	-0.0000	0.0009	0.0112	0.0111	0.0112	0.0112	-0.0048	0.0000	0.0000
GNT	198	1.0100	-0.0099	0.0000	0.0009	0.0112	0.0111	0.0112	0.0112	-0.0048	0.0000	0.0000
KTR	199	1.0100	-0.0360	0.0000	0.0410	0.0409	0.0406	-0.0410	0.0409	0.0000	0.0000	0.0000
TTO	201	1.0100	0.4988	-0.9994	-4.0910	-0.3120	-0.5635	-1.1180	0.5640	-2.1831	-0.4150	-0.5328
PSO	202	1.0100	-0.4142	0.7466	0.7835	0.8928	0.9158	0.9984	-0.5977	0.5417	0.5930	0.6047
PTODSO	203	1.0100	0.4497	0.2534	0.2147	-0.3703	-0.3579	-0.3352	-0.8681	0.4753	0.2013	0.2053
CNAC1	204	1.0100	0.0000	-0.1033	0.1484	-0.0580	-0.0616	-0.0988	0.1152	0.0145	-0.0821	-0.0837
CNAC2	205	1.0100	0.0000	1.0438	-1.5114	0.5858	0.6218	0.9994	-1.1639	-0.1516	0.8294	0.8456
CNAC3	206	1.0100	0.0000	-0.0150	-0.0216	-0.0084	-0.0089	-0.0143	0.0167	0.0021	-0.0119	-0.0122
XN1	207	1.0100	0.0000	1.0138	-1.4677	0.5690	0.6040	0.9707	-1.1305	-0.1471	0.8056	0.8213
CETAR1	208	1.0100	0.0000	0.8756	2.4419	0.4908	0.5213	0.6125	-1.2633	1.6084	0.6955	0.7092
CETAR2	209	1.0100	0.0000	0.3198	0.8919	0.1793	0.1906	0.2248	-0.4509	0.5875	0.2540	0.2591
CETAR3	210	1.0100	0.0000	-0.1854	-0.5450	-0.1086	-0.1165	-0.1379	0.2697	-0.3590	-0.1552	-0.1584
A8	211	1.0100	0.0000	0.0000	2.1375	0.0000	0.0000	0.0000	0.0000	1.0000	0.0000	0.0000
CFGP1	212	1.0100	0.0000	0.0000	14.9548	0.0000	0.0000	0.0000	0.0000	6.9966	0.0000	0.0000
CFGP2	213	1.0100	0.0000	0.0000	-31.8600	0.0000	0.0000	0.0000	0.0000	-14.9056	0.0000	0.0000
CFGP3	214	1.0100	0.0000	0.0000	20.8314	0.0000	0.0000	0.0000	0.0000	9.7459	0.0000	0.0000
XN2	215	1.0100	0.0000	0.0000	10.0111	0.0000	0.0000	0.0000	0.0000	4.6837	0.0000	0.0000
CCVSM1	216	1.0100	0.0000	0.0000	0.0000	2.1263	0.0000	0.0000	0.0000	0.0000	0.9953	0.0000
CCVSM2	217	1.0100	0.0000	0.0000	0.0000	-0.0013	0.0000	0.0000	0.0000	0.0000	-0.0006	0.0000
CCVSM3	218	1.0100	0.0000	0.0000	0.0000	0.0113	0.0000	0.0000	0.0000	0.0000	0.0053	0.0000
P6	219	1.0100	0.0000	0.0000	0.0000	0.8371	0.6429	0.9794	2.5960	0.0000	0.3919	0.3020
P16	220	1.0100	0.0000	0.0000	0.0000	0.6562	0.8572	0.6649	1.7194	0.0000	0.3072	0.4027
T6	222	1.0100	0.0000	0.0000	0.0000	-0.3468	0.0105	0.4807	0.0000	0.0000	-0.1623	0.0049
ETAT	224	1.0100	0.0000	0.0000	0.0000	0.0393	0.0129	0.0512	0.0000	0.0000	0.0184	0.0060
P3	225	1.0100	0.0000	0.0000	0.0000	-0.1702	-0.0576	-0.2226	0.0000	0.0000	-0.0797	-0.0270
BLDSA	226	1.0100	0.0000	0.0000	0.0000	0.1679	0.0549	0.2178	0.0000	0.0000	0.0786	0.0258
MFP4	227	1.0100	0.0000	0.0000	0.0000	-0.1883	-0.0637	-0.2463	0.0000	0.0000	-0.0881	-0.0299
WF	228	1.0100	0.0000	0.0000	0.0000	0.6281	0.4658	0.3075	0.0000	0.0000	0.2940	0.2188
CCVSE1	229	1.0100	0.0000	0.0000	0.0000	0.0000	2.1030	0.0000	0.0000	0.0000	0.0000	0.9879
CCVSE2	230	1.0100	0.0000	0.0000	0.0000	0.0000	0.0117	0.0000	0.0000	0.0000	0.0000	0.0055
CCVSE3	231	1.0100	0.0000	0.0000	0.0000	0.0000	0.0141	0.0000	0.0000	0.0000	0.0000	0.0066
CCVSA1	232	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	1.9046	0.0000	0.0000	0.0000	0.0000
CCVSA2	233	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	0.1159	0.0000	0.0000	0.0000	0.0000

DATE 7- 9-79 PROJECT NUMBER,
ARO, INC.
AEDC DIVISION
A SVERDRUP CORPORATION COMPANY
ENGINE TEST FACILITY
ARNOLD AIR FORCE STATION, TENN

TEST DATE. 0- 0- 0 0 HRS TEST. 0001 DATA POINT. 201201
TEST CELL. COMP DATE. 7- 9-79 1022 HRS
TEST ARTICLE. AGM-109 COMP RUN. OFF LINE TEST 001
TEST ARTICLE S/N. PROGRAM. (Flt Cond 1, Cont.)

INFLUENCE COEFFICIENT

INDEP	ITNO	PER	FGA	FGC
			314	335
CDPQ1	194	1.0100	-0.0000	-0.0000
CDPQ2	195	1.0100	-0.0000	-0.0000
CDPQ3	196	1.0100	-0.0000	0.0000
XNZ	197	1.0100	0.0000	0.0000
GNT	198	1.0100	0.0000	0.0000
XTR	199	1.0100	0.0000	0.0000
TTO	201	1.0100	-0.7920	-0.0046
PSO	202	1.0100	0.6421	-0.1050
PTODSO	203	1.0100	0.2183	-0.0322
CWAC1	204	1.0100	-0.1012	-0.0009
CWAC2	205	1.0100	1.0230	0.0097
CWAC3	206	1.0100	-0.0147	-0.0001
XN1	207	1.0100	0.9937	0.0094
CETAR1	208	1.0100	0.7528	-0.1262
CETAR2	209	1.0100	0.2754	-0.0412
CETAR3	210	1.0100	-0.1685	0.0224
A8	211	1.0100	0.0000	0.0000
CFGP1	212	1.0100	0.0000	0.0000
CFGP2	213	1.0100	0.0000	0.0000
CFGP3	214	1.0100	0.0000	0.0000
XN2	215	1.0100	0.0000	0.0000
CCV8N1	216	1.0100	0.0000	0.0000
CCV8N2	217	1.0100	0.0000	0.0000
CCV8N3	218	1.0100	0.0000	0.0000
P6	219	1.0100	0.4580	1.2160
P16	220	1.0100	0.3109	0.8054
T6	222	1.0100	0.2248	0.0000
ETAT	224	1.0100	0.0240	0.0000
P3	225	1.0100	-0.1041	0.0000
BLOSS	226	1.0100	0.1018	0.0000
MFP4	227	1.0100	-0.1152	0.0000
WF	228	1.0100	0.1438	0.0000
CCV8E1	229	1.0100	0.0000	0.0000
CCV8E2	230	1.0100	0.0000	0.0000
CCV8E3	231	1.0100	0.0000	0.0000
CCV8A1	232	1.0100	0.8905	0.0000
CCV8A2	233	1.0100	0.0542	0.0000

DATE 7- 9-79 PROJECT NUMBER,
ARO, INC.
AEDC DIVISION
A SVERDRUP CORPORATION COMPANY
ENGINE TEST FACILITY
ARNOLD AIR FORCE STATION, TENN

TEST CELL.
TEST ARTICLE. AGM-109
TEST ARTICLE S/N.

TEST DATE, 0- 0- 0 0 HRS
COMP DATE, 7- 9-79 1029 HRS
COMP RUN. OFF LINE
PROGRAM,

TEST. 0001 DATA POINT. 201201
TEST 001 (Flt Cond 1, Cont.)

INFLUENCE COEFFICIENT

INDEP	ITNO	PER	VO 251	WA 257	FN1 326	FNM 327	FNE 328	FNA 329	FNC 330	FG1 265	FGM 268	FGE 290
CCV8A3	234	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	0.0222	0.0000	0.0000	0.0000	0.0000
CCV8A4	235	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	0.4256	0.0000	0.0000	0.0000	0.0000
CCV8A5	236	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	-0.3296	0.0000	0.0000	0.0000	0.0000
A6	237	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	-0.1420	-0.0782	0.0000	0.0000	0.0000
A16	238	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	-0.1426	0.0783	0.0000	0.0000	0.0000
PS8NE	239	1.0100	0.0000	0.0000	0.0000	-1.5237	-1.5114	-1.4449	-1.9634	0.0000	-0.7132	-0.7100
QLHV	243	1.0100	0.0000	0.0000	0.0000	0.6351	0.4635	0.3033	0.0000	0.0000	0.2973	0.2177
ETAB	244	1.0100	0.0000	0.0000	-0.0000	0.6351	0.4635	0.3033	0.0000	-0.0000	0.2973	0.2177
CHPX1	245	1.0100	0.0000	0.0000	0.0000	-0.0013	-0.0009	-0.0006	0.0000	0.0000	-0.0006	-0.0004
CFGC1	246	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-4.8912	0.0000	0.0000	0.0000
CFGC2	247	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	7.6050	0.0000	0.0000	0.0000
CFGC3	248	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-1.6405	0.0000	0.0000	0.0000
CFGC4	249	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	4.5147	0.0000	0.0000	0.0000
CFGC5	250	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-3.4530	0.0000	0.0000	0.0000

DATE 7- 9-79 PROJECT NUMBER.
ARO, INC.
AEDC DIVISION
A SVERDRUP CORPORATION COMPANY
ENGINE TEST FACILITY
ARNOLD AIR FORCE STATION, TENN

TEST CELL.		TEST DATE. 0- 0- 0	0 HRS	TEST. 0001	DATA POINT. 201201
TEST ARTICLE.	AGM-109	COMP DATE. 7- 9-79	1029 HRS		
TEST ARTICLE S/N.		COMP RUN. OFF LINE		TEST 001	(Flt Cond 1, Concl.)
		PROGRAM.			

INFLUENCE COEFFICIENT

INDEP	ITNO	PER	FGA	FGC
			314	335
CCV8A3	234	1.0100	0.0104	0.0000
CCV8A4	235	1.0100	-0.1990	0.0000
CCV8A5	236	1.0100	-0.1541	0.0000
A6	237	1.0100	0.0664	-0.0366
A16	238	1.0100	-0.0667	0.0367
PS8NE	239	1.0100	-0.6756	-0.9197
QLHV	243	1.0100	0.1418	0.0000
ETAB	244	1.0100	-0.1418	0.0000
CHPX1	245	1.0100	-0.0003	0.0000
CFGC1	246	1.0100	0.0000	-2.2910
CFGC2	247	1.0100	0.0000	3.5622
CFGC3	248	1.0100	0.0000	-0.7684
CFGC4	249	1.0100	0.0000	2.1147
CFGC5	250	1.0100	0.0000	-1.6174

DATE 7- 9-79 PROJECT NUMBER.
ARO, INC.
AEDC DIVISION
A SVERDRUP CORPORATION COMPANY
ENGINE TEST FACILITY
ARNOLD AIR FORCE STATION, TENN

TEST CELL.
TEST ARTICLE. AGM-109
TEST ARTICLE S/N.

TEST DATE. 0- 0- 0 0 HRS
COMP DATE. 7- 9-79 1023 HRS
COMP RUN. OFF LINE
PROGRAM.

TEST. 0001 DATA POINT. 202201
TEST 001

(Flt Cond 2: 1,000 ft/Mach 0.65)

INFLUENCE COEFFICIENT

INDEP	ITNO	PER	VO	WA	FN1	FNM	FNE	FNA	FNC	FG1	FGN	FGE
			251	267	326	327	328	329	330	265	268	290
CDPQ1	194	1.0100	-0.0293	-0.0000	0.0034	0.0297	0.0296	0.0297	0.0298	-0.0131	-0.0000	-0.0000
CDPQ2	195	1.0100	-0.0099	-0.0000	0.0011	0.0100	0.0099	0.0100	-0.0100	-0.0044	0.0000	0.0000
CDPQ3	196	1.0100	0.0244	-0.0000	-0.0028	-0.0248	-0.0246	-0.0247	-0.0248	0.0109	-0.0000	-0.0000
XNZ	197	1.0100	-0.0099	0.0000	0.0011	0.0100	0.0099	-0.0100	0.0100	-0.0044	0.0000	0.0000
GWT	198	1.0100	-0.0099	0.0000	0.0011	0.0100	0.0099	0.0100	0.0100	-0.0044	0.0000	0.0000
KIR	199	1.0100	-0.0360	0.0000	0.0365	0.0365	0.0363	0.0365	0.0365	-0.0000	0.0000	0.0000
TIO	201	1.0100	0.4988	-0.9853	-3.8409	-0.2981	-0.5374	-1.0635	0.4985	-2.1547	-0.3955	-0.5143
PSO	202	1.0100	-0.4143	0.7466	-0.7949	0.8308	0.8588	0.9572	-0.3641	0.5604	0.5782	0.5928
PTODSO	203	1.0100	0.4497	0.2534	0.2022	-0.3192	-0.3060	-0.2750	-0.7188	0.4550	0.1963	0.2013
CWAC1	204	1.0100	0.0000	-0.0965	-0.1328	-0.0527	-0.0567	-0.0924	0.0979	-0.0174	-0.0748	-0.0767
CWAC2	205	1.0100	0.0000	1.0149	-1.4082	0.5543	0.5954	0.9730	-1.0302	-0.1884	0.7863	0.8060
CWAC3	206	1.0100	0.0000	-0.0152	0.0209	-0.0083	-0.0089	-0.0145	0.0154	0.0027	-0.0118	-0.0121
XN1	207	1.0100	0.0000	0.9846	-1.3659	0.5378	0.5776	0.9439	-0.9994	-0.1826	0.7628	0.7820
CETAR1	208	1.0100	0.0000	-0.8788	-2.2243	0.4795	0.5152	0.6283	-0.9330	1.5469	0.6806	0.6978
CETAR2	209	1.0100	0.0000	0.3354	0.8489	0.1830	0.1968	0.2406	-0.3470	0.5904	0.2597	0.2664
CETAR3	210	1.0100	0.0000	-0.2141	-0.5420	-0.1168	-0.1257	-0.1542	0.2157	-0.3770	-0.1658	-0.1701
A8	211	1.0100	0.0000	0.0000	2.0137	0.0000	0.0000	0.0000	0.0000	1.0000	0.0000	0.0000
CFGP1	212	1.0100	0.0000	0.0000	12.7909	0.0000	0.0000	0.0000	0.0000	6.3518	0.0000	0.0000
CFGP2	213	1.0100	0.0000	0.0000	-27.6765	0.0000	0.0000	0.0000	0.0000	-13.7438	0.0000	0.0000
CFGP3	214	1.0100	0.0000	0.0000	18.4305	0.0000	0.0000	0.0000	0.0000	9.1523	0.0000	0.0000
XN2	215	1.0100	0.0000	0.0000	9.3687	0.0000	0.0000	0.0000	0.0000	4.6524	0.0000	0.0000
CCVBM1	216	1.0100	0.0000	0.0000	0.0000	2.0041	0.0000	0.0000	0.0000	0.0000	0.9948	0.0000
CCVBM2	217	1.0100	0.0000	0.0000	0.0000	-0.0013	0.0000	0.0000	0.0000	0.0000	-0.0006	0.0000
CCVBM3	218	1.0100	0.0000	0.0000	0.0000	0.0118	0.0000	-0.0000	0.0000	0.0000	0.0059	0.0000
P6	219	1.0100	0.0000	0.0000	0.0000	0.7421	0.5863	0.8589	2.2594	0.0000	0.3683	0.2919
P16	220	1.0100	0.0000	0.0000	0.0000	0.5527	0.7244	0.5766	1.4743	0.0000	0.2743	0.3607
T6	222	1.0100	0.0000	0.0000	0.0000	-0.3490	0.0070	0.4313	0.0000	0.0000	-0.1733	0.0035
ETAT	224	1.0100	-0.0000	0.0000	0.0000	0.0376	0.0107	0.0536	0.0000	0.0000	0.0187	0.0053
P3	225	1.0100	0.0000	0.0000	0.0000	-0.1587	-0.0431	-0.2295	0.0000	0.0000	-0.0788	-0.0215
BLOSS	226	1.0100	0.0000	0.0000	0.0000	0.1582	0.0470	0.2252	0.0000	0.0000	0.0785	0.0234
WFP4	227	1.0100	0.0000	0.0000	0.0000	-0.1751	-0.0475	-0.2536	0.0000	0.0000	-0.0869	-0.0237
WF	228	1.0100	0.0000	0.0000	0.0000	0.6301	0.4663	0.3180	0.0000	0.0000	0.3128	0.2321
CCVBE1	229	1.0100	0.0000	0.0000	0.0000	0.0000	1.9821	0.0000	0.0000	0.0000	0.0000	0.9869
CCVBE2	230	1.0100	0.0000	0.0000	0.0000	0.0000	0.0117	0.0000	0.0000	0.0000	0.0000	0.0058
CCVBE3	231	1.0100	0.0000	0.0000	0.0000	0.0000	0.0147	0.0000	0.0000	0.0000	0.0000	0.0073
CCVBA1	232	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	1.7847	0.0000	0.0000	0.0000	0.0000
CCVBA2	233	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	0.1148	0.0000	0.0000	0.0000	0.0000

DATE 7- 9-79 PROJECT NUMBER.
ARO, INC.
AEDC DIVISION
A SVERDRUP CORPORATION COMPANY
ENGINE TEST FACILITY
ARNOLD AIR FORCE STATION, TENN

TEST DATE. 0- 0- 0	0 HRS	TEST. 0001	DATA POINT. 202201
COMP DATE. 7- 9-79	1023 HRS		
COMP RUN. OFF LINE		TEST 001	
PROGRAM.			(Flt Cond 2, Cont.)

TEST CELL.
TEST ARTICLE. AGM-109
TEST ARTICLE S/N.

INFLUENCE COEFFICIENT

INDEP	ITNO	PER	FGA	FGC
			314	335
CDPQ1	194	1.0100	-0.0000	0.0000
CDPQ2	195	1.0100	-0.0000	0.0000
CDPQ3	196	1.0100	-0.0000	-0.0000
XN2	197	1.0100	0.0000	-0.0000
GNT	198	1.0100	0.0000	0.0000
KTP	199	1.0100	0.0000	-0.0000
TT0	201	1.0100	-0.7756	-0.0001
PS0	202	1.0100	0.6411	-0.0149
PT0DS0	203	1.0100	0.2179	-0.0020
CMAC1	204	1.0100	-0.0945	-0.0000
CMAC2	205	1.0100	0.9941	-0.0001
CMAC3	206	1.0100	-0.0149	-0.0000
XN1	207	1.0100	0.9644	-0.0001
CETAR1	208	1.0100	0.7543	-0.0204
CETAR2	209	1.0100	0.2883	-0.0033
CETAR3	210	1.0100	-0.1844	-0.0008
A8	211	1.0100	0.0000	0.0000
CFGP1	212	1.0100	0.0000	-0.0000
CFGP2	213	1.0100	0.0000	0.0000
CFGP3	214	1.0100	0.0000	0.0000
XN2	215	1.0100	0.0000	0.0000
CCV8M1	216	1.0100	-0.0000	-0.0000
CCV8M2	217	1.0100	0.0000	0.0000
CCV8M3	218	1.0100	0.0000	0.0000
P6	219	1.0100	0.4266	1.1214
P16	220	1.0100	0.2864	0.7217
T6	222	1.0100	0.2142	0.0000
ETAT	224	1.0100	0.0266	0.0000
P3	225	1.0100	-0.1140	0.0000
BLOSS	226	1.0100	0.1119	0.0000
WFP4	227	1.0100	-0.1259	0.0000
WF	228	1.0100	0.1579	0.0000
CCV8E1	229	1.0100	0.0000	0.0000
CCV8E2	230	1.0100	0.0000	0.0000
CCV8E3	231	1.0100	0.0000	0.0000
CCV8A1	232	1.0100	0.8864	0.0000
CCV8A2	233	1.0100	0.0570	0.0000

DATE 7- 9-79 PROJECT NUMBER.
ARO, INC.
AEDC DIVISION
A SVERDRUP CORPORATION COMPANY
ENGINE TEST FACILITY
ARNOLD AIR FORCE STATION, TENN

TEST CELL.
TEST ARTICLE. AGM-109
TEST ARTICLE S/N.

TEST DATE. 0- 0- 0 0 HRS
COMP DATE. 7- 9-79 1029 HRS
COMP RUN. OFF LINE
PROGRAM.

TEST. 0001 DATA POINT. 202201
TEST 001 (Flt Cond 2, Cont.)

INFLUENCE COEFFICIENT

INDEP	ITNO	PER	VO 251	WA 257	FN1 326	FNM 327	FNE 328	FNA 329	FNC 330	FG1 265	FGM 268	FGE 290
CCV8A3	234	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	0.0232	0.0000	0.0000	0.0000	0.0000
CCV8A4	235	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	0.3974	0.0000	0.0000	0.0000	0.0000
CCV8A5	236	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	-0.3067	0.0000	0.0000	0.0000	0.0000
A6	237	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	0.1444	-0.0542	0.0000	0.0000	0.0000
A16	238	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	-0.1449	0.0543	0.0000	0.0000	0.0000
PS0NE	239	1.0100	0.0000	0.0000	0.0000	-1.3214	-1.3193	-1.2522	-1.7510	0.0000	-0.6559	-0.6569
QLHV	243	1.0100	0.0000	0.0000	0.0000	0.6375	0.4641	0.3140	0.0000	0.0000	0.3164	0.2311
STAB	244	1.0100	0.0000	0.0000	0.0000	0.6375	0.4641	0.3140	0.0000	0.0000	0.3164	0.2311
CHPX1	245	1.0100	0.0000	0.0000	0.0000	-0.0011	-0.0008	-0.0006	0.0000	0.0000	-0.0006	-0.0004
CFGC1	246	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-4.3109	0.0000	0.0000	0.0000
CFGC2	247	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	6.8778	0.0000	0.0000	0.0000
CFGC3	248	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-1.5680	0.0000	0.0000	-0.0000
CFGC4	249	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.8496	0.0000	0.0000	0.0000
CFGC5	250	1.0100	0.0000	0.0000	-0.0000	0.0000	0.0000	0.0000	-2.9338	0.0000	-0.0000	0.0000

DATE 7- 9-79 PROJECT NUMBER.
ARO, INC.
AEDC DIVISION
A SVERDRUP CORPORATION COMPANY
ENGINE TEST FACILITY
ARNOLD AIR FORCE STATION, TENN.

TEST DATE. 0- 0- 0 0 HRS TEST. 0001 DATA POINT. 202201
TEST CELL. COMP DATE. 7- 9-79 1039 HRS
TEST ARTICLE. AGM-109 COMP RUN. OFF LINE TEST 001
TEST ARTICLE S/N. PROGRAM. (Flt Cond 2, Concl.)

INFLUENCE COEFFICIENT

INDEP	ITNO	PER	FGA	FGC
			314	335
CCVBA3	234	1.0100	0.0115	0.0000
CCVBA4	235	1.0100	0.1974	0.0000
CCVBA5	236	1.0100	-0.1523	0.0000
A6	237	1.0100	-0.0717	-0.0269
A16	238	1.0100	-0.0720	0.0270
PSONE	239	1.0100	-0.6219	-0.8691
QLHV	243	1.0100	0.1559	0.0000
ETAB	244	1.0100	0.1559	0.0000
CHPX1	245	1.0100	-0.0003	0.0000
CFGC1	246	1.0100	0.0000	-2.0899
CFGC2	247	1.0100	0.0000	3.4136
CFGC3	248	1.0100	-0.0000	-0.7782
CFGC4	249	1.0100	0.0000	1.9106
CFGC5	250	1.0100	0.0000	-1.4561

DATE 7- 9-79 PROJECT NUMBER.
ARO, INC.
AEDC DIVISION
A SVERDRUP CORPORATION COMPANY
ENGINE TEST FACILITY
ARNOLD AIR FORCE STATION, TENN

TEST DATE. 0- 0- 0 0 HRS TEST. 0001 DATA POINT. 203201
TEST CELL. COMP DATE. 7- 9-79 1025 HRS
TEST ARTICLE. AGM-109 COMP RUN, OFF LINE TEST 001 (Flt Cond 3: 1,000 ft/Mach 0.75)
TEST ARTICLE S/N. PROGRAM.

INFLUENCE COEFFICIENT

INDEP	ITNO	PER	VD	WA	FN1	FNP	FNE	FNA	FNC	FG1	FGM	FGL
			251	257	326	327	328	329	330	265	268	290
CDPQ1	194	1.0100	-0.0298	-0.0000	0.0031	0.0313	0.0310	0.0315	0.0315	-0.0138	0.0000	0.0000
CDPQ2	195	1.0100	-0.0074	-0.0000	0.0008	0.0078	0.0077	0.0078	0.0078	-0.0034	0.0000	0.0000
CDPQ3	196	1.0100	0.0335	0.0000	-0.0034	-0.0352	-0.0349	-0.0354	-0.0354	0.0155	0.0000	0.0000
XNZ	197	1.0100	-0.0074	-0.0000	0.0008	0.0078	0.0077	0.0078	0.0078	-0.0034	0.0000	0.0000
GNT	198	1.0100	-0.0074	-0.0000	0.0008	0.0078	0.0077	0.0078	0.0078	-0.0034	0.0000	0.0000
KTR	199	1.0100	-0.0468	-0.0000	0.0491	0.0492	0.0488	0.0495	0.0495	0.0000	0.0000	0.0000
TTO	201	1.0100	0.4988	-0.9666	-3.6204	-0.2785	-0.5234	-1.0610	0.4778	-2.0083	-0.3779	-0.4975
PSO	202	1.0100	-0.3952	0.6869	0.7281	0.7537	0.7850	0.8480	-0.5534	0.5032	0.5156	0.5319
PTODSO	203	1.0100	0.4371	0.3131	0.2684	-0.3074	-0.2879	-0.2675	-0.9008	0.5159	0.2351	0.2425
CWAC1	204	1.0100	0.0000	-0.0885	0.1334	-0.0433	-0.0478	-0.0856	0.0895	0.0197	-0.0665	-0.0686
CWAC2	205	1.0100	0.0000	0.9763	-1.4835	0.4778	0.5267	0.9458	-0.9867	-0.2238	0.7332	0.7561
CWAC3	206	1.0100	0.0000	-0.0153	0.0231	-0.0075	-0.0083	-0.0148	0.0155	0.0034	-0.0115	-0.0119
XN1	207	1.0100	0.0000	0.9457	-1.4367	0.4629	0.5102	0.9162	-0.9559	-0.2166	0.7102	0.7324
CETAR1	208	1.0100	0.0000	0.8837	1.9561	0.4320	0.4764	0.5492	-1.2623	1.4069	0.6634	0.6843
CETAR2	209	1.0100	0.0000	0.3555	0.7869	0.1738	0.1918	0.2221	-0.4976	0.5660	0.2669	0.2753
CETAR3	210	1.0100	0.0000	-0.2393	-0.5296	-0.1170	-0.1292	-0.1503	0.3272	-0.3809	-0.1796	-0.1854
A8	211	1.0100	0.0000	0.0000	2.0497	0.0000	0.0000	0.0000	0.0000	1.0000	0.0000	0.0000
CFGP1	212	1.0100	0.0000	0.0000	11.0464	0.0000	0.0000	0.0000	0.0000	5.3897	0.0000	0.0000
CFGP2	213	1.0100	0.0000	0.0000	-24.3681	0.0000	0.0000	0.0000	0.0000	-11.8884	0.0000	0.0000
CFGP3	214	1.0100	0.0000	0.0000	16.5849	0.0000	0.0000	0.0000	0.0000	8.0912	0.0000	0.0000
XN2	215	1.0100	0.0000	0.0000	8.9674	0.0000	0.0000	0.0000	0.0000	4.3749	0.0000	0.0000
CCV8M1	216	1.0100	0.0000	0.0000	0.0000	2.0355	0.0000	0.0000	0.0000	0.0000	0.9928	0.0000
CCV8M2	217	1.0100	0.0000	0.0000	0.0000	-0.0015	0.0000	0.0000	0.0000	0.0000	-0.0007	0.0000
CCV8M3	218	1.0100	0.0000	0.0000	0.0000	0.0163	0.0000	0.0000	0.0000	0.0000	0.0079	0.0000
P6	219	1.0100	0.0000	0.0000	0.0000	0.6302	0.5172	0.7438	1.9751	0.0000	0.3074	0.2533
P16	220	1.0100	0.0000	0.0000	0.0000	0.4402	0.5798	0.4942	1.2666	0.0000	0.2147	0.2840
T6	222	1.0100	0.0000	0.0000	0.0000	-0.3809	-0.0047	0.4103	0.0000	0.0000	-0.1858	-0.0023
ETAT	224	1.0100	0.0000	0.0000	0.0000	0.0357	0.0080	0.0607	0.0000	0.0000	0.0174	0.0039
P3	225	1.0100	0.0000	0.0000	0.0000	-0.1544	-0.0344	-0.2607	0.0000	0.0000	-0.0753	-0.0168
BLOSS	226	1.0100	0.0000	0.0000	0.0000	0.1488	0.0332	0.2530	0.0000	0.0000	0.0726	0.0163
WFP4	227	1.0100	0.0000	0.0000	0.0000	-0.1705	-0.0379	-0.2879	0.0000	0.0000	-0.0832	-0.0185
WF	228	1.0100	0.0000	0.0000	0.0000	0.6760	0.4966	0.3591	0.0000	0.0000	0.3297	0.2432
CCV8E1	229	1.0100	0.0000	0.0000	0.0000	0.0000	2.0079	0.0000	0.0000	0.0000	0.0000	0.9834
CCV8E2	230	1.0100	0.0000	0.0000	0.0000	0.0000	-0.0137	0.0000	0.0000	0.0000	0.0000	-0.0067
CCV8E3	231	1.0100	0.0000	0.0000	0.0000	0.0000	0.0202	0.0000	0.0000	0.0000	0.0000	0.0099
CCV8A1	232	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	1.8165	0.0000	0.0000	0.0000	0.0000
CCV8A2	233	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	0.1366	0.0000	0.0000	0.0000	0.0000

DATE 7- 9-79 PROJECT NUMBER.
ARO, INC.
AEDC DIVISION
A SVERDRUP CORPORATION COMPANY
ENGINE TEST FACILITY
ARNOLD AIR FORCE STATION, TENN

TEST CELL.
TEST ARTICLE. AGM-109
TEST ARTICLE S/N.

TEST DATE. 0- 0- 0 0 HRS
COMP DATE. 7- 9-79 1025 HRS
COMP RUN. OFF LINE
PROGRAM.

TEST. 0001 DATA POINT. 203201
TEST 001 (Flt Cond 3, Cont.)

INFLUENCE COEFFICIENT

INDEP	ITNO	PER	FGA	FGC
			214	336
CDPO1	194	1.0100	-0.0000	0.0000
CDPO2	195	1.0100	-0.0000	0.0000
CDPO3	196	1.0100	0.0000	0.0000
XNZ	197	1.0100	-0.0000	0.0000
GWT	198	1.0100	-0.0000	0.0000
KTR	199	1.0100	-0.0000	0.0000
TTO	201	1.0100	-0.7588	-0.0104
PSO	202	1.0100	0.5608	-0.1207
PTODSO	203	1.0100	0.2560	-0.0519
CWAC1	204	1.0100	-0.0871	-0.0020
CWAC2	205	1.0100	0.9615	0.0216
CWAC3	206	1.0100	-0.0151	-0.0003
XN1	207	1.0100	0.9314	0.0210
CETAR1	208	1.0100	0.7210	-0.1599
CETAR2	209	1.0100	0.2906	-0.0594
CETAR3	210	1.0100	-0.1960	0.0342
A8	211	1.0100	0.0000	0.0000
CFGP1	212	1.0100	0.0000	0.0000
CFGP2	213	1.0100	0.0000	0.0000
CFGP3	214	1.0100	0.0000	0.0000
XN2	215	1.0100	0.0000	0.0000
CCV8N1	216	1.0100	0.0000	0.0000
CCV8N2	217	1.0100	0.0000	0.0000
CCV8N3	218	1.0100	0.0000	0.0000
P6	219	1.0100	0.3618	0.9605
P16	220	1.0100	0.2403	0.6159
T6	222	1.0100	0.1995	0.0000
ETAT	224	1.0100	0.0295	0.0000
P3	225	1.0100	-0.1268	0.0000
BLOSS	226	1.0100	0.1230	0.0000
MFP4	227	1.0100	-0.1400	0.0000
WF	228	1.0100	0.1742	0.0000
CCV8E1	229	1.0100	0.0000	0.0000
CCV8E2	230	1.0100	0.0000	0.0000
CCV8E3	231	1.0100	0.0000	0.0000
CCV8A1	232	1.0100	0.8834	0.0000
CCV8A2	233	1.0100	0.0664	0.0000

DATE 7- 9-79 PROJECT NUMBER.
ARO, INC.
AEDC DIVISION
A SVERDRUP CORPORATION COMPANY
ENGINE TEST FACILITY
ARNOLD AIR FORCE STATION, TENN.

TEST CELL.
TEST ARTICLE. AGM-109
TEST ARTICLE S/N.

TEST DATE. 0- 0- 0 0 HRS
COMP DATE. 7- 9-79 1030 HRS
COMP RUN. OFF LINE
PROGRAM.

TEST. 0001 DATA POINT. 203201
TEST 001 (Flt Cond 3, Cont.)

INFLUENCE COEFFICIENT

INDEP	ITNO	PER	VD 251	WA 257	FN1 326	FNM 327	FNE 328
CCVBA3	234	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000
CCVBA4	235	1.0100	0.0000	0.0000	0.0000	-0.0000	0.0000
CCVBA5	236	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000
A6	237	1.0100	0.0000	0.0000	0.0000	-0.0000	0.0000
A16	238	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000
PBSNE	239	1.0100	0.0000	0.0000	-0.0000	-1.0924	-1.1023
QLHV	243	1.0100	0.0000	0.0000	0.0000	0.6846	0.4941
ETAB	244	1.0100	0.0000	0.0000	-0.0000	0.6846	0.4941
CHPX1	245	1.0100	0.0000	0.0000	0.0000	-0.0010	-0.0007
CFGC1	246	1.0100	0.0000	-0.0000	0.0000	0.0000	0.0000
CFGC2	247	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000
CFGC3	248	1.0100	0.0000	-0.0000	0.0000	0.0000	-0.0000
CFGC4	249	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000
CFGC5	250	1.0100	0.0000	0.0000	-0.0000	0.0000	0.0000

INDEP	FNA 329	FNC 330	FGI 265	FGN 268	FGE 290
CCVBA3	0.0322	0.0000	0.0000	0.0000	0.0000
CCVBA4	-0.4397	0.0000	0.0000	0.0000	0.0000
CCVBA5	-0.3689	0.0000	0.0000	0.0000	0.0000
A6	-0.1602	-0.0334	0.0000	0.0000	0.0000
A16	-0.1600	0.0335	0.0000	0.0000	0.0000
PBSNE	-0.9742	-0.9098	-0.0000	-0.5328	-0.5398
QLHV	0.3550	0.0000	0.0000	0.3339	0.2420
ETAB	0.3550	0.0000	0.0000	0.3339	0.2420
CHPX1	-0.0005	0.0000	0.0000	-0.0005	-0.0003
CFGC1	0.0000	-3.6718	0.0000	0.0000	0.0000
CFGC2	0.0000	6.9615	0.0000	0.0000	0.0000
CFGC3	0.0000	-1.8550	-0.0000	0.0000	0.0000
CFGC4	0.0000	3.6238	0.0000	0.0000	0.0000
CFGC5	0.0000	-3.0022	0.0000	0.0000	0.0000

DATE 7- 9-79 PROJECT NUMBER,
ARO, INC.
AEDC DIVISION
A SVERDRUP CORPORATION COMPANY
ENGINE TEST FACILITY
ARNOLD AIR FORCE STATION, TENN

TEST CELL,
TEST ARTICLE, AGM-109
TEST ARTICLE S/N,

TEST DATE, 0- 0- 0 0 HRS
COMP DATE, 7- 9-79 1030 HRS
COMP RUN, OFF LINE
PROGRAM,

TEST, 0001 DATA POINT, 203201
TEST 001 (Flt Cond 3, Concl.)

INFLUENCE COEFFICIENT

INDEP	ITNO	PER	FGA	FGC
			314	336
CCVBA3	234	1.0100	0.0157	0.0000
CCVBA4	235	1.0100	-0.2139	0.0000
CCVBA5	236	1.0100	-0.1794	0.0000
A6	237	1.0100	-0.0779	-0.0163
A16	238	1.0100	-0.0782	0.0163
PSBNE	239	1.0100	-0.4738	-0.4425
QLHV	243	1.0100	0.1726	0.0000
ETAB	244	1.0100	-0.1726	0.0000
CHPX1	245	1.0100	-0.0002	0.0000
CFGC1	246	1.0100	0.0000	-1.7856
CFGC2	247	1.0100	0.0000	3.3854
CFGC3	248	1.0100	0.0000	-0.9021
CFGC4	249	1.0100	0.0000	1.7623
CFGC5	250	1.0100	0.0000	-1.4600

DATE 7- 9-79 PROJECT NUMBER.
ARO, INC.
AEDC DIVISION
A SVERDRUP CORPORATION COMPANY
ENGINE TEST FACILITY
ARNOLD AIR FORCE STATION, TENN.

TEST CELL.
TEST ARTICLE. AGM-109
TEST ARTICLE S/N.

TEST DATE. 0- 0- 0 0 HRS
COMP DATE. 7- 9-79 1026 HRS
COMP RUN. OFF LINE
PROGRAM.

TEST. 0001 DATA POINT. 204201
TEST 001 (Flt Cond 4: 8,000 ft/Mach 0.65)

INFLUENCE COEFFICIENT

INDEP	ITNO	PER	VO 251	WA 257	FN1 326	FNN 327	FNE 328	FNA 329	FNC 330	FGI 265	FGN 268	FGE 290
CDPO1	194	1.0100	-0.0297	0.0000	0.0039	0.0281	0.0280	0.0280	0.0280	-0.0124	0.0000	0.0000
CDPO2	195	1.0100	-0.0128	0.0000	0.0017	0.0121	0.0120	-0.0121	0.0121	-0.0054	0.0000	0.0000
CDPO3	196	1.0100	0.0194	0.0000	-0.0025	-0.0183	-0.0182	-0.0183	-0.0182	0.0081	0.0000	0.0000
XN2	197	1.0100	-0.0128	0.0000	0.0017	0.0121	0.0120	0.0121	0.0121	-0.0054	0.0000	0.0000
GNT	198	1.0100	-0.0128	0.0000	0.0017	0.0121	0.0120	0.0121	0.0121	-0.0054	0.0000	0.0000
KIP	199	1.0100	-0.0360	0.0000	-0.0340	0.0341	0.0339	-0.0340	0.0339	0.0000	-0.0000	0.0000
TIO	201	1.0100	0.4988	-0.9743	-3.6939	-0.2923	-0.5217	-1.0341	0.4614	-2.1331	-0.3837	-0.5017
PSO	202	1.0100	-0.4132	0.7428	0.7973	0.7930	0.8219	0.9319	-0.2221	0.5691	0.5667	0.5822
PTODSO	203	1.0100	0.4455	0.2572	0.1994	-0.2841	-0.2708	-0.2334	-0.6278	0.4444	0.1962	0.2016
CWAC1	204	1.0100	0.0000	-0.0917	0.1244	-0.0494	-0.0533	-0.0882	0.0881	0.0195	-0.0700	-0.0719
CWAC2	205	1.0100	0.0000	0.9922	-1.3587	0.5348	0.5761	0.9554	-0.9547	-0.2169	0.7572	0.7778
CWAC3	206	1.0100	0.0000	-0.0153	0.0208	-0.0082	-0.0089	-0.0147	0.0147	0.0032	-0.0117	-0.0120
XN1	207	1.0100	0.0000	0.9617	-1.3166	0.5183	0.5584	0.9260	-0.9253	-0.2101	0.7339	0.7539
CETAR1	208	1.0100	0.0000	0.8816	2.1035	0.4747	0.5116	0.6407	-0.7335	1.5101	0.6725	0.6910
CETAR2	209	1.0100	0.0000	0.3473	0.8287	0.1870	0.2017	0.2533	-0.2807	0.5949	0.2650	0.2723
CETAR3	210	1.0100	0.0000	-0.2289	-0.5462	-0.1233	-0.1330	-0.1675	0.1792	-0.3921	-0.1746	-0.1795
A8	211	1.0100	0.0000	0.0000	1.9443	0.0000	0.0000	0.0000	0.0000	1.0000	0.0000	0.0000
CFGP1	212	1.0100	0.0000	0.0000	11.5634	0.0000	0.0000	0.0000	0.0000	5.9472	0.0000	0.0000
CFGP2	213	1.0100	0.0000	0.0000	-25.2978	0.0000	0.0000	0.0000	0.0000	-13.0111	0.0000	0.0000
CFGP3	214	1.0100	0.0000	0.0000	17.0648	0.0000	0.0000	0.0000	0.0000	8.7767	0.0000	0.0000
XM2	215	1.0100	0.0000	0.0000	9.0024	0.0000	0.0000	0.0000	0.0000	4.6301	0.0000	0.0000
CCV8M1	216	1.0100	0.0000	0.0000	0.0000	1.9353	0.0000	0.0000	0.0000	0.0000	0.9944	0.0000
CCV8M2	217	1.0100	0.0000	0.0000	0.0000	-0.0013	0.0000	0.0000	0.0000	0.0000	-0.0007	0.0000
CCV8M3	218	1.0100	0.0000	0.0000	0.0000	0.0123	0.0000	0.0000	0.0000	0.0000	0.0063	0.0000
P6	219	1.0100	0.0000	0.0000	0.0000	0.6895	0.5537	0.7914	2.0505	0.0000	0.3542	0.2853
P16	220	1.0100	0.0000	0.0000	0.0000	0.4935	0.6490	0.5274	1.3248	0.0000	0.2536	0.3344
T6	222	1.0100	0.0000	0.0000	0.0000	-0.3428	-0.0001	0.4070	0.0000	0.0000	-0.1761	-0.0000
ETAT	224	1.0100	0.0000	0.0000	0.0000	0.0347	0.0090	0.0548	0.0000	0.0000	0.0179	0.0046
P3	225	1.0100	0.0000	0.0000	0.0000	-0.1478	-0.0379	-0.2331	0.0000	0.0000	-0.0759	-0.0195
BLUSS	226	1.0100	0.0000	0.0000	0.0000	0.1441	0.0375	0.2270	0.0000	0.0000	0.0740	0.0193
WFP4	227	1.0100	0.0000	0.0000	0.0000	-0.1634	-0.0418	-0.2578	0.0000	0.0000	-0.0840	-0.0215
WF	228	1.0100	0.0000	0.0000	0.0000	0.6222	0.4609	0.3197	0.0000	0.0000	0.3197	0.2375
CCV8E1	229	1.0100	0.0000	0.0000	0.0000	0.0000	1.9139	0.0000	0.0000	0.0000	0.0000	0.9861
CCV8E2	230	1.0100	0.0000	0.0000	0.0000	0.0000	0.0117	0.0000	0.0000	0.0000	0.0000	0.0060
CCV8E3	231	1.0100	0.0000	0.0000	0.0000	0.0000	0.0153	0.0000	0.0000	0.0000	0.0000	0.0079
CCV8A1	232	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	1.7159	0.0000	0.0000	0.0000	0.0000
CCV8A2	233	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	0.1148	0.0000	0.0000	0.0000	0.0000

DATE 7- 9-79 PROJECT NUMBER.
ARO, INC.
AEDC DIVISION
A SVERDRUP CORPORATION COMPANY
ENGINE TEST FACILITY
ARNOLD AIR FORCE STATION, TENN

TEST CELL.
TEST ARTICLE. AGM-109
TEST ARTICLE S/N.

TEST DATE. 0- 0- 0 0 HRS
COMP DATE. 7- 9-79 1026 HRS
COMP RUN. OFF LINE
PROGRAM.

TEST. 0001
TEST 001

DATA POINT. 204201
(Flt Cond 4, Cont.)

INFLUENCE COEFFICIENT

INDEP	ITNO	PER	FGA	FGC
			214	335
CDPO1	194	1.0100	0.0000	0.0000
CDPO2	195	1.0100	0.0000	0.0000
CDPO3	196	1.0100	0.0000	0.0000
XNZ	197	1.0100	0.0000	0.0000
CWT	198	1.0100	0.0000	0.0000
KTR	199	1.0100	0.0000	0.0000
TT0	201	1.0100	-0.7654	0.0045
P60	202	1.0100	0.4386	0.0446
PTODS0	203	1.0100	0.2214	0.0183
CWAC1	204	1.0100	-0.0899	-0.0009
CWAC2	205	1.0100	0.9732	-0.0101
CWAC3	206	1.0100	-0.0150	0.0001
XN1	207	1.0100	0.9433	-0.0098
CETAR1	208	1.0100	0.7576	0.0501
CETAR2	209	1.0100	0.2989	0.0240
CETAR3	210	1.0100	-0.1971	-0.0188
A8	211	1.0100	0.0000	0.0000
CFGP1	212	1.0100	0.0000	0.0000
CFGP2	213	1.0100	0.0000	0.0000
CFGP3	214	1.0100	0.0000	0.0000
XN2	215	1.0100	0.0000	0.0000
CCV8M1	216	1.0100	0.0000	0.0000
CCV8M2	217	1.0100	0.0000	0.0000
CCV8M3	218	1.0100	0.0000	0.0000
P6	219	1.0100	0.4073	1.0556
P16	220	1.0100	0.2714	-0.6820
T6	222	1.0100	0.2095	0.0000
ETAT	224	1.0100	0.0282	0.0000
P3	225	1.0100	-0.1200	0.0000
ALOSS	226	1.0100	0.1169	0.0000
WFP4	227	1.0100	-0.1327	0.0000
WF	228	1.0100	0.1645	0.0000
CCV8E1	229	1.0100	0.0000	0.0000
CCV8E2	230	1.0100	0.0000	0.0000
CCV8E3	231	1.0100	0.0000	0.0000
CCV8A1	232	1.0100	0.8833	0.0000
CCV8A2	233	1.0100	0.0591	0.0000

DATE 7- 9-79 PROJECT NUMBER.
ARO, INC.
AEDC DIVISION
A SVERDRUP CORPORATION COMPANY
ENGINE TEST FACILITY
ARNOLD AIR FORCE STATION, TENN

TEST CELL.
TEST ARTICLE. AGM-109
TEST ARTICLE S/N.

TEST DATE. 0- 0- 0 0 HRS
COMP DATE. 7- 9-79 1030 HRS
COMP RUN. OFF LINE
PROGRAM.

TEST. 0001 DATA POINT. 204201
TEST 001 (Flt Cond 4, Cont.)

INFLUENCE COEFFICIENT

INDEP	ITNO	PER	VO 251	WA 257	FN1 326	FNM 327	FNE 328	FNA 329	FNC 330	FG1 265	FGM 268	FGE 290
CCVBA3	234	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	0.0241	0.0000	0.0000	0.0000	0.0000
CCVBA4	235	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	0.3809	0.0000	0.0000	0.0000	0.0000
CCVBA5	236	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	-0.2930	0.0000	0.0000	0.0000	0.0000
A6	237	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	0.1465	-0.0410	0.0000	0.0000	0.0000
A16	238	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	-0.1470	0.0411	0.0000	0.0000	0.0000
PS8NE	239	1.0100	0.0000	0.0000	0.0000	-1.2069	-1.2098	-1.1453	-1.6153	0.0000	-0.6201	-0.6233
GLHV	243	1.0100	0.0000	0.0000	0.0000	0.6290	0.4587	0.3158	0.0000	0.0000	0.3232	0.2363
STAB	244	1.0100	0.0000	0.0000	0.0000	0.6290	0.4587	0.3158	0.0000	0.0000	0.3232	0.2363
CHPX1	245	1.0100	0.0000	0.0000	0.0000	-0.0014	-0.0010	-0.0007	0.0000	0.0000	-0.0007	-0.0005
CFGC1	246	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-3.7955	0.0000	0.0000	0.0000
CFGC2	247	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	6.4334	0.0000	0.0000	0.0000
CFGC3	248	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-1.5251	0.0000	0.0000	0.0000
CFGC4	249	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.4520	0.0000	0.0000	0.0000
CFGC5	250	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-2.6235	0.0000	0.0000	0.0000

DATE 7- 9-79 PROJECT NUMBER.
ARO, INC.
AEDC DIVISION
A SVERDRUP CORPORATION COMPANY
ENGINE TEST FACILITY
ARNOLD AIR FORCE STATION, TENN

TEST CELL.
TEST ARTICLE. AGM-109
TEST ARTICLE S/N.

TEST DATE. 0- 0- 0 0 HRS
COMP DATE. 7- 9-79 1030 HRS
COMP RUN. OFF LINE
PROGRAM.

TEST. 0001
TEST 001

DATA POINT. 204201

(Flt Cond 4, Concl.)

INFLUENCE COEFFICIENT

INDEP	ITNO	PER	FGA	FGC
			314	335
CCV8A3	234	1.0100	0.0124	0.0000
CCV8A4	235	1.0100	0.1961	-0.0000
CCV8A5	236	1.0100	-0.1508	0.0000
A6	237	1.0100	0.0754	-0.0211
A16	238	1.0100	-0.0757	0.0212
P5UNE	239	1.0100	-0.5896	-0.8316
QLHV	243	1.0100	0.1625	0.0000
ETAB	244	1.0100	-0.1625	-0.0000
CNPX1	245	1.0100	-0.0004	0.0000
CFGC1	246	1.0100	0.0000	-1.9540
CFGC2	247	1.0100	0.0000	3.3120
CFGC3	248	1.0100	0.0000	-0.7851
CFGC4	249	1.0100	0.0000	1.7772
CFGC5	250	1.0100	0.0000	-1.3501

DATE 7- 9-79 PROJECT NUMBER.
ARO, INC.
AEDC DIVISION
A SVERDRUP CORPORATION COMPANY
ENGINE TEST FACILITY
ARNOLD AIR FORCE STATION, TENN

TEST CELL.
TEST ARTICLE. AGM-109
TEST ARTICLE S/N.

TEST DATE. 0- 0- 0 0 HRS
COMP DATE. 7- 9-79 1027 HRS
COMP RUN. OFF LINE
PROGRAM.

TEST. 0001
TEST 001

DATA POINT. 205201

(Flt Cond 5: 8,000 ft/Mach 0.75)

INFLUENCE COEFFICIENT

INDEP	ITNO	PER	VO 251	WA 257	FN1 326	FNM 327	FNE 328	FNA 329	FNC 330	FG1 265	FGM 268	FGE 290
CDPQ1	194	1.0100	-0.0303	-0.0000	0.0034	0.0306	0.0304	0.0307	0.0307	-0.0136	-0.0000	-0.0000
CDPQ2	195	1.0100	-0.0096	-0.0000	0.0011	0.0097	0.0096	0.0098	0.0098	-0.0043	-0.0000	-0.0000
CDPQ3	196	1.0100	0.0267	0.0000	-0.0030	-0.0269	-0.0267	-0.0270	-0.0271	0.0120	0.0000	0.0000
XNZ	197	1.0100	-0.0096	-0.0000	0.0011	0.0097	0.0096	0.0098	0.0098	-0.0043	-0.0000	-0.0000
GWT	198	1.0100	-0.0096	-0.0000	0.0011	0.0097	0.0096	0.0098	0.0098	-0.0043	-0.0000	-0.0000
KIR	199	1.0100	-0.0468	0.0000	0.0477	0.0473	0.0469	0.0475	0.0475	0.0000	0.0000	0.0000
TTO	201	1.0100	0.4988	-0.9601	-3.5996	-0.2598	-0.5076	-1.0361	0.4574	-2.0182	-0.3635	-0.4868
PSO	202	1.0100	-0.3923	0.6817	0.7268	0.7287	0.7617	0.8314	-0.4627	0.5047	0.5066	0.5239
PTODSO	203	1.0100	0.4295	0.3183	0.2698	-0.2815	-0.2611	-0.2352	-0.8346	0.5117	0.2365	0.2446
CWAC1	204	1.0100	0.0000	-0.0860	0.1297	-0.0416	-0.0462	-0.0834	-0.0844	0.0208	-0.0639	-0.0661
CWAC2	205	1.0100	0.0000	0.9629	-1.4657	0.4660	0.5167	0.9357	-0.9454	-0.2400	0.7157	0.7401
CWAC3	206	1.0100	0.0000	-0.0154	0.0232	-0.0074	-0.0083	-0.0149	0.0151	-0.0037	-0.0114	-0.0118
XN1	207	1.0100	0.0000	0.9323	-1.4187	0.4512	0.5003	0.9059	-0.9153	-0.2322	0.6930	0.7166
CETAR1	208	1.0100	0.0000	0.8857	1.9136	0.4381	0.4750	0.5586	-1.1312	1.3948	0.6581	0.6806
CETAR2	209	1.0100	0.0000	0.3623	0.7829	0.1751	0.1945	0.2296	-0.4531	0.5706	0.2692	0.2785
CETAR3	210	1.0100	0.0000	-0.2480	-0.5358	-0.1199	-0.1332	-0.1580	0.3025	-0.3906	-0.1843	-0.1907
A8	211	1.0100	0.0000	0.0000	2.0190	0.0000	0.0000	0.0000	0.0000	1.0000	0.0000	0.0000
CFGP1	212	1.0100	0.0000	0.0000	10.5369	0.0000	0.0000	0.0000	0.0000	5.2190	0.0000	0.0000
CFGP2	213	1.0100	0.0000	0.0000	-23.4536	0.0000	0.0000	0.0000	0.0000	-11.6167	0.0000	0.0000
CFGP3	214	1.0100	0.0000	0.0000	16.0963	0.0000	0.0000	0.0000	0.0000	7.9726	0.0000	0.0000
XN2	215	1.0100	0.0000	0.0000	8.9000	0.0000	0.0000	0.0000	0.0000	4.4082	0.0000	0.0000
CCVSM1	216	1.0100	0.0000	0.0000	0.0000	1.9954	0.0000	0.0000	0.0000	0.0000	0.9925	0.0000
CCVSM2	217	1.0100	0.0000	0.0000	0.0000	-0.0015	0.0000	0.0000	0.0000	0.0000	-0.0008	0.0000
CCVSM3	218	1.0100	0.0000	0.0000	0.0000	0.0167	0.0000	0.0000	0.0000	0.0000	0.0083	0.0000
P6	219	1.0100	0.0000	0.0000	0.0000	0.6070	0.5036	0.7138	1.8632	0.0000	0.3019	0.2515
P16	220	1.0100	0.0000	0.0000	0.0000	0.4137	0.5459	0.4723	1.1871	0.0000	0.2057	0.2726
T6	222	1.0100	0.0000	0.0000	0.0000	-0.3766	-0.0027	0.3960	0.0000	0.0000	-0.1873	-0.0013
ETAT	224	1.0100	0.0000	0.0000	0.0000	0.0364	0.0068	0.0630	0.0000	0.0000	0.0181	0.0034
P3	225	1.0100	0.0000	0.0000	0.0000	-0.1503	-0.0267	-0.2644	0.0000	0.0000	-0.0747	-0.0133
BLOSS	226	1.0100	0.0000	0.0000	0.0000	0.1508	0.0304	0.2597	0.0000	0.0000	0.0750	0.0152
NFP4	227	1.0100	0.0000	0.0000	0.0000	-0.1659	-0.0297	-0.2920	0.0000	0.0000	-0.0825	-0.0148
WF	228	1.0100	0.0000	0.0000	0.0000	0.6845	0.4983	0.3672	0.0000	0.0000	0.3405	0.2488
CCVSE1	229	1.0100	0.0000	0.0000	0.0000	0.0000	1.9680	0.0000	0.0000	0.0000	0.0000	0.9828
CCVSE2	230	1.0100	0.0000	0.0000	0.0000	0.0000	0.0138	0.0000	0.0000	0.0000	0.0000	-0.0069
CCVSE3	231	1.0100	0.0000	0.0000	0.0000	0.0000	0.0207	0.0000	0.0000	0.0000	0.0000	0.0103
CCVSA1	232	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	1.7749	0.0000	0.0000	0.0000	0.0000
CCVSA2	233	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	0.1366	0.0000	0.0000	0.0000	0.0000

DATE 7- 9-79 PROJECT NUMBER,
ARO, INC.
AEDC DIVISION
A SVERDRUP CORPORATION COMPANY
ENGINE TEST FACILITY
ARNOLD AIR FORCE STATION, TENN

TEST DATE, 0- 0- 0 0 HRS TEST, 0001 DATA POINT, 305201
TEST CELL, COMP DATE, 7- 9-79 1027 HRS
TEST ARTICLE, AGM-109 COMP RUN, OFF LINE TEST 001 (Flt Cond 5, Cont.)
TEST ARTICLE S/N, PROGRAM,

INFLUENCE COEFFICIENT

INDEP	ITNO	PER	FGA 314	FGC 315
CDPQ1	194	1.0100	-0.0000	0.0000
CDPQ2	195	1.0100	-0.0000	0.0000
CDPQ3	196	1.0100	0.0000	0.0000
XNT	197	1.0100	-0.0000	0.0000
GWT	198	1.0100	-0.0000	0.0000
ETR	199	1.0100	-0.0000	0.0000
TTO	201	1.0100	-0.7491	-0.0078
PSO	202	1.0100	0.5571	-0.0852
PTODEO	203	1.0100	0.2604	-0.0369
CWAC1	204	1.0100	-0.0847	-0.0014
CWAC2	205	1.0100	0.9494	0.0158
CWAC3	206	1.0100	-0.0151	-0.0003
XN1	207	1.0100	0.9192	0.0153
CETAR1	208	1.0100	0.7223	-0.1163
CETAR2	209	1.0100	0.2965	-0.0424
CETAR3	210	1.0100	-0.2023	0.0252
A8	211	1.0100	0.0000	0.0000
CFGP1	212	1.0100	0.0000	0.0000
CFGP2	213	1.0100	0.0000	0.0000
CFGP3	214	1.0100	0.0000	0.0000
XN2	215	1.0100	0.0000	0.0000
CCV8N1	216	1.0100	0.0000	0.0000
CCV8N2	217	1.0100	0.0000	0.0000
CCV8N3	218	1.0100	0.0000	0.0000
P6	219	1.0100	0.3544	0.9247
P16	220	1.0100	0.2344	0.5892
T6	222	1.0100	0.1966	0.0000
ETAT	224	1.0100	0.0313	0.0000
P3	225	1.0100	-0.1313	0.0000
BLOSS	226	1.0100	0.1289	0.0000
MFP4	227	1.0100	-0.1449	0.0000
NE	228	1.0100	0.1823	0.0000
CCV8E1	229	1.0100	0.0000	0.0000
CCV8E2	230	1.0100	0.0000	0.0000
CCV8E3	231	1.0100	0.0000	0.0000
CCV8A1	232	1.0100	0.8811	0.0000
CCV8A2	233	1.0100	0.0678	0.0000

DATE 7- 9-79 PROJECT NUMBER.
ARO, INC.
AEDC DIVISION
A SVERDRUP CORPORATION COMPANY
ENGINE TEST FACILITY
ARNOLD AIR FORCE STATION, TENN

TEST CELL. TEST DATE. 0- 0- 0 0 HRS TEST. 0001 DATA POINT. 205201
COMP DATE. 7- 9-79 1030 HRS
TEST ARTICLE. AGM-109 COMP RUN. OFF LINE TEST 001 (Flt Cond 5, Cont.)
TEST ARTICLE S/N. PROGRAM.

INFLUENCE COEFFICIENT

INDEP	ITNO	PER	VO 251	WA 257	FN1 326	FNM 327	FNE 328	FNA 329	FRC 330	FG1 265	FGN 268	FGE 290
CCVGA3	234	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	0.0330	0.0000	0.0000	0.0000	0.0000
CCVGA4	235	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	0.4387	0.0000	0.0000	0.0000	0.0000
CCVGA5	236	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	-0.3589	0.0000	0.0000	0.0000	0.0000
A6	237	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	-0.1613	-0.0268	0.0000	0.0000	0.0000
A16	238	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	-0.1617	0.0268	0.0000	0.0000	0.0000
PSSNE	239	1.0100	0.0000	0.0000	0.0000	-1.0431	-1.0539	-0.9313	-0.8651	-0.0000	-0.5181	-0.5263
GLHV	243	1.0100	0.0000	0.0000	0.0000	0.6928	0.4959	0.3633	0.0000	0.0000	0.3446	0.2476
ETAB	244	1.0100	0.0000	0.0000	0.0000	0.6928	0.4959	0.3633	0.0000	0.0000	0.3446	0.2476
CNFX1	245	1.0100	0.0000	0.0000	0.0000	-0.0012	-0.0009	-0.0006	0.0000	0.0000	-0.0006	-0.0004
CFGC1	246	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-3.4726	0.0000	0.0000	0.0000
CFGC2	247	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	6.7309	0.0000	0.0000	0.0000
CFGC3	248	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-1.8354	0.0000	0.0000	0.0000
CFGC4	249	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.4165	0.0000	0.0000	0.0000
CFGC5	250	1.0100	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-2.8244	0.0000	0.0000	0.0000

DATE 7- 9-79 PROJECT NUMBER.
ARO, INC.
AEDC DIVISION
A SVERDRUP CORPORATION COMPANY
ENGINE TEST FACILITY
ARNOLD AIR FORCE STATION, TENN

TEST CELL.
TEST ARTICLE. AGM-109
TEST ARTICLE S/N.

TEST DATE. 0- 0- 0 0 HRS
COMP DATE. 7- 9-79 1030 HRS
COMP RUN. OFF LINE
PROGRAM.

TEST. 0001
TEST 001

DATA POINT. 205201

(Flt Cond 5, Concl.)

INFLUENCE COEFFICIENT

INDEP	ITNO	PER	FGA	FGC
			314	335
CCVBA3	234	1.0100	0.0164	0.0000
CCVBA4	235	1.0100	-0.3128	0.0000
CCVBA5	236	1.0100	-0.1782	0.0000
A6	237	1.0100	0.0800	-0.0133
A16	238	1.0100	-0.0803	0.0133
PSSME	239	1.0100	-0.4623	-0.4294
QLHV	243	1.0100	0.1804	0.0000
STAB	244	1.0100	-0.1804	0.0000
CHFX1	245	1.0100	-0.0003	0.0000
CFGC1	246	1.0100	0.0000	-1.7234
CFGC2	247	1.0100	0.0000	3.3404
CFGC3	248	1.0100	0.0000	-0.8109
CFGC4	249	1.0100	0.0000	1.6956
CFGC5	250	1.0100	0.0000	-1.4017

NOMENCLATURE

A8	Exhaust nozzle exit area
B	Bias error, total
b	Bias error, elemental
BLOSS	Burner loss
CDPQ1,2,3	Constants in DELPO correction equation
CV8A	Nozzle velocity coefficient based on the area-weighted, single-stream analysis
CV8E	Nozzle velocity coefficient based on the mass-weighted, single-stream analysis
CV8M	Nozzle velocity coefficient based on the mass-weighted, dual-stream analysis
DELPO	A flight measurement of the differential between free-stream total and static pressure
EG	Flight generator voltage
EP	Engine performance (computer program)
ETAB	Combustion efficiency
ETAR	Inlet pressure recovery (ram recovery)
ETAT	Turbine efficiency
FG	Gross thrust
FGC	Corrected gross thrust
FGP	Gross thrust parameter
FN	Net thrust
GWT	Vehicle gross weight

gc	Gravitational constant
H	Altitude
HPX	Horsepower extraction
IC	Influence coefficient (computer program)
IG	Flight generator current
LHV	Lower heating value of fuel
MFP4	High-pressure turbine flow parameter
MO	Flight Mach number
N1	Low-pressure rotor speed
N1C	Corrected low-pressure rotor speed
N2	High-pressure rotor speed
N2C	Corrected high-pressure rotor speed
NPR	Nozzle pressure ratio
P	Total pressure
PCM	Pulse code modulated
PLA	Power lever setting
PS	Static pressure
RPR	Ram pressure ratio
S	Precision error, total
s	Precision error, elemental
T	Total temperature
T_{95}	Ninety-fifth percentile point of the two-tailed Student's "t" distribution
TS	Static temperature

U	Uncertainty
V	Velocity
WA	Engine airflow
WAC	Corrected engine airflow
WBL	Low-pressure bleed airflow
WF	Fuel flow
XKTR	Temperature recovery factor
XNZ	Acceleration factor

Prefix

C	Curve fit coefficient

Suffixes

2,3.6,8.13, 16,22,23	Engine station locations
CDPX	Compressor discharge pressure transducer
CV8M, CV8E, CV8A	Nozzle velocity coefficients
EPX	LP turbine exhaust pressure transducer
FGC	Corrected gross thrust
FGP	Gross thrust parameter
FM	Fuel at flowmeter
I	Inlet cavity
NE	Nozzle exit lip
O	Free-stream condition
WAC	Corrected engine airflow